

UNIT 1

NUMBER SYSTEM

(A) Main Concepts and Results

(i) Knowing our Numbers

- Large numbers upto one crore
- Reading and writing of large numbers
- Comparing large numbers
- Indian System of Numeration
- International System of Numeration
- Use of large numbers
- Estimation of numbers
- Use of brackets
- Roman numerals

(ii) Whole Numbers

- Natural numbers
- Predecessor and successor of a natural number
- Whole numbers: The natural numbers along with zero form the collection of whole numbers.
- Representation of whole numbers on the number line
- Addition and subtraction of whole numbers on the number line
- Properties of whole numbers :
Closure property

Commutativity of addition and multiplication

Associativity of addition multiplication

Distributivity of multiplication over addition

Identities for addition and multiplication

- Division of a whole number by zero is not defined
- Patterns in whole numbers

(iii) Playing with Numbers

- Factors and multiples
- Number of factors of a given number is finite
- Number of multiples of a given number is infinite
- Perfect number: A number for which sum of all its factors is equal to twice the number.
- Prime and composite numbers
- Tests for divisibility of numbers by 2, 3, 4, 5, 6, 8, 9 and 11
- Common factors and common multiples
- Coprime numbers
- More divisibility rules :
 - ♦ Product of two consecutive whole numbers is divisible by 2
 - ♦ If a number is divisible by another number, then it is divisible by each of the factors of that number.
 - ♦ If a number is divisible by two coprime numbers, then it is divisible by their product also.
 - ♦ If two given numbers are divisible by a number, then their sum is also divisible by that number.
 - ♦ If two given numbers are divisible by a number, then their difference is also divisible by that number.
- Prime factorisation of a number:
- Highest Common Factor (HCF) of two or more numbers
- Least Common Multiple (LCM) of two or more numbers
- Use of HCF and LCM in problems of day to day life.

(B) Solved Examples

In examples 1 to 7, write the correct answer from the given four options:

Example 1: $3 \times 10000 + 0 \times 1000 + 8 \times 100 + 0 \times 10 + 7 \times 1$ is same as

- (A) 30087 (B) 30807 (C) 3807 (D) 3087

Solution: Correct answer is (B).

Example 2: 1 billion is equal to

- (A) 100 millions (B) 10 millions
(C) 1000 lakhs (D) 10000 lakhs

Solution: Correct answer is (D).

Example 3: Which of the following numbers in Roman Numerals is incorrect?

- (A) LXII (B) XCI (C) LC (D) XLIV

Solution: Correct answer is (C).

Example 4: Which of the following is not defined?

- (A) $5 + 0$ (B) $5 - 0$ (C) 5×0 (D) $5 \div 0$

Solution: Correct answer is (D).

Example 5: The product of a non-zero whole number and its successor is always divisible by

- (A) 2 (B) 3 (C) 4 (D) 5

Solution: Correct answer is (A).

Example 6: The number of factors of 36 is

- (A) 6 (B) 7 (C) 8 (D) 9

Solution: Correct answer is (D).

Example 7: The sum of first three common multiples of 3, 4 and 9 is

- (A) 108 (B) 144 (C) 252 (D) 216

Solution: Correct answer is (D).

In examples 8 to 10, fill in the blanks to make the statements true:

Example 8: In Indian System of Numeration, the number 61711682 is written, using commas, as _____.

Solution: 6,17,11,682

Example 9: The smallest 4 digit number with different digits is _____.

Solution: 1023

Example 10: Numbers having more than two factors are called _____ numbers.

Solution: Composite

In examples 11 to 13, state whether the given statements are true or false:

Example 11: The number 58963 rounded off to nearest hundred is 58900.

Solution: False.

Example 12: LXXV is greater than LXXIV.

Solution: True [LXXV = 75, LXXIV = 74]

Example 13: If a number is divisible by 2 and 3, then it is also divisible by 6. So, if a number is divisible by 2 and 4, it must be divisible by 8.

Solution: False [2 and 4 are not coprimes]

Example 14: Population of Agra and Aligarh districts in the year 2001 was 36,20,436 and 29,92,286, respectively. What was the total population of the two districts in that year?

Solution: In 2001 Population of Agra = 3620436

Population of Aligarh = 2992286

Total population = 3620436 + 2992286 = 66,12,722

Example 15: Estimate the product 5981×4428 by rounding off each number to the nearest (i) tens (ii) hundreds

Solution: (i) 5981 rounded off to nearest tens = 5980

4428 rounded off to nearest tens = 4430

The estimated product = $5980 \times 4430 = 26491400$

(ii) 5981 rounded off to nearest hundreds = 6000

4428 rounded off to nearest hundreds = 4400

The estimated product = 6000×4400

$$= 26400000$$

Example 16: Find the product 8739×102 using distributive property.

Solution:

$$\begin{aligned} 8739 \times 102 &= 8739 \times (100 + 2) \\ &= 8739 \times 100 + 8739 \times 2 \\ &= 873900 + 17478 \\ &= 891378 \end{aligned}$$

Example 17: Floor of a room measures 4.5 metres $\times$ 3 metres. Find the minimum number of complete square marble slabs of equal size required to cover the entire floor.

Solution: To find the minimum number of square slabs to cover the floor, we have to find the greatest size of each such slab. For this purpose, we have to find the HCF of 450 and 300 .

(Since $4.5\text{m} = 450\text{cm}$ and $3\text{m} = 300\text{cm}$)

Now HCF of 450 and $300 = 150$

So the required size of the slab must be $150\text{cm} \times 150\text{cm}$.

Hence, the number of slabs required = $\frac{\text{Area of the floor}}{\text{Area of one slab}}$

$$= \frac{450 \times 300}{150 \times 150} = 6$$

(C) Exercise

In questions 1 to 38, out of the four options, only one is correct. Write the correct answer.

- The product of the place values of two 2's in 428721 is
(A) 4 (B) 40000 (C) 400000 (D) 40000000
- $3 \times 10000 + 7 \times 1000 + 9 \times 100 + 0 \times 10 + 4$ is the same as
(A) 3794 (B) 37940 (C) 37904 (D) 379409

3. If 1 is added to the greatest 7- digit number, it will be equal to
(A) 10 thousand (B) 1 lakh (C) 10 lakh (D) 1 crore
4. The expanded form of the number 9578 is
(A) $9 \times 10000 + 5 \times 1000 + 7 \times 10 + 8 \times 1$
(B) $9 \times 1000 + 5 \times 100 + 7 \times 10 + 8 \times 1$
(C) $9 \times 1000 + 57 \times 10 + 8 \times 1$
(D) $9 \times 100 + 5 \times 100 + 7 \times 10 + 8 \times 1$
5. When rounded off to nearest thousands, the number 85642 is
(A) 85600 (B) 85700 (C) 85000 (D) 86000
6. The largest 4-digit number, using any one digit twice, from digits 5, 9, 2 and 6 is
(A) 9652 (B) 9562 (C) 9659 (D) 9965
7. In Indian System of Numeration, the number 58695376 is written as
(A) 58,69, 53, 76 (B) 58,695,376
(C) 5,86,95,376 (D) 586,95,376
8. One million is equal to
(A) 1 lakh (B) 10 lakh (C) 1 crore (D) 10 crore
9. The greatest number which on rounding off to nearest thousands gives 5000, is
(A) 5001 (B) 5559 (C) 5999 (D) 5499
10. Keeping the place of 6 in the number 6350947 same, the smallest number obtained by rearranging other digits is
(A) 6975430 (B) 6043579 (C) 6034579 (D) 6034759
11. Which of the following numbers in Roman numerals is incorrect?
(A) LXXX (B) LXX (C) LX (D) LLX
12. The largest 5-digit number having three different digits is
(A) 98978 (B) 99897 (C) 99987 (D) 98799

- 13.** The smallest 4-digit number having three different digits is
 (A) 1102 (B) 1012 (C) 1020 (D) 1002
- 14.** Number of whole numbers between 38 and 68 is
 (A) 31 (B) 30 (C) 29 (D) 28
- 15.** The product of successor and predecessor of 999 is
 (A) 999000 (B) 998000 (C) 989000 (D) 1998
- 16.** The product of a non-zero whole number and its successor is always
 (A) an even number (B) an odd number
 (C) a prime number (D) divisible by 3
- 17.** A whole number is added to 25 and the same number is subtracted from 25. The sum of the resulting numbers is
 (A) 0 (B) 25 (C) 50 (D) 75
- 18.** Which of the following is not true?
 (A) $(7 + 8) + 9 = 7 + (8 + 9)$
 (B) $(7 \times 8) \times 9 = 7 \times (8 \times 9)$
 (C) $7 + 8 \times 9 = (7 + 8) \times (7 + 9)$
 (D) $7 \times (8 + 9) = (7 \times 8) + (7 \times 9)$
- 19.** By using dot (.) patterns, which of the following numbers can be arranged in all the three ways namely a line, a triangle and a rectangle?
 (A) 9 (B) 10 (C) 11 (D) 12
- 20.** Which of the following statements is not true?
 (A) Both addition and multiplication are associative for whole numbers.
 (B) Zero is the identity for multiplication of whole numbers.
 (C) Addition and multiplication both are commutative for whole numbers.
 (D) Multiplication is distributive over addition for whole numbers.

- 21.** Which of the following statements is not true?
(A) $0 + 0 = 0$ (B) $0 - 0 = 0$ (C) $0 \times 0 = 0$ (D) $0 \div 0 = 0$
- 22.** The predecessor of 1 lakh is
(A) 99000 (B) 99999 (C) 999999 (D) 100001
- 23.** The successor of 1 million is
(A) 2 millions (B) 1000001 (C) 100001 (D) 10001
- 24.** Number of even numbers between 58 and 80 is
(A) 10 (B) 11 (C) 12 (D) 13
- 25.** Sum of the number of primes between 16 to 80 and 90 to 100 is
(A) 20 (B) 18 (C) 17 (D) 16
- 26.** Which of the following statements is not true?
(A) The HCF of two distinct prime numbers is 1
(B) The HCF of two co prime numbers is 1
(C) The HCF of two consecutive even numbers is 2
(D) The HCF of an even and an odd number is even.
- 27.** The number of distinct prime factors of the largest 4-digit number is
(A) 2 (B) 3 (C) 5 (D) 11
- 28.** The number of distinct prime factors of the smallest 5-digit number is
(A) 2 (B) 4 (C) 6 (D) 8
- 29.** If the number $7254*98$ is divisible by 22, the digit at * is
(A) 1 (B) 2 (C) 6 (D) 0
- 30.** The largest number which always divides the sum of any pair of consecutive odd numbers is
(A) 2 (B) 4 (C) 6 (D) 8
- 31.** A number is divisible by 5 and 6. It may not be divisible by
(A) 10 (B) 15 (C) 30 (D) 60

- 32.** The sum of the prime factors of 1729 is
 (A) 13 (B) 19 (C) 32 (D) 39
- 33.** The greatest number which always divides the product of the predecessor and successor of an odd natural number other than 1, is
 (A) 6 (B) 4 (C) 16 (D) 8
- 34.** The number of common prime factors of 75, 60, 105 is
 (A) 2 (B) 3 (C) 4 (D) 5
- 35.** Which of the following pairs is not coprime?
 (A) 8, 10 (B) 11, 12 (C) 1, 3 (D) 31, 33
- 36.** Which of the following numbers is divisible by 11?
 (A) 1011011 (B) 1111111 (C) 2222222 (D) 3333333
- 37.** LCM of 10, 15 and 20 is
 (A) 30 (B) 60 (C) 90 (D) 180
- 38.** LCM of two numbers is 180. Then which of the following is not the HCF of the numbers?
 (A) 45 (B) 60 (C) 75 (D) 90

In questions 39 to 98 state whether the given statements are true (T) or false (F).

- 39.** In Roman numeration, a symbol is not repeated more than three times.
- 40.** In Roman numeration, if a symbol is repeated, its value is multiplied as many times as it occurs.
- 41.** $5555 = 5 \times 1000 + 5 \times 100 + 5 \times 10 + 5 \times 1$
- 42.** $39746 = 3 \times 10000 + 9 \times 1000 + 7 \times 100 + 4 \times 10 + 6$
- 43.** $82546 = 8 \times 1000 + 2 \times 1000 + 5 \times 100 + 4 \times 10 + 6$
- 44.** $532235 = 5 \times 100000 + 3 \times 10000 + 2 \times 1000 + 2 \times 100 + 3 \times 10 + 5$

- 45.** XXIX = 31
- 46.** LXXIV = 74
- 47.** The number LIV is greater than LVI.
- 48.** The numbers 4578, 4587, 5478, 5487 are in descending order.
- 49.** The number 85764 rounded off to nearest hundreds is written as 85700.
- 50.** Estimated sum of 7826 and 12469 rounded off to hundreds is 20,000.
- 51.** The largest six digit telephone number that can be formed by using digits 5, 3, 4, 7, 0, 8 only once is 875403.
- 52.** The number 81652318 will be read as eighty one crore six lakh fifty two thousand three hundred eighteen.
- 53.** The largest 4-digit number formed by the digits 6, 7, 0, 9 using each digit only once is 9760.
- 54.** Among kilo, milli and centi, the smallest is centi.
- 55.** Successor of a one digit number is always a one digit number.
- 56.** Successor of a 3-digit number is always a 3-digit number.
- 57.** Predecessor of a two digit number is always a two digit number.
- 58.** Every whole number has its successor.
- 59.** Every whole number has its predecessor.
- 60.** Between any two natural numbers, there is one natural number.
- 61.** The smallest 4-digit number is the successor of the largest 3-digit number.
- 62.** Of the given two natural numbers, the one having more digits is greater.
- 63.** Natural numbers are closed under addition.
- 64.** Natural numbers are not closed under multiplication.
- 65.** Natural numbers are closed under subtraction.

66. Addition is commutative for natural numbers.
67. 1 is the identity for addition of whole numbers.
68. 1 is the identity for multiplication of whole numbers.
69. There is a whole number which when added to a whole number, gives the number itself.
70. There is a natural number which when added to a natural number, gives the number itself.
71. If a whole number is divided by another whole number, which is greater than the first one, the quotient is not equal to zero.
72. Any non-zero whole number divided by itself gives the quotient 1.
73. The product of two whole numbers need not be a whole number.
74. A whole number divided by another whole number greater than 1 never gives the quotient equal to the former.
75. Every multiple of a number is greater than or equal to the number.
76. The number of multiples of a given number is finite.
77. Every number is a multiple of itself.
78. Sum of two consecutive odd numbers is always divisible by 4.
79. If a number divides three numbers exactly, it must divide their sum exactly.
80. If a number exactly divides the sum of three numbers, it must exactly divide the numbers separately.
81. If a number is divisible both by 2 and 3, then it is divisible by 12.
82. A number with three or more digits is divisible by 6, if the number formed by its last two digits (i.e., ones and tens) is divisible by 6.
83. A number with 4 or more digits is divisible by 8, if the number formed by the last three digits is divisible by 8.
84. If the sum of the digits of a number is divisible by 3, then the number itself is divisible by 9.

85. All numbers which are divisible by 4 may not be divisible by 8.
86. The Highest Common Factor of two or more numbers is greater than their Lowest Common Multiple.
87. LCM of two or more numbers is divisible by their HCF.
88. LCM of two numbers is 28 and their HCF is 8.
89. LCM of two or more numbers may be one of the numbers.
90. HCF of two or more numbers may be one of the numbers.
91. Every whole number is the successor of another whole number.
92. Sum of two whole numbers is always less than their product.
93. If the sum of two distinct whole numbers is odd, then their difference also must be odd.
94. Any two consecutive numbers are coprime.
95. If the HCF of two numbers is one of the numbers, then their LCM is the other number.
96. The HCF of two numbers is smaller than the smaller of the numbers.
97. The LCM of two numbers is greater than the larger of the numbers.
98. The LCM of two coprime numbers is equal to the product of the numbers.

In questions 99 to 151, fill in the blanks to make the statements true.

99. (a) 10 million = ____ crore.
(b) 10 lakh = ____ million.
100. (a) 1 metre = ____ millimetres.
(b) 1 centimetre = ____ millimetres.
(c) 1 kilometre = ____ millimetres.
101. (a) 1 gram = ____ milligrams.
(b) 1 litre = ____ millilitres.
(c) 1 kilogram = ____ milligrams.

- 102.** 100 thousands = ____ lakh.
- 103.** Height of a person is 1m 65cm. His height in millimetres is_____.
- 104.** Length of river 'Narmada' is about 1290km. Its length in metres is_____.
- 105.** The distance between Sringar and Leh is 422km. The same distance in metres is_____.
- 106.** Writing of numbers from the greatest to the smallest is called an arrangement in ____ order.
- 107.** By reversing the order of digits of the greatest number made by five different non-zero digits, the new number is the ____ number of five digits.
- 108.** By adding 1 to the greatest____ digit number, we get ten lakh.
- 109.** The number five crore twenty three lakh seventy eight thousand four hundred one can be written, using commas, in the Indian System of Numeration as ____.
- 110.** In Roman Numeration, the symbol X can be subtracted from____, M and C only.
- 111.** The number 66 in Roman numerals is_____.
- 112.** The population of Pune was 2,538,473 in 2001. Rounded off to nearest thousands, the population was _____.
- 113.** The smallest whole number is_____.
- 114.** Successor of 106159 is _____.
- 115.** Predecessor of 100000 is_____.
- 116.** 400 is the predecessor of _____.
- 117.** _____ is the successor of the largest 3 digit number.
- 118.** If 0 is subtracted from a whole number, then the result is the _____ itself .
- 119.** The smallest 6 digit natural number ending in 5 is _____.

- 120.** Whole numbers are closed under _____ and under _____.
- 121.** Natural numbers are closed under _____ and under _____.
- 122.** Division of a whole number by _____ is not defined.
- 123.** Multiplication is distributive over _____ for whole numbers.
- 124.** $2395 \times \underline{\hspace{1cm}} = 6195 \times 2395$
- 125.** $1001 \times 2002 = 1001 \times (1001 + \underline{\hspace{1cm}})$
- 126.** $10001 \times 0 = \underline{\hspace{1cm}}$
- 127.** $2916 \times \underline{\hspace{1cm}} = 0$
- 128.** $9128 \times \underline{\hspace{1cm}} = 9128$
- 129.** $125 + (68 + 17) = (125 + \underline{\hspace{1cm}}) + 17$
- 130.** $8925 \times 1 = \underline{\hspace{1cm}}$
- 131.** $19 \times 12 + 19 = 19 \times (12 + \underline{\hspace{1cm}})$
- 132.** $24 \times 35 = 24 \times 18 + 24 \times \underline{\hspace{1cm}}$
- 133.** $32 \times (27 \times 19) = (32 \times \underline{\hspace{1cm}}) \times 19$
- 134.** $786 \times 3 + 786 \times 7 = \underline{\hspace{1cm}}$
- 135.** $24 \times 25 = 24 \times \underline{\hspace{1cm}}$
- 136.** A number is a _____ of each of its factor.
- 137.** _____ is a factor of every number.
- 138.** The number of factors of a prime number is _____.
- 139.** A number for which the sum of all its factors is equal to twice the number is called a _____ number.
- 140.** The numbers having more than two factors are called _____ numbers.
- 141.** 2 is the only _____ number which is even.
- 142.** Two numbers having only 1 as a common factor are called _____ numbers.

- 143.** Number of primes between 1 to 100 is ____.
- 144.** If a number has ____ in ones place, then it is divisible by 10.
- 145.** A number is divisible by 5, if it has ____ or ____ in its ones place.
- 146.** A number is divisible by ____ if it has any of the digits 0, 2, 4, 6, or 8 in its ones place.
- 147.** If the sum of the digits in a number is a ____ of 3, then the number is divisible by 3.
- 148.** If the difference between the sum of digits at odd places (from the right) and the sum of digits at even places (from the right) of a number is either 0 or divisible by ____, then the number is divisible by 11.
- 149.** The LCM of two or more given numbers is the lowest of their common ____.
- 150.** The HCF of two or more given numbers is the highest of their common ____.
- 151.** Given below are two columns – Column I and Column II. Match each item of Column I with the corresponding item of Column II.

Column I	Column II
(i) The difference of two consecutive whole numbers	(a) odd
(ii) The product of two non-zero consecutive whole numbers	(b) 0
(iii) Quotient when zero is divided by another non-zero whole number	(c) 3
(iv) 2 added three times, to the smallest whole number	(d) 1
(v) Smallest odd prime number	(e) 6 (f) even

- 152.** Arrange the following numbers in descending order:
8435, 4835, 13584, 5348, 25843
- 153.** Of the following numbers which is the greatest? Which is the smallest
38051425, 30040700, 67205602
- 154.** Write in expanded form :
(a) 74836
(b) 574021
(c) 8907010
- 155.** As per the census of 2001, the population of four states are given below. Arrange the states in ascending and descending order of their population.
- | | |
|--------------------|-----------|
| (a) Maharashtra | 96878627 |
| (b) Andhra Pradesh | 76210007 |
| (c) Bihar | 82998509 |
| (d) Uttar Pradesh | 166197921 |
- 156.** The diameter of Jupiter is 142800000 metres. Insert commas suitably and write the diameter according to International System of Numeration.
- 157.** India's population has been steadily increasing from 439 millions in 1961 to 1028 millions in 2001. Find the total increase in population from 1961 to 2001. Write the increase in population in Indian System of Numeration, using commas suitably.
- 158.** Radius of the Earth is 6400km and that of Mars is 4300000m. Whose radius is bigger and by how much?
- 159.** In 2001, the populations of Tripura and Meghalaya were 3,199,203 and 2,318,822, respectively. Write the populations of these two states in words.
- 160.** In a city, polio drops were given to 2,12,583 children on Sunday in March 2008 and to 2,16,813 children in the next month. Find the difference of the number of children getting polio drops in the two months.

- 161.** A person had Rs 1000000 with him. He purchased a colour T.V. for Rs 16580, a motor cycle for Rs 45890 and a flat for Rs 870000. How much money was left with him?
- 162.** Out of 180000 tablets of Vitamin A, 18734 are distributed among the students in a district. Find the number of the remaining vitamin tablets.
- 163.** Chinmay had Rs 610000. He gave Rs 87500 to Jyoti, Rs 126380 to Javed and Rs 350000 to John. How much money was left with him?
- 164.** Find the difference between the largest number of seven digits and the smallest number of eight digits.
- 165.** A mobile number consists of ten digits. The first four digits of the number are 9, 9, 8 and 7. The last three digits are 3, 5 and 5. The remaining digits are distinct and make the mobile number, the greatest possible number. What are these digits?
- 166.** A mobile number consists of ten digits. First four digits are 9,9,7 and 9. Make the smallest mobile number by using only one digit twice from 8, 3, 5, 6, 0.
- 167.** In a five digit number, digit at ten's place is 4, digit at unit's place is one fourth of ten's place digit, digit at hundred's place is 0, digit at thousand's place is 5 times of the digit at unit's place and ten thousand's place digit is double the digit at ten's place. Write the number.
- 168.** Find the sum of the greatest and the least six digit numbers formed by the digits 2, 0, 4, 7, 6, 5 using each digit only once.
- 169.** A factory has a container filled with 35874 litres of cold drink. In how many bottles of 200 ml capacity each can it be filled?
- 170.** The population of a town is 450772. In a survey, it was reported that one out of every 14 persons is illiterate. In all how many illiterate persons are there in the town?
- 171.** Find the LCM of 80, 96, 125, 160.

- 172.** Make the greatest and the smallest 5-digit numbers using different digits in which 5 appears at ten's place.
- 173.** How many grams should be added to 2kg 300g to make it 5kg 68g?
- 174.** A box contains 50 packets of biscuits each weighing 120g. How many such boxes can be loaded in a van which cannot carry beyond 900kg?
- 175.** How many lakhs make five billions?
- 176.** How many millions make 3 crores?
- 177.** Estimate each of the following by rounding off each number to nearest hundreds:
- (a) $874 + 478$
 - (b) $793 + 397$
 - (c) $11244 + 3507$
 - (d) $17677 + 13589$
- 178.** Estimate each of the following by rounding off each number to nearest tens:
- (a) $11963 - 9369$
 - (b) $76877 - 7783$
 - (c) $10732 - 4354$
 - (d) $78203 - 16407$
- 179.** Estimate each of the following products by rounding off each number to nearest tens:
- (a) 87×32
 - (b) 311×113
 - (c) 3239×28
 - (d) 1385×789
- 180.** The population of a town was 78787 in the year 1991 and 95833 in the year 2001. Estimate the increase in population by rounding off each population to nearest hundreds.

- 181.** Estimate the product 758×6784 using the general rule.
- 182.** A garment factory produced 216315 shirts, 182736 trousers and 58704 jackets in a year. What is the total production of all the three items in that year?
- 183.** Find the LCM of 160, 170 and 90.
- 184.** A vessel has 13litres 200mL of fruit juice. In how many glasses each of capacity 60mL can it be filled?
- 185.** Determine the sum of the four numbers as given below:
 - (a) successor of 32
 - (b) predecessor of 49
 - (c) predecessor of the predecessor of 56
 - (d) successor of the successor of 67
- 186.** A loading tempo can carry 482 boxes of biscuits weighing 15kg each, whereas a van can carry 518 boxes each of the same weight. Find the total weight that can be carried by both the vehicles.
- 187.** In the marriage of her daughter, Leela spent Rs 216766 on food and decoration, Rs 122322 on jewellery, Rs 88234 on furniture and Rs 26780 on kitchen items. Find the total amount spent by her on the above items.
- 188.** A box contains 5 strips having 12 capsules of 500mg medicine in each capsule. Find the total weight in grams of medicine in 32 such boxes.
- 189.** Determine the least number which when divided by 3, 4 and 5 leaves remainder 2 in each case.
- 190.** A merchant has 120 litres of oil of one kind, 180 litres of another kind and 240 litres of a third kind. He wants to sell the oil by filling the three kinds of oil in tins of equal capacity. What should be the greatest capacity of such a tin?
- 191.** Find a 4-digit odd number using each of the digits 1, 2, 4 and 5 only once such that when the first and the last digits are interchanged, it is divisible by 4.

- 192.** Using each of the digits 1, 2, 3 and 4 only once, determine the smallest 4-digit number divisible by 4.
- 193.** Fatima wants to mail three parcels to three village schools. She finds that the postal charges are Rs 20, Rs 28 and Rs 36, respectively. If she wants to buy stamps only of one denomination, what is the greatest denomination of stamps she must buy to mail the three parcels?
- 194.** Three brands A, B and C of biscuits are available in packets of 12, 15 and 21 biscuits respectively. If a shopkeeper wants to buy an equal number of biscuits, of each brand, what is the minimum number of packets of each brand, he should buy?
- 195.** The floor of a room is 8m 96cm long and 6m 72cm broad. Find the minimum number of square tiles of the same size needed to cover the entire floor.
- 196.** In a school library, there are 780 books of English and 364 books of Science. Ms. Yakang, the librarian of the school wants to store these books in shelves such that each shelf should have the same number of books of each subject. What should be the minimum number of books in each shelf?
- 197.** In a colony of 100 blocks of flats numbering 1 to 100, a school van stops at every sixth block while a school bus stops at every tenth block. On which stops will both of them stop if they start from the entrance of the colony?
- 198.** Test the divisibility of following numbers by 11
(a) 5335 (b) 9020814
- 199.** Using divisibility tests, determine which of the following numbers are divisible by 4?
(a) 4096 (b) 21084 (c) 31795012
- 200.** Using divisibility test, determine which of the following numbers are divisible by 9?
(a) 672 (b) 5652

UNIT 2

GEOMETRY

(A) Main Concepts and Results

- A **line segment** corresponds to the shortest distance between two points. The line segment joining points A and B is denoted as $\overline{AB}$ or as $\overline{BA}$. A ray with initial point A and a point B on it is denoted as $\overrightarrow{AB}$. Line AB is denoted as $\overleftrightarrow{AB}$.
- Two distinct lines in a plane that cross at a point are called **intersecting lines**, otherwise they are called **parallel lines**.
- Two rays with a common initial point form an **angle**.
- A simple closed curve made of line segments only is called a **polygon**.
- A polygon of three sides is called a **triangle** and that of four sides is called a **quadrilateral**.
- A polygon with all its sides equal and all its angles equal is called a **regular polygon**.
- A figure, every point of which is equidistant from a fixed point is called a **circle**. The fixed point is called its **centre** and the equal distance is called its **radius**.

(B) Solved Examples

In examples 1 and 2, write the correct answer from the given four options.

Example 1: The number of diagonals of a pentagon is
(A) 3 (B) 4 (C) 5 (D) 10

Solution: Correct answer is (C).

Example 2: The number of diagonals of a triangle is
(A) 0 (B) 1 (C) 2 (D) 3

Solution: Correct answer is (A).

In examples 3 and 4, fill in the blanks to make the statements true:

Example 3: A polygon of six sides is called a _____.

Solution: Hexagon

Example 4: A triangle with all its sides of unequal lengths is called a _____ triangle.

Solution: Scalene

In examples 5 to 7, state whether the statements are true or false.

Example 5: Two non-parallel line segments will always intersect.

Solution: False (Hint: They will intersect, when they are produced)

Example 6: All equilateral triangles are isosceles also.

Solution: True

Example 7: Angle of 0° is an acute angle.

Solution: False [Hint: Measure of acute angle is between 0° and 90°]

Example 8: In Fig. 2.1, $PQ \perp AB$ and $PO = OQ$. Is PQ the perpendicular bisector of line segment AB? Why or why not?

Solution: PQ is not the perpendicular bisector of line segment AB, because $AO \neq BO$. [Note: AB is the perpendicular bisector of line segment PQ].

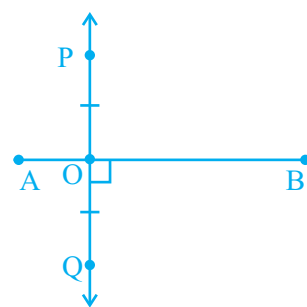


Fig. 2.1

Example 9: In Fig. 2.2, if $AC \perp BD$, then name all the right angles.

Solution: There are four right angles. They are: $\angle APD$, $\angle APB$, $\angle BPC$ and $\angle CPD$.

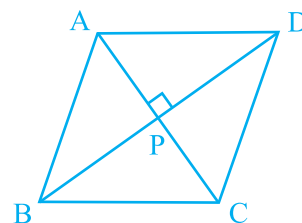


Fig. 2.2

Example 10: Is ABCD of Fig. 2.3 a polygon? If yes, what is the special name for it?

Solution: Yes, it is a polygon, because it is a simple closed figure made of line segments only. It is a quadrilateral.

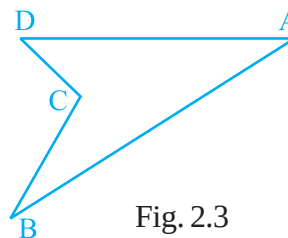


Fig. 2.3

Example 11: In Fig. 2.4, BCDE is a square and a 3D shape has been formed by joining the point A in space with the vertices B, C, D and E. Name the 3D shape and also its (i) vertices, (ii) edges and (iii) faces.

Solution: The 3D shape formed is a square pyramid.

- (i) Vertices are A, B, C, D and E.
- (ii) Edges are AB, AC, AD, AE, BC, CD, DE and EB.
- (iii) Faces are: square BCDE and triangles ABC, ACD, ADE and ABE.

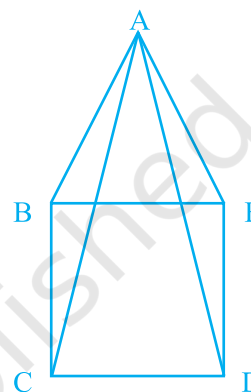


Fig. 2.4

Example 12 : Write the measure of smaller angle formed by the hour and the minute hands of a clock at 7 O' clock. Also, write the measure of the other angle and also state what types of angles these are.

