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MATHEMATICS

TERM-1

MULTIPLE CHOICE QUESTIONS

CLASS-10

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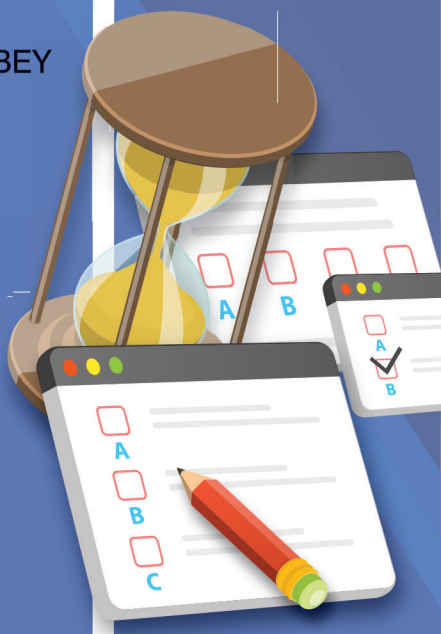

Case-based MCQs
Assertion-Reason Type MCQs
3 Practice Papers with OMR Sheets

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TERM–I

MATHEMATICS

COURSE STRUCTURE

Class-X (Code No. 041) (2021-22)

One Paper

90 Minutes

FIRST TERM

Units		Marks
I	NUMBER SYSTEMS	6
II	ALGEBRA	10
III	COORDINATE GEOMETRY	6
IV	GEOMETRY	6
V	TRIGONOMETRY	5
VI	MENSURATION	4
VII	STATISTICS & PROBABILITY	3
	Total	40
	INTERNAL ASSESSMENT	10
	Total	50

INTERNAL ASSESSMENT	MARKS	TOTAL MARKS
Periodic Tests	3	10 marks for the term
Multiple Assessments	2	
Portfolio	2	
Student Enrichment Activities-practical work	3	

Unit I: NUMBER SYSTEMS

Chapter–1 REAL NUMBER

Fundamental Theorem of Arithmetic - statements after reviewing work done earlier and after illustrating and motivating through examples. Decimal representation of rational numbers in terms of terminating/ non-terminating recurring decimals.

Unit II: ALGEBRA

Chapter–2 POLYNOMIALS

Zeroes of a polynomial. Relationship between zeroes and coefficients of quadratic polynomials only.

Chapter–3 PAIR OF LINEAR EQUATIONS IN TWO VARIABLES

Pair of linear equations in two variables and graphical method of their solution, consistency/ inconsistency. Algebraic conditions for number of solutions. Solution of a pair of linear equations in two variables algebraically - by substitution and by elimination. Simple situational problems. Simple problems on equations reducible to linear equations.

Unit III: COORDINATE GEOMETRY

Chapter–4 COORDINATE GEOMETRY

LINES (In two-dimensions)

Review: Concepts of coordinate geometry, graphs of linear equations. Distance formula. Section formula (internal division)

Unit IV: GEOMETRY

Chapter–5 TRIANGLES

Definitions, examples, counter examples of similar triangles.

1. (Prove) If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, the other two sides are divided in the same ratio.
2. (Motivate) If a line divides two sides of a triangle in the same ratio, the line is parallel to the third side.
3. (Motivate) If in two triangles, the corresponding angles are equal, their corresponding sides are proportional and the triangles are similar.
4. (Motivate) If the corresponding sides of two triangles are proportional, their corresponding angles are equal and the two triangles are similar.
5. (Motivate) If one angle of a triangle is equal to one angle of another triangle and the sides including these angles are proportional, the two triangles are similar.
6. (Motivate) If a perpendicular is drawn from the vertex of the right angle of a right triangle to the hypotenuse, the triangles on each side of the perpendicular are similar to the whole triangle and to each other.
7. (Motivate) The ratio of the areas of two similar triangles is equal to the ratio of the squares of their corresponding sides.
8. (Prove) In a right triangle, the square on the hypotenuse is equal to the sum of the squares on the other two sides.
9. (Motivate) In a triangle, if the square on one side is equal to sum of the squares on the other two sides, the angle opposite to the first side is a right angle.

Unit V: TRIGONOMETRY

Chapter–6 INTRODUCTION TO TRIGONOMETRY

Trigonometric ratios of an acute angle of a right-angled triangle. Proof of their existence (well defined). Values of the trigonometric ratios of 30°, 45° and 60°. Relationships between the ratios.

TRIGONOMETRIC IDENTITIES

Proof and applications of the identity $\sin^2 A + \cos^2 A = 1$. Only simple identities to be given.

Unit VI: MENSURATION

Chapter–7 AREAS RELATED TO CIRCLES

Motivate the area of a circle; area of sectors and segments of a circle. Problems based on areas and perimeter / circumference of the above said plane figures. (In calculating area of segment of a circle, problems should be restricted to central angle of 60° and 90° only. Plane figures involving triangles, simple quadrilaterals and circle should be taken.)

Unit VII: STATISTICS & PROBABILITY

Chapter–8 PROBABILITY

Classical definition of probability. Simple problems on finding the probability of an event.

TERM–1

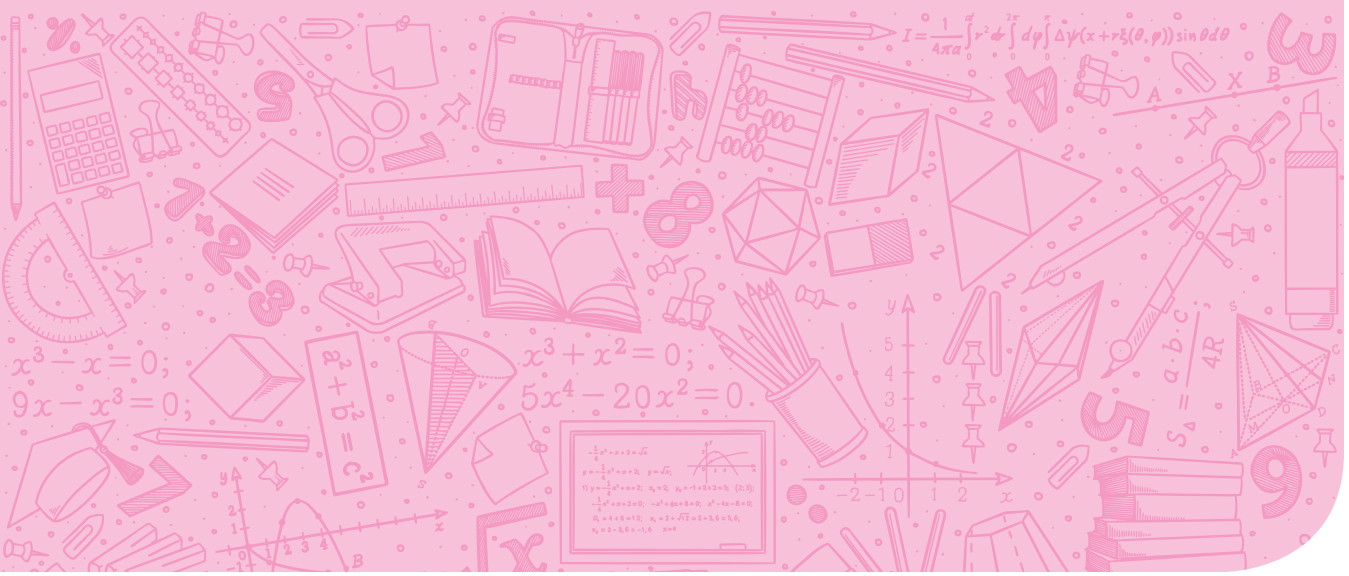
MATHEMATICS

BASIC CONCEPTS & FORMULAE

MULTIPLE CHOICE QUESTIONS
(Including Competency-based MCQs)

CASE-BASED QUESTIONS

ASSERTION-REASON QUESTIONS



01 REAL NUMBERS

BASIC CONCEPTS & FORMULAE

1. **The Fundamental Theorem of Arithmetic:** Every composite number can be expressed (factorised) as a product of primes, and this factorisation is unique, apart from the order in which the prime factors occur.
2. If p is a prime and p divides a^2 , then p divides a, where a is a positive integer.
3. If x be any rational number whose decimal expansion terminates, then we can express x in the form $\frac{p}{q}$, where p and q are coprime, and the prime factorisation of q is of the form $2^n\ 5^m$, where n, m are non-negative integers.
4. Let $x = \frac{p}{q}$ be a rational number, such that the prime factorisation of q is of the form $2^n\ 5^m$, where n, m are non-negative integers, then, x has a decimal expansion which terminates.
5. Let $x = \frac{p}{q}$ be a rational number, such that the prime factorisation of q is not of the form $2^n\ 5^m$, where n, m are non-negative integers, then, x has a decimal expansion which is non-terminating repeating (recurring).
6. For any two positive integers a and b, HCF $(a, b) \times$ LCM $(a, b) = a \times b$.

MULTIPLE CHOICE QUESTIONS

Choose and write the correct option in the following questions.

1. **The LCM of smallest two digit composite number and smallest composite number is**
   (*a*) 12 (*b*) 4 (*c*) 20 (*d*) 44
2. **The total number of factors of a prime number is** [*CBSE Sample Paper* 2020]
   (*a*) 1 (*b*) 0 (*c*) 2 (*d*) 3
3. **The sum of exponents of prime factors in the prime factorisation of 196 is**
   (*a*) 3 (*b*) 4 (*c*) 5 (*d*) 2
4. **The HCF of 135 and 225 is** [*CBSE* 2020(30/2/1)]
   (*a*) 15 (*b*) 75 (*c*) 45 (*d*) 5
5. **The decimal representation of $\frac{37}{50}$ will**
   (*a*) terminate after 1 decimal place (*b*) terminate after 2 decimal places
   (*c*) terminate after 3 decimal places (*d*) not terminate
6. **The largest number which divides 70 and 125 leaving remainders 5 and 8 respectively is**
   (*a*) 13 (*b*) 65 (*c*) 875 (*d*) 1750

7. **The decimal representation of $\frac{15}{400}$ will**

(a) terminate after 1 decimal place. (b) terminate after 2 decimal places.
(c) terminate after 3 decimal places. (d) terminate after 4 decimal places.

8. **If $6370 = 2^m \cdot 5^n \cdot 7^k \cdot 13^p$, then the value of $m + n + k + p$ is**

(a) 2 (b) 3 (c) 4 (d) 5

9. **The least number that is divisible by all the numbers from 1 to 5 is**

(a) 30 (b) 20 (c) 60 (d) 120

10. **Which of these rational number is a terminating decimal?**

(a) $\frac{7}{18}$ (b) $\frac{13}{21}$ (c) $\frac{8}{200}$ (d) $\frac{16}{225}$

11. **The largest number which divides 615 and 963 leaving remainder 6 in each case is**

(a) 82 (b) 95 (c) 87 (d) 93

12. **If 3 is the least prime factor of number a and 7 is the least prime factor of number b, then the least prime factor of $(a + b)$ is**

(a) 2 (b) 3 (c) 5 (d) 10

13. **If $a = 2^3 \times 3$, $b = 2 \times 3 \times 5$, $c = 3^n \times 5$ and LCM $(a, b, c) = 2^3 \times 3^2 \times 5$, then n is equal to**

(a) 1 (b) 2 (c) 3 (d) 4

14. **If p and q are prime numbers than the HCF of p^3q^2 and p^2q is**

(a) p^3q^2 (b) p^2q (c) p^2q^2 (d) pq

15. **HCF of 96 and 404 is**

(a) 4 (b) 2 (c) 3 (d) 101

16. **The pair of co-prime is**

(a) 32, 40 (b) 21, 28 (c) 18, 25 (d) 9, 27

17. **The product of two numbers is 320 and their LCM is 80. The HCF of the numbers is**

(a) 8 (b) 4 (c) 16 (d) 10

18. **The HCF of 8, 9 and 5 is**

(a) 8 (b) 25 (c) 9 (d) 1

19. **5 is the prime factor of**

(a) 78 (b) 240 (c) 1001 (d) 1547

20. **Which of the following rational numbers will have a terminating decimal expansion?**

(a) $\frac{17}{8}$ (b) $\frac{7}{105}$ (c) $\frac{9}{14}$ (d) $\frac{13}{30}$

21. **A teacher creates the question "Which of the following could be the sum of two rational numbers?". She now needs to create three incorrect choices and one correct answer. Which option shows the choices that the teacher should create?** *[CBSE Question Bank]*

(a) First choice: 125; Second choice: 36+42; Third choice: 81; Correct Answer: 169
(b) First choice: 227; Second choice: 25+16; Third choice: 64; Correct Answer: 5
(c) First choice: π; Second choice: 20+16; Third choice: 50 – 1; Correct Answer: 49
(d) None of them

22. **The fractions $\frac{3}{a}$ and $\frac{7}{b}$ are equivalent to decimals that terminate. Which best describes the product of a and b?** [*CBSE Question Bank*]

(a) It is a prime number.

(b) It cannot be an odd number.

(c) It is of the form $21k$, where k could be multiples of 7 or 9.

(d) It is of the form $21k$, where k could be multiples of 2 or 5.

23. **The decimal representation of $\frac{11}{2^3 \times 5}$ will** [*CBSE Sample Question Paper* 2020]

(a) terminate after 1 decimal place (b) terminate after 2 decimal places

(c) terminate after 3 decimal places (d) not terminates

24. **HCF × LCM for the numbers 150 and 10 is**

(a) 1500 (b) 150 (c) 10 (d) None of these

25. **If $(-1)^n + (-1)^{4n} = 0$, then n is**

(a) any negative integer (b) any even natural number

(c) any positive integer (d) any odd natural number

26. **$\sqrt{7}$ is**

(a) an integer (b) an irrational number

(c) a rational number (d) none of these

27. **The decimal expansion of the rational number $\frac{47}{2^3 5^2}$ will terminate after**

(a) one decimal place (b) two decimal places

(c) three decimal places (d) more than three decimal places

28. **The product of two consecutive integers is divisible by**

(a) 2 (b) 3 (c) 5 (d) 7

29. **$n^2 - 1$ is divisible by 8 if n is**

(a) an integer (b) a natural number (c) an odd integer (d) an even integer

30. **The largest number which divides 70 and 125 leaving remainders 5 and 8 respectively is** [*NCERT Exemplar*]

(a) 13 (b) 65 (c) 875 (d) 1750

31. **If two positive integers a and b are written as $a = x^3y^2$ and $b = xy^3$; x, y are prime numbers, then LCM (a, b) is** [*NCERT Exemplar*]

(a) xy (b) xy^2 (c) x^3y^3 (d) x^2y^2

32. **The product of a non zero rational and an irrational number is** [*NCERT Exemplar*]

(a) always irrational (b) always rational

(c) rational or irrational (d) one

33. **The decimal expansion of the rational number $\frac{14587}{1250}$ will terminate after** [*NCERT Exemplar*]

(a) one decimal place (b) two decimal places

(c) three decimal places (d) four decimal places

34. **The exponent of 2 in prime factorisation of 144 is**

(*a*) 4 (*b*) 5 (*c*) 6 (*d*) 3

35. **The LCM of two numbers is 1200. Which of the following cannot be their HCF?**

(*a*) 600 (*b*) 500 (*c*) 400 (*d*) 200

36. **If 3 is the least prime factor of number a and 7 is the least prime factor of number b, then the least prime factor of $(a + b)$ is**

(*a*) 2 (*b*) 3 (*c*) 5 (*d*) 10

37. **If HCF (26, 169) = 13 then LCM (26, 169) is**

(*a*) 26 (*b*) 52 (*c*) 338 (*d*) 13

38. $3.\overline{27}$ **is**

(*a*) an integer (*b*) a rational number (*c*) a natural number (*d*) an irrational number

39. **If n is any natural number then $6^n - 5^n$ always end with**

(*a*) 1 (*b*) 3 (*c*) 5 (*d*) 7

40. **If a and b are co-prime numbers then a^2 and b^2 are**

(*a*) co-prime (*b*) not co-prime (*c*) even number (*d*) odd number

41. **The decimal form of** $\frac{129}{2^2.5^7.7^5}$ **is**

(*a*) terminating (*b*) non-terminating

(*c*) non-terminating non-repeating (*d*) none of them

42. **If two positive integers a and b are written as $a = xy^2$ and $b = x^3y$, where x, y are prime numbers, then LCM (a, b) is**

(*a*) x^2y^2 (*b*) xy (*c*) x^3y^2 (*d*) none of these

43. **If the HCF of 65 and 117 is expressible in the form $65m - 117$, then the value of m is**

(*a*) 4 (*b*) 2 (*c*) 11 (*d*) 3

44. **Arnav has 40 cm long red and 84 cm long blue ribbon. He cuts each ribbon into pieces such that all pieces are of equal length. What is the length of each piece?** *[CBSE Question Bank]*

(*a*) 4 cm as it is the HCF of 40 and 84 (*b*) 4 cm as it is the LCM of 40 and 84

(*c*) 12 cm as it is the LCM of 40 and 84 (*d*) 12 cm as it is the HCF of 40 and 84

45. **Three bulbs red, green and yellow flash at intervals of 80 seconds, 90 seconds and 110 seconds. All three flash together at 8:00 am. At what time will the three bulbs flash altogether again?** *[CBSE Question Bank]*

(*a*) 8:12 am (*b*) 9:12 am (*c*) 10:12 am (*d*) 11:12 am

Answers

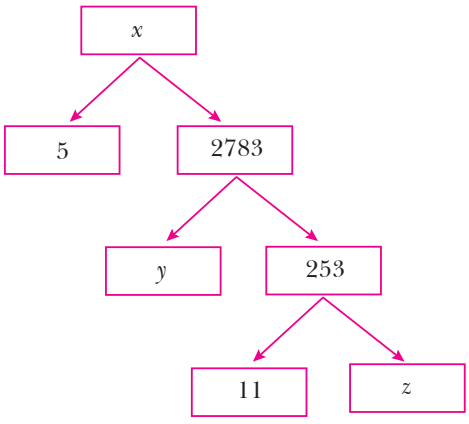
1. (*c*)	**2.** (*c*)	**3.** (*b*)	**4.** (*c*)	**5.** (*b*)	**6.** (*a*)
7. (*d*)	**8.** (*d*)	**9.** (*c*)	**10.** (*c*)	**11.** (*c*)	**12.** (*a*)
13. (*b*)	**14.** (*b*)	**15.** (*a*)	**16.** (*c*)	**17.** (*b*)	**18.** (*d*)
19. (*b*)	**20.** (*a*)	**21.** (*c*)	**22.** (*d*)	**23.** (*c*)	**24.** (*a*)
25. (*d*)	**26.** (*b*)	**27.** (*c*)	**28.** (*a*)	**29.** (*c*)	**30.** (*a*)
31. (*c*)	**32.** (*a*)	**33.** (*d*)	**34.** (*a*)	**35.** (*b*)	**36.** (*a*)
37. (*c*)	**38.** (*b*)	**39.** (*a*)	**40.** (*a*)	**41.** (*c*)	**42.** (*c*)
43. (*b*)	**44.** (*a*)	**45.** (*c*)			

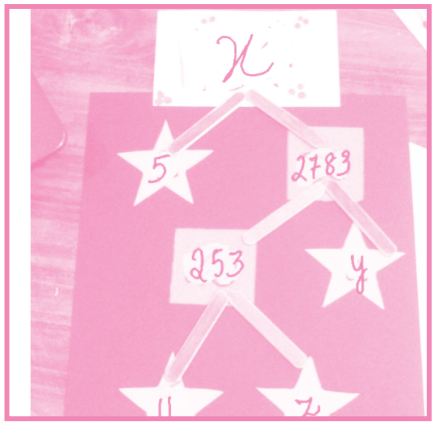
CASE-BASED QUESTIONS

1. Read the following and answer any four questions from (*i*) to (*v*).

A Mathematics Exhibition is being conducted in your School and one of your friends is making a model of a factor tree. He has some difficulty and asks for your help in completing a quiz for the audience. *[CBSE Question Bank]*

Observe the following factor tree and answer the following:





(*i*) What will be the value of *x*?

(*a*) 15005 (*b*) 13915 (*c*) 56920 (*d*) 17429

(*ii*) What will be the value of *y*?

(*a*) 23 (*b*) 22 (*c*) 11 (*d*) 19

(*iii*) What will be the value of *z*?

(*a*) 22 (*b*) 23 (*c*) 17 (*d*) 19

(*iv*) According to Fundamental Theorem of Arithmetic 13915 is a

(*a*) Composite number (*b*) Prime number

(*c*) Neither prime nor composite (*d*) Even number

(*v*) The prime factorisation of 13915 is

(*a*) $5 \times 11^3 \times 13^2$ (*b*) $5 \times 11^3 \times 23^2$ (*c*) $5 \times 11^2 \times 23$ (*d*) $5 \times 11^2 \times 13^2$

2. Read the following and answer any four questions from (*i*) to (*v*).

To enhance the reading skills of grade *X* students, the school nominates you and two of your friends to set up a class library. There are two sections- section *A* and section *B* of grade *X*. There are 32 students in section *A* and 36 students in section *B*. *[CBSE Question Bank]*

(*i*) What is the minimum number of books you will require for the class library, so that they can be distributed equally among students of Section *A* or Section *B*?

(*a*) 144 (*b*) 128 (*c*) 288 (*d*) 272

(*ii*) If the product of two positive integers is equal to the product of their HCF and LCM is true then, the HCF (32, 36) is

(*a*) 2 (*b*) 4 (*c*) 6 (*d*) 8

(*iii*) 36 can be expressed as a product of its primes as

(*a*) $2^2 \times 3^2$ (*b*) $2^1 \times 3^3$ (*c*) $2^3 \times 3^1$ (*d*) $2^0 \times 3^0$

(*iv*) $7 \times 11 \times 13 \times 15 + 15$ is

(*a*) Prime number (*b*) Composite number

(*c*) Neither prime nor composite (*d*) None of the above

(*v*) If p and q are positive integers such that $p = ab^2$ and $q = a^2b$, where a, b are prime numbers, then the LCM (p, q) is

(*a*) ab (*b*) a^2b^2 (*c*) a^3b^2 (*d*) a^3b^3

Answers

1. (*i*) (*b*) (*ii*) (*c*) (*iii*) (*b*) (*iv*) (*a*) (*v*) (*c*)

2. (*i*) (*c*) (*ii*) (*b*) (*iii*) (*a*) (*iv*) (*b*) (*v*) (*b*)

ASSERTION-REASON QUESTIONS

The following questions consist of two statements—Assertion(A) and Reason(R). Answer these questions selecting the appropriate option given below:

(*a*) Both *A* and *R* are true and *R* is the correct explanation for *A*.

(*b*) Both *A* and *R* are true and *R* is not the correct explanation for *A*.

(*c*) *A* is true but *R* is false.

(*d*) *A* is false but *R* is true.

1. Assertion (*A*) : 6^n ends with the digit zero, where n is natural number.

Reason (*R*) : Any number ends with digit zero, if its prime factor is of the form $2^m \times 5^n$, where m, n are natural numbers.

2. Assertion (*A*) : For any two positive integers a and b, HCF $(a, b) \times$ LCM $(a, b) = a \times b$.

Reason (*R*) : The HCF of two numbers is 5 and their product is 150. Then their LCM is 40.

3. Assertion (*A*) : $\frac{29}{250}$ is a terminating decimal.

Reason (*R*) : The rational number $\frac{p}{q}$ is a terminating decimal, if $q = (2^m \times 5^n)$ for some whole numbers m and n.

4. Assertion (*A*) : A number N when divided by 15 gives the reminder 2. Then the remainder is same when N is divided by 5.

Reason (*R*) : $\sqrt{3}$ is an irrational number.

Answers

1. (*d*) **2.** (*c*) **3.** (*a*) **4.** (*b*)

HINTS/SOLUTIONS OF SELECTED MCQs

1. We have, smallest two digit composite number = 10
and smallest composite number = 4

$\therefore$ LCM(10, 4) = 20

Hence, option (*c*) is correct.

2. The total number of factors of a prime number is 2 *i.e.*, 1 and number itself.

$\therefore$ Option (*c*) is correct.

3. We have,

$196 = 2^2 \times 7^2$

$\therefore$ Sum of exponents = 2 + 2 = 4

$\therefore$ Option (*b*) is correct.

4. We have,

$135 = 3 \times 3 \times 3 \times 5$

$225 = 3 \times 3 \times 5 \times 5$

$\therefore$ HCF (135, 225) = $3 \times 3 \times 5 = 45$

$\therefore$ Option (*c*) is correct.

5. We have,

$$\frac{37}{50} = \frac{37}{2 \times 5^2} = \frac{37 \times 2}{(2 \times 5)^2} = \frac{74}{(10)^2} = 0.74$$

$\therefore$ It will terminate after 2 decimal places.

Hence, option (*b*) is correct.

6. The required largest number is the HCF of (70 – 5) and (125 – 8).
i.e., HCF of 65 and 117 which is 13.

$\therefore$ Required largest number is 13.

Hence, option (*a*) is correct.

7. We have,

$$\frac{15}{400} = \frac{3 \times 5}{5^2 \times 2^4} = \frac{15}{2^4 \times 5^2} \times \frac{5^2}{5^2}$$

$$= \frac{15 \times 25}{(2 \times 5)^4} = \frac{375}{(10)^4} = \frac{375}{10000} = 0.0375$$

$\therefore$ It will terminates after 4 decimal places.

Hence, option (*d*) is correct.

8. We have,

$6370 = 2^1 \times 5^1 \times 7^2 \times 13^1$

$\Rightarrow \quad 6370 = 2^m \times 5^n \times 7^k \times 13^p$

$\Rightarrow \quad m = 1, n = 1, k = 2, p = 1$

$\therefore \quad m + n + k + p = 1 + 1 + 2 + 1 = 5$

Hence, option (*d*) is correct.

9. The required least number is the LCM(1, 2, 3, 4, 5) = 60
Hence, option (*c*) is correct.

10. We have, $\frac{8}{200} = \frac{4 \times 2}{200} = \frac{4}{100} = \frac{4}{100} = 0.04$

It is a terminating decimal.

Hence, option (*c*) is correct.

11. The required number is the HCF of (615 – 6) and (963 – 6)

i.e. HCF of 609 and 957.

We have, $609 = 3 \times 7 \times 29$

and $957 = 3 \times 11 \times 29$

$\therefore$ HCF (609, 957) $= 3 \times 29 = 87$

$\therefore$ Required number = 87

Hence, option (*c*) is correct.

12. Since, 3 is the least prime factor of a.

$\Rightarrow$ a is an odd number.

Again, 7 is the least prime factor of b.

$\Rightarrow$ b is also an odd number.

$\therefore$ $(a + b)$ is an even number, because sum of two odds is even.

So, least prime factor of $(a + b)$ is 2.

Hence, option (*a*) is correct.

13. We have, $a = 2^3 \times 3, b = 2 \times 3 \times 5, c = 3^n \times 5$

$\therefore$ LCM $(a, b, c) = 2^3 \times 3^2 \times 5$

$2^3 \times 3^n \times 5 = 2^3 \times 3^2 \times 5 \Rightarrow n = 2$

Hence, option (*b*) is correct.

14. We have,

$p^3q^2 = p \times p \times p \times q \times q$

$p^2q = p \times p \times q$

$\therefore$ HCF $= p \times p \times q = p^2q$

Hence, option (*b*) is correct.

15. We have, $96 = 2^5 \times 3$

$404 = 2^2 \times 101$

$\therefore$ HCF (96, 404) $= 2^2 = 4$

Hence, option (*a*) is correct.

16. 18 and 25 have no common prime factor.

$18 = 3 \times 3 \times 2$

$25 = 5 \times 5$

So, (18, 25) is a pair of coprime.

Hence, option (*c*) is correct.

17. HCF $= \frac{\text{Product of numbers}}{\text{LCM}}$

$= \frac{320}{80} = 4$

Hence, option (*b*) is correct.

18. No common prime factor in 8, 9 and 25.

So, HCF (8, 9, 25) = 1

Hence, option (*d*) is correct.

19. 5 is prime factor of that number, which ends with 0 or 5. So, there is only 240 which ends with zero.

Hence, option (*b*) is correct.

20. $8 = 2 \times 2 \times 2 = 2^3.5^0$. Hence, $\frac{17}{8}$ represents terminating decimals.

Hence, option (*a*) is correct.

21. Option (*c*) is correct.

22. We have, fractions $\frac{3}{a}$ and $\frac{7}{b}$ which terminate if $a = 3k_1$ and $b = 7k_2$ where k_1 and k_2 are of the form $2^m \cdot 5^n$.

$\therefore \quad ab = 21k_1k_2 = 21k \qquad (\text{Let } k = k_1k_2)$

$\Rightarrow$ $ab = 21k$, where $k = 2^m \cdot 5^n$ (m, n are non-negative integers)

$\therefore$ Option (*d*) is correct.

23. $\frac{11}{2^3 \times 5} = \frac{11 \times 5^2}{2^3 \times 5^3} = \frac{275}{(10)^3} = 0.275$

So, it will terminate after 3 decimal places.

Hence, option (*c*) is correct.

24. LCM × HCF = Product of numbers

$\therefore$ For 150 and 10

LCM × HCF = 150 × 10 = 1500

Hence, option (*a*) is correct.

29. If n is an odd positive integer then

$$\begin{aligned} n &= 4p + 1 \\ n^2 - 1 &= (4p + 1)^2 - 1 \\ &= 16p^2 + 8p + 1 - 1 \\ &= 8p(2p + 1), \text{ which is divisible by 8.} \end{aligned}$$

$\Rightarrow$ $(n^2 - 1)$ is divisible by 8.

Hence, option (*c*) is correct.

31. We have, $a = x^3y^2 = x \times x \times x \times y \times y$ and $b = xy^3 = x \times y \times y \times y$

$\therefore$ LCM$(a, b) = x \times x \times x \times y \times y \times y \quad = x^3y^3$

Hence, option (*c*) is correct.

33. We have, $\frac{14587}{1250} = \frac{14587}{2 \times 5^4} = \frac{14587}{10 \times 5^3} \times \frac{2^3}{2^3}$

$$= \frac{14587 \times 8}{10000} = \frac{116696}{10000} = 11.6696$$

So the given rational number will terminate after four decimal places.

Hence, option (*d*) is correct.

37. HCF (26, 169) = 13

$\therefore$ LCM(26, 169) $= \dfrac{26 \times 169}{13} = 338$

Hence, option (*c*) is correct.

38. We have, $3.\overline{27} = 3.272727...$ is rational because, it is non-terminating but repeating decimal expansion.

Hence, option (*b*) is correct.

44. Since each piece should be of equal length. Therefore, length of each piece is the HCF of 40 cm and 84 cm.

Now, using Fundamental Theorem of Arithmetic, we have

$$40 = 2 \times 2 \times 2 \times 5$$

and $$84 = 2 \times 2 \times 3 \times 7$$

$\therefore$ $$\text{HCF}(40, 84) = 2 \times 2 = 4$$

$\Rightarrow$ Length of each piece is 4 cm.

$\therefore$ Option (*a*) is correct.

45. The required time is LCM of 80, 90 and 110 seconds.

$$80 = 2 \times 2 \times 2 \times 2 \times 5$$

$$90 = 2 \times 3 \times 3 \times 5$$

$$110 = 2 \times 5 \times 11$$

$\therefore$ $$\text{LCM}(80, 90, 110) = 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 5 \times 11$$

$$= 7920 \text{ seconds}$$

$$= \frac{7920}{60} \text{ minutes}$$

$$= 132 \text{ minutes}$$

$$= 2 \text{ hours and } 12 \text{ minutes}$$

So, three bulbs flash together again, after 2 hours and 12 minutes.

So, the three bulbs will flash altogether at 10:12 am.

$\therefore$ Option (*c*) is correct.

SOLUTIONS OF CASE-BASED QUESTIONS

1. (*i*) From the factor tree it is clear that

$x = 5 \times 2783 = 13915$

Hence option (*b*) is correct.

(*ii*) From the factor tree

$$y = \frac{2783}{253} = 11$$

Hence option (*c*) is correct.

(*iii*) From the factor tree

$$z = \frac{253}{11} = 23$$

Hence option (*b*) is correct.

(*iv*) $\because$ The given number 13915 is not an even number and have more than two factors.

$\therefore$ According to fundamental theorem of arithmetic 13915 is a composite number.

Hence option (*a*) is correct.

(*v*) The prime factorisation of 13915

$= 5 \times 11 \times 11 \times 23$

$= 5 \times 11^2 \times 23$

5	13915
11	2783
11	253
	23

Hence option (*c*) is correct.

2. (*i*) Minimum number of books required to distribute equally among student of both the sections = LCM(32, 36)

LCM (32, 36) = $2 \times 2 \times 8 \times 9 = 288$

Hence option (*c*) is correct.

2	32, 36
2	16, 18
	8, 9

(*ii*) It is given that

Product of two positive integers = HCF × LCM

So, $$\text{HCF} = \frac{\text{Product of two integers}}{\text{LCM}}$$

$$= \frac{32 \times 36}{288} = 4$$

Hence option (*b*) is correct.

(*iii*) Prime factorisation of 36 is

$36 = 2 \times 2 \times 3 \times 3$

$= 2^2 \times 3^2$

Hence option (*a*) is correct.

2	36
2	18
3	9
3	3
	1

(*iv*) Given expression is $7 \times 11 \times 13 \times 15 + 15$

$= 15(7 \times 11 \times 13 + 1)$

$= 15 \times 1002$

So, it is composite number.

Hence option (*b*) is correct.

(*v*) Given $p = ab^2$ and $q = a^2b$, where a, b are prime numbers.

$\because$ LCM of p and q is the highest power of the variables.

$\therefore$ LCM $(p, q) = a^2b^2$

Hence option (*b*) is correct.

SOLUTIONS OF ASSERTION-REASON QUESTIONS

1. $6^n = (2 \times 3)^n = 2^n \times 3^n$, Its prime factors do not contain 5^n *i.e.*, of the form $2^m \times 5^n$, where m, n are natural numbers. Here assertion is incorrect but reason is correct.

Hence, option (*d*) is correct.

2. We have,

$\text{LCM}(a, b) \times \text{HCF}(a, b) = a \times b$

$\text{LCM} \times 5 = 150$

$\therefore \quad \text{LCM} = \frac{150}{5} = 30$

$\Rightarrow \quad$ LCM = 30, *i.e.*, reason is incorrect and assertion is correct.

Hence, (*c*) is the correct option.

3. We have, $\frac{29}{250} = \frac{29}{2 \times 5^3} = \frac{29 \times 2^2}{2^3 \times 5^3}$

$= \frac{29 \times 4}{(10)^3} = \frac{116}{1000} = 0.116$

Thus, it is a terminating decimal, which terminate after there decimal places.

Also, it is a rational number whose denominator is of the form $2^m \times 5^n$.

Thus option (*a*) is correct.

4. Clearly, both *A* and *R* are correct but *R* does not explain *A*.

Hence, (*b*) is correct option.

02 POLYNOMIALS

BASIC CONCEPTS & FORMULAE

1. **Polynomial:** An algebraic expression of the form $a_0x^n + a_1x^{n-1} + a_2x^{n-2} + ...+ a_{n-1}\,x + a_n$, where $a_0, a_1, a_2, ...a_n$ are real numbers, n is a non-negative integer and $a_0 \neq 0$ is called a polynomial of degree n.
2. **Degree of polynomial:** The highest power of variable in a polynomial is called the degree of polynomial.
3. **Types of polynomials:**

   (i) **Constant Polynomial:** A polynomial $p(x)$ of degree zero is called a constant polynomial and it is of the form $p(x) = k$.

   (ii) **Linear Polynomial:** A polynomial of degree one is called linear polynomial and it is of the form $p(x) = ax + b$, where a, b are real numbers and $a \neq 0$.

   (iii) **Quadratic Polynomial:** A polynomial of degree two is called quadratic polynomial and it is of the form $p(x) = ax^2 + bx + c$, where a, b, c are real numbers and $a \neq 0$.

   (iv) **Cubic Polynomial:** A polynomial of degree three is called cubic polynomial and it is of the form $p(x) = ax^3 + bx^2 + cx + d$, where a, b, c, d are real numbers and $a \neq 0$.

   (v) **Bi-quadratic Polynomial:** A polynomial of degree four is called bi-quadratic polynomial and it is of the form $p(x) = ax^4 + bx^3 + cx^2 + dx + e$, where a, b, c, d, e are real numbers and $a \neq 0$.

4. **Graph of polynomial:**

   (i) Graph of a linear polynomial $p(x) = ax + b$ is a straight line.

   (ii) Graph of a quadratic polynomial $p(x) = ax^2 + bx + c$ is a parabola open upwards like $\cup$ if $a > 0$

   (iii) Graph of a quadratic polynomial $p(x) = ax^2 + bx + c$ is a parabola open downwards like $\cap$ if $a < 0$.

   (iv) In general a polynomial $p(x)$ of degree n crosses the x-axis at atmost n points.

5. **Zeroes of a polynomial:** α is said to be zero of a polynomial $p(x)$ if $p(\alpha) = 0$.

   (i) Geometrically, the zeroes of a polynomial $p(x)$ are the x-co-ordinates of the points, where the graph of $y = p(x)$ intersects the x-axis.

   (ii) A polynomial of degree 'n' can have atmost n zeros.

   That is a quadratic polynomial can have atmost 2 zeroes and a cubic polynomial can have atmost 3 zeroes.

   (iii) 0 may a zero of a polynomial.

   (iv) A non-zero constant polynomial have no zeroes.

6. Discriminant of a quadratic polynomial: For polynomial $p(x) = ax^2 + bx + c$, $a \neq 0$, the expression $b^2 - 4ac$ is known as its discriminant 'D'.

$\therefore \qquad D = b^2 - 4ac$

7. Relationship between the zeroes and the coefficients of a polynomial:

(*i*) If α, β are zeros of $p(x) = ax^2 + bx + c$, then

$$\text{Sum of zeros} = \alpha + \beta = \frac{-b}{a} = \frac{-(\text{Coefficient of } x)}{\text{Coefficient of } x^2}$$

$$\text{Product of zeros} = \alpha\beta = \frac{c}{a} = \frac{\text{Constant term}}{\text{Coefficient of } x^2}$$

(*ii*) If α, β, γ are zeros of $p(x) = ax^2 + bx + cx + d$, then

$$\alpha + \beta + \gamma = \frac{-b}{a} = \frac{-(\text{Coefficient of } x^2)}{\text{Coefficient of } x^3}$$

$$\alpha\beta + \beta\gamma + \gamma\alpha = \frac{c}{a} = \frac{\text{Coefficient of } x}{\text{Coefficient of } x^3}$$

$$\alpha\beta\gamma = \frac{-d}{a} = \frac{-(\text{Constant term})}{\text{Coefficient of } x^3}$$

(*iii*) If α, β, are roots of a quadratic polynomial $p(x)$, then

$p(x) = x^2 - (\text{sum of zeroes})x + \text{product of zeroes} \quad \Rightarrow \quad p(x) = x^2 - (\alpha + \beta)x + \alpha\beta$

(*iv*) If α, β, γ are the roots of a cubic polynomial $p(x)$, then

$p(x) = x^3 - (\text{sum of zeroes})\, x^2 + (\text{sum of product of zeroes taken two at a time})\, x$ – product of zeroes

$\Rightarrow \quad p(x) = x^3 - (\alpha + \beta + \gamma)x^2 + (\alpha\beta + \beta\gamma + \gamma\alpha)x - \alpha\beta\gamma$

MULTIPLE CHOICE QUESTIONS

Choose and write the correct option in the following questions.

1. The zeroes of the polynomial $x^2 - 3x - m(m + 3)$ are [*CBSE* 2020 (30/2/1)]

(*a*) $m, m + 3$ (*b*) $-m, m + 3$ (*c*) $m, -(m + 3)$ (*d*) $-m, -(m + 3)$

2. The degree of polynomial having zeroes – 3 and 4 only is [*CBSE* 2020 (30/5/2)]

(*a*) 2 (*b*) 1 (*c*) more than 3 (*d*) 3

3. The number of zeroes for a polynomial $p(x)$ where graph of $y = p(x)$ given in Fig. 2.1, is [*CBSE* 2020 (30/4/1)]

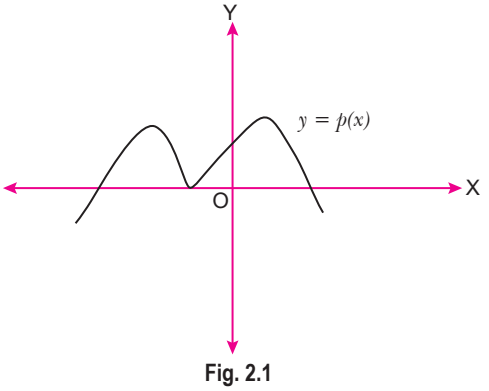


Fig. 2.1

(*a*) 3 (*b*) 4 (*c*) 0 (*d*) 5

4. **In Fig. 2.2, the graph of the polynomial $p(x)$ is given. The number of zeroes of the polynomial is** [*CBSE* 2020 (30/3/1)]

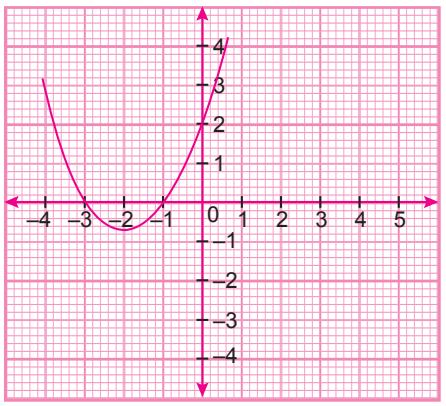


Fig. 2.2

(*a*) 1 (*b*) 2 (*c*) 3 (*d*) 0

5. **The quadratic polynomial, the sum of whose zeroes is – 5 and their product is 6, is** [*CBSE* 2020 (30/1/1)]

(*a*) $x^2 + 5x + 6$ (*b*) $x^2 - 5x + 6$ (*c*) $x^2 - 5x - 6$ (*d*) $-x^2 + 5x + 6$

6. **If one of the zeroes of the quadratic polynomial $x^2 + 3x + k$ is 2, then the value of k is** [*CBSE* 2020 (30/1/1)]

(*a*) 10 (*b*) – 10 (*c*) – 7 (*d*) – 2

7. **The graph of a quadratic polynomial $ax^2 + bx + c = 0$, having discriminant equal to zero, will touch x-axis at exactly how many points?**

(*a*) one (*b*) two (*c*) three (*d*) can't say

8. **The quadratic polynomial $p(x)$ with –24 and 4 as a product and one of the zeros respectively is**

(*a*) $x^2 - 2x - 24$ (*b*) $x^2 + 2x - 24$ (*c*) $x^2 + 2x + 24$ (*d*) Can't be determined

9. **The polynomial $(x - a)$, where $a > 0$, is a factor of the polynomial $q(x) = 4\sqrt{2}x^2 - \sqrt{2}$. Which of these is a polynomial whose factor is $\left(x - \frac{1}{a}\right)$?** [*CBSE Question Bank*]

(*a*) $x^2 + x + 6$ (*b*) $x^2 + x - 6$ (*c*) $x^2 - 5x + 4$ (*d*) $x^2 + 4x - 3$

10. **Which of these is a factor of the polynomial $p(x) = x^3 + 4x + 5$?** [*CBSE Question Bank*]

(*a*) $(x + 1)$ (*b*) $(x - 1)$ (*c*) $(x + 3)$ (*d*) $(x - 3)$

11. **Given that $m + 2$, where m is a positive integer, is a zero of the polynomial $q(x) = x^2 - mx - 6$. Which of these is the value of m?** [*CBSE Question Bank*]

(*a*) 4 (*b*) 3 (*c*) 2 (*d*) 1

12. **Which of these is a zero of the polynomials $p(y) = 3y^3 - 16y - 8$?** [*CBSE Question Bank*]

(*a*) 2 (*b*) 8 (*c*) –2 (*d*) –8

13. **Consider the polynomial in z, $p(z) = z^4 - 2z^3 + 3$. What is the value of the polynomial at $z = -1$?** [*CBSE Question Bank*]

(*a*) 6 (*b*) 5 (*c*) 4 (*d*) 3

14. **Consider the expression $x^{(m^2-1)} + 3x^{\frac{m}{2}}$, where m is a constant. For what value of m, will the expression be a cubic polynomial?** [*CBSE Question Bank*]

(*a*) 1 (*b*) 2 (*c*) –1 (*d*) –2

15. **Which of the following graphs could be for the simple polynomial x^2 ?** [*CBSE Question Bank*]

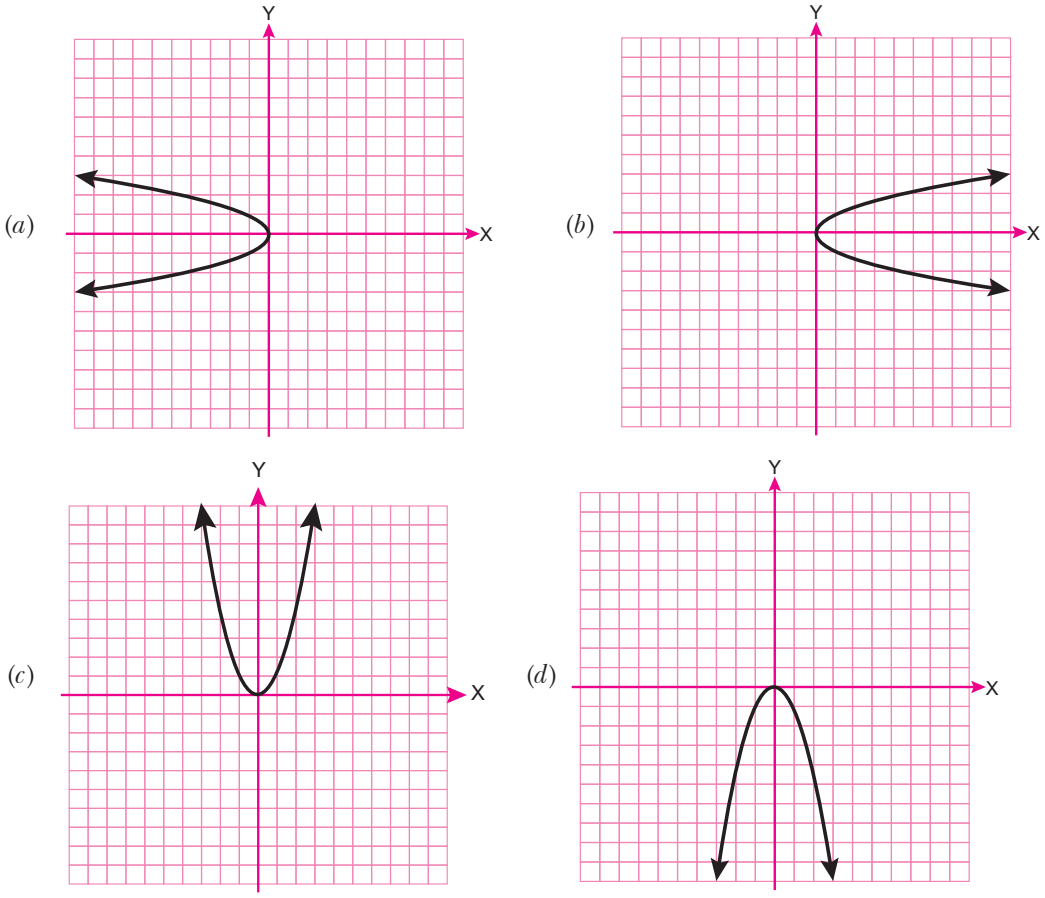


Fig. 2.3 (*a* to *d*)

16. **Prashant claims that the polynomial $p(x) = mx^a + x^{2b}$ $(a > 2b)$ has $4b$ zeroes. For Prashant's claim to be correct, which of these must be true?** [*CBSE Question Bank*]

(*a*) $a = 2$ or $a = 4b$ (*b*) $a = 4b$

(*c*) $m = 2b$ (*d*) $m = 4b$

17. **Which of the following statements is correct?** [*CBSE Question Bank*]

(*a*) A polynomial of degree 3 has two zeroes (*b*) A polynomial of degree 4 has four zeroes

(*c*) A polynomial of degree 5 has six zeroes (*d*) A polynomial of degree 6 has five zeroes

18. **Product of zeros of a cubic polynomial is**

(*a*) $\frac{-d}{a}$ (*b*) $\frac{c}{b}$ (*c*) $\frac{d}{b}$ (*d*) $\frac{-b}{a}$

19. **The zeros of the quadratic polynomial $ax^2 + bx + c$, $c \neq 0$ are equal, then**

(*a*) c and a have opposite signs (*b*) c and b have opposite signs

(*c*) c and a have the same sign (*d*) c and b have the same sign

20. **The zeros of the quadratic polynomial $x^2 + 99x + 127$ are**

(*a*) both positive (*b*) both negative

(*c*) one positive and one negative (*d*) both equal

21. **A quadratic polynomial, whose zeros are – 3 and 4, is**

(*a*) $x^2 - x + 12$ (*b*) $x^2 + x + 12$ (*c*) $\frac{x^2}{2} - \frac{x}{2} - 6$ (*d*) $2x^2 + 2x - 24$

22. **The product of the zeros of the polynomial $4x^2 + 3x + 7$ is**

(*a*) $\frac{3}{4}$ (*b*) $-\frac{3}{4}$ (*c*) $\frac{7}{4}$ (*d*) $\frac{-7}{4}$

23. **If two of the zeros of the cubic polynomial $ax^3 + bx^2 + cx + d$ are 0, then the third zero is**

(*a*) $\frac{b}{a}$ (*b*) $\frac{c}{a}$ (*c*) $\frac{-d}{a}$ (*d*) $\frac{-b}{a}$

24. **If 2 and α are zeros of $2x^2 - 6x + 2$ then the value of α is**

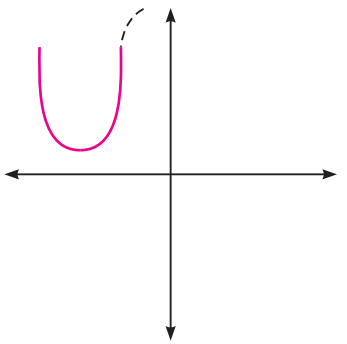
(*a*) 2 (*b*) 3 (*c*) 1 (*d*) 5

25. **A quadratic polynomial with sum and product of its zeros as 8 and –9 respectively is**

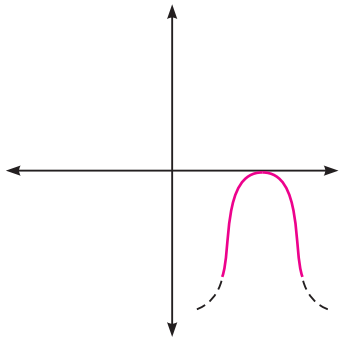
(*a*) $x^2 - 8x + 9$ (*b*) $x^2 - 8x - 9$ (*c*) $x^2 + 8x - 9$ (*d*) $x^2 + 8x + 9$

26. **Which of the following is not the graph of a quadratic polynomial?** *[NCERT Exemplar]*

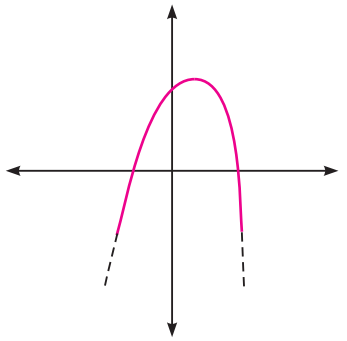
(*a*)



(*b*)



(*c*)



(*d*)

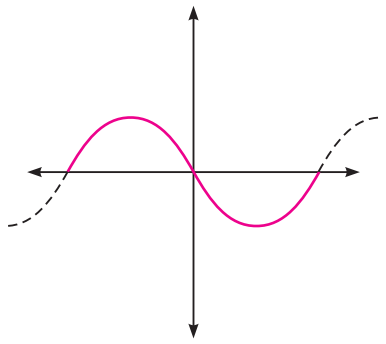


Fig. 2.4 (*a* to *d*)

27. **If one zero of the quadratic polynomial $x^2 - 5x + k$ is – 4 , then the value of k is**

(*a*) 36 (*b*) –36 (*c*) 18 (*d*) –18

28. **If the graph of a polynomial intersects the x-axis at exactly two points, then it**

(*a*) cannot be a linear or a cubic polynomial (*b*) can be a quadratic polynomial only

(*c*) can be a cubic or a quadratic polynomial (*d*) can be a linear or a quadratic polynomial

29. **The zeros of the quadratic polynomial $x^2 + kx + k$, $k \neq 0$**

(*a*) both cannot be positive (*b*) both cannot be negative

(*c*) are always equal (*d*) are always unequal

30. **The number of polynomials having zeros 1 and –2 is**

(*a*) 1 (*b*) 2 (*c*) 3 (*d*) more than 3

31. **A quadratic polynomial, whose zeros are 5 and – 8 is**

(*a*) $x^2 + 13x - 40$ (*b*) $x^2 + 4x - 3$ (*c*) $x^2 - 3x + 40$ (*d*) $x^2 + 3x - 40$

32. **A quadratic polynomial with 3 and 2 as the sum and product of its zeros respectively is**

(*a*) $x^2 + 3x - 2$ (*b*) $x^2 - 3x + 2$ (*c*) $x^2 - 2x + 3$ (*d*) $x^2 - 2x - 3$

33. **Given that two of the zeros of the cubic polynomial $ax^3 + bx^2 + cx + d$ are 0, the value of c is**

(*a*) less than 0 (*b*) greater than 0 (*c*) equal to 0 (*d*) can't say

34. **If one root of the polynomial $p(y) = 5y^2 + 13y + m$ is reciprocal of other, then the value of m is**

(*a*) 6 (*b*) 0 (*c*) 5 (*d*) $\frac{1}{5}$

35. **If one of the zeros of the cubic polynomial $x^3 + ax^2 + bx + c$ is – 1, then the product of the other two zeroes is** [*NCERT Exemplar*]

(*a*) $b - a + 1$ (*b*) $b - a - 1$ (*c*) $a - b + 1$ (*d*) $a - b - 1$

36. **The number of polynomials having zeros as – 2 and 5 is** [*NCERT Exemplar*]

(*a*) 1 (*b*) 2 (*c*) 3 (*d*) more than 3

37. **If one of the zeros of the quadratic polynomial $(k - 1)x^2 + kx + 1$ is – 3, then the value of k is** [*NCERT Exemplar*]

(*a*) $\frac{4}{3}$ (*b*) $\frac{-4}{3}$ (*c*) $\frac{2}{3}$ (*d*) $\frac{-2}{3}$

38. **If one of the zeros of a quadratic polynomial of the form $x^2 + ax + b$ is the negative of the other, then it**

(*a*) has no linear term and the constant term is negative.

(*b*) has no linear term and the constant term is positive.

(*c*) can have a linear term but the constant term is negative.

(*d*) can have a linear term but the constant term is positive.

39. **Given that one of the zeroes of the cubic polynomial $ax^3 + bx^2 + cx + d$ is zero, then product of the other two zeros is** [*NCERT Exemplar*]

(*a*) $-\frac{c}{a}$ (*b*) $\frac{c}{a}$ (*c*) 0 (*d*) $-\frac{b}{a}$

40. **If the zeros of the quadratic polynomial $x^2 + (a + 1)x + b$ are 2 and –3, then** [*NCERT Exemplar*]

(*a*) $a = -7, b = -1$ (*b*) $a = 5, b = -1$ (*c*) $a = 2, b = -6$ (*d*) $a = 0, b = -6$

41. **The zeros of the quadratic polynomial $x^2 + ax + b$, $a, b > 0$ are**

(*a*) both positive (*b*) both negative

(*c*) one positive one negative (*d*) can't say

42. **If 5 is a zero of the quadratic polynomial, $x^2 - kx - 15$ then the value of k is**

(*a*) 2 (*b*) –2 (*c*) 4 (*d*) – 4

Answers

1. (*b*)	**2.** (*a*)	**3.** (*a*)	**4.** (*b*)	**5.** (*a*)	**6.** (*b*)
7. (*a*)	**8.** (*b*)	**9.** (*b*)	**10.** (*a*)	**11.** (*d*)	**12.** (*c*)
13. (*a*)	**14.** (*b*)	**15.** (*c*)	**16.** (*b*)	**17.** (*b*)	**18.** (*a*)
19. (*c*)	**20.** (*b*)	**21.** (*c*)	**22.** (*c*)	**23.** (*d*)	**24.** (*c*)
25. (*b*)	**26.** (*d*)	**27.** (*b*)	**28.** (*c*)	**29.** (*a*)	**30.** (*d*)
31. (*d*)	**32.** (*b*)	**33.** (*c*)	**34.** (*c*)	**35.** (*a*)	**36.** (*d*)
37. (*a*)	**38.** (*a*)	**39.** (*b*)	**40.** (*d*)	**41.** (*b*)	**42.** (*a*)

CASE-BASED QUESTIONS

1. Read the following and answer any four questions from (*i*) to (*v*).

The below pictures are few natural examples of parabolic shape which is represented by a quadratic polynomial. A parabolic arch is an arch in the shape of a parabola. In structures, their curve represents an efficient method of load, and so can be found in bridges and in architecture in a variety of forms. *[CBSE Question Bank]*

Fig. 2.5

Fig. 2.6

(*i*) In the standard form of quadratic polynomial, $ax^2 + bx + c$, where a, b, and c

(*a*) All are real numbers.