Solution : Measure of the required angle = $30^\circ + 30^\circ + 30^\circ + 30^\circ + 30^\circ = 150^\circ$

Measure of the other angle = $360^\circ - 150^\circ = 210^\circ$

Angle of measure 150° is an obtuse angle and that of 210° is a reflex angle.

(C) Exercise

In each of the questions 1 to 16, out of four options only one is correct. Write the correct answer.

1. Number of lines passing through five points such that no three of them are collinear is

(A) 10 (B) 5 (C) 20 (D) 8

2. The number of diagonals in a septagon is

(A) 21 (B) 42 (C) 7 (D) 14

3. Number of line segments in Fig. 2.5 is

(A) 5 (B) 10 (C) 15 (D) 20



Fig. 2.5

4. Measures of the two angles between hour and minute hands of a clock at 9 O' clock are

(A) 60° , 300° (B) 270° , 90° (C) 75° , 285° (D) 30° , 330°

5. If a bicycle wheel has 48 spokes, then the angle between a pair of two consecutive spokes is

(A) $\left(5\frac{1}{2}\right)$ (B) $\left(7\frac{1}{2}\right)$ (C) $\left(\frac{2}{11}\right)$ (D) $\left(\frac{2}{15}\right)$

6. In Fig. 2.6, $\angle XYZ$ cannot be written as

(A) $\angle Y$ (B) $\angle ZXY$
(C) $\angle ZYX$ (D) $\angle XYP$

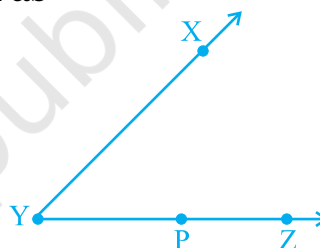


Fig. 2.6

7. In Fig 2.7, if point A is shifted to point B along the ray PX such that $PB = 2PA$, then the measure of $\angle BPY$ is

(A) greater than 45° (B) 45°
(C) less than 45° (D) 90°

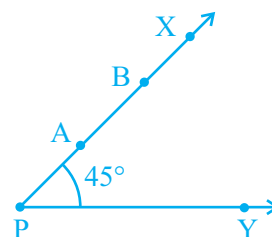


Fig. 2.7

8. The number of angles in Fig. 2.8 is

(A) 3 (B) 4
(C) 5 (D) 6

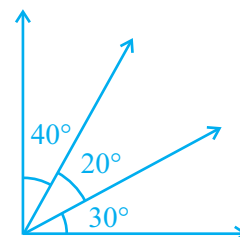


Fig. 2.8

9. The number of obtuse angles in Fig. 2.9 is

- (A) 2 (B) 3
(C) 4 (D) 5

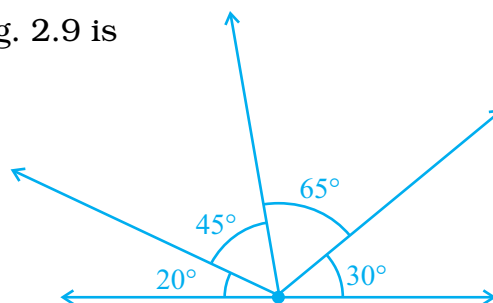


Fig. 2.9

10. The number of triangles in Fig. 2.10 is

- (A) 10 (B) 12
(C) 13 (D) 14

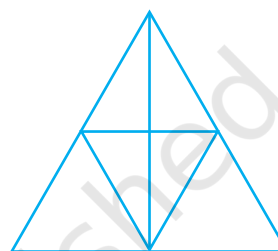


Fig. 2.10

11. If the sum of two angles is greater than 180° , then which of the following is not possible for the two angles?

- (A) One obtuse angle and one acute angle
(B) One reflex angle and one acute angle
(C) Two obtuse angles
(D) Two right angles.

12. If the sum of two angles is equal to an obtuse angle, then which of the following is not possible?

- (A) One obtuse angle and one acute angle.
(B) One right angle and one acute angle.
(C) Two acute angles.
(D) Two right angles.

13. A polygon has prime number of sides. Its number of sides is equal to the sum of the two least consecutive primes. The number of diagonals of the polygon is

- (A) 4 (B) 5 (C) 7 (D) 10

14. In Fig. 2.11, $AB = BC$ and $AD = BD = DC$.

The number of isoscles triangles in the figure is

- (A) 1 (B) 2
(C) 3 (D) 4

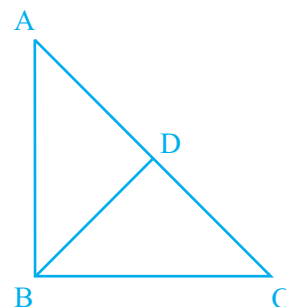


Fig. 2.11

15. In Fig. 2.12,

$\angle BAC = 90^\circ$ and $AD \perp BC$.

The number of right triangles in the figure is

- (A) 1 (B) 2
(C) 3 (D) 4

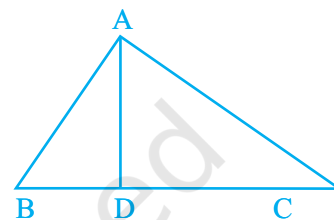


Fig. 2.12

16. In Fig. 2.13, $PQ \perp RQ$, $PQ = 5$ cm and $QR = 5$ cm. Then ΔPQR is

- (A) a right triangle but not isosceles
(B) an isosceles right triangle
(C) isosceles but not a right triangle
(D) neither isosceles nor right triangle

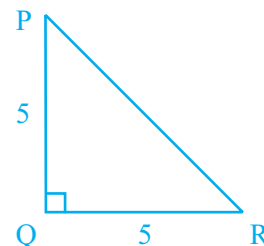


Fig. 2.13

In questions 17 to 31, fill in the blanks to make the statements true:

17. An angle greater than 180° and less than a complete angle is called _____.
18. The number of diagonals in a hexagon is _____.
19. A pair of opposite sides of a trapezium are _____.
20. In Fig. 2.14, points lying in the interior of the triangle PQR are _____, that in the exterior are _____ and that on the triangle itself are _____.

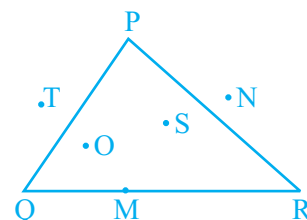


Fig. 2.14

- 21.** In Fig. 2.15, points A, B, C, D and E are collinear such that $AB = BC = CD = DE$. Then

- $AD = AB + \underline{\hspace{2cm}}$
- $AD = AC + \underline{\hspace{2cm}}$
- mid point of AE is $\underline{\hspace{2cm}}$
- mid point of CE is $\underline{\hspace{2cm}}$
- $AE = \underline{\hspace{2cm}} \times AB$.



Fig. 2.15

- 22.** In Fig. 2.16,

- $\angle AOD$ is a/an $\underline{\hspace{2cm}}$ angle
- $\angle COA$ is a/an $\underline{\hspace{2cm}}$ angle
- $\angle AOE$ is a/an $\underline{\hspace{2cm}}$ angle

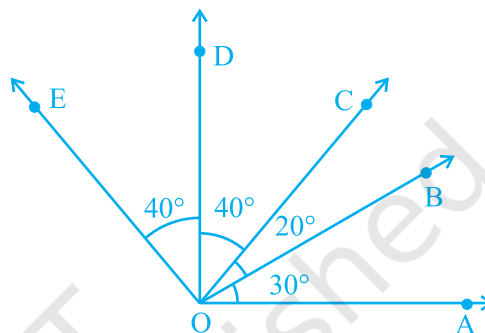


Fig. 2.16

- 23.** The number of triangles in Fig. 2.17 is $\underline{\hspace{2cm}}$.

Their names are $\underline{\hspace{4cm}}$.

- 24.** Number of angles less than 180° in Fig. 2.17 is $\underline{\hspace{2cm}}$ and their names are $\underline{\hspace{4cm}}$.

- 25.** The number of straight angles in Fig. 2.17 is $\underline{\hspace{2cm}}$.

- 26.** The number of right angles in a straight angle is $\underline{\hspace{2cm}}$ and that in a complete angle is $\underline{\hspace{2cm}}$.

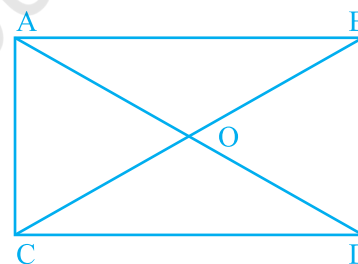


Fig. 2.17

- 27.** The number of common points in the two angles marked in Fig. 2.18 is $\underline{\hspace{2cm}}$.

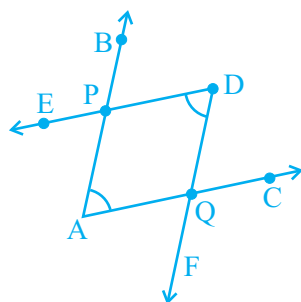


Fig. 2.18

28. The number of common points in the two angles marked in Fig. 2.19 is _____.

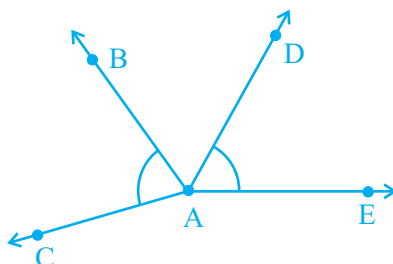


Fig. 2.19

29. The number of common points in the two angles marked in Fig. 2.20 _____.

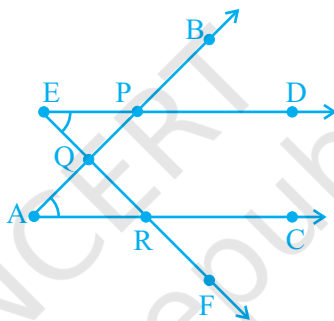


Fig. 2.20

30. The number of common points in the two angles marked in Fig. 2.21 is _____.

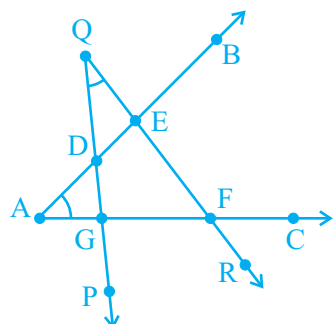


Fig. 2.21

- 31.** The common part between the two angles BAC and DAB in Fig. 2.22 is _____.

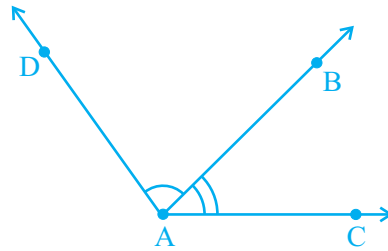


Fig. 2.22

State whether the statements given in questions 32 to 41 are true (T) or false (F):

- 32.** A horizontal line and a vertical line always intersect at right angles.
33. If the arms of an angle on the paper are increased, the angle increases.
34. If the arms of an angle on the paper are decreased, the angle decreases.
35. If line $PQ \parallel$ line m , then line segment $PQ \parallel$ m
36. Two parallel lines meet each other at some point.
37. Measures of $\angle ABC$ and $\angle CBA$ in Fig. 2.23 are the same.

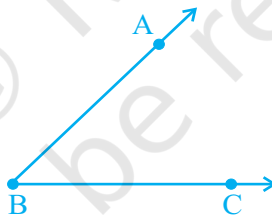


Fig. 2.23

- 38.** Two line segments may intersect at two points.
39. Many lines can pass through two given points.
40. Only one line can pass through a given point.
41. Two angles can have exactly five points in common.
42. Name all the line segments in Fig. 2.24.



Fig. 2.24

43. Name the line segments shown in Fig. 2.25.

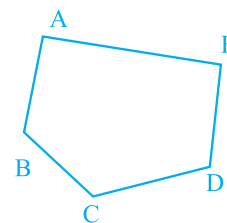


Fig. 2.25

44. State the mid points of all the sides of Fig. 2.26.

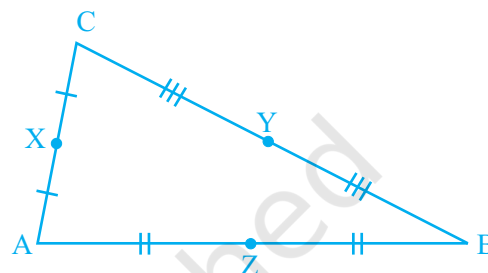


Fig. 2.26

45. Name the vertices and the line segments in Fig. 2.27.

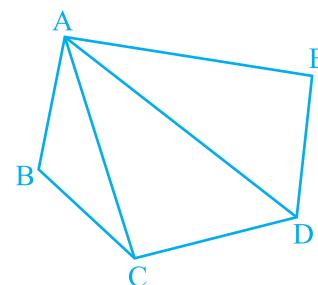


Fig. 2.27

46. Write down fifteen angles (less than 180°) involved in Fig. 2.28.

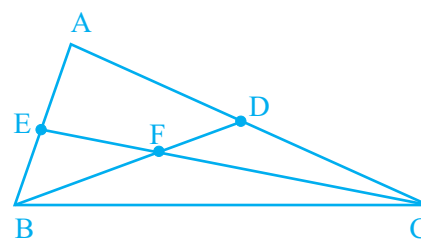


Fig. 2.28

47. Name the following angles of Fig. 2.29, using three letters:

- (a) $\angle 1$
- (b) $\angle 2$
- (c) $\angle 3$
- (d) $\angle 1 + \angle 2$
- (e) $\angle 2 + \angle 3$
- (f) $\angle 1 + \angle 2 + \angle 3$
- (g) $\angle CBA - \angle 1$

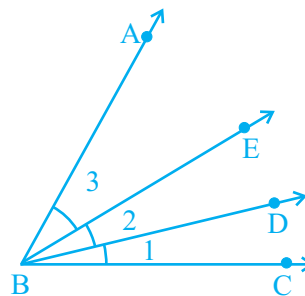


Fig. 2.29

48. Name the points and then the line segments in each of the following figures (Fig. 2.30):

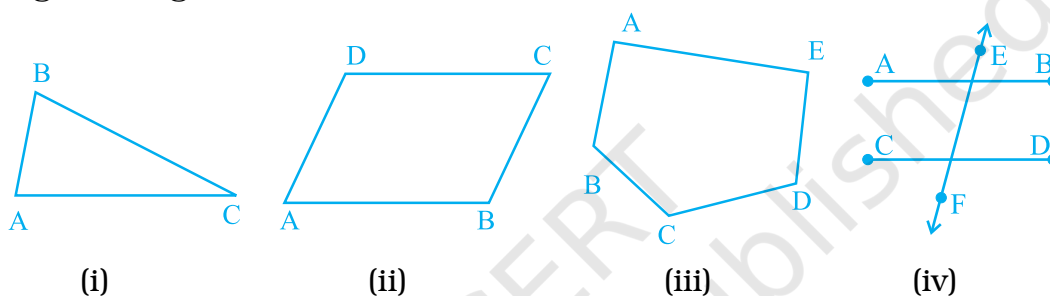


Fig. 2.30

49. Which points in Fig. 2.31, appear to be mid-points of the line segments? When you locate a mid-point, name the two equal line segments formed by it.

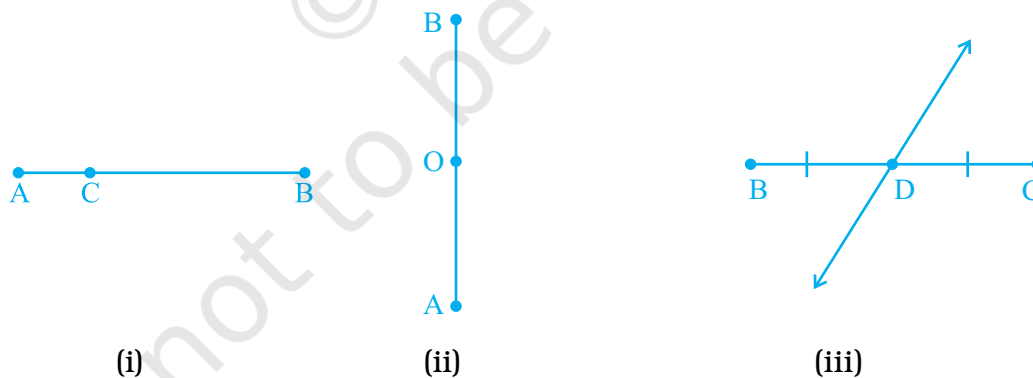


Fig. 2.31

50. Is it possible for the same

- (a) line segment to have two different lengths?
- (b) angle to have two different measures?

51. Will the measure of $\angle ABC$ and of $\angle CBD$ make measure of $\angle ABD$ in Fig. 2.32?

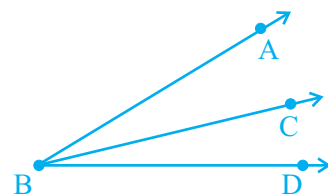


Fig. 2.32

52. Will the lengths of line segment AB and line segment BC make the length of line segment AC in Fig. 2.33?



Fig. 2.33

53. Draw two acute angles and one obtuse angle without using a protractor. Estimate the measures of the angles. Measure them with the help of a protractor and see how much accurate is your estimate.

54. Look at Fig. 2.34. Mark a point

- A which is in the interior of both $\angle 1$ and $\angle 2$.
- B which is in the interior of only $\angle 1$.
- Point C in the interior of $\angle 1$.

Now, state whether points B and C lie in the interior of $\angle 2$ also.

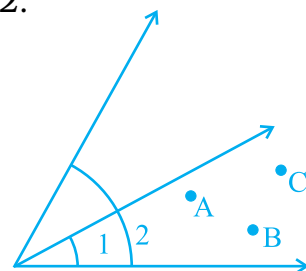


Fig. 2.34

55. Find out the incorrect statement, if any, in the following:

An angle is formed when we have

- two rays with a common end-point
- two line segments with a common end-point
- a ray and a line segment with a common end-point

56. In which of the following figures (Fig. 2.35),

- perpendicular bisector is shown?

- (b) bisector is shown?
- (c) only bisector is shown?
- (d) only perpendicular is shown?

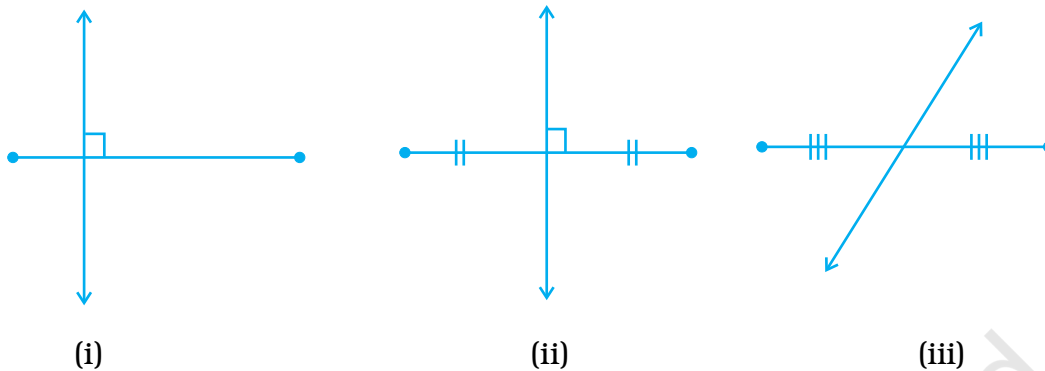


Fig. 2.35

57. What is common in the following figures (i) and (ii) (Fig. 2.36.)?

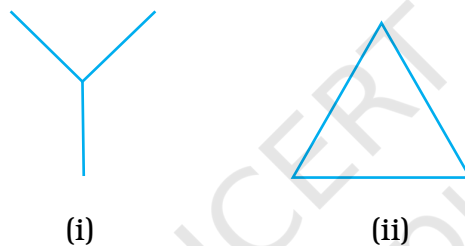


Fig. 2.36

Is Fig. 2.36 (i) that of triangle? if not, why?

58. If two rays intersect, will their point of intersection be the vertex of an angle of which the rays are the two sides?

59. In Fig. 2.37,

- (a) name any four angles that appear to be acute angles.
- (b) name any two angles that appear to be obtuse angles.

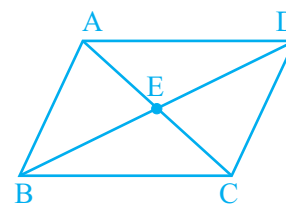


Fig. 2.37

60. In Fig. 2.38,

- (a) is $AC + CB = AB$?
- (b) is $AB + AC = CB$?
- (c) is $AB + BC = CA$?



Fig. 2.38

61. In Fig. 2.39,

- (a) What is $AE + EC$?
- (b) What is $AC - EC$?
- (c) What is $BD - BE$?
- (d) What is $BD - DE$?

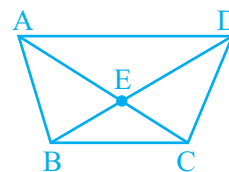
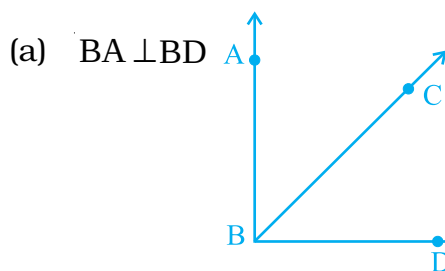
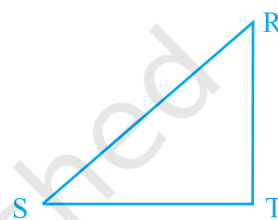


Fig. 2.39

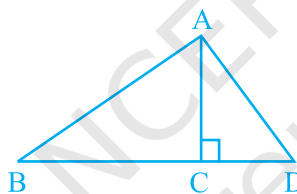
62. Using the information given, name the right angles in each part of Fig. 2.40:



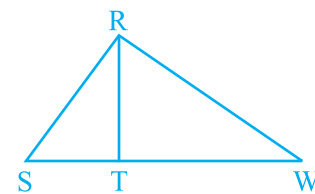
(b) $RT \perp ST$



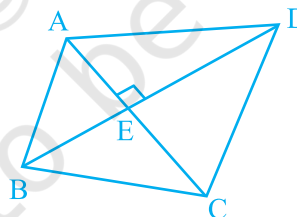
(c) $AC \perp BD$



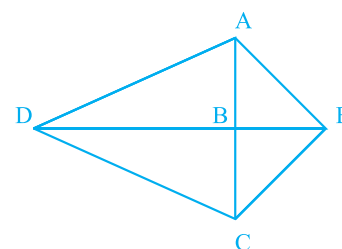
(d) $RS \perp RW$



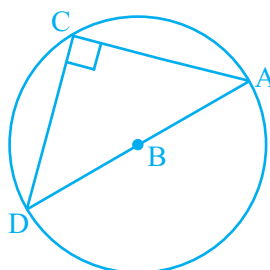
(e) $AC \perp BD$



(f) $AE \perp CE$



(g) $AC \perp CD$



(h) $OP \perp AB$

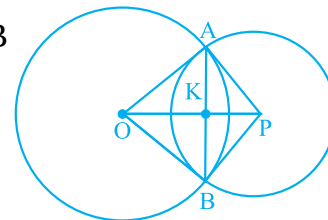
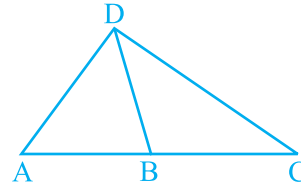


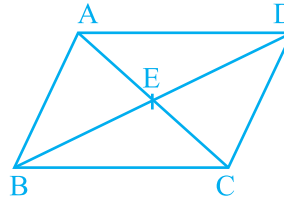
Fig. 2.40

63. What conclusion can be drawn from each part of Fig. 2.41, if

(a) DB is the bisector of $\angle ADC$?



(b) BD bisects $\angle ABC$?



(c) DC is the bisector of $\angle ADB$, $CA \perp DA$ and $CB \perp DB$?

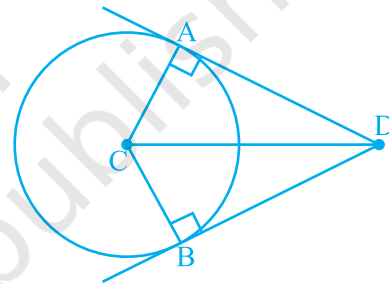


Fig. 2.41

64. An angle is said to be trisected, if it is divided into three equal parts. If in Fig. 2.42, $\angle BAC = \angle CAD = \angle DAE$, how many trisectors are there for $\angle BAE$?

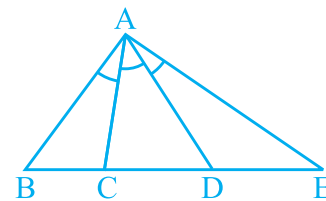


Fig. 2.42

65. How many points are marked in Fig. 2.43?



Fig. 2.43

66. How many line segments are there in Fig. 2.43?

67. In Fig. 2.44, how many points are marked? Name them.

68. How many line segments are there in Fig. 2.44? Name them.



Fig. 2.44

69. In Fig. 2.45 how many points are marked? Name them.

70. In Fig. 2.45 how many line segments are there? Name them.



Fig. 2.45

71. In Fig. 2.46, how many points are marked? Name them.

72. In Fig. 2.46 how many line segments are there? Name them.



Fig. 2.46

73. In Fig. 2.47, O is the centre of the circle.

(a) Name all chords of the circle.

(b) Name all radii of the circle.

(c) Name a chord, which is not the diameter of the circle.

(d) Shade sectors OAC and OPB.

(e) Shade the smaller segment of the circle formed by CP.

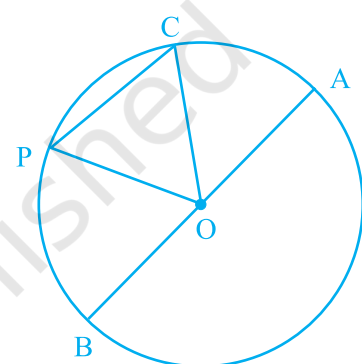


Fig. 2.47

74. Can we have two acute angles whose sum is

(a) an acute angle? Why or why not?

(b) a right angle? Why or why not?

(c) an obtuse angle? Why or why not?

(d) a straight angle? Why or why not?

(e) a reflex angle? Why or why not?

75. Can we have two obtuse angles whose sum is

(a) a reflex angle? Why or why not?

(b) a complete angle? Why or why not?

76. Write the name of

(a) vertices (b) edges, and

(c) faces of the prism shown in Fig. 2.48.

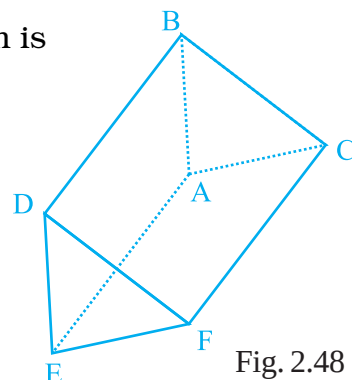


Fig. 2.48

77. How many edges, faces and vertices are there in a sphere?
78. Draw all the diagonals of a pentagon ABCDE and name them.

(D) Activities

Activity 1: Observe questions 65 to 72. Can you find out the number of line segments, when the number of points marked on line segment is 7?, 9?, 10?.

Activity 2: Copy the equilateral $\triangle ABC$ shown in Fig. 2.49 on your notebook.

- Take a point P as shown in the figure.
- Draw $PD \perp BC$, $PE \perp CA$ and $PF \perp AB$
- Also, draw $AK \perp BC$

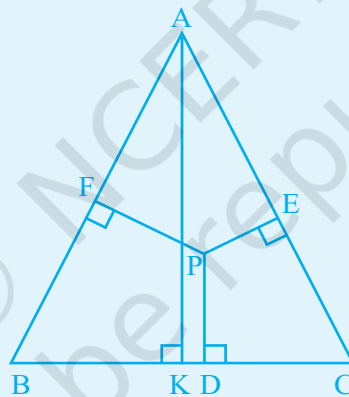


Fig. 2.49

Now, draw a line l , measure PD using a divider and ruler and mark it on line l as shown Fig. 2. 50.



Fig. 2.50

Again measure PE with divider and mark it on the line l as DE (say). Again measure PF with divider and mark it on line l next to E as EF.

Now check whether the length of AK and the length $(PD + DE + EF)$ are the same!

Activity 3: Copy the isosceles triangle ABC shown in Fig. 2.51 on your notebook. Take a point E on BC and draw $EF \perp CA$ and $EG \perp AB$. Measure EF and EG and add them.

Draw $AD \perp BC$.

Check whether the sum of EF and EG is equal to AD with the help of ruler or with the help of divider.

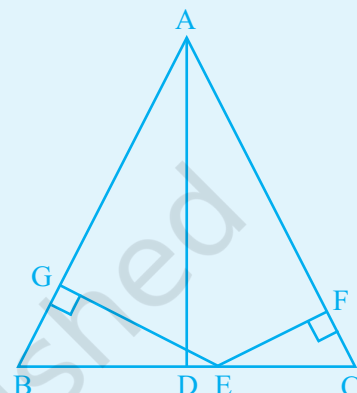


Fig. 2.51

Rough Work

© NCERT
not to be republished

Rough Work

© NCERT
not to be republished

UNIT 3

INTEGERS

(A) Main Concepts and Results

- The collection of numbers $0, +1, -1, +2, -2, +3, -3, \dots$ is called **integers**.
- The numbers $+1, +2, +3, +4, \dots$ are referred to as **positive integers**.
- The numbers $-1, -2, -3, -4, \dots$ are referred to as **negative integers**.
- The numbers $0, +1, +2, +3, \dots$ are called **non-negative integers**.
- The integers are represented on the number line as follows :



Fig. 3.1

- All the positive integers lie to the right of 0 and the negative integers to the left of 0 on the number line.
- All non negative integers are the same as whole numbers and hence all the operations on them are done as in the case of whole numbers.
- To add two negative integers, we add the corresponding positive integers and retain the negative sign with the sum.
- To add a positive integer and a negative integer, we ignore the signs and subtract integer with smaller numerical value from the integer with larger numerical value and take the sign of the larger one.
- Two integers whose sum is zero are called **additive inverses** of each other. They are also called the **negatives** of each other.

- Additive inverse of an integer is obtained by changing the sign of the integer. For example, the additive inverse of +5 is -5 and the additive inverse of -3 is +3.
- To subtract an integer from a given integer, we add the additive inverse of the integer to the given integer.
- To compare two integers on the number line, we locate their positions on the number line and the integer lying to the right of the other is always greater.

(B) Solved Examples

Example 1: Write the correct answer from the given four options:

Sania and Trapi visited Leh and Tawang respectively during winter. Sania reported that she had experienced -4°C on Sunday, while Trapi reported that she had experienced -2°C on that day. On that Sunday

- (A) Leh was cooler than Tawang.
- (B) Leh was hotter than Tawang.
- (C) Leh was as cool as Tawang.
- (D) Tawang was cooler than Leh.

Solution: The correct answer is (A).

Example 2: State whether each of the following statements is true or false:

- (a) Every positive integer is greater than 0.
- (b) Every integer is either positive or negative.

Solution: (a) True (b) False

Example 3: Fill in the blank using $<$, $>$ or $=$ to make the statement correct

$$3 + (-2) \quad \underline{\hspace{1cm}} \quad 3 + (-3)$$

Solution : $3 + (-2) > 3 + (-3)$

Example 4: Represent the following using integers with proper sign:

- (a) 3 km above sea level (b) A loss of Rs 500

Solution: (a) +3
(b) -500

Example 5: Find the sum of the pairs of integers:

- (a) -6, -4 (b) +3, -4 (c) +4, -2

Solution: (a) -6 and -4 both have negative signs.

$$\text{So, } -6 + (-4) = -(6 + 4) = -10$$

(b) +3 and -4 have opposite signs.

$$\text{As } 4 - 3 = 1, \text{ therefore } +3 + (-4) = -1$$

(c) +4 and -2 have opposite signs.

$$\text{So, } 4 + (-2) = 4 - 2 = 2$$

Example 6: Find the sum of -2 and -3, using the number line.

Solution: To add -2 and -3, on the number line, we first move 2 steps to the left of 0, reaching -2. Then we move 3 steps to the left of -2 and reach -5. (Fig. 3.2)

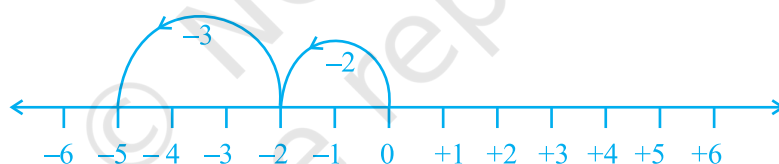


Fig. 3.2

$$\text{Thus, } -2 + (-3) = -5.$$

Example 7: Subtract : (i) 3 from -4 (ii) -3 from -4

Solution: (a) The additive inverse of 3 is -3.

$$\text{So, } -4 - 3 = -4 + (-3) = -(4 + 3) = -7$$

(b) The additive inverse of -3 is +3.

$$\text{So, } -4 - (-3) = -4 + (+3) = -1$$

Example 8: Using the number line, subtract : (a) 2 from -3

(b) -2 from -3.

Solution: (a) To subtract 2 from -3 , we move 2 steps to the left of -3 on the number line and reach -5 . (Fig. 3.3)



Fig. 3.3

So, $-3 - 2 = -5$.

(b) To subtract -2 from -3 , we observe that 2 is the additive inverse of -2 .

So, we add 2 to -3 using the number line and reach at -1 .

So, $-3 - (-2) = -3 + (+2) = -1$

Example 9: How many integers are there between -9 and -2 ?

Solution: The integers $-8, -7, -6, -5, -4$ and -3 lie between -9 and -2 . So, there are six integers between -9 and -2 .

Example 10: Calculate:

$$1 - 2 + 3 - 4 + 5 - 6 + 7 - 8 + 9 - 10$$

Solution:

$$\begin{aligned} &1 - 2 + 3 - 4 + 5 - 6 + 7 - 8 + 9 - 10 \\ &= (1 + 3 + 5 + 7 + 9) - (2 + 4 + 6 + 8 + 10) \\ &= 25 - 30 \\ &= -5. \end{aligned}$$

Alternatively,

$$\begin{aligned} &1 - 2 + 3 - 4 + 5 - 6 + 7 - 8 + 9 - 10 \\ &= (1 - 2) + (3 - 4) + (5 - 6) + (7 - 8) + (9 - 10) \\ &= (-1) + (-1) + (-1) + (-1) + (-1) \\ &= -5. \end{aligned}$$

Example 11: The sum of two integers is 47. If one of the integers is -24 , find the other.

Solution: As the sum is 47, the other integer is obtained by subtracting -24 from 47. So, the required integer

$$\begin{aligned} &= 47 - (-24) \\ &= 47 + 24 \\ &= 71. \end{aligned}$$

Example 12: Write the digits 0, 1, 2, 3, 4, 5, 6, 7, 8 and 9 in this order and insert '+' or '-' between them to get the result
(a) 5 (b) -3

Solution: (a) $0 + 1 - 2 + 3 - 4 + 5 - 6 + 7 - 8 + 9 = 5$
(b) $0 - 1 - 2 + 3 + 4 - 5 + 6 - 7 + 8 - 9 = -3$

Example 13: Write five distinct integers whose sum is 5.

Solution: As the required sum is 5, keep 5 as one of the integers and write two pairs of integers which are additive inverses of each other.

For example, $5 + [2 + (-2)] + [3 + (-3)] = 5$.

Thus, the required five integers are 5, 2, -2, 3, -3

There can be many combinations of five integers, such as 5, 3, -3, 6, -6 or 4, 2, 3, -3, -1 etc., whose sum is 5.

(C) Exercise

In questions 1 to 17, only one of the four options is correct. Write the correct one.

- Every integer less than 0 has the sign
(A) + (B) - (C) $\times$ (D) $\div$
- The integer '5 units to the right of 0 on the number line' is
(A) +5 (B) -5 (C) +4 (D) -4
- The predecessor of the integer -1 is
(A) 0 (B) 2 (C) -2 (D) 1
- Number of integers lying between -1 and 1 is
(A) 1 (B) 2 (C) 3 (D) 0
- Number of whole numbers lying between -5 and 5 is
(A) 10 (B) 3 (C) 4 (D) 5
- The greatest integer lying between -10 and -15 is
(A) -10 (B) -11 (C) -15 (D) -14

7. The least integer lying between -10 and -15 is
(A) -10 (B) -11 (C) -15 (D) -14
8. On the number line, the integer 5 is located
(A) to the left of 0 (B) to the right of 0
(C) to the left of 1 (D) to the left of -2
9. In which of the following pairs of integers, the first integer is not on the left of the other integer on the number line?
(A) $(-1, 10)$ (B) $(-3, -5)$ (C) $(-5, -3)$ (D) $(-6, 0)$
10. The integer with negative sign $(-)$ is always less than
(A) 0 (B) -3 (C) -1 (D) -2
11. An integer with positive sign $(+)$ is always greater than
(A) 0 (B) 1 (C) 2 (D) 3
12. The successor of the predecessor of -50 is
(A) -48 (B) -49 (C) -50 (D) -51
13. The additive inverse of a negative integer
(A) is always negative (B) is always positive
(C) is the same integer (D) zero
14. Amulya and Amar visited two places A and B respectively in Kashmir and recorded the minimum temperatures on a particular day as -4°C at A and -1°C at B. Which of the following statement is true?
(A) A is cooler than B
(B) B is cooler than A
(C) There is a difference of 2°C in the temperature
(D) The temperature at A is 4°C higher than that at B.
15. When a negative integer is subtracted from another negative integer, the sign of the result
(A) is always negative (B) is always positive
(C) is never negative (D) depends on the numerical value of the integers

- 16.** The statement “When an integer is added to itself, the sum is greater than the integer” is
- (A) always true
 - (B) never true
 - (C) true only when the integer is positive
 - (D) true for non-negative integers
- 17.** Which of the following shows the maximum rise in temperature?
- (A) 0°C to 10°C
 - (B) -4°C to 8°C
 - (C) -15°C to -8°C
 - (D) -7°C to 0°C

In questions 18 to 39, state whether the given statements are true (T) or false (F) :

- 18.** The smallest natural number is zero.
- 19.** Zero is not an integer as it is neither positive nor negative.
- 20.** The sum of all the integers between -5 and -1 is -6 .
- 21.** The successor of the integer 1 is 0 .
- 22.** Every positive integer is larger than every negative integer.
- 23.** The sum of any two negative integers is always greater than both the integers.
- 24.** The sum of any two negative integers is always smaller than both the integers.
- 25.** The sum of any two positive integers is greater than both the integers.
- 26.** All whole numbers are integers.
- 27.** All integers are whole numbers.
- 28.** Since $5 > 3$, therefore $-5 > -3$
- 29.** Zero is less than every positive integer.
- 30.** Zero is larger than every negative integer.
- 31.** Zero is neither positive nor negative.
- 32.** On the number line, an integer on the right of a given integer is always larger than the integer.

33. -2 is to the left of -5 on the number line.
34. The smallest integer is 0 .
35. 6 and -6 are at the same distance from 0 on the number line.
36. The difference between an integer and its additive inverse is always even.
37. The sum of an integer and its additive inverse is always zero.
38. The sum of two negative integers is a positive integer.
39. The sum of three different integers can never be zero.

In questions 40 to 49, fill in the blanks to make the statements true:

40. On the number line, -15 is to the _____ of zero.
41. On the number line, 10 is to the _____ of zero.
42. The additive inverse of 14 is _____.
43. The additive inverse of -1 is _____.
44. The additive inverse of 0 is _____.
45. The number of integers lying between -5 and 5 is _____.
46. $(-11) + (-2) + (-1) =$ _____.
47. _____ $+ (-11) + 111 = 130$
48. $(-80) + 0 + (-90) =$ _____
49. _____ $-3456 = -8910$

In questions 50 to 58, fill in the blanks using $<$, $=$ or $>$:

50. $(-11) + (-15)$ _____ $11 + 15$
51. $(-71) + (+9)$ _____ $(-81) + (-9)$
52. 0 _____ 1
53. -60 _____ 50
54. -10 _____ -11
55. -101 _____ -102
56. $(-2) + (-5) + (-6)$ _____ $(-3) + (-4) + (-6)$
57. 0 _____ -2
58. $1 + 2 + 3$ _____ $(-1) + (-2) + (-3)$

59. Match the items of Column I with that of Column II:

Column I	Column II
(i) The additive inverse of +2	(A) 0
(ii) The greatest negative integer	(B) -2
(iii) The greatest negative even integer	(C) 2
(iv) The smallest integer greater than every negative integer	(D) 1
(v) Sum of predecessor and successor of -1	(E) -1

60. Compute each of the following:

- (a) $30 + (-25) + (-10)$ (b) $(-20) + (-5)$
 (c) $70 + (-20) + (-30)$ (d) $-50 + (-60) + 50$
 (e) $1 + (-2) + (-3) + (-4)$ (f) $0 + (-5) + (-2)$
 (g) $0 - (-6) - (+6)$ (h) $0 - 2 - (-2)$

61. If we denote the height of a place above sea level by a positive integer and depth below the sea level by a negative integer, write the following using integers with the appropriate signs:

- (a) 200 m above sea level (b) 100 m below sea level
 (c) 10 m above sea level (d) sea level

62. Write the opposite of each of the following:

- (a) Decrease in size (b) Failure
 (c) Profit of Rs.10 (d) 1000 A.D.
 (e) Rise in water level (f) 60 km south
 (g) 10 m above the danger mark of river Ganga
 (h) 20 m below the danger mark of the river Brahmaputra
 (i) Winning by a margin of 2000 votes
 (j) Depositing Rs.100 in the Bank account
 (k) 20°C rise in temperature.

63. Temperature of a place at 12:00 noon was $+5^{\circ}\text{C}$. Temperature increased by 3°C in first hour and decreased by 1°C in the second hour. What was the temperature at 2:00 pm?

64. Write the digits 0, 1, 2, 3, ..., 9 in this order and insert '+' or '-' between them to get the result 3.
65. Write the integer which is its own additive inverse.
66. Write six distinct integers whose sum is 7.
67. Write the integer which is 4 more than its additive inverse.
68. Write the integer which is 2 less than its additive inverse.
69. Write two integers whose sum is less than both the integers.
70. Write two distinct integers whose sum is equal to one of the integers.
71. Using number line, how do you compare
- (a) two negative integers? (b) two positive integers?
 - (c) one positive and one negative integer?
72. Observe the following :
- $$1 + 2 - 3 + 4 + 5 - 6 - 7 + 8 - 9 = -5$$
- Change one '-' sign as '+' sign to get the sum 9.
73. Arrange the following integers in the ascending order :
- 2, 1, 0, -3, +4, -5
74. Arrange the following integers in the descending order :
- 3, 0, -1, -4, -3, -6
75. Write two integers whose sum is 6 and difference is also 6.
76. Write five integers which are less than -100 but greater than -150.
77. Write four pairs of integers which are at the same distance from 2 on the number line.
78. The sum of two integers is 30. If one of the integers is -42, then find the other.
79. Sum of two integers is -80. If one of the integers is -90, then find the other.

- 80.** If we are at 8 on the number line, in which direction should we move to reach the integer
- (a) -5 (b) 11 (c) 0?
- 81.** Using the number line, write the integer which is
- (a) 4 more than -5
- (b) 3 less than 2
- (c) 2 less than -2
- 82.** Find the value of
- $$49 - (-40) - (-3) + 69$$
- 83.** Subtract -5308 from the sum $[(-2100) + (-2001)]$

(D) Activities

Activity I : The faces of two dice are marked +1, +2, +3, +4, +5, +6 and -1, -2, -3, -4, -5, -6, respectively.

Two players throw the pair of dice alternately and record the sum of the numbers that turn up each time and keep adding their scores separately. The player whose score reaches 20 or more first, wins the game.

- (i) What can be the possible scores in a single throw of the pair of dice?
- (ii) What is the maximum score?
- (iii) What is the minimum score?
- (iv) A player gets his score 20 as follows:
 $(5) + (-4) + (6) + (2) + (+5) + (4) + (2)$
 Is he a winner?
- (v) What is the minimum number of throws needed to win the game?

Activity II : Repeat Activity I by taking two dice marked with numbers +1, -2, +3, -4, +5, -6 and -1, +2, -3, +4, -5, +6, respectively.

DO YOU KNOW?

- I. Indians were the first to use negative numbers. Brahmagupta used negative numbers in 628 A.D. He stated rules for operations on negative numbers. European Mathematicians of 16th and 17th century did not accept the idea of negative numbers and referred them as absurd and fiction. John Wallis believed that negative numbers were greater than infinity.
- II. The scientists believe that the lowest temperature attainable is about -273°C . At this temperature, the molecules and the atoms of a substance have the least possible energy.

UNIT 4

FRACTIONS AND DECIMALS

(A) Main Concepts and Results

- A **fraction** is a number representing a part of a whole. This whole may be a single object or a group of objects.
- A fraction whose numerator is less than the denominator is called a **proper fraction**, otherwise it is called an **improper fraction**.
- Numbers of the type $3\frac{5}{7}, 8\frac{4}{9}, 2\frac{1}{5}$ etc. are called **mixed fractions** (numbers).
- An improper fraction can be converted into a mixed fraction and vice versa.
- Fractions equivalent to a given fraction can be obtained by multiplying or dividing its numerator and denominator by a non-zero number.
- A fraction in which there is no common factor, except 1, in its numerator and denominator is called a fraction in the **simplest** or **lowest** form.
- Fractions with same denominators are called **like fractions** and if the denominators are different, then they are called **unlike fractions**.
- Fractions can be compared by converting them into like fractions and then arranging them in ascending or descending order.
- Addition (or subtraction) of like fractions can be done by adding (or subtracting) their numerators.

- Addition (or subtraction) of unlike fractions can be done by converting them into like fractions.
- Fractions with denominators 10, 100, etc. can be written in a form, using a decimal point, called **decimal numbers** or **decimals**.
- Place value of the place immediately after the decimal point (i.e. tenth place) is $\frac{1}{10}$, that of next place (i.e. hundredths place) is $\frac{1}{100}$ and so on.
- Fractions can be converted into decimals by writing them in the form with denominators 10, 100, and so on. Similarly, decimals can be converted into fractions by removing their decimal points and writing 10, 100, etc in the denominators, depending upon the number of decimal places in the decimals.
- Decimal numbers can be compared using the idea of place value and then can be arranged in ascending or descending order.
- Decimals can be added (or subtracted) by writing them with equal number of decimal places.
- Many daily life problems can be solved by converting different units of measurements such as money, length, weight, etc. in the decimal form and then adding (or subtracting) them.

(B) Solved Examples

In examples 1 and 2, write the correct answer from the given four options:

Example 1. Which of the following fractions is the smallest?

- (A) $\frac{11}{9}$ (B) $\frac{11}{7}$ (C) $\frac{11}{10}$ (D) $\frac{11}{6}$

Solution: Answer is (C)

Example 2: 0.7625 lies between

- (A) 0.7 and 0.76 (B) 0.77 and 0.78
(C) 0.76 and 0.761 (D) 0.76 and 0.763

Solution: Answer is (D)

Example 3: Fill in the blanks so that the statement is true:

Decimal 8.125 is equal to the fraction _____.

Solution: $\frac{65}{8}$ or $8\frac{1}{8}$ (because $8.125 = \frac{8125}{1000}$)

Example 4: Fill in the blanks so that the statement is true:

$6.45 - 3.78 =$ _____.

Solution: 2.67

Example 5: State true or false:

The fraction $14\frac{2}{5}$ is equal to 14.2.

Solution: False [Hint: $14\frac{2}{10} = 14.2$]

Example 6: Fill in the blanks using $>$ or $<$:

$$\frac{8}{45} - \frac{16}{89}$$

Solution: $\frac{8}{45} = \frac{8 \times 2}{45 \times 2} = \frac{16}{90}$

$$\text{Now, } \frac{16}{90} < \frac{16}{89}, \quad \text{so, } \frac{8}{45} < \frac{16}{89}$$

Another method: $8 \times 89 = 712$ and $16 \times 45 = 720$

As $712 < 720$, therefore $\frac{8}{45} < \frac{16}{89}$

Example 7: Express $\frac{12}{25}$ as a decimal.

Solution: $\frac{12}{25} = \frac{12 \times 4}{25 \times 4}$
 $= \frac{48}{100} = 0.48$

Example 8: Convert 5809g to kg.

Solution: Since $1000\text{g} = 1\text{kg}$, therefore, $5809\text{g} = \frac{5809}{1000}\text{kg}$
 $= 5.809\text{kg}.$

Example 9: Round off 87.952 to tenths place.

Solution: For rounding off to tenths place, we look at the hundredths place. Here the digit is 5.

So, the digit at the tenths place (9) will be increased by 1 (i.e., it will become $9 + 1$)

Hence, rounding off 87.952 to tenths place, we get 88.0

(Note: Do not write it as 88.)

Example 10: Add the fractions $5\frac{3}{8}$ and $\frac{5}{16}$

$$\begin{aligned}\text{Solution: } 5\frac{3}{8} + \frac{5}{16} &= \frac{43}{8} + \frac{5}{16} \\ &= \frac{43 \times 2}{8 \times 2} + \frac{5}{16} = \frac{86}{16} + \frac{5}{16} \\ &= \frac{86+5}{16} = \frac{91}{16} = 5\frac{11}{16}\end{aligned}$$

Example 11: What should be added to 37.28 to obtain 46.8?

Solution: Here, we want to fill in the box in $37.28 + \square = 46.8$.

For this, We will have to find $46.8 - 37.28$. We perform this operation as follows by writing the two numbers having equal number of decimal places:

(Since $46.8 = 46.80$)

$$\begin{array}{r} 46.80 \\ - 37.28 \\ \hline 9.52 \end{array}$$

Hence, the required number to be added to 37.28 is 9.52.

Example 12: Arrange the following in ascending order.

2.2, 2.023, 2.0226, 22.1, 20.42

Solution: We have to arrange them from the smallest to the greatest number. We arrange them as follows (using the idea of place value and comparing their digits at different places);

2.0226, 2.023, 2.2, 20.42, 22.1

(Note: Using the $<$ sign, these numbers can also be written as $2.0226 < 2.023 < 2.2 < 20.42 < 22.1$.)

Example 13: Gorang purchased 2kg 280g apples, 3kg 375g bananas, 225g grapes and 5kg 385g oranges. Find the total weight of the fruits purchased by Gorang in kg.

Solution: Weight of apples = 2kg 280g = 2280g (Since 1kg = 1000g)

Weight of bananas = 3kg 375g = 3375g

Weight of grapes = 225g

Weight of oranges = 5kg 385g = 5385g

Total weight = 2280g + 3375g + 225g + 5385g

2280g

+ 3375g

+ 225g

+ 5385g

11265g

Thus, total weight = 11265g = $\frac{11265}{1000}$ kg

= 11.265kg i.e. 11kg 265g

Example 14: What is wrong in the following?

$$\frac{7}{4} + \frac{5}{2} = \frac{7+5}{4+2} = \frac{12}{6} = 2$$

Solution: Writing $\frac{7}{4} + \frac{5}{2} = \frac{7+5}{4+2}$ is wrong. It should be as follows:

$$\frac{7}{4} + \frac{5}{2} = \frac{7}{4} + \frac{10}{4} \text{ (Converting into like fractions)}$$

$$\frac{7+10}{4} = \frac{17}{4} \text{ (Only numerators are added)}$$

(C) Exercise

In questions 1 to 20, out of the four options, only one answer is correct.

Choose the correct answer.

1. The fraction which is not equal to $\frac{4}{5}$ is

(A) $\frac{40}{50}$

(B) $\frac{12}{15}$

(C) $\frac{16}{20}$

(D) $\frac{9}{15}$

2. The two consecutive integers between which the fraction $\frac{5}{7}$ lies are
(A) 5 and 6 (B) 0 and 1 (C) 5 and 7 (D) 6 and 7
3. When $\frac{1}{4}$ is written with denominator as 12, its numerator is
(A) 3 (B) 8 (C) 24 (D) 12
4. Which of the following is not in the lowest form?
(A) $\frac{7}{5}$ (B) $\frac{15}{20}$ (C) $\frac{13}{33}$ (D) $\frac{27}{28}$
5. If $\frac{5}{8} = \frac{20}{p}$, then value of p is
(A) 23 (B) 2 (C) 32 (D) 16
6. Which of the following is not equal to the others?
(A) $\frac{6}{8}$ (B) $\frac{12}{16}$ (C) $\frac{15}{25}$ (D) $\frac{18}{24}$
7. Which of the following fractions is the greatest?
(A) $\frac{5}{7}$ (B) $\frac{5}{6}$ (C) $\frac{5}{9}$ (D) $\frac{5}{8}$
8. Which of the following fractions is the smallest?
(A) $\frac{7}{8}$ (B) $\frac{9}{8}$ (C) $\frac{3}{8}$ (D) $\frac{5}{8}$
9. Sum of $\frac{4}{17}$ and $\frac{15}{17}$ is
(A) $\frac{19}{17}$ (B) $\frac{11}{17}$ (C) $\frac{19}{34}$ (D) $\frac{2}{17}$
10. On subtracting $\frac{5}{9}$ from $\frac{19}{9}$, the result is
(A) $\frac{24}{9}$ (B) $\frac{14}{9}$ (C) $\frac{14}{18}$ (D) $\frac{14}{0}$
11. 0.7499 lies between
(A) 0.7 and 0.74 (B) 0.75 and 0.79
(C) 0.749 and 0.75 (D) 0.74992 and 0.75

12. 0.023 lies between
 (A) 0.2 and 0.3 (B) 0.02 and 0.03
 (C) 0.03 and 0.029 (D) 0.026 and 0.024
13. $\frac{11}{7}$ can be expressed in the form
 (A) $7\frac{1}{4}$ (B) $4\frac{1}{7}$ (C) $1\frac{4}{7}$ (D) $11\frac{1}{7}$
14. The mixed fraction $5\frac{4}{7}$ can be expressed as
 (A) $\frac{33}{7}$ (B) $\frac{39}{7}$ (C) $\frac{33}{4}$ (D) $\frac{39}{4}$
15. $0.07 + 0.008$ is equal to
 (A) 0.15 (B) 0.015 (C) 0.078 (D) 0.78
16. Which of the following decimals is the greatest?
 (A) 0.182 (B) 0.0925 (C) 0.29 (D) 0.038
17. Which of the following decimals is the smallest?
 (A) 0.27 (B) 1.5 (C) 0.082 (D) 0.103
18. 13.572 correct to the tenths place is
 (A) 10 (B) 13.57 (C) 14.5 (D) 13.6
19. $15.8 - 6.73$ is equal to
 (A) 8.07 (B) 9.07 (C) 9.13 (D) 9.25
20. The decimal 0.238 is equal to the fraction
 (A) $\frac{119}{500}$ (B) $\frac{238}{25}$ (C) $\frac{119}{25}$ (D) $\frac{119}{50}$

In questions 21 to 44, fill in the blanks to make the statements true:

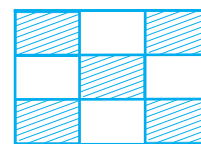
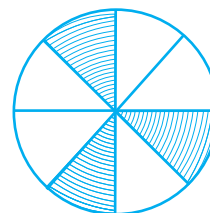
21. A number representing a part of a _____ is called a fraction.
22. A fraction with denominator greater than the numerator is called a _____ fraction.
23. Fractions with the same denominator are called _____ fractions.
24. $13\frac{5}{18}$ is a _____ fraction.

25. $\frac{18}{5}$ is an _____ fraction. 26. $\frac{7}{19}$ is a _____ fraction.
27. $\frac{5}{8}$ and $\frac{3}{8}$ are _____ proper fractions.
28. $\frac{6}{11}$ and $\frac{6}{13}$ are _____ proper fractions.
29. The fraction $\frac{6}{15}$ in simplest form is _____.
30. The fraction $\frac{17}{34}$ in simplest form is _____.
31. $\frac{18}{135}$ and $\frac{90}{675}$ are proper, unlike and _____ fractions.
32. $8\frac{2}{7}$ is equal to the improper fraction _____.
33. $\frac{87}{7}$ is equal to the mixed fraction _____.
34. $9 + \frac{2}{10} + \frac{6}{100}$ is equal to the decimal number _____.
35. Decimal 16.25 is equal to the fraction _____.
36. Fraction $\frac{7}{25}$ is equal to the decimal number _____.
37. $\frac{17}{9} + \frac{41}{9} =$ _____. 38. $\frac{67}{14} - \frac{24}{14} =$ _____.
 39. $\frac{17}{2} + 3\frac{1}{2} =$ _____. 40. $9\frac{1}{4} - \frac{5}{4} =$ _____.
 41. $4.55 + 9.73 =$ _____. 42. $8.76 - 2.68 =$ _____.
 43. The value of 50 coins of 50 paise = Rs _____.
 44. 3 Hundredths + 3 tenths = _____.

In each of the questions 45 to 65, state whether the statement is true or false:

45. Fractions with same numerator are called like fractions.
46. Fraction $\frac{18}{39}$ is in its lowest form.

47. Fractions $\frac{15}{39}$ and $\frac{45}{117}$ are equivalent fractions.
48. The sum of two fractions is always a fraction.
49. The result obtained by subtracting a fraction from another fraction is necessarily a fraction.
50. If a whole or an object is divided into a number of equal parts, then each part represents a fraction.
51. The place value of a digit at the tenths place is 10 times the same digit at the ones place.
52. The place value of a digit at the hundredths place is $\frac{1}{10}$ times the same digit at the tenths place.
53. The decimal 3.725 is equal to 3.72 correct to two decimal places.
54. In the decimal form, fraction $\frac{25}{8} = 3.125$.
55. The decimal $23.2 = 23\frac{2}{5}$
56. The fraction represented by the shaded portion in the adjoining figure is $\frac{3}{8}$.
57. The fraction represented by the unshaded portion in the adjoining figure is $\frac{5}{9}$.
58. $\frac{25}{19} + \frac{6}{19} = \frac{31}{19}$
59. $\frac{8}{18} - \frac{8}{15} = \frac{8}{3}$
60. $\frac{7}{12} + \frac{11}{12} = \frac{3}{2}$
61. $3.03 + 0.016 = 3.019$
62. $42.28 - 3.19 = 39.09$
63. $\frac{16}{25} > \frac{13}{25}$
64. $19.25 < 19.053$
65. $13.730 = 13.73$



In each of the questions 66 to 71, fill in the blanks using '>', '<' or '=' :

66. $\frac{11}{16} \dots \frac{14}{15}$
67. $\frac{8}{15} \dots \frac{95}{14}$

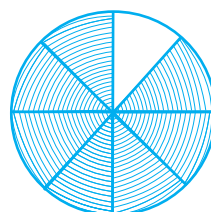
68. $\frac{12}{75} \dots \frac{32}{200}$

69. $3.25 \dots 3.4$

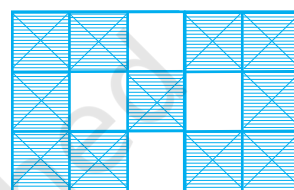
70. $\frac{18}{15} \dots 1.3$

71. $6.25 \dots \frac{25}{4}$

72. Write the fraction represented by the shaded portion of the adjoining figure:



73. Write the fraction represented by the unshaded portion of the adjoining figure:



74. Ali divided one fruit cake equally among six persons. What part of the cake he gave to each person?
75. Arrange 12.142, 12.124, 12.104, 12.401 and 12.214 in ascending order.
76. Write the largest four digit decimal number less than 1 using the digits 1, 5, 3 and 8 once.
77. Using the digits 2, 4, 5 and 3 once, write the smallest four digit decimal number.
78. Express $\frac{11}{20}$ as a decimal.
79. Express $6\frac{2}{3}$ as an improper fraction.
80. Express $3\frac{2}{5}$ as a decimal.
81. Express 0.041 as a fraction.
82. Express 6.03 as a mixed fraction.
83. Convert 5201g to kg.

84. Convert 2009 paise to rupees and express the result as a mixed fraction.
85. Convert 1537cm to m and express the result as an improper fraction.
86. Convert 2435m to km and express the result as mixed fraction.
87. Arrange the fractions $\frac{2}{3}$, $\frac{3}{4}$, $\frac{1}{2}$ and $\frac{5}{6}$ in ascending order.
88. Arrange the fractions $\frac{6}{7}$, $\frac{7}{8}$, $\frac{4}{5}$ and $\frac{3}{4}$ in descending order.
89. Write $\frac{3}{4}$ as a fraction with denominator 44.
90. Write $\frac{5}{6}$ as a fraction with numerator 60.
91. Write $\frac{129}{8}$ as a mixed fraction.
92. Round off 20.83 to nearest tenths.
93. Round off 75.195 to nearest hundredths.
94. Round off 27.981 to nearest tenths.
95. Add the fractions $\frac{3}{8}$ and $\frac{2}{3}$.
96. Add the fractions $\frac{3}{8}$ and $6\frac{3}{4}$.
97. Subtract $\frac{1}{6}$ from $\frac{1}{2}$.
98. Subtract $8\frac{1}{3}$ from $\frac{100}{9}$.
99. Subtract $1\frac{1}{4}$ from $6\frac{1}{2}$.
100. Add $1\frac{1}{4}$ and $6\frac{1}{2}$.
101. Katrina rode her bicycle $6\frac{1}{2}$ km in the morning and $8\frac{3}{4}$ km in the evening. Find the distance travelled by her altogether on that day.

- 102.** A rectangle is divided into certain number of equal parts. If 16 of the parts so formed represent the fraction $\frac{1}{4}$, find the number of parts in which the rectangle has been divided.
- 103.** Grip size of a tennis racquet is $11\frac{9}{80}$ cm. Express the size as an improper fraction.
- 104.** On an average $\frac{1}{10}$ of the food eaten is turned into organism's own body and is available for the next level of consumer in a food chain. What fraction of the food eaten is not available for the next level?
- 105.** Mr. Rajan got a job at the age of 24 years and he got retired from the job at the age of 60 years. What fraction of his age till retirement was he in the job?
- 106.** The food we eat remains in the stomach for a maximum of 4 hours. For what fraction of a day, does it remain there?
- 107.** What should be added to 25.5 to get 50?
- 108.** Alok purchased 1kg 200g potatoes, 250g dhania, 5kg 300g onion, 500g palak and 2kg 600g tomatoes. Find the total weight of his purchases in kilograms.
- 109.** Arrange in ascending order:
0.011, 1.001, 0.101, 0.110
- 110.** Add the following:
20.02 and 2.002
- 111.** It was estimated that because of people switching to Metro trains, about 33000 tonnes of CNG, 3300 tonnes of diesel and 21000 tonnes of petrol was saved by the end of year 2007. Find the fraction of :
- (i) the quantity of diesel saved to the quantity of petrol saved.
 - (ii) the quantity of diesel saved to the quantity of CNG saved.