(*b*) All are rational numbers.

(*c*) '*a*' is a non zero real number and *b* and *c* are any real numbers.

(*d*) All are integers.

(*ii*) If the roots of the quadratic polynomial are equal, where the discriminant $D = b^2 - 4ac$, then

(*a*) $D > 0$ (*b*) $D < 0$ (*c*) $D \geq 0$ (*d*) $D = 0$

(*iii*) If α and $\frac{1}{\alpha}$ are the zeros of the quadratic polynomial $2x^2 - x + 8k$ then k is

(*a*) 4 (*b*) $\frac{1}{4}$ (*c*) $\frac{-1}{4}$ (*d*) 2

(*iv*) The graph of $x^2 + 1 = 0$

(*a*) Intersects *x*-axis at two distinct points.

(*b*) Touches *x*-axis at a point.

(*c*) Neither touches nor intersects *x*-axis.

(*d*) Either touches or intersects *x*-axis.

(v) If the sum of the roots is $-p$ and product of the roots is $-\frac{1}{p}$, then the quadratic polynomial is

(a) $k\left(-px^2+\frac{x}{p}+1\right)$ (b) $k\left(px^2+\frac{x}{p}-1\right)$ (c) $k\left(x^2+px-\frac{1}{p}\right)$ (d) $k\left(x^2-px+\frac{1}{p}\right)$

2. Read the following and answer any four questions from (i) to (v).

An *asana* is a body posture, originally and still a general term for a sitting meditation pose, and later extended in hatha yoga and modern yoga as exercise, to any type of pose or position, adding reclining, standing, inverted, twisting, and balancing poses. In the figure, one can observe that poses can be related to representation of quadratic polynomial. [*CBSE Question Bank*]

Fig. 2.7

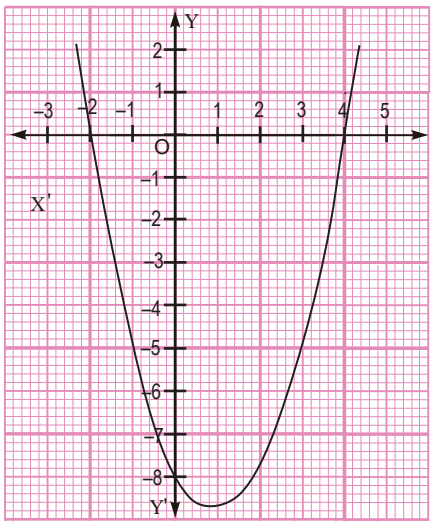


Fig. 2.8

(i) The shapes of the poses shown are

(a) Spiral (b) Ellipse (c) Linear (d) Parabola

(ii) The graph of parabola opens downward, if _____

(a) $a \geq 0$ (b) $a = 0$ (c) $a < 0$ (d) $a > 0$

(iii) In the graph, how many zeros are there for the polynomial?

(a) 0 (b) 1 (c) 2 (d) 3

(iv) The two zeroes in the above shown graph are

(a) 2, 4 (b) –2, 4 (c) –8, 4 (d) 2, –8

(v) The zeros of the quadratic polynomial $4\sqrt{3}x^2 + 5x - 2\sqrt{3}$ are

(a) $\frac{2}{\sqrt{3}}, \frac{\sqrt{3}}{4}$ (b) $-\frac{2}{\sqrt{3}}, \frac{\sqrt{3}}{4}$ (c) $\frac{2}{\sqrt{3}}, -\frac{\sqrt{3}}{4}$ (d) $-\frac{2}{\sqrt{3}}, -\frac{\sqrt{3}}{4}$

3. Read the following and answer any four questions from (i) to (v).

Basketball and soccer are played with a spherical ball. Even though an athlete dribbles the ball in both sports, a basketball player uses his hands and a soccer player uses his feet. Usually, soccer is played outdoors on a large field and basketball is played indoor on a court made up of wood. The projectile (path traced) of soccer ball and basketball are in the form of parabola representing quadratic polynomial. *[CBSE Question Bank]*

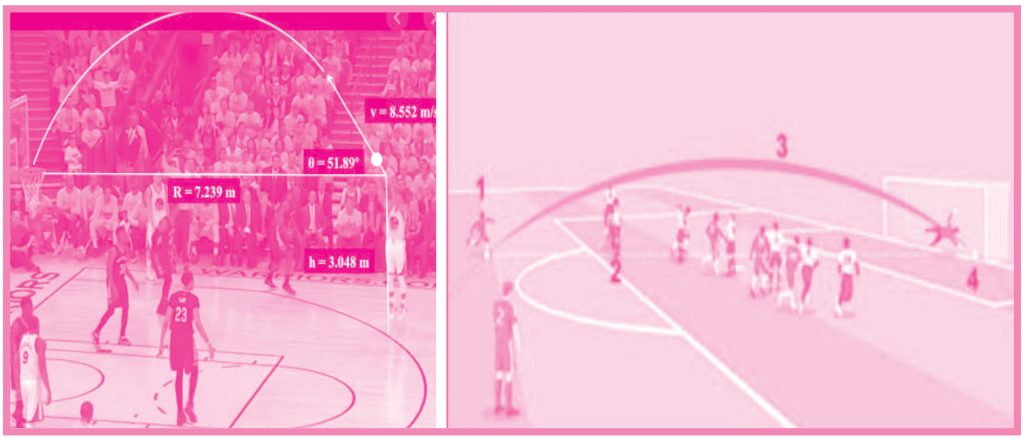


Fig. 2.9

(i) The shape of the path traced shown is

(a) Spiral (b) Ellipse (c) Linear (d) Parabola

(ii) The graph of parabola opens upward, if _____

(a) $a = 0$ (b) $a < 0$ (c) $a > 0$ (d) $a \geq 0$

(iii) Observe the following graph and answer.

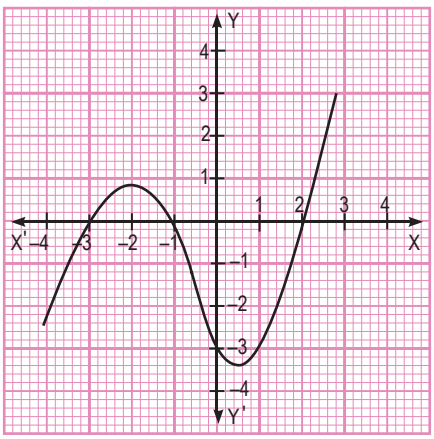


Fig. 2.10

In the above graph, how many zeros are there for the polynomial?

(a) 0 (b) 1 (c) 2 (d) 3

(iv) The three zeros in the above shown graph are

(a) 2, 3,–1 (b) –2, 3, 1 (c) –3, –1, 2 (d) –2, –3, –1

(v) What will be the expression of the polynomial of the shown graph?

(a) $x^3 + 2x^2 - 5x - 6$ (b) $x^3 + 2x^2 - 5x + 6$

(c) $x^3 + 2x^2 + 5x - 6$ (d) $x^3 + 2x^2 + 5x + 6$

4. Read the following and answer any four questions from (i) to (v).

The wall of room is decorated with beautiful garlands, each garland forming a parabola.

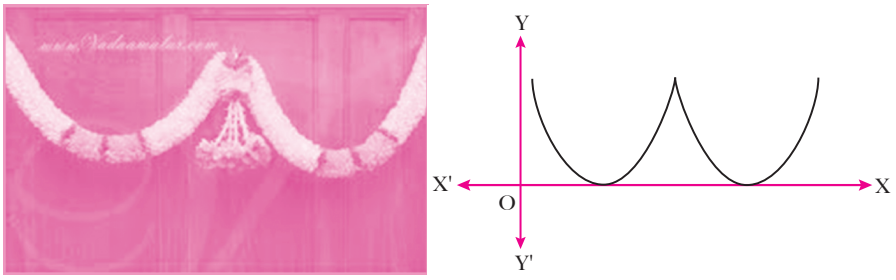


Fig. 2.11

(i) What type of polynomial does a parabola represent?

(a) linear (b) quadratic (c) cubic (d) None of these

(ii) The number of zeros of a quadratic polynomial is

(a) equal to 2 (b) equal to 1 (c) more than 2 (d) atmost 2

(iii) A quadratic polynomial with the sum and product of its zeroes as –1 and –2 is

(a) $x^2 + x - 2$ (b) $x^2 - x - 2$ (c) $x^2 + 2x - 1$ (d) $x^2 - 2x - 1$

(iv) If one of the zeroes of the quadratic polynomial $(k-2)x^2 - 2x - 5$ is –1, then the value of k is

(a) 3 (b) 5 (c) –5 (d) –3

(v) If α, β are the zeros of the polynomial $f(x) = x^2 - 7x + 12$ then the value of $\frac{1}{\alpha} + \frac{1}{\beta}$ is

(a) –7 (b) 12 (c) $\frac{7}{12}$ (d) $\frac{-7}{12}$

5. Read the following and answer any four questions from (i) to (v).

Water flowing in a fountain follows trajectory as shown below:

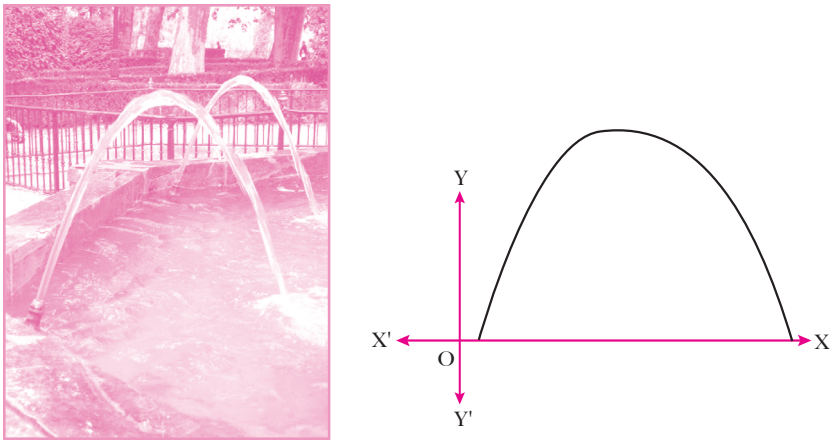


Fig. 2.12

(*i*) The shape formed by the water trajectory is

(*a*) ellipse (*b*) oval (*c*) parabola (*d*) spiral

(*ii*) Number of zeroes of polynomial is equal to the number of points where the graph of polynomial

(*a*) intersects x- axis (*b*) intersects y- axis

(*c*) intersects y- axis or x- axis (*d*) none of the above

(*iii*) If the trajectory is represented by $x^2 - 3x - 18$, then its zeros are

(*a*) (6, – 3) (*b*) (–6, 3) (*c*) (3, – 3) (*d*) (–6, –3)

(*iv*) If $\frac{-1}{3}$ is one of the zeroes of $9x^2 - kx - 5$, then the value of k is

(*a*) 9 (*b*) 3 (*c*) 12 (*d*) 4

(*v*) If α and β are the roots of the equation $2x^2 - 3x - 5$ then $\alpha + \beta$ is equal to

(*a*) 3 (*b*) –3 (*c*) $\frac{-3}{2}$ (*d*) $\frac{3}{2}$

6. Read the following and answer any four questions from (*i*) to (*v*).

The path moved by a group of ants has been traced on a floor which is shown below:

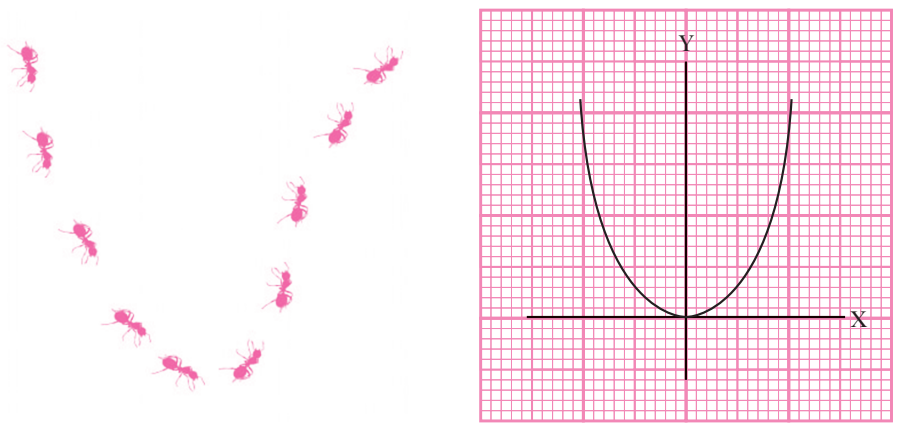


Fig. 2.13

(*i*) The shape formed by the path is

(*a*) ellipse (*b*) oval (*c*) parabola (*d*) spiral

(*ii*) If the path is represented by $x^2 + 2x - 3$, then its zeroes are

(*a*) (–3, 1) (*b*) (3, –1) (*c*) (2, –3) (*d*) (–2, 3)

(*iii*) The number of zeroes of the polynomial represented by the path is

(*a*) one (*b*) at most two (*c*) atleast two (*d*) less than two

(*iv*) If the sum and product of zeroes of the polynomial representing the path are 6 and –16, then the polynomial is

(*a*) $x^2 - 10x + 96$ (*b*) $x^2 - 6x + 16$ (*c*) $x^2 - 6x - 16$ (*d*) $x^2 + 6x$

(*v*) The number of zeroes of the polynomial $f(x) = x^2 - 8$ are

(*a*) 0 (*b*) 1 (*c*) 2 (*d*) 3

7. Read the following and answer any four questions from (*i*) to (*v*).

A runner is running along a straight path parallel to a given boundary.

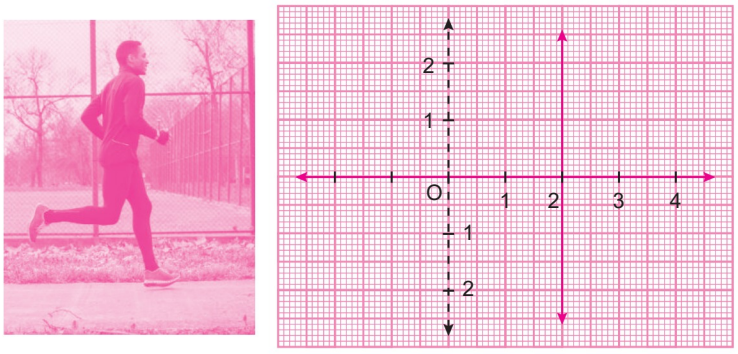


Fig. 2.14

(*i*) The path of the runner represents the graph of a

(*a*) cubic polynomial (*b*) quadratic polynomial

(*c*) linear polynomial (*d*) None of these

(*ii*) The equation of this graph can be written as

(*a*) $x = 2$ (*b*) $y = 2$ (*c*) $x = 0$ (*d*) $y = 0$

(*iii*) How many zeros does it have?

(*a*) 0 (*b*) 1 (*c*) 2 (*d*) more than 1

(*iv*) If the graph would have been parallel to x-axis, then its number of zeroes would be

(*a*) 0 (*b*) 1 (*c*) 2 (*d*) more than 1

(*v*) If one zero of the polynomial $p(z) = 3z^2 - 10z + m$ is reciprocal of other, then value of m is

(*a*) 2 (*b*) 3 (*c*) 5 (*d*) 6

8. Read the following and answer any four questions from (*i*) to (*v*).

A child was flying a kite, and its string got struck into a tree and touched ground as shown in figure.

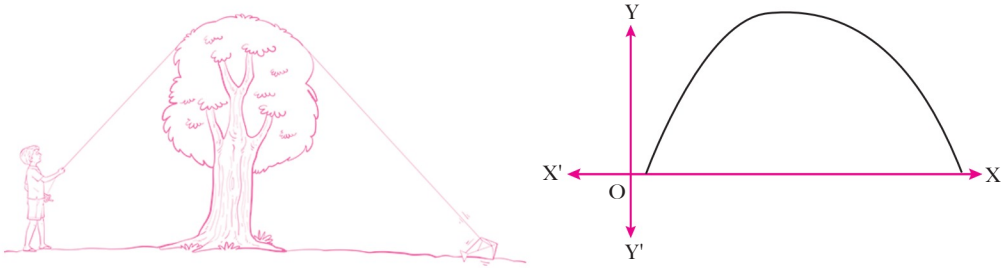


Fig. 2.15

(*i*) The string of the kite represents the graph of a

(*a*) linear polynomial (*b*) quadratic polynomial

(*c*) cubic polynomial (*d*) polynomial of degree more than

(*ii*) The number of zeros of a cubic polynomial is

(*a*) 2 (*b*) atmost 2 (*c*) 3 (*d*) atmost 3

(*iii*) If one zero of the polynomial $x^2 - 12x + (3k - 1)$ is five times the other, then the value of k is

(*a*) 2 (*b*) 3 (*c*) 10 (*d*) 7

(iv) Which of the following could be the equation of the given graph?

(a) $(x + 1)^2 = (x - 3)^2 + 5$ (b) $x + 9 = 3 - 2x$

(c) $1 + x^3 = 2$ (d) $2x^2 + 3x - 6 = 0$

(v) The zeros of the polynomial $6x^2 - 3 - 7x$ are

(a) 6, –7 (b) 3, –7 (c) $\frac{3}{2}, \frac{-1}{3}$ (d) $\frac{3}{2}, \frac{1}{3}$

9. Read the following and answer any four questions from (i) to (v).

A few children are playing with a skipping rope. When two of them hold it in their hands, as shown in the figure, it formed a mathematical shape.

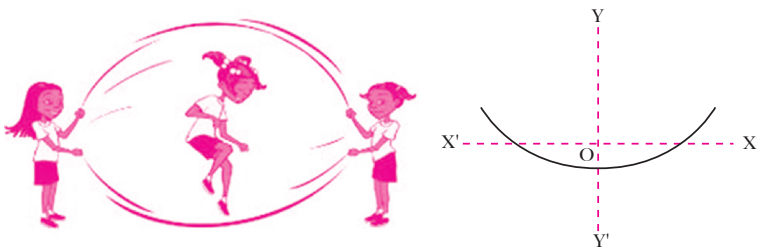


Fig. 2.16

(i) The name of the shape formed is

(a) parabola (b) ellipse (c) oval (d) spiral

(ii) If the graph of a polynomial has such a shape, it is always

(a) linear (b) quadratic (c) cubic (d) None of these

(iii) If the polynomial $x^2 + kx - 15$ represents such a curve, with one of its zeros as 3, then the value of k is

(a) 3 (b) 5 (c) 2 (d) –2

(iv) If both the zeros of a quadratic polynomial $ax^2 + bx + c$ are equal and opposite in sign, then value of b is

(a) 1 (b) –1 (c) 2 (d) 0

(v) If the graph of a polynomial intersects the x-axis at only one point, then it

(a) is always a linear polynomial (b) can be a quadratic polynomial

(c) can never be a quadratic polynomial

(d) can neither be linear nor quadratic polynomial

Answers

1. (i) (c)	(ii) (d)	(iii) (b)	(iv) (c)	(v) (c)
2. (i) (d)	(ii) (c)	(iii) (c)	(iv) (b)	(v) (b)
3. (i) (d)	(ii) (c)	(iii) (d)	(iv) (c)	(v) (a)
4. (i) (b)	(ii) (d)	(iii) (a)	(iv) (b)	(v) (c)
5. (i) (c)	(ii) (a)	(iii) (a)	(iv) (c)	(v) (d)
6. (i) (c)	(ii) (a)	(iii) (b)	(iv) (c)	(v) (c)
7. (i) (c)	(ii) (a)	(iii) (b)	(iv) (a)	(v) (b)
8. (i) (b)	(ii) (d)	(iii) (d)	(iv) (d)	(v) (c)
9. (i) (a)	(ii) (b)	(iii) (c)	(iv) (d)	(v) (b)

ASSERTION-REASON QUESTIONS

The following questions consist of two statements—Assertion(A) and Reason(R). Answer these questions selecting the appropriate option given below:

(*a*) **Both *A* and *R* are true and *R* is the correct explanation for *A*.**

(*b*) **Both *A* and *R* are true and *R* is not the correct explanation for *A*.**

(*c*) ***A* is true but *R* is false.**

(*d*) ***A* is false but *R* is true.**

1. Assertion (*A*) : $(2-\sqrt{3})$ is one zero of the quadratic polynomial then other zero will be $(2+\sqrt{3})$.

Reason (*R*) : Irrational zeros (roots) always occurs in pairs.

2. Assertion (*A*) : If both zeros of the quadratic polynomial $x^2 - 2kx + 2$ are equal in magnitude but opposite in sign then value of k is $\frac{1}{2}$.

Reason (*R*) : Sum of zeros of a quadratic polynomial $ax^2 + bx + c$ is $\frac{-b}{a}$.

3. Assertion (*A*) : $P(x) = 14x^3 - 2x^2 + 8x^4 + 7x - 8$ is a polynomial of degree 3.

Reason (*R*) : The highest power of x in any polynomial $p(x)$ is the degree of the polynomial.

4. Assertion (*A*): The graph $y = f(x)$ is shown in figure, for the polynomial $f(x)$. The number of zeros of $f(x)$ is 4.

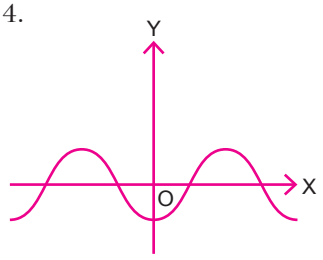


Fig. 2.17

Reason (*R*) : The number of zero of the polynomial $f(x)$ is the number of point of which $f(x)$ cuts or touches the axes.

Answers

1. (*a*) **2.** (*d*) **3.** (*d*) **4.** (*c*)

HINTS/SOLUTIONS OF SELECTED MCQs

1. Let $p(x) = x^2 - 3x - m\,(m+3)$

$\Rightarrow\ p(x) = x^2 - (m+3)\,x + mx - m\,(m+3)$

$= x\{x - (m+3)\} + m\,\{x - (m+3)\}$

For zeros of $p(x)$

$\Rightarrow\ p(x) = (x+m)\,\{(x - (m+3)\} = 0$

$\Rightarrow\ x = -m,\ m+3$

$\therefore$ Its zeros are $-m,\ m+3$.

$\therefore$ Option (*b*) is correct.

2. The degree of polynomial having zeroes –3 and 4 only *i.e* only two zeros, is 2 because it will be a quadratic polynomial.

i.e $p(x) = x^2 - (-3 + 4) \cdot x + (-3) \times 4$

$\Rightarrow$ $p(x) = x^2 - x - 12$, which is a polynomial of degree 2.

$\therefore$ Option (a) is correct.

3. Since the graph of $y = p(x)$ intersect (touch) x–axis at three points, therefore it has three zeros.

$\therefore$ Option (a) is correct.

4. Since the graph of the polynomial $p(x)$ cuts the x-axis at two distinct points. Therefore it has two zeros.

$\therefore$ Number of zeros of polynomial $p(x)$ is 2.

$\therefore$ Option (b) is correct.

5. Given sum of zeros = –5 and their product = 6

$\therefore$ Quadratic polynomial is given by

$x^2 - (-5)\, x + 6 = x^2 + 5x + 6$

$\therefore$ Option (a) is correct.

6. Let given polynomial be $p(x) = x^2 + 3x + k$ and one of the zeros of $p(x)$ is 2.

$\therefore$ $p(2) = 0$ $\Rightarrow$ $(2)^2 + 3 \times 2 + k = 0$

$\Rightarrow$ $4 + 6 + k = 0$ $\Rightarrow$ $k = -10$

$\therefore$ Option (b) is correct.

7. For a quadratic polynomial $ax^2 + bx + c = 0$ has discriminant equal to zero, therefore it has equal roots.

Hence, it will touch x-axis at one point.

Hence, option (a) is correct.

8. Let α and β are two zeros then

$\alpha.\beta = -24$ and $\alpha = 4$

$\Rightarrow$ $\beta = \dfrac{-24}{\alpha}$ $\beta = \dfrac{-24}{4} = -6$

So, $\alpha + \beta = 4 - 6 = -2$

The quadratic polynomial is $x^2 - (\alpha + \beta)\, x + \alpha.\beta$.

$\Rightarrow$ $x^2 - (-2)x + (-24)$

$\Rightarrow$ $x^2 + 2x - 24$

Hence, option (b) is correct.

9. We have $q(x) = 4\sqrt{2}x^2 - \sqrt{2}$

Since, $(x - a)$ is a factor of $q(x)$.

$\therefore$ $q(a) = 0$

$\Rightarrow$ $4\sqrt{2}\,(a)^2 - \sqrt{2} = 0$

$\Rightarrow$ $4a^2 - 1 = 0$

$\Rightarrow$ $a^2 = \dfrac{1}{4}$

$\Rightarrow$ $\dfrac{1}{a^2} = 4$

$\Rightarrow$ $\dfrac{1}{a} = \pm 2$

$\therefore$ $x - \dfrac{1}{a} = (x - 2)$ or $(x + 2)$

Now, $x^2 + x - 6 = x^2 + 3x - 2x - 6 = x(x + 3) - 2(x + 3)$

$= (x - 2)\,(x + 3)$

$\Rightarrow$ $(x-2)$ is a factor of $x^2 + x - 6$

$\therefore$ $\left(x - \frac{1}{a}\right)$ is a factor of $x^2 + x - 6$.

$\therefore$ Option (b) is correct.

10. We have, $p(x) = x^3 + 4x + 5$

Putting $x = -1$, we have

$\therefore$ $p(-1) = (-1)^3 + 4 \times (-1) + 5 = -1 - 4 + 5 = 0$

$\Rightarrow$ $p(-1) = 0$

$\Rightarrow$ $(x + 1)$ is a factor.

$\therefore$ Option (a) is correct.

11. We have polynomial, $q(x) = x^2 - mx - 6$.

Since $(m + 2)$ is a zero of $q(x)$.

$\therefore$ $(m+2)^2 - m(m+2) - 6 = 0$

$\Rightarrow$ $m^2 + 4m + 4 - m^2 - 2m - 6 = 0$

$\Rightarrow$ $2m - 2 = 0$

$\Rightarrow$ $2m = 2 \Rightarrow m = 1$

$\therefore$ Option (d) is correct.

12. We have, $p(y) = 3y^3 - 16y - 8$

$\therefore$ $p(-2) = 3 \times (-2)^3 - 16 \times (-2) - 8$

$= -24 + 32 - 8$

$= -32 + 32 = 0$

$\Rightarrow$ $p(-2) = 0$

$\therefore$ $y = -2$ is the zero of $p(y)$.

i.e., -2 is the zero of $p(y)$.

$\therefore$ Option (c) is correct.

13. We have, $p(z) = z^4 - 2z^3 + 3$

At $z = -1$, we have

$p(-1) = (-1)^4 - 2 \times (-1)^3 + 3$

$= 1 + 2 + 3 = 6$

$\therefore$ Option (a) is correct.

14. Let $p(x) = x^{(m^2-1)} + 3x^{\frac{m}{2}}$

For $p(x)$ to be a cubic polynomial, we have

$\Rightarrow$ $m^2 - 1 = 3 \Rightarrow m^2 = 4 \Rightarrow m = \sqrt{4} = 2$

$\Rightarrow$ $m = 2$ [$\because$ $m = -2$ is not possible]

$\therefore$ Option (b) is correct.

15. For the polynomial $p(x) = x^2$, we have

x	0	1	–1	–2	2
y	0	1	1	4	4

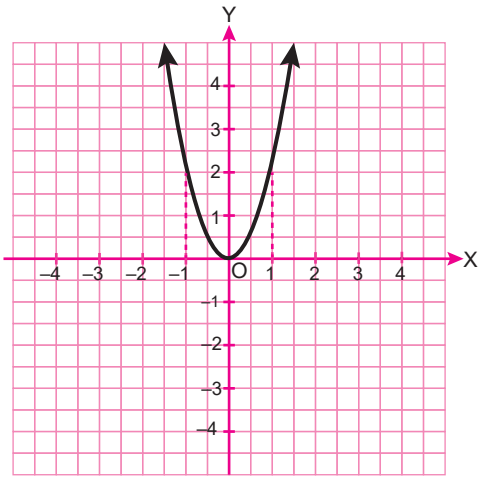


Fig. 2.18

$\therefore$ Option (*c*) is correct.

16. We have a polynomial $p(x) = mx^a + x^{2b}$ $(a > 2b)$.

Since, it has $4b$ zeros.

$\therefore$ Its degree must be $4b$.

$\therefore$ $a = 4b$.

$\therefore$ Option (*b*) is correct.

17. As we know that a polynomial of degree n has n zeros.

Therefore, a polynomial of degree 4 has four zeroes.

$\therefore$ Option (*b*) is correct.

18. From the formula that product of all zeros *ie*, α, β and γ is $\alpha\beta\gamma = -\frac{d}{a}$.

$\therefore$ Option (*a*) is correct.

19. Since zeros of the polynomial are equal, hence c and a both have equal sign.

So, option (*c*) is correct.

20. Since sum of zeros and product of zeros both are positive, so both zeros must be negative.

So, option (*b*) is correct.

21. The required quadratic polynomial is

$x^2 -$ (sum of zeros)$x +$ product of zeros

$\Rightarrow$ $x^2 - (-3 + 4)x + (-3 \times 4) \Rightarrow x^2 - x - 12 \Rightarrow \frac{x^2}{2} - \frac{x}{2} - 6$

So, option (*c*) is correct.

22. Given polynomial is $4x^2 + 3x + 7$.

Product of roots $= \frac{c}{a} = \frac{7}{4}$

So, option (*c*) is correct.

23. Given polynomial is $ax^3 + bx^2 + cx + d$.

Sum of roots $= \frac{-b}{a}$

$\alpha + \beta + \gamma = \frac{-b}{a}$

But it is given sum of two roots is equal to zero

$$0 + \gamma = \frac{-b}{a} \quad \Rightarrow \gamma = \frac{-b}{a}$$

So, option (*d*) is correct.

24. For the polynomial $2x^2 - 6x + 2$, 2 and α are its zeros.

Sum of roots $= 2 + \alpha$

$$\Rightarrow \quad \frac{-b}{a} = 2 + \alpha \qquad \Rightarrow \quad \frac{6}{2} = 2 + \alpha$$

$$\Rightarrow \quad 3 - 2 = \alpha \qquad \Rightarrow \quad \alpha = 1$$

So, option (*c*) is correct.

SOLUTIONS OF CASE-BASED QUESTIONS

1. (*i*) In the standard form of quadratic polynomial $ax^2 + bx + c$, a is a non zero real number and b and c are any real numbers.

Hence option (*c*) is correct.

(*ii*) In case of quadratic polynomial if the roots are equal then the discriminant (D) should be equal to 0.

Hence option (*d*) is correct.

(*iii*) Given quadratic polynomial is $2x^2 - x + 8k$.

If α and $\frac{1}{\alpha}$ are zeros then their product $= \alpha \times \frac{1}{\alpha} = \frac{8k}{2}$

$$\Rightarrow \quad 1 = 4k \quad \Rightarrow \quad k = \frac{1}{4}$$

Hence option (*b*) is correct.

(*iv*) Given quadratic polynomial is $x^2 + 1 = 0$.

$$\Rightarrow \quad x^2 = -1$$

$\Rightarrow$ Zeros can't be find out so its graph neither touches nor intersects x-axis.

Hence option (*c*) is correct.

(*v*) Given: Sum of roots $= -p$ and product of roots $= \frac{-1}{p}$

The general form of quadratic polynomial is

$$k(x^2 - (\text{sum of zeros})x + \text{product of zeros})$$

$$\Rightarrow \quad k\left(x^2 - (-p)x + \left(\frac{-1}{p}\right)\right) \quad \Rightarrow \quad k\left(x^2 + px - \frac{1}{p}\right)$$

Hence option (*c*) is correct.

2. (*i*) The shape of the poses shown is parabola.

Hence option (*d*) is correct.

(*ii*) The graph of the parabola opens downward if $a < 0$.

Hence option (*c*) is correct.

(*iii*) Since the given graph is intersecting x-axis at two places, therefore it should have 2 zeros.

Hence option (*c*) is correct.

(*iv*) Two zeros of the given graph are –2 and 4.

Hence option (*b*) is correct.

(*v*) Given quadratic polynomial is $4\sqrt{3}x^2 + 5x - 2\sqrt{3}$.

By mid term splitting, we can write

$$4\sqrt{3}x^2 + 8x - 3x - 2\sqrt{3} \quad \Rightarrow \quad 4x(\sqrt{3}x + 2) - \sqrt{3}(\sqrt{3}x + 2)$$

$$\Rightarrow \quad (\sqrt{3}x + 2)(4x - \sqrt{3}) \quad \Rightarrow \quad x = \frac{-2}{\sqrt{3}}, x = \frac{\sqrt{3}}{4}$$

Hence option (*b*) is correct.

3. (*i*) The shape of the path traced shown is parabola.

Hence option (*d*) is correct.

(*ii*) The graph of parabola opens upward if $a > 0$.

Hence option (*c*) is correct.

(*iii*) From the given graph it is clear that number of zeros should be 3 as it intersecting *x*-axis at three places.

Hence option (*d*) is correct.

(*iv*) From the given graph the three zeros are –3, –1 and 2.

Hence option (*c*) is correct.

(*v*) General form of the polynomial having three zeros is

x^3 – (Sum of zeros) x^2 + (Sum of product of zeros taken two at a time)x – Product of zeros

$= x^3 - (-3 - 1 + 2)x^2 + [(-3 \times (-1) + (-1) \times 2) + 2 \times (-3)]x - [(-3) \times (-1) \times 2]$

$= x^3 + 2x^2 - 5x - 6$

Hence option (*a*) is correct.

4. (*i*) A parabola represents a quadratic polynomial.

∴ Option (*b*) is correct.

(*ii*) A quadratic polynomial has atmost two zeros.

Option (*d*) is correct.

(*iii*) A quadratic polynomial is written as

x^2 – (sum of zeros)x + product of zeros

So, required polynomial = $x^2 - (-1)x + (-2) = x^2 + x - 2$

∴ Option (*a*) is correct.

(*iv*) Since (–1) is a zero of the given polynomial.

So, $(k - 2)(-1)^2 - 2(-1) - 5 = 0$

$\Rightarrow k - 2 + 2 - 5 = 0 \Rightarrow k = 5$

∴ Option (*b*) is correct.

(*v*) $\alpha + \beta = \frac{-b}{a} = 7, \quad \alpha\beta = \frac{c}{a} = 12, \frac{1}{\alpha} + \frac{1}{\beta} = \frac{\alpha + \beta}{\alpha\beta} = \frac{7}{12}$

∴ Option (*c*) is correct.

5. (*i*) parabola

∴ Option (*c*) is correct.

(*ii*) Number of zeros of a polynomial is equal to the number of points where the graph of polynomial intersects *x*-axis.

∴ Option (*a*) is correct.

(*iii*) $x^2 - 3x - 18 = x^2 - 6x + 3x - 18$

$= x(x - 6) + 3(x - 6) = (x - 6)(x + 3)$

For zeros, $(x - 6)(x + 3) = 0 \Rightarrow x = 6, -3$

$\therefore$ Option (*a*) is correct.

(*iv*) Since, $\frac{-1}{3}$ is one zero of given polynomial.

$\therefore \; 9\left(\frac{-1}{3}\right)^2 - k\left(\frac{-1}{3}\right) - 5 = 0$

$\Rightarrow \quad 1 + \frac{k}{3} - 5 = 0 \quad \Rightarrow \quad k = 4 \times 3 = 12$

$\therefore$ Option (*c*) is correct.

(*v*) $\alpha + \beta = \frac{-b}{a} = \frac{3}{2}$

$\therefore$ Option (*d*) is correct.

6. (*i*) parabola

$\therefore$ Option (*c*) is correct.

(*ii*) Given polynomial $= x^2 + 2x - 3 = x^2 + 3x - x - 3$

$= x(x + 3) - 1(x + 3) = (x + 3)(x - 1)$

For zeros, $(x + 3)(x - 1) = 0$

$x = -3, 1$

$\therefore$ Option (*a*) is correct.

(*iii*) Parabola represents a quadratic polynomial which has atmost two zeros.

$\therefore$ Option (*b*) is correct.

(*iv*) A quadratic polynomial is given by

$x^2 -$ (sum of zeros) $x +$ product of zeros $= x^2 - 6x - 16$

$\therefore$ Option (*c*) is correct.

(*v*) $f(x) = x^2 - 8$

For zeros, $x^2 - 8 = 0 \Rightarrow x^2 = 8$

$\Rightarrow \; x = \pm\sqrt{8} = \pm 2\sqrt{2}$ (two zeros)

$\therefore$ Option (*c*) is correct.

7. (*i*) Linear polynomial

$\therefore$ Option (*c*) is correct.

(*ii*) Equation of given graph is $x = 2$, it is a line parallel to y-axis intersecting x-axis at (2, 0).

$\therefore$ Option (*a*) is correct.

(*iii*) It has one zero, since it is a linear polynomial.

$\therefore$ Option (*b*) is correct.

(*iv*) If the graph would be parallel to x-axis it would have no zero, as it will not intersect x-axis at any point.

$\therefore$ Option (*a*) is correct.

(*v*) Let the zeros of given polynomial are α and $\frac{1}{\alpha}$.

Then $\alpha \times \frac{1}{\alpha} = \frac{m}{3} \quad \Rightarrow \quad 1 = \frac{m}{3} \; \Rightarrow \; m = 3$

$\therefore$ Option (*b*) is correct.

8. (*i*) The string is in the shape of a parabola.

So, it represents quadratic polynomial.

$\therefore$ Option (*b*) is correct.

(*ii*) The number of zeros of a cubic polynomial is atmost 3.

$\therefore$ Option (*d*) is correct.

(*iii*) Let the zeros of given polynomial be α and 5α.

$\Rightarrow$ Sum of zeros $= 6\alpha = 12$

$\Rightarrow \quad \alpha = 2$

Product of zeros $= 5\alpha^2 = (3k - 1)$

$\Rightarrow \quad 5 \times 4 = 3k - 1 \Rightarrow k = \dfrac{21}{3} = 7$

$\therefore$ Option (*d*) is correct.

(*iv*) Only $2x^2 + 3x - 6 = 0$ is a quadratic equation out of the given equations.

So, option (*d*) is correct.

(*v*) Given polynomial $= 6x^2 - 3 - 7x$

$= 6x^2 - 7x - 3$

$= 6x^2 - 9x + 2x - 3$

$= 3x(2x - 3) + 1(2x - 3)$

For zeros, $(2x - 3)(3x + 1) = 0$

$\Rightarrow \qquad x = \dfrac{3}{2}, \dfrac{-1}{3}$

$\therefore$ Option (*c*) is correct.

9. (*i*) The shape formed is a parabola.

$\therefore$ Options (*a*) is correct.

(*ii*) A quadratic polynomial is represented by a parabola graphically.

$\therefore$ Option (*b*) is correct.

(*iii*) Since 3 is one of the zero, so

$(3)^2 + k(3) - 15 = 0$

$\Rightarrow 9 + 3k - 15 = 0$

$\Rightarrow k = \dfrac{6}{3} = 2$

$\therefore$ Option (*c*) is correct.

(*iv*) Let α and $-\alpha$ be the zeros of given polynomial.

Then sum of zeros $= \alpha + (-\alpha) = \dfrac{-b}{a}$

$\Rightarrow \qquad 0 = \dfrac{-b}{a} \qquad b = 0$

$\therefore$ Option (*d*) is correct.

(*v*) A quadratic polynomial has atmost two zeros, *i.e.*, may intersect *x*-axis at only one point also.

Option (*b*) is correct.

SOLUTIONS OF ASSERTION-REASON QUESTIONS

1. As irrational roots/zeros always occurs in pairs therefore, when one zero is $2-\sqrt{3}$ then other will be $2+\sqrt{3}$. So, both A and R are correct and R explains A.

Hence, option (a) is correct.

2. As the polynomial is $x^2 - 2kx + 2$ and its zeros are equal but opposition sign

$$\therefore \quad \text{Sum of zeros} = 0 = \frac{-(-2k)}{1} = 0 \Rightarrow \quad 2k = 0 \quad \Rightarrow \quad k = 0$$

So, A is incorrect but R is correct.

Hence, option (d) is correct.

3. The highest power of x in the polynomial $p(x) = 14x^3 - 2x^2 + 8x^4 + 7x - 8$ is 4.

$\therefore$ Degree of $p(x)$ is 4. So, A is incorrect but R is correct.

Hence, option (d) is correct.

4. As the number of zeroes of polynomial $f(x)$ is the number of points at which $f(x)$ cuts (intersects) the x-axis and number of zero in the given figure is 4. So A is correct but R is incorrect.

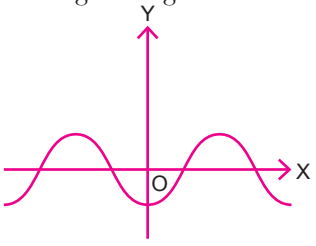


Fig. 2.19

Hence, option (c) is correct.

03 PAIR OF LINEAR EQUATIONS IN TWO VARIABLES

BASIC CONCEPTS & FORMULAE

1. **Algebraic expression:** A combination of constants and variables, connected by four fundamental arithmetical operations $+, -, \times$ and $\div$ is called algebraic expression.

   For example, $3x^3 + 4xy - 5y^2$ is an algebraic expression.

2. **Equation:** An algebraic expression with equal to sign $(=)$ is called the equation. Without an equal to sign, it is an expression only.

   For example, $3x + 9 = 0$ is an equation, but only $3x + 9$ is an expression.

3. **Linear equation:** If the greatest exponent of the variable(s) in an equation is one, the equation is said to be a linear equation(s).

4. If the number of variables used in linear equation is one, then equation is said to be linear equation in one variable.

   For example, $3x + 4 = 0$, $3y + 15 = 0$; $2t + 15 = 0$; and so on.

5. If the number of variables used in linear equation is two, equation is said to be linear equation in two variables.

   For example, $3x + 2y = 12$; $4x + 6z = 24$, $3y + 4t = 15$, etc.

   Thus, equations of the form $ax + by + c = 0$, where a, b, c are non-zero real numbers (*i.e.*, $a, b \neq 0$) are called linear equations in two variables.

6. **Solution:** Solution(s) is/are the value/values for the variable(s) used in equation which make(s) the two sides of the equation equal.

7. Two linear equations of the form $ax + by + c = 0$, taken together form a system of linear equations, and pair of values of x and y satisfying each one of the given equation is called a solution of the system.

8. To get the solution of simultaneous linear equations two methods are used:

   (*i*) Graphical method (*ii*) Algebraic method

9. **Graphical Method**

   (*a*) If two or more pair of values for x and y which satisfy the given equation are joined on paper, we get the graph of the given equation.

   (*b*) Every solution $x = a$, $y = b$ (where a and b are real numbers), of the given equation determines a point (a, b) which lies on the graph of line.

   (*c*) Every point (c, d) lying on the line determines a solution $x = c$, $y = d$ of the given equation.

   Thus, line is known as the graph of the given equation.

   (*d*) When $a \neq 0$, $b = 0$ and $c \neq 0$ then the equation $ax + by + c = 0$ becomes $ax + c = 0$ or $x = -\frac{c}{a}$ then the graph of this equation is a **straight line parallel to *y*-axis** and passing through a point $\left(-\frac{c}{a}, 0\right)$.

(*e*) When $a = 0$, $b \neq 0$ and $c \neq 0$ then the equation $ax + by + c = 0$ becomes $by + c = 0$ or $y = -\frac{c}{a}$ then the graph of the equation is a **straight line parallel to *x*-axis** and passing through the point $\left(0, -\frac{c}{b}\right)$.

(*f*) When $a \neq 0$, $b = 0$ and $c = 0$ then the equation is $ax = 0$ or $x = 0$. **Then the graph is *y*-axis itself.**

(*g*) When $a = 0$, $b \neq 0$, and $c = 0$ then equation becomes $by = 0$ or $y = 0$. Then the graph of this **equation is *x*-axis it self.**

(*h*) When only $c = 0$ then the equation becomes $ax + by = 0$. Then the graph of this **equation is a line passing through the origin**.

(*i*) The graph of ***x* = constant** is a line parallel to the *y*-axis.

(*j*) The graph of ***y* = constant** is a line parallel to the *x*-axis.

(*k*) The graph of $y = \pm x$ is a line passing through the origin.

(*l*) The graph of a pair of linear equations in two variables is represented by two lines.

(*i*) If the lines intersect at a point, then that point gives the unique solution of the two equations. In this case, the pair of equations is **consistent**.

(*ii*) If the lines coincide, then there are infinitely many solutions—each point on the line being a solution. In this case, the pair of equations is also **consistent**.

(*iii*) If the lines are parallel, then the pair of equations has no solution. In this case, the pair of equations is **inconsistent**.

10. Algebraic Method

(*a*) Substitution Method

(*b*) Method of Elimination

11. Conditions for solvability (or consistency)

If a pair of linear equations is given by $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$, then the following situations can arise :

(*i*) $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$

In this case, the pair of linear equations has a unique solution (consistent pair of equations)

(*ii*) $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

In this case, the pair of linear equations has no solution (inconsistent pair of equations)

(*iii*) $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

In this case, the pair of linear equations has infinitely many solutions [consistent pair of equations].

MULTIPLE CHOICE QUESTIONS

Choose and write the correct option in the following questions.

1. The value of *k* for which the lines represented by the following pair of linear equations are coincident is

$$2x + 3y + 7 = 0$$
$$8x + 12y + k = 0$$

(*a*) all real values except 14 (*b*) 8

(*c*) 28 (*d*) 14

2. The value of a for which the pair of equations $10x + 5y = a - 5$, $20x + 10y - a = 0$ has infinitely many solutions is

(*a*) 5 (*b*) –10 (*c*) 10 (*d*) 20

3. If the lines given by $3x + 2ky = 8$ and $2x + 5y - 4 = 0$ are parallel, then the value of k is

(*a*) $\frac{-5}{4}$ (*b*) $\frac{15}{4}$ (*c*) $\frac{2}{5}$ (*d*) $\frac{3}{2}$

4. The value of k for which the pair of equation $kx - y = 2$ and $6x - 2y = 3$ has unique solution

(*a*) $k = 3$ (*b*) $k \neq 3$ (*c*) $k \neq 0$ (*d*) $k = 0$

5. If a pair of linear equations has infinitely many solutions, then the lines representing them will be

(*a*) parallel (*b*) intersecting or coincident

(*c*) always intersecting (*d*) always coincident

6. The pair of linear equations $\frac{3x}{2} + \frac{5y}{3} = 7$ and $9x + 10y = 14$ is [*CBSE* 2020 (30/5/1)]

(*a*) consistent (*b*) inconsistent

(*c*) consistent with one solution (*d*) consistent with many solutions

7. The pair of linear equations $x = 0$ and $x = -4$ has [*CBSE* 2020 (30/4/1)]

(*a*) a unique solution (*b*) no solution

(*c*) infinitely many solutions (*d*) only solution (0, 0)

8. The pair of linear equations $y = 0$ and $y = -6$ has [*CBSE* 2020 (30/4/1)]

(*a*) a unique solution (*b*) no solution

(*c*) infinitely many solutions (*d*) only solution (0, 0)

9. The value of k, for which the pair of linear equations $kx + y = k^2$ and $x + ky = 1$ have infinitely many solutions is [*CBSE* 2020 (30/3/1)]

(*a*) ±1 (*b*) 1 (*c*) –1 (*d*) 2

10. The value of k for which the system of linear equations $x + 2y = 3$, $5x + ky + 7 = 0$ is inconsistent is [*CBSE* 2020 (30/2/1)]

(*a*) $-\frac{14}{3}$ (*b*) $\frac{2}{5}$ (*c*) 5 (*d*) 10

11. The value of k for which the system of equations $x + y - 4 = 0$ and $2x + ky = 3$, has no solution, is [*CBSE* 2020 (30/1/1)]

(*a*) – 2 (*b*) $\neq 2$ (*c*) 3 (*d*) 2

12. For which value(s) of p, will the lines represented by the following pair of linear equations be parallel?

$$3x - y - 5 = 0$$
$$6x - 2y - p = 0$$

[*CBSE Sample Paper* 2020]

(*a*) all real values except 10 (*b*) 10

(*c*) $\frac{5}{2}$ (*d*) $\frac{1}{2}$

13. The value of k for which the lines $(k + 1)x + 3ky + 15 = 0$ and $5x + ky + 5 = 0$ are coincident is

(*a*) 14 (*b*) 2 (*c*) –14 (*d*) –2

14. **If the lines given by $3x + 2ky = 8$ and $2x + 5y - 4 = 0$ are parallel, then the value of k is**

(*a*) $\frac{-5}{4}$ (*b*) $\frac{15}{4}$ (*c*) $\frac{2}{5}$ (*d*) $\frac{3}{2}$

15. **If the lines given by $3x + 2ky = 2$ and $2x + 5y + 1 = 0$ are parallel, then value of k is** [*NCERT Exemplar*]

(*a*) $\frac{-5}{4}$ (*b*) $\frac{2}{5}$ (*c*) $\frac{15}{4}$ (*d*) $\frac{3}{2}$

16. **The value of k for which the system of equations $x + 2y - 3 = 0$ and $5x + ky + 7 = 0$ has no solution, is**

(*a*) 5 (*b*) 10 (*c*) 7 (*d*) None of these

17. **Consider a pair of equations as shown.**

$$\frac{5}{x+2} + \frac{7}{y+2} = \frac{31}{12}$$
$$\frac{4}{x+2} + \frac{3}{y+2} = \frac{17}{12}$$

What is the value of x and y? [*CBSE Question Bank*]

(*a*) $x = 2$ and $y = 4$ (*b*) $x = 3$ and $y = 4$

(*c*) $x = 4$ and $y = 2$ (*d*) $x = 4$ and $y = 3$

18. **Consider a pair of equations as shown.**

$$\frac{7}{x+2} + \frac{2}{y-2} = \frac{33}{20}$$
$$\frac{2}{x+2} + \frac{6}{y-2} = \frac{23}{20}$$

Which of these pair of equations is equivalent to the given pair of equations? [*CBSE Question Bank*]

(*a*) $7u + 2v = \frac{33}{20}$ and $2u + 6v = \frac{23}{20}$ (*b*) $7u + 6v = \frac{33}{20}$ and $2u + 2v = \frac{23}{20}$

(*c*) $7u + 2v = \frac{20}{33}$ and $2u + 6v = \frac{20}{23}$ (*d*) $2u + 6v = \frac{33}{20}$ and $7u + 2v = \frac{23}{20}$

19. **Consider the equations as shown:**

$$(x - a)(y - b) = (x - 2a)\left(y - \frac{b}{2}\right)$$
$$x\left(x + \frac{1}{2b}\right) + y\left(y + \frac{a}{2}\right) - 2xy = 5 + (x - y)^2$$

On comparing the coefficients, a student says these pairs of equations is consistent. Is he/she correct? Which of these explains why? [*CBSE Question Bank*]

(*a*) Yes; because they are parallel lines. (*b*) Yes; because they are intersecting lines.

(*c*) No; because they are parallel lines. (*d*) No; because they are intersecting lines.

20. **Consider the equations as shown:**

$$9x + 6y = 5$$
$$3x + 2y = 7$$

Which of these is true about the given equations? [*CBSE Question Bank*]

(*a*) This is a pair of coincident lines as $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$.

(*b*) This is a pair of parallel lines as $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$.

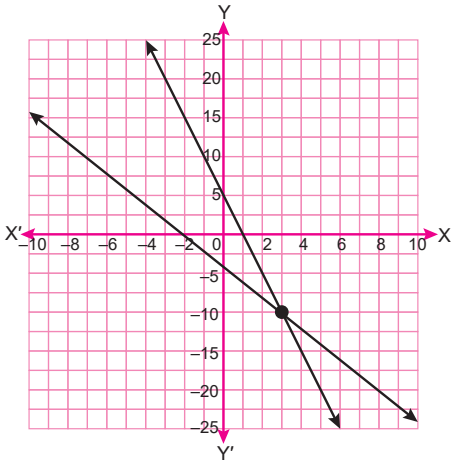
(*c*) This is a pair of Intersecting lines as $\frac{a_1}{a_2} = \frac{b_1}{b_2}$.

(*d*) This is a pair of coincident lines as $\frac{a_1}{a_2} = \frac{b_1}{b_2}$.

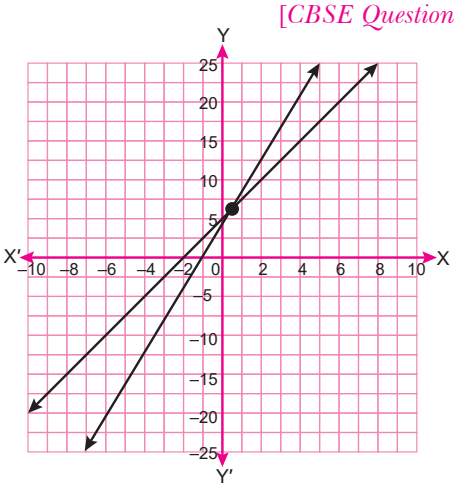
21. Naveen wants to plant some saplings in columns. If he increases the number of saplings in a column by 4, the number of columns decreases by 1. If he decreases the number of saplings by 5 in a column, the number of columns increased by 2.

Which of these graphs relates the number, *x*, of columns and the number, *y*, of plants in a column? *[CBSE Question Bank]*

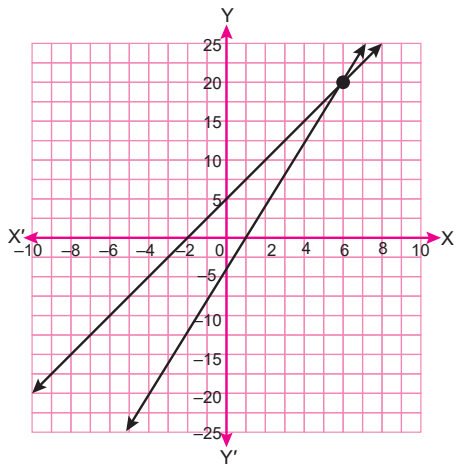
(*a*)



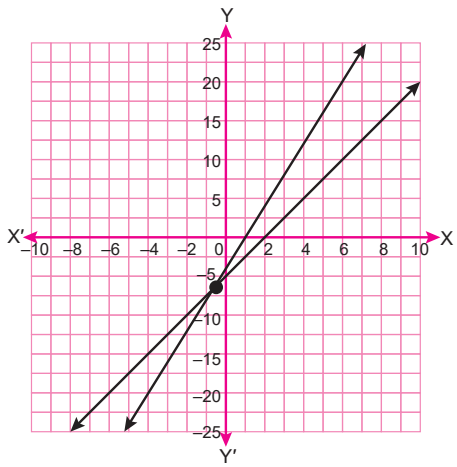
(*b*)



(*c*)



(*d*)



22. Shipra gave a note of ₹ 2,000 for a pair of jeans worth ₹ 500. She was returned 11 notes in denominations of ₹ 200 and ₹ 100. Which pair of equations can be used to find the number of ₹ 200 notes, *x*, and the number of ₹ 100 notes *y*? How many notes of ₹ 200 did she get?

[CBSE Question Bank]

(*a*) $x+y = 11$ and $200x+100y = 1500$; 4 (*b*) $x = y+11$ and $200x+100y = 2000$; 4

(*c*) $x+y = 15$ and $200x+100y = 1800$; 10 (*d*) $x+y = 15$ and $100x+200y = 1800$; 12

23. Consider the equations shown: $ax + by = ab$ & $2ax + 3by = 3b$

Which of these is the value of *y* in terms of *a*? *[CBSE Question Bank]*

(*a*) $y = 5 - 3a$ (*b*) $y = 3 - 2a$ (*c*) $y = 9a - 35$ (*d*) $y = 2ab - 3b$

24. **Consider the equations shown. $p + q = 5$ & $p - q = 2$.**

Which of these are the values of p and q? [CBSE Question Bank]

(a) $p = 1.5, q = 3.5$ (b) $p = 3.5, q = 1.5$ (c) $p = 2, q = 3$ (d) $p = 3, q = 2$

25. **In the equations shown below, a and b are unknown constants.**

$$3ax + 4y = -2$$
$$2x + by = 14$$

If (–3, 4) is the solution of the given equations, what are the values of a and b?

[CBSE Question Bank]

(a) $a = 5, b = 2$ (b) $a = 5, b = -2$ (c) $a = 2, b = 5$ (d) $a = -2, b = 5$

26. **Consider the equations shown.**

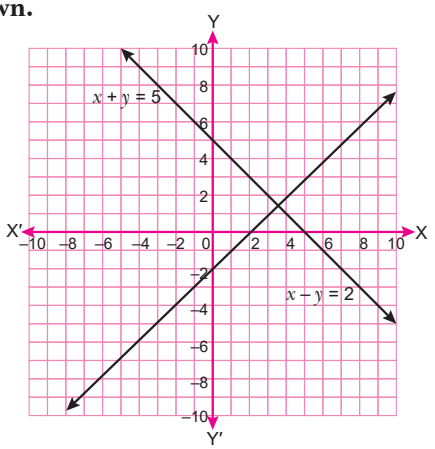
$$4x + 3y = 41$$
$$x + 3y = 26$$

Which of these is the correct way of solving the given pair of equations? [CBSE Question Bank]

(a) $4x + x + 3y - 3y = 41 - 26$ (b) $4x + 3y + 3y = 41 - 26$

(c) $4x - x + 3y - 3y = 41 - 26$ (d) $4(x + 3y) + 3y = 41$

27. **Consider the graph shown.** [CBSE Question Bank]



Which of these is true about the given graph?

(a) These lines have infinitely many solutions as they lie in the same quadrant.

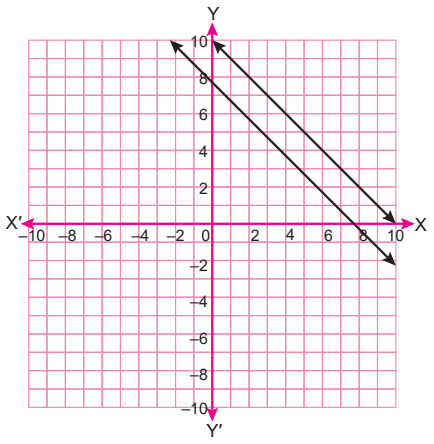
(b) These lines have a unique solution as they are intersecting at a point.

(c) These lines have a unique solution as the coefficient of x in both the equations is one.

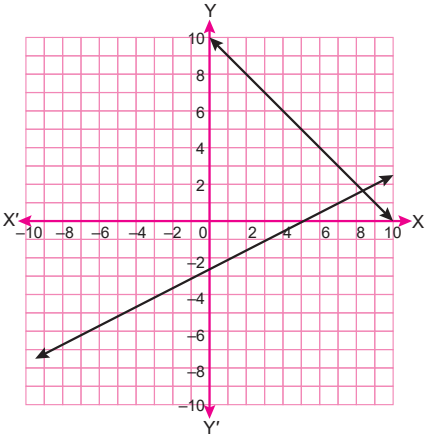
(d) These lines have infinitely many solutions as they lie in the same quadrant.

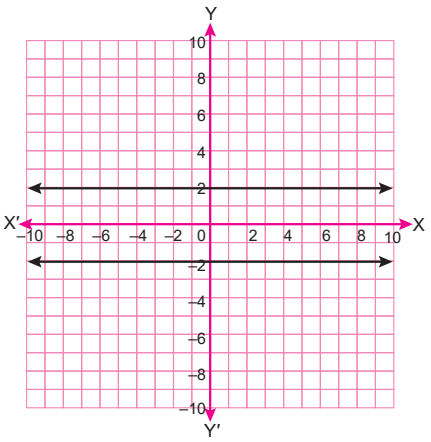
28. **Which of these linear equations have a unique solution?** [CBSE Question Bank]

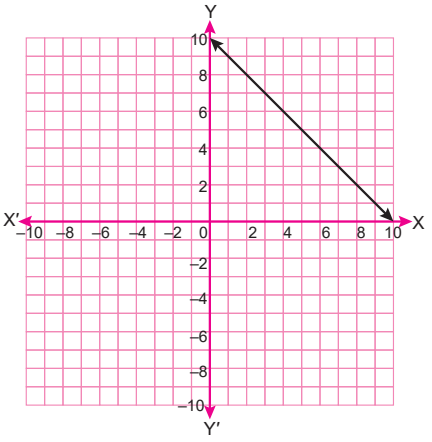
(a)



(b)



(*c*) 

(*d*) 

29. **The cost of production per unit for two products, *A* and *B*, are ₹ 100 and ₹ 80 respectively. In a week, the total production cost is ₹ 32000. In the next week, the production cost reduces by 20%, and the total cost of producing the same number of units of each product is ₹ 25600. Which of these are the equations that can be used to find the number of units of *A*, *x*, and the number of units of *B*, *y*?** *[CBSE Question Bank]*

(*a*) $100x + 80y = 32000$ and $80x + 64y = 25600$

(*b*) $100x + 64y = 32000$ and $80x + 100y = 25600$

(*c*) $80x + 64y = 25600$ and $80x + 64y = 32000$

(*d*) $80x + 80y = 32000$ and $100x + 64y = 25600$

30. **Raghav earned ₹ 3550 by selling some bags each for ₹ 500 and some baskets each for ₹ 150. Aarav earned ₹ 3400 by selling the same number of bags each for ₹ 400 and the same number of baskets each for ₹ 200 as Raghav sold. Which of these equations relates the number of bags *x*, and the number of baskets, *y*?** *[CBSE Question Bank]*

(*a*) $500x + 150y = 3400$ and $400x + 200y = 3550$

(*b*) $400x + 150y = 3550$ and $500x + 200y = 3400$

(*c*) $500x + 150y = 3550$ and $400x + 200y = 3400$

(*d*) $500x + 200y = 3550$ and $400x + 150y = 3400$

31. **If $x^{2n} - 1 + y^{m-4} = 0$ is a linear equation, which of these is also a linear equation?** *[CBSE Question Bank]*

(*a*) $x^n + y^m = 0$ (*b*) $x^{1/n} + y^{m/5} = 0$ (*c*) $x^{n+1/2} + y^{m+4} = 0$ (*d*) $x^{\frac{n}{5}} + y^{\frac{m}{5}} = 0$

32. **Which of these is a linear equation in two variables?** *[CBSE Question Bank]*

(*a*) $3x - 2y + 2 = 0$ (*b*) $x + x^2 - 2y + 8 = 0$

(*c*) $x - 2y + 10 = x^2 + y$ (*d*) $5x - 2y = 0$

33. **One of the common solution of $ax + by = c$ and *y*-axis is**

(*a*) $(0, c/b)$ (*b*) $(0, b/c)$ (*c*) $(c/b, 0)$ (*d*) $(0, -c/b)$

34. **Every linear equation in two variables has ..... solutions.**

(*a*) no (*b*) one (*c*) two (*d*) infinitely many

35. **Five years hence, fathers age will be three times the age of his daughter. Five years ago father was seven times as old as his daughter. Their present ages are**

(*a*) 20 years, 10 years (*b*) 40 years, 20 years

(*c*) 40 years, 10 years (*d*) 30 years, 10 years

36. **Point (4, 3) lies on the line**

(*a*) $3x + 7y = 27$ (*b*) $7x + 2y = 47$

(*c*) $3x + 4y = 24$ (*d*) $5x - 4y = 1$

37. **A boat can row 1 km with stream in 10 minutes and 1 km against the stream in 20 minutes. The speed of the boat in still water is**

(*a*) 1.5 km/h (*b*) 3 km/h (*c*) 3.4 km/h (*d*) 4.5 km/h

38. **The sum of two numbers is 1000 and the difference between their squares is 256000, then the numbers are**

(*a*) 616 and 384 (*b*) 628 and 372 (*c*) 564 and 436 (*d*) None of them

39. **The sum of a two digit number and the number obtained by interchanging its digits is 99. If the digits differ by 3 then the number is**

(*a*) 36 (*b*) 33 (*c*) 66 (*d*) None of them

40. **The solution of the equations $x + 2y = 1.5$ and $2x + y = 1.5$ is**

(*a*) $x = 1$ and $y = 1$ (*b*) $x = 1.5$ and $y = 1.5$

(*c*) $x = 0.5$ and $y = 0.5$ (*d*) None of these

41. **Sum of two numbers is 35 and their difference is 13, then the numbers are**

(*a*) 24 and 12 (*b*) 24 and 11 (*c*) 12 and 11 (*d*) None of these

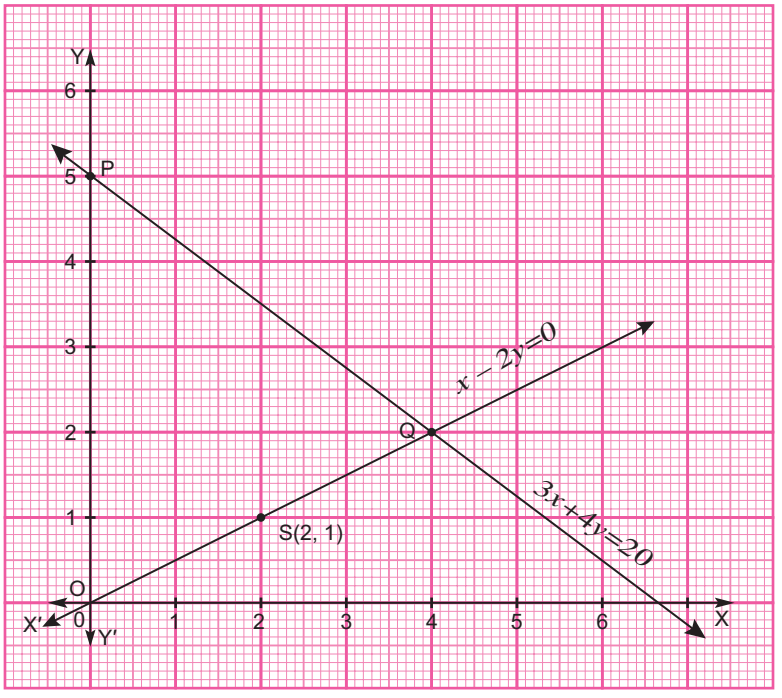
42. **The value of k for which the system of equations $x - 2y = 3$ and $3x + ky = 1$ has a unique solution is**

(*a*) $k = -6$ (*b*) $k \neq -6$ (*c*) $k = 0$ (*d*) no value

43. **The sum of the numerator and denominator of a fraction is 12. If the denominator is increased by 3, the fraction becomes $\frac{1}{2}$, then the fraction is**

(*a*) $\frac{4}{7}$ (*b*) $\frac{5}{7}$ (*c*) $\frac{6}{7}$ (*d*) $\frac{8}{7}$

44. **The coordinates of the vertices of triangle formed between the lines and *y*-axis from the graph is**



(*a*) (0, 5), (0, 0) and (6.5, 0) (*b*) (4, 2), (6, 0) and (6.5, 0)

(*c*) (4, 2), (0, 0) and (0, 5) (*d*) none of these

45. **When L_1 and L_2 are coincident, then the graphical solution of system of linear equation have**

(*a*) infinite number of solutions (*b*) unique solution

(*c*) no solution (*d*) one solution

46. **The pair of linear equations $4x + 6y = 9$ and $2x + 3y = 6$ has**

(*a*) no solution (*b*) many solutions (*c*) two solutions (*d*) one solution

47. **Two numbers are in the ratio 1 : 3. If 5 is added to both the numbers, the ratio becomes 1 : 2. The numbers are**

(*a*) 4 and 12 (*b*) 5 and 15 (*c*) 6 and 18 (*d*) 7 and 21

48. **The value of c for which the pair of equation $cx - y = 2$ and $6x - 2y = 3$ will have infinitely many solutions is** [*NCERT Exemplar*]

(*a*) 3 (*b*) –3 (*c*) –12 (*d*) no value

49. **For what value of k, do the equations $3x - y + 8 = 0$ and $6x - ky = -16$ represent coincident lines?** [*NCERT Exemplar*]

(*a*) $\frac{1}{2}$ (*b*) $-\frac{1}{2}$ (*c*) 2 (*d*) –2

50. **Gunjan has only ₹ 1 and ₹ 2 coins with her. If the total number of coins that she has is 50 and the amount of money with her is ₹ 75, then the number of ₹ 1, and ₹ 2 coins are respectively**

(*a*) 25 and 25 (*b*) 15 and 35 (*c*) 35 and 15 (*d*) 35 and 20

51. **The pair of equations $x + 2y + 5 = 0$ and $-3x - 6y + 1 = 0$ have** [*NCERT Exemplar*]

(*a*) a unique solution (*b*) exactly two solutions

(*c*) infinitely many solutions (*d*) no solution

52. **A pair of linear equations which has a unique solution $x = 3, y = -2$ is**

(*a*) $\begin{matrix} x + y = 1 \\ 2x - 3y = 12 \end{matrix}$ (*b*) $\begin{matrix} 2x + 5y + 4 = 1 \\ 4x + 10y + 8 = 0 \end{matrix}$ (*c*) $\begin{matrix} 2x - y = 1 \\ 3x + 2y = 0 \end{matrix}$ (*d*) $\begin{matrix} x - 4y = 14 \\ 5x - y = 13 \end{matrix}$

53. **The area of the triangle formed by the line $\frac{x}{a} + \frac{y}{b} = 1$ with the coordinate axes is**

(*a*) ab (*b*) $2ab$ (*c*) $\frac{1}{2}ab$ (*d*) $\frac{1}{4}ab$

54. **If $2x - 3y = 7$ and $(a + b)x - (a + b - 3)y = 4a + b$ represent coincident lines, then a and b satisfy the equation**

(*a*) $a + 5b = 0$ (*b*) $5a + b = 0$ (*c*) $a - 5b = 0$ (*d*) $5a - b = 0$

55. **Graphically, the pair of equations** [*NCERT Exemplar*]

$6x - 3y + 10 = 0$; $2x - y + 9 = 0$ represents two lines which are

(*a*) intersecting at exactly one point (*b*) intersecting at exactly two points

(*c*) coincident (*d*) parallel

56. **If a pair of linear equations is consistent, then the lines will be** [*NCERT Exemplar*]

(*a*) parallel (*b*) always coincident

(*c*) intersecting or coincident (*d*) always intersecting

57. **The pair of equations $y = 0$ and $y = -7$ has** [*NCERT Exemplar*]

(*a*) one solution (*b*) two solutions

(*c*) infinitely many solutions (*d*) no solution

58. **The pair of equations $x = a$ and $y = b$ graphically represents lines which are** [*NCERT Exemplar*]

(*a*) parallel (*b*) intersecting at (b, a) (*c*) coincident (*d*) intersecting at (a, b)

59. **The sum of the digits of a two-digit number is 9. If 27 is added to it, the digit of number get reversed. The number is** [*NCERT Exemplar*]

(*a*) 25 (*b*) 72 (*c*) 63 (*d*) 36

60. **The pair of equations $5x - 15y = 8$ and $3x - 9y = \frac{24}{5}$ has** [*NCERT Exemplar*]

(*a*) one solution (*b*) two solutions

(*c*) infinite solutions (*d*) no solution

61. **The father's age is six times his son's age. Four years hence, the age of the father will be four times his son. The present ages (in years) of the son and the father are, respectively.** [*NCERT Exemplar*]

(*a*) 4 and 24 (*b*) 5 and 30 (*c*) 6 and 36 (*d*) 3 and 24

62. **If $x = a, y = b$ is the solution of the equations $x - y = 2$ and $x + y = 4$, then the values of a and b are, respectively** [*NCERT Exemplar*]

(*a*) 3 and 5 (*b*) 5 and 3 (*c*) 3 and 1 (*d*) –1 and –3

63. **If $am \neq bl$, then the system of equations, $ax + by = c$, $lx + my = n$**

(*a*) has a unique solution (*b*) has no solution

(*c*) has infinitely many solutions (*d*) may or may not have a solution

Answers

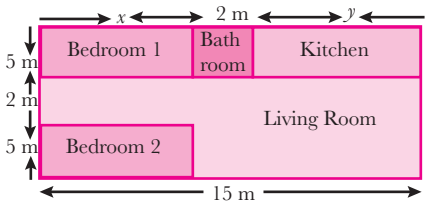
1. (*c*)	**2.** (*c*)	**3.** (*b*)	**4.** (*b*)	**5.** (*d*)	**6.** (*b*)
7. (*b*)	**8.** (*b*)	**9.** (*b*)	**10.** (*d*)	**11.** (*d*)	**12.** (*a*)
13. (*a*)	**14.** (*b*)	**15.** (*c*)	**16.** (*b*)	**17.** (*c*)	**18.** (*a*)
19. (*b*)	**20.** (*b*)	**21.** (*c*)	**22.** (*a*)	**23.** (*b*)	**24.** (*b*)
25. (*c*)	**26.** (*c*)	**27.** (*b*)	**28.** (*b*)	**29.** (*a*)	**30.** (*c*)
31. (*b*)	**32.** (*d*)	**33.** (*a*)	**34.** (*d*)	**35.** (*c*)	**36.** (*c*)
37. (*d*)	**38.** (*b*)	**39.** (*a*)	**40.** (*c*)	**41.** (*b*)	**42.** (*b*)
43. (*b*)	**44.** (*c*)	**45.** (*a*)	**46.** (*a*)	**47.** (*b*)	**48.** (*d*)
49. (*c*)	**50.** (*a*)	**51.** (*d*)	**52.** (*a*)	**53.** (*c*)	**54.** (*c*)
55. (*d*)	**56.** (*c*)	**57.** (*d*)	**58.** (*d*)	**59.** (*d*)	**60.** (*c*)
61. (*c*)	**62.** (*c*)	**63.** (*a*)			

CASE-BASED QUESTIONS

1. **Read the following and answer any four questions from (*i*) to (*v*).**

Amit is planning to buy a house and the layout is given figure. The design and the measurement has been made such that areas of two bedrooms and kitchen together is 95 sq.m.

[*CBSE Question Bank*]



Based on the above information, answer the following questions:

(*i*) The pair of linear equations in two variables from this situation are

(*a*) $x + y = 19$, $x + y = 13$ (*b*) $2x + y = 19$, $x + 2y = 13$ (*c*) $2x + y = 19$, $x + y = 13$ (*d*) none of these

(*ii*) The length of the outer boundary of the layout is

(*a*) 50 m (*b*) 52 m (*c*) 54 m (*d*) 56 m

(*iii*) The area of each bedroom and kitchen in the layout is

(*a*) 30 m^2, 40 m^2 (*b*) 30 m^2, 35 m^2 (*c*) 30 m^2, 45 m^2 (*d*) 35 m^2, 45 m^2

(*iv*) The area of living room in the layout is

(*a*) 60 m^2 (*b*) 75 m^2 (*c*) 80 m^2 (*d*) 100 m^2

(*v*) The cost of laying tiles in kitchen at the rate of ₹50 per sq.m is

(*a*) ₹1700 (*b*) ₹1800 (*c*) ₹1900 (*d*) ₹1750

2. Read the following and answer any four questions from (*i*) to (*v*).

It is common that governments revise travel fares from time to time based on various factors such as inflation (a general increase in prices and fall in the purchasing value of money) on different types of vehicles like auto, rickshaws, taxis, radio cab etc. The auto charges in a city comprise of a fixed charge together with the charge for the distance covered. Study the following situations: *[CBSE Question Bank]*

Name of the city	Distance travelled (km)	Amount paid (₹)
City A	10	75
	15	110
City B	8	91
	14	145

Situation 1: In city A, for a journey of 10 km, the charge paid is ₹75 and for a journey of 15 km, the charge paid is ₹110.

Situation 2: In a city B, for a journey of 8 km, the charge paid is ₹91 and for a journey of 14 km, the charge paid is ₹145.

Refer situation 1

(*i*) If the fixed charges of auto rickshaw be ₹ x and the running charges be ₹ y per km, the pair of linear equations representing the situation is

(*a*) $x + 10y = 110, x + 15y = 75$ (*b*) $x + 10y = 75, x + 15y = 110$

(*c*) $10x + y = 110, 15x + y = 75$ (*d*) $10x + y = 75, 15x + y = 110$

(*ii*) A person travels a distance of 50 km. The amount he has to pay is

(*a*) ₹155 (*b*) ₹255 (*c*) ₹355 (*d*) ₹455

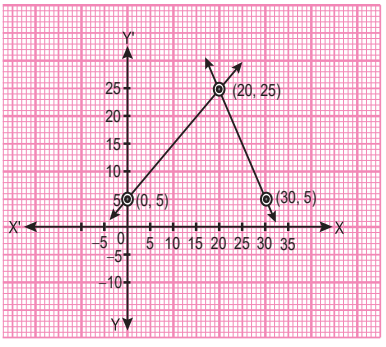
Refer situation 2

(*iii*) What will a person have to pay for travelling a distance of 30 km?

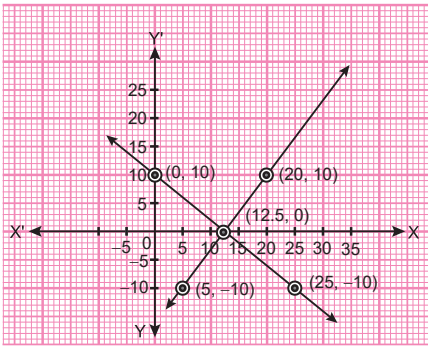
(*a*) ₹185 (*b*) ₹289 (*c*) ₹275 (*d*) ₹305

(iv) The graph of lines representing the conditions are: (situation 2)

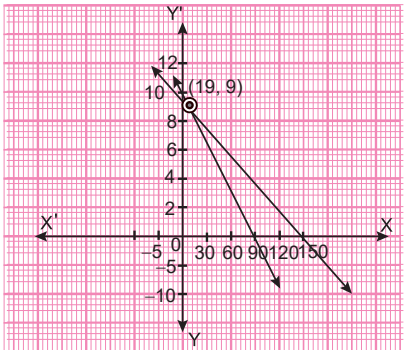
(*a*)



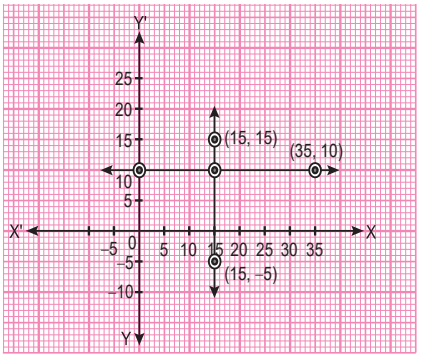
(*b*)



(*c*)



(*d*)



(*v*) Out of both the city, which one has cheaper fare?

(*a*) City *A* (*b*) City *A* (*c*) Both are same (*d*) cannot decided

3. Read the following and answer any four questions from (*i*) to (*v*).

A test consists of 'True' or 'False' questions. One mark is awarded for every correct answer while ¼ mark is deducted for every wrong answer. A student knew correct answers of some of the questions. Rest of the questions he attempted by guessing. He answered 120 questions and got 90 marks. *[CBSE Question Bank]*

Type of Question	Marks given for correct answer	Marks deducted for wrong answer
True/False	**1**	0.25

(*i*) If answer to all questions he attempted by guessing were wrong, then number of questions did he answer correctly are

(*a*) 90 (*b*) 100 (*c*) 96 (*d*) 105

(*ii*) Number of questions did he guess are

(*a*) 20 (*b*) 24 (*c*) 28 (*d*) 30

(*iii*) If answer to all questions he attempted by guessing were wrong and answered 80 correctly, then how many marks will he get?

(*a*) 60 (*b*) 70 (*c*) 80 (*d*) 90

(*iv*) If answer to all questions he attempted by guessing were wrong, then how many questions were answered correctly to score 95 marks?

(*a*) 90 (*b*) 95 (*c*) 98 (*d*) 100

(*v*) The maximum marks that a student can score is

(*a*) 110 (*b*) 115 (*c*) 120 (*d*) 125

4. Read the following and answer any four questions from (*i*) to (*v*).

A man is trying to choose between two phone plans. The first plan of company A, cost ₹ 20 per month, with calls costing an additional 25 paise per minute.

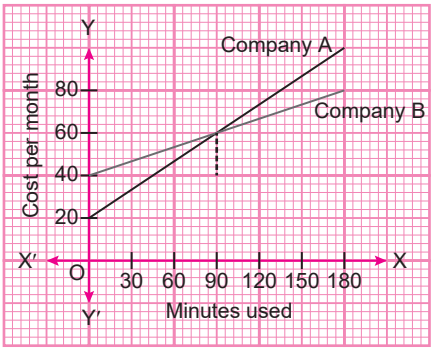
The second plan of company B charges ₹ 40 per month, but calls cost 8 paise per minute. These two situations are shown below which represent linear equations.

The total cost for the two company's are given by

$y = 0.25x + 20$

and $y = 0.08x + 40$

where x is the minutes used and y is the total cost per month.



(*i*) If a person takes first plan and calls for 90 minutes in a month then how much amount he will have to pay whose cost for a month is given by $y = 0.25x + 20$?

(*a*) ₹ 20 (*b*) ₹ 40 (*c*) ₹ 42.50 (*d*) ₹ 45

(*ii*) Another person takes second plan and also calls for 90 minutes in a month, then the amount which he has to pay when total cost is given by $y = 0.08x + 40$, is

(*a*) ₹ 45 (*b*) ₹ 47 (*c*) ₹ 45.20 (*d*) ₹ 47.20

(*iii*) Solution of system of linear equations $x + 2y = -1$ and $2x - 3y = 12$ is

(*a*) (–3, 2) (*b*) (–3, –2) (*c*) (3, – 2) (*d*) (3, 2)

(*iv*) If the system of pair of linear equations $kx + 2y = 5$, $3x + y = 1$ has a unique solution, then

(*a*) $k \neq \frac{3}{2}$ (*b*) $k = 6$ (*c*) $k \neq 6$ (*d*) $k \neq \frac{2}{3}$

(v) Given system of linear equations $x + 2y - 4 = 0$, $2x + 4y - 12 = 0$ represents

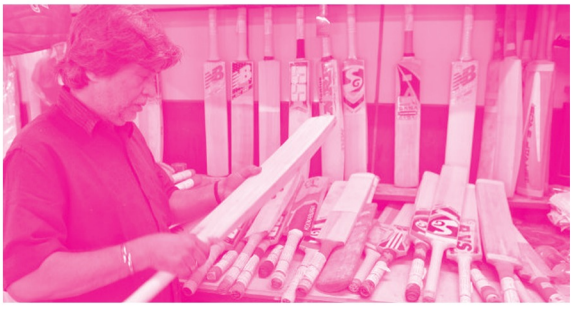
(a) parallel lines (b) intersecting lines

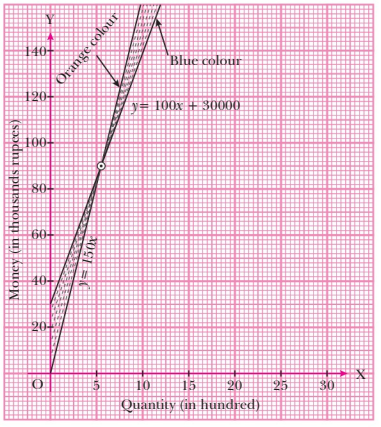
(c) coincident lines (d) can't say

5. Read the following and answer any four questions from (i) to (v).

A cricket bat manufacturer's revenue is the function used to calculate the amount of money that comes into the business. It can be represented by the equation $R = xp$, where x = quantity and p = price.

The revenue function is shown in orange colour in the figure. The cost function is the function used to calculate the costs of doing business. It includes fixed costs, such as rent and salaries, and variable costs such as utilities. The cost function is shown in blue colour in figure.





The x-axis represents quantity (in hundreds) of units, and the y-axis represents either cost or revenue (in thousand of rupees).

The profit function is the difference of revenue function and the cost function, written as

$$P(x) = R(x) - C(x)$$

Now, let $C(x) = 100x + 30000$ and $R(x) = 150x$

If we replace function by y, we get

Linear equations are $y = 100x + 30000$

and $y = 150x$

(i) The number of bat manufactured (x) so that there is no profit or loss for the manufacturer is

(a) $x = 200$ (b) $x = 300$ (c) $x = 400$ (d) $x = 600$

(ii) If the cost and revenue are given by the linear equations $y = 0.85x + 35000$ and $y = 1.55x$ respectively, and the break-even point is the point at which the two lines intersect, then its break even point is

(a) (50000, 77500) (b) (50000, 60000) (c) (45000, 50000) (d) (45000, 60000)

(iii) The system of linear equations $3x + 2y = 12$, $5x - 2y = 4$ represents

(a) parallel lines (b) intersecting lines

(c) coincident lines (d) can't say

(iv) Solution of the system of linear equations $x + y = 1$, $2x - 3y = 7$, is

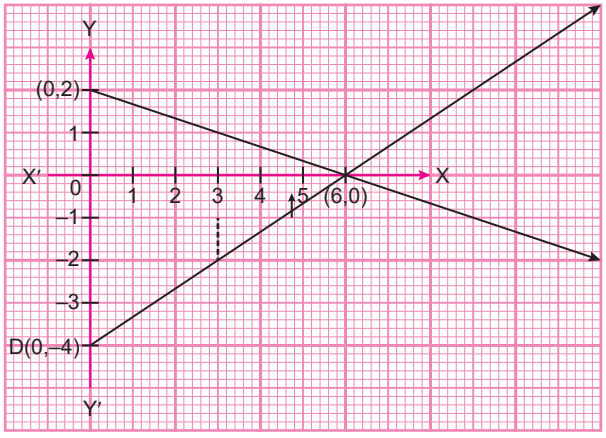
(a) (1, 2) (b) (2, 1) (c) (2, –1) (d) (–2, –1)

(v) The value of k for which the system of linear equations $4x + 5y = 3$ and $kx + 15y = 9$ has infinitely many solutions is

(a) $k = 3$ (b) $k = 4$ (c) $k = 12$ (d) $k = 8$

6. Read the following and answer any four questions from (*i*) to (*v*).

The scissors which is so common in our daily life use, its blades represent the graph of linear equations.



Let the blades of a scissor are represented by the system of linear equations:

$x + 3y = 6$ and $2x - 3y = 12$

(*i*) The pivot point (point of intersection) of the blades represented by the linear equation $x + 3y = 6$ and $2x - 3y = 12$ of the scissor is

(*a*) (2, 3) (*b*) (6, 0) (*c*) (3, 2) (*d*) (2, 6)

(*ii*) The points at which linear equations $x + 3y = 6$ and $2x - 3y = 12$ intersect y – axis respectively are

(*a*) (0, 2) and (0, 6) (*b*) (0, 2) and (6, 0)

(*c*) (0, 2) and (0, –4) (*d*) (2, 0) and (0, –4)

(*iii*) The number of solution of the system of linear equations $x + 2y - 8 = 0$ and $2x + 4y = 16$ is

(*a*) 0 (*b*) 1 (*c*) 2 (*d*) infinitely many

(*iv*) If (1, 2) is the solution of linear equations $ax + y = 3$ and $2x + by = 12$, then values of a and b are respectively

(*a*) 1, 5 (*b*) 2, 3 (*c*) –1, 5 (*d*) 3, 5

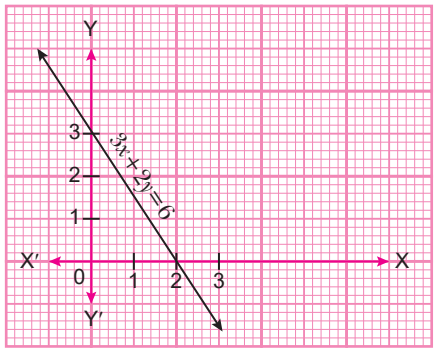
(*v*) If a pair of linear equations in two variables is consistent, then the lines represented by two equations are

(*a*) intersecting (*b*) parallel

(*c*) always coincident (*d*) intersecting or coincident

7. Read the following and answer any four questions from (*i*) to (*v*).

A pen stand with a pen is represented by the system of linear equations $y = 0$ and $3x + 2y = 6$.



(*i*) The system of linear equations $y = 0$ and $3x + 2y = 6$ represents the pen stand and a pen respectively then their point of contact (intersection) is

(*a*) (0, 3) (*b*) (2, 0) (*c*) (3, 2) (*d*) (3, 0)

(*ii*) The pair of linear equation $y = x$ and $x + y = 6$ intersect each other at point

(*a*) (4, 2) (*b*) (4, 4) (*c*) (3, 3) (*d*) (3, 2)

(*iii*) The system of linear equations $3x + 6y = 3900$ and $x + 3y = 1300$ represent the lines which are

(*a*) parallel (*b*) intersecting (*c*) coincident (*d*) can't say

(*iv*) The value of k for which the system of equations $kx - 5y = 2$ and $6x + 2y = 7$ has no solution, is

(*a*) 30 (*b*) –30 (*c*) 15 (*d*) –15

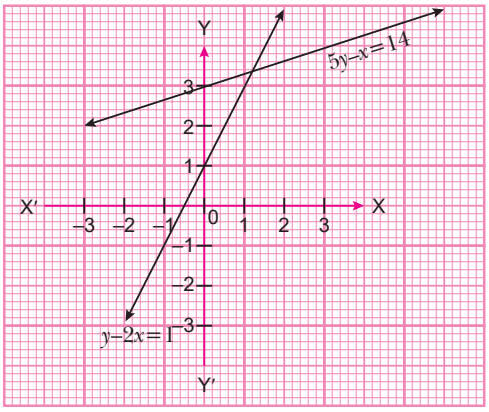
(*v*) The linear equation $3x + 2y = 6$ intersects the y–axis at the point

(*a*) (0, 3) (*b*) (0, 2) (*c*) (0, –3) (*d*) (2, 3)

8. Read the following and answer any four questions from (*i*) to (*v*).

A boy enjoying the pizza with his friends and share with them by slicing it. During slicing the pizza, he noticed that the pair of linear equations formed.

Let these pair of linear equations be $y - 2x = 1$ and $5y - x = 14$. *[CBSE Question Bank]*



(*i*) The point of intersection of the lines given by the equations $y - 2x = 1$ and $5y - x = 14$ is

(*a*) (–2, 3) (*b*) (–4, 2) (*c*) (6, 4) (*d*) (1, 3)

(*ii*) The linear equation $y - 2x = 1$ intersect the y–axis at point

(*a*) $\left(-\frac{1}{2}, 0\right)$ (*b*) (0, 1) (*c*) (0, –14) (*d*) $\left(0, \frac{14}{5}\right)$

(*iii*) The system of linear equations $2x - 3y + 6 = 0$ and $2x + 3y - 18 = 0$

(*a*) has a unique solution (*b*) has no solution

(*c*) has infinitely many solution (*d*) may or may not have a solution

(*iv*) The value(s) of k for which the system of linear equations $2x - ky + 3 = 0$ and $3x + 2y - 1 = 0$ has no solution, is

(*a*) $\frac{4}{3}$ (*b*) $-\frac{4}{3}$ (*c*) 6 (*d*) –6

(*v*) If a pair of linear equations in two variables is inconsistent, then the lines represented by two equations are

(*a*) intersecting (*b*) parallel

(*c*) always coincident (*d*) Intersecting or coincident

Answers

1.	(*i*) (*c*)	(*ii*) (*c*)	(*iii*) (*b*)	(*iv*) (*b*)	(*v*) (*d*)
2.	(*i*) (*b*)	(*ii*) (*c*)	(*iii*) (*b*)	(*iv*) (*c*)	(*v*) (*a*)
3.	(*i*) (*c*)	(*ii*) (*b*)	(*iii*) (*b*)	(*iv*) (*d*)	(*v*) (*c*)
4.	(*i*) (*c*)	(*ii*) (*d*)	(*iii*) (*c*)	(*iv*) (*c*)	(*v*) (*a*)
5.	(*i*) (*d*)	(*ii*) (*a*)	(*iii*) (*b*)	(*iv*) (*c*)	(*v*) (*c*)
6.	(*i*) (*b*)	(*ii*) (*c*)	(*iii*) (*d*)	(*iv*) (*a*)	(*v*) (*d*)
7.	(*i*) (*b*)	(*ii*) (*c*)	(*iii*) (*b*)	(*iv*) (*d*)	(*v*) (*a*)
8.	(*i*) (*d*)	(*ii*) (*b*)	(*iii*) (*a*)	(*iv*) (*b*)	(*v*) (*b*)

ASSERTION-REASON QUESTIONS

The following questions consist of two statements—Assertion(A) and Reason(R). Answer these questions selecting the appropriate option given below:

(*a*) Both *A* and *R* are true and *R* is the correct explanation for *A*.

(*b*) Both *A* and *R* are true and *R* is not the correct explanation for *A*.

(*c*) *A* is true but *R* is false.

(*d*) *A* is false but *R* is true.

1. Assertion (*A*) : Pair of linear equations: $9x + 3y + 12 = 0$, $18x + 6y + 24 = 0$ have infinitely many solutions.

Reason (*R*) : Pair of linear equations $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ have infinitely many solutions, if $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$.

2. Assertion (*A*) : For $k = 6$, the system of linear equations $x + 2y + 3 = 0$ and $3x + ky + 6 = 0$ is inconsistent.

Reason (*R*) : The system of linear equations $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ is inconsistent if

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}.$$

3. Assertion (*A*) : The value of $q = \pm 2$, if $x = 3$, $y = 1$ is the solution of the line $2x + y - q^2 - 3 = 0$.

Reason (*R*) : The solution of the line will satisfy the equation of the line.

4. Assertion (*A*) : The value of k for which the system of equations $kx - y = 2$, $6x - 2y = 3$ has a unique solution is 3.

Reason (*R*) : The system of linear equations $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ has a unique solution if $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$.

Answers

1. (*a*) **2.** (*c*) **3.** (*a*) **4.** (*d*)

HINTS/SOLUTIONS OF SELECTED MCQs

1. For lines to be coincident, we have

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2} \quad \Rightarrow \quad \frac{2}{8} = \frac{3}{12} = \frac{7}{k}$$

$$\Rightarrow \quad \frac{1}{4} = \frac{1}{4} = \frac{7}{k} \quad \Rightarrow k = 7 \times 4 = 28 \quad \therefore k = 28$$

$\therefore$ Option (c) is correct.

2. For infinitely many solutions, we have

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2} \quad \Rightarrow \quad \frac{10}{20} = \frac{5}{10} = \frac{-(a-5)}{-a}$$

$$\Rightarrow \quad \frac{1}{2} = \frac{a-5}{a} \quad \Rightarrow \quad a = 2a - 10$$

$$\Rightarrow \quad a - 2a = -10 \quad \Rightarrow \quad -a = -10 \quad \Rightarrow \quad a = 10$$

$\therefore$ Option (c) is correct.

3. Since two lines are parallel.

Therefore, $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2} \quad \Rightarrow \quad \frac{3}{2} = \frac{2k}{5} \neq \frac{-8}{-4}$

$$\Rightarrow \quad 2k = \frac{15}{2} \quad \Rightarrow \quad k = \frac{15}{4}$$

$\therefore$ Option (b) is correct.

4. For unique solution, we have

$$\frac{a_1}{a_2} \neq \frac{b_1}{b_2} \quad \Rightarrow \quad \frac{k}{6} \neq \frac{-1}{-2}$$

$$\Rightarrow \quad \frac{k}{6} \neq \frac{1}{2} \quad \Rightarrow \quad k \neq \frac{6}{2} = 3 \quad \Rightarrow \quad k \neq 3$$

$\therefore$ Option (b) is correct.

6. Given pair of linear equations,

$$\frac{3x}{2} + \frac{5}{3}y - 7 = 0$$

and, $\quad 9x + 10y - 14 = 0$

$$\therefore \quad \frac{a_1}{a_2} = \frac{3}{2\times 9} = \frac{1}{6}, \ \frac{b_1}{b_2} = \frac{5}{3\times 10} = \frac{1}{6} \ \text{ and } \ \frac{c_1}{c_2} = \frac{-7}{-14} = \frac{1}{2}$$

$$\therefore \quad \frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$$

$\therefore$ Both lines are parallel.

Hence, there is no solution and the given system of equations is inconsistent.

$\therefore$ Option (b) is correct.

7. Since the lines $x = 0$ and $x = -4$ are parallel to each other, therefore there is no solution for the given pair of equations.

$\therefore$ Option (b) is correct.

8. Given pair of linear equations $y = 0$ and $y = -6$ are parallel lines, therefore it has no solution.

$\therefore$ Option (b) is correct.

9. Given pair of linear equations,

$kx + y = k^2 \quad \Rightarrow \quad kx + y - k^2 = 0$

and $x + ky = 1 \quad \Rightarrow \quad x + ky - 1 = 0$

For infinitely many solutions,

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2} \Rightarrow \frac{k}{1} = \frac{1}{k} = \frac{-k^2}{-1}$$

$$\Rightarrow \quad k = \frac{1}{k} = k^2 \quad \Rightarrow \quad k = \frac{1}{k}$$

$$\Rightarrow \quad k^2 = 1 \quad \Rightarrow \quad k = \pm 1$$

and $k^3 = 1 \quad \Rightarrow \quad k = 1$

$\therefore \quad k = 1$

Also, when $k = k^2 \quad \Rightarrow \quad k(k-1) = 0 \quad \Rightarrow \quad k = 0, 1$

Hence common value of $k = 1$.

$\therefore \quad k = 1$ is the required value of k.

$\therefore$ Option (b) is correct.

10. Given system of linear equations

$x + 2y = 3$ and $5x + ky + 7 = 0$

$\Rightarrow \quad x + 2y - 3 = 0$ and $5x + ky + 7 = 0$

For inconsistent, we have

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2} \quad \Rightarrow \quad \frac{1}{5} = \frac{2}{k} \neq \frac{-3}{7} \quad \Rightarrow \frac{1}{5} = \frac{2}{k} \Rightarrow k = 10$$

$\therefore$ Option (d) is correct.

11. Given system of equations:

$x + y - 4 = 0$ and $2x + ky - 3 = 0$

For no solution

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2} \Rightarrow \frac{1}{2} = \frac{1}{k} \neq \frac{-4}{-3} \Rightarrow k = 2$$

$\therefore$ Option (d) is correct.

12. For pair of linear equations to be parallel, we have

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$$

$$\Rightarrow \quad \frac{3}{6} = \frac{-1}{-2} \neq \frac{5}{p} \quad \Rightarrow \quad \frac{1}{2} = \frac{1}{2} \neq \frac{5}{p} \quad \Rightarrow \quad p \neq 10$$

$\therefore$ Option (a) is correct.

13. Given lines,

$(k + 1)x + 3ky + 15 = 0$ ...(i)

$5x + ky + 5 = 0$ ...(ii)

For both lines to be coincident, we have

$$\frac{k+1}{5} = \frac{3k}{k} = \frac{15}{5}$$

$$\Rightarrow \frac{k+1}{5} = 3 \Rightarrow k + 1 = 15 \Rightarrow k = 15 - 1 = 14$$

$$\therefore\ k = 14$$

$\therefore$ Option (a) is correct.

14. Since two lines are parallel.

Therefore, $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2} \Rightarrow \frac{3}{2} = \frac{2k}{5} \neq \frac{-8}{-4}$

$\Rightarrow \quad 2k = \frac{15}{2} \quad \Rightarrow k = \frac{15}{4}$

$\therefore$ Option (b) is correct.

16. For no solution; we have

$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2} \quad \Rightarrow \frac{1}{5} = \frac{2}{k} \neq \frac{-3}{7} \quad \Rightarrow \quad k = 10$

$\therefore$ Option (b) is correct.

17. Given system of equations

$$\frac{5}{x+2} + \frac{7}{y+2} = \frac{31}{12}$$

$$\frac{4}{x+2} + \frac{3}{y+2} = \frac{17}{12}$$

Let $\frac{1}{x+2} = u$ and $\frac{1}{y+2} = v$

$\therefore$ Equations becomes

$$5u + 7v = \frac{31}{12} \qquad \ldots(i) \times 3$$

$$4u + 3v = \frac{17}{12} \qquad \ldots(ii) \times 7$$

$$- \quad - \quad = -$$

$$-13u = \frac{-26}{12} \Rightarrow u = \frac{1}{6}$$

Putting the value of $u = \frac{1}{6}$ in equation (i), we get

$$5 \times \frac{1}{6} + 7v = \frac{31}{12}$$

$$\Rightarrow \quad 7v = \frac{31}{12} - \frac{5}{6} = \frac{21}{12} \quad \Rightarrow \quad v = \frac{1}{4}$$

$\therefore \quad u = \frac{1}{6} \Rightarrow \frac{1}{x+2} = \frac{1}{6} \Rightarrow x + 2 = 6 \Rightarrow x = 4$

and $v = \frac{1}{4} \Rightarrow \frac{1}{y+2} = \frac{1}{4} \Rightarrow y + 2 = 4 \Rightarrow y = 2$

$\therefore$ Option (c) is correct.

18. Given pair of linear equations

$$\frac{7}{x+2} + \frac{2}{y-2} = \frac{33}{20} \quad \text{and} \quad \frac{2}{x+2} + \frac{6}{y-2} = \frac{23}{20}$$

Let $\frac{1}{x+2} = u$ and $\frac{1}{y-2} = v$

We get

$$7u + 2v = \frac{33}{20} \quad \text{and} \quad 2u + 6v = \frac{23}{20}$$

Hence, the equivalent pair of equations are

$$7u + 2v = \frac{33}{20} \quad \text{and} \quad 2u + 6v = \frac{23}{20}$$

$\therefore$ Option (a) is correct.

19. Given equations,

$$(x-a)(y-b) = (x-2a)\left(y-\frac{b}{2}\right)$$

$$\Rightarrow \quad xy - bx - ay + ab = xy - \frac{bx}{2} - 2ay + ab$$

$$\Rightarrow \quad \frac{bx}{2} - ay = 0$$

$$\Rightarrow \quad bx - 2ay = 0 \qquad \ldots(i)$$

$$\text{Also, } x\left(x+\frac{1}{2b}\right) + y\left(y+\frac{a}{2}\right) - 2xy = 5 + (x-y)^2$$

$$\Rightarrow \quad x^2 + \frac{x}{2b} + y^2 + \frac{ay}{2} - 2xy = 5 + x^2 + y^2 - 2xy$$

$$\Rightarrow \quad \frac{x}{2b} + \frac{ay}{2} = 5$$

$$\Rightarrow \quad \frac{x + aby}{2b} = 5$$

$$\Rightarrow \quad x + aby = 10b \qquad \ldots(ii)$$

From equation (i) and (ii), we have

$$bx - 2ay = 0 \qquad \ldots(i)$$

$$x + aby = 10b \qquad \ldots(ii) \times b$$

$$- a(2 + b^2)y = -10b^2$$

$$\Rightarrow \quad y = \frac{10b^2}{a(b^2+2)}$$

From (i), we have

$$bx = 2ay = 2a \times \frac{10b^2}{a(b^2+2)} = \frac{20b^2}{b^2+2}$$

$$\Rightarrow \quad x = \frac{20b}{b^2+2}$$

$$\therefore \quad \text{Point of intersection is } x = \frac{20b}{b^2+2}$$

$$\Rightarrow \quad y = \frac{10b^2}{a(b^2+2)}$$

Hence, these two lines are intersecting lines.

$\therefore$ Option (b) is correct.

20. Given equations of lines

$$9x + 6y = 5 \Rightarrow 9x + 6y - 5 = 0$$

$$\text{and } 3x + 2y = 7 \Rightarrow 3x + 2y - 7 = 0$$

$$\text{Now, } \frac{a_1}{a_2} = \frac{9}{3} = 3, \frac{b_1}{b_2} = \frac{6}{2} = 3 \text{ and } \frac{c_1}{c_2} = \frac{-5}{-7} = \frac{5}{7}$$

$$\therefore \quad \frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$$

$\therefore$ This is a pair of parallel lines.

Thus, option (b) is correct.

21. We have x columns and in each column there are y plants.

$\therefore$ Total number of plants $= xy$

According to question,

$$(y + 4)(x - 1) = xy$$
$$4x - y = 4 \quad ...(i)$$

and
$$(y - 5)(x + 2) = xy$$
$$5x - 2y = -10 \quad ...(ii)$$

On solving equation (i) and (ii), we have

$$4x - y = 4 \quad ...(i) \times 2$$
$$5x - 2y = -10 \quad ...(ii)$$
$$- \quad + \quad = \quad +$$
$$3x = 18$$
$$\Rightarrow \quad x = \frac{18}{3} = 6$$

Putting the value of $x = 6$ in equation (i), we get

$$4 \times 6 - y = 4$$
$$\Rightarrow \quad 24 - 4 = y \quad \Rightarrow \quad y = 20$$

$\therefore$ Point of intersection is $x = 6$ and $y = 20$.

The graph shown in the option (c) is correct since both lines intersect at (6, 20) or $x = 6, y = 20$.

$\therefore$ Option (c) is correct.

22. Since total number of notes is 11.

$\therefore \quad x + y = 11 \quad ...(i)$

and remaining amount $= 2000 - 500$

$200x + 100y = 1500 \quad ...(ii)$

From equations (i) $\times$ 100 – (ii), we get

$$100x + 100y - 200x - 100y = 1100 - 1500$$
$$\Rightarrow \quad -100x = -400$$
$$\Rightarrow \quad x = 4$$

$\therefore$ Option (a) is correct.

23. Given equations,

We have $ax + by = ab \quad ...(i) \times 2$

$$2ax + 3by = 3b \quad ...(ii)$$
$$- \quad - \quad = \quad -$$
$$-by = 2ab - 3b$$
$$\Rightarrow \quad y = 3 - 2a$$

$\therefore$ Option (b) is correct.

24. Given equations,

$$p + q = 5 \quad ...(i)$$
$$p - q = 2 \quad ...(ii)$$

On adding (i) and (ii), we get

$$\Rightarrow \quad 2p = 7 \quad \Rightarrow \quad p = \frac{7}{2} = 3.5$$

Putting the value of $p = 3.5$ in equation (i), we have

$\Rightarrow$ $3.5 + q = 5$ $\Rightarrow$ $q = 5 - 3.5$ $\Rightarrow$ $q = 1.5$

$\therefore$ $p = 3.5$ and $q = 1.5$

$\therefore$ Option (b) is correct.

25. Given system of equations:

$3ax + 4y = -2$ ...(i)

$2x + by = 14$ ...(ii)

Since, $(-3, 4)$ is the solution of the system of equations.

$\therefore$ From equation (i), we have

$\Rightarrow$ $3a \times (-3) + 4 \times 4 = -2$

$\Rightarrow$ $-9a + 16 = -2$

$\Rightarrow$ $9a = 18$ $\Rightarrow$ $a = 2$

From equation (ii), we have

$\Rightarrow$ $2 \times (-3) + b \times 4 = 14$

$\Rightarrow$ $4b = 14 + 6$

$\Rightarrow$ $4b = 20$ $\Rightarrow$ $b = 5$

$\therefore$ $a = 2$ and $b = 5$

$\therefore$ Option (c) is correct.

26. Given system of equations:

$4x + 3y = 41$ ...(i)

$x + 3y = 26$ ...(ii)

To eliminate y, we subtract (ii) from (i), we get

$(4x - x) + 3y - 3y = 41 - 26$

$\therefore$ Option (c) is correct..

27. Since in the given graph, two lines intersect at a point so it has a unique solution.

Hence, option (b) is correct.

28. Option (b) is correct, because in this graph two lines intersect at a point. So, it has a unique solution.

29. Initially, total production costs for two products A and B is given by

$100x + 80y = 32000$

After reducing 20% production cost, we have

Total production costs= 25600

$80x + 64y = 25600$

$\therefore$ Option (a) is correct.

30. Raghav earned ₹3,550 by selling x bags and y baskets.

$\therefore$ $500x + 150y = 3550$

And, Aarav earned ₹3400 by selling same number of bags and baskets.

$\therefore$ $400x + 200y = 3400$

$\therefore$ Option (c) is correct.

31. Given, $x^{2n} - 1 + y^{m-4} = 0$ is a linear equation.

$\therefore$ $2n = 1$ and $m - 4 = 1$ $\Rightarrow$ $n = \frac{1}{2}$ and $m = 5$

$\therefore$ $x^{\frac{1}{2n}} + y^{\frac{m}{5}} = 0$ $\Rightarrow$ $x^{\frac{1}{1}} + y^{\frac{5}{5}} = 0$

$\Rightarrow$ $x + y = 0$ is a linear equation.

$\therefore$ Option (b) is correct.

32. Any equation of the form $ax + by + c = 0$ (where $a, b \neq 0$) is called linear equation in two variables, where a, b and c are constants.

$\therefore$ $5x - 2y = 0$ is a linear equation in two variables.

$\therefore$ Option (d) is correct.

33. Given equation is $ax + by = c$ and y-axis.

Equation of y-axis $= x = 0$

From given equation $a \times 0 + by = c$

$\Rightarrow 0 + by = c \Rightarrow y = \frac{c}{b}$

$\therefore$ Option (a) is correct.

34. Every linear equation in two variables has infinitely many solutions.

$\therefore$ Option (d) is correct.

35. Let the present age of father be x years and that of daughter be y years.

Five years hence.

Father's age $= (x + 5)$ years

Daughter's age $= (y + 5)$

From question,

$$x + 5 = 3(y + 5)$$

$$x - 3y = 10 \quad \ldots(i)$$

Five years ago

Father's age $= (x - 5)$ years

Daughter's age $= (y - 5)$ years

From question,

$$x - 5 = 7(y - 5)$$

$$\Rightarrow \quad x - 7y = -30 \quad \ldots(ii)$$

Subtracting (ii) from (i), we get

$$\begin{array}{r} x - 3y = 10 \\ x - 7y = -30 \\ \hline 4y = 40 \end{array} \quad \begin{array}{l} \\ \\ \Rightarrow y = 10 \end{array}$$

(–) (+) (+)

From equation (i), we have

$$x - 3 \times 10 = 10 \Rightarrow x = 40$$

So, age of father is 40 years and that of daughter is 10 years.

$\therefore$ Option (c) is correct.

36. The point (4, 3) satisfies the euqation $3x + 4y = 24$ only.

LHS $= 3x + 4y$

$\Rightarrow 3 \times 4 + 4 \times 3 = 12 + 12 = 24 =$ RHS

Hence (4, 3) lies on the line $3x + 4y = 24$.

$\therefore$ Option (c) is correct.

37. Let the speed of boat be x km/h and stream be y km/h.

Now, speed in upstream $= (x - y)$ km/h

Speed in downstream $= (x + y)$ km/h

According to question,

$$\frac{1}{x+y} = \frac{10}{60} \Rightarrow x + y = 6 \ldots (i)$$

and $$\frac{1}{x-y} = \frac{20}{60} \Rightarrow x - y = 3 \ \ldots (ii)$$

By adding (i) and (ii), we get

$$2x = 9 \Rightarrow x = \frac{9}{2} = 4.5 \text{ km/h}$$

Hence speed of boat in still water is 4.5 km/h.

$\therefore$ Option (d) is correct.

38. Let the two numbers are x and y.

According to question, $x + y = 1000 \ldots (i)$

$$x^2 - y^2 = 256000$$

$$(x + y)(x - y) = 256000 \Rightarrow 1000(x - y) = 256000 \text{ [From } (i)\text{]}$$

$$x - y = \frac{256000}{1000} \Rightarrow x - y = 256 \ldots (ii)$$

By adding (i) and (ii), we get

$$2x = 1256 \qquad \Rightarrow x = \frac{1256}{2} = 628$$

From equation (ii), we have

$$628 - y = 256 \Rightarrow y = 372$$

$\therefore$ Numbers are 628 and 372.