- 112.** Energy content of different foods are as follows:

Food	Energy Content per kg.
Wheat	3.2 Joules
Rice	5.3 Joules
Potatoes (Cooked)	3.7 Joules
Milk	3.0 Joules

Which food provides the least energy and which provides the maximum?

Express the least energy as a fraction of the maximum energy.

- 113.** A cup is $\frac{1}{3}$ full of milk. What part of the cup is still to be filled by milk to make it full?
- 114.** Mary bought $3\frac{1}{2}$ m of lace. She used $1\frac{3}{4}$ m of lace for her new dress. How much lace is left with her?
- 115.** When Sunita weighed herself on Monday, she found that she had gained $1\frac{1}{4}$ 5kg. Earlier her weight was $46\frac{3}{8}$ kg. What was her weight on Monday?
- 116.** Sunil purchased $12\frac{1}{2}$ litres of juice on Monday and $14\frac{3}{4}$ litres of juice on Tuesday. How many litres of juice did he purchase together in two days?
- 117.** Nazima gave $2\frac{3}{4}$ litres out of the $5\frac{1}{2}$ litres of juice she purchased to her friends. How many litres of juice is left with her?
- 118.** Roma gave a wooden board of length $150\frac{1}{4}$ cm to a carpenter for making a shelf. The Carpenter sawed off a piece of $40\frac{1}{5}$ cm from it. What is the length of the remaining piece?

- 119.** Nasir travelled $3\frac{1}{2}$ km in a bus and then walked $1\frac{1}{8}$ km to reach a town. How much did he travel to reach the town?
- 120.** The fish caught by Neetu was of weight $3\frac{3}{4}$ kg and the fish caught by Narendra was of weight $2\frac{1}{2}$ kg. How much more did Neetu's fish weigh than that of Narendra?
- 121.** Neelam's father needs $1\frac{3}{4}$ m of cloth for the skirt of Neelam's new dress and $\frac{1}{2}$ m for the scarf. How much cloth must he buy in all?
- 122.** What is wrong in the following additions?

(a)

$$\begin{array}{r} 8\frac{1}{2} = 8\frac{2}{4} \\ + 4\frac{1}{4} = 4\frac{1}{4} \\ \hline = 12\frac{3}{8} \end{array}$$

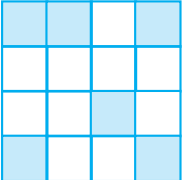
(b)

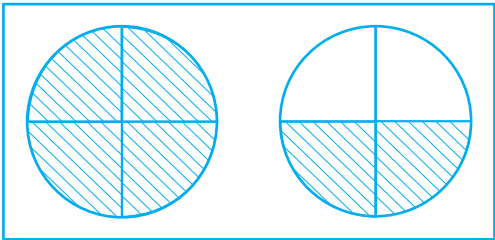
$$\begin{array}{r} 6\frac{1}{2} \\ + 2\frac{1}{4} \\ \hline = 8\frac{2}{6} = 8\frac{1}{3} \end{array}$$

- 123.** Which one is greater?

1 metre 40 centimetres + 60 centimetres or 2.6 metres.

- 124.** Match the fractions of Column I with the shaded or marked portion of figures of Column II:

Column I	Column II
(i) $\frac{6}{4}$	(A) 
(ii) $\frac{6}{10}$	(B) 

(iii) $\frac{6}{6}$	(C) 
(iv) $\frac{6}{16}$	(D) 
	(E) 

- 125.** Find the fraction that represents the number of natural numbers to total numbers in the collection 0, 1, 2, 3, 4, 5. What fraction will it be for whole numbers?
- 126.** Write the fraction representing the total number of natural numbers in the collection of numbers -3, -2, -1, 0, 1, 2, 3. What fraction will it be for whole numbers? What fraction will it be for integers?
- 127.** Write a pair of fractions whose sum is $\frac{7}{11}$ and difference is $\frac{2}{11}$.
- 128.** What fraction of a straight angle is a right angle?
- 129.** Put the right card in the right bag.

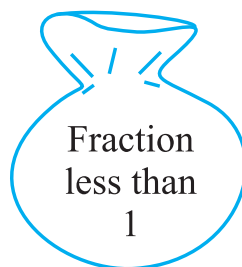
Cards

(i) $\frac{3}{7}$

(ii) $\frac{4}{4}$

Bags

Bag I



(iii) $\frac{9}{8}$

(iv) $\frac{8}{9}$

(v) $\frac{5}{6}$

(vi) $\frac{6}{11}$

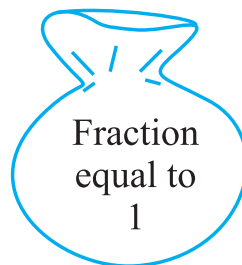
(vii) $\frac{18}{18}$

(viii) $\frac{19}{25}$

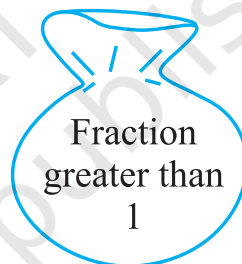
(ix) $\frac{2}{3}$

(x) $\frac{13}{17}$

Bag II



Bag III

**(D) Activities**

Activity: Find the number of boys and girls in your school and write:

- (i) The fraction representing boys among the total students
- (ii) The fraction representing girls among the total students
- (iii) check that the sum of two fractions in (i) and (ii) is 1.

UNIT 5

DATA HANDLING

(A) Main Concepts and Results

- The data can be arranged in a tabular form using tally marks.
- A pictograph represents data through pictures of objects.
- Interpretation of a pictograph and drawing a pictograph.
- Representation of data using a bar diagram or bar graph.
- In a bar graph, bars of uniform width are drawn horizontally or vertically with equal spacing between them. Length of each bar gives the required information.
- Interpretation of a bar graph and drawing a bar graph.

(B) Solved Examples

Write the correct answer from the given four options:

Example 1: Using tally marks which one of the following represents the number five?

- (A) ||||| (B) √√√√√ (C) ||||| (D) |||||

Solution: Answer is (D).

Example 2: State whether the following statements are true or false:

- A tabular form of data is also a pictorial representation of the data.
- A pictograph represents data in the form of pictures of objects or parts of objects.

Solution: (a) False (b) True

Example 3: The blood groups of 25 students are recorded as under:
A, B, O, A, AB, O, A, O, B, A, O, B, A, AB, AB, A, A, B, B,
O, B, AB, O, A, B.

Arrange the information in a table using tally marks.

Solution:

Blood group	Tally marks	Number of students
A		8
B		7
O		6
AB		4

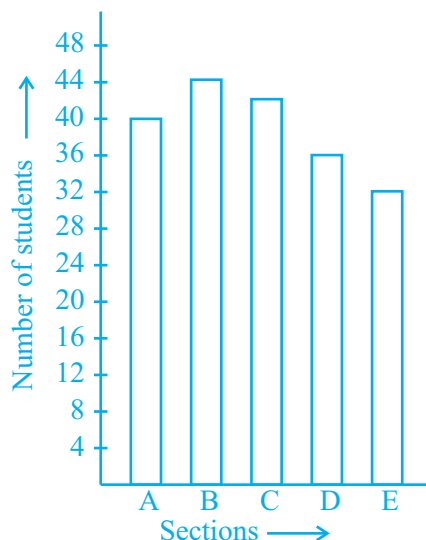
Example 4: In a school, there are five sections of Class VI. The number of students in each section is given below:

Section	A	B	C	D	E
Number of students	40	44	42	36	32

Represent the above data using a bar graph.

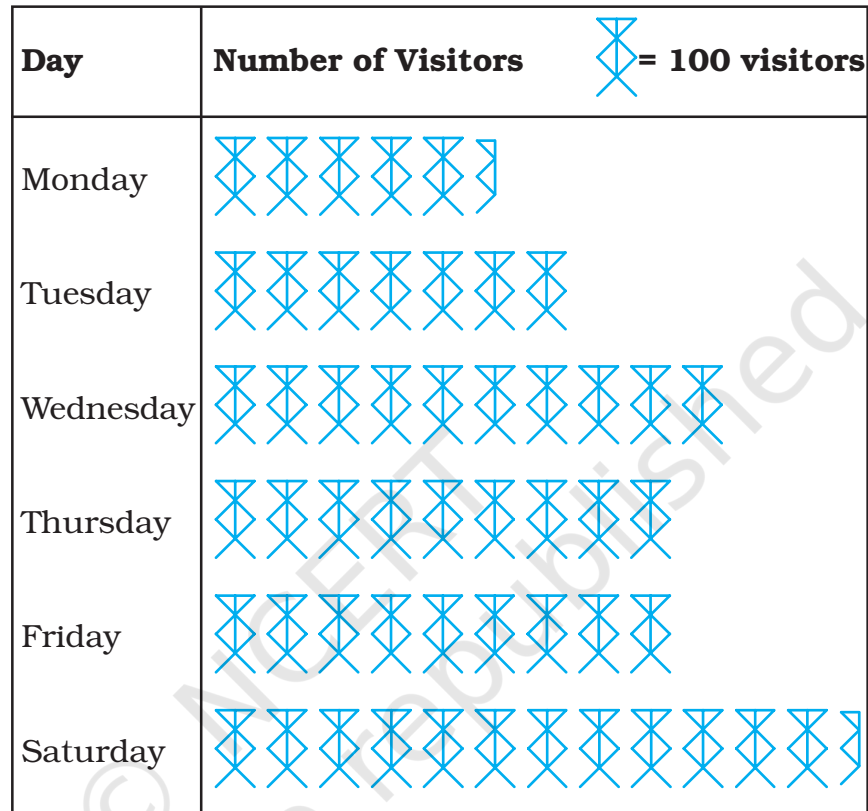
Solution:

First of all, draw a horizontal line and a vertical line. Choose a suitable scale along the vertical line, say 1 unit length= 4 students. On the horizontal line, write the sections A, B, C, D and E. Draw vertical bars on the respective section showing the number of students in that section.



Example 5: The number of visitors in a science exhibition on different days of a week is shown below:

Look at the above pictograph and answer the following questions:



- What is the total number of visitors from Monday to Saturday?
- On which day was the number of visitors maximum? What was their total number?
- On which day was the number of visitors minimum?
- On which day was the number of visitors same as the number of visitors on two days taken together?

Solution: Number of visitors on Monday, Tuesday, Wednesday, Thursday, Friday and Saturday were 550, 700, 1000, 900, 900, and 1250 respectively.

- The total number of visitors from Monday to Saturday
 $= 550 + 700 + 1000 + 900 + 900 + 1250 = 5300$

- (b) The number of visitors was maximum on Saturday and the number was 1250.
- (c) The number of visitors was minimum on Monday and the number was 550.
- (d) The number of visitors on Saturday was 1250 which was equal to the total number of visitors on Monday (550) and Tuesday (700).

(C) Exercise

In questions 1 to 5, out of the four options, only one is correct. write the correct answer.

1. Using tally marks, which one of the following represents the number eight:

(A)  ||| (B)  || (C)  || (D) 

2. The marks (out of 10) obtained by 28 students in a Mathematics test are listed as below:

8, 1, 2, 6, 5, 5, 5, 0, 1, 9, 7, 8, 0, 5, 8, 3, 0, 8, 10, 10, 3, 4, 8, 7, 8, 9, 2, 0

The number of students who obtained marks more than or equal to 5 is

- (A) 13 (B) 15 (C) 16 (D) 17
3. In question 2 above, the number of students who scored marks less than 4 is
- (A) 15 (B) 13 (C) 12 (D) 10
4. The choices of the fruits of 42 students in a class are as follows:

A , O , B , M , A , G , B , G , A , G ,
 B , M , A , G , M , A , B , G , M , B ,
 A , O , M , O , G , B , O , M , G , A ,
 A , B , M , O , M , G , B , A , M , O , M , O ,

where A, B, G, M and O stand for the fruits Apple, Banana, Grapes, Mango and Orange respectively.

Which two fruits are liked by an equal number of students?

(A) A and M (B) M and B (C) B and O (D) B and G

5. According to data of question 4, which fruit is liked by most of the students?

(A) O (B) G (C) M (D) A

In questions 6 to 13, state whether the given statements are true (T) or false (F).

6. In a bar graph, the width of bars may be unequal.
7. In a bar graph, bars of uniform width are drawn vertically only.
8. In a bar graph, the gap between two consecutive bars may not be the same.
9. In a bar graph, each bar (rectangle) represents only one value of the numerical data.
10. To represent the population of different towns using bar graph, it is convenient to take one unit length to represent one person.
11. Pictographs and bar graphs are pictorial representations of the numerical data.
12. An observation occurring five times in a data is recorded as | | | | |, using tally marks.
13. In a pictograph, if a symbol  represents 50 books in a library shelf, then the symbol  represents 25 books.

In questions 14 to 20, fill in the blanks to make the statements true:

14. A _____ is a collection of numbers gathered to give some meaningful information.
15. The data can be arranged in a tabular form using _____ marks.
16. A _____ represents data through pictures of objects.

17. In a bar graph, _____ can be drawn horizontally or vertically.
18. In a bar graph, bars of _____ width can be drawn horizontally or vertically with _____ spacing between them.
19. An observation occurring seven times in a data is represented as _____ using tally marks.
20. In a pictograph, if a symbol  represents 20 flowers in a basket then  stands for _____ flowers.
21. On the scale of 1 unit length = 10 crore, the bar of length 6 units will represent _____ crore and of _____ units will represent 75 crore.
22. In an examination, the grades achieved by 30 students of a class are given below. Arrange these grades in a table using tally marks:
B, C, C, E, A, C, B, B, D, D, D, D, B, C, C, C, A, C, B, E, A, D, C, B, E, C, B, E, C, D
23. The number of two wheelers owned individually by each of 50 families are listed below. Make a table using tally marks.
1, 1, 2, 1, 1, 1, 2, 1, 2, 1, 0, 1, 1, 2, 3, 1, 2, 1, 1, 2, 1, 2, 3, 1, 0, 2, 1, 0, 2, 1, 2, 1, 2, 1, 1, 4, 1, 3, 1, 1, 2, 1, 1, 1, 1, 2, 3, 2, 1, 1
Find the number of families having two or more, two wheelers.
24. The lengths in centimetres (to the nearest centimetre) of 30 carrots are given as follows:
15, 22, 21, 20, 22, 15, 15, 20, 20, 15, 20, 18, 20, 22, 21,
20, 21, 18, 21, 18, 20, 18, 21, 18, 22, 20, 15, 21, 18, 20
Arrange the data given above in a table using tally marks and answer the following questions.
(a) What is the number of carrots which have length more than 20 cm?

- (b) Which length of the carrots occur maximum number of times?
Minimum number of times?

- 25.** Thirty students were interviewed to find out what they want to be in future. Their responses are listed as below:

doctor, engineer, doctor, pilot, officer, doctor, engineer, doctor, pilot, officer, pilot, engineer, officer, pilot, doctor, engineer, pilot, officer, doctor, officer, doctor, pilot, engineer, doctor, pilot, officer, doctor, pilot, doctor, engineer

Arrange the data in a table using tally marks.

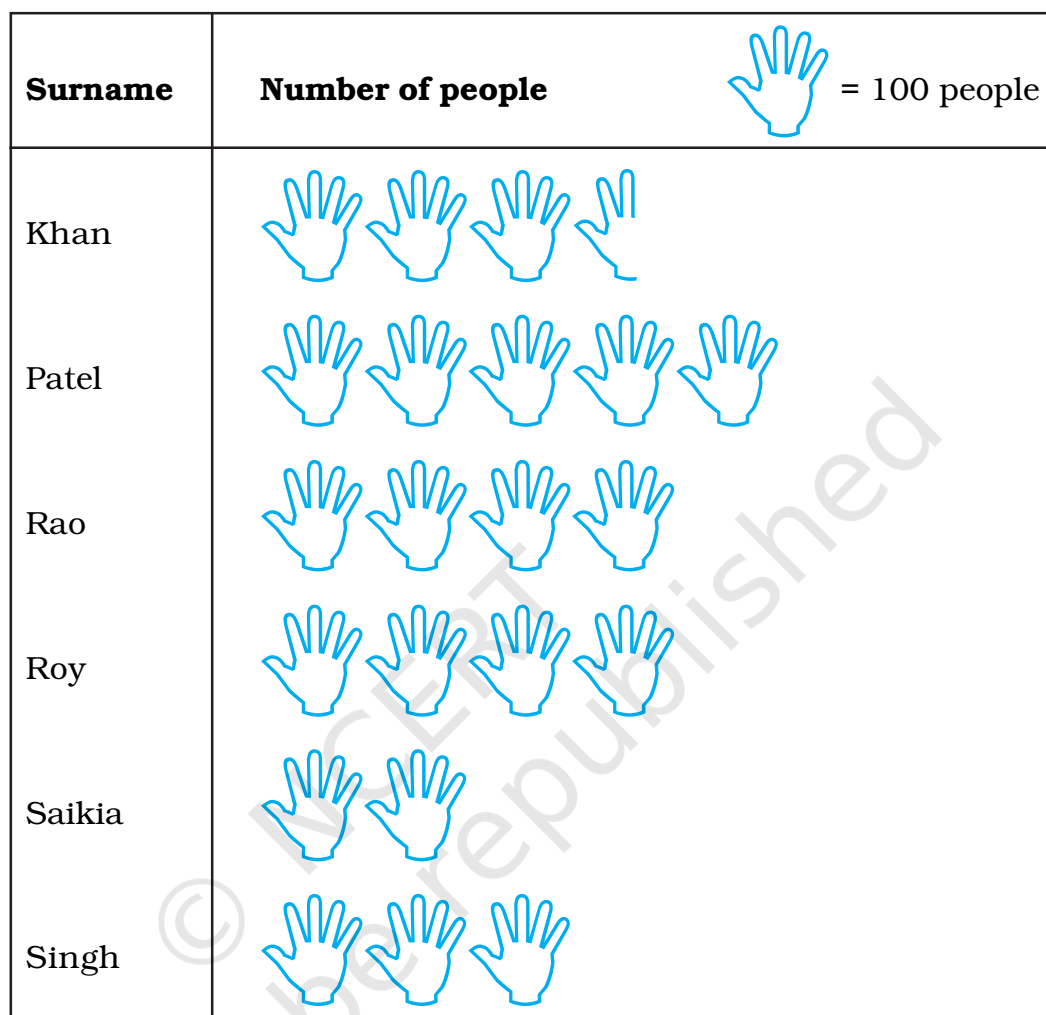
- 26.** Following are the choices of games of 40 students of Class VI:

football, cricket, football, kho-kho, hockey, cricket, hockey, kho-kho, tennis, tennis, cricket, football, football, hockey, kho-kho, football, cricket, tennis, football, hockey, kho-kho, football, cricket, cricket, football, hockey, kho-kho, tennis, football, hockey, cricket, football, hockey, cricket, football, kho-kho, football, cricket, hockey, football.

- (a) Arrange the choices of games in a table using tally marks.
(b) Which game is liked by most of the students?
(c) Which game is liked by minimum number of students?
- 27.** Fill in the blanks in the following table which represents shirt size of 40 students of a school.

Shirt size	Tally Marks	Number of students
30		3
32		—
34	—	8
36		—
38	—	10
40	—	7

- 28.** Following pictograph represents some surnames of people listed in the telephone directory of a city



Observe the pictograph and answer the following questions:

- How many people have surname 'Roy'?
 - Which surname appears the maximum number of times in the telephone directory?
 - Which surname appears the least number of times in the directory?
 - Which two surnames appear an equal number of times?
- 29.** Students of Class VI in a school were given a task to count the number of articles made of different materials in the school. The information collected by them is represented as follows:

Material used	Articles  = 20 articles
Wood	
Glass	
Metal	
Rubber	
Plastic	

Observe the pictograph and answer the following questions:

- Which material is used in maximum number of articles?
- Which material is used in minimum number of articles?
- Which material is used in exactly half the number of articles as those made up of metal?
- What is the total number of articles counted by the students?

30. The number of scouts in a school is depicted by the following pictograph:

Class	Number of scouts  = 10 scouts
VI	
VII	
VIII	
IX	
X	

Observe the pictograph and answer the following questions:

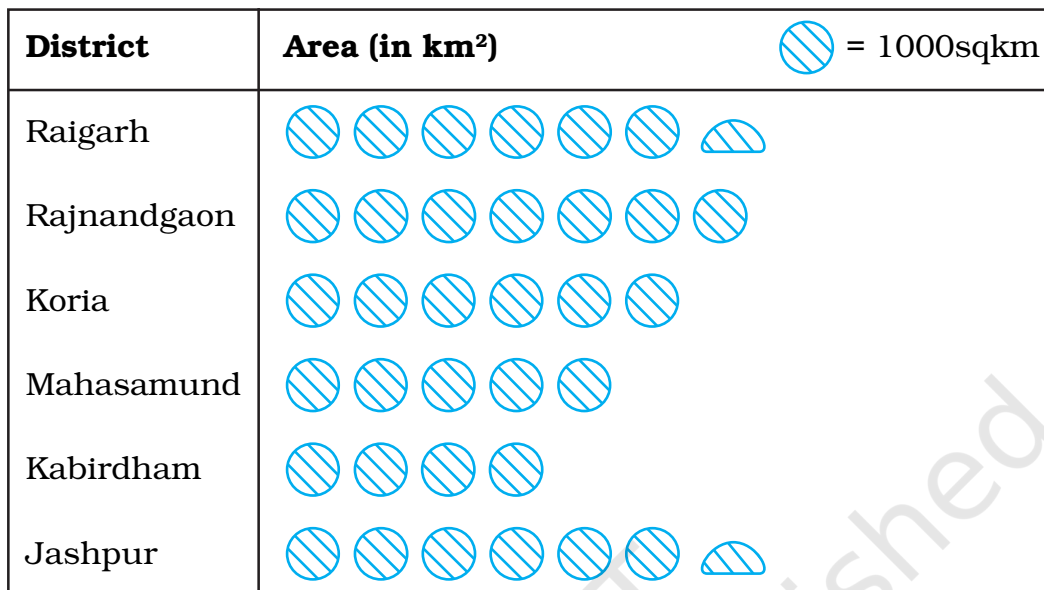
- Which class has the minimum number of scouts?
- Which class has the maximum number of scouts?
- How many scouts are there in Class VI?
- Which class has exactly four times the scouts as that of Class X?
- What is the total number of scouts in the Classes VI to X?

- 31.** A survey was carried out in a certain school to find out the popular school subjects among students of Classes VI to VIII. The data in this regard is displayed as pictograph given below:

Subject	Number of Students  = 50 students
Hindi	   
English	  
Mathematics	   
Science	 
Social Studies	 

- Which subject is most popular among the students?
- How many students like Mathematics?
- Find the number of students who like subjects other than Mathematics and Science.

32. The following pictograph depicts the information about the areas in sqkm (to nearest hundred) of some districts of Chhattisgarh State:



- (a) What is the area of Koria district?
- (b) Which two districts have the same area?
- (c) How many districts have area more than 5000 square kilometres?
33. The number of bottles of cold drinks sold by a shopkeeper on six consecutive days is as follows:

Day	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday
Number of bottles	350	200	300	250	100	150

Prepare a pictograph of the data using one symbol to represent 50 bottles.

34. The following table gives information about the circulation of newspapers (dailies) in a town in five languages.

Language	English	Hindi	Tamil	Punjabi	Gujarati
Number of newspapers	5000	8500	500	2500	1000

Prepare a pictograph of the above data, using a symbol of your choice, each representing 1000 newspapers.

35. Annual expenditure of a company in the year 2007-2008 is given below:

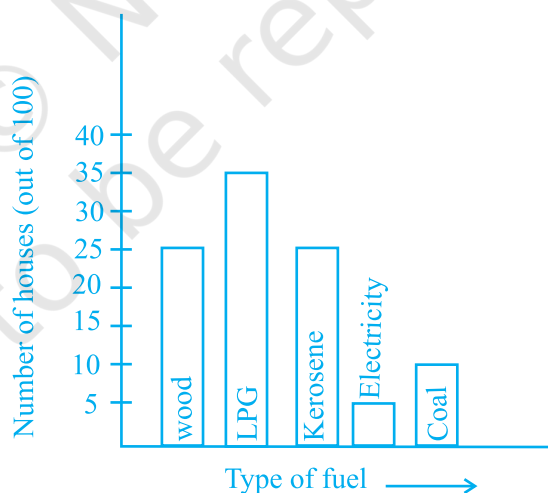
Items	Expenditure (Rs in lakh)
Salaries of employees	65
Advertisement	10
Purchase of machinery	85
Electricity and water	15
Transportation	25
Other expenses	30

Prepare a pictograph of the above data using an appropriate symbol to represent Rs 10 lakh.

36. The following bar graph shows the number of houses (out of 100) in a town using different types of fuels for cooking.

Read the bar graph and answer the following questions:

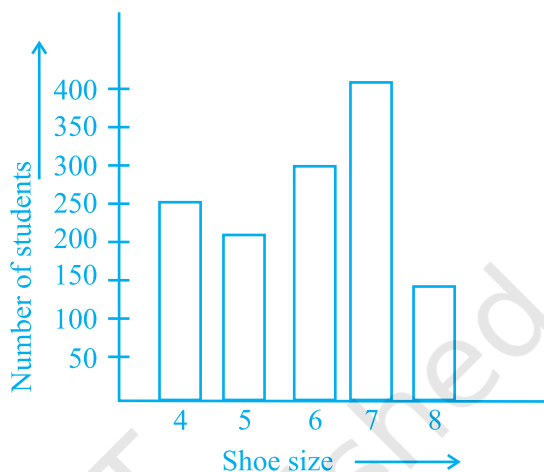
Scale: 1 unit length = 5 houses



- Which fuel is used in maximum number of houses?
- How many houses are using coal as fuel?
- Suppose that the total number of houses in the town is 1 lakh. From the above graph estimate the number of houses using electricity.

- 37.** The following bar graph represents the data for different sizes of shoes worn by the students in a school. Read the graph and answer the following questions.

Scale : 1 unit length = 50 students

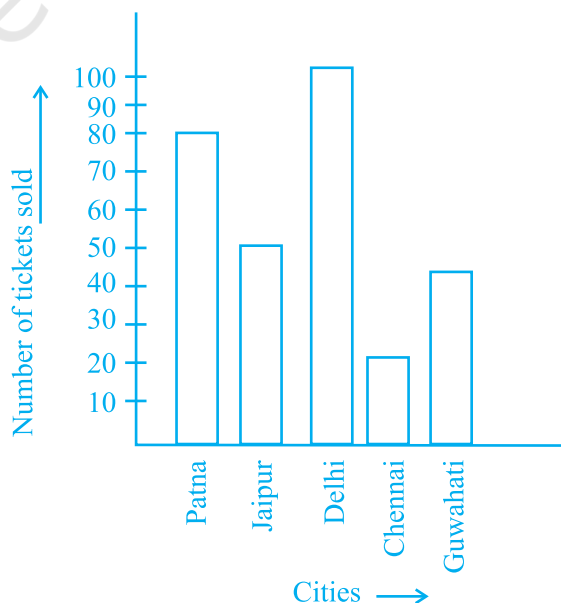


- Find the number of students whose shoe sizes have been collected.
- What is the number of students wearing shoe size 6?
- What are the different sizes of the shoes worn by the students?
- Which shoe size is worn by the maximum number of students?
- Which shoe size is worn by minimum number of students?
- State whether true or false:

The total number of students wearing shoe sizes 5 and 8 is the same as the number of students wearing shoe size 6.

- 38.** The following graph gives the information about the number of railway tickets sold for different cities on a railway ticket counter between 6.00 am to 10.00 am. Read the bar graph and answer the following questions.

Scale : 1 unit length = 10 tickets



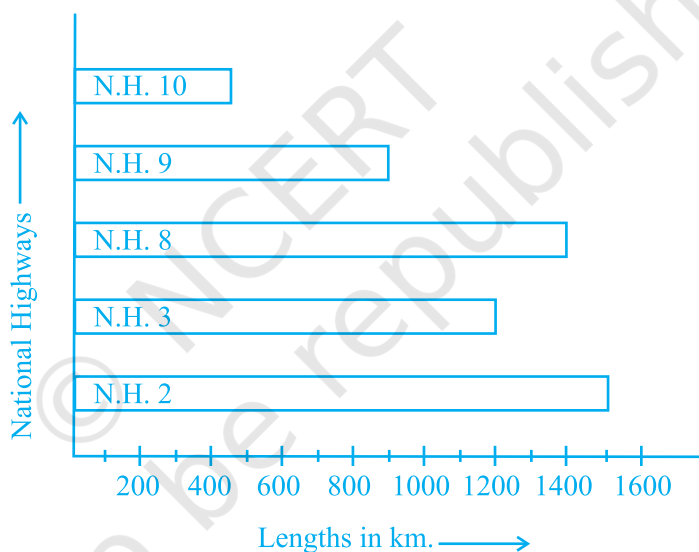
- How many tickets were sold in all?
- For which city were the maximum number of tickets sold?

- (c) For which city were the minimum number of tickets sold?
- (d) Name the cities for which the number of tickets sold is more than 20.
- (e) Fill in the blanks:

Number of tickets sold for Delhi and Jaipur together exceeds the total number of tickets sold for Patna and Chennai by _____.

- 39.** The bar graph given below represents approximate length (in kilometres) of some National Highways in India. Study the bar graph and answer the following questions:

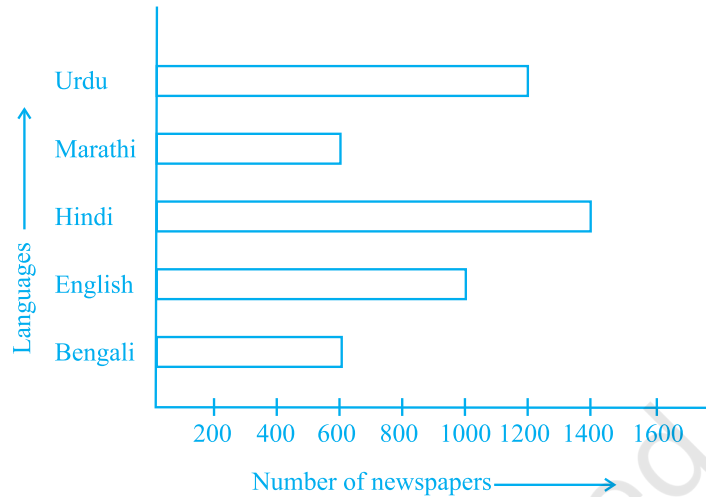
Scale : 1 unit length = 200km



- (a) Which National Highway (N.H.) is the longest among the above?
- (b) Which National Highway is the shortest among the above?
- (c) What is the length of National Highway 9?
- (d) Length of which National Highway is about three times the National Highway 10?
- 40.** The bar graph given below represents the circulation of newspapers in different languages in a town. Study the bar graph and answer the following questions:

Scale : 1 unit length = 200 Newspapers

- (a) What is the circulation of English newspaper?
- (b) Name the two languages in which circulation of newspaper is the same.

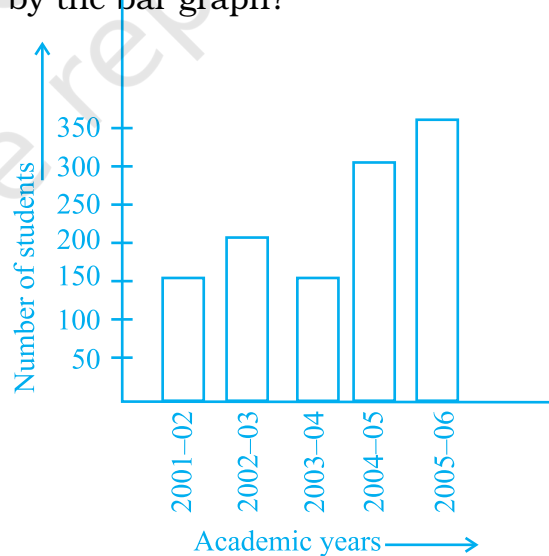


- (c) By how much is the circulation of newspaper in Hindi more than the newspaper in Bengali?