$\therefore$ Option (b) is correct.

39. Let ones place digit be x and tens place digit be y.

The given number is $10y + x$.

Number formed by interchanging digits is $10x + y$.

According to question,

$$x + 10y + 10x + y = 99 \Rightarrow x + y = 9 \qquad \ldots(i)$$

$$x - y = 3 \qquad \ldots(ii)$$

Adding (i) and (ii), we get

$$2x = 12 \Rightarrow x = 6$$

From equation (i), $6 + y = 9 \Rightarrow y = 3$

So, the number is $10y + x = 10 \times 3 + 6 = 36$

$\therefore$ Option (a) is correct.

40. Given equation are

$$x + 2y = 1.5 \qquad \ldots(i)$$

$$2x + y = 1.5 \qquad \ldots(ii)$$

Adding (i) and (ii)

$$3x + 3y = 3$$

or $$x + y = 1 \Rightarrow y = 1 - x$$

From equation (ii)

$$2x + (1 - x) = 1.5$$

$$x = 1.5 - 1 \Rightarrow x = 0.5$$

Now, $y = 1 - x \Rightarrow y = 1 - 0.5 = 0.5$

$\therefore$ Option (c) is correct.

41. Let the two numbers be x and y.

According to question,

$x + y = 35 \ldots (i)$ and $x - y = 13 \ldots (ii)$

Subtracting (ii) from (i)

$$\begin{array}{r} x + y = 35 \\ x - y = 13 \\ \hline (-)\ (+)\ (-) \\ 2y = 22 \end{array} \Rightarrow y = 11$$

From equation (i)

$x + 11 = 35 \Rightarrow x = 24$.

Therefore numbers are 24 and 11.

$\therefore$ Option (b) is correct.

42. Given equations are

$x - 2y = 3$ and $3x + ky = 1$

For unique solution $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$

$$\frac{1}{3} \neq \frac{-2}{k} \Rightarrow k \neq -6$$

$\therefore$ Option (b) is correct.

43. Let the numerator be x and denominator be y.

According to question,

$$x + y = 12 \quad \ldots (i) \quad \text{and} \quad \frac{x}{y+3} = \frac{1}{2} \quad \ldots (ii)$$

$\Rightarrow \quad y = 12 - x$

Put value of y in equation (ii), we have

$$\frac{x}{12 - x + 3} = \frac{1}{2} \Rightarrow \frac{x}{15 - x} = \frac{1}{2}$$

$\Rightarrow 2x = 15 - x \Rightarrow 3x = 15 \Rightarrow x = 5$

So, $y = 12 - x = 12 - 5 = 7$

Hence, the fraction is $\frac{5}{7}$.

$\therefore$ Option (b) is correct.

44. Coordinates of the triangle OPQ are $Q(4, 2)$, $O(0, 0)$ and $P(0, 5)$ on y-axis.

$\therefore$ Option (c) is correct.

45. All coincident lines have infinite number of solutions.

$\therefore$ Option (a) is correct.

46. From the given pair of linear equations

$$\frac{a_1}{a_2} = \frac{4}{2} = \frac{2}{1}, \ \frac{b_1}{b_2} = \frac{6}{3} = \frac{2}{1}, \ \frac{c_1}{c_2} = \frac{9}{6} = \frac{3}{2}$$

So, $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$ which is condition of parallel lines.

Hence, it has no solutions.

$\therefore$ Option (a) is correct.

47. Let two numbers be x and $3x$.

According to question

$$\frac{x+5}{3x+5} = \frac{1}{2}$$

$\Rightarrow \quad 2x + 10 = 3x + 5 \Rightarrow 2x - 3x = 5 - 10 \quad \Rightarrow \quad x = 5$

So, two numbers are 5 and 15.

$\therefore$ Option (b) is correct.

48. Given lines are $cx - y = 2$ and $6x - 2y = 3$

For infinitely many solutions, we have

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2} \quad \Rightarrow \quad \frac{c}{6} = \frac{-1}{-2} = \frac{-2}{-3} \quad \Rightarrow \quad \frac{c}{6} = \frac{1}{2} \text{ and } \frac{c}{6} = \frac{2}{3}$$

$$\Rightarrow \quad c = \frac{6}{2} \text{ and } c = 4 \quad \Rightarrow \quad c = 3 \text{ and } c = 4$$

Since, c has different values, hence, for no value of c, the pair of equations will have infinitely many solutions.

$\therefore$ Option (d) is correct.

51. Given, pair of equations

$$x + 2y + 5 = 0 \quad \text{and} \quad -3x - 6y + 1 = 0$$

$$\therefore \quad \frac{1}{-3} = \frac{2}{-6} \neq \frac{5}{1} \qquad \Rightarrow \qquad \frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$$

$\Rightarrow$ Lines are parallel $\Rightarrow$ No solution.

Hence, option (d) is correct.

54. Given lines,

$$2x - 3y - 7 = 0 \qquad \ldots(i)$$

and, $(a + b)x - (a + b - 3)y - (4a + b) = 0 \qquad \ldots(ii)$

For both lines to be coincident

$$\frac{2}{(a+b)} = -\frac{-3}{(a+b-3)} = \frac{-7}{-(4a+b)}$$

$$\Rightarrow \qquad \frac{2}{a+b} = \frac{3}{a+b-3}$$

$$\Rightarrow \qquad 2a + 2b - 6 = 3a + 3b$$

$$\Rightarrow \qquad 3a + 3b - 2a - 2b + 6 = 0$$

$$\Rightarrow \quad a + b + 6 = 0 \Rightarrow a + b = -6 \qquad \ldots(iii)$$

Again, $$\frac{2}{a+b} = \frac{7}{4a+b}$$

$$\Rightarrow \qquad 8a + 2b = 7a + 7b$$

$$\Rightarrow \qquad 8a - 7a = 7b - 2b \Rightarrow a = 5b$$

$$\Rightarrow \qquad a - 5b = 0 \qquad \ldots(iv)$$

Hence, option (c) is correct.

55. Given equations: $6x - 3y + 10 = 0$ and $2x - y + 9 = 0$;

Here, $a_1 = 6 \qquad b_1 = -3 \qquad c_1 = 10$

$a_2 = 2 \qquad b_2 = -1 \qquad c_2 = 9$

$$\frac{a_1}{a_2} = \frac{6}{2} = \frac{3}{1} \quad \frac{b_1}{b_2} = \frac{-3}{-1} = \frac{c_1}{c_2} = \frac{10}{9} \qquad \Rightarrow \qquad \frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$$

Hence, the given system has no solution and the equations will represent parallel lines.

So, option (*d*) is correct.

56. A pair of linear equations is consistent.

$\therefore$ It has unique or infinite solutions.

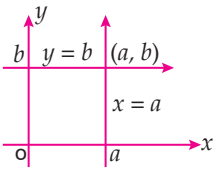
Hence, lines are either intersecting or coincident.

$\therefore$ Option (*c*) is correct.

57. Since both lines $y = 0$ and $y = -7$ are parallel, therefore there is no solution.

$\therefore$ Option (*d*) is correct.

58. If we represent $x = a$ and $y = b$ graphically then we get one is the lines parallel to *y*-axis and other is parallel to *x*-axis that intersect at point (a, b).



$\therefore$ Option (*d*) is correct.

59. Let unit digit be *x* and tens digit be *y*.

$\therefore$ Number $= 10y + x$

Given, $x + y = 9$ ...(*i*)

Also, $10y + x + 27 = 10x + y$

$\Rightarrow$ $9x - 9y = 27$

$\Rightarrow$ $x - y = 3$ ...(*ii*)

From equation (*i*) and (*ii*), we have

$$\begin{array}{r} x + y = 9 \\ x - y = 3 \\ \hline \text{On adding} \quad 2x = 12 \end{array} \Rightarrow \quad x = 6$$

Putting $x = 6$ in (*i*), we get $y = 3$

$\therefore$ Number $= 10y + x = 36$

Hence, option (*d*) is correct.

60. Given equations are: $5x - 15y = 8$ and $3x - 9y = \frac{24}{5}$

$$a_1 = 5 \qquad b_1 = -15 \qquad c_1 = -8$$

$$a_2 = 5 \qquad b_2 = -9 \qquad c_2 = \frac{-24}{5}$$

$$\frac{a_1}{a_2} = \frac{5}{3}, \qquad \frac{b_1}{b_2} = \frac{-15}{-9} = \frac{5}{3}, \quad \frac{c_1}{c_2} = \frac{-8}{-24} \times 5 = \frac{5}{3}$$

$$\Rightarrow \qquad \frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$$

Hence, the given system has infinitely many solutions. So option (*c*) is correct.

61. Let present age of son be *x* years.

Therefore, present age of father be $6x$ years.

After four years, we have

$6x + 4 = 4(x + 4) \quad \Rightarrow \quad 6x + 4 = 4x + 16$

$\Rightarrow$ $6x - 4x = 16 - 4 = 12 \quad \Rightarrow \quad 2x = 12$

$\Rightarrow$ $x = 6$

$\therefore$ Present age of son = 6 years

and present age of father = $6x = 6 \times 6 = 36$ years.

$\therefore$ Option (c) is correct.

62. By putting $x = a$ and $y = b$, we get

$$\begin{array}{rll} a - b = 2 & \cdots(i) \\ a + b = 4 & \ldots(ii) \\ \overset{(-)\ (-)\ (-)}{\hline -2b = -2} & \Rightarrow & b = \frac{-2}{-2} = 1 \end{array}$$

From equation (i)

$a - 1 = 2 \Rightarrow a = 3$ and $b = 1$

$\therefore$ Option (c) is correct.

SOLUTIONS OF CASE-BASED QUESTIONS

1. We have length of each bedroom be x m and length of kitchen be y m.

(i) Areas of two bedrooms and kitchen together = $2(x \times 5) + y \times 5$

$\Rightarrow \quad 95 = 10x + 5y$

$\Rightarrow \quad 2x + y = 19 \qquad \ldots(a)$

Also, Total length = $x + 2 + y$

$\Rightarrow \quad 15 = x + 2 + y \quad \Rightarrow \quad x + y = 13 \qquad \ldots(b)$

$\therefore$ Option (c) is correct.

(ii) Length of outer boundary of the layout = 15 + 12 + 15 + 12 = 54 metre

$\therefore$ Option (c) is correct.

(iii) Subtracting (b) from (a), we get

$x = 6$

Putting $x = 6$ in (b), we get $y = 7$

$\therefore \quad x = 6$ and $y = 7$

Area of each bedroom = length $\times$ breadth = $x \times 5 = 6 \times 5 = 30$ m^2

and area of kitchen = length $\times$ breadth

$= y \times 5 = 7 \times 5 = 35$ m^2

$\therefore$ Option (b) is correct.

(iv) Area of living room = 15×7 – area of bedroom 2

$= 15 \times 7 - x \times 5 = 15 \times 7 - 6 \times 5 = 105 - 30 = 75$ m^2

$\therefore$ Option (b) is correct.

(v) We have area of kitchen = 35 m^2

$\therefore$ Total cost of laying tiles in the kitchen at the rate of ₹50 per m^2

$= 35 \times 50 = 1750 =$ ₹1750

$\therefore$ Option (d) is correct.

2. (i) In city A, for journey of 10 km, the charge paid is ₹75.

$\therefore \quad x + 10y = 75 \qquad \ldots(i)$

where x be the fixed charge and y be the running charge per km.

Also, for journey of 15 km, the charge paid is ₹110.

$\therefore \quad x + 15y = 110 \qquad ...(ii)$

$\therefore$ Option (*b*) is correct.

(*ii*) When a person travels a distance of 50 km.

$\therefore$ Amount he has to pay $= x + 50\,y \qquad ...(iii)$

On solving equation (*i*) and (*ii*), we get $x = 5, y = 7$

putting in (*iii*), we have

Total payment $= x + 50y$

$= 5 + 50 \times 7 = ₹\ 355$

$\therefore$ Option (*c*) is correct.

(*iii*) **Referring Situation 2**

We have, In a city B, for a journey of 8 km, the charge paid is ₹91 and for a journey of 14 km, the charge paid is ₹145.

$\therefore \quad x + 8y = 91 \qquad ...(i)$

$x + 14y = 145 \qquad ...(ii)$

be the required pair of linear equations.

Subtracting (*i*) from (*ii*), we have

$6y = 54 \qquad \Rightarrow \quad y = 9$

from (*i*), we have

$x + 8 \times 9 = 91 \qquad \Rightarrow \quad x = 91 - 72 = 19$

$\therefore \quad x = 19$

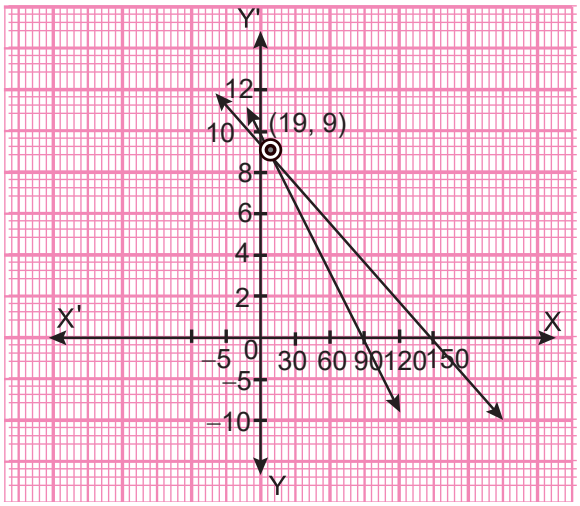
Total payment for travelling a distance of 30 km

$= x + 30y = 19 + 30 \times 9 = 19 + 270 = ₹289$

$\therefore$ Option (*b*) is correct.

(*iv*) From situation 2, we have pair of linear equations

$$\left.\begin{aligned} x + 8y &= 91 \\ x + 14y &= 145 \end{aligned}\right\}$$



and point of intersection of these lines is (19,9).

$\therefore$ Option (*c*) is correct.

(*v*) From the table given, we can easily find out that city A is more cheaper than city B as per the fare charge.

∴ Option (*a*) is correct.

3. Let the student answered x question correctly and y question incorrectly (wrong).

∴ Total number of questions = 120

$$x + y = 120 \qquad ...(i)$$

Also, one mark is awarded for each correct answer and ¼ mark is deducted for every wrong answer.

∴ Total marks student got = 90

$$x - \frac{1}{4}y = 90 \qquad ...(ii)$$

Subtracting (*ii*) from (*i*), we get

$$y + \frac{1}{4}y = 120 - 90 = 30$$

$$\frac{5y}{4} = 30 \Rightarrow y = 24$$

$$\Rightarrow x = 96$$

From (*ii*), $x - \frac{1}{4} \times 24 = 90$

(*i*) The student answered correctly 96 questions.

∴ Option (*c*) is correct.

(*ii*) The number of questions student guess (do incorrect) = 120 – 96 = 24.

∴ Option (*b*) is correct.

(*iii*) As the student answered all 120 questions in which 80 questions answered correctly *i.e.* rest 40 questions do incorrectly.

∴ Student got the marks = $80 - \frac{1}{4} \times 40 = 70$ marks

∴ Option (*b*) is correct.

(*iv*) Let student answered correctly x questions.

∴ $x - \frac{1}{4} \times (120 - x) = 95$

$\Rightarrow x - 30 + \frac{x}{4} = 95 \Rightarrow \frac{5x}{4} = 125 \Rightarrow x = 100$

∴ Option (*d*) is correct.

(*v*) Since the total question are 120.

If a student answered all questions correctly then he can score maximum marks *i.e*; 120.

∴ Option (*c*) is correct.

4. (*i*) We have, $y = 0.25x + 20$

When $x = 90$

∴ $y = 0.25 \times 90 + 20 = 42.50$

∴ Total cost for a month is ₹42.50.

∴ Option (*c*) is correct.

(*ii*) We have, total cost, $y = 0.08x + 40$

When $x = 90$ minutes then

Total cost for him = $y = 0.08 \times 90 + 40 = 47.20$

$\therefore$ Cost = ₹ 47.20

$\therefore$ Option (*d*) is correct.

(*iii*) We have, $x + 2y = -1$ ...(*i*) $\times 2$

$\underline{-\ 2x \mp 3y = -12}$ ...(*ii*)

On subtracting $7y = -14 \Rightarrow y = -2$

Putting $y = -2$ in equation (*i*), we get

$x + 2 \times (-2) = -1$

$\Rightarrow$ $x = -1 + 4 = 3 \Rightarrow x = 3$

$\therefore$ Solution is (3, –2).

$\therefore$ Option (*c*) is correct.

(*iv*) Given system of linear equations

$kx + 2y = 5$

$3x + y = 1$

For unique solution we have

$\Rightarrow \quad \frac{k}{3} \neq \frac{2}{1} \quad \Rightarrow \quad k \neq 6$

$\therefore$ Option (*c*) is correct.

(*v*) Given linear equations

$x + 2y - 4 = 0$

$2x + 4y - 12 = 0$

We have, $\frac{1}{2} = \frac{2}{4} \neq \frac{-4}{-12} \quad \Rightarrow \quad \frac{1}{2} = \frac{1}{2} \neq \frac{1}{3}$

i.e., $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

$\therefore$ It represent parallel lines.

$\therefore$ Option (*a*) is correct.

5. (*i*) Given linear equation $y = 100x + 30000$

and $y = 150x$

For there is no profit or loss, we have

$150x = 100x + 30000 \quad \Rightarrow \quad 150x - 100x = 30000$

$\Rightarrow \quad 50x = 30000 \quad \Rightarrow \quad x = 600$

$\therefore$ Option (*d*) is correct.

(*ii*) Given linear equations,

$y = 0.85x + 35000$ and $y = 1.55x$

$0.85x + 35000 = 1.55x$ (for break even point)

$\Rightarrow \quad 0.70x = 35000$

$\Rightarrow \quad x = 50000$

$\therefore \quad y = 1.55x = 1.55 \times 50000 = 77500$

$\therefore$ Break even point is (50000, 77500).

$\therefore$ Option (*a*) is correct.

(*iii*) We have, system of linear equations

$3x + 2y = 12$

$5x - 2y = 4$

Here, $\frac{a_1}{a_2} = \frac{3}{5}$, $\frac{b_1}{b_2} = \frac{2}{-2} = -1$

$\therefore \quad \frac{a_1}{a_2} \neq \frac{b_1}{b_2}$

$\therefore$ It has unique solution *i.e.*, lines are intersecting.

$\therefore$ Option (*b*) is correct.

(*iv*) We have, $x + y = 1$ ...(*i*) $\times 3$

$2x - 3y = 7$ ...(*ii*)

On adding $5x = 10$

$$x = \frac{10}{5} = 2$$

Putting $x = 2$ in (*i*), we get $y = -1$

$\therefore$ Solution is $(2, -1)$.

$\therefore$ Option (*c*) is correct.

(*v*) Given system of equation,

$4x + 5y = 3$

and $kx + 15y = 9$

For infinitely many solution

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$$

$$\frac{4}{k} = \frac{5}{15} = \frac{3}{9} \quad \Rightarrow \quad \frac{4}{k} = \frac{1}{3} \Rightarrow k = 12$$

$\therefore$ Option (*c*) is correct.

6. (*i*) We have,

$x + 3y = 6$ ...(*i*)

$2x - 3y = 12$ ...(*ii*)

On adding $3x = 18 \quad \Rightarrow \quad x = 6$

Putting $x = 6$ in (*i*), we get

$y = 0$

$\therefore$ Point of intersection *i.e* pivot point is $(6, 0)$.

$\therefore$ Option (*b*) is correct.

(*ii*) Given linear equations

$x + 3y = 6$ ...(*i*)

Its point on *y*–axis is when $x = 0$.

$\therefore \quad 0 + 3y = 6 \quad \Rightarrow \quad y = 2$

$\therefore$ Point on *y*–axis is $(0, 2)$.

and $2x - 3y = 12$ ...(*ii*)

When $x = 0$

$0 - 3y = 12 \quad \Rightarrow \quad y = -4$

$\therefore$ Point on *y*–axis is $(0, -4)$.

$\therefore$ Option (*c*) is correct.

(*iii*) Given system of linear equations

$x + 2y - 8 = 0$

and $2x + 4y - 16 = 0$

$\therefore \frac{a_1}{a_2} = \frac{1}{2}, \frac{b_1}{b_2} = \frac{2}{4} = \frac{1}{2}$ and $\frac{c_1}{c_2} = \frac{-8}{-16} = \frac{1}{2}$

$\Rightarrow \frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

$\therefore$ System has infinitely many solution.

$\therefore$ Option (*d*) is correct.

(*iv*) Since (1, 2) is the solution of $ax + y = 3$ ...(*i*)

and $2x + by = 12$ ...(*ii*)

$\therefore$ From (*i*), we have

$a \times 1 + 2 = 3 \quad \Rightarrow \quad a = 1$

From (*ii*), we have

$2 \times 1 + b \times 2 = 12$

$\Rightarrow \quad 2b = 10 \quad \Rightarrow \quad b = 5$

$\therefore$ Values of a and b are 1 and 5.

$\therefore$ Option (*a*) is correct.

(*v*) The system of equations is consistent. It means the lines are intersecting or coincident, *i.e* it has unique solution or infinitely many solution.

$\therefore$ Option (*d*) is correct.

7. (*i*) We have, $y = 0$ ....(*i*)

and $3x + 2y = 6$

$\Rightarrow \quad 3x + 2 \times 0 = 6$

$\Rightarrow \quad 3x = 6$ (from (*i*))

$\Rightarrow \quad x = 2$

$\therefore$ Point of contact is (2, 0).

$\therefore$ Option (*b*) is correct.

(*ii*) We have, $y = x$ ....(*i*)

and $x + y = 6$

$\Rightarrow \quad x + x = 6$ (from (*i*))

$\Rightarrow \quad 2x = 6 \quad \Rightarrow \quad x = 3$

$\Rightarrow \quad y = 3$ (from (*i*))

$\therefore$ Point of intersection is (3, 3).

$\therefore$ Option (*c*) is correct.

(*iii*) We have, $3x + 6y = 3900$

$x + 3y = 1300$

$\therefore \quad \frac{a_1}{a_2} = \frac{3}{1}, \frac{b_1}{b_2} = \frac{6}{3} = 2 \quad \Rightarrow \quad \frac{a_1}{a_2} \neq \frac{b_1}{b_2}$

$\therefore$ It is intersecting.

$\therefore$ Option (*b*) is correct.

(*iv*) Given system of linear equations

$$kx - 5y = 2 \quad \text{and} \quad 6x + 2y = 7$$

has no solution if

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2} \qquad \Rightarrow \qquad \frac{k}{6} = \frac{-5}{2} \neq \frac{2}{7}$$

$$\Rightarrow \quad \frac{k}{6} = \frac{-5}{2} \qquad \Rightarrow \qquad k = -15$$

$\therefore$ Option (*d*) is correct.

(*v*) We have equation

$$3x + 2y = 6$$

Point where this line intersects the *y*–axis is $x = 0$ on putting we get

$$3 \times 0 + 2y = 6$$

$$\Rightarrow \quad 2y = 6 \qquad \Rightarrow \qquad y = 3$$

$\therefore$ Point on *y*–axis is (0, 3).

$\therefore$ Option (*a*) is correct.

8. (*i*) We have pair of linear equations

$$\begin{array}{lll} y - 2x = 1 & \ldots(i) & \times 5 \\ 5y - x = 14 & \ldots(ii) & \\ - \quad + \quad - & & \\ \hline -9x = -9 \quad \Rightarrow \quad x = 1 & & \end{array}$$

From (*i*), we get $y = 1 + 2x = 1 + 2 \times 1 = 3$

$\therefore$ Point of intersection of lines is (1, 3).

$\therefore$ Option (*d*) is correct.

(*ii*) We have, $y - 2x = 1$

We know any point on *y*-axis has *x* co-ordinate 0.

$\therefore$ Putting $x = 0$, we get

$$y - 2 \times 0 = 1 \qquad \Rightarrow \qquad y = 1$$

$\therefore$ Point on *y*–axis is (0, 1).

$\therefore$ Option (*b*) is correct.

(*iii*) We have system of linear equations

$$2x - 3y + 6 = 0 \quad \text{and} \quad 2x + 3y - 18 = 0$$

$\therefore$ For unique solution, we have

$$\frac{a_1}{a_2} = \frac{2}{2} = 1, \ \frac{b_1}{b_2} = \frac{-3}{3} = -1$$

$\therefore$ $\dfrac{a_1}{a_2} \neq \dfrac{b_1}{b_2}$ $\Rightarrow$ It has a unique solution.

$\therefore$ Option (*a*) is correct.

(*iv*) Given system of linear equations

$$2x - ky + 3 = 0 \quad \text{and} \quad 3x + 2y - 1 = 0$$

For no solution we have, $\dfrac{a_1}{a_2} = \dfrac{b_1}{b_2} \neq \dfrac{c_1}{c_2}$

$$\Rightarrow \quad \frac{2}{3} = \frac{-k}{2} \neq \frac{3}{-1} \quad \Rightarrow \quad \frac{2}{3} = \frac{-k}{2} \qquad \Rightarrow \quad k = \frac{-4}{3}$$

$\therefore$ Option (b) is correct.

(v) When two lines are parallel then the pair of linear equations is inconsistent.

$\therefore$ Option (b) is correct.

SOLUTIONS OF ASSERTION-REASON QUESTIONS

1. From the given equations, we have

$$\frac{9}{18} = \frac{3}{6} = \frac{12}{24} \qquad \Rightarrow \quad \frac{1}{2} = \frac{1}{2} = \frac{1}{2} \; i.e., \frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$$

So, both A and R are correct and R explains A.

Hence, option (a) is correct.

2. For inconsistent solution we have

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$$

So, A is correct but R is incorrect.

Hence, option (c) is correct.

3. As $x = 3, y = 1$ is the solution of $2x + y - q^2 - 3 = 0$.

$\therefore \quad 2 \times 3 + 1 - q^2 - 3 = 0 \quad \Rightarrow 4 - q^2 = 0$

$\Rightarrow \quad q^2 + 4 \qquad\qquad \Rightarrow q = \pm 2$

So, both A and R are correct and R explains A.

Hence, option (a) is correct.

4. Given system of linear equations has a unique solution if $\frac{k}{6} \neq \frac{-1}{-2}$.

$$\Rightarrow \qquad \frac{k}{6} \neq \frac{1}{2} \quad \Rightarrow \quad k \neq 3$$

So, A is incorrect and R is correct.

Hence, option (d) is correct.

04 COORDINATE GEOMETRY

BASIC CONCEPTS & FORMULAE

1. The distance between two points $A(x_1, y_1)$ and $B(x_2, y_2)$ is given by
$$AB = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$
2. The distance of a point (x, y) from the origin $(0, 0)$ is $\sqrt{(x^2 + y^2)}$.
3. The coordinates of a point on x-axis is taken as $(x, 0)$ while on y-axis it is taken as $(0, y)$ respectively.
4. **Section formula:** The coordinates of the point $P(x, y)$ which divides the line segment joining $A(x_1, y_1)$ and $B(x_2, y_2)$ internally in the ratio $m : n$ are given by
$$x = \frac{mx_2 + nx_1}{m + n}, \; y = \frac{my_2 + ny_1}{m + n}$$
5. **Mid-point formula:** Coordinates of mid-point of AB, where $A(x_1, y_1)$ and $B(x_2, y_2)$ are
$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$
6. **Centroid of a triangle and its coordinates:** The medians of a triangle are concurrent. Their point of concurrence is called the centroid. It divides each median in the ratio 2 : 1. The coordinates of centroid of a triangle with vertices $A(x_1, y_1)$, $B(x_2, y_2)$ and $C(x_3, y_3)$ are given by.
$$\left(\frac{x_1 + x_2 + x_3}{3}, \frac{y_1 + y_2 + y_3}{3}\right)$$

MULTIPLE CHOICE QUESTIONS

Choose and write the correct option in the following questions.

1. **Point on y-axis has coordinate**
(a) $(-a, b)$ (b) $(a, 0)$ (c) $(0, b)$ (d) $(-a, -b)$
2. **The perimeter of a triangle with vertices (0, 4), (0, 0) and (3, 0) is**
(a) 5 units (b) 12 units (c) 11 units (d) 10 units
3. **The ratio in which x-axis divides the line segment joining $A(2, -3)$ and $B(5, 6)$ is**
(a) 3 : 5 (b) 1 : 2 (c) 2 : 1 (d) 2 : 3
4. **If the point $C(x, 3)$ divides the line joining points $A(2, 6)$ and $B(5, 2)$ in the ratio 2 : 1 then the value of x is**
(a) 4 (b) 8 (c) 6 (d) 3
5. **The mid point of the line segment joining the points (– 5, 7) and (– 1, 3) is**
(a) (– 3, 7) (b) (– 3, 5) (c) (– 1, 5) (d) (5, – 3)
6. **The distance of the point $P(3, 4)$ from the origin is**
(a) 7 units (b) 5 units (c) 4 units (d) 3 units

7. **The distance between the lines $2x + 4 = 0$ and $x - 5 = 0$, is**

(*a*) 9 units (*b*) 1 unit (*c*) 5 units (*d*) 7 units

8. **A line intersects the *y*-axis and *x*-axis at the points *P* and *Q*, respectively. If (2, –5) is the mid-point of *PQ*, then the coordinates of *P* and *Q* are, respectively** [*NCERT Exemplar*]

(*a*) (0, –5) and (2, 0) (*b*) (0, 10) and (–4, 0) (*c*) (0, 4) and (–10, 0) (*d*) (0, –10) and (4, 0)

9. **The perpendicular bisector of the line segment joining the points *A* (1, 5) and *B* (4, 6) cuts the *y*-axis at** [*NCERT Exemplar*]

(*a*) (0, 13) (*b*) (0, –13) (*c*) (0, 12) (*d*) (13, 0)

10. **If $P\left(\frac{a}{3}, 4\right)$ is the mid-point of the line segment joining the points *Q* (–6, 5) and *R* (–2, 3), then the value of *a* is** [*NCERT Exemplar*]

(*a*) –4 (*b*) –12 (*c*) 12 (*d*) –6

11. **If the point *P* (2, 1) lies on the line segment joining points *A* (4, 2) and *B* (8, 4), then**

(*a*) $AP = \frac{1}{3}AB$ (*b*) $AP = PB$ (*c*) $PB = \frac{1}{3}AB$ (*d*) $AP = \frac{1}{2}AB$

12. **The points which lie on the perpendicular bisector of the line segment joining the points *A* (–2, –5) and *B* (2, 5) is** [*NCERT Exemplar*]

(*a*) (0, 0) (*b*) (0, 2) (*c*) (2, 0) (*d*) (–2, 0)

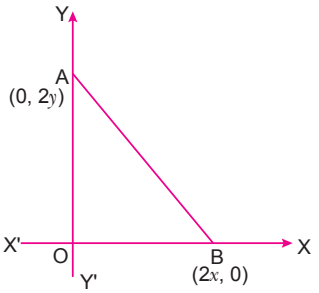
13. **The point which divides the line segment joining the points (7, –6) and (3, 4) in ratio 1 : 2 internally lies in the** [*NCERT Exemplar*]

(*a*) I quadrant (*b*) II quadrant (*c*) III quadrant (*d*) IV quadrant

14. **The coordinates of the point where line $\frac{x}{a} + \frac{y}{b} = 7$ intersects *y*-axis are**

(*a*) $(a, 0)$ (*b*) $(0, b)$ (*c*) $(0, 7b)$ (*d*) $(7a, 0)$

15. **The coordinates of the point which is equidistant from the three vertices of the triangle shown in the given figure are**



(*a*) (x, y) (*b*) (y, x) (*c*) $\left(\frac{x}{2}, \frac{y}{2}\right)$ (*d*) $\left(\frac{y}{2}, \frac{x}{2}\right)$

16. **The end points of diameter of circle are (2, 4) and (–3, –1). The radius of the circle is**

(*a*) $\frac{5\sqrt{2}}{2}$ units (*b*) $5\sqrt{2}$ units (*c*) $3\sqrt{2}$ units (*d*) $\frac{\pm 5\sqrt{2}}{2}$ units

17. **The point *A* (–5, 6) is at a distance of**

(*a*) $\sqrt{61}$ units from origin (*b*) $\sqrt{11}$ units from origin

(*c*) 61 units from origin (*d*) 11 units from origin

18. **The distance of the point *P* (–6, 8) from the origin is** [*NCERT Exemplar*]

(*a*) 8 units (*b*) $2\sqrt{7}$ units (*c*) 10 units (*d*) 6 units

19. **The distance between the points A (0, 6) and B (0, –2) is** [*NCERT Exemplar*]

(a) 6 units (b) 8 units (c) 4 units (d) 2 units

20. **The distance of the point P (2, 3) from the x-axis is** [*NCERT Exemplar*]

(a) 2 units (b) 3 units (c) 1 units (d) 5 units

21. **The points A (9, 0), B (9, 6), C (–9, 6) and D (–9, 0) are the vertices of a** [*NCERT Exemplar*]

(a) square (b) rectangle (c) rhombus (d) trapezium

22. **The mid-point of the line segment joining the points A (–2, 8) and B (–6, –4) is** [*NCERT Exemplar*]

(a) (–4, –6) (b) (2, 6) (c) (–4, 2) (d) (4, 2)

23. **If the distance between the points (2, –2) and (–1, x) is 5, one of the values of x is** [*NCERT Exemplar*]

(a) –2 (b) 2 (c) –1 (d) 1

24. **Komal was asked to plot a point 10 units on the left of the origin and other points 4 units directly above the origin. Which of the following are the two points?** [*CBSE Question Bank*]

(a) (10, 0) and (0, 4) (b) (–10, 0) and (0, 4) (c) (10, 0) and (0, –4) (d) (–10, 0) and (4, 0)

25. **Three points lie on a vertical line. Which of the following could be those points?** [*CBSE Question Bank*]

(a) (– 8, 3), (– 8, 8), (8, 7) (b) (–8, 7), (–8, –8), (–8, –100)

(c) (4, 3), (5, 3), (–12, 3) (d) (0, 4), (4, 0), (0, 0)

26. **On a graph, two-line segments, AB and CD of equal length are drawn. Which of these could be the coordinates of the points, A, B, C and D?** [*CBSE Question Bank*]

(a) A(–3, 4), B(–1, –2) and C(3, 4) D(1, 2) (b) A(3, 4), B(–1, 2) and C(3, 4), D(1, 2)

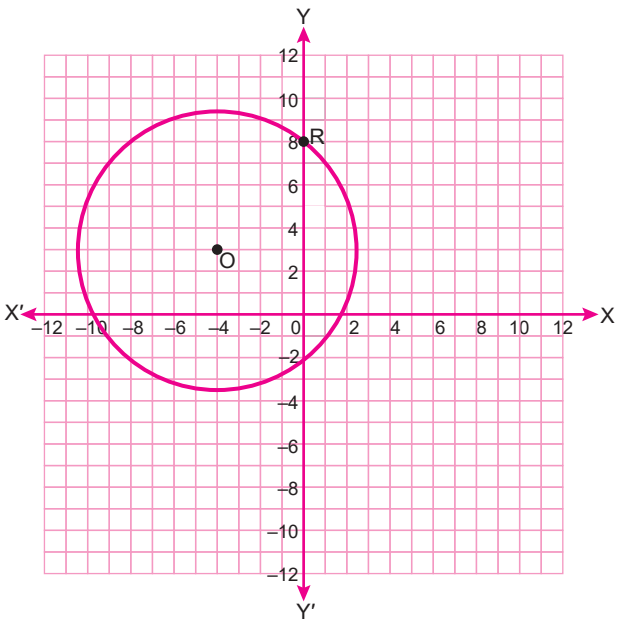
(c) A(–3, 4), B(–1, 2) and C(3, 4) D(1, 2) (d) A(–3, –4), B(–1, 2) and C(3, 4), D(1, 2)

27. **The distance between two points, M and N, on a graph is given as $\sqrt{10^2 + 7^2}$. The coordinates of point M are (–4, 3). Given that the point N lies in the first quadrant, which of the following is true about the all possible x coordinates of point N?** [*CBSE Question Bank*]

(a) They are multiple of 3. (b) They are multiple of 4.

(c) They are multiple of 5. (d) They are multiple of 6.

28. **The graph of a circle with centre O with point R on its circumference is shown.**



What is the side length of the square that circumscribes the circle? [*CBSE Question Bank*]

(*a*) $\sqrt{41}$ (*b*) $2\sqrt{41}$ (*c*) $\sqrt{17}$ (*d*) $3\sqrt{17}$

29. **On a coordinate grid, the location of a bank is (–4, 8) and the location of a post office is (2, 0). The scale used is 1 unit = 50 m. What is the shortest possible distance between the bank and the post office?** [*CBSE Question Bank*]

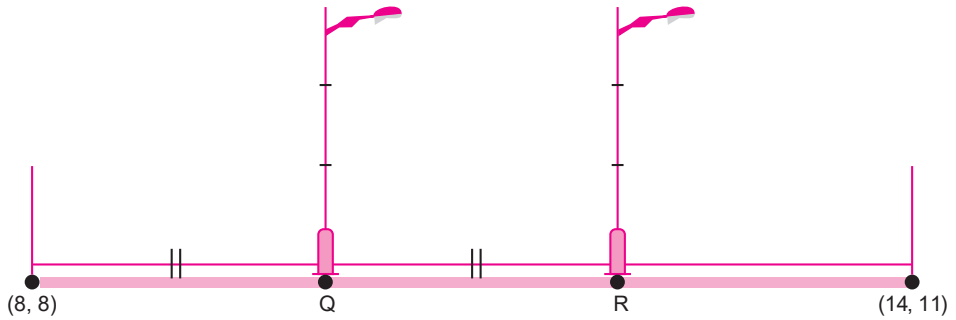
(*a*) 200 m (*b*) 300 m (*c*) 400 m (*d*) 500 m

30. **A point G divides a line segment in the ratio 3:7. The segment starts at the origin and ends at a point *K* having 20 as its abscissa and 40 as its ordinate. Given that *G* is closer to the origin than to point *K*,**

Which of the following are the coordinates of point *G*? [*CBSE Question Bank*]

(*a*) (6, 12) (*b*) (12, 6) (*c*) (14, 28) (*d*) (28, 14)

31. **Two poles are to be installed on an elevated road as shown in the diagram. The diagram also shows the starting and ending points of the road.**



Which of the following are the coordinates of the poles? [*CBSE Question Bank*]

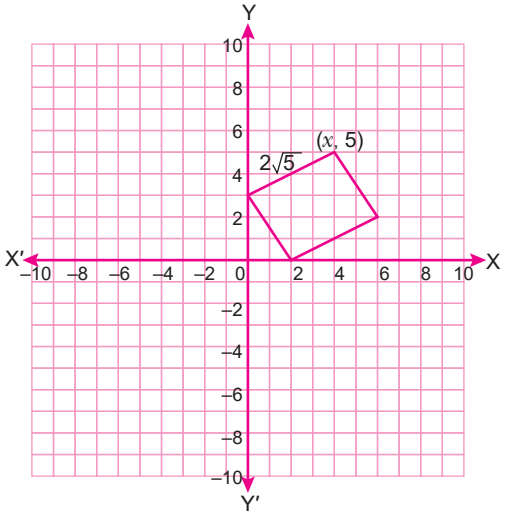
(*a*) *Q* (10, 9) and *R* (12, 8) (*b*) *Q* (10, 9) and *R* (12, 10)

(*c*) *Q* (10, 8) and *R* (12, 11) (*d*) *Q* (–10, 9) and *R* (0, 11)

32. **Which of the following are the coordinates of the intersection points of the diagonals of the rectangle *ABCD* with vertices *A*(0, 3), *B*(3, 0), *C*(1, –2) and *D*(–2, 1)?** [*CBSE Question Bank*]

(*a*) $\left(\frac{1}{2}, \frac{1}{2}\right)$ (*b*) $\left(-\frac{1}{2}, -\frac{1}{2}\right)$ (*c*) (1.5, 1.5) (*d*) (2, –1)

33. **The figure shows a parallelogram with one of its vertices intersecting the *y*-axis at 3 and another vertex intersecting the *x*-axis at 2.**



If (m, n) is the intersection point of the diagonals of the parallelogram, which relation is correct? [*CBSE Question Bank*]

(*a*) $m = n - 0.5$ (*b*) $m = n - 1.50$ (*c*) $m = 0.5 + n$ (*d*) $m = 1.50 + n$

34. The point $P(1, 2)$ divides the line joining of $A(-2, 1)$ and $B(7, 4)$ in the ratio

(*a*) 1:2 (*b*) 2:1 (*c*) 3:2 (*d*) 2:3

35. Let $A(4, 2)$, $B(6, 5)$ and $C(1, 4)$ be the vertices of ΔABC. The median from A meets BC at D. Then the co-ordinates of the point D are

(*a*) $\left(5, \frac{7}{2}\right)$ (*b*) $\left(\frac{7}{2}, \frac{9}{2}\right)$ (*c*) $\left(\frac{5}{2}, 3\right)$ (*d*) $\left(\frac{5}{2}, \frac{7}{2}\right)$

36. Centre of circle is at $(-1, 3)$ and one end of a diameter has coordinates $(2, 5)$, the co-ordinates of the other end are

(*a*) $(-4, 1)$ (*b*) $(1, -4)$ (*c*) $(4, -1)$ (*d*) $(3, 2)$

37. The points $A(0, 6)$, $B(-5, 3)$ and $C(3, 1)$ are the vertices of a triangle which is

(*a*) isosceles (*b*) equilateral

(*c*) scalene (*d*) none of these

38. The point which divides the line segment joining the points $(8, -9)$ and $(2, 3)$ in ratio $1 : 2$ internally lies in the [*CBSE Sample Question Paper 2020*]

(*a*) I quadrant (*b*) II quadrant

(*c*) III quadrant (*d*) IV quadrant

39. The distance of the point $P(-3, -4)$ from the x-axis (in units) is [*CBSE Sample Question Paper 2020*]

(*a*) 3 (*b*) – 3 (*c*) 4 (*d*) 5

40. If $A\left(\frac{m}{3}, 5\right)$ is the mid-point of the line segment joining the points $Q(-6, 7)$ and $R(-2, 3)$, then the value of m is [*CBSE Sample Question Paper 2020*]

(*a*) –12 (*b*) – 4 (*c*) 12 (*d*) – 6

41. If the point $P(k, 0)$ divides the line segment joining the points $A(2, -2)$ and $B(-7, 4)$ in the ratio $1 : 2$, then the value of k is [*CBSE* 2020 (30/1/1)]

(*a*) 1 (*b*) 2 (*c*) – 2 (*d*) – 1

42. The point P on x-axis equidistant from the points $A(-1, 0)$ and $B(5, 0)$ is [*CBSE* 2020 (30/2/1)]

(*a*) (2, 0) (*b*) (0, 2) (*c*) (3, 0) (*d*) (2, 2)

43. The co-ordinates of the point which is reflection of point $(-3, 5)$ in x-axis are [*CBSE* 2020 (30/2/1)]

(*a*) (3, 5) (*b*) (3, –5) (*c*) (–3, –5) (*d*) (–3, 5)

44. If the point $P(6, 2)$ divides the line segment joining $A(6, 5)$ and $B(4, y)$ in the ratio $3 : 1$, then the value of y is [*CBSE* 2020 (30/2/1)]

(*a*) 4 (*b*) 3 (*c*) 2 (*d*) 1

45. If (a, b) is the mid-point of the line segment joining the points $A(10, -6)$ and $B(k, 4)$ and $a - 2b = 18$, the value of k is [*CBSE* 2020 (30/3/1)]

(*a*) 30 (*b*) 22 (*c*) 4 (*d*) 40

46. Point $P\left(\frac{a}{8}, 4\right)$ is the mid-point of the line segment joining the points A (–5, 2) and B (4, 6). The value of 'a' is [*CBSE* 2020 (30/4/1)]

(*a*) – 4 (*b*) 4 (*c*) – 8 (*d*) – 2

47. The point on the x-axis which is equidistant from (–4, 0) and (10, 0) is [*CBSE* 2020 (30/5/1)]

(*a*) (7, 0) (*b*) (5, 0) (*c*) (0, 0) (*d*) (3, 0)

48. The centre of a circle whose end points of a diameter are (–6, 3) and (6, 4) is [*CBSE* 2020 (30/5/1)]

(*a*) (8, –8) (*b*) (4, 7) (*c*) $\left(0, \frac{7}{2}\right)$ (*d*) $\left(4, \frac{7}{2}\right)$

49. The distance between the points (m, – n) and (– m, n) is [*CBSE* 2020 (30/5/1)]

(*a*) $\sqrt{m^2 + n^2}$ (*b*) $m + n$ (*c*) $2\sqrt{m^2 + n^2}$ (*d*) $\sqrt{2m^2 + 2n^2}$

50. If the distance between the points (4, p) and (1, 0) is 5, then the value of p is

(*a*) 4 only (*b*) ± 4 (*c*) –4 only (*d*) 0

51. What point on x-axis is equidistant from the points A(7, 6) and B(–3, 4)?

(*a*) (0, 4) (*b*) (–4, 0) (*c*) (3, 0) (*d*) (0, 3)

52. A point P divides the join of A(5, –2) and B(9, 6) in the ratio 3:1. The co-ordinates of P are

(*a*) (4, 7) (*b*) (8, 4) (*c*) $\left(\frac{11}{2}, 5\right)$ (*d*) (12, 8)

53. If C(–1, 1) is the mid point of the line segment joining A(–3, b) and B(1, b + 4), then the value of b is

(*a*) 1 (*b*) 3 (*c*) –1 (*d*) 2

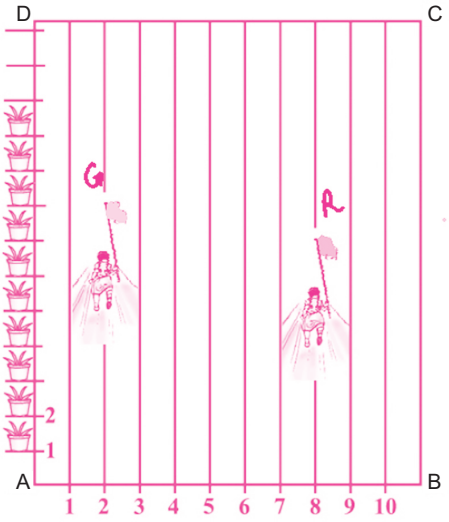
Answers

1. (*c*)	**2.** (*b*)	**3.** (*b*)	**4.** (*a*)	**5.** (*b*)	**6.** (*b*)
7. (*d*)	**8.** (*d*)	**9.** (*a*)	**10.** (*b*)	**11.** (*d*)	**12.** (*a*)
13. (*d*)	**14.** (*c*)	**15.** (*a*)	**16.** (*a*)	**17.** (*a*)	**18.** (*c*)
19. (*b*)	**20.** (*b*)	**21.** (*b*)	**22.** (*c*)	**23.** (*b*)	**24.** (*b*)
25. (*b*)	**26.** (*c*)	**27.** (*a*)	**28.** (*b*)	**29.** (*d*)	**30.** (*a*)
31. (*b*)	**32.** (*a*)	**33.** (*c*)	**34.** (*a*)	**35.** (*b*)	**36.** (*a*)
37. (*a*)	**38.** (*d*)	**39.** (*c*)	**40.** (*a*)	**41.** (*d*)	**42.** (*a*)
43. (*c*)	**44.** (*d*)	**45.** (*b*)	**46.** (*a*)	**47.** (*d*)	**48.** (*c*)
49. (*c*)	**50.** (*b*)	**51.** (*c*)	**52.** (*b*)	**53.** (*c*)	

CASE-BASED QUESTIONS

1. Read the following and answer any four questions from (*i*) to (*v*).

In order to conduct Sports Day activities in your School, lines have been drawn with chalk powder at a distance of 1 m each, in a rectangular shaped ground $ABCD$, 100 flowerpots have been placed at a distance of 1 m from each other along AD, as shown in given figure below. Niharika runs 1/4 th the distance AD on the 2nd line and posts a green flag. Preet runs 1/5th distance AD on the eighth line and posts a red flag. [*CBSE Question Bank*]



Now she asked some questions to the students as given below:

(*i*) The position of green flag is

(*a*) (2, 25) (*b*) (2, 0.25) (*c*) (25, 2) (*d*) (0, –25)

(*ii*) The position of red flag is

(*a*) (8, 0) (*b*) (20, 8) (*c*) (8, 20) (*d*) (8, 0.2)

(*iii*) The distance between both the flags is

(*a*) $\sqrt{41}$ (*b*) $\sqrt{11}$ (*c*) $\sqrt{61}$ (*d*) $\sqrt{51}$

(*iv*) If Rashmi has to post a blue flag exactly halfway between the line segment joining the two flags, where should she post her flag?

(*a*) (5, 22.5) (*b*) (10, 22) (*c*) (2, 8.5) (*d*) (2.5, 20)

(*v*) If Joy has to post a flag at one-fourth distance from green flag in the line segment joining the green and red flags, then where should he post his flag?

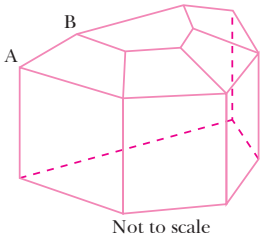
(*a*) (3.5, 24) (*b*) (0.5, 12.5) (*c*) (2.25, 8.5) (*d*) (25, 20)

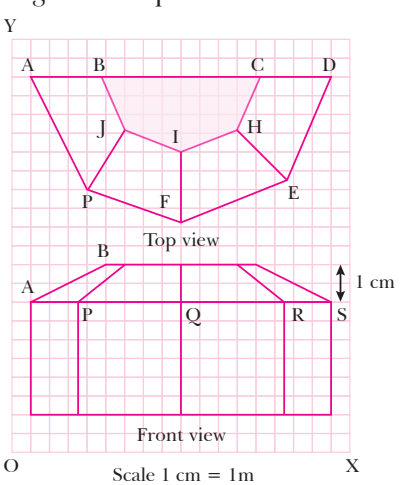
2. Read the following and answer any four questions from (*i*) to (*v*).

SUN ROOM *[CBSE Sample Paper 2020-21]*

The diagrams show the plans for a sun room. It will be built onto the wall of a house. The four walls of the sun room are square clear glass panels. The roof is made using

- Four clear glass panels, trapezium in shape, all the same size
- One tinted glass panel, half a regular octagon in shape





(*i*) Refer to Top View

The mid-point of the segment joining the points *J* (6, 17) and *I* (9, 16) is

(*a*) (33/2, 15/2) (*b*) (3/2, 1/2) (*c*) (15/2, 33/2) (*d*) (1/2, 3/2)

(*ii*) Refer to Top View

The distance of the point *P* from the *y*-axis is

(*a*) 4 (*b*) 15 (*c*) 19 (*d*) 25

(*iii*) Refer to Front View

The distance between the points *A* and *S* is

(*a*) 4 (*b*) 8 (*c*) 16 (*d*) 20

(*iv*) Refer to Front View

The co-ordinates of the point which divides the line segment joining the points *A* and *B* in the ratio 1:3 internally are

(*a*) (8.5, 2.0) (*b*) (2.0, 9.5) (*c*) (3.0, 7.5) (*d*) (2.0, 8.5)

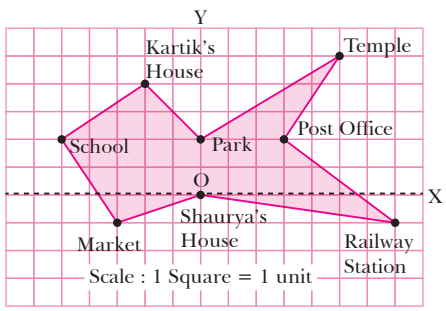
(*v*) Refer to Front View

If a point (*x*, *y*) is equidistant from *Q*(9, 8) and *S*(17, 8), then

(*a*) $x + y = 13$ (*b*) $x - 13 = 0$ (*c*) $y - 13 = 0$ (*d*) $x - y = 13$

3. Read the following and answer any four questions from (*i*) to (*v*).

Shaurya made a map of his locality on a coordinate plane



(*i*) If he considered his house as the origin, then coordinates of market are

(*a*) (3, –1) (*b*) (–3, –1) (*c*) (–3, 1) (*d*) (3, 1)

(*ii*) The distance of his friend Kartik's house from his house is

(*a*) $\sqrt{20}$ units (*b*) $\sqrt{10}$ units (*c*) 20 units (*d*) 10 units

(*iii*) There is a fort at a distance of 10 units from his house. If its ordinate is 6, then its abscissa is

(*a*) ± 2 (*b*) 0 (*c*) ± 4 (*d*) ± 8

(*iv*) The coordinates of the point which divides the line segment joining school and park internally in the ratio 3 : 2 are

(*a*) (–2, 2) (*b*) (–2, –2) (*c*) (2, 3) (*d*) (2, –2)

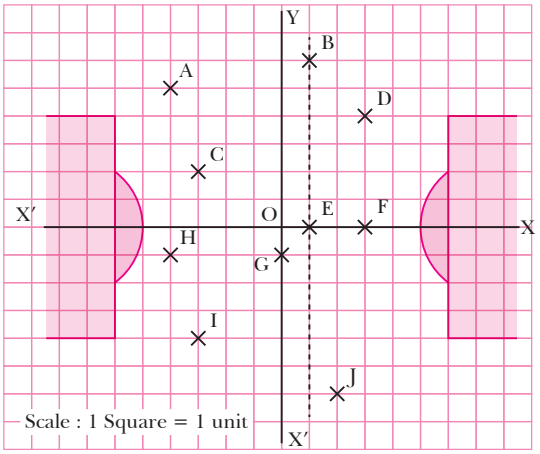
(*v*) If you form a polygon with vertex as position of park, Shaurya's home, railway station, post office and temple, then the polygon is

(*a*) Regular polygon (*b*) Convex Polygon

(*c*) Concave Polygon (*d*) Rhombus

4. Read the following and answer any four questions from (*i*) to (*v*).

A coach is discussing the strategy of the game with his players. The position of players is marked with '×' in the figure.



(*i*) If O is taken as the origin, the point whose abscissa equal to zero is

(*a*) H (*b*) E (*c*) G (*d*) F

(*ii*) The distance between the player C and B is

(*a*) 5 units (*b*) $4\sqrt{2}$ units (*c*) $2\sqrt{5}$ units (*d*) $5\sqrt{2}$ units

(*iii*) The player who is 6 units from *x*-axis and 2 units to the right of *y*-axis is at position

(*a*) J (*b*) B (*c*) I (*d*) A

(*iv*) If (*x*, *y*) are the coordinates of the mid-point of the line segment joining A and H, then

(*a*) $x = -4, y = 2$ (*b*) $x = 2, y = 4$

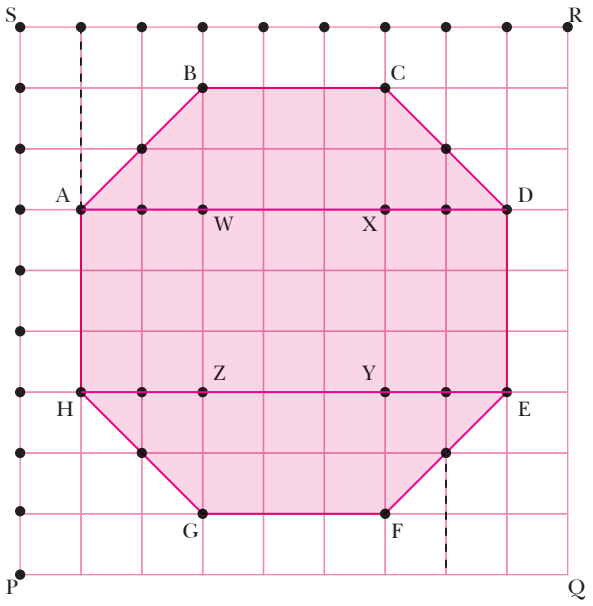
(*c*) $x = -2, y = 4$ (*d*) $x = -4, y = -2$

(*v*) According to sudden requirement coach of the team decided to increase one player in the 4th quadrant without increasing the total number of players, so he decided to change the position of player F in such a way that F becomes symmetric to D w.r.t *x* axis, then new position of F is

(*a*) (3, 4) (*b*) (3, – 4) (*c*) (–4, 3) (*d*) (4, 3)

5. Read the following and answer any four questions from (*i*) to (*v*).

The children of a school prepared a dance item for Republic Day parade for which they were asked to form a rectangle by standing at a fixed distance, taken as one unit. Some children, then formed a pattern inside the rectangle.



(*i*) If *P* is considered as the origin, the coordinates of *B* are

(*a*) (8, 5) (*b*) (3, 8) (*c*) (8, 0) (*d*) (0, 3)

(*ii*) The distance between the children standing at H and G is

(*a*) 8 units (*b*) 2 units (*c*) 5 units (*d*) $\sqrt{8}$ units

(*iii*) The coordinate of the point that divides the line segment joining the points *A* and *D* in the ratio 2 : 3 internally are

(*a*) $\left(6, \frac{19}{5}\right)$ (*b*) (6, 6) (*c*) (6, 2) (*d*) $\left(\frac{19}{5}, 6\right)$

(*iv*) If a point (*x*, *y*) is equidistant from *C*(6, 8) and *F*(6, 1) then

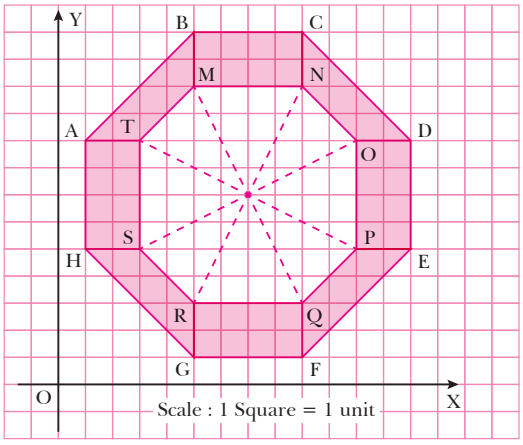
(*a*) $2x - 7y + 36 = 0$ (*b*) $144y = 63$ (*c*) $x - y = 5$ (*d*) $x + y = 5$

(*v*) The coordinates of the point *P* if *H* is taken as the origin are

(*a*) (2, 3) (*b*) (–1, –3) (*c*) (–2, 3) (*d*) (2, –3)

6. Read the following and answer any four questions from (*i*) to (*v*).

The top of a table is shown in the figure given below:



(*i*) The coordinates of the points H and G are respectively

(*a*) (1, 5), (5, 1) (*b*) (0, 5), (5, 0) (*c*) (1, 5), (5, 0) (*d*) (5, 1), (1, 5)

(*ii*) The distance between the points A and B is

(*a*) 4 units (*b*) $4\sqrt{2}$ units (*c*) 16 units (*d*) 32 units

(*iii*) The coordinates of the mid point of line segment joining points M and Q are

(*a*) (9, 3) (*b*) (5, 11) (*c*) (14, 14) (*d*) (7, 7)

(*iv*) Which among the following have same ordinate?

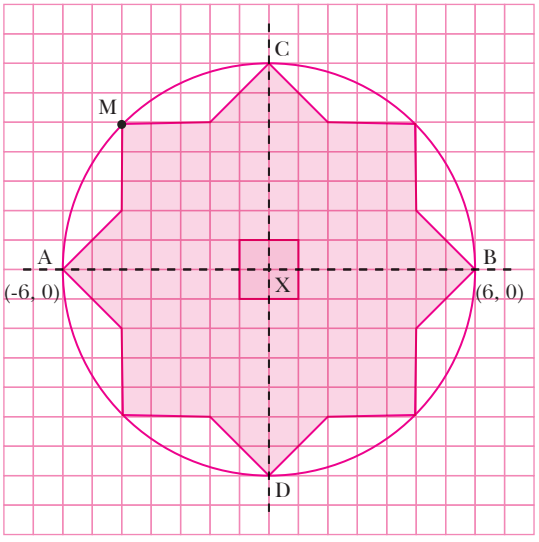
(*a*) H and A (*b*) T and O (*c*) R and M (*d*) N and R

(*v*) If G is taken as the origin, and *x*, *y* axis put along GF and GB, then the point denoted by coordinate (4, 2) is

(*a*) H (*b*) F (*c*) Q (*d*) R

7. Read the following and answer any four questions from (*i*) to (*v*).

A rangoli design was made by Ishita using coordinate plane.



(*i*) If coordinates of centre *X* are (0, 0) and *B* is a point on circle with coordinates (7, 0), then coordinate of *C* and *D* are respectively

(*a*) (0, 7), (0, – 7) (*b*) (0, –7), (0, 7) (*c*) (7, 7), (–7, – 7) (*d*) (–7, –7), (7, 7)

(*ii*) The coordinates of the point on the circle in first quadrant whose abscissa equal to 3 is

(*a*) (3, 3) (*b*) (3, –3) (*c*) $(2\sqrt{10}, 3)$ (*d*) $(3, 2\sqrt{10})$

(*iii*) *PQRS* is a square inside the circle where *P* is (–1, 1) then coordinates of *R* are

(*a*) (–1, –1) (*b*) (–1, 1) (*c*) (1, –1) (*d*) (1, 1)

(*iv*) The coordinates of the mid point of the line segment joining *PR* is

(*a*) (1, 1) (*b*) (0, 0) (*c*) (–1, –1) (*d*) (1, 2)

(*v*) The distance of the point *M* on the circle from *x*-axis is

(*a*) 4 units (*b*) 3 units (*c*) 2 units (*d*) 5 units

Answers

1.	(*i*) (*a*)	(*ii*) (*c*)	(*iii*) (*c*)	(*iv*) (*a*)	(*v*) (*a*)
2.	(*i*) (*c*)	(*ii*) (*a*)	(*iii*) (*c*)	(*iv*) (*d*)	(*v*) (*b*)
3.	(*i*) (*b*)	(*ii*) (*a*)	(*iii*) (*d*)	(*iv*) (*a*)	(*v*) (*c*)
4.	(*i*) (*c*)	(*ii*) (*b*)	(*iii*) (*a*)	(*iv*) (*a*)	(*v*) (*b*)
5.	(*i*) (*b*)	(*ii*) (*d*)	(*iii*) (*d*)	(*iv*) (*b*)	(*v*) (*b*)
6.	(*i*) (*a*)	(*ii*) (*b*)	(*iii*) (*d*)	(*iv*) (*b*)	(*v*) (*c*)
7.	(*i*) (*a*)	(*ii*) (*d*)	(*iii*) (*c*)	(*iv*) (*b*)	(*v*) (*d*)

ASSERTION-REASON QUESTIONS

The following questions consist of two statements—Assertion(A) and Reason(R). Answer these questions selecting the appropriate option given below:

(*a*) Both *A* and *R* are true and *R* is the correct explanation for *A*.

(*b*) Both *A* and *R* are true and *R* is not the correct explanation for *A*.

(*c*) *A* is true but *R* is false.

(*d*) *A* is false but *R* is true.

1. Assertion (*A*) : The point (0, 4) lies on *y*-axis.

Reason (*R*) : The *x* co-ordinate of the point on *y*-axis is zero.

2. Assertion (*A*) : The value of *y* is 6, for which the distance between the points $P(2, -3)$ and $Q(10, y)$ is 10.

Reason (*R*) : Distance between two given points $A(x_1, y_1)$ and $B(x_2, y_2)$ is given 6, $AB = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$.

3. Assertion (*A*) : The point (– 1, 6) divides the line segment joining the points (– 3, 10) and (6, – 8) in the ratio 2 : 7 internally.

Reason (*R*) : Mid point of line segment *PQ* whose co-ordinate are $P(x_1, y_1)$ and $Q(x_2, y_2)$ is given by $R\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$.

4. Assertion (*A*) : Centroid of a triangle formed by the points (*a*, *b*), (*b*, *c*) and (*c*, *a*) is at origin, Then $a + b + c = 0$.

Reason (*R*) : Centroid of a ΔABC with vertices $A(x_1, y_1)$, $B(x_2, y_2)$ and $C(x_3, y_3)$ is given by $\left(\frac{x_1 + x_2 + x_3}{3}, \frac{y_1 + y_2 + y_3}{3}\right)$.

Answers

1. (*a*) **2.** (*d*) **3.** (*b*) **4.** (*a*)

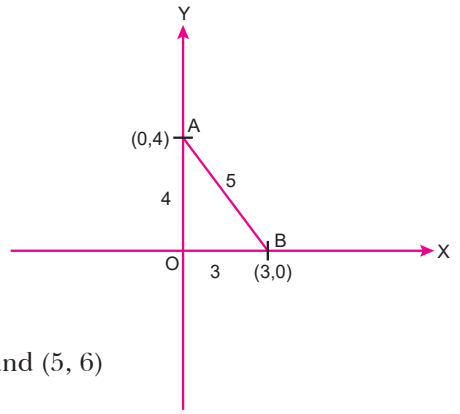
HINTS/SOLUTIONS OF SELECTED MCQs

1. As we know that all points on *y*-axis should have *x*-coordinate 0.

Then coordinate is (0, *b*).

∴ Option (*c*) is correct.

2. Let the vertices be $A\ (0, 4)$, $O\ (0, 0)$, $B\ (3, 0)$.



We have

$$AB = \sqrt{(3-0)^2 + (0-4)^2}$$

$$= \sqrt{9+16} = \sqrt{25} = 5 \text{ units}$$

$\therefore$ Perimeter of $\Delta OAB = OA + AB + OB$

$$= 4 + 5 + 3$$

$$= 12 \text{ units}$$

$\therefore$ Option (b) is correct.

3. Given x-axis divides the segment joining points $(2, -3)$ and $(5, 6)$

Let the ratio be $k : 1$

Then $$x = \frac{m_1 x_2 + m_2 x_1}{m_1 + m_2}$$

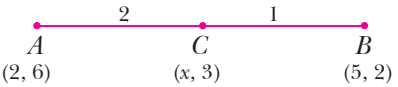
$$y = \frac{m_1 y_2 + m_2 y_1}{m_1 + m_2} = 0 \quad \Rightarrow \quad \frac{6k - 3(1)}{k+1} = 0$$

$$\Rightarrow \quad 6k - 3 = 0 \quad \Rightarrow \quad k = \frac{3}{6} = \frac{1}{2}$$

$\therefore$ Required ratio $= 1 : 2$

So, option (b) is correct.

4. Given points are $A(2, 6)$, $B(5, 2)$, divided by $C(x, 3)$ in ratio $2 : 1$



By section formula

$$x = \frac{2(5)+1(2)}{2+1} = \frac{10+2}{3} = \frac{12}{3} = 4$$

$$\Rightarrow \quad x = 4$$

So, option (a) is correct.

5. Mid points of line joining the points $(-5, 7)$ and $(-1, 3)$ is given by

$$\left(\frac{-5-1}{2}, \frac{7+3}{2}\right) = \left[\frac{-6}{2}, \frac{10}{2}\right] = (-3, 5)$$

So, option (b) is correct.

6. Distance of point $P(3, 4)$ from origin $(0, 0)$ is given by:

$$\sqrt{(3-0)^2 + (4-0)^2} = \sqrt{9+16} = \sqrt{25} = 5 \text{ units}$$

So option (b) is correct.

10. We have,

$$\frac{a}{3} = \frac{-6 + (-2)}{2} \quad \Rightarrow \quad \frac{a}{3} = -4 \quad \Rightarrow \quad a = -12$$

$\therefore$ Option (b) is correct.

11. We have, $AP = \sqrt{(8-4)^2 + (4-2)^2} = \sqrt{16+4} = \sqrt{20} = 2\sqrt{5}$

$$AP = \sqrt{(4-2)^2 + (2-1)^2} = \sqrt{4+1} = \sqrt{5}$$

Clearly, $AP = \frac{1}{2}AB$

Hence, option (d) is correct.

12. Since perpendicular bisector of line segment AB passes through mid point of AB.

$\therefore$ Mid point of $AB \equiv \left(\frac{-2+2}{2}, \frac{-5+5}{2}\right) \equiv (0, 0)$

$\therefore$ Point $(0, 0)$ lies on perpendicular bisector.

$\therefore$ Option (a) is correct.

15. Let the required point be $P(\alpha, \beta)$.

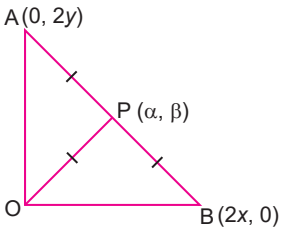
$\therefore$ $OP = PA$ (by distance formula)

$\Rightarrow$ $\sqrt{(\alpha-0)^2 + (\beta-0)^2} = \sqrt{(\alpha-0)^2 + (\beta-2y)^2}$

$\Rightarrow$ $\alpha^2 + \beta^2 = \alpha^2 + (\beta-2y)^2$ (Squaring both sides)

$\Rightarrow$ $\beta^2 = \beta^2 + 4y^2 - 4\beta y$

$\Rightarrow$ $4y^2 = 4\beta y \Rightarrow y = \beta$



Similarly,

$OP = PB$

$\Rightarrow$ $\sqrt{\alpha^2 + \beta^2} = \sqrt{(\alpha-2x)^2 + \beta^2}$

$\Rightarrow$ $\alpha^2 + \beta^2 = \alpha^2 + 4x^2 - 4\alpha x + \beta^2$ (Squaring both sides)

$\Rightarrow$ $4x^2 = 4\alpha x \Rightarrow \alpha = x$

$\therefore$ Point is $P(\alpha, \beta) = P(x, y)$.

Hence, option (a) is correct.

17. Distance of the point $A(-5, 6)$ from $O(0, 0)$ is given by

$OA = \sqrt{(0+5)^2 + (0.6)^2} = \sqrt{25+36} = \sqrt{61}$

$\therefore$ Option (a) is correct.

18. We have, $P(2, 3)$, $O(0, 0)$

Required distance $= OP = \sqrt{(-6-0)^2 + (8-0)^2}$

$= \sqrt{36+64} = \sqrt{100} = 10$ units

$\therefore$ Option (c) is correct.

19. Distance, $AB = \sqrt{(0-0)^2 + (-2-6)^2} = 8$ units.

Hence, option (b) is correct.

20. Since coordinates of point P are $(2, 3)$.

$\therefore$ Its distance from X–axis is 3 *i.e.,* its y–co-ordinate.

$\therefore$ Option (b) is correct.

21. We have,

$AB = \sqrt{(9-9)^2 + (6-0)^2} = 6$

$BC = \sqrt{(-9-9)^2 + (6-6)^2} = 18$

$CD = \sqrt{(-9+9)^2 + (0-6)^2} = 6$

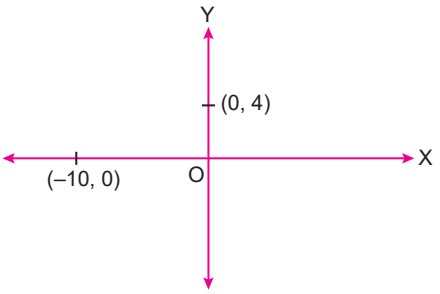
$DA = \sqrt{(9+9)^2 + (0-0)^2} = 18$

Here, $AB = CD$ and $BC = DA$

$\Rightarrow$ $ABCD$ is a rectangle.

Hence, option (b) is correct.

24. We have the points



(–10, 0) and (0, 4), since first lies on x-axis, left of origin and second lies on y-axis above the origin.

$\therefore$ Option (b) is correct.

25. As we know that all the points lying on the same vertical line has same x-coordinates

$\therefore$ Points (–8, 7), (–8, –8), (–8, –100) lie on the one vertical line.

$\therefore$ Option (b) is correct.

26. Since given points $A(-3, 4)$, $B(-1, 2)$ and $C(3, 4)$, $D(1, 2)$.

We have, $AB = \sqrt{(-1+3)^2 + (2-4)^2} = \sqrt{4+4} = 2\sqrt{2}$

$CD = \sqrt{(1-3)^2 + (2-4)^2} = \sqrt{4+4} = 2\sqrt{2}$

$\therefore \quad AB = CD$

$\therefore$ Option (c) is correct.

27. Given coordinate of point M are $(-4, 3)$.

Let x be the x-coordinate of point N

$\therefore (x+4)^2 = 10^2$ or $(x+4)^2 = 7^2$

$\Rightarrow x + 4 = \pm 10$ or $x + 4 = \pm 7$

$\Rightarrow x = \pm 10 - 4$ or $x = \pm 7 - 4$

$\Rightarrow x = 10 - 4, -10 - 4$ or $x = 7 - 4, -7 - 4$

$\Rightarrow x = 6, -14,$ or $x = 3, -11$

But x lies in the first quadrant.

$\therefore x = 6$ or 3

$\therefore x$ coordinate is multiple of 3.

$\therefore$ Option (a) is correct.

28. We have coordinates of centre of circle O be $(-4, 3)$ and coordinate of R be $(0, 8)$.

$\therefore$ Radius, $OR = \sqrt{(0+4)^2 + (8-3)^2} = \sqrt{16+25} = \sqrt{41}$

$\therefore$ Diameter of circle = 2 × radius = $2\sqrt{41}$ units

Hence, length of the side of the square that circumscribes the circle = Diameter of the circle = $2\sqrt{41}$ units

$\therefore$ Option (b) is correct.

29. We have location of a bank is $(-4, 8)$ and location of a post office is $(2, 0)$.

$\therefore$ Shortest distance between them

$= \sqrt{(2+4)^2 + (0-8)^2} = \sqrt{36+64}$

$= \sqrt{100} = 10$ unit

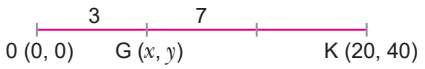
$= 10 \times 50 = 500$ m

$\therefore$ Option (d) is correct.

30. Using section formula, we have

Coordinate of G

$$x = \frac{3\times 20 + 7\times 0}{3+7} \quad \Rightarrow \quad x = \frac{60}{10} = 6$$



and, $$y = \frac{3\times 40 + 7\times 0}{3+7} = \frac{120}{10} = 12$$

$\therefore$ Coordinates of point $G(6, 12)$.

$\therefore$ Option (a) is correct.

31. For the coordinates of point $Q(x_1, y_1)$ we have $AQ : QB = 1 : 2$.

$\therefore$ Using section formula, we have

$$x_1 = \frac{1\times 14 + 2\times 8}{1+2} \quad \Rightarrow \quad x_1 = \frac{30}{3} = 10$$

and $$y_1 = \frac{1\times 11 + 2\times 8}{1+2} = \frac{11+16}{3} = \frac{27}{3} = 9$$

$\therefore$ Coordinate of point $Q(x_1, y_1)$ be $(10, 9)$.

Now for point R ratio be $2 : 1$.

$\therefore$ Using section formula

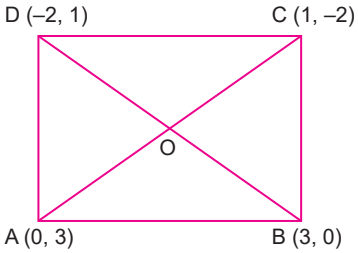
$$x_2 = \frac{2\times 14 + 1\times 8}{2+1} = \frac{28+8}{3} = \frac{36}{3} = 12$$

$$y_2 = \frac{2\times 11 + 1\times 8}{2+1} = \frac{22+8}{3} = \frac{30}{3} = 10$$

Coordinate of point R be $(12, 10)$.

Thus, option (b) is correct.

32. Since the diagonals of a rectangle bisect each other.



Let intersection point be O.

$\therefore$ Co-ordinates of point O be mid point of AC and BD.

$$\left(\frac{0+1}{2}, \frac{-2+3}{2}\right) = \left(\frac{1}{2}, \frac{1}{2}\right)$$

$\therefore$ Option (a) is correct.

33. Let $ABCD$ is a parallelogram

We have,

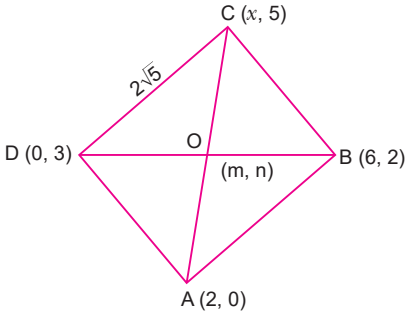
$$DC = 2\sqrt{5}$$

$$\Rightarrow DC^2 = 20$$

$$\Rightarrow (x-0)^2 + (5-3)^2 = 20$$

$$\Rightarrow x^2 + 4 = 20 \Rightarrow x^2 = 16$$

$\Rightarrow x = 4$ (Since x lies in Ist quadrant)



Midpoint of AC = mid point of $BD = \left(3, \frac{5}{2}\right)$

$$= (m, n) \Rightarrow m = 3, n = \frac{5}{2} = 2.5$$

$\Rightarrow m = n + 0.5$

$\therefore$ Option (c) is correct.

34. Let ratio be $k : 1$.

Using section formula, we have

$$x = \frac{kx_2 + x_1}{k + 1}$$

$\Rightarrow \quad 1 = \frac{k \times 7 + (-2)}{k + 1} \quad \Rightarrow k + 1 = 7k - 2$

$\Rightarrow \quad 1 + 2 = 7k - k \quad \Rightarrow 3 = 6k$

$\Rightarrow \quad k = \frac{3}{6} = \frac{1}{2} \quad \Rightarrow k = \frac{1}{2}$

$\therefore$ Ratio be 1 : 2.

$\therefore$ Option (*a*) is correct.

35. We have AD is the median of ΔABC.

$\therefore$ D is the mid point of BC

$\therefore$ Coordinates of D are $\left(\frac{6+1}{2}, \frac{5+4}{2}\right) = \left(\frac{7}{2}, \frac{9}{2}\right)$

$\therefore$ Option (*b*) is correct.

36. Since $O(-1, 3)$ is the centre of diameter AB.

$\therefore$ O be the mid point of AB.

Let coordinates of B be (x, y).

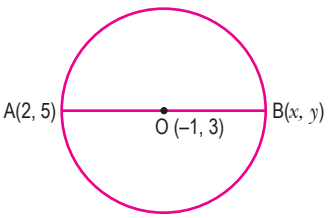
$\therefore \quad -1 = \frac{2 + x}{2}$ and $3 = \frac{y + 5}{2}$

$\Rightarrow \quad -2 = 2 + x$ and $6 = y + 5$

$\Rightarrow \quad x = -4$ and $y = 1$

$\therefore$ Coordinates of other end are $(-4, 1)$.

$\therefore$ Option (*a*) is correct.



37. We have, $AB = \sqrt{(-5-0)^2 + (3-6)^2} = \sqrt{25 + 9} = \sqrt{34}$

$AC = \sqrt{(3-0)^2 + (1-6)^2} = \sqrt{9 + 25} = \sqrt{34}$

$BC = \sqrt{(3+5)^2 + (1-3)^2} = \sqrt{64 + 4} = \sqrt{68}$

Here, $AB = AC \quad \Rightarrow \quad \Delta ABC$ is an isosceles triangle.

Hence, option (*a*) is correct.

38. We have point $p(x, y)$ is given by

$$x = \frac{1 \times 2 + 2 \times 8}{1 + 2} = 6, \; y = \frac{1 \times 3 + 2 \times (-9)}{1 + 2} = -5$$

$\therefore$ Point is $p(6, -5)$

Which lies in IVth quadrant.

$\therefore$ Option (*d*) is correct.

39. Since, the distance of the point from x-axis is the y-coordinate of the point, and distance is always positive.

$\therefore$ Distance from x–axis = 4

$\therefore$ Option (*c*) is correct.

40. We have,

$$\frac{m}{3} = \frac{-6 + (-2)}{2} \quad \Rightarrow \; m = \frac{-8}{2} \times 3 \quad \Rightarrow \quad m = -12$$

$\therefore$ Option (*a*) is correct.

41. Using section formula, we have

$$k = \frac{1\times(-7)+2\times 2}{1+2} \quad \Rightarrow \quad k = \frac{-7+4}{3} = \frac{-3}{3} = -1 \quad \Rightarrow \quad k = -1$$

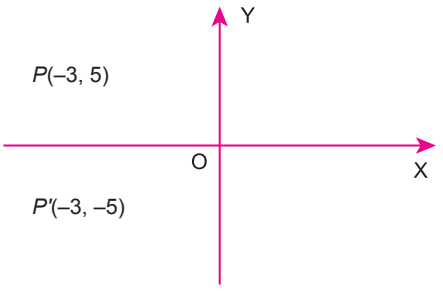
$\therefore$ Option (d) is correct.

42. The required point P an x-axis is the mid point of the line joining the points A (–1, 0) and B(5, 0)

$\therefore$ Co-ordinates of point $P = \left(\frac{-1+5}{2}, \frac{0+0}{2}\right) = (2, 0)$

$\therefore$ Option (a) is correct.

43. Since the point (– 3, 5) lies in second quadrant therefore its reflection in x-axis will be in third quadrant.



$\therefore$ Its co-ordinates are (– 3, – 5)

$\therefore$ Option (c) is correct.

44. Using section formula,

We have

$$2 = \frac{3\times y + 1\times 5}{3+1}$$

$$\Rightarrow \quad 2 = \frac{3y+5}{4} \quad \Rightarrow 8 = 3y + 5 \quad \Rightarrow 3y = 8 - 5 = 3$$

$$\therefore \quad y = \frac{3}{3} = 1 \quad \Rightarrow y = 1$$

$\therefore$ Option (d) is correct.

45. We have, $a = \frac{10+k}{2}$ and $b = \frac{-6+4}{2} \Rightarrow \quad b = -1$

Also given, $a - 2b = 18$

$$\Rightarrow \quad \frac{k+10}{2} - 2\times(-1) = 18 \quad \Rightarrow \quad \frac{k+10+4}{2} = 18 \Rightarrow \quad k + 14 = 36$$

$\Rightarrow k = 36 - 14 = 22$

$\therefore$ Option (b) is correct.

46. Since $P\left(\frac{a}{8}, 4\right)$ is the mid point of line segment joining points A (– 5, 2) and B (4, 6)

$$\therefore \quad \frac{a}{8} = \frac{-5+4}{2} \quad \Rightarrow \frac{a}{8} = \frac{-1}{2} \quad \Rightarrow \quad a = \frac{-8}{2} = -4$$

$\therefore \quad a = -4$

$\therefore$ Option (a) is correct.

47. The point on x-axis equidistance from (–4, 0) and (10, 0) is its mid-point

$$\therefore \quad \text{Required point} = \left(\frac{-4+10}{2}, \frac{0+0}{2}\right) = (3, 0)$$

$\therefore$ Option (d) is correct.

48. We have,

Centre of the circle is the mid-point of the end points of its diameter.

$$\therefore \quad \text{Co-ordinates of the centre are } \left(\frac{-6+6}{2}, \frac{3+4}{2}\right) \quad i.e \quad \left(0, \frac{7}{2}\right)$$

$\therefore$ Option (c) is correct.

49. Given points be $A(m, -n)$ and $B(-m, n)$

$$\therefore \quad AB = \sqrt{(m+m)^2 + (-n-n)^2} = \sqrt{4m^2 + 4n^2} = 2\sqrt{m^2 + n^2}$$

$\therefore$ Required distance $= 2\sqrt{m^2 + n^2}$

$\therefore$ Option (c) is correct.

50. We have, $5 = \sqrt{(4-1)^2 + (p-0)^2} = \sqrt{9 + p^2}$

$\Rightarrow 25 = 9 + p^2 \Rightarrow p^2 = 16 \Rightarrow p = \pm 4$

$\therefore$ Option (b) is correct.

52. Let co-ordinates of P be (x, y)

$\therefore \quad x = \dfrac{3\times 9 + 1\times 5}{3+1} = \dfrac{32}{4} = 8$ and $y = \dfrac{3\times 6 + 1\times(-2)}{3+1} = \dfrac{16}{4} = 4$

$\therefore$ Co-ordinates of P are (8, 4).

$\therefore$ Option (b) is correct.

53. Since $C(-1, 1)$ is the mid point of AB.

$\therefore \quad -1 = \dfrac{-3+1}{2}$ and $1 = \dfrac{b+b+4}{2}$

$\Rightarrow -1 = -1$ and $1 = b + 2 \Rightarrow b = -1$

$\therefore$ Option (c) is correct.

SOLUTIONS OF CASE-BASED QUESTIONS

1. (*i*) Niharika runs $\dfrac{1}{4}$th the distance AD on the second line, post a green flag.

$\therefore$ Position of the green flag is $\left(2, \dfrac{1}{4}\times 100\right)$, *i.e.*, (2, 25).

$\therefore$ Option (a) is correct.

(*ii*) Preet runs $\dfrac{1}{5}$th distance AD on the eight line and posts a red flag.

$\therefore$ Position of the red flag is $\left(8, \dfrac{1}{5}\times 100\right)$, *i.e.*, (8, 20).

Its position is (8, 20).

$\therefore$ Option (c) is correct.

(*iii*) Distance between by green flag and red flag is given by

$= \sqrt{(20-25)^2 + (8-2)^2} = \sqrt{25 + 36} = \sqrt{61}$ units

$\therefore$ Option (c) is correct.

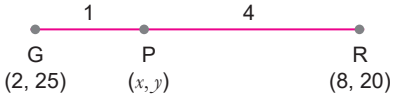
(*iv*) Position of the blue flag $= \left(\dfrac{2+8}{2}, \dfrac{25+20}{2}\right) = (5,\ 22.5)$

$\therefore$ Option (a) is correct.

(*v*) Let $P(x, y)$ be the position of a flag posted by Joy using section formula, we have

$x = \dfrac{1\times 8 + 4\times 2}{1+4} = \dfrac{16}{5} = 3.2$

$y = \dfrac{1\times 20 + 4\times 25}{1+4} = \dfrac{120}{5} = 24$



$\therefore$ Position of the flag posted by Joy is (3.2, 24).

$\therefore$ Option (a) is correct.

2. (*i*) Mid point $= \left(\dfrac{x_1 + x_2}{2}, \dfrac{y_1 + y_2}{2}\right)$

$= \left(\dfrac{6+9}{2}, \dfrac{17+16}{2}\right) = \left(\dfrac{15}{2}, \dfrac{33}{2}\right)$

$\therefore$ Option (c) is correct.

(*ii*) From top view P point is 4 boxes away.

$\therefore$ Option (*a*) is correct.

(*iii*) Distance between A and S = 16 boxes.

$\therefore$ Option (*c*) is correct.

(*iv*) Coordinates of A and B are (1, 8) and (5, 10) respectively.

Coordinates of point dividing AB in the ratio 1 : 3 internally are:

$$x = \frac{1\times 5 + 3\times 1}{1+3},\ y = \frac{1\times 10 + 3\times 8}{1+3}$$

$\Rightarrow$ $x = \frac{8}{4} = 2$ $\qquad$ $y = \frac{34}{4} = 8.5$

$\therefore$ Option (*d*) is correct.

(*v*) $P.(x, y)$ is equidistant from $Q(9, 8)$ and $S(17, 8)$ then

$$PQ = PS$$

$\Rightarrow$ $\sqrt{(9-x)^2 + (8-y)^2} = \sqrt{(17-x)^2 + (8-y)^2}$

$\Rightarrow$ $(9-x)^2 + (8-y)^2 = (17-x)^2 + (8-y)^2$

$= 81 + x^2 - 18x + 64 + y^2 - 16y$

$= 289 + x^2 - 34x + 64 + y^2 - 16y$

$= 145 - 18x = 353 - 34x = 16x = 208$

$\Rightarrow$ $x = 13$ or $x - 13 = 0$

$\therefore$ Option (*b*) is correct.

3. (*i*) If Shaurya's house is at (0, 0), then market is at (–3, –1).

$\therefore$ Option (*b*) is correct.

(*ii*) Kartik's house is at (–2, 4).

Distance between (0, 0) and (–2, 4) = $\sqrt{(-2-0)^2 + (4-0)^2} = \sqrt{4+16} = \sqrt{20}$ units

$\therefore$ Option (*a*) is correct.

(*iii*) Let coordinate of the fort be (x , 6).

Then distance between (0, 0) and (x, 6) = 10.

$\Rightarrow$ $\sqrt{(x-0)^2 + (6-0)^2} = 10$ $\qquad$ $\Rightarrow$ $\qquad$ $x^2 + 36 = 100$

$\Rightarrow$ $x^2 = 64$ $\qquad$ $\Rightarrow$ $\qquad$ $x = \pm 8$

$\therefore$ Option (*d*) is correct.

(*iv*) Coordinate of school = (–5, 2) and park = (0, 2)

$$\text{Coordinate of required point} = \left(\frac{3\times 0 + 2\times(-5)}{3+2}, \frac{3\times 2 + 2\times 2}{3+2}\right)$$

$$= \left(\frac{-10}{5}, \frac{10}{5}\right) = (-2, 2)$$

$\therefore$ Option (*a*) is correct.

(*v*) The Polygon formed is a concave polygon.

$\therefore$ Option (*c*) is correct.

4. (*i*) The abscissa, *i.e.*, x-coordinate of G is 0 as it lies on y-axis.

$\therefore$ Option (*c*) is correct.

(*ii*) Distance between $C(-3, 2)$ and $B(1, 6)$ is

$\sqrt{(1+3)^2 + (6-2)^2} = \sqrt{16+16} = 4\sqrt{2}$ units.

$\therefore$ Option (*b*) is correct.

(*iii*) Coordinates of the required player are (2, –6), or (2, 6). J is at (2, – 6).

∴ Option (*a*) is correct.

(*iv*) Let (*x*, *y*) is the mid point of *A*(–4, 5) and *H*(–4, –1).

So, $x = \frac{-4-4}{2}, y = \frac{5-1}{2} \Rightarrow x = -4, y = 2$

∴ Option (*a*) is correct.

(*v*) If player *F* is shifted to IV Quadrant symmetric to *D* w.r.t *x*-axis, coordinates of *F* are (3, –4).

∴ Option (*b*) is correct.

5. (*i*) Coordinate of point *B* = (3, 8)

∴ Option (*b*) is correct.

(*ii*) Distance between *H*(1, 3) and *G*(3, 1) = $\sqrt{(3-1)^2+(1-3)^2} = \sqrt{4+4} = \sqrt{8}$

∴ Option (*d*) is correct.

(*iii*) Let point *P*(*x*, *y*) divides line segments joining *A*(1, 6) and *D*(8, 6) in the ratio 2 : 3.

Then, $x = \frac{8\times2+1\times3}{2+3}$ $y = \frac{6\times2+6\times3}{2+3}$

$x = \frac{19}{5},$ $y = \frac{30}{5} = 6$

Required coordinates are $\left(\frac{19}{5}, 6\right)$.

∴ Option (*d*) is correct.

(*iv*) Let *P*(*x*, *y*) is equidistant from *C*(6, 8) and *F*(6, 1).

∴ $CP = FP \Rightarrow CP^2 = FP^2$

$\Rightarrow (6-x)^2 + (8-y)^2 = (6-x)^2 + (1-y)^2$

$\Rightarrow (8-y)^2 = (1-y)^2 \Rightarrow 64 + y^2 - 16y = 1 + y^2 - 2y$

$\Rightarrow 64 - 16y - 1 + 2y = 0 \Rightarrow 63 = 14y$

$\Rightarrow 14y = 63$

∴ Option (*b*) is correct.

(*v*) If *H* is origin then coordinates of *P* are (–1, –3).

∴ Option (*b*) is correct.

6. (*i*) Coordinate of *H* = (1, 5) and *G* = (5, 1)

∴ Option (*a*) is correct.

(*ii*) Distance between *A*(1, 9) and *B*(5, 13) is

$\sqrt{(5-1)^2+(13-9)^2} = \sqrt{4^2+4^2} = \sqrt{16+16} = \sqrt{32} = 4\sqrt{2}$ unit

∴ Option (*b*) is correct.

(*iii*) Mid point of line segment joining *M*(5, 11) and *Q*(9, 3) is given by

$\left(\frac{5+9}{2}, \frac{11+3}{2}\right) = \left(\frac{14}{2}, \frac{14}{2}\right) = (7, 7)$

∴ Option (*d*) is correct.

(*iv*) Points *T* and *O* have same ordinate as 9.

∴ Option (*b*) is correct.

(*v*) If *G* is (0, 0), then *Q* = (4, 2).

∴ Option (*c*) is correct.

7. (*i*) Coordinate of point *C* = (0, 7) and *D* = (0, – 7).

∴ Option (*a*) is correct.

(*ii*) Let the required point be $(3, y)$.

Then, radius $= 7 \Rightarrow \sqrt{(0-3)^2 + y^2} = 7 \Rightarrow 9 + y^2 = 49$

$y = \sqrt{40} = 2\sqrt{10}$ (Since point lies in I quadrant)

$\therefore$ Option (*d*) is correct.

(*iii*) Coordinates of $R = (1, -1)$

$\therefore$ Option (*c*) is correct.

(*iv*) Coordinate of mid point of the line segment joining $P(-1, 1)$ and

$$R(1, -1) = \left(\frac{-1+1}{2}, \frac{1-1}{2}\right) = (0, 0)$$

$\therefore$ Option (*b*) is correct.

(*v*) y-coordinates of M is 5, so its distance from x-axis in 5 units.

$\therefore$ Option (*d*) is correct.

SOLUTIONS OF ASSERTION-REASON QUESTIONS

1. The x co-ordinate of the point $(0, 4)$ is zero.

$\therefore$ Point $(0, 4)$ lies on y-axis.

So, both A and R are correct and R explains A.

Hence, option (*a*) is correct.

2. $PQ = 10 \Rightarrow PQ^2 = 100 \Rightarrow (10-2)^2 + (y+3)^2 = 100$

$\Rightarrow (y+3)^2 \Rightarrow 100 - 64 = 36 \Rightarrow y + 3 = \pm 6$

$\Rightarrow y = -3 \pm 6 \Rightarrow y = 3, -9$

So, A is incorrect but R is correct.

Hence, option (*d*) is correct.

3. Using section formula, we have

$$-1 = \frac{k \times 6 + 1 \times (-3)}{k+1} \Rightarrow -k - 1 = 6k - 3$$

$\Rightarrow 7k = 2 \Rightarrow k = \frac{2}{7}$

$\Rightarrow$ Ratio be 2 : 7 internally.

So, both A and R are correct but R does not explain A.

Hence, option (*b*) is correct.

4. Centroid of a triangle with vertices (a, b), (b, c) and (c, a) is $\left(\frac{a+b+c}{3}, \frac{b+c+a}{3}\right)$.

$$\Rightarrow \left(\frac{a+b+c}{3}, \frac{b+c+a}{3}\right) = (0, 0) \Rightarrow a + b + c = 0$$

So, both A and R are correct and R explains A.

Hence, option (*a*) is correct.

05 TRIANGLES

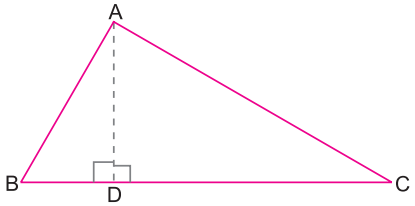
BASIC CONCEPTS & FORMULAE

1. Two figures having the same shape but not necessarily the same size are called similar figures.
2. All congruent figures are similar but the converse is not true.
3. Two polygons with same number of sides are similar, if (i) their corresponding angles are equal and (ii) their corresponding sides are in the same ratio (i.e., proportion).
4. If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, then the other two sides are divided in the same ratio (Basic Proportionality Theorem or Thales Theorem).
5. If a line divides any two sides of a triangle in the same ratio, then the line is parallel to the third side.
6. If in two triangles, corresponding angles are equal, then the two triangles are similar (AAA similarity criterion).
7. If in two triangles, two angles of one triangle are respectively equal to the two corresponding angles of the other triangle, then the two triangles are similar (AA similarity criterion).
8. If in two triangles, corresponding sides are in the same ratio, then the two triangles are similar (SSS similarity criterion).
9. If one angle of a triangle is equal to one angle of another triangle and the sides including these angles are in the same ratio (proportional), then the two triangles are similar (SAS similarity criterion).
10. The ratio of the areas of two similar triangles is equal to the square of the ratio of their corresponding sides.
11. If a perpendicular is drawn from the vertex of the right angle of a right triangle to the hypotenuse, then the triangles on both sides of the perpendicular are similar to the whole triangle and also to each other.
12. In a right triangle, the square of the hypotenuse is equal to the sum of the squares of the other two sides (Pythagoras Theorem).
13. If in a triangle, square of one side is equal to the sum of the squares of the other two sides, then the angle opposite the first side is a right angle.

MULTIPLE CHOICE QUESTIONS

Choose and write the correct option in the following questions.

1. In figure, $\angle BAC = 90°$ and $AD \perp BC$. Then, [*NCERT Exemplar*]



(*a*) $BD \cdot CD = BC^2$ (*b*) $AB \cdot AC = BC^2$ (*c*) $BD \cdot CD = AD^2$ (*d*) $AB \cdot AC = AD^2$

2. **The length of each side of a rhombus whose diagonals are of lengths 10 cm and 24 cm is**

(*a*) 25 cm (*b*) 13 cm (*c*) 26 cm (*d*) 34 cm

3. **If $\Delta ABC \sim \Delta EDF$ and ΔABC is not similar to ΔDEF, then which of the following is not true?** [*NCERT Exemplar*]

(*a*) $BC.EF = AC.FD$ (*b*) $AB.EF = AC.DE$ (*c*) $BC.DE = AB.EF$ (*d*) $BC.DE = AB.FD$

4. **If $\Delta ABC \sim \Delta DEF$, $\frac{ar(\Delta ABC)}{ar(\Delta DEF)} = \frac{9}{25}$, $BC = 21$ cm, then EF is equal to**

(*a*) 9 cm (*b*) 6 cm (*c*) 35 cm (*d*) 25 cm

5. **D and E are respectively the points on the sides AB and AC of a triangle ABC such that $AD = 3$ cm, $BD = 5$ cm, $BC = 12.8$ cm and $DE \parallel BC$. Then length of DE (in cm) is**

(*a*) 4.8 cm (*b*) 7.6 cm (*c*) 19.2 cm (*d*) 2.5 cm

6. **If in two triangles ABC and PQR, $\frac{AB}{QR} = \frac{BC}{PR} = \frac{CA}{PQ}$, then**

(*a*) $\Delta PQR \sim \Delta CAB$ (*b*) $\Delta PQR \sim \Delta ABC$ (*c*) $\Delta CBA \sim \Delta PQR$ (*d*) $\Delta BCA \sim \Delta PQR$

7. **If $\Delta PRQ \sim \Delta XYZ$, then**

(*a*) $\frac{PR}{XZ} = \frac{RQ}{YZ}$ (*b*) $\frac{PQ}{XY} = \frac{PR}{XZ}$ (*c*) $\frac{PQ}{XZ} = \frac{QR}{YZ}$ (*d*) $\frac{QR}{XZ} = \frac{PR}{XY}$

8. **A square and a rhombus are always**

(*a*) similar (*b*) congruent

(*c*) similar but not congruent (*d*) neither similar nor congruent

9. **In triangles ABC and DEF, $\angle B = \angle E$, $\angle F = \angle C$ and $AB = 3DE$. Then, the two triangles are** [*NCERT Exemplar*]

(*a*) congruent but not similar (*b*) similar but not congruent

(*c*) neither congruent nor similar (*d*) congruent as well as similar

10. **It is given that $\Delta ABC \sim \Delta DFE$, $\angle A = 30°$, $\angle C = 50°$, $AB = 5$ cm, $AC = 8$ cm and $DF = 7.5$ cm. Then, which of the following is true?** [*NCERT Exemplar*]

(*a*) $DE = 12$ cm, $\angle F = 50°$ (*b*) $DE = 12$ cm, $\angle F = 100°$

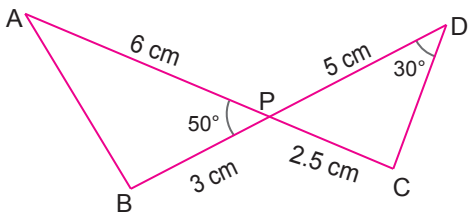
(*c*) $EF = 12$ cm, $\angle D = 100°$ (*d*) $EF = 12$ cm, $\angle D = 30°$

11. **Two circles are always**

(*a*) congruent (*b*) neither similar nor congruent

(*c*) similar but may not be congruent (*d*) none of these

12. **In figure, two line segments AC and BD intersect each other at the point P such that $PA = 6$ cm, $PB = 3$ cm, $PC = 2.5$ cm, $PD = 5$ cm, $\angle APB = 50°$ and $\angle CDP = 30°$. Then, $\angle PBA$ is equal to** [*NCERT Exemplar*]



(*a*) 50° (*b*) 30° (*c*) 60° (*d*) 100°

13. If $\Delta ABC \sim \Delta QRP$, $\frac{ar(\Delta ABC)}{ar(\Delta PQR)} = \frac{9}{4}$, $AB = 18$ cm and $BC = 15$ cm, then PR is equal to [*NCERT Exemplar*]

(*a*) 10 cm (*b*) 12 cm (*c*) $\frac{20}{3}$ cm (*d*) 8 cm

14. In ΔLMN and ΔPQR, $\angle L = \angle P$, $\angle N = \angle R$ and $MN = 2QR$. Then the two triangles are

(*a*) Congruent but not similar (*b*) Similar but not congruent

(*c*) neither congruent nor similar (*d*) Congruent as well as similar

15. In ΔABC and ΔRPQ, $AB = 4.5$ cm, $BC = 5$ cm, $CA = 6\sqrt{2}$ cm, $PR = 12\sqrt{2}$ cm, $PQ = 10$ cm, $QR = 9$ cm. If $\angle A = 75°$ and $\angle B = 55°$, then $\angle P$ is equal to

(*a*) 75° (*b*) 55° (*c*) 50° (*d*) 130°

16. If $\Delta ABC \sim \Delta EDF$ and ΔABC is not similar to ΔDEF, then which of the following is not true?

(*a*) $BC \cdot EF = AC \cdot FD$ (*b*) $AB \cdot EF = AC \cdot DE$

(*c*) $BC \cdot DE = AB \cdot EF$ (*d*) $BC \cdot DE = AB \cdot FD$

17. If $\Delta PQR \sim \Delta XYZ$ and $\frac{PQ}{XY} = \frac{5}{2}$, then $\frac{ar(\Delta XYZ)}{ar(\Delta PQR)}$ is equal to

(*a*) $\frac{4}{25}$ (*b*) $\frac{2}{5}$ (*c*) $\frac{25}{4}$ (*d*) $\frac{5}{2}$

18. It is given that $ar(\Delta ABC) = 81$ square units and $ar(\Delta DEF) = 64$ square units. If $\Delta ABC \sim \Delta DEF$, then

(*a*) $\frac{AB}{DE} = \frac{81}{64}$ (*b*) $\frac{AB^2}{DE^2} = \frac{9}{8}$

(*c*) $\frac{AB}{DE} = \frac{9}{8}$ (*d*) $AB = 81$ units, $DE = 64$ units

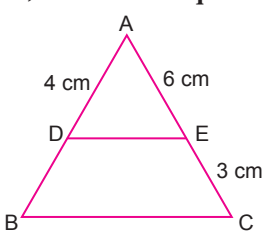
19. ΔABC and ΔBDE are two equilateral triangles such that D is the mid-point of BC. Ratio of the area of triangles ABC and BDE is

(*a*) 2 : 1 (*b*) 1 : 2 (*c*) 1 : 4 (*d*) 4 : 1

20. In triangle ABC, if $AB = 6\sqrt{3}$ cm, $AC = 12$ cm and $BC = 6$ cm, then $\angle B$ is

(*a*) 120° (*b*) 60° (*c*) 90° (*d*) 45°

21. In ΔABC, $DE \parallel BC$ in given figure, then BD is equal to



(*a*) 2 cm (*b*) 8 cm (*c*) 3 cm (*d*) 9 cm

22. If Manish goes 3 km towards East and then 4 km towards North. His distance from starting point is

(*a*) 3 km (*b*) 4 km (*c*) 5 km (*d*) 2 km

23. In a triangle ABC if $AB = 13$ cm, $BC = 12$ cm and $AC = 5$ cm, then the triangle is right angled at

(*a*) A (*b*) B (*c*) C (*d*) can't say

24. If $\Delta ABC \sim \Delta PQR$ and $\frac{ar(\Delta ABC)}{ar(\Delta PQR)} = \frac{9}{4}$, also $AB = 4$ cm, then PQ is equal to

(a) $\frac{8}{3}$ units (b) $\frac{8}{2}$ units (c) $\frac{3}{2}$ units (d) 8 units

25. If in ΔABC and ΔDEF, $\frac{AB}{BC} = \frac{DE}{FD}$, then both will be similar when

(a) $\angle B = \angle E$ (b) $\angle A = \angle D$ (c) $\angle B = \angle D$ (d) $\angle A = \angle F$

26. In ΔABC, $AB = 6\sqrt{7}$ cm, $BC = 24$ cm and $CA = 18$ cm. Then angle A is

(a) an acute angle (b) an obtuse angle (c) a right angle (d) can't say

27. It is given that $\Delta ABC \sim \Delta PQR$, with $\frac{BC}{QR} = \frac{1}{3}$. Then, $\frac{ar(PRQ)}{ar(BCA)}$ is equal to *[NCERT Exemplar]*

(a) 9 (b) 3 (c) $\frac{1}{3}$ (d) $\frac{1}{9}$

28. If S is a point on side PQ of a ΔPQR such that $PS = QS = RS$, then *[NCERT Exemplar]*

(a) $PR \cdot QR = RS^2$ (b) $QS^2 + RS^2 = QR^2$

(c) $PR^2 + QR^2 = PQ^2$ (d) $PS^2 + RS^2 = PR^2$

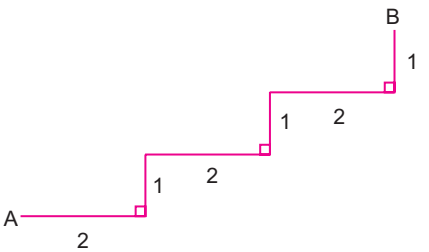
29. If in two triangles DEF and PQR, $\angle D = \angle Q$ and $\angle R = \angle E$, then which of the following is not true?

(a) $\frac{EF}{PR} = \frac{DF}{PQ}$ (b) $\frac{DE}{PQ} = \frac{EF}{RP}$ (c) $\frac{DE}{QR} = \frac{DF}{PQ}$ (d) $\frac{EF}{RP} = \frac{DE}{QR}$

30. Given that $\Delta ABC \sim \Delta DEF$. If $DE = 2AB$ and $BC = 3$ cm then, EF equals

(a) 12 cm (b) 2 cm (c) 1.5 cm (d) 6 cm

31. The straight line distance between A and B is (See figure)



(a) $5\sqrt{3}$ units (b) 5 units (c) $3\sqrt{5}$ units (d) $5\sqrt{2}$ units

32. In a ΔABC, $\angle A = 25°$, $\angle B = 35°$ and $AB = 16$ units. In ΔPQR, $\angle P = 35°$, $\angle Q = 120°$ and $PR = 4$ units. Which of the following is true?