41. Read the bar graph given below and answer the following questions:

Scale : 1 unit = 50 students

- (a) What information is given by the bar graph?
- (b) In which year is the number of students maximum?
- (c) In which year is the number of students twice as that of 2001-02?
- (d) In which year did the number of students decrease as compared to previous year?
- (e) In which year is the increase in number of students maximum as compared to the previous year?



42. The lengths in km (rounded to nearest hundred) of some major rivers of India is given below:

River	Length (in km)
Narmada	1300
Mahanadi	900
Brahmputra	2900
Ganga	2500
Kaveri	800
Krishna	1300

Draw a bar graph to represent the above information.

43. The number of ATMs of different banks in a city is shown below:

Bank	Number of ATMs
Syndicate Bank	5
Dena Bank	15
Indian Bank	20
State Bank of India	25
Vijaya Bank	10

Draw a bar graph to represent the above information by choosing the scale of your choice.

44. Number of mobile phone users in various age groups in a city is listed below:

Age group (in years)	Number of mobile users
1—20	25000
21—40	40000
41—50	35000
61—80	10000

Draw a bar graph to represent the above information.

45. The following table gives the number of vehicles passing through a toll gate, every hour from 8.00 am. to 1.00 pm:

Time Interval	8.00 to 9.00	9.00 to 10.00	10.00 to 11.00	11.00 to 12.00	12.00 to 1.00
Number of vehicles	250	450	300	250	150

Draw a bar graph representing the above data.

46. The following table represents income of a Gram Panchayat from different sources in a particular year:

Sources	Income (in Rs.)
Income from local taxes	75000
Funds received from government	150000
Donations	25000
Income from other resources	50000

Draw a bar graph to represent the above information.

47. The following table gives the data of number of schools (stage-wise) of a country in the year 2002.

Stage	Number of schools (in thousands)
Primary	80
Upper Primary	55
Secondary	30
Higher Secondary	20

Draw a bar graph to represent the above data:

- 48.** Home appliances sold by a shop in one month are given as below:

Home appliance	Number of home appliances
Refrigerator	75
Television	45
Washing Machine	30
Cooler	60
DVD Player	30

Draw a bar graph to represent the above information.

- 49.** In a botanical garden, the number of different types of plants are found as follows:

Type of the plant	Number of plants
Herb	50
Shrub	60
Creeper	20
Climber	45
Tree	95

Draw a bar graph to represent the above information and answer the following questions:

- Which type of plant is maximum in number in the garden?
 - Which type of plant is minimum in number in the garden?
- 50.** Prepare a bar graph of the data given in question 28.
- 51.** Refer to question 39. Prepare a pictograph of the data by taking a suitable symbol to represent 200 kilometers.
- 52.** Prepare a pictograph of the information given in question 38.
- 53.** Refer to question 23. Prepare a bar graph of the data.

- 54.** The following table shows the area of the land on which different crops were grown.

Crop	Area of land (in million hectares)
Rice	50
Wheat	30
Pulses	20
Sugarcane	25
Cotton	15

Prepare a pictograph by choosing a suitable symbol to represent 10 million hectares.

- 55.** Refer to question 54. Prepare a bar graph of the data.

Rough Work

© NCERT
not to be republished

UNIT 6

MENSURATION

(A) Main Concepts and Results

- **Perimeter** of a closed figure is the distance covered in one round along the boundary of the figure.
- A closed figure in which all sides and angles are equal is called a **regular polygon**.
- Perimeter of a rectangle = $2 \times (\text{length} + \text{breadth})$
- Perimeter of a square = $4 \times \text{length of its side}$
- Perimeter of an equilateral triangle = $3 \times \text{length of a side}$
- The amount of region enclosed by a plane closed figure is called its **area**.
- Area of a rectangle = $\text{length} \times \text{breadth}$
- Area of a square = $\text{side} \times \text{side}$

(B) Solved Examples

Example 1: Choose the correct answer from the given four options:

In Fig. 6.1, a square of side 1 cm is joined to a square of side 3 cm. The perimeter of the new figure is

- (A) 13cm (B) 14cm
(C) 15cm (D) 16cm

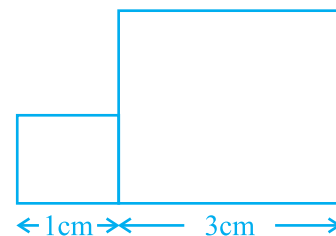


Fig. 6.1

Solution: Correct answer is (B)

Example 2: Which of the following statements are true or false?

- (a) Geeta wants to raise a boundary wall around her house. For this, she must find the area of the land of her house.
- (b) A person preparing a track to conduct sports must find the perimeter of the sports ground.

Solution:

- (a) False – Boundary wall is around her house, so she must know the perimeter of the land and not the area.
- (b) True – Track is prepared along the boundary of the sports ground.

Example 3: Fill in the blanks to make the statements true:

- (a) Perimeter of a triangle with sides 4.5cm, 6.02cm and 5.38cm is _____ .
- (b) Area of a square of side 5cm is _____ .

Solution:

- (a) 15.9cm.
- (b) 25sqcm.

Example 4: Bhavna runs 10 times around a square field of side 80m. Her sister Sushmita runs 8 times around a rectangular field with length 150m and breadth 60m. Who covers more distance? By how much?

Solution: Distance covered by Bhavna in one round = Perimeter of the square field
 $= 4 \times \text{side of square field} = 4 \times 80\text{m} = 320\text{m}$
 Distance covered in 10 rounds = $(320 \times 10)\text{m} = 3200\text{m}$
 Distance covered by Sushmita in one round
 $= \text{Perimeter of the rectangular field}$
 $= 2 \times (\text{length} + \text{breadth})$
 $= 2 \times (150 + 60)\text{m} = 2 \times 210 = 420\text{m}$
 Distance covered in 8 rounds = $420 \times 8 = 3360\text{m}$
 Hence, Sushmita has covered 160m more than the distance covered by Bhavna.

Example 5: The length of a rectangular field is thrice its breadth. If the perimeter of this field is 800m, what is the length of the field?

Solution: Perimeter of a rectangle $= 2 (\text{length} + \text{breadth})$
 Length of the rectangular field $= 3 \times \text{breadth}$
 Therefore perimeter of field $= 2 (3 \times \text{breadth} + \text{breadth})$
 $= 2 (4 \times \text{breadth})$
 $= 8 \times \text{breadth}$
 The given perimeter $= 800\text{m}$
 Therefore $8 \times \text{breadth} = 800$
 Or, $\text{breadth} = 800 \div 8 = 100\text{m}$
 So, $\text{length} = 3 \times 100\text{m} = 300\text{m}$

Example 6: Cost of fencing around a square field is Rs. 12000. If the cost of fencing per metre is Rs. 30, find the area of the square field.

Solution: Cost of fencing per metre $= \text{Rs } 30$
 Total cost of fencing $= \text{Rs } 12000$
 So, the length of fencing (perimeter) $= \frac{\text{Total cost}}{\text{Cost per metre}}$
 $= \frac{12000}{30} = 400\text{m}$
 Now, length of fencing $=$ Perimeter of the square field
 $= 4 \times \text{side of the field}$
 Therefore, $4 \times \text{side of the field} = 400\text{m}$
 or, side of the field $= \frac{400}{4} \text{ m} = 100\text{m}$
 So, area of the field $= 100\text{m} \times 100\text{m}$
 $= 10000\text{sq m.}$

Example 7: Sabina wants to cover the floor of her room whose length is 4 m and breadth is 3m by square tiles. If each square tile is of side 20cm, then find the number of tiles required to cover the floor of her room.

Solution: Length of the room $= 4\text{m} = 400\text{cm}$
 Breadth of the room $= 3\text{m} = 300\text{cm}$
 Area of the floor of the room $= \text{Length} \times \text{Breadth}$

$$= 400 \times 300 \text{sqcm} = 120000 \text{sqcm}$$

$$\text{Side of the square tile} = 20 \text{cm}$$

$$\text{Area of the square tile} = \text{Side} \times \text{Side} = 20 \times 20 \text{sqcm}$$

$$= 400 \text{sqcm}$$

$$\text{So, number of tiles required} = \quad =$$

Example 8: By splitting the figure into rectangles, find its area.
(see Fig. 6.2)

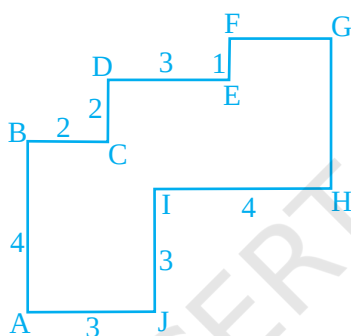


Fig. 6.2

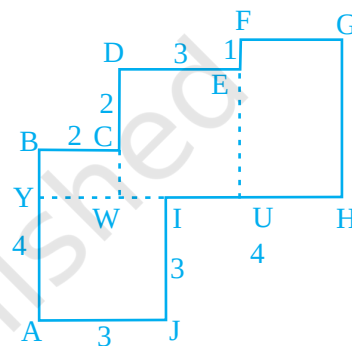


Fig. 6.3

Solution: By splitting the figure into four rectangles, we get Fig. 6.3

$$\begin{aligned} \text{Area of the figure} &= \text{Area AJIY} + \text{Area YWCB} \\ &\quad + \text{Area DWUE} + \text{Area FUHG.} \end{aligned}$$

$$\text{Area AJIY} = AJ \times JI = 3 \times 3 = 9$$

$$\text{Now, } BY = AB - YA = 4 - 3 = 1$$

$$\text{So, Area YWCB} = BY \times BC = 1 \times 2 = 2$$

$$\text{Next, } DW = DC + CW = 2 + 1 = 3$$

$$\text{Therefore, area DWUE} = DW \times DE = 3 \times 3 = 9$$

$$\text{Similarly, } UH = IH - IU = 4 - 2 = 2$$

$$GH = FU \text{ and } FU = EU + FE$$

$$= DW + FE = 3 + 1 = 4$$

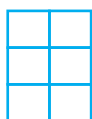
$$\text{Area FUHG} = UH \times GH = 2 \times 4 = 8$$

$$\begin{aligned} \text{Therefore, the area of the figure} &= 9 + 2 + 9 + 8 \\ &= 28 \text{sq units} \end{aligned}$$

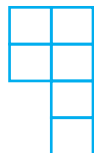
(C) Exercise

In questions 1 to 6, out of the four options only one is correct. Write the correct answer.

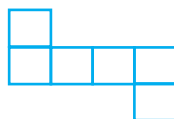
1. Following figures are formed by joining six unit squares. Which figure has the smallest perimeter in Fig. 6.4?



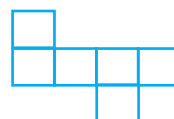
(i)



(ii)



(iii)



(iv)

Fig. 6.4

- (A) (ii) (B) (iii) (C) (iv) (D) (i)

2. A square shaped park ABCD of side 100m has two equal rectangular flower beds each of size 10m $\times$ 5m (Fig. 6.5). Length of the boundary of the remaining park is

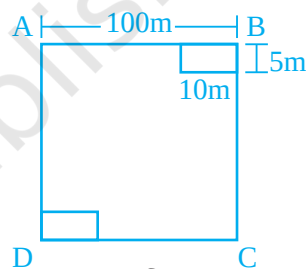


Fig. 6.5

- (A) 360m (B) 400m
(C) 340m (D) 460m
3. The side of a square is 10cm. How many times will the new perimeter become if the side of the square is doubled?
- (A) 2 times (B) 4 times (C) 6 times (D) 8 times
4. Length and breadth of a rectangular sheet of paper are 20cm and 10cm, respectively. A rectangular piece is cut from the sheet as shown in Fig. 6.6. Which of the following statements is correct for the remaining sheet?

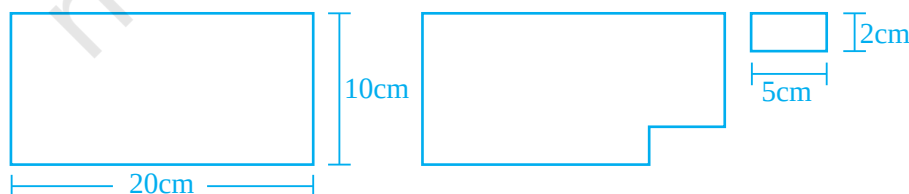


Fig. 6.6

- (A) Perimeter remains same but area changes.

- (B) Area remains the same but perimeter changes.
 (C) Both area and perimeter are changing.
 (D) Both area and perimeter remain the same.

5. Two regular Hexagons of perimeter 30cm each are joined as shown in Fig. 6.7. The perimeter of the new figure is

- (A) 65cm (B) 60cm
 (C) 55cm (D) 50cm



Fig. 6.7

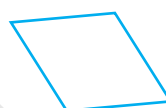
6. In Fig. 6.8 which of the following is a regular polygon? All have equal side except (i)



(i)



(ii)



(iii)



(iv)

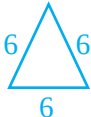
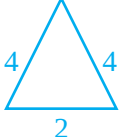
Fig. 6.8

- (A) (i) (B) (ii)
 (C) (iii) (D) (iv)

7. Match the shapes (each sides measures 2cm) in column I with the corresponding perimeters in column II:

Column I	Column II
(A) 	(i) 16cm
(B) 	(ii) 20cm
(C) 	(iii) 24cm
(D) 	(iv) 28cm
	(v) 32cm

8. Match the following

Shapes	Perimeter
(A)  rectangle	(i) 10
(B)  square	(ii) 18
(C)  equilateral triangle	(iii) 20
(D)  isosceles triangle	(iv) 25

In questions 9 to 13, fill in the blanks to make the statements true.

9. Perimeter of the shaded portion in Fig. 6.9 is

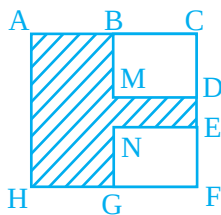


Fig. 6.9

$$AB + _ + _ + _ + _ + _ + _ + HA$$

10. The amount of region enclosed by a plane closed figure is called its _____.

11. Area of a rectangle with length 5cm and breadth 3cm is _____.

12. A rectangle and a square have the same perimeter (Fig. 6.10).

(a) The area of the rectangle is _____.

(b) The area of the square is _____.



Fig. 6.10

13. (a) $1\text{m} = \underline{\hspace{2cm}} \text{cm}.$
 (b) $1\text{sqcm} = \underline{\hspace{2cm}} \text{cm} \times 1\text{cm}.$
 (c) $1\text{sqm} = 1\text{m} \times \underline{\hspace{2cm}} \text{m} = 100\text{cm} \times \underline{\hspace{2cm}} \text{cm}.$
 (d) $1\text{sqm} = \underline{\hspace{2cm}} \text{sqcm}.$

In questions 14 to 20, state which of the statements are true and which are false.

14. If length of a rectangle is halved and breadth is doubled then the area of the rectangle obtained remains same.
 15. Area of a square is doubled if the side of the square is doubled.
 16. Perimeter of a regular octagon of side 6cm is 36cm.
 17. A farmer who wants to fence his field, must find the perimeter of the field.
 18. An engineer who plans to build a compound wall on all sides of a house must find the area of the compound.
 19. To find the cost of painting a wall we need to find the perimeter of the wall.
 20. To find the cost of a frame of a picture, we need to find the perimeter of the picture.
 21. Four regular hexagons are drawn so as to form the design as shown in Fig. 6.11. If the perimeter of the design is 28cm, find the length of each side of the hexagon.

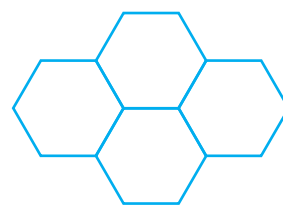


Fig. 6.11

22. Perimeter of an isosceles triangle is 50cm. If one of the two equal sides is 18cm, find the third side.
 23. Length of a rectangle is three times its breadth. Perimeter of the rectangle is 40cm. Find its length and width.
 24. There is a rectangular lawn 10m long and 4m wide in front of Meena's house (Fig. 6.12). It is fenced along the two smaller sides and one longer side leaving a gap of 1m for the entrance. Find the length of fencing.

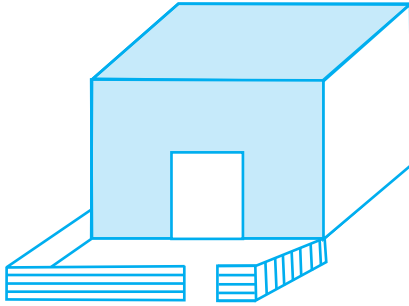


Fig. 6.12

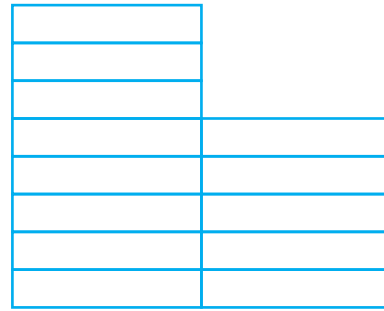


Fig. 6.13

- 25.** The region given in Fig. 6.13 is measured by taking as a unit. What is the area of the region?
- 26.** Tahir measured the distance around a square field as 200 rods (*lathi*). Later he found that the length of this rod was 140cm. Find the side of this field in metres.
- 27.** The length of a rectangular field is twice its breadth. Jamal jogged around it four times and covered a distance of 6km. What is the length of the field?

- 28.** Three squares are joined together as shown in Fig. 6.14. Their sides are 4cm, 10cm and 3cm. Find the perimeter of the figure.

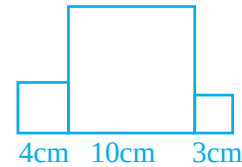


Fig. 6.14

- 29.** In Fig. 6.15 all triangles are equilateral and $AB = 8$ units. Other triangles have been formed by taking the mid points of the sides. What is the perimeter of the figure?
- 30.** Length of a rectangular field is 250m and width is 150m. Anuradha runs around this field 3 times. How far did she run? How many times she should run around the field to cover a distance of 4km?

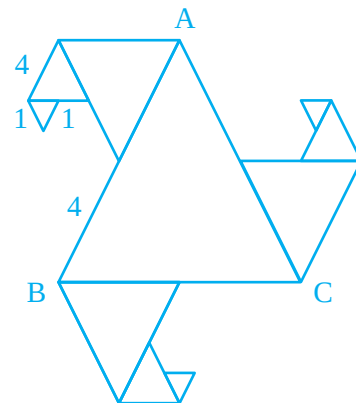


Fig. 6.15

- 31.** Bajinder runs ten times around a square track and covers 4km. Find the length of the track.

32. The lawn in front of Molly's house is $12\text{m} \times 8\text{m}$, whereas the lawn in front of Dolly's house is $15\text{m} \times 5\text{m}$. A bamboo fencing is built around both the lawns. How much fencing is required for both?
33. The perimeter of a regular pentagon is 1540cm . How long is its each side?
34. The perimeter of a triangle is 28cm . One of its sides is 8cm . Write all the sides of the possible isosceles triangles with these measurements.
35. The length of an aluminium strip is 40cm . If the lengths in cm are measured in natural numbers, write the measurement of all the possible rectangular frames which can be made out of it. (For example, a rectangular frame with 15cm length and 5cm breadth can be made from this strip.)
36. Base of a tent is a regular hexagon of perimeter 60cm . What is the length of each side of the base?
37. In an exhibition hall, there are 24 display boards each of length 1m 50cm and breadth 1m . There is a 100m long aluminium strip, which is used to frame these boards. How many boards will be framed using this strip? Find also the length of the aluminium strip required for the remaining boards.
38. In the above question, how many square metres of cloth is required to cover all the display boards? What will be the length in m of the cloth used, if its breadth is 120cm ?
39. What is the length of outer boundary of the park shown in Fig. 6.16? What will be the total cost of fencing it at the rate of Rs 20 per metre? There is a rectangular flower bed in the center of the park. Find the cost of manuring the flower bed at the rate of Rs 50 per square metre.

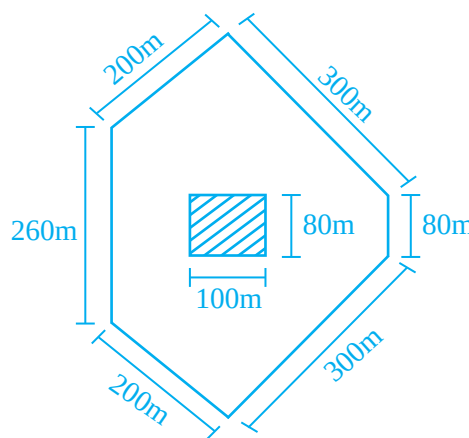


Fig. 6.16

- 40.** Total cost of fencing the park shown in Fig. 6.17 is Rs 55000. Find the cost of fencing per metre.

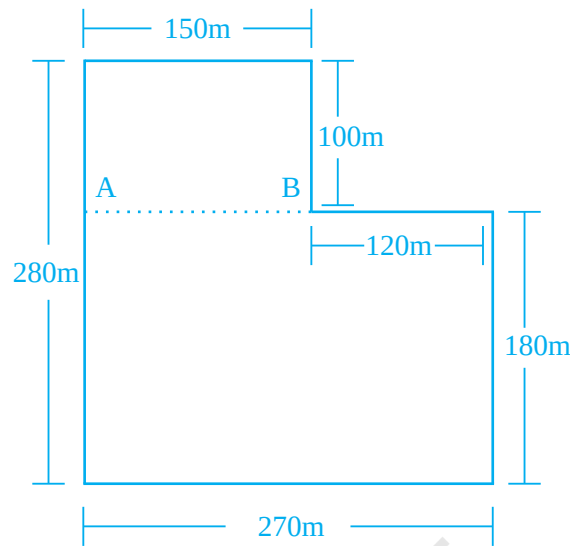


Fig. 6.17

- 41.** In Fig. 6.18 each square is of unit length

- What is the perimeter of the rectangle ABCD?
- What is the area of the rectangle ABCD?
- Divide this rectangle into ten parts of equal area by shading squares.
(Two parts of equal area are shown here)
- Find the perimeter of each part which you have divided. Are they all equal?

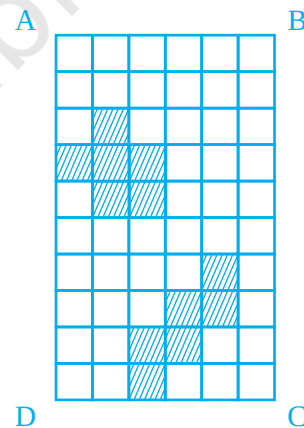


Fig. 6.18

- 42.** Rectangular wall MNOP of a kitchen is covered with square tiles of 15cm length (Fig. 6.19). Find the area of the wall.

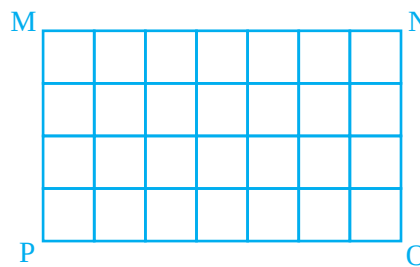
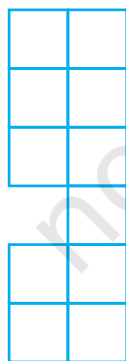


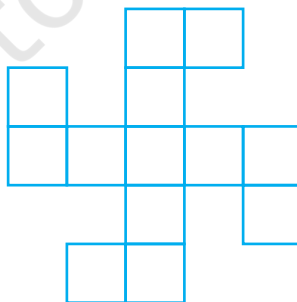
Fig. 6.19

43. Length of a rectangular field is 6 times its breadth. If the length of the field is 120cm, find the breadth and perimeter of the field.
44. Anmol has a chart paper of measure $90\text{cm} \times 40\text{cm}$, whereas Abhishek has one which measures $50\text{cm} \times 70\text{cm}$. Which will cover more area on the table and by how much?
45. A rectangular path of 60m length and 3m width is covered by square tiles of side 25cm. How many tiles will there be in one row along its width? How many such rows will be there? Find the number of tiles used to make this path?
46. How many square slabs each with side 90cm are needed to cover a floor of area 81sqm.
47. The length of a rectangular field is 8m and breadth is 2m. If a square field has the same perimeter as this rectangular field, find which field has the greater area.
48. Parmindar walks around a square park once and covers 800m. What will be the area of this park?
49. The side of a square is 5cm. How many times does the area increase, if the side of the square is doubled?
50. Amita wants to make rectangular cards measuring $8\text{cm} \times 5\text{cm}$. She has a square chart paper of side 60cm. How many complete cards can she make from this chart? What area of the chart paper will be left?
51. A magazine charges Rs 300 per 10sqcm area for advertising. A company decided to order a half page advertisement. If each page of the magazine is $15\text{cm} \times 24\text{cm}$, what amount will the company has to pay for it?
52. The perimeter of a square garden is 48m. A small flower bed covers 18sqm area inside this garden. What is the area of the garden that is not covered by the flower bed? What fractional part of the garden is covered by flower bed? Find the ratio of the area covered by the flower bed and the remaining area.
53. Perimeter of a square and a rectangle is same. If a side of the square is 15cm and one side of the rectangle is 18cm, find the area of the rectangle.

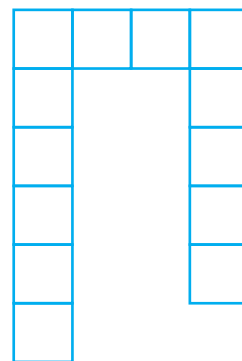
- 54.** A wire is cut into several small pieces. Each of the small pieces is bent into a square of side 2cm. If the total area of the small squares is 28 square cm, what was the original length of the wire?
- 55.** Divide the park shown in Fig. 6.17 of question 40 into two rectangles. Find the total area of this park. If one packet of fertilizer is used for 300sqm, how many packets of fertilizer are required for the whole park?
- 56.** The area of a rectangular field is 1600sqm. If the length of the field is 80m, find the perimeter of the field.
- 57.** The area of each square on a chess board is 4sqcm. Find the area of the board.
- At the beginning of game when all the chess men are put on the board, write area of the squares left unoccupied.
 - Find the area of the squares occupied by chess men.
- 58.** (a) Find all the possible dimensions (in natural numbers) of a rectangle with a perimeter 36cm and find their areas.
- (b) Find all the possible dimensions (in natural numbers) of a rectangle with an area of 36sqcm, and find their perimeters.
- 59.** Find the area and Perimeter of each of the following figures, if area of each small square is 1sqcm.



(i)



(ii)



(iii)

Fig. 6.20

60. What is the area of each small square in the Fig. 6.21 if the area of entire figure is 96sqcm. Find the perimeter of the figure.

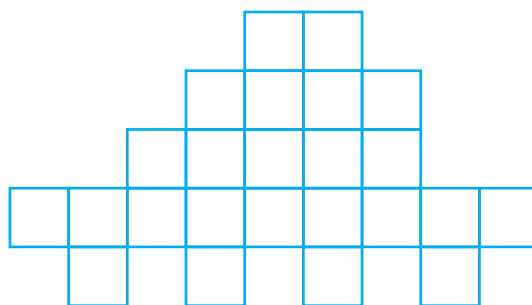


Fig. 6.21

(D) Activities

Activity 1: Take 36 square cards each of unit length. In how many ways can you put them together to form a rectangle? One is done for you (Fig. 6.22). Which arrangement will make a rectangle of greatest perimeter and which arrangement will make a rectangle of least perimeter?

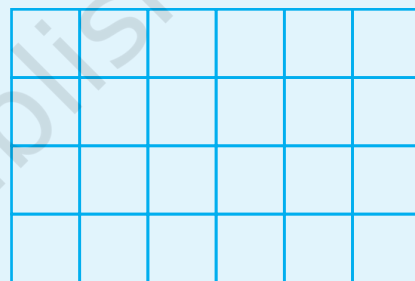


Fig. 6.22

Activity 2: Copy the triangular region in Fig. 6.23 (a). Use it as a unit to measure the area of each polygon in Fig. 6.23 (b), (c) and (d)

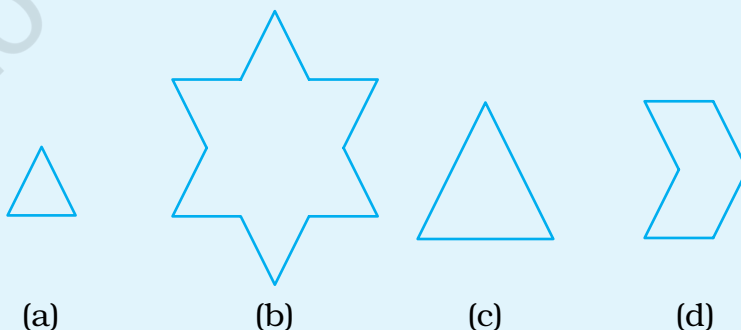


Fig. 6.23

Activity 3: If  = 10sq units

Find how many such triangles will cover the following figures (Fig. 6.24)

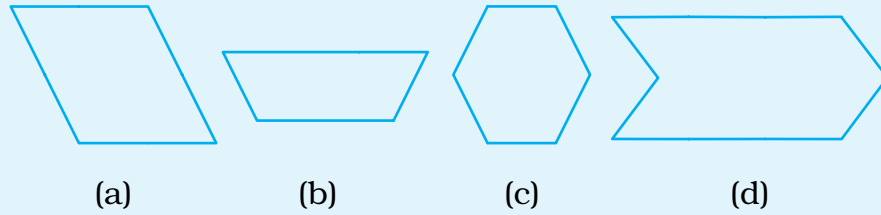


Fig. 6.24

Activity 4: Measure the following region in Fig. 6.25. Use the rectangular region of Q.25 as the unit of measure.

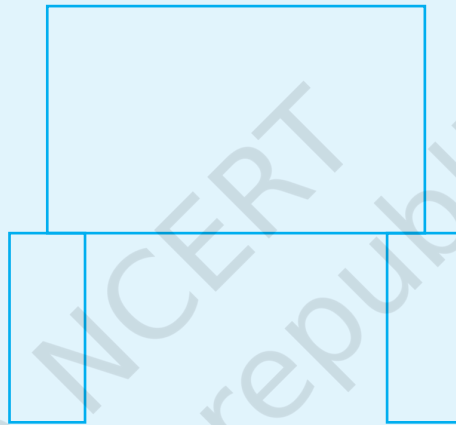
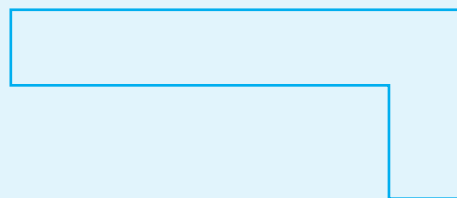


Fig. 6.25

Copy the rectangular unit on cardboard and cut it out, so that you can use it.