(a) $ar(\Delta ABC) = 2ar(\Delta PQR)$ (b) $ar(\Delta ABC) = 4ar(\Delta PQR)$

(c) $ar(\Delta ABC) = 8ar(\Delta PQR)$ (d) $ar(\Delta ABC) = 16ar(\Delta PQR)$

33. The altitude of an equilateral triangle, having the length of its side as 12 cm, is

(a) $6\sqrt{2}$ cm (b) 6 cm (c) 8.5 cm (d) $6\sqrt{3}$ cm

34. All the equilateral triangles are

(a) similar (b) congruent (c) both (a) and (b) (d) none

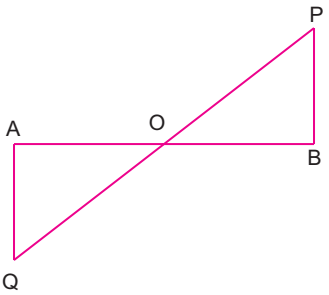
35. A ΔPQR is similar to another triangle ABC such that $ar(\Delta PQR) = 4ar(\Delta ABC)$. The ratio of their perimeter is given as

(a) 2 : 1 (b) 1 : 2 (c) 4 : 1 (d) none of these

36. If the three sides of a triangle are a, $\sqrt{3}a$, $\sqrt{2}a$ then the measure of the angle opposite to the longest side is

(*a*) 60° (*b*) 90° (*c*) 45° (*d*) 30°

37. QA and PB are perpendicular on AB, if $AO = 10$ cm, $BO = 6$ cm and $PB = 9$ cm, then measure of AQ (see figure) is



(*a*) 15 cm (*b*) 25 cm (*c*) 10 cm (*d*) none of these

38. The areas of two similar triangles are 144 cm^2 and 81 cm^2. If one median of the first triangle is 16 cm, length of corresponding median of the second triangle is

(*a*) 9 cm (*b*) 27 cm (*c*) 12 cm (*d*) 16 cm

39. O is a point on side PQ of a ΔPQR such that $PO = QO = RO$, then which of the following is true?

(*a*) $RO^2 = PR \times QR$ (*b*) $PR^2 + QR^2 = PQ^2$

(*c*) $QR^2 = OQ^2 + QR^2$ (*d*) $OP^2 + OR^2 = PR^2$

40. If in two triangles ABC and DEF, $\frac{AB}{DF} = \frac{BC}{FE} = \frac{CA}{ED}$ then

(*a*) $\Delta ABC \sim \Delta DEF$ (*b*) $\Delta ABC \sim \Delta EDF$ (*c*) $\Delta ABC \sim \Delta EFD$ (*d*) $\Delta ABC \sim \Delta DFE$

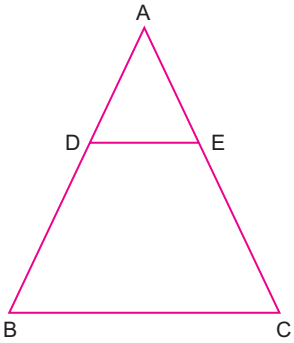
41. It is given that $\Delta ABC \sim \Delta DEF$ and $\frac{BC}{EF} = \frac{1}{5}$. Then $\frac{ar(\Delta DEF)}{ar(\Delta ABC)}$ is equal to

(*a*) 5 (*b*) 25 (*c*) $\frac{1}{25}$ (*d*) $\frac{1}{5}$

42. If $\Delta ABC \sim \Delta DEF$ then which of the following is not true?

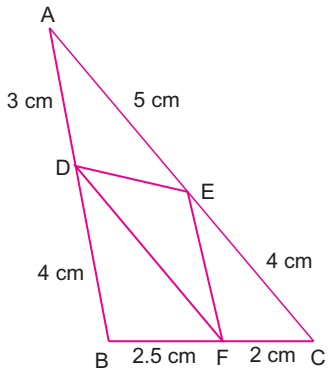
(*a*) $BC.DF = AC.EF$ (*b*) $AB.DF = AC.DE$ (*c*) $BC.DE = AB.EF$ (*d*) $BC.DE = AB.FD$

43. In the given figure $\frac{AD}{BD} = \frac{AE}{EC}$ and $\angle ADE = 70°$ and $\angle ACB = 50°$ then $\angle BAC$ is equal to



(*a*) 70° (*b*) 50° (*c*) 80° (*d*) 60°

44. **In the given figure $AD = 3$ cm, $AE = 5$ cm, $BD = 4$ cm. $CE = 4$ cm, $CF = 2$ cm, $BF = 2.5$ cm then which of the following is true?**



(*a*) $DE \,||\, BC$ (*b*) $DF \,||\, AC$

(*c*) $EF \,||\, AB$ (*d*) none of them

45. **Two triangles BAC and BDC, right angled at A and D respectively, are drawn on the same base BC and on the same side of BC. If AC and DB intersect at P, then $AP \times PC$ is equal to**

(*a*) $AB \times CD$ (*b*) $AB \times BC$

(*c*) $BC \times CD$ (*d*) $DP \times PB$

46. **XY is drawn parallel to the base BC of a ΔABC cutting AB at X and AC at Y. If $AB = 4\,BX$ and $YC = 2$ cm, then AY is equal to**

(*a*) 2 cm (*b*) 6 cm

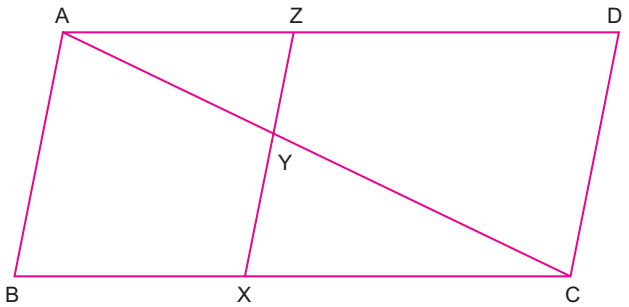
(*c*) 8 cm (*d*) 4 cm

47. **If D, E and F are mid points of sides BC, CA and AB repspectively of ΔABC, then the ratio of the areas of triangles DEF and ABC is**

(*a*) 2 : 3 (*b*) 1 : 4

(*c*) 1 : 2 (*d*) 4 : 5

48. **$ABCD$ is a parallelogram with diagonal AC. If a line XZ is drawn such that $XZ \,||\, AB$ then $\frac{BX}{XC}$ is equal to**



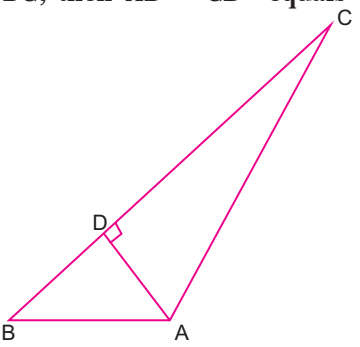
(*a*) $\frac{AY}{AC}$ (*b*) $\frac{DZ}{AZ}$ (*c*) $\frac{AZ}{ZD}$ (*d*) $\frac{AC}{AY}$

49. **Sum of squares of the sides of rhombus is equal to**

(*a*) Sum of diagonals (*b*) Difference of diagonals

(*c*) Sum of squares of diagonals (*d*) none of them

50. **In the given figure, if $AD \perp BC$, then $AB^2 + CD^2$ equals**



(*a*) $AD^2 + BC^2$ (*b*) $AD^2 + CD^2$ (*c*) $BD^2 + AC^2$ (*d*) none of them

51. **Sides of triangles are given below. Which of these is a right triangle?**

(*a*) 7 cm, 5 cm, 24 cm (*b*) 34 cm, 30 cm, 16 cm

(*c*) 4 cm, 3 cm, 7 cm (*d*) 8 cm, 12 cm, 14 cm

52. **The ratio of areas of two similar triangles is equal to**

(*a*) ratio of their corresponding sides

(*b*) ratio of their corresponding altitudes

(*c*) ratio of the square of their corresponding sides

(*d*) ratio of the squares of their perimeter

53. **The areas of two similar triangles are 144 cm^2 and 64 cm^2. If one median of the first triangle is 12 cm, length of corresponding median of the second triangle is**

(*a*) 9 cm (*b*) 8 cm (*c*) 7 cm (*d*) 16 cm

54. **In ΔABC, if AD is the bisector of $\angle A$ then $\frac{ar(\Delta ABD)}{ar(\Delta ACD)}$ is equal to**

(*a*) $\frac{AB}{BC}$ (*b*) $\frac{AB}{AD}$ (*c*) $\frac{AC}{BC}$ (*d*) $\frac{AB}{AC}$

55. **The ratio between the area of an equilateral triangle described on one diagonal of square and area of an equilateral triangle described on one side of the square is**

(*a*) 1 : 2 (*b*) 4 : 1 (*c*) 2 : 1 (*d*) 1 : 1

56. **In an equilateral triangle ABC if $AD \perp BC$, which of the following is true?**

(*a*) $2AB^2 = 3AD^2$ (*b*) $4AB^2 = 3AD^2$ (*c*) $3AB^2 = 4AD^2$ (*d*) $3AB^2 = 2AD^2$

57. **If ΔABC is an equilateral triangle such that $AD \perp BC$, then which of the following is true?**

(*a*) $\frac{3}{2}DC^2$ (*b*) $2\,DC^2$ (*c*) $3CD^2$ (*d*) $4DC^2$

58. **ΔABC is a right triangle right angled at A and $AD \perp BC$. Then, BD/DC is equal to**

(*a*) $(AB/AC)^2$ (*b*) AB/AC (*c*) $\left(\frac{AB}{AD}\right)^2$ (*d*) $\frac{AB}{AD}$

59. **Vatsal claims that congruent figures are similar as well. Vinayak claims that similar figures are congruent as well. Who is/are correct?** [*CBSE Question Bank*]

(*a*) Only Vatsal (*b*) Only Vinayak

(*c*) Both Vatsal and Vinayak (*d*) Neither Vatsal nor Vinayak

60. **Consider the statements below.**

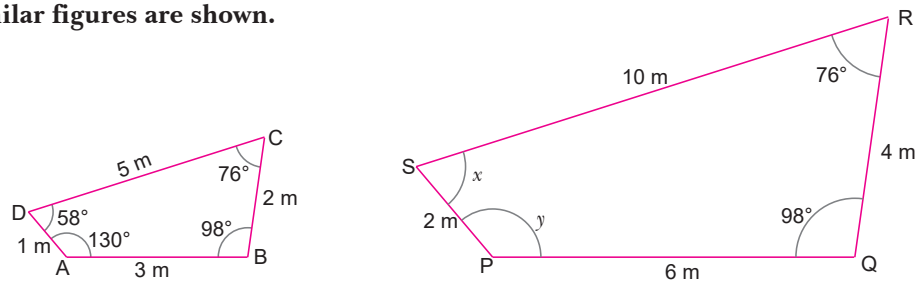
(*i*) All circles are similar. **(*ii*) All squares are similar.**

(*iii*) All right triangles are congruent. **(*iv*) All equilateral triangles are congruent.**

Which statement is/are correct? [*CBSE Question Bank*]

(*a*) (*i*) and (*ii*) (*b*) (*ii*) and (*iv*) (*c*) (*i*) and (*iii*) (*d*) (*iii*) and (*iv*)

61. **Two similar figures are shown.**



What are the values of *x* and *y*? [*CBSE Question Bank*]

(*a*) $x = 58°, y = 130°$ (*b*) $x = 98°, y = 76°$ (*c*) $x = 82°, y = 84°$ (*d*) $x = 130°, y = 84°$

62. **Two quadrilaterals are such that their diagonals bisect each other. What additional information is required to conclude that the quadrilaterals are similar?** [*CBSE Question Bank*]

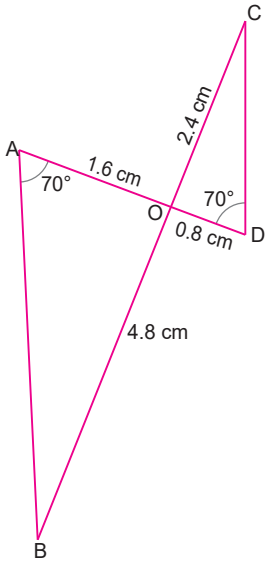
(*a*) Opposite angles are equal

(*b*) Opposite sides are equal

(*c*) Diagonals bisect at right angle and adjacent angles are equal

(*d*) Diagonals are equal and opposite sides are equal

63. **Consider the figure below.**



Which of the following statement is correct about the triangles in the figure? [*CBSE Question Bank*]

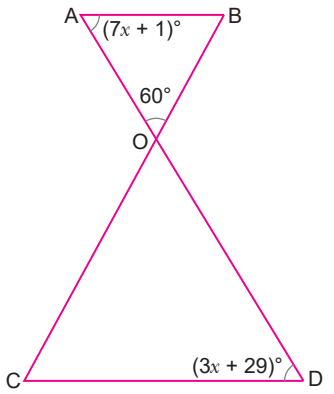
(*a*) $\Delta AOB \sim \Delta DOC$ because $\frac{AO}{DO} = \frac{BO}{CO}$

(*b*) $\Delta AOB \sim \Delta DOC$ because $\angle AOB = \angle DOC$

(*c*) $\Delta AOB \sim \Delta DOC$ because $\frac{AO}{DO} = \frac{BO}{CO}$ and $\angle BAO = \angle CDO$

(*d*) $\Delta AOB \sim \Delta DOC$ because $\frac{AO}{DO} = \frac{BO}{CO}$ and $\angle AOB = \angle DOC$

64. **Consider the figure below.**



Which of the following statement help proving that triangle *ABO* is similar to triangle *DOC*?

(*i*) $\angle B = 70°$ and (*ii*) $\angle C = 70°$ [*CBSE Question Bank*]

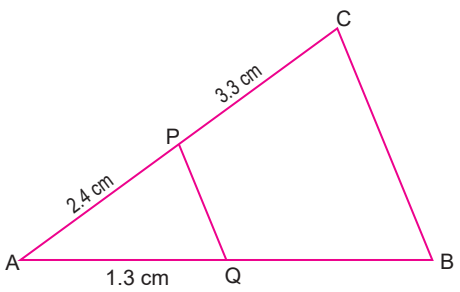
(*a*) Statement (*i*) alone is sufficient, but statement (*ii*) alone is not sufficient.

(*b*) Statement (*ii*) alone is sufficient, but statement (*i*) alone is not sufficient.

(*c*) Each statement alone is sufficient.

(*d*) Both statement together is sufficient, but neither statement alone is sufficient.

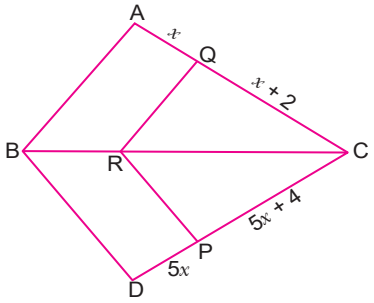
65. **In the figure below, $PQ \parallel CB$.**



To the nearest tenth, what is the length of *QB*? [*CBSE Question Bank*]

(*a*) 1.4 cm (*b*) 1.7 cm (*c*) 1.8 cm (*d*) 2.2 cm

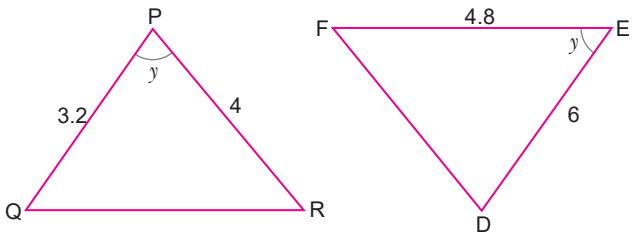
66. **In the given figure, $QR \parallel AB$, $RP \parallel BD$, $CQ = x + 2$, $QA = x$, $CP = 5x + 4$, $PD = 3x$.**



The value of x is _____. [*CBSE Question Bank*]

(*a*) 1 (*b*) 6 (*c*) 3 (*d*) 9

67. **Observe the two triangles shown below.**



Which statement is correct? [*CBSE Question Bank*]

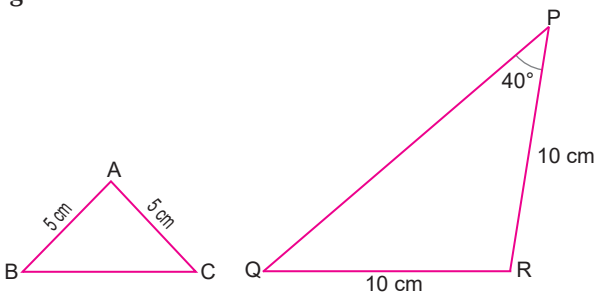
(*a*) Triangles are similar by SSA

(*b*) Triangles are similar by SAS

(*c*) Triangles are not similar as sides are not in proportion

(*d*) No valid conclusion about similarity of triangles can be made as angle measures are not

68. **Consider the triangles below.** [*CBSE Question Bank*]



Which statement is correct?

(*a*) For triangles to be similar, the measure of $\angle A = 40°$.

(*b*) For triangles to be similar, the measure of $\angle A = 100°$.

(*c*) Triangles are similar as all isosceles triangles are similar.

(*d*) Triangles are similar as corresponding sides of the triangles are in the ratio 1 : 2.

69. **Rohit is 6 feet tall. At an instant, his shadow is 5 feet long. At the same instant, the shadow of a pole is 30 feet long. How tall is the pole?** [*CBSE Question Bank*]

(*a*) 12 feet (*b*) 24 feet (*c*) 30 feet (*d*) 36 feet

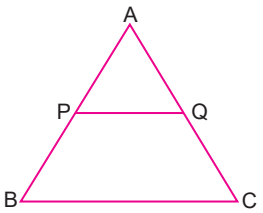
70. **Ankit is 5 feet tall. He places a mirror on the ground and moves until he can see the top of a building. At the instant when Ankit is 2 feet from the mirror, the building is 48 feet from the mirror. How tall is the building?** [*CBSE Question Bank*]

(*a*) 96 feet (*b*) 120 feet (*c*) 180 feet (*d*) 240 feet

71. **The area of two similar triangles are a and k^2a. What is the ratio of the corresponding side lengths of the triangles?** [*CBSE Question Bank*]

(*a*) $1 : k$ (*b*) $1 : k^2$ (*c*) $1 : a$ (*d*) $1 : a^2$

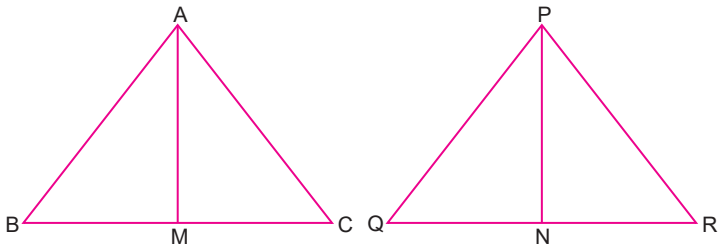
72. **In the figure below, $PQ \parallel BC$.**



The ratio of the perimeter of triangle ABC to the perimeter of triangle APQ is 3:1. Given that the numerical value of the area of triangle APQ is a whole number, which of the following could be the area of the triangle ABC? [*CBSE Question Bank*]

(*a*) 28 (*b*) 60 (*c*) 99 (*d*) 120

73. **The ratio of the areas of two similar triangles, ABC and PQR shown below is 25 : 144. What is the ratio of their medians AM and PN?** [*CBSE Question Bank*]

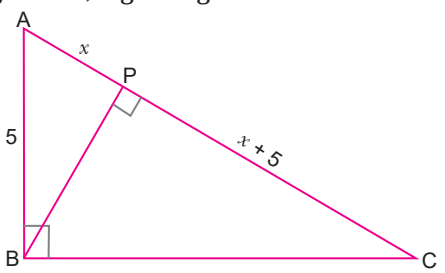


(*a*) 5 : 12 (*b*) 5 : 16 (*c*) 12 : 5 (*d*) 25 : 144

74. **The ratio of the areas of two similar right triangles is 9 : 16. The length of one of the sides of the smaller triangle is 15 cm. How much longer is the length of the corresponding side of the larger triangle from smaller triangle?** [*CBSE Question Bank*]

(*a*) 2 cm (*b*) 3 cm (*c*) 4 cm (*d*) 5 cm

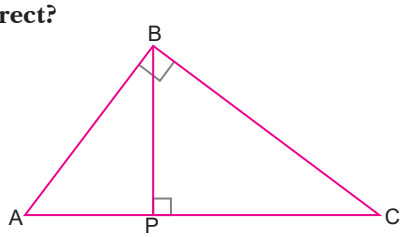
75. **Observe the right triangle *ABC*, right angled at *B* as shown below.**



What is the length of *PC*? [*CBSE Question Bank*]

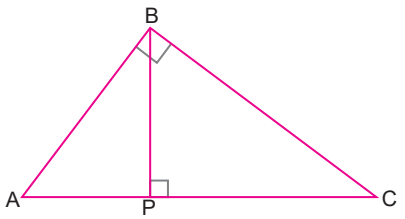
(*a*) 2.5 cm (*b*) 4.5 cm (*c*) 6 cm (*d*) 7.5 cm

76. **Observe the right triangle *ABC*, right angled at *A* as shown below. If $BP \perp AC$, then which of the following is NOT correct?** [*CBSE Question Bank*]



(*a*) $\Delta APB \sim \Delta ABC$ (*b*) $\Delta APB \sim \Delta BPC$ (*c*) $BC^2 = CP \cdot AC$ (*d*) $AC^2 = AB \cdot CB$

77. **Consider the figure below.**



Mr Shah follows the below step to prove $AB^2 + BC^2 = AC^2$.

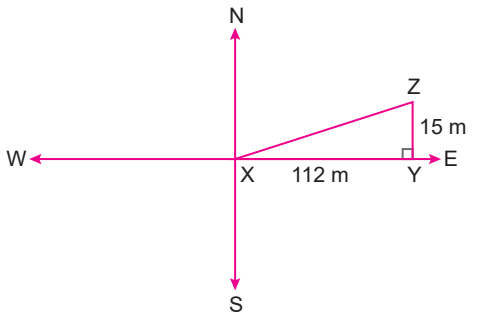
(*i*) $\Delta APB \sim \Delta ABC$ (*ii*) $\frac{AP}{AB} = \frac{AB}{AC}$ (*iii*) $AB^2 = AP \cdot AC$. [*CBSE Question Bank*]

Which of these could be his next step?

(*a*) Prove $\Delta ABC \sim \Delta PAB$ (*b*) Prove $\Delta APB \sim \Delta CPB$

(*c*) Prove $\Delta BPC \sim \Delta ABC$ (*d*) Prove $\Delta APB \sim \Delta BPC$

78. From point X, Alok walks 112 m east to reach at point Y. From point Y, Alok walks 15 m toward north to reach point Z. What is the straight-line distance between position when he started and his position now? [*CBSE Question Bank*]



(*a*) 113 m (*b*) 117 m (*c*) 123 m (*d*) 127 m

79. Which set of lengths forms a right triangle? [*CBSE Question Bank*]

(*a*) 5 cm, 12 cm, 16 cm (*b*) 7 cm, 24 cm, 25 cm

(*c*) 3 cm, 3 cm, 4 cm (*d*) 6 cm, 7 cm, 9 cm

80. Consider the following three clamis about a triangle *ABC* with side lengths *m*, *n* and *r*.

(*i*) *ABC* is a right triangle provided $n^2 - m^2 = r^2$.

(*ii*) Triangle with side lengths $m + 2$, $n + 2$ and $r + 2$ is a right-angle triangle.

(*iii*) Triangle with side lengths $2m$, $2n$ and $2r$ is a right-angle triangle.

Which of these is correct? [*CBSE Question Bank*]

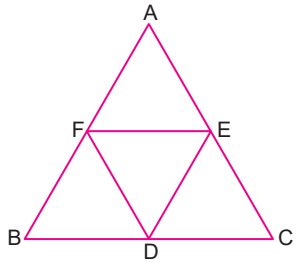
(*a*) Statement (*i*) would be correct if $n > m$, $n > r$ and statement 2 would be correct if ABC is a right triangle.

(*b*) Statement (*i*) would be correct if $r > m$, $r > n$ and statement 2 would be correct if ABC is a right triangle.

(*c*) Statement (*i*) would be correct if $n > m$, $n > r$ and statement 3 would be correct if ABC is a right triangle.

(*d*) Statement (*i*) would be correct if $r > m$, $r > n$ and statement 3 would be correct if ABC is a right triangle.

81. In the adjoining figure, *D*, *E* and *F* are the mid-points of the side *BC*, *AC* and *AB* respectively of ΔABC then $ar(\Delta DEF) : ar(\Delta ABC)$ is

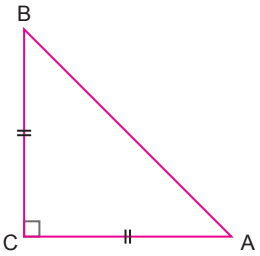


(*a*) $\frac{1}{2}$ (*b*) $\frac{1}{4}$ (*c*) $\frac{1}{9}$ (*d*) None of these

82. If $\Delta ABC \sim \Delta DEF$ such that $AB = 1.2$ cm and $DE = 1.4$ cm, the ratio of the areas of ΔABC and ΔDEF is [*CBSE* 2020 (30/3/1)]

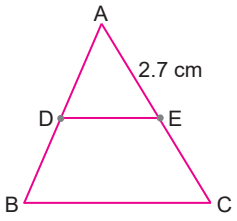
(*a*) 49 : 36 (*b*) 6 : 7 (*c*) 7 : 6 (*d*) 36 : 49

83. In figure, ABC is an isosceles triangle, right-angled at C. Therefore [*CBSE* 2020 (30/5/1)]



(*a*) $AB^2 = 2AC^2$ (*b*) $BC^2 = 2AB^2$ (*c*) $AC^2 = 2AB^2$ (*d*) $AB^2 = 4AC^2$

84. In figure, $DE \parallel BC$. If $\frac{AD}{DB} = \frac{3}{2}$ and $AE = 2.7$ cm, then EC is equal to [*CBSE* 2020 (30/5/3)]



(*a*) 2.0 cm (*b*) 1.8 cm (*c*) 4.0 cm (*d*) 2.7 cm

85. It is given that $\Delta ABC \sim \Delta DFE$, $\angle A = 30°$, $\angle C = 50°$, $AB = 5$ cm, $AC = 8$ cm and $DF = 7.5$ cm. Then, which of the following is true.

(*a*) $DE = 12$ cm, $\angle F = 50°$ (*b*) $DE = 12$ cm, $\angle F = 100°$

(*c*) $EF = 12$ cm, $\angle D = 100°$ (*d*) $EF = 12$ cm, $\angle D = 30°$

86. If in triangles ABC and DEF, $\frac{AB}{EF} = \frac{AC}{DE}$, then they will be similar when

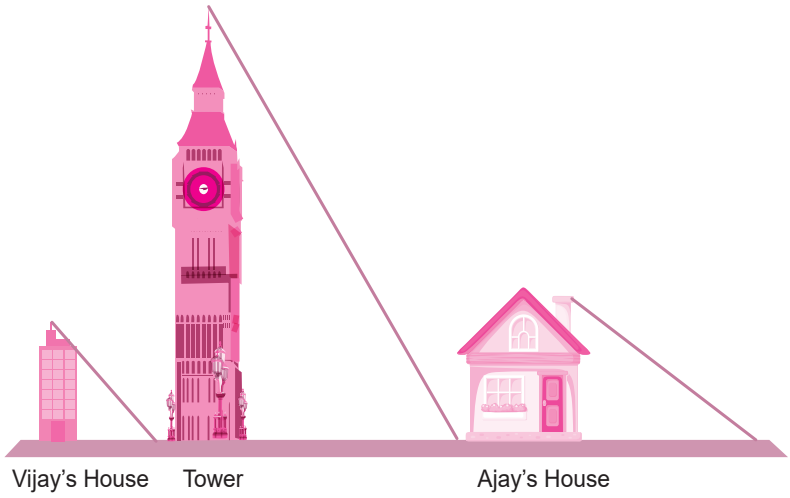
(*a*) $\angle A = \angle D$ (*b*) $\angle A = \angle E$ (*c*) $\angle B = \angle E$ (*d*) $\angle C = \angle F$

Answers

1. (*c*)	**2.** (*b*)	**3.** (*c*)	**4.** (*c*)	**5.** (*a*)	**6.** (*a*)
7. (*c*)	**8.** (*d*)	**9.** (*b*)	**10.** (*b*)	**11.** (*c*)	**12.** (*d*)
13. (*a*)	**14.** (*b*)	**15.** (*c*)	**16.** (*c*)	**17.** (*a*)	**18.** (*c*)
19. (*d*)	**20.** (*c*)	**21.** (*a*)	**22.** (*c*)	**23.** (*c*)	**24.** (*a*)
25. (*c*)	**26.** (*c*)	**27.** (*a*)	**28.** (*c*)	**29.** (*b*)	**30.** (*d*)
31. (*c*)	**32.** (*d*)	**33.** (*d*)	**34.** (*a*)	**35.** (*a*)	**36.** (*b*)
37. (*a*)	**38.** (*c*)	**39.** (*b*)	**40.** (*d*)	**41.** (*b*)	**42.** (*d*)
43. (*d*)	**44.** (*c*)	**45.** (*d*)	**46.** (*b*)	**47.** (*b*)	**48.** (*c*)
49. (*c*)	**50.** (*c*)	**51.** (*b*)	**52.** (*c*)	**53.** (*b*)	**54.** (*d*)
55. (*c*)	**56.** (*c*)	**57.** (*c*)	**58.** (*b*)	**59.** (*a*)	**60.** (*a*)
61. (*a*)	**62.** (*c*)	**63.** (*d*)	**64.** (*c*)	**65.** (*c*)	**66.** (*a*)
67. (*b*)	**68.** (*b*)	**69.** (*d*)	**70.** (*b*)	**71.** (*a*)	**72.** (*c*)
73. (*a*)	**74.** (*d*)	**75.** (*d*)	**76.** (*d*)	**77.** (*c*)	**78.** (*a*)
79. (*b*)	**80.** (*c*)	**81.** (*b*)	**82.** (*d*)	**83.** (*a*)	**84.** (*b*)
85. (*b*)	**86.** (*b*)				

CASE-BASED QUESTIONS

1. Read the following and answer any four questions from (*i*) to (*v*).



Vijay is trying to find the average height of a tower near his house. He is using the properties of similar triangles. The height of Vijay's house if 20 m when Vijay's house casts a shadow 10 m long on the ground. At the same time, the tower casts a shadow 50m long on the ground and the house of Ajay casts 20 m shadow on the ground. *[CBSE Question Bank]*

(*i*) What is the height of the tower?

(*a*) 20 m (*b*) 50 m (*c*) 100 m (*d*) 200 m

(*ii*) What will be the length of the shadow of the tower when Vijay's house casts a shadow of 12m?

(*a*) 75 m (*b*) 50 m (*c*) 45 m (*d*) 60 m

(*iii*) What is the height of Ajay's house?

(*a*) 30 m (*b*) 40 m (*c*) 50 m (*d*) 20 m

(*iv*) When the tower casts a shadow of 40m, same time what will be the length of the shadow of Ajay's house?

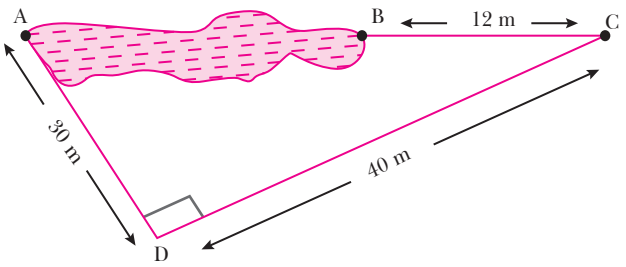
(*a*) 16 m (*b*) 32 m (*c*) 20 m (*d*) 8 m

(*v*) When the tower casts a shadow of 40m, same time what will be the length of the shadow of Vijay's house?

(*a*) 15 m (*b*) 32 m (*c*) 16 m (*d*) 8 m

2. Read the following and answer any four questions from (*i*) to (*v*).

Rohan wants to measure the distance of a pond during the visit to his native. He mark points A and B on the opposite edges of a pond as shown in the figure below. To find the distance between the points, he makes a right-angled triangle using rope connecting B with another point C at a distance of 12 m, connecting C to point D at a distance of 40m from point C and then connecting D to the point A which is at a distance of 30 m from D such that $\angle ADC = 90°$. *[CBSE Question Bank]*



(*i*) Which property of geometry will be used to find the distance *AC*?

(*a*) Similarity of triangles (*b*) Thales Theorem

(*c*) Pythagoras Theorem (*d*) Area of similar triangles

(*ii*) What is the distance *AC*?

(*a*) 50 m (*b*) 12 m (*c*) 100 m (*d*) 70 m

(*iii*) Which is the following does not form a Pythagorian triplet?

(*a*) 7,24,25 (*b*) 15,8,17 (*c*) 5,12,13 (*d*) 21,20,28

(*iv*) The length *AB* is

(*a*) 12 m (*b*) 38 m (*c*) 50 m (*d*) 100 m

(*v*) The length of the rope used

(*a*) 120 m (*b*) 70 m (*c*) 82 m (*d*) 22 m

3. Read the following and answer any four questions from (*i*) to (*v*).

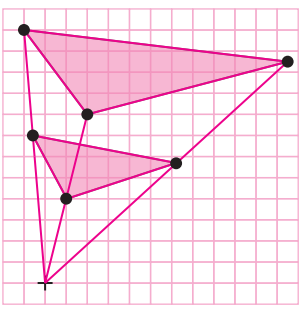
SCALE FACTOR

A scale drawing of an object is the same shape as the object but a different size.

The scale of a drawing is a comparison of the length used on a drawing to the length it represents. The scale is written as a ratio.

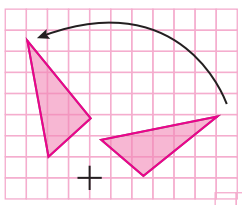
SIMILAR FIGURES

The ratio of two corresponding sides in similar figures is called the scale factor.

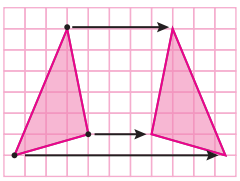


$$\text{Scale Factor} = \frac{\text{Length in image}}{\text{Corresponding length in object}}$$

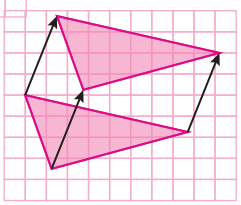
If one shape can become another using Resizing then the shapes are similar.



Rotation or Turn



Reflection or Flip



Translation or Slide

Hence, two shapes are Similar when one can become the other after a resize, flip, slide or turn.

(*i*) A model of a boat is made on the scale of 1 : 4. The model is 120 cm long. The full size of the boat has a width of 60 cm. What is the width of the scale model?

(*a*) 20 cm (*b*) 25 cm (*c*) 15 cm (*d*) 240 cm

(*ii*) What will effect the similarity of any two polygons?

(*a*) They are flipped horizontally (*b*) They are dilated by a scale factor

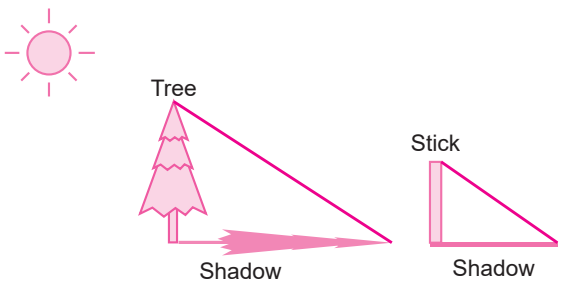
(*c*) They are translated down (*d*) They are not the mirror image of one another

(*iii*) If two similar triangles have a scale factor of *a* : *b*. Which statement regarding the two triangles is true?

(*a*) The ratio of their perimeters is $3a : b$ (*b*) Their altitudes have a ratio $a : b$

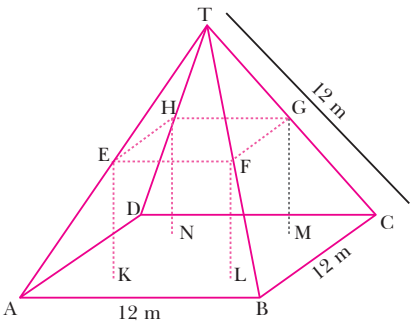
(*c*) Their medians have a ratio $\frac{a}{2} : b$ (*d*) Their angle bisectors have a ratio $a^2 : b^2$

(*iv*) The shadow of a stick 5 m long is 2 m. At the same time the shadow of a tree 12.5 m high is



(*a*) 3 m (*b*) 3.5 m (*c*) 4.5 m (*d*) 5 m

(*v*) Below you see a student's mathematical model of a farmhouse roof with measure-ments. The attic floor, *ABCD* in the model, is a square. The beams that support the roof are the edges of a rectangular prism, *EFGHKLMN*. *E* is the middle of *AT*, *F* is the middle of *BT*, *G* is the middle of *CT*, and *H* is the middle of *DT*. All the edges of the pyramid in the model have length of 12 m.

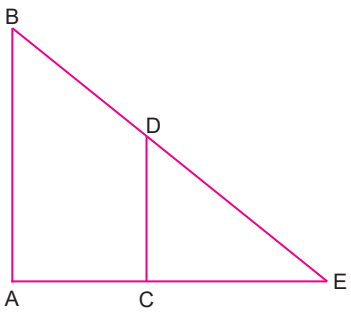


What is the length of *EF*, where *EF* is one of the horizontal edges of the block?

(*a*) 24 m (*b*) 3 m (*c*) 6 m (*d*) 10 m

4. Read the following and answer any four questions from (*i*) to (*v*).

Two trees are standing parallel to each other. The bigger tree 8 m high, casts a shadow of 6 m.



(*i*) If *AB* and *CD* are the two trees and *AE* is the shadow of the longer tree, then

(*a*) $\Delta AEB \sim \Delta CED$ (*b*) $\Delta ABE \sim \Delta CED$ (*c*) $\Delta AEB \sim \Delta DEC$ (*d*) $\Delta BEA \sim \Delta DEC$

(*ii*) Since $AB \parallel CD$, so by basic proportionality theorem, we have

(*a*) $\frac{AE}{CE} = \frac{BD}{DE}$ (*b*) $\frac{AC}{AE} = \frac{DE}{BE}$ (*c*) $\frac{AE}{CE} = \frac{AB}{CD}$ (*d*) $\frac{AE}{CE} = \frac{BE}{DE}$

(*iii*) If the ratio of the height of two trees is 3 : 1, then the shadow of the smaller tree is

(*a*) 2 m (*b*) 6 m (*c*) $\frac{8}{3}$ m (*d*) 8 m

(*iv*) The distance of point *B* from *E* is

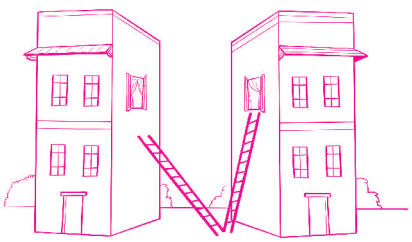
(*a*) 10 m (*b*) 8 m (*c*) 18 m (*d*) $\frac{10}{3}$ m

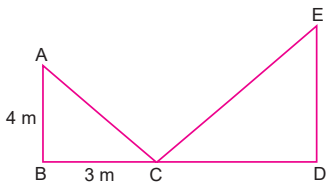
(*v*) If $\Delta ABC \sim \Delta PQR$, $\frac{ar(\Delta ABC)}{ar(\Delta PQR)} = \frac{4}{25}$, $PQ = 10$ cm, then *AB* is equal to

(*a*) 4 cm (*b*) 2 cm (*c*) 5 cm (*d*) $\frac{8}{5}$ cm

5. Read the following and answer any four questions from (*i*) to (*v*).

A ladder was placed against a wall such that it touches a point 4 m above the ground. The distance of the foot of the ladder from the bottom of the ground was 3 m. Keeping its foot at the same point, Akshay turns the ladder to the opposite side so that it reached the window of his house.





(*i*) The theorem which can be used for find the length of the ladder is

(*a*) Thales Theorem (*b*) Converse of Thales Theorem

(*c*) Pythagoras Theorem (*d*) Converse of Pythagoras Theorem

(*ii*) The length of the ladder, in metre is

(*a*) 4 m (*b*) 5 m (*c*) 9 m (*d*) 2 m

(*iii*) If the window of the house is 3 m above the ground, then the distance of the point *C* from *D* is

(*a*) 3 m (*b*) 4 m (*c*) 5 m (*d*) 3.5 m

(iv) In an isosceles right triangle *PQR*, right angled at *P*, then

(*a*) $QR^2 = 2PQ^2$ (*b*) $QP^2 = 2PR^2$ (*c*) $QP^2 = 2QR^2$ (*d*) $PR^2 = 2QR^2$

(v) If $OA^2 = OB^2 + AB^2$, then

(*a*) ΔOBA is an equilateral triangle.

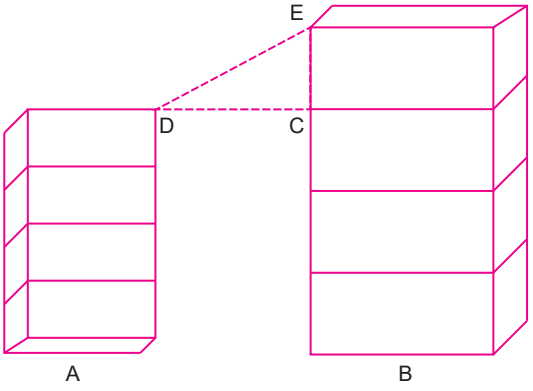
(*b*) ΔOAB is an isosceles right triangle.

(*c*) ΔOAB is a right triangle right angled at O.

(*d*) ΔOAB is a right triangle right angled at B.

6. Read the following and answer any four questions from (*i*) to (*v*).

Two buildings (say A and B) are located 12 m apart. The height of the two buildings are 32 m and 41 m.



(i) The distance between the top of the two buildings can be calculated using

(*a*) Thales Theorem (*b*) Pythagoras Theorem

(*c*) Converse of Thales Theorem (*d*) Converse of Pythagoras Theorem

(ii) The length *EF* in the figure is

(*a*) 32 m (*b*) 41 m (*c*) $\frac{41}{2}$ m (*d*) 9 m

(iii) The distance *DF* is equal to

(*a*) 15 m (*b*) 12 m (*c*) 9 m (*d*) 21 m

(iv) In a triangle *PQR*, *PQ* = 7 cm, *QR* = 25 cm, *RP* = 24 cm, then the triangle is right angled at

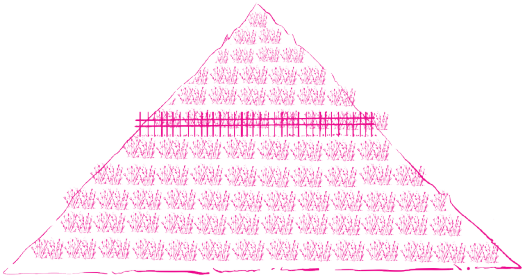
(*a*) *P* (*b*) *Q* (*c*) *R* (*d*) can't say

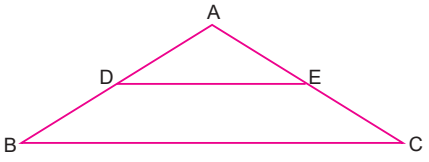
(v) *ABC* is an equilateral triangle of side '2*a*' units. The length of each of its altitude is

(*a*) a units (*b*) $2a$ units (*c*) $\sqrt{2}a$ units (*d*) $\sqrt{3}a$ units

7. Read the following and answer any four questions from (*i*) to (*v*).

A farmer had a triangular piece of land. He put a fence, parallel to one of the sides of the field as shown in the figure.





(i) Which of the following statements is true?

(a) $\frac{AD}{DB} = \frac{AE}{EC}$, using Thales Theorem (b) $\frac{AD}{DB} = \frac{AE}{EC}$, using Pythagoras Theorem

(c) $\frac{AD}{AB} = \frac{AE}{EC}$, using Pythagoras Theorem (d) $\frac{AD}{AB} = \frac{AE}{EC}$, using Thales Theorem

(ii) If the point *D* is 20 m away from *A*, where as *AB* and *AC* are 80 m and 100 m respectively, then

(a) $AE = 20$ m (b) $EC = 25$ cm (c) $AE = 25$ cm (d) $EC = 60$ cm

(iii) If $AD = x + 1$, $DB = 3x - 1$, $AE = x + 3$, $EC = 3x + 4$, then

(a) $x = 5$ (b) $x = 7$ (c) $x = 8$ (d) $x = 4$

(iv) Which of the following is not true?

(a) $\frac{AD}{AB} = \frac{AE}{AC}$ (b) $\frac{AD}{AE} = \frac{AB}{AC}$ (c) $\frac{AB}{BD} = \frac{AC}{EC}$ (d) $\frac{BD}{AD} = \frac{AE}{EC}$

(v) If *P* and *Q* are the mid points of sides *YZ* and *XZ* respectively, then

(a) $PQ \parallel XY$ (b) $PQ \parallel YZ$ (c) $PQ \parallel ZX$ (d) None of these

8. Read the following and answer any four questions from (i) to (v).

The ratio of two corresponding sides in similar figures is called scale factor.

$$\text{Scale factor} = \frac{\text{Length of image}}{\text{Actual length of object}}$$

(i) A model of a car is made on the scale 1 : 8. The model is 40 cm long and 20 cm wide. The actual length of car is

(a) 320 cm (b) 160 cm (c) 5 cm (d) 2.5 cm

(ii) If two similar triangles have a scale factor of 2 : 5, then which of the following statements is true?

(a) The ratio of their medians is 2 : 5.

(b) The ratio of their altitudes is 5 : 2.

(c) The ratio of their perimeters is $2 \times 3 : 5$.

(d) The ratio of their altitudes is $2^2 : 5^2$.

(iii) The shadow of a statue 8 m long has length 5 m. At the same time the shadow of a pole 5.6 m high is

(a) 3 m (b) 3.5 m (c) 4 cm (d) 4.5 m

(iv) For two similar polygons which of the following is not true?

(a) They are not flipped horizontally.

(b) They are dilated by a scale factor.

(c) They cannot be translated down.

(d) They are mirror images of each other.

(v) Two similar triangles have a scale factor of 1 : 2. Then their corresponding altitudes have a ratio

(a) 2 : 1 (b) 4 : 1 (c) 1 : 2 (d) 1 : 1

Answers

1.	(*i*) (*c*)	(*ii*) (*d*)	(*iii*) (*b*)	(*iv*) (*a*)	(*v*) (*d*)
2.	(*i*) (*c*)	(*ii*) (*a*)	(*iii*) (*d*)	(*iv*) (*b*)	(*v*) (*c*)
3.	(*i*) (*c*)	(*ii*) (*d*)	(*iii*) (*b*)	(*iv*) (*d*)	(*v*) (*c*)
4.	(*i*) (*a*)	(*ii*) (*d*)	(*iii*) (*a*)	(*iv*) (*a*)	(*v*) (*a*)
5.	(*i*) (*c*)	(*ii*) (*b*)	(*iii*) (*b*)	(*iv*) (*a*)	(*v*) (*d*)
6.	(*i*) (*b*)	(*ii*) (*d*)	(*iii*) (*a*)	(*iv*) (*a*)	(*v*) (*d*)
7.	(*i*) (*a*)	(*ii*) (*c*)	(*iii*) (*b*)	(*iv*) (*d*)	(*v*) (*a*)
8.	(*i*) (*a*)	(*ii*) (*a*)	(*iii*) (*b*)	(*iv*) (*d*)	(*v*) (*c*)

ASSERTION-REASON QUESTIONS

The following questions consist of two statements—Assertion(A) and Reason(R). Answer these questions selecting the appropriate option given below:

(*a*) Both *A* and *R* are true and *R* is the correct explanation for *A*.

(*b*) Both *A* and *R* are true and *R* is not the correct explanation for *A*.

(*c*) *A* is true but *R* is false.

(*d*) *A* is false but *R* is true.

1. Assertion (*A*) : $\Delta ABC \sim \Delta DEF$ such that $ar(\Delta ABC) = 36$ cm^2 and $ar(\Delta DEF) = 49$ cm^2 then, $AB : DE = 6 : 7$.

Reason (*R*) : If $\Delta ABC \sim \Delta DEF$, then $\dfrac{ar(\Delta ABC)}{ar(\Delta DEF)} = \dfrac{AB^2}{DE^2} = \dfrac{BC^2}{EF^2} = \dfrac{AC^2}{DF^2}$

2. Assertion (*A*) : In ΔABC, $DE \parallel BC$ such that $AD = (7x - 4)$ cm, $AE = (5x - 2)$ cm, $DB = (3x + 4)$ cm and $EC = 3x$ cm than x equal to 5.

Reason (*R*) : If a line is drawn parallel to one side of a triangle to intersect the other two sides in distant point, than the other two sides are divided in the same ratio.

3. Assertion (*A*) : ΔABC is an isosceles triangle right angled of C, then $AB^2 = 2AC^2$.

Reason (*R*) : In right ΔABC, right angled at B, $AC^2 = AB^2 + BC^2$.

4. Assertion (*A*) : In the ΔABC, $AB = 24$ cm, $BC = 10$ cm and $AC = 26$ cm, then ΔABC is a right angle triangle.

Reason (*R*) : If in two triangles, their corresponding angles are equal, then the triangles are similar.

Answers

1. (*a*) **2.** (*d*) **3.** (*a*) **4.** (*b*)

HINTS/SOLUTIONS OF SELECTED MCQs

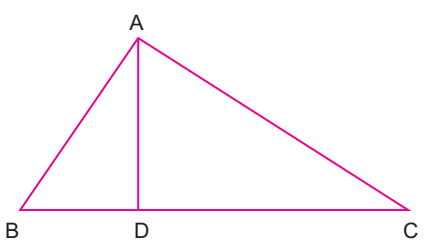
1. $\because \Delta ABC$ is a right angled triangle

$\therefore$ The line drawn from right angled vertex to the hypotenuse divides the triangle into two similar triangles.

So, $\Delta ABD \sim \Delta CAD$

$\therefore \dfrac{BD}{AD} = \dfrac{AD}{CD} \quad \Rightarrow AD^2 = BD \times CD.$

Hence, option (*c*) is correct.



3. Since, $\Delta ABC \sim \Delta EDF$

Therefore the ratio of their corresponding sides are equal.

But $\frac{BC}{EF} \neq \frac{AB}{DE} \Rightarrow BC.DE \neq AB.EF$

Hence, option (*c*) is correct.

7. Since, $\Delta PRQ \sim \Delta XYZ$

$\therefore$ The ratio of their corresponding sides are equal.

$\Rightarrow \quad \frac{PQ}{XZ} = \frac{QR}{YZ}$

Hence, option (*c*) is correct.

9. In two triangles *ABC* and *DEF*

$\angle B = \angle E, \angle C = \angle F$ and $AB = 3DE$

So $\Delta ABC \sim \Delta DEF$ (By AA similarity)

But both triangles are not congruent. Since there is no information about sides.

Hence, option (*b*) is correct.

12. We have,

In ΔPAB and ΔPDC

$$\frac{BP}{PC} = \frac{AP}{PD}$$

$\angle APB = \angle DPC = 50°$ (Vertically opposite angles)

$\therefore \quad \Delta PAB \sim \Delta PDC$ (By SAS similarity criteria)

$\therefore \quad \angle A = \angle D = 30°$

In ΔABP, we have

$\angle A + \angle B + \angle P = 180° \quad \Rightarrow \quad 30° + \angle B + 50° = 180°$

$\Rightarrow \quad \angle B = 100° \quad \Rightarrow \quad \angle PBA = 100°$

Hence, option (*d*) is correct.

13. Given, $\Delta ABC \sim \Delta QRP$

$$\therefore \quad \frac{ar(\Delta ABC)}{ar(\Delta QRP)} = \frac{BC^2}{RP^2}$$

$$\Rightarrow \quad \frac{9}{4} = \frac{(15)^2}{(RP)^2} \quad \Rightarrow \quad \frac{15}{RP} = \frac{3}{2}$$

$$\Rightarrow \quad RP = \frac{15 \times 2}{3} = 5 \times 2 = 10 \quad \Rightarrow \quad RP = 10 \text{ cm}$$

Hence, option (*a*) is correct.

17. We have,

$$\frac{ar(\Delta XYZ)}{ar(\Delta PQR)} = \frac{XY^2}{PQ^2} = \left(\frac{XY}{PQ}\right)^2$$

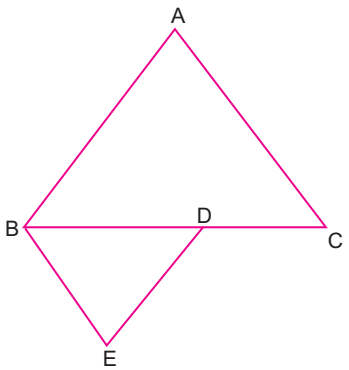
$$\frac{ar(\Delta XYZ)}{ar(\Delta PQR)} = \left(\frac{2}{5}\right)^2 = \frac{4}{25}$$

Hence, option (*a*) is correct.

19. $\because D$ is mid point of *BC*

Let $BC = a$.

$\therefore BD = BC/2 \quad \Rightarrow BD = \frac{a}{2}$



$ar(\Delta ABC) = \frac{\sqrt{3}}{4}a^2$

$ar(\Delta BDE) = \frac{\sqrt{3}}{4}\left(\frac{a}{2}\right)^2 = \frac{\sqrt{3}}{4}\left(\frac{a^2}{4}\right)$

Now $\frac{ar(\Delta ABC)}{ar(\Delta BDE)} = \frac{\frac{\sqrt{3}}{4}a^2}{\frac{\sqrt{3}}{4}\frac{a^2}{4}} = \frac{a^2}{a^2}\times 4 = \frac{4}{1} = 4:1$

Hence, option (*d*) is correct.

20. $\because AC$ is the longest side.

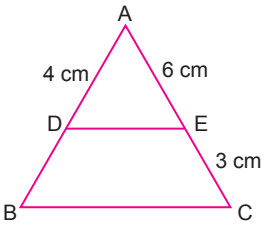
$AC^2 = AB^2 + BC^2 \Rightarrow 144 = (6\sqrt{3})^2 + (6)^2$

$\Rightarrow 144 = 108 + 36 \Rightarrow 144 = 144$

$\therefore \angle B$ is right angle. [By converse of Pythagoras theorem]

Hence, option (*c*) is correct.

21. In ΔABC



$DE \| BC$

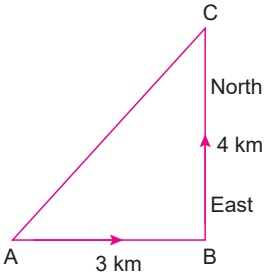
Then $\frac{AD}{BD} = \frac{AE}{EC}$ [By BPT]

$\frac{4}{BD} = \frac{6}{3} \Rightarrow 4 \times 3 = BD \times 6$

$\Rightarrow BD = \frac{4\times 3}{6} = 2\text{cm}$

$\therefore$ Option (*a*) is correct.

22. By Pythagoras theorem in ΔABC



$AC^2 = AB^2 + BC^2$

$= (3)^2 + (4)^2 = 9 + 16$

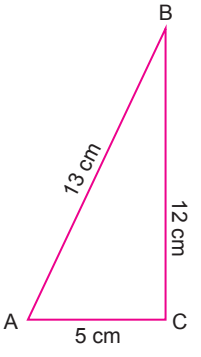
$AC^2 = 25$

$AC = 5$

$\therefore$ Option (*c*) is correct.

23. Given $AB = 13$ cm, $BC = 12$ cm and $AC = 5$ cm

Here longest side is 13 cm, So, it is the hypotenuse,



$AB^2 = AC^2 + BC^2$

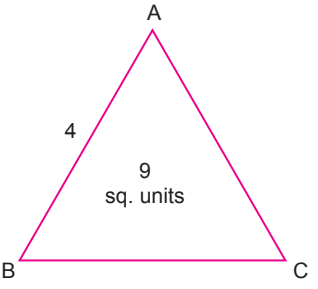
$169 = 25 + 144$

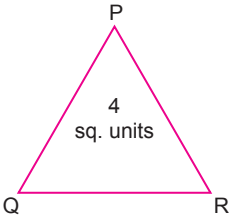
$169 = 169$

So $\angle C$ is 90° [Angle opposite to hypotenuse is 90°]

$\therefore$ Option (*c*) is correct.

24. Given $\frac{ar(\Delta ABC)}{ar(\Delta PQR)} = \frac{9}{4}$





Since $\Delta ABC \sim \Delta PQR$

$\frac{ar(\Delta ABC)}{ar(\Delta PQR)} = \frac{AB^2}{PQ^2}$

$\frac{9}{4} = \frac{4^2}{PQ^2}$

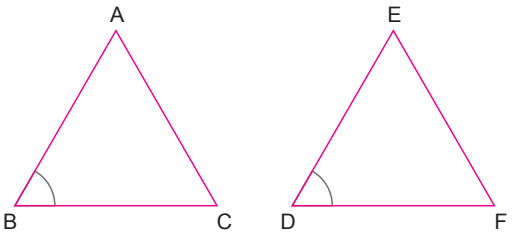
$PQ^2 \times 9 = 4 \times 16$

$\Rightarrow \quad PQ^2 = \dfrac{4 \times 16}{9}$

$PQ = \sqrt{\dfrac{4 \times 16}{9}} \quad \Rightarrow \quad PQ = \dfrac{2 \times 4}{3} = \dfrac{8}{3}$ cm

Hence, option (*a*) is correct.

25. In ΔABC and ΔEDF, $\dfrac{AB}{BC} = \dfrac{DE}{FD}$



In given figure included angle is $\angle B$ and $\angle D$

So, $\angle B = \angle D$

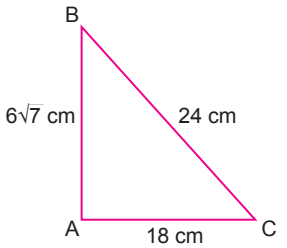
Thus option (*c*) is correct.

26. In ΔABC,

$AB^2 + AC^2 = (6\sqrt{7})^2 + (18)^2$

$= 252 + 324 = 576$

$= BC^2$



So, by Pythagoras theorem, it is a right angle.

Hence, option (*c*) is correct.

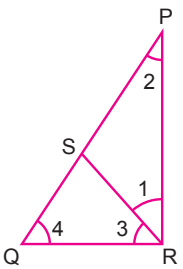
27. ∵ Both, the triangles are similar, so the ratio of their areas is equal to the ratio of square of their corresponding sides.

$\Rightarrow \quad \dfrac{ar(\triangle PRQ)}{ar(\triangle BCA)} = \left(\dfrac{QR}{BC}\right)^2 = \left(\dfrac{3}{1}\right)^2 = \dfrac{9}{1}$ or 9

Hence, option (*a*) is correct.

28. In ΔPQR,

$PS = QS = RS$ (Given) ...(*i*)



In ΔPSR,

$PS = RS$

$\Rightarrow \quad \angle 1 = \angle 2$ ... (*ii*)

Similarly in ΔSQR,

$QS = RS$

$\Rightarrow \quad \angle 3 = \angle 4$ [Corresponding angles of equal sides are equal]

Now, in ΔPQR,

$\angle P + \angle Q + \angle R = 180°$ [Angle sum property]

$\Rightarrow \quad \angle 2 + \angle 4 + \angle 1 + \angle 3 = 180°$

$\Rightarrow \quad \angle 1 + \angle 3 + \angle 1 + \angle 3 = 180°$ [From equation (*i*) and (*ii*)]

$\Rightarrow \quad 2\,[\angle 1 + \angle 3] = 180° \quad \Rightarrow \angle 1 + \angle 3 = 90°$

So, $\angle R = 90°$

In ΔPQR, by Pythagoras theorem,

$PR^2 + QR^2 = PQ^2$

Hence, option (*c*) is correct.

29. Two triangles DEF and PQR, in which

$\angle D = \angle Q$ and $\angle R = \angle E$ (Given)

$\Rightarrow \Delta DEF \sim \Delta QRP$ [By AA similarity]

So, ratio of corresponding sides are equal.

$$\frac{DE}{QR} = \frac{DF}{QP} = \frac{EF}{RP}$$

Hence, $\frac{DE}{PQ} = \frac{EF}{RP}$ is not true.

Hence, option (*b*) is correct.

30. $\because \Delta ABC \sim \Delta DEF$ (Given)

$$\Rightarrow \frac{AB}{DE} = \frac{BC}{EF} \Rightarrow \frac{AB}{2AB} = \frac{3}{EF}$$

$$\Rightarrow \frac{1}{2} = \frac{3}{EF} \Rightarrow EF = 6 \text{ cm}$$

Hence, option (*d*) is correct.

31. In ΔAQM

$AQ^2 = 4 + 1 \Rightarrow AQ = \sqrt{5}$

In ΔPQN

$PQ^2 = 4 + 1 \Rightarrow PQ = \sqrt{5}$

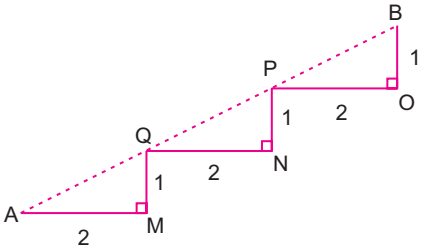
In ΔBPO

$PB^2 = 4 + 1 \Rightarrow PB = \sqrt{5}$

$AB = AQ + QP + PB$

$= \sqrt{5} + \sqrt{5} + \sqrt{5} = 3\sqrt{5}$ units

Hence, option (*c*) is correct.



32. In ΔABC and ΔPQR

$\angle A = \angle R = 25°$

$\angle B = \angle P = 35°$

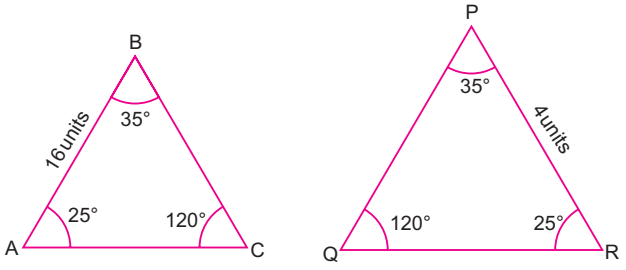
$\therefore \Delta ABC \sim \Delta RPQ$ (By AA similarity)

So, $\frac{ar(\Delta ABC)}{ar(RPQ)} = \frac{AB^2}{PR^2} = \frac{16^2}{4^2}$

$$= \frac{256}{16} = \frac{16}{1}$$

$\Rightarrow ar(\Delta ABC) = 16\, ar(\Delta RPQ)$

Hence, option (*d*) is correct.



33. As we know that altitude also acts as a median of an equilateral triangle.

$$\therefore BM = CM = \frac{BC}{2} = \frac{12}{2} = 6 \text{ cm}$$

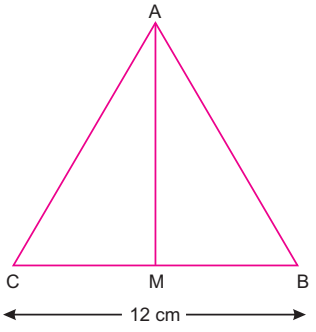
In ΔABM

$AM^2 = AB^2 - BM^2$

$= 12^2 - 6^2 = 144 - 36 = 108$

$AM = \sqrt{108} = \sqrt{36 \times 3} = 6\sqrt{3}$ cm

Hence, option (*d*) is correct.



34. Since the ratio of corresponding sides of all equilateral triangles are same. So all equilateral triangles are similar.

Hence, option (*a*) is correct.

35. It is given that $\frac{ar(\Delta PQR)}{ar(\Delta ABC)} = \frac{4}{1}$

We know that in similar triangles ratio of areas is equal to ratio of square of its corresponding sides.

So, $\frac{ar(\Delta PQR)}{ar(\Delta ABC)} = \frac{PQ^2}{AB^2} = \frac{4}{1} \quad \Rightarrow \quad \frac{PQ}{AB} = \frac{2}{1}$

Again ratio of perimeters is equal to ratio of corresponding sides.

So, $\frac{\text{Perimeter of } \Delta PQR}{\text{Perimeter of } \Delta ABC} = \frac{PQ}{AB} = \frac{2}{1}$ *i.e.*, 2 : 1

Hence, option (*a*) is correct.

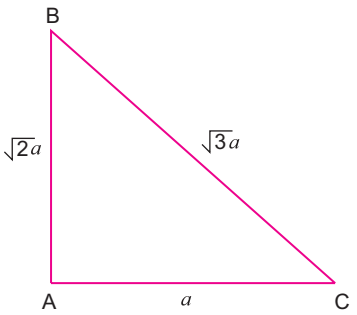
36. Three sides are $a, \sqrt{3}a$ and $\sqrt{2}a$,

let $AB = \sqrt{2}a, AC = a, BC = \sqrt{3}a$

Here, $AB^2 + AC^2 = BC^2$

$\Rightarrow (\sqrt{2}a)^2 + (a)^2 = (\sqrt{3}a)^2$

$\Rightarrow 2a^2 + a^2 = 3a^2 \Rightarrow 3a^2 = 3a^2$



Here sum of squares of two sides is equal to square of third side.
So, the triangle is right angled triangle.

$\Rightarrow$ Angle opposite to longest side is 90°.

Hence, option (*b*) is correct.

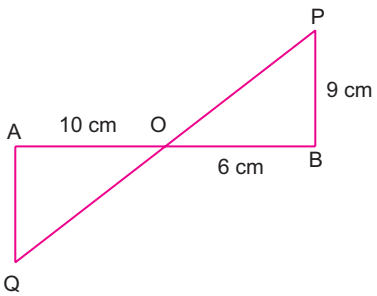
37. In ΔAOQ and ΔBOP, we have

$\angle AOQ = \angle BOP$ (Vertically opposite angle)

$\angle OAQ = \angle OBP$ (Both of 90°)

$\therefore \Delta AOQ \sim \Delta BOP$ (By AA similarity)

So $\frac{AO}{BO} = \frac{AQ}{PB} \Rightarrow \frac{10}{6} = \frac{AQ}{9} \Rightarrow AQ = \frac{10 \times 9}{6} = 15$ cm



Hence, option (*a*) is correct.

38. As we know that ratio of area of two triangles is equal to ratio of square of medians of both the triangle.

So, $\frac{\text{area of triagle 1}}{\text{area of triangle 2}} = \frac{(\text{median 1})^2}{(\text{median 2})^2}$

$\Rightarrow \frac{144}{81} = \frac{(16)^2}{(\text{median})^2} \quad \Rightarrow (\text{median 2})^2 = \frac{81 \times 256}{144} = 144$

$\Rightarrow$ median 2 $= \sqrt{144} = 12$ cm

Hence, option (*c*) is correct.

39. In ΔPQR, $PO = QO = RO$ (Given)

In ΔPOR,

$OP = OR \Rightarrow \angle 1 = \angle 2 \quad \ldots(i)$ (Equal sides have equal opposite angles)

Similarly in ΔROQ

$\angle 3 = \angle 4 \quad \ldots(ii)$

Now in ΔPQR,

$\angle P + \angle Q + \angle R = 180°$

$\Rightarrow \angle 2 + \angle 4 + \angle 1 + \angle 3 = 180°$

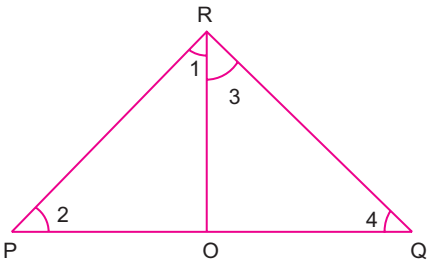
$\Rightarrow \angle 1 + \angle 3 + \angle 1 + \angle 3 = 180°$

$\Rightarrow 2(\angle 1 + \angle 3) = 180°$

$\Rightarrow \angle 1 + \angle 3 = 90°$

$\Rightarrow \Delta PQR$ is right angled triangle.

So, $PQ^2 = PR^2 + QR^2$



Hence, option (*b*) is correct.

40. From the correspondence of sides we can clearly say that $\Delta ABC \sim \Delta DFE$.

Hence, option (*d*) is correct.

41. As we know ratio of areas of two similar triangles is equal to ratio of squares of its corresponding sides.

So, $\frac{ar(\Delta DEF)}{ar(\Delta ABC)} = \frac{EF^2}{BC^2} = \left(\frac{EF}{BC}\right)^2 = \left(\frac{5}{1}\right)^2 = \frac{25}{1} = 25$

Hence, option (*b*) is correct.

42. $\because \Delta ABC \sim \Delta DEF$

$\therefore$ Ratio of corresponding sides are equal.

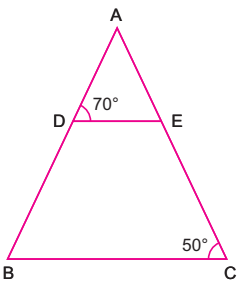
So, $\frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF}$ $\Rightarrow BC.DF = AC.EF$ is true

or $AB.DF = AC.DE$ is true or $BC.DE = AB.EF$ is true

But $BC.DE = AB.FD$ is not correct.

Hence, option (*d*) is correct.

43. Given that $\frac{AD}{BD} = \frac{AE}{EC}$ and $\angle ADE = 70°$



By BPT, $DE \,||\, BC$

$\Rightarrow \angle AED = \angle ACB$ (Corresponding angles)

$= 50°$

In ΔADE

$\angle A + \angle ADE + \angle AED = 180°$ (By ASP)

$\Rightarrow \angle A = 180° - 70° - 50°$

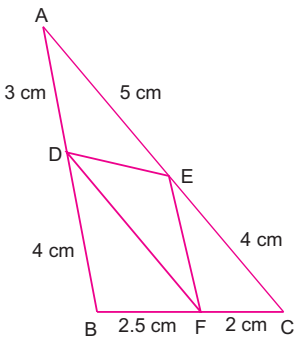
$\Rightarrow \angle A = 60° \Rightarrow \angle BAC = 60°$

Hence, option (*d*) is correct.

44. $\because \frac{CE}{AE} = \frac{4}{5} = 0.8$ and

$\frac{CF}{BF} = \frac{2}{2.5} = \frac{20}{25} = \frac{4}{5} = 0.8$

$\Rightarrow \frac{CE}{AE} = \frac{CF}{BF} \Rightarrow EF \,||\, AB$ [By converse of BPT]



Hence, option (*c*) is correct.

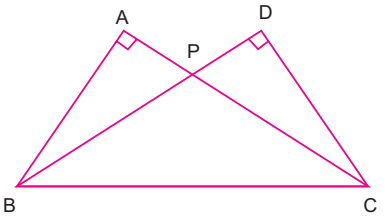
45. In ΔAPB and ΔDPC, we have

$\angle A = \angle D$ (Both of 90°)

$\angle APB = \angle DPC$ (Vertically opposite angles)

$\therefore \Delta APB \sim \Delta DPC$ (By AA similarty)

$\Rightarrow \frac{AP}{DP} = \frac{PB}{PC} \Rightarrow AP \times PC = DP \times PB$



Hence, option (*d*) is correct.

46. Given $AB = 4BX$ and $YC = 2$ cm

$\because XY \,||\, BC$

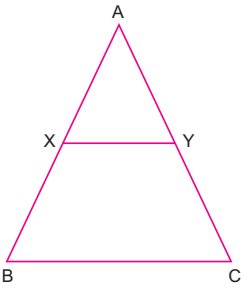
$\therefore \dfrac{AB}{BX} = \dfrac{AC}{CY} = \dfrac{4}{1} \Rightarrow \dfrac{AC}{CY} = \dfrac{4}{1}$

$\dfrac{AC}{2} = \dfrac{4}{1}$ [$\because YC = 2$ cm]

$\Rightarrow AC = 8$ cm

Now $AY = AC - CY \Rightarrow (8 - 2)$ cm $\Rightarrow 6$ cm

Hence, option (*b*) is correct.



47. $\because D, E$ and F are mid points of BC, AC and AB respectively.

$\therefore DE = \dfrac{1}{2}AB, EF = \dfrac{1}{2}BC$ and $DF = \dfrac{1}{2}AC$

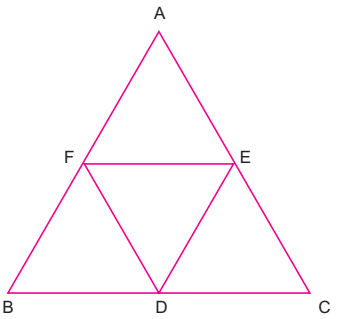
and $DE \,||\, AB, EF \,||\, BC, DF \,||\, AC$

Therefore $\Delta DEF \sim \Delta ABC$

So, $\dfrac{ar(\Delta DEF)}{ar(\Delta ABC)} = \dfrac{EF^2}{BC^2} = \dfrac{EF^2}{(2EF)^2}$

$= \dfrac{EF^2}{4EF^2} = \dfrac{1}{4}$ or 1 : 4.

Hence, option (*b*) is correct.



48. In ΔABC

$\because AB \,||\, XY$

$\therefore \dfrac{BX}{XC} = \dfrac{AY}{YC}$ (By BPT) …(*i*)

In parallelogram $ABCD$,

$AB \,||\, CD \,||\, XZ$

In ΔACD,

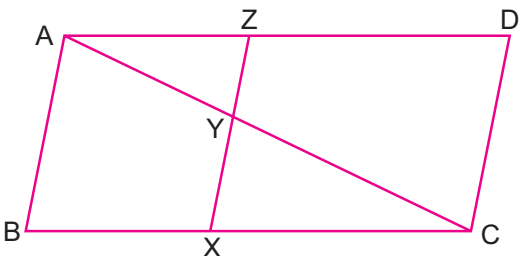
$\because CD \,||\, YZ$

$\Rightarrow \dfrac{AY}{YC} = \dfrac{AZ}{ZD}$ (By BPT) …(*ii*)

From (*i*) and (*ii*), we get

$\dfrac{BX}{XC} = \dfrac{AZ}{ZD}$

Hence, option (*c*) is correct.



49. $\because$ Diagonals of rhombus bisect each other at 90°.

$\therefore \Delta AOB, \Delta AOD, \Delta BOC$ and ΔCOD are right angled triangles.

Here, $OA = OC = \dfrac{1}{2}AC$ and $OB = OD = \dfrac{1}{2}BD$

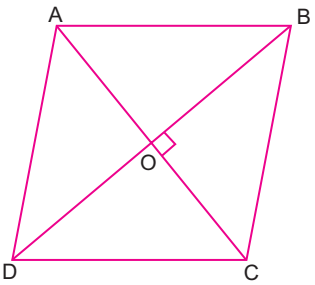
In ΔAOB,

$AB^2 = OA^2 + OB^2$

$\Rightarrow AB^2 = \left(\dfrac{AC}{2}\right)^2 + \left(\dfrac{BD}{2}\right)^2$

$\Rightarrow AB^2 = \dfrac{AC^2}{4} + \dfrac{BD^2}{4}$

$\Rightarrow 4AB^2 = AC^2 + BD^2$

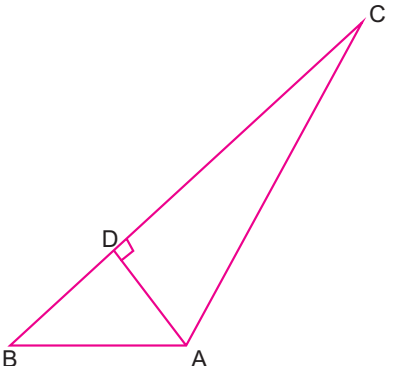


$\Rightarrow AB^2 + AB^2 + AB^2 + AB^2 = AC^2 + BD^2$

$\Rightarrow AB^2 + BC^2 + CD^2 + AD^2 = AC^2 + BD^2$

Hence, option (*c*) is correct.

50. Here $AD \perp BC$



In ΔABD

$AB^2 = AD^2 + BD^2$ ...(*i*)

In ΔACD

$AC^2 = AD^2 + CD^2$ ...(*ii*)

From (*i*) and (*ii*)

$AB^2 = (AC^2 - CD^2) + BD^2$ [Put value of AD^2]

$\Rightarrow AB^2 + CD^2 = AC^2 + BD^2$

Hence, option (*c*) is correct.

51. All right angle triangles should satisfy the Pythagoras Theorem

So, $h^2 = p^2 + b^2$

$(34)^2 = (30)^2 + (16)^2 \quad \Rightarrow \quad 1156 = 900 + 256$

$\Rightarrow 1156 = 1156$

So, sides of a right triangle are 34 cm, 30 cm and 16 cm

Hence, option (*b*) is correct.

52. We know from theorem that if two triangles are similar then ratio of area of these triangles is equal to ratio of square of their corresponding sides.

Hence, option (*c*) is correct.

53. As we know that in two similar triangles ratio of area of two triangles is equal to ratio of square of their corresponding medians

So, $\dfrac{\text{Area of triangle 1}}{\text{Area of triangle 2}} = \dfrac{(\text{median}_1)^2}{(\text{median}_2)^2}$

$\Rightarrow \dfrac{144}{64} = \dfrac{(12)^2}{(\text{median } 2)^2} \Rightarrow (\text{median } 2)^2 = \dfrac{64 \times 144}{144}$

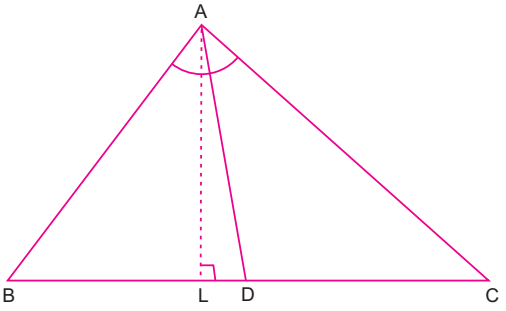
median 2 = 8 cm

Hence, option (*b*) is correct.

54. In ΔABC, AD is the bisectors of $\angle A$.

$\therefore \dfrac{AB}{AC} = \dfrac{BD}{DC}$ ...(*i*)

From A draw $AL \perp BC$



$\therefore \dfrac{ar(\Delta ABD)}{ar(\Delta ACD)} = \dfrac{\frac{1}{2} BD \times AL}{\frac{1}{2} CD \times AL} = \dfrac{BD}{CD}$

$\Rightarrow \dfrac{ar(\Delta ABD)}{ar(\Delta ACD)} = \dfrac{AB}{AC}$ [From (*i*)]

Hence, option (*d*) is correct.

55. *ABCD* is a square and *APC* is a triangle described on diagonal and *BCQ*, is a triangle described on a side of square.

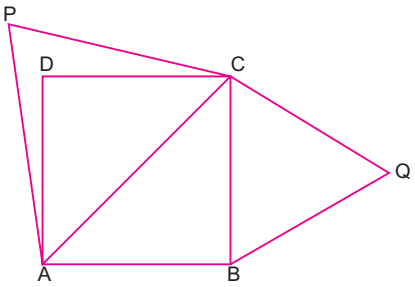
Let each side of square be of length *a* unit.

Diagonal $AC = \sqrt{a^2 + a^2} = a\sqrt{2}$ units

$\because$ Both triangles are equilateral triangles.

$$\therefore \frac{ar(\Delta APC)}{ar(\Delta BCQ)} = \frac{\frac{\sqrt{3}}{4} \times (a\sqrt{2})^2}{\frac{\sqrt{3}}{4}a^2} = \frac{a^2 \times 2}{a^2} = \frac{2}{1} \; i.e., 2:1$$

Hence, option (*c*) is correct.



56. $\because$ Perpendicular of an equilateral triangle act as a median.

$$\therefore BD = CD = \frac{BC}{2}$$

In ΔABD,

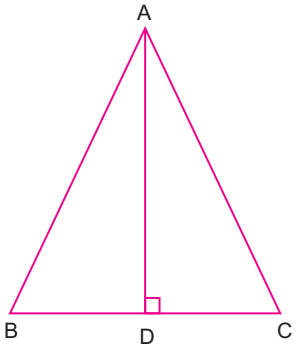
$$AB^2 = AD^2 + BD^2$$

$$AB^2 = AD^2 + \left(\frac{BC}{2}\right)^2 \Rightarrow AB^2 = AD^2 + \frac{BC^2}{4}$$

$$\Rightarrow AB^2 = AD^2 + \frac{AB^2}{4} [\because AB = BC = AC]$$

$$\Rightarrow AB^2 = \frac{4AD^2 + AB^2}{4} \Rightarrow 3AB^2 = 4AD^2$$

Hence, option (*c*) is correct.



57. $\because$ Perpendicular of an equilateral triangle act as a median.

$$\therefore BD = CD = BC/2$$

In ΔADC

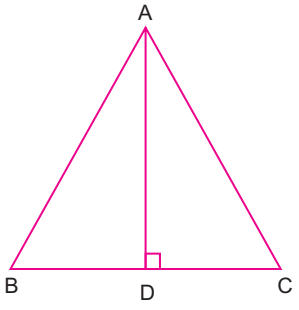
$$AC^2 = AD^2 + CD^2$$

$$\Rightarrow BC^2 = AD^2 + CD^2 [\because AB = BC = AC]$$

$$\Rightarrow (2CD)^2 = AD^2 + CD^2$$

$$\Rightarrow 4CD^2 = AD^2 + CD^2 \Rightarrow AD^2 = 3CD^2$$

Hence, option (*c*) is correct.



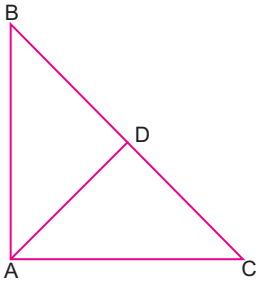
58. As we know that the perpendicular from the right angle vertex on hypotenuse divides the triangle into two similar triangles.

$\therefore \Delta ABD \sim \Delta ACD$

Ratio of corresponding sides are equal.

$$\frac{BD}{CD} = \frac{AB}{AC}$$

Hence, option (*b*) is correct.



59. Since we know that all the congruent figures are similar. Therefore only Vatsal is correct.

$\therefore$ Option (*a*) is correct.

60. We know that all circles are similar, all squares are also similar because their angles are equal but all right triagles are not congruent because different right triangles can have different sides. Also, all equilateral triangles are not congruent due to same reason.

$\therefore$ Option (*a*) is correct.

61. We have,

$AB = 3$ m, $BC = 2$ m, $CD = 5$ m, $DA = 1$ m

and $PQ = 6$ m, $QR = 4$ m, $RS = 10$ m, $SP = 2$ m

$$\therefore \quad \frac{AB}{PQ} = \frac{BC}{QR} = \frac{CD}{RS} = \frac{DA}{SP} = \frac{1}{2}$$

$\therefore$ Quadrilateral $ABCD \sim \square PQRS$

$\therefore \quad \angle A = \angle P$ and $\angle D = \angle S$ (Corresponding angles)

$\Rightarrow 130° = y$ and $58° = x$

$\therefore \quad x = 58°$ and $y = 130°$

$\therefore$ Option (a) is correct.

62. For two quadrilaterals to be similar whose diagonals bisect each other, the diagonals should bisected at right angles and their adjacent angles should be equal.

$\therefore$ Option (c) is correct.

63. In ΔAOB and ΔDOC, we have

$$\frac{AO}{OD} = \frac{1.6}{0.8} = 2 \quad \text{and} \quad \frac{OB}{OC} = \frac{4.8}{2.4} = 2$$

$$\therefore \frac{AO}{OD} = \frac{OB}{OC}$$

$\angle AOB = \angle COD$ (Vertically opposite angles are equal)

$\therefore \Delta AOB \sim \Delta DOC$ (By SAS similarity criteria)

Thus, option (d) is correct.

64. Statement (i), $\angle B = 70$

$\therefore \angle A = 180° - (60° + 70°) = 50°$

$\Rightarrow 7x + 1 = 50 \qquad \Rightarrow 7x = 49 \Rightarrow x = 7$

$\therefore \angle D = 3x + 29 = 3 \times 7 + 29 = 21 + 29 = 50$

$\therefore \angle A = \angle D$ and $\angle AOB = \angle COD = 60°$

Also third angle $\angle B = \angle C = 70°$

$\Delta AOB \sim \Delta DCO$ (*By AAA* similarity criteria)

Now, if we take statement (ii), $\angle C = 70°$, then also same result will be found *i.e.*,

$\Delta AOB \sim \Delta DOC$

Thus, option (c) is correct, *i.e*; each statement alone is sufficient.

65. We have

In ΔABC $PQ \,||\, BC$

$$\therefore \frac{AQ}{QB} = \frac{AP}{PC} \qquad \Rightarrow \frac{1.3}{QB} = \frac{2.4}{3.3} = \frac{24}{33}$$

$$\Rightarrow \frac{1.3}{QB} = \frac{8}{11} \Rightarrow QB = \frac{1.3 \times 11}{8} = 1.78 = 1.8 \text{ cm}$$

$\therefore$ Option (c) is correct.

66. It is given that

$QR \,||\, AB, RP \,||\, BD$

and, $CQ = x + 2, QA = x,$

$CP = 5x + 4, PD = 3x,$

Now,

In $\Delta ABC, QR \,||\, AB$

$$\therefore \frac{CQ}{AQ} = \frac{CR}{RB} \qquad \ldots(i)$$

In $\Delta BCD, RP \,||\, BD$

$$\therefore \frac{CR}{RB} = \frac{CP}{PD} \qquad \ldots(ii)$$

From (i) and (ii), we have

$$\frac{CQ}{AQ} = \frac{CP}{PD} \quad \Rightarrow \quad \frac{x+2}{x} = \frac{5x+4}{3x} \Rightarrow \frac{x+2}{1} = \frac{5x+4}{3}$$

$\Rightarrow 3x + 6 = 5x + 4 \quad \Rightarrow 2 = 2x \Rightarrow x = 1$

$\therefore$ Option (a) is correct.

67. We have,

$PQ = 3.2, PR = 4$ and $\angle P = y$

Also, $EF = 4.8, DE = 6$ and $\angle E = y$

In ΔPQR and ΔEFD, we have

$$\frac{PQ}{EF} = \frac{3.2}{4.8} = \frac{2}{3}, \frac{PR}{DE} = \frac{4}{6} = \frac{2}{3}$$

and $\angle P = \angle E = y$

$$\Rightarrow \frac{PQ}{EF} = \frac{PR}{DE} \text{ and } \angle P = \angle E$$

$\therefore$ Both triangles are similar by SAS similarity criteria.

$\therefore$ Option (b) is correct.

68. In ΔPQR we have

$PR = QR \Rightarrow \angle Q = \angle P = 40°$

$\angle R = 180° - (\angle P + \angle Q) = 180° - (40° + 40°) = 100°$

$\therefore \angle R = 100°$

We have, $\frac{AB}{PR} = \frac{5}{10} = \frac{1}{2}, \frac{AC}{QR} = \frac{5}{10} = \frac{1}{2} \Rightarrow \frac{AB}{PR} = \frac{AC}{QR} = \frac{1}{2}$

Condition for both be triangles to be similar is

$\angle A = \angle R = 100°$

$\therefore$ Option (b) is correct.

69. Let AB be position of Rohit and PQ be the pole.

Now, at the same instant $\angle C = \angle R$

$\angle B = \angle Q = 90°$

$\angle C = \angle R$

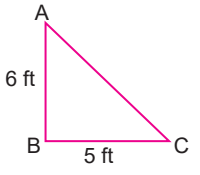
$\therefore \Delta ABC \sim \Delta PQR$ (By AA similarity criteria)

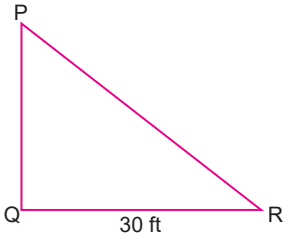
$\therefore \frac{AB}{PQ} = \frac{BC}{QR}$ (Corresponding sides)

$\Rightarrow \frac{6}{PQ} = \frac{5}{30} \Rightarrow PQ = 36$ ft.

$\therefore$ Height of the pole be 36 ft

$\therefore$ Option (d) is correct.





70. Let h feet be the height of the building.

Since both the triangle formed by Ankit and a building, are similar.

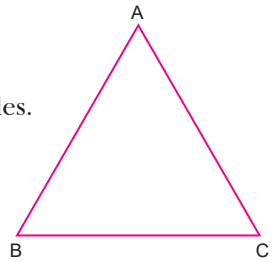
$$\frac{5}{2} = \frac{h}{48} \Rightarrow h = 24 \times 5 = 120 \text{ feet}$$

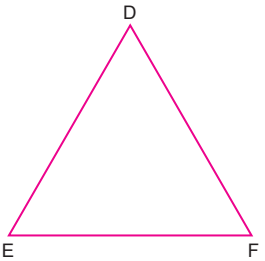
$\therefore$ Option (b) is correct.

71. Let ΔABC and ΔDEF are two similar triangles.

$$\therefore \quad \frac{ar(\Delta ABC)}{ar(\Delta DEF)} = \frac{AB^2}{DE^2} = \frac{BC^2}{EF^2} = \frac{AC^2}{DF^2}$$

$$\Rightarrow \quad \frac{a}{k^2 a} = \frac{AB^2}{DE^2}$$





$\Rightarrow \frac{1}{k^2} = \frac{AB^2}{DE^2} \Rightarrow \frac{AB}{DE} = \frac{1}{k}$

$\therefore \quad AB : DE = 1 : k$

$\therefore$ Option (a) is correct.

72. In $\Delta ABC, PQ \| BC$

$\therefore \Delta APQ \sim \Delta ABC$ (By AAA similarity criteria)

$\therefore \frac{\text{Perimeter of } \Delta ABC}{\text{Perimeter of } \Delta APQ} = \frac{3}{1} \Rightarrow \frac{AB}{AP} = \frac{3}{1} \quad \ldots(i)$

Now, $\frac{\text{area of } \Delta ABC}{\text{area of } \Delta APQ} = \frac{AB^2}{AP^2} = \left(\frac{3}{1}\right)^2 \Rightarrow \frac{ar(\Delta ABC)}{ar(\Delta APQ)} = 9$

$\Rightarrow ar(\Delta ABC) = 9 \times ar(\Delta APQ)$

$\because ar(\Delta APQ)$ is whole number.

$\therefore ar(\Delta ABC)$ is a multiple of 9.

In the given option it is only 99.

$\therefore$ Option (c) is correct.

73. We have

$\Delta ABC \sim \Delta PQR$

and $\frac{ar(\Delta ABC)}{ar(\Delta PQR)} = \frac{25}{144} \Rightarrow \frac{AM^2}{PN^2} = \frac{25}{144} = \frac{5^2}{12^2}$

$\frac{AM}{PN} = \frac{5}{12}$

$\therefore$ Option (a) is correct.

74. Let x cm be length of corresponding sides of larger triangle.

$\therefore \frac{(15)^2}{x^2} = \frac{9}{16} \Rightarrow \frac{15}{x} = \frac{3}{4} \Rightarrow x = \frac{60}{3} = 20$ cm

Difference between both sides = 20 – 15 = 5 cm

$\therefore$ Option (d) is correct.

75. We have

In ΔAPB and ΔABC

$\angle APB = \angle ABC = 90°$

$\angle BAP = \angle BAC$ (Common)

$\therefore \Delta APB \sim \Delta ABC$ (By AA similarity criteria)

$\therefore \frac{AB}{AC} = \frac{AP}{AB} \Rightarrow AB^2 = AC \cdot AP \Rightarrow 25 = (2x + 5) \cdot x$

$\Rightarrow 25 = 2x^2 + 5x \Rightarrow 2x^2 + 5x - 25 = 0 \Rightarrow 2x^2 + 10x - 5x - 25 = 0$

$\Rightarrow 2x(x + 5) - 5(x + 5) = 0 \Rightarrow (x + 5)(2x - 5) = 0$

$\Rightarrow 2x - 5 = 0 \quad (\because x + 5 \neq 0 \Rightarrow x \neq -5$ and length cannot be negative)

$\therefore x = \frac{5}{2} = 2.5$

Length of $PC = x + 5 = 2.5 + 5 = 7.5$ cm

$\therefore$ Option (d) is correct.

76. We have

In ΔAPB and ΔABC

$\angle APB = \angle ABC = 90$

$\angle BAP = \angle BAC$ (Common)

$\therefore \Delta APB \sim \Delta ABC$ (By AA similarity criteria) ...(*i*)

Similarly, $\Delta BPC \sim \Delta ABC$ (BY AA similarity criteria) ...(*ii*)

$$\frac{BC}{PC} = \frac{AC}{BC} \Rightarrow BC^2 = CP \cdot AC$$

Also $\Delta APB \sim \Delta BPC$ (From (*i*) and (*ii*))

So, all the option (*a*), (*b*) and (*c*) are correct.

The only option (*d*) is not true.

Thus, option (*d*) is correct.

77. To prove $AB^2 + BC^2 = AC^2$

In right ΔABC, we have to prove first $\Delta APB \sim \Delta ABC$ and again $\Delta BPC \sim \Delta ABC$.

Mr Shah follows steps to prove $\Delta APB \sim \Delta ABC$ and

$$\frac{AP}{AB} = \frac{AB}{AC} \Rightarrow AB^2 = AP.AC$$

So the next step be to prove $\Delta BPC \sim \Delta ABC$.

$\therefore$ Option (*c*) is correct.

78. In right ΔXYZ, we have

$XZ^2 = XY^2 + YZ^2$

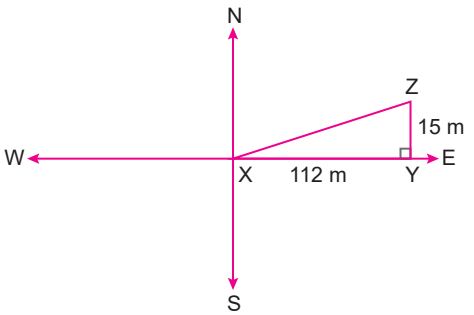
$\Rightarrow XZ^2 = (112)^2 + (15)^2 = 12544 + 225$

$\Rightarrow XZ^2 = 12769$

$\therefore XZ = \sqrt{12769} = 113$ m

$\therefore$ Required distance = 113 m

$\therefore$ Option (*a*) is correct.



79. Option (*b*) is correct.

Because its given length of sides are 7 cm, 24 cm, 25 cm

$\therefore (7)^2 + (24)^2 = (25)^2$

It satisfies Pythagoras Theorem.

80. We have ΔABC with sides m, n and r.

So, claim (*i*): ABC is a right triangle provided

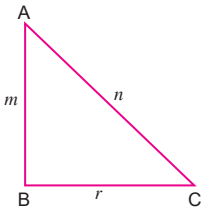
$n^2 - m^2 = r^2 \Rightarrow n^2 = r^2 + m^2$ (Pythagoras theorem)

$\therefore$ Claim (*i*) would be correct.

Also, triangle with side lengths $2m$, $2n$ and $2r$ is a right angle triangle, if ΔABC is right triangle.

$\therefore$ Claim (*iii*) would be correct.

$\therefore$ Option (*c*) is correct.



81. We have,

$$\frac{ar(\Delta AEF)}{ar(\Delta ABC)} = \left(\frac{1}{2}\right)^2 = \frac{1}{4} \quad \Rightarrow \quad \frac{ar(\Delta DEF)}{ar(\Delta ABC)} = \frac{1}{4} \quad [\because ar(\Delta AEF) = ar(\Delta DEF)]$$

Hence, option (*b*) is correct.

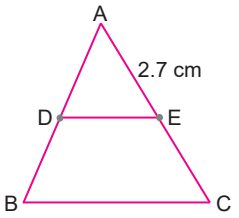
82. Since $\Delta ABC \sim \Delta DEF$

$$\therefore \quad \frac{ar(\Delta ABC)}{ar(\Delta DEF)} = \frac{AB^2}{DE^2} = \left(\frac{AB}{DE}\right)^2 = \left(\frac{1.2}{1.4}\right)^2$$

$$= \left(\frac{12}{14}\right)^2 = \left(\frac{6}{7}\right)^2 = \frac{36}{49}$$

$\therefore$ Option (*d*) is correct.

84. We have,



In ΔABC, $DE \parallel BC$

$\Rightarrow \quad \frac{AD}{DB} = \frac{AE}{EC} \qquad \Rightarrow \quad \frac{3}{2} = \frac{2.7}{EC}$

$\Rightarrow \quad EC = \frac{2.7 \times 2}{3} = 1.8 \text{ cm}$

$\therefore$ Option (b) is correct.

85. Given, $\Delta ABC \sim \Delta DFE$,

$\therefore \quad \angle A = \angle D, \ \angle B = \angle F$ and $\angle C = \angle E$

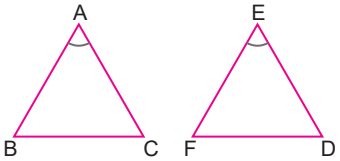
$\Rightarrow \quad \angle D = 30°, \angle E = 50° \Rightarrow \angle F = 180° - (30° + 50°) = 100°$ (Using angle sum property)

Also, $\frac{AB}{DF} = \frac{AC}{DE} \Rightarrow \frac{5}{7.5} = \frac{8}{DE} \quad \Rightarrow \qquad DE = 12 \text{ cm}$

$\therefore \quad DE = 12$ cm and $\angle F = 100°$

Hence, option (b) is correct.

86. Given, $\frac{AB}{EF} = \frac{AC}{DE}$



For two triangles (ABC and EFD) to be similar when

$\angle A = \angle E$ (Corresponding angles)

$\therefore$ Option (b) is correct.

SOLUTIONS OF CASE-BASED QUESTIONS

1. (i) Let h m be the height of tower, therefore using property of similar triangle between two triangle *i.e.* for Vijay's house and for tower with shadows.

We have,

$$\frac{20}{h} = \frac{10}{50} \quad \Rightarrow h = 100 \text{ m}$$

$\therefore$ Height of tower is 100 m.

$\therefore$ Option (c) is correct.

(ii) When Vijay's house casts a shadow of 12 m, we have

$\frac{20}{h} = \frac{12}{x}$, where x is the length of shadow of tower.

$\Rightarrow \quad \frac{20}{100} = \frac{12}{x} \quad \Rightarrow \quad x = 60 \text{ m}$

$\therefore$ Option (d) is correct.

(iii) Let H m be the height of Ajay's house.

$\therefore \quad \frac{20}{10} = \frac{H}{20} \quad \Rightarrow \quad H = 40 \text{ m}$

$\therefore$ Option (b) is correct.

(iv) When the tower casts a shadow of 40 m.

$$\therefore \quad \frac{100}{40} = \frac{\text{Height of Ajay's house}}{\text{Length of shadow of Ajay's house}}$$

$$\Rightarrow \quad \frac{5}{2} = \frac{40}{\text{Shadow length}}$$

$\Rightarrow$ Length of shadow of Ajay house = 16 m.

$\therefore$ Option (*a*) is correct.

(*v*) We have,

$$\frac{100}{40} = \frac{\text{Height of Vijay's house}}{\text{Length of its shadow}} \Rightarrow \frac{5}{2} = \frac{20}{\text{Length of its shadow}}$$

$\Rightarrow$ Length of shadow of Vijay house = 8 m

$\therefore$ Option (*d*) is correct.

2. (*i*) Pythagoras Theorem will be used to find the distance AC in right angle ΔACD.

$\therefore$ Option (*c*) is correct.

(*ii*) In right angle ΔACD, we have

$AC^2 = AD^2 + CD^2$ (Pythagoras Theorem)

$\Rightarrow$ $AC^2 = (30)^2 + (40)^2 = 900 + 1600 = 2500 \Rightarrow AC = 50$ m

$\therefore$ Option (*a*) is correct.

(*iii*) Here, (21, 20, 28) is not a Pythagorean triplet because

$(21)^2 + (20)^2 \neq (28)^2$

$\Rightarrow$ $441 + 400 \neq 784 \Rightarrow 841 \neq 784$

$\therefore$ Option (*d*) is correct.

(*iv*) $AB = AC - BC = 50 - 12 = 38$ m

$\therefore$ Option (*b*) is correct.

(*v*) Total length of rope used

$= BC + CD + DA = 12 + 40 + 30 = 82$ m

$\therefore$ Option (*c*) is correct.

3. (*i*) Since scale is 1 : 4.

Let the width of the scale model is x cm.

So $4x = 60 \Rightarrow x = \frac{60}{4} = 15$ cm

$\therefore$ Option (*c*) is correct.

(*ii*) They are not the mirror image of one another.

$\therefore$ Option (*d*) is correct.

(*iii*) Since the scale factor is $a : b$ then their altitudes have the ratio $a : b$.

$\therefore$ Option (*b*) is correct.

(*iv*) By basic proportionality theorem

$$\frac{5}{12.5} = \frac{2}{x} \Rightarrow x = \frac{25}{5} = 5 \text{ m}$$

$\therefore$ Option (*d*) is correct.

(*v*) E is the mid point of AT *i.e*; $ET = \frac{AT}{2} = 6$ m

F is the mid point of BT *i.e*; $FT = \frac{BT}{2} = 6$ m

Now in ΔTEF and ΔTAB

$\because$ Both are similar. (By AA similarity)

$\therefore$ $\frac{ET}{AT} = \frac{EF}{AB} \Rightarrow \frac{6}{12} = \frac{EF}{12} \Rightarrow EF = 6$ m

$\therefore$ Option (*c*) is correct.

4. (*i*) In ΔAEB and ΔCED,

$\angle E = \angle E$ (Common)

$\angle EDC = \angle EBA$ (Corresponding angles)

$\Delta AEB \sim \Delta CED$ (By AA similarity)

$\therefore$ Option (*a*) is correct.

(*ii*) $\frac{AE}{CE} = \frac{BE}{DE}$ (By BPT)

$\therefore$ Option (*d*) is correct.

(*iii*) We have, $\Delta AEB \sim \Delta CED$

$\Rightarrow \frac{AB}{CD} = \frac{AE}{CE} \Rightarrow \frac{3}{1} = \frac{6}{CE} \Rightarrow CE = \frac{6}{3} = 2$ m

$\therefore$ Option (*a*) is correct.

(*iv*) In right triangle ABE

$BE = \sqrt{AB^2 + AE^2}$ (Pythagoras theorem)

$= \sqrt{8^2 + 6^2} = \sqrt{64 + 36} = 10$ m

$\therefore$ Option (*a*) is correct.

(*v*) $\Delta ABC \sim \Delta PQR \Rightarrow \frac{ar(\Delta ABC)}{ar(\Delta PQR)} = \frac{AB^2}{PQ^2}$

$\Rightarrow \frac{4}{25} = \frac{AB^2}{10^2} \Rightarrow AB^2 = \frac{4}{25} \times 100 = 16 \Rightarrow AB^2 = 16$ cm $\Rightarrow AB = 4$ cm

$\therefore$ Option (*a*) is correct.

5. (*i*) Since the ladder placed against wall forms a right angled triangle, so length of ladder can be found using Pythagoras theorem.

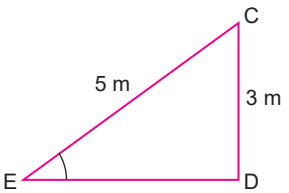
$\therefore$ Option (*c*) is correct.

(*ii*) In ΔABC,

$AB^2 = 4^2 + 3^2 = 16 + 9 = 25 \Rightarrow$ Length of ladder (AB) = 5 m

$\therefore$ Option (*b*) is correct.

(*iii*) Let C be the window, CE be the ladder.



$\therefore$ In ΔCDE

$ED^2 = CE^2 - CD^2 = 25 - 9 = 16$

$ED = 4$ m

$\therefore$ Option (*b*) is correct.

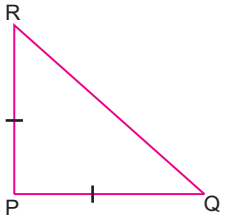
(*iv*) In right ΔPQR

$RQ^2 = RP^2 + PQ^2$ (By Pythagoras theorem)

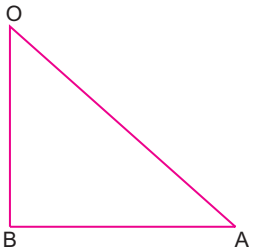
$= PQ^2 + PQ^2$ ($\because RP = PQ$)

$= 2PQ^2$

$\therefore$ Option (*a*) is correct.



(*v*) $OA^2 = OB^2 + BA^2$



$\Rightarrow$ ΔOAB is a right triangle, right angled at B (Converse of Pythagoras theorem)

$\therefore$ Option (d) is correct.

6. (*i*) Since a right triangle is formed, so distance between two buildings can be calculated using Pythagoras theorem.

$\therefore$ Option (b) is correct.

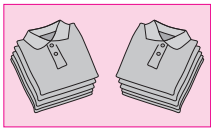
(*ii*) $EF = BF - BE = 41 - 32 = 9$ m

$\therefore$ Option (d) is correct.

(*iii*) $DF = \sqrt{DE^2 + EF^2}$ (Using Pythagoras theorem)

$= \sqrt{12^2 + 9^2} = \sqrt{144 + 81} = \sqrt{225} = 15$ m

Option (a) is correct.



(*iv*) Longest side = QR (25 cm)

$\Rightarrow$ $\angle P$ is a right angle.

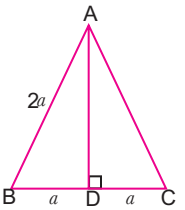
[$\because$ Angle opposite to longest side is equal to 90°.]

$\therefore$ Option (a) is correct.

(*v*) Altitude, $AD = \sqrt{AB^2 - BD^2}$

$= \sqrt{(2a)^2 - a^2}$

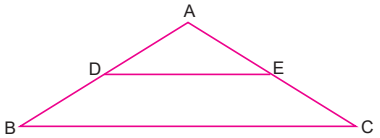
$= \sqrt{4a^2 - a^2} = \sqrt{3}\,a$ units



Option (d) is correct.

7. (*i*) $\frac{AD}{DB} = \frac{AE}{EC}$ [By Thales theorem]

Option (a) is correct



(*ii*) Since $DE \,||\, BC, \frac{AD}{AB} = \frac{AE}{AC}$ [By Thales Theorem]

$\Rightarrow \frac{20}{80} = \frac{AE}{100} \Rightarrow AE = \frac{1}{4} \times 100 = 25$ cm

$\therefore$ Option (c) is correct.

(*iii*) We have $\frac{AD}{DB} = \frac{AE}{EC}$ (By Thales Theorem)

$\Rightarrow \frac{x+1}{3x-1} = \frac{x+3}{3x+4}$

$\Rightarrow (x+1)(3x+4) = (x+3)(3x-1)$

$\Rightarrow 3x^2 + 4x + 3x + 4 = 3x^2 - x + 9x - 3$

$\Rightarrow 7x - 8x = -3 - 4 \Rightarrow x = 7$

$\therefore$ Option (b) is correct.

(*iv*) Out of the given options, $\frac{BD}{AD} \neq \frac{AE}{EC}$

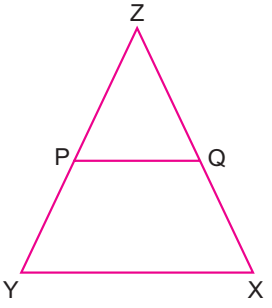
Option (d) is correct.

(*v*) P and Q are midpoints of sides YZ and XZ respectively.

$\therefore \frac{YP}{PZ} = 1, \frac{XQ}{QZ} = 1 \Rightarrow \frac{YP}{PZ} = \frac{XQ}{QZ}$

$\Rightarrow PQ \,||\, YX$

$\therefore$ Option (a) is correct.



8. (*i*) Given scale = 1 : 8

Let actual length of car = x cm.

Then $\frac{40}{x} = \frac{1}{8} \Rightarrow x = 320$ cm

$\therefore$ Option (a) is correct.

(*ii*) Ratio of medians = 2 : 5, since two similar triangles have ratio 2 : 5.

$\therefore$ Option (*a*) is correct

(*iii*) $\dfrac{\text{Length of statue}}{\text{Length of shadow of statue}} = \dfrac{\text{Length of pole}}{\text{Length of its shadow}}$

$\Rightarrow \quad \dfrac{8}{5} = \dfrac{5.6}{x} \Rightarrow x = \dfrac{5.6 \times 5}{8} = 3.5 \text{ m}$

$\therefore$ Option (*b*) is correct.

(*iv*) Two similar polygons are not the mirror images of each other.

So, (*d*) is correct option.

(*v*) The ratio of corresponding altitude of two similar triangles is equal to their scale factor.

So, (*c*) is correct option.

SOLUTIONS OF ASSERTION-REASON QUESTIONS

1. $\dfrac{ar(\Delta ABC)}{ar(\Delta DEF)} = \dfrac{AB^2}{DE^2} \Rightarrow \dfrac{36}{49} = \dfrac{AB^2}{DE^2}$

$\Rightarrow \dfrac{AB}{DE} = \dfrac{6}{7} \Rightarrow AB : DE = 6 : 7$

So, both *A* and *R* are correct and *R* explain *A*.

Hence, option (*a*) is correct.

2. We have, $\dfrac{AD}{DB} = \dfrac{AE}{EC} \Rightarrow \dfrac{7x-4}{3x+4} = \dfrac{5x-2}{3x}$

$\Rightarrow \quad 21x^2 - 12x = 15x^2 + 20x - 6x - 8 \Rightarrow 6x^2 - 26x + 8 = 0$

$\Rightarrow \quad 3x^2 - 13x + 4 = 0 \Rightarrow 3x^2 - 12x - x + 4 = 0$

$\Rightarrow \quad 3x(x-4) - 1(x-4) = 0 \Rightarrow (x-4)(3x-1) = 0$

$\Rightarrow \quad x = 4, \dfrac{1}{3}$

So, *A* is incorrect but *R* is correct.

Hence, option (*d*) is correct.

3. In an isosceles ΔABC, right angled at *C* *is* $AB^2 = AC^2 + BC^2$

$\Rightarrow AB^2 = AC^2 + AC^2 \Rightarrow AB^2 = 2AC^2 \quad (\because AC = BC)$

So, both *A* and *R* are correct and *R* explains *A*.

Hence, option (*a*) is correct.

4. We have, $AB^2 + BC^2 = (24)^2 + (10)^2$

$= 576 + 100 = 676 = AC^2$

$AB^2 + BC^2 = AC^2$

$\therefore$ *ABC* is a right angled triangle.

Also, two triangles are similar if their corresponding angles are equal.

So, both *A* and *R* are correct but *R* does not explain *A*.

Hence, option (*b*) is correct.

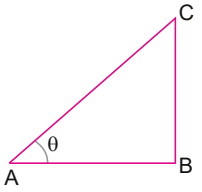
06 INTRODUCTION TO TRIGONOMETRY

BASIC CONCEPTS & FORMULAE

1. Trigonometry is the branch of mathematics which deals with the measurement of sides and angles of the triangles.

Trigonometric ratios:

Let ABC be a right-triangle, right angled at B. Let $\angle CAB = \theta$.



Then,

$$\sin\theta = \frac{BC}{AC} \qquad \cos\theta = \frac{AB}{AC} \qquad \tan\theta = \frac{BC}{AB}$$

$$\cot\theta = \frac{AB}{BC} \qquad \sec\theta = \frac{AC}{AB} \qquad \operatorname{cosec}\theta = \frac{AC}{BC}$$

Relation between trigonometric ratios:

(*i*) Reciprocal Relations

$$\sin\theta = \frac{1}{\operatorname{cosec}\theta} \Rightarrow \operatorname{cosec}\theta = \frac{1}{\sin\theta} \Rightarrow \sin\theta \cdot \operatorname{cosec}\theta = 1$$

$$\cos\theta = \frac{1}{\sec\theta} \Rightarrow \sec\theta = \frac{1}{\cos\theta} \Rightarrow \cos\theta \cdot \sec\theta = 1$$

$$\tan\theta = \frac{1}{\cot\theta} \Rightarrow \cot\theta = \frac{1}{\tan\theta} \Rightarrow \tan\theta \cdot \cot\theta = 1$$

(*ii*) Quotient Relations

$$\tan\theta = \frac{\sin\theta}{\cos\theta} \quad \text{and} \quad \cot\theta = \frac{\cos\theta}{\sin\theta}$$

2. An expression having equal to sign (=) is called an equation.

3. An equation which involves trigonometric ratios of an angle and is true for all values of the angle is called a trigonometric identity.

Some common trigonometric identites are

(*i*) $\sin^2\theta + \cos^2\theta = 1$ for $0° \le \theta \le 90°$

(*ii*) $\sec^2\theta = 1 + \tan^2\theta$ for $0° \le \theta \le 90°$

(*iii*) $\operatorname{cosec}^2\theta = 1 + \cot^2\theta$ for $0° \le \theta \le 90°$

4. Values of Trigonometric Ratios of Standard Angles

	30°	**45°**	**60°**
$\sin\theta$	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$
$\cos\theta$	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$

$\tan\theta$	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$
$\cot\theta$	$\sqrt{3}$	1	$\frac{1}{\sqrt{3}}$
$\sec\theta$	$\frac{2}{\sqrt{3}}$	$\sqrt{2}$	2
$\operatorname{cosec}\theta$	2	$\sqrt{2}$	$\frac{2}{\sqrt{3}}$

MULTIPLE CHOICE QUESTIONS

Choose and write the correct option in the following questions.