Activity 5: Using the same unit as in Q.25 measure these regions. (Fig. 6.26)



(a)

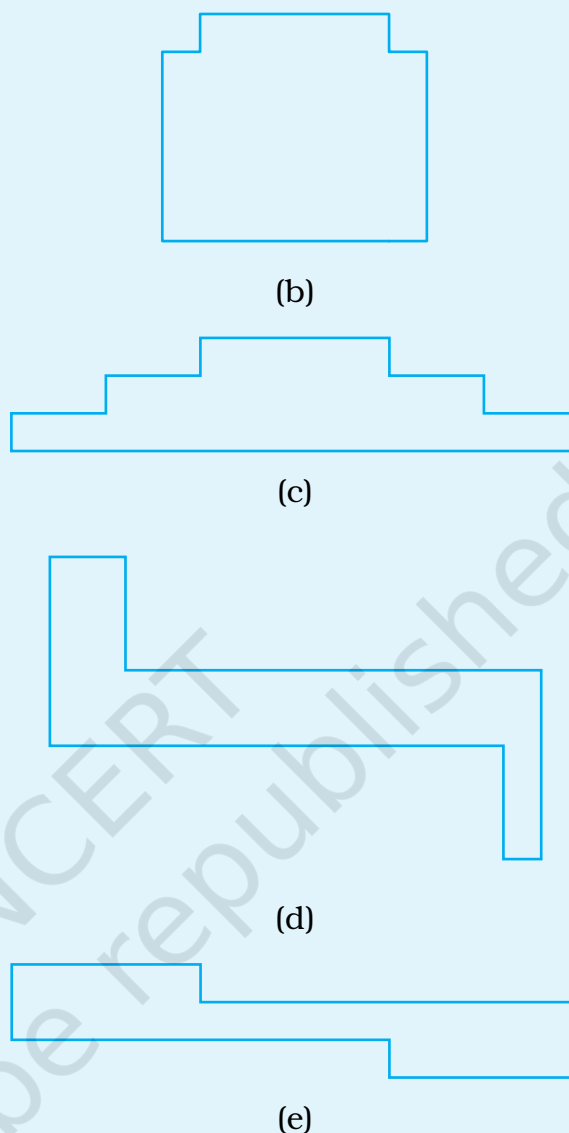


Fig. 6.26

Activity 6: Area of the rectangle shown in Activity 1 is 24sq units. Its length is 6 units and breadth is 4 units. We can also write $24 = 6 \times 4$ which means that 6 and 4 are factors of 24. Now write factors of 24 by observing the rectangles formed in Q9. Similarly take 48 unit squares and try to write all the factors of 48 using these squares.

Activity 7: On a squared paper, draw two rectangles with same perimeter but different areas. Draw two other rectangles which have same area but different perimeters.

UNIT 7

ALGEBRA

(A) Main Concepts and Results

- The word '**variable**' means something that can vary, i.e., change. The value of a variable is not fixed. We use a variable to represent a number and denote it by any letter such as l, m, n, p, x, y, z etc.
- A variable allows us to express relation in any practical situation and to express many common rules and properties of geometry, algebra etc.
- An expression with a variable, constants and the sign of equality ($=$) is called an **equation**.
- The value of the variable which satisfies the equation is called a **solution** of the equation.

(B) Solved Examples

In examples 1 to 3, write the correct answer from the given four options:

Example 1: $4a$ equals

(A) $4 + a$

(B) $4 \times a$

(C) $a \times a \times a \times a$

(D) $4 \div a$

Solution: Correct answer is (B).

Example 2: 8 more than three times the number x can be represented as

(A) $8 + x + 3$ (B) $3x - 8$ (C) $3x + 8$ (D) $8x + 3$

Solution: Correct answer is (C).

Example 3: Which of the following is an equation?

(A) $x + 7$

(B) $2y + 3 = 7$

(C) $2p < 10$

(D) $12x$

Solution: Correct answer is (B)

Example 4: Fill in the blanks to make it a true statement:

7 times of y subtracted from 50 can be expressed as _____

Solution: $50 - 7y$

Example 5: State true or false:

$x = 5$ is a solution of the equation $3 - x = 8$

Solution: False

Give an expression for each of the examples 6 to 8:

Example 6: 13 subtracted from thrice of a number.

Solution: Let the number be x .

Thrice of the number is $3x$.

13 subtracted from it is the expression $3x - 13$.

Example 7: Megha's age (in years) is 2 more than 5 times her daughter's age.

Solution: Let the daughter's age be m years.

5 times of m is $5m$.

2 more than $5m$ is the expression $5m + 2$.

The age of Megha (in years) is $(5m + 2)$.

Example 8: Anagha, Sushant and Faizal are climbing the steps to a hill top. Anagha is at the step p . Sushant is 10 steps ahead and Faizal is 6 steps behind Anagha. Where are Sushant and Faizal? The total number of steps to the hill top is 3 steps less than 8 times what Anagha has reached. Express the total number of steps using p .

Solution: Anagha is at step p .

Sushant is 10 steps ahead of Anagha. That is, he is at the step $p + 10$.

Faizal is 6 steps behind Anagha. That is, he is at step $p - 6$.

8 times of $p = 8p$

3 less than $8p = 8p - 3$

So, the total number of steps = $8p - 3$

In examples 9 and 10, change the statements, converting expressions into statements in ordinary language.

Example 9: Cost of a pencil is Rs x . A pen costs Rs $6x$.

Solution: Cost of a pen is 6 times the cost of a pencil.

Example 10: Manisha is z years old. Her uncle is $5z$ years old and her aunt is $(5z - 4)$ years old.

Solution: Manisha's uncle is five times of Manisha's age. Her aunt is 4 years younger than her uncle.

(C) Exercise

In questions 1 to 23, out of the four given options, only one is correct. Write the correct answer.

- If each match box contains 50 matchsticks, the number of matchsticks required to fill n such boxes is
(A) $50 + n$ (B) $50n$ (C) $50 \div n$ (D) $50 - n$
- Amulya is x years of age now. 5 years ago her age was
(A) $(5 - x)$ years (B) $(5 + x)$ years
(C) $(x - 5)$ years (D) $(5 \div x)$ years
- Which of the following represents $6 \times x$
(A) $6x$ (B) $\frac{x}{6}$ (C) $6 + x$ (D) $6 - x$
- Which of the following is an equation?
(A) $x + 1$ (B) $x - 1$ (C) $x - 1 = 0$ (D) $x + 1 > 0$
- If x takes the value 2, then the value of $x + 10$ is
(A) 20 (B) 12 (C) 5 (D) 8

6. If the perimeter of a regular hexagon is x metres, then the length of each of its sides is
- (A) $(x + 6)$ metres (B) $(x \div 6)$ metres
(C) $(x - 6)$ metres (D) $(6 \div x)$ metres
7. Which of the following equations has $x = 2$ as a solution?
- (A) $x + 2 = 5$ (B) $x - 2 = 0$ (C) $2x + 1 = 0$ (D) $x + 3 = 6$
8. For any two integers x and y , which of the following suggests that operation of addition is commutative ?
- (A) $x + y = y + x$ (B) $x + y > x$ (C) $x - y = y - x$ (D) $x \times y = y \times x$
9. Which of the following equations does not have a solution in integers?
- (A) $x + 1 = 1$ (B) $x - 1 = 3$ (C) $2x + 1 = 6$ (D) $1 - x = 5$
10. In algebra, $a \times b$ means ab , but in arithmetic 3×5 is
- (A) 35 (B) 53 (C) 15 (D) 8
11. In algebra, letters may stand for
- (A) known quantities (B) unknown quantities
(C) fixed numbers (D) none of these
12. "Variable" means that it
- (A) can take different values (B) has a fixed value
(C) can take only 2 values (D) can take only three values
13. $10 - x$ means
- (A) 10 is subtracted x times (B) x is subtracted 10 times
(C) x is subtracted from 10 (D) 10 is subtracted from x
14. Savitri has a sum of Rs x . She spent Rs 1000 on grocery, Rs 500 on clothes and Rs 400 on education, and received Rs 200 as a gift. How much money (in Rs) is left with her?
- (A) $x - 1700$ (B) $x - 1900$ (C) $x + 200$ (D) $x - 2100$

15. The perimeter of the triangle shown in Fig. 7.1 is

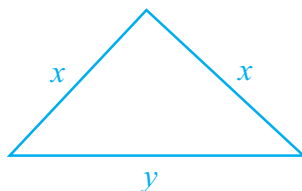


Fig. 7.1

- (A) $2x + y$ (B) $x + 2y$ (C) $x + y$ (D) $2x - y$
16. The area of a square having each side x is
 (A) $x \times x$ (B) $4x$ (C) $x + x$ (D) $4 + x$
17. The expression obtained when x is multiplied by 2 and then subtracted from 3 is
 (A) $2x - 3$ (B) $2x + 3$ (C) $3 - 2x$ (D) $3x - 2$
18. $\frac{q}{2} = 3$ has a solution
 (A) 6 (B) 8 (C) 3 (D) 2
19. $x - 4 = -2$ has a solution
 (A) 6 (B) 2 (C) -6 (D) -2
20. $\frac{4}{2} = 2$ denotes a
 (A) numerical equation (B) algebraic expression
 (C) equation with a variable (D) false statement
21. Kanta has p pencils in her box. She puts q more pencils in the box. The total number of pencils with her are
 (A) $p + q$ (B) pq (C) $p - q$ (D) $\frac{p}{q}$
22. The equation $4x = 16$ is satisfied by the following value of x
 (A) 4 (B) 2 (C) 12 (D) -12
23. I think of a number and on adding 13 to it, I get 27. The equation for this is
 (A) $x - 27 = 13$ (B) $x - 13 = 27$
 (C) $x + 27 = 13$ (D) $x + 13 = 27$

In question 24 to 40, fill in the blanks to make the statements true:

24. The distance (in km) travelled in h hours at a constant speed of 40km per hour is _____.
25. p kg of potatoes are bought for Rs 70. Cost of 1kg of potatoes (in Rs) is _____.
26. An auto rickshaw charges Rs 10 for the first kilometre then Rs 8 for each such subsequent kilometre. The total charge (in Rs) for d kilometres is _____.
27. If $7x + 4 = 25$, then the value of x is _____.
28. The solution of the equation $3x + 7 = -20$ is _____.
29. ' x exceeds y by 7' can be expressed as _____.
30. '8 more than three times the number x ' can be written as _____.
31. Number of pencils bought for Rs x at the rate of Rs 2 per pencil is _____.
32. The number of days in w weeks is _____.
33. Annual salary at r rupees per month alongwith a festival bonus of Rs 2000 is _____.
34. The two digit number whose ten's digit is ' t ' and units's digit is ' u ' is _____.
35. The variable used in the equation $2p + 8 = 18$ is _____.
36. x metres = _____ centimetres
37. p litres = _____ millilitres
38. r rupees = _____ paise
39. If the present age of Ramandeep is n years, then her age after 7 years will be _____.
40. If I spend f rupees from 100 rupees, the money left with me is _____ rupees.

In question 41 to 45, state whether the statements are true or false.

41. 0 is a solution of the equation $x + 1 = 0$
42. The equations $x + 1 = 0$ and $2x + 2 = 0$ have the same solution.
43. If m is a whole number, then $2m$ denotes a multiple of 2.
44. The additive inverse of an integer x is $2x$.
45. If x is a negative integer, $-x$ is a positive integer.
46. $2x - 5 > 11$ is an equation.
47. In an equation, the LHS is equal to the RHS.
48. In the equation $7k - 7 = 7$, the variable is 7.
49. $a = 3$ is a solution of the equation $2a - 1 = 5$
50. The distance between New Delhi and Bhopal is not a variable.
51. t minutes are equal to $60t$ seconds.
52. $x = 5$ is the solution of the equation $3x + 2 = 20$
53. 'One third of a number added to itself gives 8', can be expressed as

$$\frac{x}{3} + 8 = x$$
54. The difference between the ages of two sisters Leela and Yamini is a variable.
55. The number of lines that can be drawn through a point is a variable.

In questions 56 to 74, choose a letter x , y , z , p etc....., wherever necessary, for the unknown (variable) and write the corresponding expressions:

56. One more than twice the number.
57. 20°C less than the present temperature.
58. The successor of an integer.
59. The perimeter of an equilateral triangle, if side of the triangle is m .
60. Area of the rectangle with length k units and breadth n units.
61. Omar helps his mother 1 hour more than his sister does.

- 62. Two consecutive odd integers.
- 63. Two consecutive even integers.
- 64. Multiple of 5.
- 65. The denominator of a fraction is 1 more than its numerator.
- 66. The height of Mount Everest is 20 times the height of Empire State building.
- 67. If a note book costs Rs p and a pencil costs Rs 3, then the total cost (in Rs) of two note books and one pencil.
- 68. z is multiplied by -3 and the result is subtracted from 13.
- 69. p is divided by 11 and the result is added to 10.
- 70. x times of 3 is added to the smallest natural number.
- 71. 6 times q is subtracted from the smallest two digit number.
- 72. Write two equations for which 2 is the solution.
- 73. Write an equation for which 0 is a solution.
- 74. Write an equation whose solution is not a whole number.

In questions 75 to 84, change the statements, converting expressions into statements in ordinary language:

- 75. A pencil costs Rs p and a pen costs Rs $5p$.
- 76. Leela contributed Rs y towards the Prime Minister's Relief Fund. Leela is now left with Rs $(y + 10000)$.
- 77. Kartik is n years old. His father is $7n$ years old.
- 78. The maximum temperature on a day in Delhi was $p^{\circ}\text{C}$. The minimum temperature was $(p - 10)^{\circ}\text{C}$.
- 79. John planted t plants last year. His friend Jay planted $2t + 10$ plants that year.
- 80. Sharad used to take p cups tea a day. After having some health problem, he takes $p - 5$ cups of tea a day.
- 81. The number of students dropping out of school last year was m . Number of students dropping out of school this year is $m - 30$.

- 82.** Price of petrol was Rs p per litre last month. Price of petrol now is Rs $(p - 5)$ per litre.
- 83.** Khader's monthly salary was Rs P in the year 2005. His salary in 2006 was Rs $(P + 1000)$.
- 84.** The number of girls enrolled in a school last year was g . The number of girls enrolled this year in the school is $3g - 10$.
- 85.** Translate each of the following statements into an equation, using x as the variable:
- (a) 13 subtracted from twice a number gives 3.
 - (b) One fifth of a number is 5 less than that number.
 - (c) Two-third of number is 12.
 - (d) 9 added to twice a number gives 13.
 - (e) 1 subtracted from one-third of a number gives 1.
- 86.** Translate each of the following statements into an equation:
- (a) The perimeter (p) of an equilateral triangle is three times of its side (a).
 - (b) The diameter (d) of a circle is twice its radius (r).
 - (c) The selling price (s) of an item is equal to the sum of the cost price (c) of an item and the profit (p) earned.
 - (d) Amount (a) is equal to the sum of principal (p) and interest (i).
- 87.** Let Kanika's present age be x years. Complete the following table, showing ages of her relatives:

Situation (described in ordinary language)	Expressions
(i) Her brother is 2 years younger.	_____
(ii) Her father's age exceeds her age by 35 years.	_____
(iii) Mother's age is 3 years less than that of her father.	_____
(iv) Her grand father's age is 8 times of her age.	_____

- 88.** If m is a whole number less than 5, complete the table and by inspection of the table, find the solution of the equation $2m - 5 = -1$:

m					
$2m - 5$					

- 89.** A class with p students has planned a picnic. Rs 50 per student is collected, out of which Rs 1800 is paid in advance for transport. How much money is left with them to spend on other items?
- 90.** In a village, there are 8 water tanks to collect rain water. On a particular day, x litres of rain water is collected per tank. If 100 litres of water was already there in one of the tanks, what is the total amount of water in the tanks on that day?
- 91.** What is the area of a square whose side is m cm?
- 92.** Perimeter of a triangle is found by using the formula $P = a + b + c$, where a , b and c are the sides of the triangle. Write the rule that is expressed by this formula in words.
- 93.** Perimeter of a rectangle is found by using the formula $P = 2(l + w)$, where l and w are respectively the length and breadth of the rectangle. Write the rule that is expressed by this formula in words.
- 94.** On my last birthday, I weighed 40kg. If I put on m kg of weight after a year, what is my present weight?
- 95.** Length and breadth of a bulletin board are r cm and t cm, respectively.
- What will be the length (in cm) of the aluminium strip required to frame the board, if 10cm extra strip is required to fix it properly.
 - If x nails are used to repair one board, how many nails will be required to repair 15 such boards?
 - If 500sqcm extra cloth per board is required to cover the edges, what will be the total area of the cloth required to cover 8 such boards?
 - What will be the expenditure for making 23 boards, if the carpenter charges Rs x per board.

96. Sunita is half the age of her mother Geeta. Find their ages

- (i) after 4 years?
- (ii) before 3 years?

97. Match the items of Column I with that of Column II:

Column I

- (i) The number of corners of a quadrilateral
- (ii) The variable in the equation $2p + 3 = 5$
- (iii) The solution of the equation $x + 2 = 3$
- (iv) solution of the equation $2p + 3 = 5$
- (v) A sign used in an equation

Column II

- (A) =
- (B) constant
- (C) +1
- (D) -1
- (E) p
- (F) x

(D) Activities

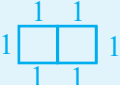
Activity 1: Observe the following patterns and find a rule:

(i)

	Perimeter	Number of unit shapes
	3	1
	4	2
	5	3
	6	4

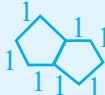
Rule : Perimeter = Number of unit shapes + 2 = $k + 2$,
where k is the number of unit shapes (triangles).

(ii)

	4	1
		2
		

Rule :

(iii)

	5	1
		
		

Rule :

(iv)

	5	1
		
		

Rule :

UNIT 8

RATIO AND PROPORTION

(A) Main Concepts and Results

- Ratio, Proportion and Unitary Method.
- The comparison of two numbers or quantities by division is known as the **ratio**. Symbol ':' is used to denote ratio.
- For a ratio, the two quantities must be in the same unit. If they are not, they should be expressed in the same unit before the ratio is taken.
- A ratio may be treated as a fraction.
- Two ratios are **equivalent**, if the fractions corresponding to them are equivalent.
- Four quantities are said to be in **proportion**, if the ratio of the first and the second quantities is equal to the ratio of the third and the fourth quantities. The symbol '::' or '=' is used to equate the two ratios.
- The order of terms in a proportion is important. For example 3, 8, 24, 64 are in proportion but 3, 8, 64, 24 are not in proportion.
- The method in which first we find the value of one unit and then the value of the required number of units is known as **unitary method**.

(B) Solved Examples

In examples 1 and 2, write the correct answer from the given four options:

Example 1. The ratio of Rs 8 to 80 paise is
(A) 1 : 10 (B) 10 : 1 (C) 1 : 1 (D) 100 : 1

Solution: Correct answer is (B)
(**Hint:** 1 Rupee = 100 paise)

Example 2. The length and breadth of a steel tape are 10m and 2.4cm, respectively. The ratio of the length to the breadth is
(A) 5 : 1.2 (B) 25 : 6 (C) 625 : 6 (D) 1250 : 3

Solution: Correct answer is (D)
(**Hint:** 10m = 10 × 100cm)

Example 3. Find the missing number in the box in the following proportion:
 $\square : 8 :: 12 : 32$

Solution: $12:32 = \frac{12}{32} = \frac{3 \times 4}{8 \times 4} = \frac{3}{8} = 3:8$

We have, $\square : 8 = 3 : 8$ (Given)

So, the missing number in $\square$ is 3.

Example 4. State whether the given statements are true or false:
(a) $12 : 18 = 28 : 56$
(b) $25 \text{ persons} : 130 \text{ persons} = 15\text{kg} : 78\text{kg}$

Solution: (a) False, Because

$$12:18 = \frac{12}{18} = \frac{2}{3} = 2:3$$

$$\text{and } 28:56 = \frac{28}{56} = \frac{1}{2} = 1:2$$

These are not equal.

(b) True, Because

$$25 \text{ persons} : 130 \text{ persons} = 5 : 26$$

$$\text{and } 15\text{kg} : 78\text{kg} = 5 : 26$$

These are equal.

Example 5. Fill in the blanks:

If two ratios are _____, then they are in proportion.

Solution: Equal/same.

Example 6. Find the ratio of the shaded portion to the unshaded portion in Fig. 8.1

Solution: Number of squares in the shaded portion = 15

Number of squares in the unshaded portion = 33

So, the ratio of the shaded portion to the unshaded portion = 15 : 33

$$= \frac{15}{33} = \frac{5 \times 3}{11 \times 3} = \frac{5}{11} = 5:11$$

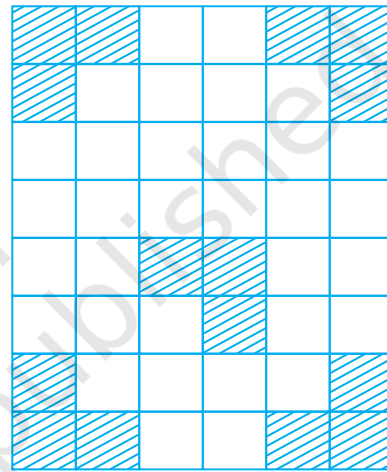


Fig. 8.1

Example 7. Income of Rahim is Rs 12000 per month and that of Ami is Rs 191520 per annum. If the monthly expenditure of each of them is Rs 9960 per month find the ratio of their savings.

Solution: Savings of Rahim per month = Rs (12000 – 9960)
= Rs 2040

$$\text{Monthly income of Ami} = \text{Rs } \frac{191520}{12} = \text{Rs } 15960$$

$$\text{Savings of Ami per month} = \text{Rs } (15960 - 9960) \\ = \text{Rs } 6000$$

$$\text{Therefore, ratio of savings of Rahim and Ami} \\ = 2040 : 6000 = 17:50$$

Example 8. 20 tons of iron costs Rs 600000. Find the cost of 560kg of iron.

Solution: 1 ton = 1000kg

Therefore, 20 tons = 20000kg

Now, cost of 20000kg iron = Rs 600000

Therefore, cost of 1kg iron = Rs $\frac{600000}{20000}$ = Rs 30

Therefore, cost of 560kg iron = Rs 30 × 560 = Rs 16800

(C) Exercise

In questions 1 to 10, only one of the four options is correct. Write the correct one.

- The ratio of 8 books to 20 books is
(A) 2 : 5 (B) 5 : 2 (C) 4 : 5 (D) 5 : 4
- The ratio of the number of sides of a square to the number of edges of a cube is
(A) 1 : 2 (B) 3 : 2 (C) 4 : 1 (D) 1 : 3
- A picture is 60cm wide and 1.8m long. The ratio of its width to its perimeter in lowest form is
(A) 1 : 2 (B) 1 : 3 (C) 1 : 4 (D) 1 : 8
- Neelam's annual income is Rs. 288000. Her annual savings amount to Rs. 36000. The ratio of her savings to her expenditure is
(A) 1 : 8 (B) 1 : 7 (C) 1 : 6 (D) 1 : 5
- Mathematics textbook for Class VI has 320 pages. The chapter 'symmetry' runs from page 261 to page 272. The ratio of the number of pages of this chapter to the total number of pages of the book is
(A) 11 : 320 (B) 3 : 40 (C) 3 : 80 (D) 272 : 320
- In a box, the ratio of red marbles to blue marbles is 7:4. Which of the following could be the total number of marbles in the box?
(A) 18 (B) 19 (C) 21 (D) 22

7. On a shelf, books with green cover and that with brown cover are in the ratio 2:3. If there are 18 books with green cover, then the number of books with brown cover is
- (A) 12 (B) 24 (C) 27 (D) 36
8. The greatest ratio among the ratios 2 : 3, 5 : 8, 75 : 121 and 40 : 25 is
- (A) 2 : 3 (B) 5 : 8 (C) 75 : 121 (D) 40 : 25
9. There are 'b' boys and 'g' girls in a class. The ratio of the number of boys to the total number of students in the class is:
- (A) $\frac{b}{b+g}$ (B) $\frac{g}{b+g}$ (C) $\frac{b}{g}$ (D) $\frac{b+g}{b}$
10. If a bus travels 160 km in 4 hours and a train travels 320km in 5 hours at uniform speeds, then the ratio of the distances travelled by them in one hour is
- (A) 1 : 2 (B) 4 : 5 (C) 5 : 8 (D) 8 : 5

In questions 11 to 15, find the missing number in the box $\square$ in each of the proportions:

11. $\frac{3}{5} = \frac{\square}{20}$

12. $\frac{\square}{18} = \frac{2}{9}$

13. $\frac{8}{\square} = \frac{3.2}{4}$

14. $\frac{\square}{45} = \frac{16}{40} = \frac{24}{\square}$

15. $\frac{16}{36} = \frac{\square}{63} = \frac{36}{\square} = \frac{\square}{117}$

In questions 16 to 34, state whether the given statements are true (T) or false (F).

16. $\frac{3}{8} = \frac{15}{40}$

17. $4 : 7 = 20 : 35$
18. $0.2 : 5 = 2 : 0.5$
19. $3 : 33 = 33 : 333$
20. $15\text{m} : 40\text{m} = 35\text{m} : 65\text{m}$
21. $27\text{cm}^2 : 57\text{cm}^2 = 18\text{cm} : 38\text{cm}$
22. $5\text{kg} : 7.5\text{kg} = \text{Rs } 7.50 : \text{Rs } 5$
23. $20\text{g} : 100\text{g} = 1\text{metre} : 500\text{cm}$
24. $12 \text{ hours} : 30 \text{ hours} = 8\text{km} : 20\text{km}$
25. The ratio of 10kg to 100kg is $1:10$
26. The ratio of 150cm to 1metre is $1:1.5$.
27. $25\text{kg} : 20\text{g} = 50\text{kg} : 40\text{g}$
28. The ratio of 1 hour to one day is $1:1$.
29. The ratio $4 : 16$ is in its lowest form.
30. The ratio $5 : 4$ is different from the ratio $4 : 5$.
31. A ratio will always be more than 1 .
32. A ratio can be equal to 1 .
33. If $b : a = c : d$, then a, b, c, d are in proportion.
34. The two terms of a ratio can be in two different units.

In questions 35 to 46, fill in the blanks to make the statements true.

35. A ratio is a form of comparison by _____.
36. $20\text{m} : 70\text{m} = \text{Rs } 8 : \text{Rs } \underline{\hspace{2cm}}$.
37. There is a number in the box such that , $24, 9, 12$ are in proportion. The number in the box is _____.
38. If two ratios are equal, then they are in _____.

Use Fig. 8.2 (In which each square is of unit length) for questions 39 and 40:

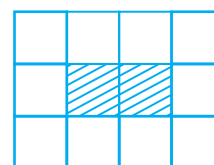


Fig. 8.2

39. The ratio of the perimeter of the boundary of the shaded portion to the perimeter of the whole figure is _____.
40. The ratio of the area of the shaded portion to that of the whole figure is _____.
41. Sleeping time of a python in a 24 hour clock is represented by the shaded portion in Fig. 8.3.

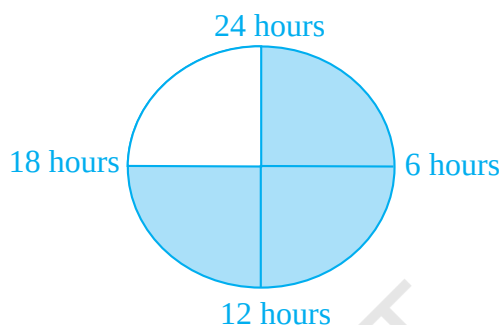


Fig. 8.3

The ratio of sleeping time to awaking time is _____.

42. A ratio expressed in lowest form has no common factor other than _____ in its terms.
43. To find the ratio of two quantities, they must be expressed in _____ units.
44. Ratio of 5 paise to 25 paise is the same as the ratio of 20 paise to _____.
45. Saturn and Jupiter take 9 hours 56 minutes and 10 hours 40 minutes, respectively for one spin on their axes. The ratio of the time taken by Saturn and Jupiter in lowest form is _____.
46. 10g of caustic soda dissolved in 100mL of water makes a solution of caustic soda. Amount of caustic soda needed for 1 litre of water to make the same type of solution is _____.
47. The marked price of a table is Rs 625 and its sale price is Rs 500. What is the ratio of the sale price to the marked price?

48. Which pair of ratios are equal? And why?
- (i) $\frac{2}{3}, \frac{4}{6}$ (ii) $\frac{8}{4}, \frac{2}{1}$ (iii) $\frac{4}{5}, \frac{12}{20}$
49. Which ratio is larger 10 : 21 or 21 : 93?
50. Reshma prepared 18kg of *Burfi* by mixing *Khoya* with sugar in the ratio of 7 : 2. How much *Khoya* did she use?
51. A line segment 56cm long is to be divided into two parts in the ratio of 2 : 5. Find the length of each part.
52. The number of milk teeth in human beings is 20 and the number of permanent teeth is 32. Find the ratio of the number of milk teeth to the number of permanent teeth.
53. Sex ratio is defined as the number of females per 1000 males in the population. Find the sex ratio if there are 3732 females per 4000 males in a town.
54. In a year, Ravi earns Rs 360000 and paid Rs 24000 as income tax. Find the ratio of his
- (a) income to income tax.
- (b) income tax to income after paying income tax.
55. Ramesh earns Rs 28000 per month. His wife Rama earns Rs 36000 per month. Find the ratio of
- (a) Ramesh's earnings to their total earnings
- (b) Rama's earnings to their total earnings.
56. Of the 288 persons working in a company, 112 are men and the remaining are women. Find the ratio of the number of
- (a) men to that of women.
- (b) men to the total number of persons.
- (c) women to the total number of persons.
57. A rectangular sheet of paper is of length 1.2m and width 21cm. Find the ratio of width of the paper to its length.

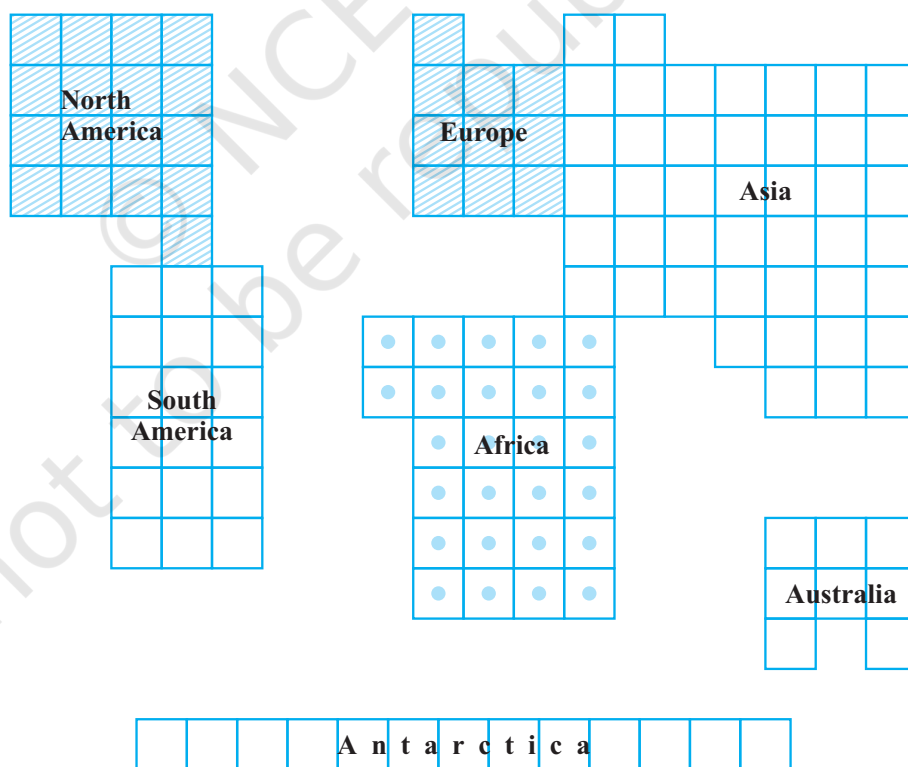
- 58.** A scooter travels 120km in 3 hours and a train travels 120km in 2 hours.

Find the ratio of their speeds.

(**Hint** : Speed = $\frac{\text{distance travelled}}{\text{time taken}}$)

- 59.** An office opens at 9 a.m. and closes at 5.30 p.m. with a lunch break of 30 minutes. What is the ratio of lunch break to the total period in the office?
- 60.** The shadow of a 3m long stick is 4m long. At the same time of the day, if the shadow of a flagstaff is 24m long, how tall is the flagstaff?
- 61.** A recipe calls for 1 cup of milk for every $2\frac{1}{2}$ cups of flour to make a cake that would feed 6 persons. How many cups of both flour and milk will be needed to make a similar cake for 8 people?
- 62.** In a school, the ratio of the number of large classrooms to small classrooms is 3:4. If the number of small rooms is 20, then find the number of large rooms.
- 63.** Samira sells newspapers at Janpath crossing daily. On a particular day, she had 312 newspapers out of which 216 are in English and remaining in Hindi. Find the ratio of
- the number of English newspapers to the number of Hindi newspapers.
 - the number of Hindi newspapers to the total number of newspapers.
- 64.** The students of a school belong to different religious backgrounds. The number of Hindu students is 288, the number of Muslim students is 252, the number of Sikh students is 144 and the number of Christian students is 72. Find the ratio of
- the number of Hindu students to the number of Christian students.

- (b) the number of Muslim students to the total number of students.
65. When Chinmay visited Chowpati at Mumbai on a holiday, he observed that the ratio of North Indian food stalls to South Indian food stalls is 5:4. If the total number of food stalls is 117, find the number of each type of food stalls.
66. At the parking stand of Ramleela ground, Kartik counted that there are 115 cycles, 75 scooters and 45 bikes. Find the ratio of the number of cycles to the total number of vehicles.
67. A train takes 2 hours to travel from Ajmer to Jaipur, which are 130km apart. How much time will it take to travel from Delhi to Bhopal which are 780km apart if the train is travelling at the uniform speed?
68. The length and breadth of a school ground are 150m and 90m respectively, while the length and breadth of a mela ground are 210m and 126m, respectively. Are these measurements in proportion?



(Comparative areas of the continents)

Fig. 8.4

- 69.** In Fig. 8.4, the comparative areas of the continents are given:
What is the ratio of the areas of
- Africa to Europe
 - Australia to Asia
 - Antarctica to Combined area of North America and South America.
- 70.** A tea merchant blends two varieties of tea costing her Rs 234 and Rs 130 per kg in the ratio of their costs. If the weight of the mixture is 84kg, then find the weight of each variety of tea.
- 71.** An alloy contains only zinc and copper and they are in the ratio of 7:9. If the weight of the alloy is 8kg, then find the weight of copper in the alloy.
- 72.** In the following figure, each division represents 1cm:



Fig. 8.5

Express numerically the ratios of the following distances:

- AC : AF
 - AG : AD
 - BF : AI
 - CE : DI
- 73.** Find two numbers whose sum is 100 and whose ratio is 9 : 16.
- 74.** In Fig. 8.6 (i) and Fig. 8.6 (ii), find the ratio of the area of the shaded portion to that of the whole figure:

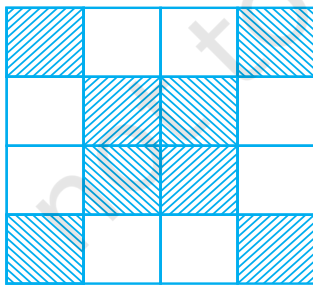


Fig. 8.6 (i)

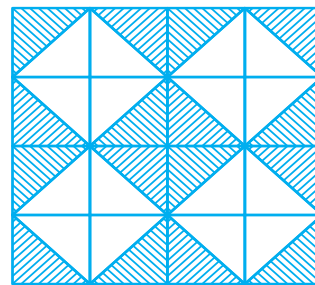


Fig. 8.6 (ii)

- 75.** A typist has to type a manuscript of 40 pages. She has typed 30 pages of the manuscript. What is the ratio of the number of pages typed to the number of pages left?

- 76.** In a floral design made from tiles each of dimensions 40cm by 60cm (See Fig. 8.7), find the ratios of:
- the perimeter of shaded portion to the perimeter of the whole design.
 - the area of the shaded portion to the area of the unshaded portion.

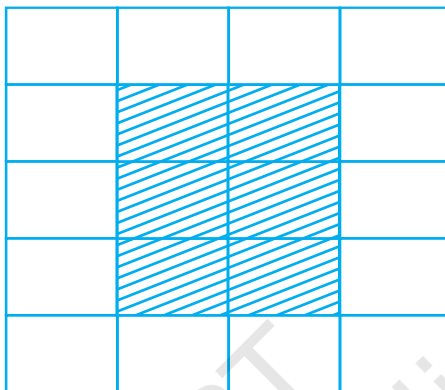


Fig. 8.7

- 77.** In Fig. 8.8, what is the ratio of the areas of
- shaded portion I to shaded portion II ?

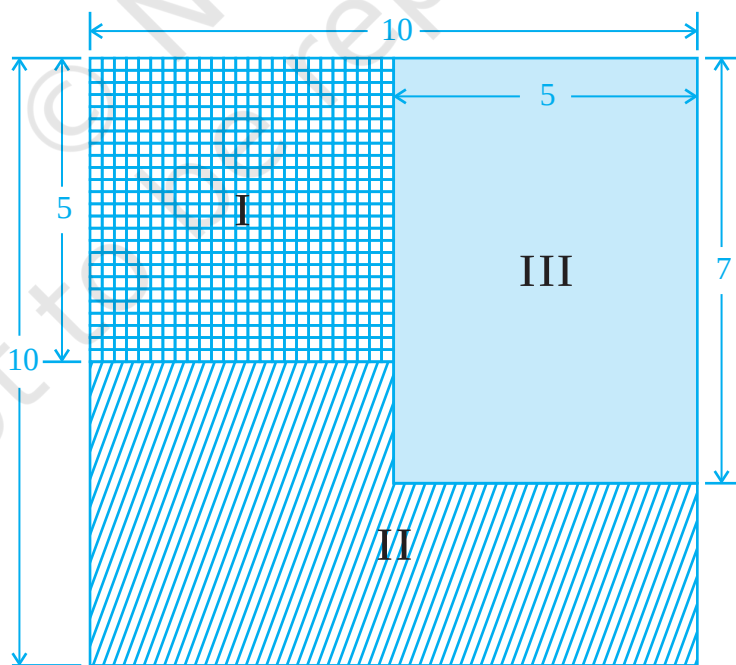


Fig. 8.8

- (b) shaded portion II to shaded portion III?
- (c) shaded portions I and II taken together and shaded portion III?
- 78.** A car can travel 240km in 15 litres of petrol. How much distance will it travel in 25 litres of petrol?
- 79.** Bachhu Manjhi earns Rs 24000 in 8 months. At this rate,
- (a) how much does he earn in one year?
- (b) in how many months does he earn Rs 42000?
- 80.** The yield of wheat from 8 hectares of land is 360 quintals. Find the number of hectares of land required for a yield of 540 quintals?
- 81.** The earth rotates 360° about its axis in about 24 hours. By how much degree will it rotate in 2 hours?
- 82.** Shivangi is suffering from anaemia as haemoglobin level in her blood is lower than the normal range. Doctor advised her to take one iron tablet two times a day. If the cost of 10 tablets is Rs 17, then what amount will she be required to pay for her medical bill for 15 days?
- 83.** The quarterly school fee in Kendriya Vidyalaya for Class VI is Rs 540. What will be the fee for seven months?
- 84.** In an election, the votes cast for two of the candidates were in the ratio 5 : 7. If the successful candidate received 20734 votes, how many votes did his opponent receive?
- 85.** A metal pipe 3 metre long was found to weigh 7.6kg. What would be the weight of the same kind of 7.8m long pipe?
- 86.** A recipe for raspberry jelly calls for 5 cups of raspberry juice and $2\frac{1}{2}$ cups of sugar. Find the amount of sugar needed for 6 cups of the juice?
- 87.** A farmer planted 1890 tomato plants in a field in rows each having 63 plants. A certain type of worm destroyed 18 plants in each row. How many plants did the worm destroy in the whole field?

- 88.** Length and breadth of the floor of a room are 5m and 3m, respectively. forty tiles, each with area $\frac{1}{16}$ m² are used to cover the floor partially. Find the ratio of the tiled and the non tiled portion of the floor.
- 89.** A carpenter had a board which measured 3m × 2m. She cut out a rectangular piece of 250cm × 90cm. What is the ratio of the area of cut out piece and the remaining piece?

Rough Work

© NCERT
not to be republished

Rough Work

© NCERT
not to be republished

UNIT 9

SYMMETRY AND PRACTICAL GEOMETRY

(A) Main Concepts and Results

- A figure is said to have **line symmetry**, if by folding the figure along a line, the left and right parts of it coincide exactly. The line is called the **line (or axis) of symmetry** of the figure.
- A figure may have no line of symmetry, one line of symmetry, two lines of symmetry, three lines of symmetry and so on.
- Line symmetry is closely related to mirror reflection. The distance of the image of a point (or object) from the line of symmetry (mirror) is the same as that of the point from that line of symmetry.
- Many constructions can be made using different instruments of a geometry box.

(B) Solved Examples

In examples 1 and 2, out of four given options, only one is correct. Write the correct answer.

Example 1: Which of the following letters does not have any line of symmetry?

- (A) E (B) T (C) N (D) X

Solution: Correct answer is (C)

Example 2: Which of the following angles cannot be constructed using ruler and compasses?

- (A) 75° (B) 15° (C) 135° (D) 85°

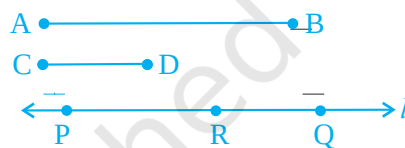
Solution: Correct answer is (D)

In examples 3 to 5, fill in the blanks so that the statements are true:

Example 3: If B is the image of A in line l and D is the image of C in line l , then $AC =$ _____.

Solution: BD

Example 4: In Fig. 9.1, the line segments PQ and RQ have been marked on a line l such that $PQ = AB$ and $RQ = CD$.



Then $AB - CD =$ _____.

Fig. 9.1

Solution: PR

Example 5: The number of scales in a protractor for measuring the angles is _____.

Solution: Two

In examples 6 and 7, state whether the statements are true or false:

Example 6: Using the set squares $30^\circ - 60^\circ - 90^\circ$ and $45^\circ - 45^\circ - 90^\circ$, we can draw an angle of 75° .

Solution: True. (Since $75^\circ = 45^\circ + 30^\circ$)

Example 7: A circle has only 8 lines of symmetry.

Solution: False (A circle has infinitely many lines of symmetry).

Example 8. Write the letters of the word ALGEBRA which have no line of symmetry.

Solution: The letters L, G and R have no line of symmetry. (Do you see why the dotted line is not the line of symmetry



Example 9: Draw a line segment equal to the sum of two line segments given in Fig. 9.2

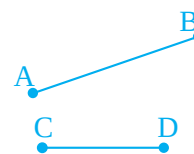


Fig. 9.2

Solution: 1. Draw a line l and on it, cut a line segment

$PQ = AB$, using compasses.
(Fig. 9.3)



Fig. 9.3

2. With Q as centre and CD as radius, draw an arc to cut a line segment $QS = CD$ on l as shown in



Fig. 9.4

Fig. 9.4. Then, line segment PS is equal to the sum of AB and CD , i.e., $PS = AB + CD$

Example 10. Draw an angle equal to the difference of two angles given in Fig. 9.5.

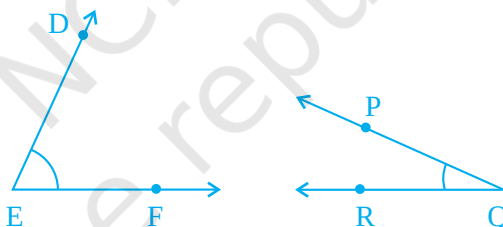


Fig. 9.5

Solution: 1. Draw an angle ABC equal to $\angle DEF$ (as $\angle DEF > \angle PQR$), using ruler and compasses.

2. With BC as one of the arms, draw an angle SBC equal to $\angle PQR$ such that BS is in the interior of $\angle ABC$ as shown in Fig. 9.6. Then, $\angle ABS$ is the required angle which is equal to $\angle DEF - \angle PQR$.

[Note: For making $\angle ABS = \angle DEF - \angle PQR$, how will you draw ray BS ?]

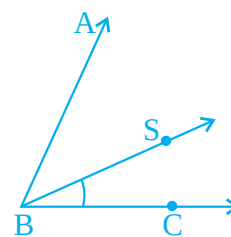


Fig. 9.6

Example 11. Complete Fig. 9.7 so that l is the line of symmetry of the completed figure.

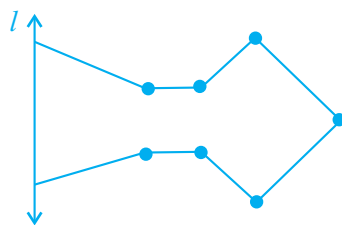


Fig. 9.7

Solution: The figure can be completed as shown in Fig. 9.8, by drawing the points symmetric to different corners (points) with respect to line l .

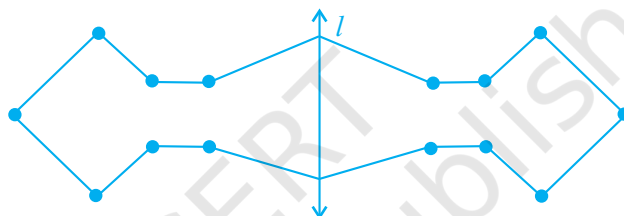


Fig. 9.8

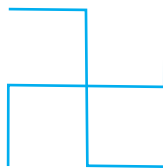
(C) Exercise

In questions 1 to 17, out of the given four options, only one is correct. Write the correct answer.

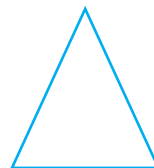
1. In the following figures, the figure that is not symmetric with respect to any line is:



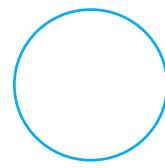
(i)



(ii)



(iii)



(iv)

(A) (i)

(B) (ii)

(C) (iii)

(D) (iv)

2. The number of lines of symmetry in a scalene triangle is

(A) 0

(B) 1

(C) 2

(D) 3

3. The number of lines of symmetry in a circle is
(A) 0 (B) 2 (C) 4 (D) more than 4
4. Which of the following letters does not have the vertical line of symmetry?
(A) M (B) H (C) E (D) V
5. Which of the following letters have both horizontal and vertical lines of symmetry?
(A) X (B) E (C) M (D) K
6. Which of the following letters does not have any line of symmetry?
(A) M (B) S (C) K (D) H
7. Which of the following letters has only one line of symmetry?
(A) H (B) X (C) Z (D) T
8. The instrument to measure an angle is a
(A) Ruler (B) Protractor (C) Divider (D) Compasses
9. The instrument to draw a circle is
(A) Ruler (B) Protractor (C) Divider (D) Compasses
10. Number of set squares in the geometry box is
(A) 0 (B) 1 (C) 2 (D) 3
11. The number of lines of symmetry in a ruler is
(A) 0 (B) 1 (C) 2 (D) 4
12. The number of lines of symmetry in a divider is
(A) 0 (B) 1 (C) 2 (D) 3
13. The number of lines of symmetry in compasses is
(A) 0 (B) 1 (C) 2 (D) 3
14. The number of lines of symmetry in a protractor is
(A) 0 (B) 1 (C) 2 (D) more than 2

15. The number of lines of symmetry in a $45^\circ - 45^\circ - 90^\circ$ set-square is
(A) 0 (B) 1 (C) 2 (D) 3
16. The number of lines of symmetry in a $30^\circ - 60^\circ - 90^\circ$ set square is
(A) 0 (B) 1 (C) 2 (D) 3
17. The instrument in the geometry box having the shape of a triangle is called a
(A) Protractor
(B) Compasses
(C) Divider
(D) Set-square

In questions 18 to 42, fill in the blanks to make the statements true.

18. The distance of the image of a point (or an object) from the line of symmetry (mirror) is _____ as that of the point (object) from the line (mirror).
19. The number of lines of symmetry in a picture of Taj Mahal is _____.
20. The number of lines of symmetry in a rectangle and a rhombus are _____ (equal/unequal).
21. The number of lines of symmetry in a rectangle and a square are _____ (equal/unequal).
22. If a line segment of length 5cm is reflected in a line of symmetry (mirror), then its reflection (image) is a _____ of length _____.
23. If an angle of measure 80° is reflected in a line of symmetry, then the reflection is an _____ of measure _____.
24. The image of a point lying on a line l with respect to the line of symmetry l lies on _____.
25. In Fig. 9.10, if B is the image of the point A with respect to the line l and P is any point lying on l , then the lengths of line segments PA and PB are _____.

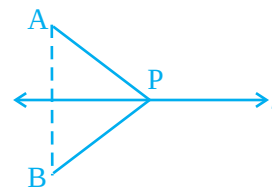


Fig. 9.10

26. The number of lines of symmetry in Fig. 9.11 is_____.

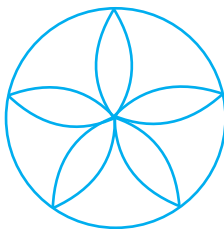


Fig. 9.11

27. The common properties in the two set-squares of a geometry box are that they have a _____ angle and they are of the shape of a _____.
28. The digits having only two lines of symmetry are_____ and _____.
29. The digit having only one line of symmetry is _____.
30. The number of digits having no line of symmetry is_____.
31. The number of capital letters of the English alphabets having only vertical line of symmetry is_____.
32. The number of capital letters of the English alphabets having only horizontal line of symmetry is_____.
33. The number of capital letters of the English alphabets having both horizontal and vertical lines of symmetry is_____.
34. The number of capital letters of the English alphabets having no line of symmetry is_____.
35. The line of symmetry of a line segment is the _____ bisector of the line segment.
36. The number of lines of symmetry in a regular hexagon is _____.
37. The number of lines of symmetry in a regular polygon of n sides is_____.
38. A protractor has _____ line/lines of symmetry.

- 39. A $30^\circ - 60^\circ - 90^\circ$ set-square has _____ line/lines of symmetry.
- 40. A $45^\circ - 45^\circ - 90^\circ$ set-square has _____ line/lines of symmetry.
- 41. A rhombus is symmetrical about _____.
- 42. A rectangle is symmetrical about the lines joining the _____ of the opposite sides.

In questions 43 - 61, state whether the statements are true (T) or false (F).

- 43. A right triangle can have at most one line of symmetry.
- 44. A kite has two lines of symmetry.
- 45. A parallelogram has no line of symmetry.
- 46. If an isosceles triangle has more than one line of symmetry, then it need not be an equilateral triangle.
- 47. If a rectangle has more than two lines of symmetry, then it must be a square.
- 48. With ruler and compasses, we can bisect any given line segment.
- 49. Only one perpendicular bisector can be drawn to a given line segment.
- 50. Two perpendiculars can be drawn to a given line from a point not lying on it.
- 51. With a given centre and a given radius, only one circle can be drawn.
- 52. Using only the two set-squares of the geometry box, an angle of 40° can be drawn.
- 53. Using only the two set-squares of the geometry box, an angle of 15° can be drawn.
- 54. If an isosceles triangle has more than one line of symmetry, then it must be an equilateral triangle.
- 55. A square and a rectangle have the same number of lines of symmetry.
- 56. A circle has only 16 lines of symmetry.
- 57. A $45^\circ - 45^\circ - 90^\circ$ set-square and a protractor have the same number of lines of symmetry.

58. It is possible to draw two bisectors of a given angle.
59. A regular octagon has 10 lines of symmetry.
60. Infinitely many perpendiculars can be drawn to a given ray.
61. Infinitely many perpendicular bisectors can be drawn to a given ray.
62. Is there any line of symmetry in the Fig. 9.12? If yes, draw all the lines of symmetry.

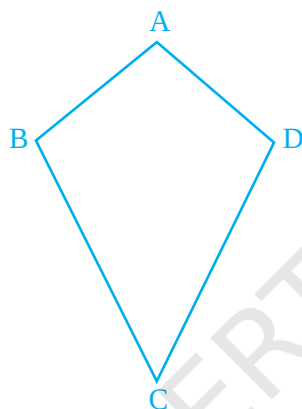


Fig. 9.12

63. In Fig. 9.13, PQRS is a rectangle. State the lines of symmetry of the rectangle.

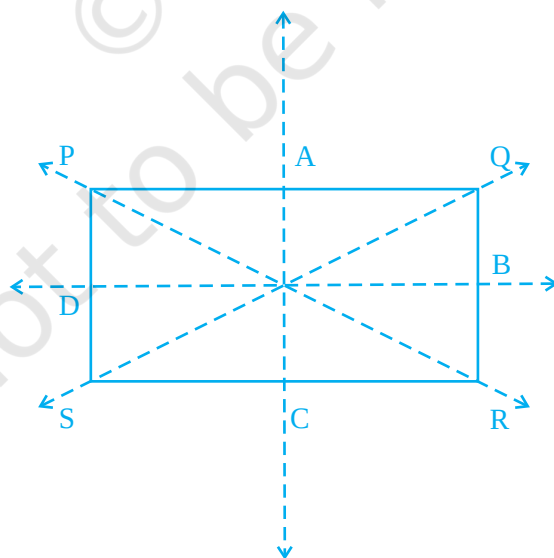


Fig. 9.13

- 64.** Write all the capital letters of the English alphabets which have more than one lines of symmetry.
- 65.** Write the letters of the word 'MATHEMATICS' which have no line of symmetry.
- 66.** Write the number of lines of symmetry in each letter of the word 'SYMMETRY'.
- 67.** Match the following:

Shape	Number of lines of symmetry
(i) Isosceles triangle	(a) 6
(ii) Square	(b) 5
(iii) Kite	(c) 4
(iv) Equilateral triangle	(d) 3
(v) Rectangle	(e) 2
(vi) Regular hexagon	(f) 1
(vii) Scalene triangle	(g) 0

- 68.** Open your geometry box. There are some drawing tools. Observe them and complete the following table:

Name of the tool	Number of lines of symmetry
(i) The Ruler	_____
(ii) The Divider	_____
(iii) The Compasses	_____
(iv) The Protactor	_____
(v) Triangular piece with two equal sides	_____
(vi) Triangular piece with unequal sides	_____

- 69.** Draw the images of points A and B in line l of Fig. 9.14 and name them as A' and B' respectively. Measure AB and $A'B'$. Are they equal?

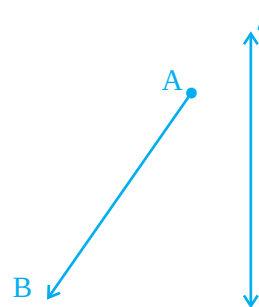


Fig. 9.14

- 70.** In Fig. 9.15, the point C is the image of point A in line l and line segment BC intersects the line l at P.

- Is the image of P in line l the point P itself?
- Is $PA = PC$?
- Is $PA + PB = PC + PB$?
- Is P that point on line l from which the sum of the distances of points A and B is minimum?

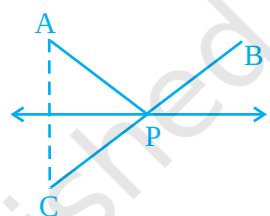


Fig. 9.15

- 71.** Complete the figure so that line l becomes the line of symmetry of the whole figure (Fig. 9.16).

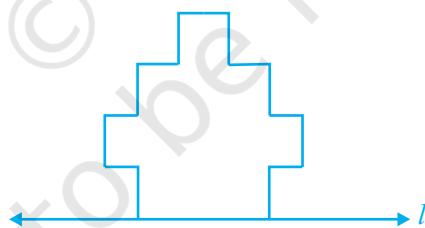


Fig. 9.16

- 72.** Draw the images of the points A, B and C in the line m (Fig. 9.17). Name them as A' , B' and C' , respectively and join them in pairs. Measure AB , BC , CA , $A'B'$, $B'C'$ and $C'A'$. Is $AB = A'B'$, $BC = B'C'$ and $CA = C'A'$?

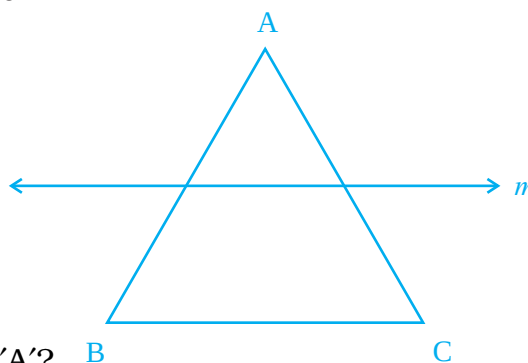


Fig. 9.17

- 73.** Draw the images P' , Q' and R' of the points P , Q and R , respectively in the line n (Fig. 9.18). Join $P'Q'$ and $Q'R'$ to form an angle $P'Q'R'$. Measure $\angle PQR$ and $\angle P'Q'R'$. Are the two angles equal?

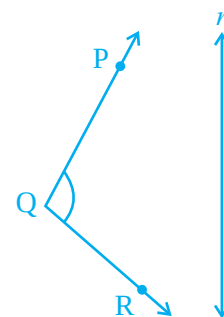


Fig. 9.18

- 74.** Complete Fig. 9.19 by taking l as the line of symmetry of the whole figure.

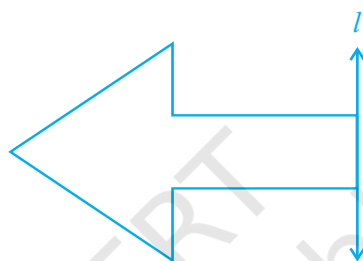


Fig. 9.19

- 75.** Draw a line segment of length 7cm. Draw its perpendicular bisector, using ruler and compasses.
- 76.** Draw a line segment of length 6.5cm and divide it into four equal parts, using ruler and compasses.
- 77.** Draw an angle of 140° with the help of a protractor and bisect it using ruler and compasses.
- 78.** Draw an angle of 65° and draw an angle equal to this angle, using ruler and compasses.
- 79.** Draw an angle of 80° using a protractor and divide it into four equal parts, using ruler and compasses. Check your construction by measurement.
- 80.** Copy Fig. 9.20 on your notebook and draw a perpendicular to l through P , using (i) set squares (ii) Protractor (iii) ruler and compasses. How many such perpendiculars are you able to draw?



Fig. 9.20

- 81.** Copy Fig. 9.21 on your notebook and draw a perpendicular from P to line m , using (i) set squares (ii) Protractor (iii) ruler and compasses. How many such perpendiculars are you able to draw?



Fig. 9.21

- 82.** Draw a circle of radius 6cm using ruler and compasses. Draw one of its diameters. Draw the perpendicular bisector of this diameter. Does this perpendicular bisector contain another diameter of the circle?
- 83.** Bisect $\angle XYZ$ of Fig. 9.22

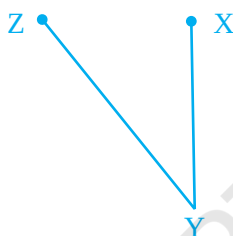


Fig. 9.22

- 84.** Draw an angle of 60° using ruler and compasses and divide it into four equal parts. Measure each part.
- 85.** Bisect a straight angle, using ruler and compasses. Measure each part.
- 86.** Bisect a right angle, using ruler and compasses. Measure each part. Bisect each of these parts. What will be the measure of each of these parts?
- 87.** Draw an angle ABC of measure 45° , using ruler and compasses. Now draw an angle DBA of measure 30° , using ruler and compasses as shown in Fig. 9.23. What is the measure of $\angle DBC$?

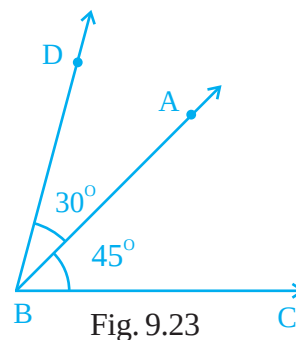


Fig. 9.23

- 88.** Draw a line segment of length 6cm. Construct its perpendicular bisector. Measure the two parts of the line segment.
- 89.** Draw a line segment of length 10cm. Divide it into four equal parts. Measure each of these parts.

(D) Activities

Activity 1: Make three different ink blot devils in your notebook and mark their line of symmetry.

Activity 2: Draw all the lines of symmetry of Fig. 9.24 by paper folding.

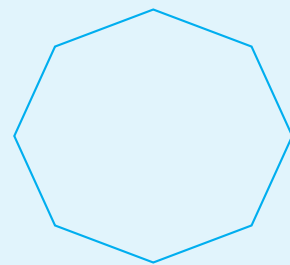


Fig. 9.24

Activity 3: Draw an angle of 15° by first drawing an angle of 60° and then an angle of 45° , using ruler and compasses.

Activity 4: Using ruler and compasses draw an angle of 90° and in its interior, draw two rays with the initial point of each as the vertex of the angle so that each of the three angles so formed is of 30° (See Fig. 9.25).

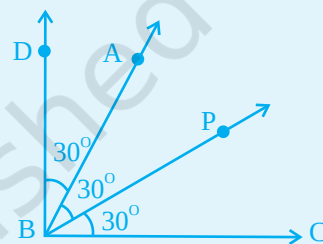


Fig. 9.25

Activity 5: Draw an angle of 45° and in its interior, draw two rays to form three angles each of measure 15° , using ruler and compasses.

Activity 6: Draw an angle of 135° and in its interior, draw two rays to form three angles each of equal measure, using ruler and compasses.

Activity 7: Draw the perpendicular bisectors of BC, CA and AB (Fig. 9.26). What do you observe?



Fig. 9.26

Activity 8: Bisect AE and CE by drawing up their perpendicular bisectors in (Fig. 9.27).

Let P be the point of intersection of these perpendicular bisectors check whether

$PA = PE$, $PE = PC$

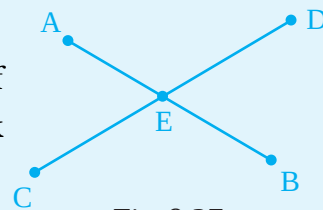


Fig. 9.27

Activity 9: Bisect BC and AB by drawing their perpendicular bisectors (Fig. 9.28). Make the point of intersection as P. Check whether $PA = PB = PC$

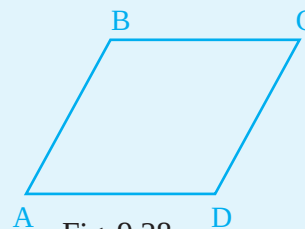


Fig. 9.28

Activity 10: Draw two line segments of lengths 8cm and 6cm. Using these line segments, construct a line segment of length $(8 + 6)$ cm.

Activity 11: Draw two line segments of lengths 3cm and 5cm. Construct line segments of the following lengths using these line segments:

- | | | |
|----------------|------------------|------------------|
| (a) 6cm | (b) 15cm | (c) $(3+5)$ cm |
| (d) $(6+5)$ cm | (e) $(9 - 5)$ cm | (f) $(5 - 3)$ cm |

Activity 12: Draw two line segments of lengths 3cm and 6cm. Construct line segments, equal to the following lengths, using these line segments.

- | | | |
|------------------------|----------------------|---------------------------|
| (a) $\frac{3+6}{2}$ cm | (b) $\frac{6}{2}$ cm | (c) $\frac{2(3)+6}{2}$ cm |
|------------------------|----------------------|---------------------------|

Activity 13: Drop perpendiculars from D to AB and from D to AC (Fig. 9.29).

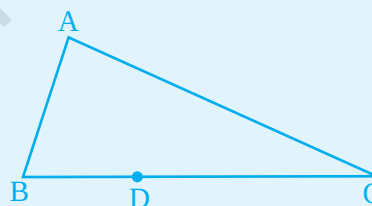


Fig. 9.29

Activity 14: O is the centre of the circle (Fig. 9.30). Drop perpendicular from B on CA. Where does it meet CA?

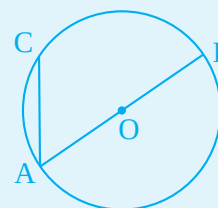


Fig. 9.30

Activity 15: Copy the figure and bisect $\angle A$ and $\angle B$ (Fig. 9.31). Let the bisectors meet at some point P. Measure angle $\angle APB$.

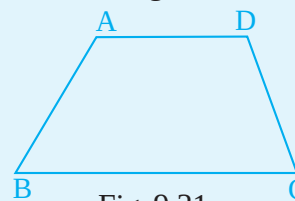


Fig. 9.31

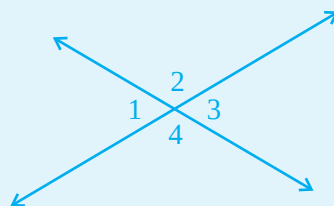
Activity 16:

Fig. 9.32

- Bisect angle 1 and angle 2 (Fig. 9.32).
- Measure the angle between these bisectors.
- Now bisect angle 3 and angle 4.
- Measure the angle formed between these bisectors.
- What do you observe from (b) and (d)? Can you conclude something?

Activity 17: Construct an angle equal to $1\frac{1}{2}$ times the $\angle PQR$ of Fig. 9.33, using ruler and compasses.

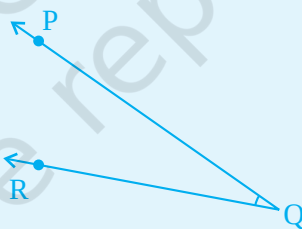


Fig. 9.33

Activity 18: Bisect angle A, angle B and angle C (Fig. 9.34). What do you observe?

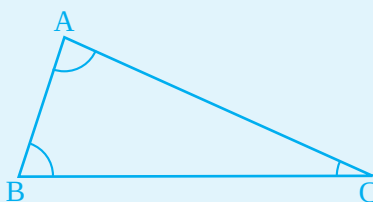


Fig. 9.34

ANSWERS

Unit 1

1. (C) 2. (C) 3. (D) 4. (B) 5. (D) 6. (D)
 7. (C) 8. (B) 9. (D) 10. (C) 11. (D) 12. (C)
 13. (D) 14. (D) 15. (B) 16. (A) 17. (C) 18. (C)
 19. (B) 20. (B) 21. (D) 22. (B) 23. (B) 24. (A)
 25. (C) 26. (D) 27. (B) 28. (A) 29. (C) 30. (B)
 31. (D) 32. (D) 33. (B) 34. (A) 35. (A) 36. (C)
 37. (B) 38. (C) 39. T 40. F 41. T 42. T
 43. F 44. T 45. F 46. T 47. F 48. F
 49. F 50. T 51. F 52. F 53. T 54. F
 55. F 56. F 57. F 58. T 59. F 60. F
 61. T 62. T 63. T 64. F 65. F 66. T
 67. F 68. T 69. T 70. F 71. T 72. T
 73. F 74. T 75. T 76. F 77. T 78. T
 79. T 80. F 81. F 82. F 83. T 84. F
 85. T 86. F 87. T 88. F 89. T 90. T
 91. F 92. F 93. T 94. T 95. T 96. F
 97. F 98. T 99. (a) 1 (b) 1
 100. (a) 1000 (b) 10 (c) 10,00,000 101. (a) 1000 (b) 1000 (c) 1000,000
 102.1 103. 1650 104. 1290000 105. 422000 106. descending

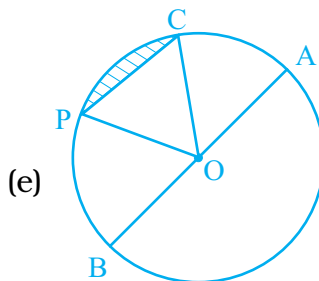
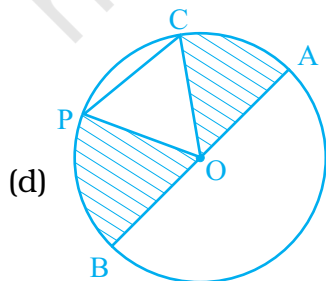
- 107.** smallest **108.** 6 **109.** 5,23,78,401 **110.** L **111.** LXVI
112. 2,538,000 **113.** 0 **114.** 106160 **115.** 99999 **116.** 401
117. 1000 **118.** number **119.** 100005 **120.** addition, multiplication
121. addition, multiplication **122.** 0 **123.** addition **124.** 6195
125. 1001 **126.** 0 **127.** 0 **128.** 1 **129.** 68 **130.** 8925
131. 1 **132.** 17 **133.** 27 **134.** 7860 **135.** 100 **136.** multiple
137. 1 **138.** 2 **139.** perfect **140.** composite **141.** prime
142. co-prime **143.** 25 **144.** 0 **145.** 0, 5 **146.** 2
147. multiple **148.** 11 **149.** multiple **150.** factors
151. (i)- (d), (ii)- (f), (iii)- (b), (iv)- (e), (v)- (c)
152. 25843, 13584, 8435, 5348, 4835. **153.** 67205602, 30040700
154. (a) $7 \times 10000 + 4 \times 1000 + 8 \times 100 + 3 \times 10 + 6 \times 1$
(b) $5 \times 100000 + 7 \times 10000 + 4 \times 1000 + 0 \times 100 + 2 \times 10 + 1 \times 1$
(c) $8 \times 1000000 + 9 \times 100000 + 0 \times 10000 + 7 \times 1000 + 0 \times 100 + 1 \times 10 + 0 \times 1$
155. ascending order – (b), (c), (a), (d), descending order – (d), (a), (c), (b)
156. 142,800,000 **157.** 589 millions, 589,000,000
158. Earth, 2100000m
159. Tripura-Three million, one hundred ninty-nine thousand, two hundred three; Meghalaya-Two million, three hundred eighteen thousand, eight hundred twenty two.
160. 4230 **161.** 67530 **162.** 161266 **163.** 46120 **164.** 1
165. 6, 4, 2 **166.** 9979003568 **167.** 85041 **168.** 969987
169. 179370 **170.** 32198 **171.** 12000 **172.** 98756, 10253
173. 2768g or 2kg 768g **174.** 150 boxes **175.** 50000 **176.** 30
177. (a)1400 (b) 1200 (c) 14700 (d) 31300
178. (a) 2590 (b) 69100 (c) 6380 (d) 61790
179. (a) 2700 (b) 34100 (c) 97200 (d) 1098100

180. 17000 181. 5600000 182. 457755 183. 24480
 184. 220 185. 204 186. 15000kg 187. Rs. 454102
 188. 960000g 189. 62 190. 60 L 191. 4521
 192. 1324 193. Rs. 4 194. A – 35, B – 28, C – 20
 195. 12 196. 52 197. 30, 60, 90.
 198. Both the numbers are divisible by 11.
 199. All the three number are divisible by 4. 200. 5652.

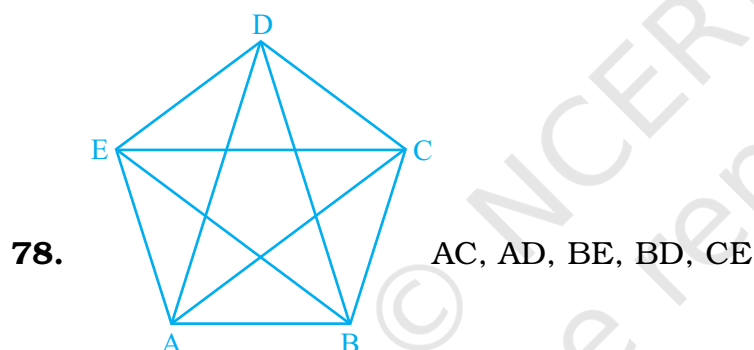
Unit 2

1. (A) 2. (D) 3. (B) 4. (B) 5. (B) 6. (B)
 7. (B) 8. (D) 9. (C) 10. (B) 11. (D) 12. (D)
 13. (B) 14. (C) 15. (C) 16. (B) 17. Reflex angle
 18. 9 19. Parallel 20. O and S, T and N, M, P, Q, R
 21. (a) BD (b) CD (c) C (d) D (e) 4
 22. (a) Right (b) acute (c) obtuse
 23. 5, $\triangle AOB$, $\triangle AOC$, $\triangle ACD$, $\triangle COD$, $\triangle ABC$
 24. 12; $\angle OAB$, $\angle OBA$, $\angle OAC$, $\angle OCA$, $\angle OCD$, $\angle ODC$, $\angle AOB$, $\angle AOC$, $\angle COD$,
 $\angle DOB$, $\angle BAC$, $\angle ACD$ 25. Four 26. Two, Four
 27. Two, 28. One 29. Three 30. Four 31. Ray AB
 32. T 33. F 34. F 35. T 36. F 37. T
 38. F 39. F 40. F 41. F
 42. AB, AC, AD, AE, BC, BD, BE, CD, CE, DE
 43. AB, BC, CD, DE, EA 44. X, Z, Y
 45. Vertices – A, B, C, D and E; line segments –
 AB, AC, AD, AE, BC, CD, DE
 46. $\angle EAD$, $\angle AEF$, $\angle EFD$, $\angle ADF$, $\angle DFC$, $\angle DCF$,
 $\angle CDF$, $\angle BEF$, $\angle BFE$, $\angle EBF$,
 $\angle FBC$, $\angle FCB$, $\angle BFC$, $\angle ABC$, $\angle ACB$

- 47.** (a) $\angle CBD$, (b) $\angle DBE$, (c) $\angle EBA$, (d) $\angle CBE$, (e) $\angle DBA$, (f) $\angle CBA$, (g) $\angle DBA$
- 48.** (i) A, B, C, AB, BC, AC (ii) A, B, C, D, AB, BC, CD, DA
(iii) A, B, C, D, E, AB, BC, CD, DE, EA
(iv) A, B, C, D, E, F, AB, CD, EF
- 49.** (ii) O, OA and OB (iii) D, DC and DB
- 50.** (a) No (b) No **51.** Yes **52.** Yes
- 54.** Yes points B and C lie in the interior of $\angle 2$ also.
- 55.** (b) and (c) **56.** (a) (ii) (b) (ii) and (iii) (c) (iii) (d) (i)
- 57.** Both figures have 3 line segments. No. It is not a closed figure
- 58.** No **59.** (a) $\angle AEB$, $\angle ADE$, $\angle BAE$, $\angle BCE$ (b) $\angle BCD$, $\angle BAD$
- 60.** (a) Yes (b) No (c) No.
- 61.** (a) AC (b) AE (c) ED (d) BE
- 62.** (a) $\angle ABD$ (b) $\angle RTS$ (c) $\angle ACD$ and $\angle ACB$
(d) $\angle RTW$ and $\angle RTS$ (e) $\angle AED$, $\angle AEB$, $\angle BEC$ and $\angle DEC$
(f) $\angle AEC$ (g) $\angle ACD$ (h) $\angle AKO$, $\angle AKP$, $\angle BKO$, $\angle BKP$
- 63.** (a) $\angle ADB = \angle CDB$ (b) $\angle ABD = \angle CBD$
(c) $\angle ADC = \angle BDC$, $\angle CAD = 90^\circ$, $\angle CBD = 90^\circ$
- 64.** Two, AC and AD **65.** Two **66.** One **67.** Three A, B, C
- 68.** Three, AB, BC, AC **69.** Four, A, B, C, D
- 70.** Six, AB, AC, AD, BC, BD, CD **71.** Five A, B, C, D, E
- 72.** Ten, AB, AD, AE, AC, BD, BE, BC, DE, DC, EC
- 73.** (a) CP and AB (b) OA, OB, OC, OP (c) CP



- 74.** (a) Yes. The sum of two acute angles may be less than a right angle.
 (b) Yes. The sum of two acute angles may be equal to a right angle.
 (c) Yes. The sum of two acute angles may be more than a right angle.
 (d) No. The sum of two acute angles is always less than 180° .
 (e) No. The sum of two acute angles is always less than 180° .
- 75.** (a) Yes. The sum of two obtuse angles is always greater than 180° .
 (b) No. The sum of two obtuse angles is always greater than 180° , but less than 360° .
- 76.** (a) Vertices A, B, C, D, E, F
 (b) Edges AB, AC, BC, BD, DF, FC, EF, ED, AE
 (c) Faces ABC, DEF, AEFC, AEDB, BDFC
- 77.** No edges, No faces and No vertices.



Unit 3

- | | | | | | |
|----------------|----------------|----------------|-----------------|------------------|----------------|
| 1. (B) | 2. (A) | 3. (C) | 4. (A) | 5. (D) | 6. (B) |
| 7. (D) | 8. (B) | 9. (B) | 10. (A) | 11. (A) | 12. (C) |
| 13. (B) | 14. (A) | 15. (D) | 16. (C) | 17. (B) | 18. F |
| 19. F | 20. F | 21. F | 22. T | 23. F | 24. T |
| 25. T | 26. T | 27. F | 28. F | 29. T | 30. T |
| 31. T | 32. T | 33. F | 34. F | 35. T | 36. T |
| 37. T | 38. F | 39. F | 40. Left | 41. Right | 42. -14 |

ANSWERS

43. 1 44. 0 45. 9 46. -14 47. 30 48. -170
49. -5454 50. < 51. > 52. < 53. < 54. >
55. > 56. = 57. > 58. >
59. (i) -(B) (ii) -(E) (iii) -(B) (iv) -(A) (v) -(B)
60. (a) -5 (b) -25 (c) 20 (d) -60 (e) -8 (f) -7 (g) 0 (h) 0
61. (a) +200 (b) -100 (c) +10 (d) 0
62. (a) Increase in size (b) Success (c) loss of Rs. 10
(d) 1000 B.C. (e) Fall in water level (f) 60 km North
(g) 10 m below the danger mark of river Ganga.
(h) 20 m above the danger mark of river Brahmaputra.
(i) Losing by a margin of 2000 votes.
(j) Withdrawing Rs 100 from the Bank. (k) 20°C fall in temperature.
63. 7°C 64. $0 - 1 - 2 - 3 - 4 - 5 - 6 + 7 + 8 + 9$ (One possible answer).
65. 0 66. $1 + 2 + 3 + 6 + (-2) + (-3)$ (One possible answer).
67. 2 68. -1 69. -2, -3 (any two negative integers can be taken).
70. 2, 0 (any two integers with one of them as 0).
71. (a), (b) and (c). The number on the right is greater.
72. $1 + 2 - 3 + 4 + 5 - 6 + 7 + 8 - 9 = 9$
73. -5, -3, -2, 0, 1, 4 74. 0, -1, -3, -3, -4, -6 75. 0, 6
76. -140, -130, -120, -110, -101 (there can be many answers).
77. (1, 3), (0, 4), (-1, 5), (-2, 6) 78. 72 79. 10
80. (a) Left (b) Right (c) Left 81. (a) -1 (b) -1 (c) -4
82. 161 83. 1207

Unit 4

1. (D) 2. (B) 3. (A) 4. (B) 5. (C) 6. (C)
7. (B) 8. (C) 9. (A) 10. (B) 11. (C) 12. (B)
13. (C) 14. (B) 15. (C) 16. (C) 17. (C) 18. (D)

19. (B) 20. (A) 21. Whole 22. proper 23. like 24. mixed
25. improper 26. proper 27. like 28. unlike 29. $\frac{2}{5}$
30. $\frac{1}{2}$ 31. equivalent 32. $\frac{58}{7}$ 33. $12\frac{3}{7}$ 34. 9.26
35. $16\frac{1}{4}$ or $\frac{65}{4}$ 36. 0.28 37. $\frac{58}{9}$ 38. $\frac{43}{14}$ 39. 12 40. 8
41. 14.28 42. 6.08 43. Rs 25 44. 0.33 45. T 46. F
47. T 48. F 49. F 50. T 51. F 52. T
53. F 54. T 55. F 56. T 57. F 58. F
59. F 60. T 61. F 62. T 63. T 64. F
65. T 66. < 67. < 68. = 69. < 70. <
71. = 72. $\frac{7}{8}$ 73. $\frac{4}{15}$ 74. $\frac{1}{6}$
75. 12.104, 12.122, 12.142, 12.214, 12.401 76. 0.8531
77. 0.2345 78. 0.55 79. $\frac{20}{3}$ 80. 3.4 81. $\frac{41}{1000}$ 82. $6\frac{3}{100}$
83. 5.201kg 84. Rs 20.09, Rs $20\frac{9}{100}$ 85. 15.37 m, $\frac{1537}{100}$ m
86. 2.435km, $2\frac{87}{200}$ km 87. $\frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{5}{6}$ 88. $\frac{7}{8}, \frac{6}{7}, \frac{4}{5}, \frac{3}{4}$ 89. $\frac{33}{44}$
90. $\frac{60}{72}$ 91. $16\frac{1}{8}$ 92. 20.8 93. 75.20 94. 28.0 95. $\frac{25}{24}$
96. $7\frac{1}{8}$ 97. $\frac{1}{3}$ 98. $2\frac{7}{9}$ 99. $5\frac{1}{4}$ 100. $7\frac{3}{4}$ 101. $15\frac{1}{4}$
102. 64 103. $\frac{889}{80}$ cm 104. $\frac{9}{10}$ 105. $\frac{3}{5}$ 106. $\frac{1}{6}$ 107. 24.5
108. 9.850kg 109. 0.011, 0.101, 0.110, 1.001 110. 22.022
111. (i) $\frac{11}{70}$ (ii) $\frac{1}{10}$ 112. Milk, Rice, $\frac{30}{53}$ 113. $\frac{2}{3}$ 114. $1\frac{3}{4}$ m

115. $47\frac{5}{8}$ kg **116.** $27\frac{1}{4}$ litres **117.** $2\frac{3}{4}$ litres **118.** $110\frac{1}{20}$ cm

119. $4\frac{5}{8}$ km **120.** $1\frac{1}{4}$ kg **121.** $2\frac{1}{4}$ m

122. (a) Equal denominators too have been added.

(b) Numerators and denominators have been added.

123. 2.6 metres **124.** (i) (D) (ii) (A) (iii) (E) (iv) (B) **125.** $\frac{5}{6}, \frac{6}{6}$

126. $\frac{3}{7}, \frac{4}{7}, \frac{7}{7}$ **127.** $\frac{9}{22}$ and $\frac{5}{22}$ **128.** $\frac{1}{2}$

129. (i) Bag I (ii) Bag II (iii) Bag III (iv) Bag I (v) Bag I (vi) Bag I

(vii) Bag II (viii) Bag I (ix) Bag I (x) Bag I

Unit 5

1. (D) **2.** (D) **3.** (D) **4.** (D) **5.** (C) **6.** F

7. F **8.** F **9.** T **10.** F **11.** T **12.** F

13. T **14.** data **15.** tally **16.** pictograph **17.** bars

18. uniform, equal **19.**  **20.** 60 **21.** 60, 7.5

22.

Grades	Tally marks
A	
B	
C	
D	
E	

23.

Number of two wheelers	Tally marks
0	
1	
2	
3	
4	

19 Families

24.

Lengths in cm	Tally marks	Number of carrots
15		5
18		6
20		9
21		6
22		4

(a) 10 (b) 20, 22

25.

Responses	Tally Marks	Number of Responses
Doctor		10
Engineer		6
Pilot		8
Officer		6

26. (a)

Games	Tally marks	Number of Students
Football		13
Cricket		9
Kho-Kho		6
Hockey		8
Tennis		4

(b) Football (c) Tennis.

27. Shirt size 32 : 5, Shirt size 34 : |||||, Shirt size 36 : 7
 Shirt size 38 : ||||, Shirt size 40 : |||||

28. (a) 400 (b) Patel (c) Saikia (d) Rao, Roy **29.** (a) Metal (b) Glass

(c) Rubber (d) 160 **30.** (a) X (b) VIII (c) 40 (d) VI (e) 160

31. (a) Hindi (b) 175 (c) 425

32. (a) 6000sqkm (b) Raigarh and Jashpur (c) Four

33.

Day	Bottles  = 50 bottles
Sunday	      
Monday	   
Tuesday	     
Wednesday	    
Thursday	 
Friday	  

34.

Language	News paper  = 1000 news papers
English	    
Hindi	        
Tamil	
Punjabi	  
Gujarati	

- 36.** (a) LPG (b) 10 (c) 5000 **37.** (a) 1300 (b) 300 (c) 4, 5, 6, 7, 8
 (d) 7 (e) 8 (f) False **38.** (a) 295 (b) Delhi (c) Chennai
 (d) Patna, Jaipur, Delhi, Guwahati (e) 50
- 39.** (a) N.H. 2 (b) N.H. 10 (c) 900km (d) N.H. 8 **40.** (a) 1000
 (b) Marathi, Bengali (c) 800
- 41.** (a) Number of students in different Academic years. (b) 2005 – 06
 (c) 2004 – 05 (d) 2003 – 04 (e) 2004 – 05

Unit 6

1. (D) 2. (B) 3. (A) 4. (A) 5. (D) 6. (B)
7. (A) – (iv), (B) – (i), (C) – (ii), (D) – (iii)
8. (A) – (iii), (B) – (iii), (C) – (ii), (D) – (i)
9. $BM + MD + DE + EN + NG + GH$ 10. Area. 11. 16sq cm
12. (a) 12sq units (b) 16sq units 13. (a) 100 (b) 1 (c) 1, 100
(d) 10000 14. T 15. F 16. F 17. T 18. F
19. F 20. T 21. 2cm 22. 14cm 23. 15cm, 5cm
24. 17m 25. 13sq units 26. 70m 27. 500m 28. 54cm
29. 44 Units 30. 2km 400m, 5 times 31. 400m 32. 80m
33. 308cm 34. 8cm, 10cm, 10cm; 8cm, 8cm, 12cm
35. $1\text{cm} \times 19\text{cm}$, $2\text{cm} \times 18\text{cm}$, $3\text{cm} \times 17\text{cm}$, $4\text{cm} \times 16\text{cm}$,
 $5\text{cm} \times 15\text{cm}$, $6\text{cm} \times 14\text{cm}$, $7\text{cm} \times 13\text{cm}$, $8\text{cm} \times 12\text{cm}$,
 $9\text{cm} \times 11\text{cm}$, $10\text{cm} \times 10\text{cm}$ 36. 10cm 37. 20, 20m
38. 36sq m, 30m 39. 1340m, Rs 26800, Rs 400000
40. Rs 50 41. (a) 32 units (b) 60 units 42. 6300sq cm
43. 20cm, 280cm 44. Anmol's chart paper 45. 12, 240, 2880
46. 100 47. Square field 48. 40000sq m 49. 4 times
50. $84, 240\text{cm}^2$ 51. Rs 5400 52. 126sq m , $\frac{1}{8}$, 1:7
53. 216sq cm 54. 56 cm 55. 212 56. 20m
57. 256sq m , (a) 128sq m , (b) 128sq m

58. (a) Dimensions	Area	Dimensions	Area
in cm	in cm^2	in cm	in cm^2
17×1	17	12×6	72
16×2	32	11×7	77
15×3	45	10×8	80
14×4	56	9×9	81
13×5	65		

(b)	Dimensions in cm	Perimeter in cm ²
	36×1	74
	18×2	40
	12×3	30
	9×4	26
	6×6	24

59. Area: (i) 11cm^2 (ii) 13cm^2 (iii) 13cm^2

Perimeter: (i) 18cm (ii) 28cm (iii) 28cm

60. 4sq cm, 34cm

Unit 7

- 1.** (B) **2.** (C) **3.** (A) **4.** (C) **5.** (B) **6.** (B)
7. (B) **8.** (A) **9.** (C) **10.** (C) **11.** (B) **12.** (A)
13. (C) **14.** (A) **15.** (A) **16.** (A) **17.** (C) **18.** (A)
19. (B) **20.** (A) **21.** (A) **22.** (A) **23.** (D) **24.** $40h$
25. $\frac{70}{p}$ **26.** $8d + 2$ **27.** 3 **28.** -9 **29.** $x = y + 7$
30. $3x + 8$ **31.** $\frac{x}{2}$ **32.** $7w$ **33.** $12x + 2000$
34. $10t + u$ **35.** p **36.** $100x$ **37.** $1000p$ **38.** $100x$ **39.** $n + 7$
40. $100 - f$ **41.** F **42.** T **43.** T **44.** F **45.** T
46. F **47.** T **48.** F **49.** T **50.** T **51.** T
52. F **53.** F **54.** F **55.** F **56.** $2x + 1$ **57.** $t - 20$
58. $n + 1$ **59.** $3m$ **60.** kn **61.** $x + 1$ **62.** $2n + 1$ and $2n + 3$
63. $2m$ and $2m + 2$ **64.** $5n$ **65.** $\frac{x}{x+1}$
66. $20y$, where y is height of Empire State Building. **67.** $2p + 3$
68. $13 - (-3)z (=13+3z)$ **69.** $10 + \frac{p}{11}$ **70.** $3x + 1$ **71.** $10 - 6q$
72. $3y + 4 = 10$, $2x - 3 = 1$ **73.** $2t + 3 = 3$ **74.** $x + 1 = 0$

75. The cost of pen is 5 times the cost of a pencil.
76. Amount left with Leela is Rs 10,000 more than the amount she contributed towards Prime Minister's Relief fund.
77. Age of Kartik's Father is seven times the age of Kartik.
78. The difference between maximum and minimum temperature on a day in Delhi was 10°C .
79. Last year Jay planted 10 more plants than twice the number of plants planted by John.
80. Sharad reduced the consumption of tea per day by 5 cups after having some health problem.
81. The number of students dropping out this year is 30 less than the number of students dropped last year.
82. The price of petrol per liter decreased this month by Rs 5 than its price last month.
83. Khader's monthly salary increased by Rs 1000 in the year 2006 than in 2005.
84. The number of girls enrolled this year was 10 less than 3 times the girls enrolled last year.
85. (a) $2x - 13 = 3$ (b) $\frac{x}{5} = x - 5$ (c) $\frac{2x}{3} = 12$ (d) $2x + 9 = 13$ (e) $\frac{x}{3} - 1 = 1$
86. (a) $p = 3a$ (b) $d = 2r$ (c) $s = c + p$ (d) $a = p + i$
87. (i) $x - 2$ (ii) $x + 35$ (iii) $x + 32$ (iv) $8x$
88.

m	0	1	2	3	4
$2m - 5$	-5	-3	-1	1	3

 Solution is $m = 2$
89. $50p - 1800$ 90. $8x + 100L$ 91. $m \times m$ sq cm.
92. The perimeter of a triangle is the sum of all its sides.
93. The perimeter of a rectangle is twice the sum of its length and breadth.
94. $(m + 40)\text{kg}$ 95. (i) $2(r + t) + 10$ (ii) $15x$ (iii) $(8rt + 4000)\text{sq cm}$
(iv) Rs 23x

- 96.** (i) Sunita : $x + 4$, Geeta : $2x + 4$, where x is the present age (in years) of Sunita. (ii) Sunita : $x - 3$, Geeta : $2x - 3$
- 97.** (i) – (B), (ii) – (E), (iii) – (C), (iv) – (C), (v) – (A)

Unit 8

- 1.** (A) **2.** (D) **3.** (D) **4.** (A) **5.** (C) **6.** (D)
- 7.** (C) **8.** (D) **9.** (A) **10.** (C) **11.** 12 **12.** 4
- 13.** 10 **14.** 18, 60 **15.** 28, 81, 52 **16.** T **17.** T **18.** F
- 19.** F **20.** F **21.** T **22.** F **23.** T **24.** T
- 25.** T **26.** F **27.** T **28.** F **29.** F **30.** T
- 31.** F **32.** T **33.** F **34.** F **35.** division
- 36.** 28 **37.** 18 **38.** proportion **39.** 3 : 7 **40.** 1 : 6
- 41.** 3 : 1 **42.** one **43.** same **44.** 100 paise OR 1 Rupee
- 45.** 149 : 160 **46.** 100gm **47.** 4 : 5 **48.** (i) and (ii)
- 49.** 10 : 21 **50.** 14kg **51.** 16cm and 40cm **52.** 5 : 8 **53.** 933
- 54.** (a) 15 : 1 (b) 1 : 14 **55.** (a) 7 : 16 (b) 9 : 16
- 56.** (a) 7 : 11 (b) 7 : 18 (c) 11 : 18 **57.** 7 : 40 **58.** 2 : 3 **59.** 1 : 17
- 60.** 18 m **61.** $4\frac{2}{3}$ cups **62.** 15 **63.** (a) 9 : 4 (b) 4 : 13
- 64.** (a) 4 : 1 (b) 1 : 3 **65.** 65 North Indian and 52 South Indian foodstalls.
- 66.** 23 : 47 **67.** 12 hours **68.** Yes **69.** (a) 13 : 5 (b) 2 : 11 (c) 13 : 35
- 70.** 54kg and 30kg **71.** $4\frac{1}{2}$ kg **72.** (i) 2 : 5 (ii) 2 : 1 (iii) 1 : 2 (iv) 2 : 5 **73.** 36 and 64 **74.** 1 : 2, 1 : 2 **75.** 3 : 1
- 76.** (a) 5 : 9 (b) 3 : 10 **77.** (a) 5 : 8 (b) 8 : 7 (c) 13 : 7
- 78.** 400km **79.** (a) Rs 36000 (b) 14 months. **80.** 12 hectares
- 81.** 30° **82.** Rs 51 **83.** Rs 1260 **84.** 14810 **85.** 19.76kg
- 86.** 3 cups **87.** 540 **88.** 1 : 5 **89.** 3 : 5

Unit 9

1. (B) 2. (A) 3. (D) 4. (C) 5. (A) 6. (B)
7. (D) 8. (B) 9. (B) 10. (C) 11. (C) 12. (B)
13. (A) 14. (B) 15. (B) 16. (A) 17. (D) 18. same
19. one 20. equal 21. unequal 22. Line segment, 5cm
23. Angle, 80° 24. l 25. equal 26. 5 27. right, triangle
28. 0, 8 29. 3 30. 7 (1, 2, 4, 5, 6, 7, 9)
31. 7 (A, M, U, V, W, Y, T) 32. 5 (B, C, D, E, K) 33. 4 (H, I, O, X)
34. 10 (F, G, J, L, N, P, Q, R, S, Z) 35. perpendicular 36. 6
37. n 38. one 39. no 40. one 41. diagonals
42. mid points 43. T 44. F 45. T 46. F
47. T 48. T 49. T 50. F 51. T 52. F
53. T 54. T 55. F 56. F 57. T 58. F
59. F 60. T 61. F 62. Yes, One line of symmetry.
63. AC, BD 64. H, I, O, X 65. S
66. S (Zero), Y (One), M (One), E (One), T (One), R (Zero)
67. (i) $\rightarrow$ (f), (ii) $\rightarrow$ (c), (iii) $\rightarrow$ (f), (iv) $\rightarrow$ (d), (v) $\rightarrow$ (e), (vi) $\rightarrow$ (a), (vii) $\rightarrow$ (g)
68. (i) 2, (ii) 1, (iii) 0, (iv) 1, (v) 1 (vi) 0
69. Yes 70. (a) Yes, (b) Yes, (c) Yes, (d) Yes 72. Yes, Yes, Yes
73. Yes 80. One 81. One 82. Yes

Notes

© NCERT
not to be republished

Notes

© NCERT
not to be republished

Notes

© NCERT
not to be republished