1. **The value of $(\sin 30° + \cos 30°) - (\sin 60° + \cos 60°)$ is** [*NCERT Exemplar*]

(*a*) -1 (*b*) 0 (*c*) 1 (*d*) 2

2. **The value of $\frac{\tan 30°}{\cot 60°}$ is** [*NCERT Exemplar*]

(*a*) $\frac{1}{\sqrt{2}}$ (*b*) $\frac{1}{\sqrt{3}}$ (*c*) $\sqrt{3}$ (*d*) 1

3. **The value of $(\sin 45° + \cos 45°)$ is** [*NCERT Exemplar*]

(*a*) $\frac{1}{\sqrt{2}}$ (*b*) $\sqrt{2}$ (*c*) $\frac{\sqrt{3}}{2}$ (*d*) 1

4. **If $6\cot\theta + 2\operatorname{cosec}\theta = \cot\theta + 5\operatorname{cosec}\theta$, then $\cos\theta$ is**

(*a*) $\frac{4}{5}$ (*b*) $\frac{5}{3}$ (*c*) $\frac{3}{5}$ (*d*) $\frac{5}{4}$

5. **The value of $\frac{2\tan 30°}{1-\tan^2 30°}$ is equal to**

(*a*) $\cos 60°$ (*b*) $\sin 60°$ (*c*) $\tan 60°$ (*d*) $\sin 30°$

6. **If $\sin A = \frac{1}{2}$, then the value of $\cot A$ is** [*NCERT Exemplar*]

(*a*) $\sqrt{3}$ (*b*) $\frac{1}{\sqrt{3}}$ (*c*) $\frac{\sqrt{3}}{2}$ (*d*) 1

7. **Given that $\sin\theta = \frac{a}{b}$, then $\cos\theta$ is equal to** [*NCERT Exemplar*]

(*a*) $\frac{b}{\sqrt{b^2-a^2}}$ (*b*) $\frac{b}{a}$ (*c*) $\frac{\sqrt{b^2-a^2}}{b}$ (*d*) $\frac{a}{\sqrt{b^2-a^2}}$

8. **If $\sin A + \sin^2 A = 1$, then the value of the expression $(\cos^2 A + \cos^4 A)$ is** [*NCERT Exemplar*]

(*a*) 1 (*b*) $\frac{1}{2}$ (*c*) 2 (*d*) 3

9. **If $4\tan\theta = 3$, then $\left(\frac{4\sin\theta - \cos\theta}{4\sin\theta + \cos\theta}\right)$ is equal to** [*NCERT Exemplar*]

(*a*) $\frac{2}{3}$ (*b*) $\frac{1}{3}$ (*c*) $\frac{1}{2}$ (*d*) $\frac{3}{4}$

10. **Value of $\sin 30° \tan 45°$ is**

(a) $\frac{\sqrt{3}}{2}$ (b) 2 (c) $\frac{1}{2}$ (d) 0

11. **If $\cos A = \frac{4}{5}$, then the value of $\tan A$ is** [*NCERT Exemplar*]

(a) $\frac{3}{5}$ (b) $\frac{3}{4}$ (c) $\frac{4}{3}$ (d) $\frac{5}{3}$

12. **The value of $\frac{\tan^2 60° - \sin^2 30°}{\tan^2 45° + \cos^2 30°}$ is**

(a) $\frac{7}{11}$ (b) $\frac{11}{13}$ (c) $\frac{13}{11}$ (d) $\frac{11}{7}$

13. **If $x = r \sin \theta$ and $y = r \cos \theta$ then the value of $x^2 + y^2$ is**

(a) r (b) r^2 (c) $\frac{1}{r}$ (d) 1

14. **If $3 \sec \theta - 5 = 0$ then $\cot \theta$ is equal to**

(a) $\frac{5}{3}$ (b) $\frac{4}{5}$ (c) $\frac{3}{4}$ (d) $\frac{3}{5}$

15. **If $\alpha + \beta = 90°$ and $\alpha = 2\beta$, then $\cos^2 \alpha + \sin^2 \beta$ is equal to**

(a) 1 (b) $\frac{1}{2}$ (c) 0 (d) 2

16. **If $\tan x + \sin x = m$ and $\tan x - \sin x = n$ then $m^2 - n^2$ is equal to**

(a) $4\sqrt{mn}$ (b) $\sqrt{mn}$ (c) $2\sqrt{mn}$ (d) none of them

17. **If $\sec \theta + \tan \theta = x$, the value of $\sec \theta$ is**

(a) $\frac{1}{2}\left(x - \frac{1}{x}\right)$ (b) $\frac{x^2 - 1}{x^2 + 1}$ (c) $\frac{1}{2}\left(x + \frac{1}{x}\right)$ (d) none of them

18. **The value of $\sqrt{\frac{1 + \cos \theta}{1 - \cos \theta}}$ is**

(a) $\cot \theta - \operatorname{cosec} \theta$ (b) $\operatorname{cosec} \theta + \cot \theta$ (c) $\operatorname{cosec}^2 \theta + \cot^2 \theta$ (d) $(\cot \theta + \operatorname{cosec} \theta)^2$

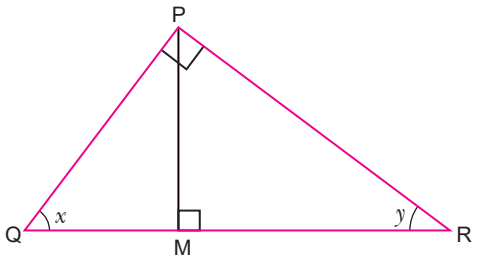
19. $\frac{\sin \theta}{1 - \cot \theta} + \frac{\cos \theta}{1 - \tan \theta}$ **is equal to**

(a) 0 (b) 1 (c) $\sin \theta + \cos \theta$ (d) $\sin \theta - \cos \theta$

20. **Given that $\sin \theta = \frac{a}{b}$, then $\tan \theta$ is equal to**

(a) $\frac{b}{\sqrt{b^2 - a^2}}$ (b) $\frac{\sqrt{b^2 - a^2}}{b}$ (c) $\frac{a}{\sqrt{b^2 - a^2}}$ (d) $\frac{\sqrt{b^2 - a^2}}{a}$

21. **Considering the diagram below.**



Which of the following statements is true? [*CBSE Question Bank*]

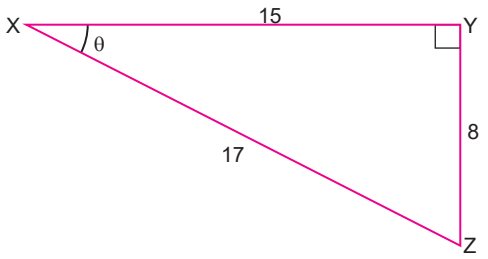
(*a*) Side *PR* is adjacent to $\angle y$ in triangle *PMR* and side *QR* is adjacent to $\angle y$ in triangle *PQR*

(*b*) Side *MR* is adjacent to $\angle y$ in triangle *PMR* and side *PR* is adjacent to $\angle y$ in triangle *PQR*

(*c*) Side *PR* is adjacent to $\angle y$ in triangle *PMR* and side *MR* is adjacent to $\angle y$ in triangle *PQR*

(*d*) Side *PR* is adjacent to $\angle y$ in triangle *PMR* and triangle *PQR*

22. Consider the triangle shown below.



What are the values of tan θ, cosec θ and sec θ? [*CBSE Question Bank*]

(*a*) $\tan\theta = \frac{8}{15}, \operatorname{cosec}\theta = \frac{17}{8}, \sec\theta = \frac{17}{15}$ (*b*) $\tan\theta = \frac{8}{15}, \operatorname{cosec}\theta = \frac{17}{15}, \sec\theta = \frac{17}{8}$

(*c*) $\tan\theta = \frac{17}{15}, \operatorname{cosec}\theta = \frac{8}{15}, \sec\theta = \frac{17}{8}$ (*d*) $\tan\theta = \frac{8}{15}, \operatorname{cosec}\theta = \frac{17}{15}, \sec\theta = \frac{8}{17}$

23. If $\sin\theta = \frac{7}{\sqrt{85}}$, what are the values of tan θ, cos θ and cosec θ? [*CBSE Question Bank*]

(*a*) $\tan\theta = \frac{6}{7}, \cos\theta = \frac{7}{\sqrt{85}}$ and $\operatorname{cosec}\theta = \frac{\sqrt{85}}{7}$ (*b*) $\tan\theta = \frac{7}{6}, \cos\theta = \frac{7}{\sqrt{85}}$ and $\operatorname{cosec}\theta = \frac{\sqrt{85}}{7}$

(*c*) $\tan\theta = \frac{7}{6}, \cos\theta = \frac{6}{\sqrt{85}}$ and $\operatorname{cosec}\theta = \frac{\sqrt{85}}{7}$ (*d*) $\tan\theta = \frac{7}{6}, \cos\theta = \frac{6}{\sqrt{85}}$ and $\operatorname{cosec}\theta = \frac{\sqrt{85}}{6}$

24. The two legs *AB* and *BC* of right triangle *ABC* are in a ratio 1 : 3. What will be the value of sin *C*? [*CBSE Question Bank*]

(*a*) $\sqrt{10}$ (*b*) $\frac{1}{\sqrt{10}}$ (*c*) $\frac{3}{\sqrt{10}}$ (*d*) $\frac{1}{2}$

25. What is the value of $\frac{3 - \sin^2 60°}{\tan 30° \tan 60°}$? [*CBSE Question Bank*]

(*a*) $2\frac{1}{4}$ (*b*) $3\frac{1}{4}$ (*c*) $2\frac{3}{4}$ (*d*) $3\frac{3}{4}$

26. The value of $\frac{4 - \sin^2 45°}{\cot k \tan 60°}$ is 3.5. [*CBSE Question Bank*]

What is the value of *k*?

(*a*) 30° (*b*) 45° (*c*) 60° (*d*) 90°

27. Which of these is equivalent to $\frac{2\tan x (\sec^2 x - 1)}{\cos^3 x}$? [*CBSE Question Bank*]

(*a*) $2\tan^3 x \operatorname{cosec} x$ (*b*) $2\cot^3 x \operatorname{cosec}^3 x$ (*c*) $2\tan^3 x \sec^3 x$ (*d*) $2\cot^3 x \sec^3 x$

28. Which of the following option makes the statement below true?

$$\frac{\frac{1}{\sec x} + \sec x}{\cos^2 x - 1 - \tan^2 x}$$

[*CBSE Question Bank*]

(*a*) $-\operatorname{cosec} x \tan x$ (*b*) $-\sec x \tan x$ (*c*) $-\operatorname{cosec} x \cot x$ (*d*) $-\sec x \cot x$

29. If $\sin\theta = \frac{1}{3}$, the value of $(2\cot^2\theta + 2)$ is

(a) 16 (b) 20 (c) 12 (d) 18

30. If $x = a\cos\theta$ and $y = b\sin\theta$, then the value of $b^2x^2 + a^2y^2$ is

(a) $a^2 + b^2$ (b) $\frac{a^2}{b^2}$ (c) a^2b^2 (d) None of these

31. If $\sqrt{3}\tan\theta = 3\sin\theta, (\theta \neq 0)$ then the value of $\sin^2\theta - \cos^2\theta$ is

(a) $\frac{1}{3}$ (b) 3 (c) $\frac{2}{3}$ (d) $\frac{3}{2}$

32. $(\text{cosec}\,\theta - \sin\theta)(\sec\theta - \cos\theta)(\tan\theta + \cot\theta)$ is equal to

(a) 0 (b) 1 (c) –1 (d) none of these

33. $(\sec A + \tan A)(1 - \sin A)$ is equal to

(a) $\sec A$ (b) $\sin A$ (c) $\text{cosec}\,A$ (d) $\cos A$

34. Given that $\sin\alpha = \frac{1}{2}$ and $\cos\beta = \frac{1}{2}$, then the value of $(\alpha + \beta)$ is

(a) 0° (b) 30° (c) 60° (d) 90°

35. If $\sin\theta + \cos\theta = \sqrt{2}\cos\theta, (\theta \neq 90)$ then the value of $\tan\theta$ is

[*CBSE Sample Question Paper 2020*]

(a) $\sqrt{2} - 1$ (b) $\sqrt{2} + 1$ (c) $\sqrt{2}$ (d) $-\sqrt{2}$

36. If $2x = \sec\theta$ and $\frac{2}{x} = \tan\theta$, then the value of $\left(x^2 - \frac{1}{x^2}\right)$ is

(a) 4 (b) $\frac{1}{4}$ (c) 2 (d) $\frac{1}{2}$

37. The value of $(1 + \cot\theta - \text{cosec}\,\theta)(1 + \tan\theta + \sec\theta)$ is

(a) 1 (b) 2 (c) –1 (d) None of these

38. If $\sin 77° = x$, than the value of $\tan 77°$ is

(a) $\frac{1}{1+x^2}$ (b) $\frac{x}{\sqrt{1+x^2}}$ (c) $\frac{x}{\sqrt{1-x^2}}$. (d) None of these

39. $\sec^4 A - \sec^2 A$ is equal to

(a) $\tan^2 A - \tan^4 A$ (b) $\tan^4 A - \tan^2 A$ (c) $\tan^4 A + \tan^2 A$ (d) None of these

40. If $a\cos\theta + b\sin\theta = m$ and $a\sin\theta - b\cos\theta = n$, then $a^2 + b^2$ is equal to

(a) $m^2 - n^2$ (b) m^2n^2 (c) $n^2 - m^2$ (d) $m^2 + n^2$

41. If $\cos A + \cos^2 A = 1$, then $\sin^2 A + \sin^4 A$ is equal to

(a) –1 (b) 0 (c) 1 (d) None of these

42. The value of the expression $\frac{\sin 60°}{\cos 30°}$ is

(a) $\frac{\sqrt{3}}{2}$ (b) $\frac{1}{2}$ (c) 1 (d) 2

43. If $4\tan x = 3$, than $\frac{\cos x + \sin x}{\cos x - \sin x}$ is equal to

(a) 7 (b) $\frac{1}{7}$ (c) – 7 (d) $-\frac{1}{7}$

44. $\cos^4 A - \sin^4 A$ is equal to

(a) $2\cos^2 A + 1$ (b) $2\cos^2 A - 1$ (c) $2\sin^2 A - 1$ (d) $2\sin^2 A + 1$

45. If $\tan A = \frac{3}{2}$, then the value of $\cos A$ is

(a) $\frac{3}{\sqrt{13}}$ (b) $\frac{2}{\sqrt{13}}$ (c) $\frac{2}{3}$ (d) $\frac{\sqrt{13}}{2}$

46. $\frac{1+\tan^2 A}{1+\cot^2 A}$ is equal to

(a) $\sec^2 A$ (b) -1 (c) $\cot^2 A$ (d) $\tan^2 A$

47. $\frac{\sin\theta}{1+\cos\theta}$ is equal to

(a) $\frac{1+\cos\theta}{\sin\theta}$ (b) $\frac{1+\cos\theta}{\cos\theta}$ (c) $\frac{1-\cos\theta}{\sin\theta}$ (d) $\frac{1-\sin\theta}{\cos\theta}$

Answers

1. (b)	**2.** (d)	**3.** (b)	**4.** (c)	**5.** (c)	**6.** (a)
7. (c)	**8.** (a)	**9.** (c)	**10.** (c)	**11.** (b)	**12.** (d)
13. (b)	**14.** (c)	**15.** (b)	**16.** (a)	**17.** (c)	**18.** (b)
19. (c)	**20.** (c)	**21.** (b)	**22.** (a)	**23.** (c)	**24.** (b)
25. (a)	**26.** (c)	**27.** (c)	**28.** (c)	**29.** (d)	**30.** (c)
31. (a)	**32.** (b)	**33.** (d)	**34.** (d)	**35.** (a)	**36.** (b)
37. (b)	**38.** (c)	**39.** (c)	**40.** (d)	**41.** (c)	**42.** (c)
43. (a)	**44.** (b)	**45.** (b)	**46.** (d)	**47.** (c)	

ASSERTION-REASON QUESTIONS

The following questions consist of two statements—Assertion(A) and Reason(R). Answer these questions selecting the appropriate option given below:

(a) Both *A* and *R* are true and *R* is the correct explanation for *A*.

(b) Both *A* and *R* are true and *R* is not the correct explanation for *A*.

(c) *A* is true but *R* is false.

(d) *A* is false but *R* is true.

1. Assertion (*A*) : $\sin^2 67° + \cos^2 67° = 1$

Reason (*R*) : For any value of θ, $\sin^2\theta + \cos^2\theta = 1$.

2. Assertion (*A*) : If $\cos A + \cos^2 A = 1$ then $\sin^2 A + \sin^4 A = 2$.

Reason (*R*) : $1 - \sin^2 A = \cos^2 A$, for any value of A.

3. Assertion (*A*) : In a right angled triangle, if $\tan\theta = \frac{3}{4}$ then $\sin\theta = \frac{3}{5}$.

Reason (*R*) : $\sin 60° = \frac{1}{2}$

4. Assertion (*A*) : In a right angled triangle, if $\cos\theta = \frac{1}{2}$ and $\sin\theta = \frac{\sqrt{3}}{2}$, then $\tan\theta = \sqrt{3}$.

Reason (*R*) : $\tan\theta = \frac{\sin\theta}{\cos\theta}$

Answers

1. (a) **2.** (d) **3.** (c) **4.** (a)

HINTS/SOLUTIONS OF SELECTED MCQs

2. We have,

$$\frac{\tan 30^\circ}{\cot 60^\circ} = \frac{\frac{1}{\sqrt{3}}}{\frac{1}{\sqrt{3}}} = 1$$

$\therefore$ Option (*d*) is correct.

3. We have,

$$\sin 45^\circ + \cos 45^\circ = \frac{1}{\sqrt{2}} + \frac{1}{\sqrt{2}} = \frac{2}{\sqrt{2}} = \sqrt{2}$$

$\therefore$ Option (*b*) is correct.

6. Given, $\sin A = \frac{1}{2}$

$\Rightarrow \quad \sin A = \sin 30^\circ \quad \Rightarrow \quad A = 30^\circ$

$\therefore \quad \cot A = \cot 30^\circ = \sqrt{3}$

$\therefore$ Option (*a*) is correct.

8. Given $\sin A + \sin^2 A = 1$ ...(*i*)

$\Rightarrow \quad \sin^2 A = 1 - \sin A$

$\Rightarrow \quad 1 - \cos^2 A = 1 - \sin A$ ...(*ii*)

Now, we have to find value of $\cos^2 A + \cos^4 A$

Put value from (*ii*), we get

$\sin A + \sin^2 A = 1$ [From equation (*i*)]

$\therefore$ Option (*a*) is correct.

9. If $4 \tan \theta = 3 \Rightarrow \tan \theta = \frac{3}{4}$

Now, $\frac{4 \sin \theta - \cos \theta}{4 \sin \theta + \cos \theta} = \frac{4 \frac{\sin \theta}{\cos \theta} - 1}{4 \frac{\sin \theta}{\cos \theta} + 1}$ (Divide N^r and D^r by $\cos \theta$)

$$= \frac{4 \tan \theta - 1}{4 \tan \theta + 1} = \frac{4 \times \frac{3}{4} - 1}{4 \times \frac{3}{4} + 1}$$

$$= \frac{3 - 1}{3 + 1} = \frac{2}{4} = \frac{1}{2}$$

Hence, option (*c*) is correct.

10. $\sin 30^\circ \tan 45^\circ = \frac{1}{2} \times 1 = \frac{1}{2}$

Hence option (*c*) is correct.

11. $\cos A = \frac{4}{5}$, (Given)

$$\sin A = \sqrt{1 - \cos^2 A} = \sqrt{1 - \left(\frac{4}{5}\right)^2} = \sqrt{1 - \frac{16}{25}} = \sqrt{\frac{9}{25}} = \frac{3}{5}$$

$$\tan A = \frac{\sin A}{\cos A} \Rightarrow \tan A = \frac{\frac{3}{5}}{\frac{4}{5}} = \frac{3}{4}$$

$\therefore$ Option (b) is correct.

12. Given expression is $\dfrac{\tan^2 60° - \sin^2 30°}{\tan^2 45° + \cos^2 30°}$

$$= \frac{(\sqrt{3})^2 - \left(\frac{1}{2}\right)^2}{(1)^2 + \left(\frac{\sqrt{3}}{2}\right)^2} = \frac{3 - \frac{1}{4}}{1 + \frac{3}{4}}$$

$$= \frac{\frac{12-1}{4}}{\frac{4+3}{4}} = \frac{11}{7}$$

$\therefore$ Option (d) is correct.

13. Given $x = r\sin\theta$ and $y = r\cos\theta$ then

$x^2 + y^2 = (r\sin\theta)^2 + (r\cos\theta)^2$

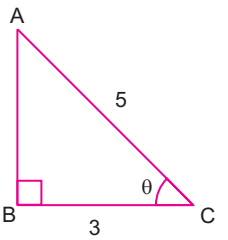
$= r^2\sin^2\theta + r^2\cos^2\theta = r^2(\sin^2\theta + \cos^2\theta)$

$= r^2$

$\therefore$ Option (b) is correct.

14. $3\sec\theta - 5 = 0 \Rightarrow \sec\theta = \dfrac{5}{3}$

But $\sec\theta = \dfrac{\text{Hypotenuse}}{\text{base}} \Rightarrow h = 5$ and $b = 3$



By Pythagoras theorem,

$h^2 = p^2 + b^2 \Rightarrow (5)^2 = p^2 + (3)^2$

$\Rightarrow \quad p^2 = 25 - 9 = 16 \Rightarrow p = 4$

So $\cot\theta = \dfrac{\text{base}}{\text{perpendicular}} = \dfrac{b}{p} = \dfrac{3}{4}$

$\therefore$ Option (c) is correct.

15. Given $\alpha + \beta = 90°$ and $\alpha = 2\beta$

$\Rightarrow 2\beta + \beta = 90° \Rightarrow \beta = 30°$

So, $\alpha = 2\beta = 2 \times 30° = 60°$

Now value of $\cos^2\alpha + \sin^2\beta$

Put the values of α and β, we get

$\Rightarrow \cos^2(60°) + \sin^2 30°$

$\Rightarrow \left(\frac{1}{2}\right)^2 + \left(\frac{1}{2}\right)^2 = \frac{1}{4} + \frac{1}{4} = \frac{2}{4} = \frac{1}{2}$

$\therefore$ Option (b) is correct.

16. Given $\tan x + \sin x = m$ and $\tan x - \sin x = n$

Now $m^2 - n^2 = (\tan x + \sin x)^2 - (\tan x - \sin x)^2$

$= \tan^2 x + \sin^2 x + 2\sin x \tan x - \tan^2 x - \sin^2 x + 2\sin x \tan x$

$= 4 \sin x \tan x$

$= 4\sqrt{\sin^2 x \tan^2 x}$

$= 4\sqrt{\sin^2 x \times \frac{\sin^2 x}{\cos^2 x}} = 4\sqrt{\frac{\sin^2 x(1-\cos^2 x)}{\cos^2 x}}$

$= 4\sqrt{\frac{\sin^2 x - \sin^2 x \cos^2 x}{\cos^2 x}} = 4\sqrt{\tan^2 x - \sin^2 x}$

$= 4\sqrt{(\tan x - \sin x)(\tan x + \sin x)} = 4\sqrt{mn}$

$\therefore$ Option (a) is correct.

17. Given $\sec\theta + \tan\theta = x$ ...(i)

From identity $\sec^2\theta - \tan^2\theta = 1$

$\Rightarrow (\sec\theta - \tan\theta)(\sec\theta + \tan\theta) = 1$

$\Rightarrow (\sec\theta - \tan\theta)x = 1$

$\Rightarrow \sec\theta - \tan\theta = \frac{1}{x}$ ...(ii)

By adding (i) and (ii), we get

$2\sec\theta = x + \frac{1}{x} \quad \Rightarrow \sec\theta = \frac{1}{2}\left(x + \frac{1}{x}\right)$

$\therefore$ Option (c) is correct.

18. $\sqrt{\frac{1+\cos\theta}{1-\cos\theta}}$

By rationalisation, we get

$\sqrt{\frac{1+\cos\theta}{1-\cos\theta}} \times \frac{\sqrt{1+\cos\theta}}{\sqrt{1+\cos\theta}} \quad \Rightarrow \sqrt{\frac{(1+\cos\theta)^2}{(1-\cos^2\theta)}}$

$\Rightarrow \frac{1+\cos\theta}{\sqrt{\sin^2\theta}} \Rightarrow \frac{1+\cos\theta}{\sin\theta} \quad \Rightarrow \frac{1}{\sin\theta} + \frac{\cos\theta}{\sin\theta} \Rightarrow \operatorname{cosec}\theta + \cot\theta$

$\therefore$ Option (b) is correct.

19. $\frac{\sin\theta}{1-\cot\theta} + \frac{\cos\theta}{1-\tan\theta} \quad \Rightarrow \frac{\sin\theta}{1-\frac{\cos\theta}{\sin\theta}} + \frac{\cos\theta}{1-\frac{\sin\theta}{\cos\theta}}$

$\Rightarrow \frac{\sin}{\frac{\sin\theta - \cos\theta}{\sin\theta}} + \frac{\cos\theta}{\frac{\cos\theta - \sin\theta}{\cos\theta}} \quad \Rightarrow \frac{\sin^2\theta}{\sin\theta - \cos\theta} + \frac{\cos^2\theta}{\cos\theta - \sin\theta}$

$\Rightarrow \frac{\sin^2\theta}{\sin\theta - \cos\theta} - \frac{\cos^2\theta}{\sin\theta - \cos\theta} \quad \Rightarrow \frac{\sin^2\theta - \cos^2\theta}{\sin\theta - \cos\theta} = \frac{(\sin\theta - \cos\theta)(\sin\theta + \cos\theta)}{(\sin\theta - \cos\theta)}$

$\Rightarrow \sin\theta + \cos\theta$

$\therefore$ Option (c) is correct.

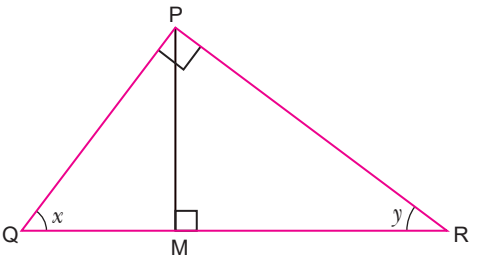
20. $\because \sin\theta = \frac{a}{b} \quad \Rightarrow \sin^2\theta = \frac{a^2}{b^2}$

$\cos^2\theta = 1 - \sin^2\theta = 1 - \frac{a^2}{b^2} = \frac{b^2 - a^2}{b^2} \quad \Rightarrow \cos\theta = \frac{\sqrt{b^2 - a^2}}{b}$

$\tan\theta = \frac{\sin\theta}{\cos\theta} = \frac{\frac{a}{b}}{\frac{\sqrt{b^2 - a^2}}{b}} = \frac{a}{\sqrt{b^2 - a^2}}$

$\therefore$ Option (c) is correct.

21. Clearly side MR is adjacent to $\angle y$ in ΔPMR and side PR is adjacent to $\angle y$ in ΔPQR.



$\therefore$ Option (b) is correct.

22. We have, $\tan\theta = \dfrac{P}{B} \Rightarrow \tan\theta = \dfrac{YZ}{XY} = \dfrac{8}{15}$

and $\operatorname{cosec}\theta = \dfrac{H}{P} = \dfrac{XZ}{YZ} = \dfrac{17}{8}$

Also $\sec\theta = \dfrac{H}{B} = \dfrac{XZ}{XY} = \dfrac{17}{15}$

$\therefore$ Option (a) is correct.

23. Given, $\sin\theta = \dfrac{7}{\sqrt{85}} \Rightarrow \cos\theta = \sqrt{1-\left(\dfrac{7}{\sqrt{85}}\right)^2}$

$\Rightarrow \cos\theta = \sqrt{1-\dfrac{49}{85}} = \sqrt{\dfrac{36}{85}} \Rightarrow \cos\theta = \dfrac{6}{\sqrt{85}}$

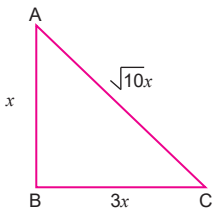
$\tan\theta = \dfrac{\sin\theta}{\cos\theta} = \dfrac{7/\sqrt{85}}{6\sqrt{85}} = \dfrac{7}{6}$ and $\operatorname{cosec}\theta = \dfrac{1}{\sin\theta} = \dfrac{\sqrt{85}}{7}$

$\therefore$ Option (c) is correct.

24. Let $AB = x, BC = 3x$

$\therefore AC = \sqrt{AB^2 + AC^2} = \sqrt{x^2 + 9x^2} = \sqrt{10x^2} = \sqrt{10}\,x$

$\therefore \sin C = \dfrac{AB}{AC} = \dfrac{x}{\sqrt{10}\,x} = \dfrac{1}{\sqrt{10}}$



$\therefore$ Option (b) is correct.

25. We have,

$$\frac{3-\sin^2 60°}{\tan 30°\,.\,\tan 60°} = \frac{3-\left(\dfrac{\sqrt{3}}{2}\right)^2}{\dfrac{1}{\sqrt{3}}\times\sqrt{3}} = 3-\frac{3}{4} = 2\frac{1}{4}$$

$\therefore$ Option (a) is correct.

26. Given $\dfrac{4-\sin^2 45°}{\cot k \tan 60°} = 3.5$

$\Rightarrow \dfrac{4-\left(\dfrac{1}{\sqrt{2}}\right)^2}{\cot k\sqrt{3}} = 3.5 \Rightarrow \dfrac{4-\dfrac{1}{2}}{\sqrt{3}\cot k} = 3.5$

$\Rightarrow \dfrac{7}{2\sqrt{3}\times 3.5} = \cot k \Rightarrow \dfrac{7}{7\sqrt{3}} = \cot k \Rightarrow \dfrac{1}{\sqrt{3}} = \cot k \Rightarrow \cot 60° = \cot k$

$\Rightarrow k = 60°$

$\therefore$ Option (c) is correct.

27. We have

$$\frac{2\tan x(\sec^2 x - 1)}{\cos^3 x}$$

$$= \frac{2\tan x \times \tan^2 x}{\cos^3 x} = 2\tan^3 x \sec^3 x$$

$\therefore$ Option (c) is correct.

28. $$\frac{\frac{1}{\sec x} + \sec x}{\cos^2 x - 1 - \tan^2 x} = \frac{(\cos x + \sec x)}{\cos^2 x - (1 + \tan^2 x)}$$

$$= \frac{(\cos x + \sec x)}{\cos^2 x - \sec^2 x} = \frac{\cos x + \sec x}{(\cos x - \sec x)(\cos x + \sec x)}$$

$$= \frac{1}{\cos x - \sec x} = -\frac{1}{\sec x - \cos x}$$

$$= -\frac{1}{\frac{1}{\cos x} - \cos x} = -\frac{1}{1 - \cos^2 x} \times \cos x$$

$$= -\frac{\cos x}{\sin^2 x} = -\frac{\cos x}{\sin x} \times \frac{1}{\sin x} = -\operatorname{cosec} x \times \cot x$$

$\therefore$ Option (c) is correct.

29. $\sin\theta = \frac{1}{3} = \frac{\text{Perpendicular}}{\text{Hypotenuse}}$

$\therefore (3)^2 = (\text{Perpendicular})^2 + (\text{Base})^2$

$(\text{Base})^2 = 9 - 1 = 8$

$\text{Base} = 2\sqrt{2}$

$$\cot^2\theta = \frac{\text{Base}}{\text{Perpendicular}} = \frac{2\sqrt{2}}{1}$$

$\therefore \quad 2\cot^2\theta + 2$

$$= 2(2\sqrt{2})^2 + 2 = 2(8) + 2 = 16 + 2 = 18$$

Hence, option (d) is correct.

30. We have,

$$b^2x^2 + a^2y^2 = b^2 \times a^2\cos^2\theta + a^2 \times b^2\sin^2\theta = a^2b^2(\cos^2\theta + \sin^2\theta)$$

$$= a^2b^2 \times 1 = a^2b^2$$

$\therefore$ Option (c) is correct.

31. We have, $\sqrt{3}\ \tan\theta = 3\sin\theta$

$$\Rightarrow \quad \sqrt{3}\ \frac{\sin\theta}{\cos\theta} = 3\sin\theta$$

$$\Rightarrow \quad \frac{\sqrt{3}}{\cos\theta} = 3 \quad \Rightarrow \frac{\sqrt{3}}{3} = \cos\theta \qquad \Rightarrow \qquad \frac{1}{\sqrt{3}} = \cos\theta$$

$$\therefore \quad \cos\theta = \frac{1}{\sqrt{3}}$$

Now, $\sin^2\theta - \cos^2\theta = 1 - \cos^2\theta - \cos^2\theta = 1 - 2\cos^2\theta$

$$= 1 - 2 \times \left(\frac{1}{\sqrt{3}}\right)^2 = 1 - \frac{2}{3} = \frac{1}{3}$$

$\therefore$ Option (a) is correct.

32. We have,

$(\text{cosec}\,\theta - \sin\theta)(\sec\theta - \cos\theta)(\tan\theta + \cot\theta)$

$$= \left(\frac{1}{\sin\theta} - \sin\theta\right)\left(\frac{1}{\cos\theta} - \cos\theta\right)\left(\frac{\sin\theta}{\cos\theta} + \frac{\cos\theta}{\sin\theta}\right)$$

$$= \left(\frac{1-\sin^2\theta}{\sin\theta}\right)\left(\frac{1-\cos^2\theta}{\cos\theta}\right)\left(\frac{\sin^2\theta+\cos^2\theta}{\sin\theta\cos\theta}\right)$$

$$= \frac{\cos^2\theta}{\sin\theta} \times \frac{\sin^2\theta}{\cos\theta} \times \frac{1}{\sin\theta\cos\theta} = 1$$

$\therefore$ Option (*b*) is correct.

33. We have, $(\sec A + \tan A)(1 - \sin A)$

$$= \left(\frac{1}{\cos A} + \frac{\sin A}{\cos A}\right)(1 - \sin A) = \frac{(1+\sin A)(1-\sin A)}{\cos A}$$

$$= \frac{1-\sin^2 A}{\cos A} = \frac{\cos^2 A}{\cos A} = \cos A$$

$\therefore$ Option (*d*) is correct.

34. We have, $\sin\alpha = \frac{1}{2} = \sin 30° \quad \Rightarrow \quad \alpha = 30°$

and, $\cos\beta = \frac{1}{2} = \cos 60° \quad \Rightarrow \quad \beta = 60°$

$\therefore\ \alpha + \beta = 30° + 60° = 90°$

Hence, option (*d*) is correct.

35. Given, $\sin\theta + \cos\theta = \sqrt{2}\cos\theta$

Dividing both sides by $\cos\theta$, we get

$$\frac{\sin\theta}{\cos\theta} + 1 = \sqrt{2} \Rightarrow \tan\theta = \sqrt{2} - 1$$

$\therefore$ Option (*a*) is correct.

36. We have, $(2x)^2 - \left(\frac{2}{x}\right)^2 = \sec^2\theta - \tan^2\theta$

$$\Rightarrow \quad 4x^2 - \frac{4}{x^2} = 1 \qquad \Rightarrow \qquad 4\left(x^2 - \frac{1}{x^2}\right) = 1$$

$$\therefore \quad \left(x^2 - \frac{1}{x^2}\right) = \frac{1}{4}$$

$\therefore$ Option (*b*) is correct.

37. We have,

$(1 + \cot\theta - \text{cosec}\,\theta)(1 + \tan\theta + \sec\theta)$

$$= \left(1 + \frac{\cos\theta}{\sin\theta} - \frac{1}{\sin\theta}\right)\left(1 + \frac{\sin\theta}{\cos\theta} + \frac{1}{\cos\theta}\right)$$

$$= \left(\frac{\sin\theta+\cos\theta-1}{\sin\theta}\right)\left(\frac{\sin\theta+\cos\theta+1}{\cos\theta}\right)$$

$$= \left(\frac{(\sin\theta+\cos\theta)^2-(1)^2}{\sin\theta\cos\theta}\right) = \frac{\sin^2\theta+\cos^2\theta+2\sin\cos\theta-1}{\sin\theta\cos\theta}$$

$$= \frac{1+2\sin\theta\cos\theta-1}{\sin\theta\cos\theta} = \frac{2\sin\theta\cos\theta}{\sin\theta\cos\theta} = 2$$

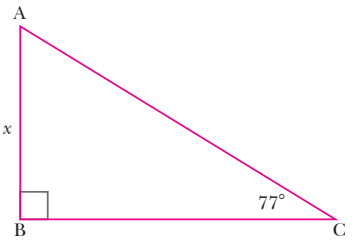
$\therefore$ Option (*b*) is correct.

38. We have, $\sin 77° = x$

$\cos 77° = \sqrt{1 - x^2}$ $\quad [\because \cos^2\theta = 1 - \sin^2\theta]$

$\tan 77° = \dfrac{x}{\sqrt{1 - x^2}}$

$\therefore$ Option (c) is correct.



39. We have,

$$\sec^4 A - \sec^2 A = \sec^2 A\,(\sec^2 A - 1)$$
$$= \sec^2 A \times \tan^2 A = (1 + \tan^2 A)\tan^2 A$$
$$= \tan^2 A + \tan^4 A$$
$$= \tan^4 A + \tan^2 A$$

$\therefore$ Option (c) is correct.

40. We have,

$$m^2 + n^2 = (a\cos\theta + b\sin\theta)^2 + (a\sin\theta - b\cos\theta)^2$$
$$= a^2\cos^2\theta + b^2\sin^2\theta + 2ab\cos\theta\sin\theta + a^2\sin^2\theta + b^2\cos^2\theta - 2ab\sin\theta\cos\theta$$
$$= a^2(\cos^2\theta + \sin^2\theta) + b^2(\sin^2\theta + \cos^2\theta)$$

$\Rightarrow \quad m^2 + n^2 = a^2 \times 1 + b^2 \times 1 = a^2 + b^2$

$\therefore \quad a^2 + b^2 = m^2 + n^2$

$\therefore$ Option (d) is correct.

41. Given, $\cos A + \cos^2 A = 1$

$\Rightarrow \cos A = 1 - \cos^2 A = \sin^2 A$

$\Rightarrow \sin^2 A = \cos A$

$\Rightarrow \sin^4 A = \cos^2 A$

$\therefore \sin^2 A + \sin^4 A = \cos A + \cos^2 A = 1$

$\therefore$ Option (c) is correct.

42. $\dfrac{\sin 60°}{\cos 30°} = \dfrac{\frac{\sqrt{3}}{2}}{\frac{\sqrt{3}}{2}} = 1$

$\therefore$ Option (c) is correct.

43. We have,

$$4\tan x = 3 \Rightarrow \quad \tan x = \frac{3}{4}$$

$\therefore \dfrac{\cos x + \sin x}{\cos x - \sin x} = \dfrac{1 + \tan x}{1 - \tan x}$ (Divide N^r and D^r by $\cos x$)

$$= \frac{1 + \frac{3}{4}}{1 - \frac{3}{4}} = 7$$

$\therefore$ Option (a) is correct.

44. $\cos^4 A - \sin^4 A = (\cos^2 A - \sin^2 A)(\cos^2 A + \sin^2 A)$

$= (\cos^2 A - \sin^2 A) \times 1 = \cos^2 A - (1 - \cos^2 A) = 2\cos^2 A - 1$

$\therefore$ Option (b) is correct.

45. Given $\tan A = \frac{3}{2}$

$$\therefore \quad \cos A = \frac{1}{\sec A} = \frac{1}{\sqrt{1+\tan^2 A}} = \frac{1}{\sqrt{1+\left(\frac{3}{2}\right)^2}} = \frac{1}{\sqrt{1+\frac{9}{4}}}$$

$$= \frac{1}{\sqrt{\frac{13}{4}}} = \frac{1}{\frac{\sqrt{13}}{2}} = \frac{2}{\sqrt{13}}$$

$$\therefore \quad \cos A = \frac{2}{\sqrt{13}}$$

$\therefore$ Option (b) is correct.

46. $$\frac{1+\tan^2 A}{1+\cot^2 A} = \frac{\sec^2 A}{\text{cosec}^2 A} = \frac{\frac{1}{\cos^2 A}}{\frac{1}{\sin^2 A}} = \frac{\sin^2 A}{\cos^2 A} = \tan^2 A$$

Hence, option (d) is correct.

47. $$\frac{\sin\theta}{1+\cos\theta} = \frac{\sin\theta}{1+\cos\theta} \times \frac{1-\cos\theta}{1-\cos\theta} = \frac{\sin\theta(1-\cos\theta)}{1-\cos^2\theta}$$

$$= \frac{\sin\theta(1-\cos\theta)}{\sin^2\theta} = \frac{1-\cos\theta}{\sin\theta}$$

$\therefore$ Option (c) is correct.

SOLUTIONS OF ASSERTION-REASON QUESTIONS

1. $\sin^2\theta + \cos^2\theta = 1 \quad \Rightarrow \quad \sin^2 67° + \cos^2 67° = 1$

Hence, option (a) is correct.

2. $\cos A + \cos^2 A = 1 \quad \Rightarrow \quad \cos A = 1 - \cos^2 A = \sin^2 A$

$\therefore \quad \sin^2 A + \sin^4 A = \cos A + \cos^2 A = 1$

$\Rightarrow \quad \sin^2 A + \sin^4 A = 1$

Hence, option (d) is correct.

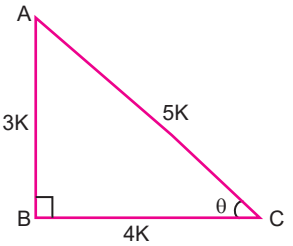
3. Let ΔABC be a right angled triangle and $\angle C = \theta$.

It is given that $\tan\theta = \frac{3}{4} = \frac{AB}{BC}$

Let $AB = 3K$, $BC = 4K$

$\therefore \quad AC = \sqrt{AB^2 + BC^2} = \sqrt{9K^2 + 16K^2} = 5K$

$\therefore \quad \text{Sin}\,\theta = \frac{AB}{AC} = \frac{3K}{5K} = \frac{3}{5}$ Thus, Assertion (A) is true.



But $\sin 60° = \frac{\sqrt{3}}{2}$, $\therefore$ Reason (R) is false.

Hence, option (c) is correct.

4. We have, $\tan\theta = \frac{\sin\theta}{\cos\theta} = \frac{\sqrt{3}/2}{1/2} = \sqrt{3}$

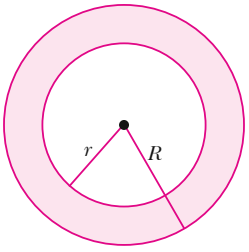
Hence, both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation for A.

Hence option (a) is correct.

07 AREAS RELATED TO CIRCLES

BASIC CONCEPTS & FORMULAE

1. **Circle:** A circle is the locus of a point which moves in a plane in such a way that its distance from a fixed point always remains same. The fixed point is called the centre and the given constant distance is known as the radius of the circle.
2. If r is the radius of a circle, then
   (*i*) Circumference $= 2\pi r$ or πd, where $d = 2r$ is the diameter of circle.
   (*ii*) Area $= \pi r^2$ or $\frac{\pi d^2}{4}$
   (*iii*) Area of semi-circle $= \frac{\pi r^2}{2}$
   (*iv*) Area of quadrant of a circle $= \frac{\pi r^2}{4}$
3. **Area enclosed by two concentric circles:** If R and r are radii of two concentric circles, then

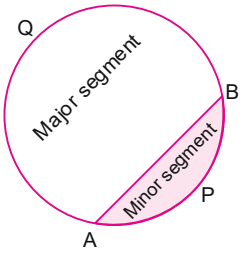


$$\begin{aligned}\text{Area enclosed by the two circles} &= \pi R^2 - \pi r^2 \\ &= \pi(R^2 - r^2) \\ &= \pi(R + r)(R - r)\end{aligned}$$

4. (*i*) If two circles touch internally, then the distance between their centres is equal to the difference of their radii.
   (*ii*) If two circles touch externally, then distance between their centres is equal to the sum of their radii.
   (*iii*) Distance moved by a rotating wheel in one revolution is equal to the circumference of the wheel.
   (*iv*) The number of revolutions completed by a rotating wheel in one minute

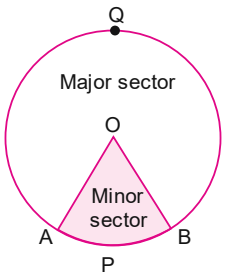
$$= \frac{\text{Distance moved in one minute}}{\text{Circumference of the wheel}}$$

5. **Segment of a circle:** The portion (or part) of a circular region enclosed between a chord and the corresponding arc is called a segment of the circle.



Here, APB is called minor segment and AQB is called major segment.

6. **Sector of a circle:** The portion (or part) of the circular region enclosed by the two radii and the corresponding arc is called a sector of the circle.



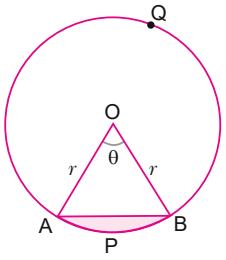
Here, *OAPB* is called minor sector and *OAQB* is called the major sector.

7. (*i*) The sum of the arcs of major and minor sectors of a circle is equal to the circumference of the circle.

(*ii*) The sum of the areas of major and minor sectors of a circle is equal to the area of the circle.

8. Area of the sector of angle $\theta = \frac{\theta}{360^\circ} \times \pi r^2$ or $\frac{1}{2} \times$ length of arc $\times$ radius $= \frac{1}{2} lr$

9. Length of an arc of a sector of angle $\theta = \frac{\theta}{360^\circ} \times 2\pi r$



10. Area of segment *APB*

$$= \text{Area of the sector } OAPB - \text{Area of } \Delta OAB$$

$$= \frac{\theta}{360^\circ} \times \pi r^2 - \frac{1}{2} r^2 \sin\theta$$

11. (*a*) Angle described by minute hand in 60 minutes = 360°

$\therefore$ Angle described by minute hand in one minute $= \left(\frac{360}{60}\right)^\circ = 6^\circ$

Thus, minute hand rotates through an angle of 6° in one minute.

(*b*) Angle described by hour hand in 12 hours = 360°

$\therefore$ Angle described by hour hand in one hour $= \left(\frac{360}{12}\right)^\circ = 30^\circ$

$\Rightarrow$ Angle described by hour hand in one minute $= \left(\frac{30}{60}\right)^\circ = \frac{1}{2}^\circ$

Thus, hour hand rotates through $\left(\frac{1}{2}\right)^\circ$ in one minute.

MULTIPLE CHOICE QUESTIONS

Choose and write the correct option in the following questions.

1. **The perimeter of a circle is equal to that of a square, then the ratio of their areas is** *[NCERT Exemplar]*

(*a*) 22 : 7 (*b*) 14 : 11 (*c*) 7 : 22 (*d*) 11 : 14

2. **Area of the largest triangle that can be inscribed in a semi-circle of radius *r* units is** *[NCERT Exemplar]*

(*a*) r^2sq. units (*b*) $\frac{1}{2} r^2$sq. units (*c*) $2r^2$sq. units (*d*) $\sqrt{2}\, r^2$sq. units

3. **If the circumference of a circle and the perimeter of a square are equal, then** [*NCERT Exemplar*]

(*a*) Area of the circle = Area of the square

(*b*) Area of the circle > Area of the square

(*c*) Area of the circle < Area of the square

(*d*) Nothing definite can be said about the relation between the areas of the circle and square.

4. **If the sum of the circumferences of two circles with radii R_1 and R_2 is equal to the circumference of a circle of radius R, then** [*NCERT Exemplar*]

(*a*) $R_1 + R_2 = R$ (*b*) $R_1 + R_2 > R$ (*c*) $R_1 + R_2 < R$ (*d*) None of these

5. **If the area of a circle is 154 cm^2, then its perimeter is** [*NCERT Exemplar*]

(*a*) 11 cm (*b*) 22 cm (*c*) 44 cm (*d*) 55 cm

6. **It is proposed to build a single circular park equal in area to the sum of areas of two circular parks of diameters 16 m and 12 m in a locality. The radius of the new park would be** [*NCERT Exemplar*]

(*a*) 10 m (*b*) 15 m (*c*) 20 m (*d*) 24 m

7. **The area of the circle that can be inscribed in a square of side 6 cm is** [*NCERT Exemplar*]

(*a*) 36 π cm^2 (*b*) 18 π cm^2 (c) 12 π cm^2 (*d*) 9 π cm^2

8. **The area of the square that can be inscribed in a circle of radius 8 cm is** [*NCERT Exemplar*]

(*a*) 256 cm^2 (*b*) 128 cm^2 (*c*) $64\sqrt{2}$ cm^2 (*d*) 64 cm^2

9. **The radius of a circle whose circumference is equal to the sum of the circumferences of the two circles of diameters 36 cm and 20 cm is** [*NCERT Exemplar*]

(*a*) 56 cm (*b*) 42 cm (*c*) 28 cm (*d*) 16 cm

10. **The diameter of a circle whose area is equal to the sum of the areas of the two circles of radii 24 cm and 7 cm is** [*NCERT Exemplar*]

(*a*) 31 cm (*b*) 25 cm (*c*) 62 cm (*d*) 50 cm

11. **If the area of circle is 1386 cm^2, then its circumference is**

(*a*) 66 cm (*b*) 88 cm (*c*) 132 cm (*d*) 264 cm

12. **The diameter of a wheel is 1 m. The number of revolutions it will make to travel a distance of 22 km will be**

(*a*) 2,800 (*b*) 4,000 (*c*) 5,500 (*d*) 7,000

13. **A circular park has a path of uniform width around it. The difference between the outer and inner circumferences of the circular park is 132 cm. Its width is**

(*a*) 20 cm (*b*) 21 cm (*c*) 22 cm (*d*) 24 cm

14. **The ratio of the areas of a circle and an equilateral triangle whose diameter and a side are respectively equal is**

(*a*) $\pi : \sqrt{2}$ (*b*) $\pi : \sqrt{3}$ (*c*) $\sqrt{3} : \pi$ (*d*) $\sqrt{2} : \pi$

15. **The area of a circular path of uniform width b surrounding a circular region of radius r is**

(*a*) $\pi(2r + b)r$ sq. units (*b*) $\pi(2r + b)b$ sq. units

(*c*) $\pi(b + r)r$ sq. units (*d*) $\pi(b + r)b$ sq. units

16. **The area of a circle whose area and circumference are numerically equal is**

(*a*) 2π sq. units (*b*) 4π sq. units (*c*) 6π sq. units (*d*) 8π sq. units

17. **The area of a quadrant of a circle whose circumference is 616 cm will be**

(*a*) 7546 cm^2 (*b*) 7500 cm^2 (*c*) 7456 cm^2 (*d*) 7564 cm^2

18. **The circumference of two circles are in the ratio 2 : 3. The ratio of their areas is**

(*a*) 2 : 3 (*b*) 4 : 9 (*c*) 9 : 4 (*d*) None of these

19. **If the perimeter of a semicircular protractor is 36 cm; its diameter is**

(*a*) 14 cm (*b*) 16 cm (*c*) 18 cm (*d*) 12 cm

20. **The area of a sector of a circle with radius 14 cm and central angle 45° is**

(*a*) 76 cm^2 (*b*) 77 cm^2 (*c*) 66 cm^2 (*d*) 55 cm^2

21. **If θ is the angle (in degrees) of a sector of a circle of radius *r*, then area of the sector is**

(*a*) $\frac{\pi r^2\theta}{360°}$ (*b*) $\frac{\pi r^2\theta}{180°}$ (*c*) $\frac{2\pi r\theta}{360°}$ (*d*) $\frac{2\pi r\theta}{180°}$

22. **A wire can be bent in the form of a circle of radius 35 cm. If it is bent in the form of a square, then its area will be**

(*a*) 3025 cm^2 (*b*) $\frac{3025}{2}cm^2$ (*c*) 1225 cm^2 (*d*) 2450 cm^2

23. **The difference between the circumference and radius of a circle is 37 cm. The area of circle is**

(*a*) 111 cm^2 (*b*) 184 cm^2 (*c*) 154 cm^2 (*d*) 259 cm^2

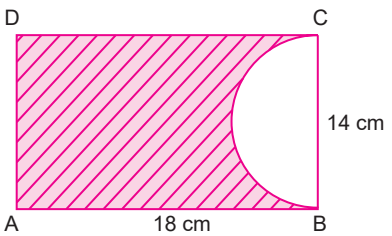
24. **On increasing the distance of circle by 40%, its area will be increased by**

(*a*) 40% (*b*) 80% (*c*) 96% (*d*) none of them

25. **The area of the square is same as the area of circle. Then their perimeter are in the ratio**

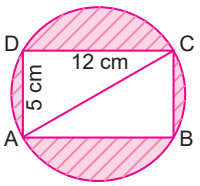
(*a*) 1 : 1 (*b*) $\sqrt{\pi}:2$ (*c*) $2:\pi$ (*d*) none of them

26. **A paper is in the form of a rectangle *ABCD* in which *AB* = 18 cm and *BC* = 14 cm. A semicircular portion with *BC* as diameter is cut off. The area of the remaining paper is**



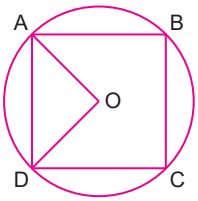
(*a*) 175 cm^2 (*b*) 165 cm^2 (*c*) 145 cm^2 (*d*) none of them

27. **The area of the shaded region in the given figure is (Take π = 3.14).**



(*a*) 75 cm^2 (*b*) 73 cm^2 (*c*) 70 cm^2 (*d*) none of them

28. **A square *ABCD* is inscribed in a circle of radius '*r*'. The area of the square in square units is**

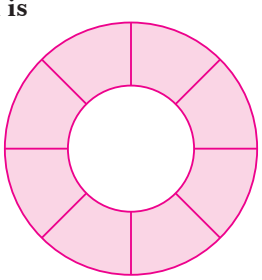


(*a*) $3r^2$ (*b*) $2r^2$ (*c*) $4r^2$ (*d*) none of them

29. **The perimeter of a sector of a circle of radius 5.6 cm is 27.2 cm. The area of sector is**

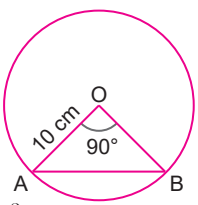
(*a*) 44 cm^2 (*b*) 44.6 cm^2 (*c*) 44.8 cm^2 (*d*) none of them

30. **A racetrack is in the form of a ring whose inner circumferences is 352 m and outer circumference is 396 m. The width of the track is**



(*a*) 4 m (*b*) 6 m (*c*) 8 m (*d*) 7 m

31. **A chord *AB* of a circle of radius 10 cm makes a right angle at the centre of the circle. The area of major segment is**



(*a*) 210 cm^2 (*b*) 285.7 cm^2 (*c*) 185.5 cm^2 (*d*) 258.1 cm^2

32. **The ratio of outer and inner perimeters of circular path is 23:22. If the path is 5 m wide, the inner circle is**

(*a*) 55 m (*b*) 110 m (*c*) 220 m (*d*) 230 m

33. **The area of the incircle of an equilateral triangle of side 42 cm is**

(*a*) $22\sqrt{3}$ cm^2 (*b*) 231 cm^2 (*c*) 462 cm^2 (*d*) 924 cm^2

34. **The area of the largest triangle that can be inscribed in a semicircle is**

(*a*) r^2 (b) $2r^2$ (c) r^3 (*d*) $2r^3$

35. **If the circumference of a circle increases from 4π to 8π, then the area is**

(*a*) halved (*b*) doubled (*c*) tripled (*d*) quadrupled

36. **A horse is placed for grazing inside a rectangular field 70 m by 52 m is tethered to one corner by a rope 21 m long. The area it can graze is**

(*a*) 340.5 cm^2 (*b*) 345 cm^2 (*c*) 346.5 cm^2 (*d*) none of them

37. **A drain cover is made from a square metal of side 40 cm having 441 holes of diameter 1 cm each drilled in it. The area of remaining square plate is**

(*a*) 1250.5 cm^2 (*b*) 1256.5 cm^2 (*c*) 1253.5 cm^2 (*d*) none of them

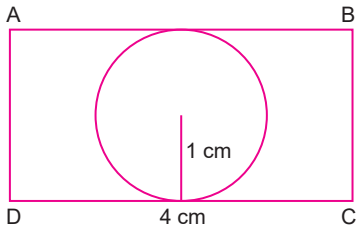
38. **A pendulum swings through an angle of 30° and describes an arc 8.8 cm is length. The length of the pendulum is**

(*a*) 16 cm (*b*) 16.8 cm (*c*) 16.4 cm (*d*) none of them

39. **A wheel has diameter 84 cm. The number of complete revolution it take to cover 792 m is**

(*a*) 330 (*b*) 400 (*c*) 360 (*d*) 300

40. **A rectangular sheet of card board is 4 cm by 2 cm. The greatest possible circle is cut off form the card board then the remaining area is**

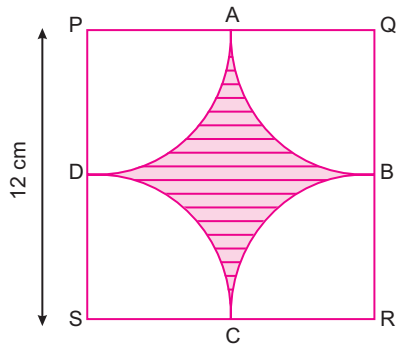


(*a*) $(16 - \pi)\ \text{cm}^2$ (*b*) $(16 - 4\pi)\ \text{cm}^2$ (*c*) $(8 - \pi)\ \text{cm}^2$ (*d*) none of them

41. **If the length of an arc of a circle of radius r is equal to that of an arc of a circle of radius $2r$ then the relation between corresponding angles θ_1 and θ_2 is**

(*a*) $\theta_1 = 2\theta_2$ (*b*) $\theta_1 = \theta_2$ (*c*) $\theta_1 = \frac{1}{2}\theta_2$ (*d*) $\theta_1 = 4\theta_2$

42. **The area of the shaded region in fig, where arcs drawn with centres P, Q, R and S intersect in pairs at mid points A, B, C and D of the sides PQ, QR, RS and SP respectively of a square $PQRS$, is**

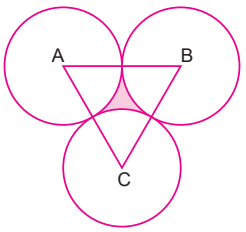


(*a*) $30.86\ \text{cm}^2$ (*b*) $30.86\ \text{m}^2$ (*c*) $30.86\ \text{mm}^2$ (*d*) $30.86\ \text{km}^2$

43. **If the sum of the areas of two circles with radii r_1 and r_2 is equal to the area of a circle of radius r, then $r_1^2 + r_2^2$ is**

(*a*) $> r^2$ (*b*) $= r^2$ (*c*) $< r^2$ (*d*) none of them

44. ***ABC* is an equailateral triangle. The area of the shaded region if the radius of each of the circle is 1 cm, is**



(*a*) $2 - \frac{\pi}{3}$ (*b*) $\sqrt{3} - \pi$ (*c*) $\sqrt{3} - \frac{\pi}{2}$ (*d*) $\sqrt{3} - \frac{\pi}{4}$

45. **Which of these is equivalent to π?** *[CBSE Question Bank]*

(*a*) $\frac{\text{Circumference}}{\text{Radius}}$ (*b*) $\frac{\text{Circumference}}{\text{Diameter}}$

(*c*) Circumference × Diameter (*d*) Circumference × Radius

46. **David draws a circle with diameter 6 units. He draws another circle by increasing the radius of the previously drawn circle by 4 units. What would be the quotient if he divides the circumference of the newly formed circle by its diameter?** *[CBSE Question Bank]*

(*a*) 8 (*b*) 12 (*c*) π (*d*) 2π

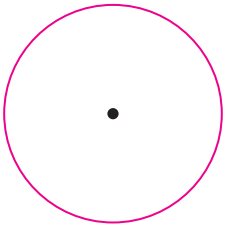
47. **A circular garden, of circumference 88 m is surrounded by a pathway of width 3.5 m. Ajay wants to put fence around the pathway. What is the cost of fencing the pathway at the rate of ₹70 per metre?** $\left(\text{Use } \pi = \frac{22}{7}\right)$ *[CBSE Question Bank]*

(*a*) ₹ 3,080 (*b*) ₹ 3,850 (*c*) ₹ 6,160 (*d*) ₹ 7,700

48. **A fountain is enclosed by a circular fence of circumference 11 m and is surrounded by a circular path. The circumference of the outer boundary of the path is 16 m. A gardener increased the width of the pathway by decreasing the area enclosed by the fence such that the length of the fence is decreased by 3 m. The path is to be covered by the bricks which cost ₹125 per m^2. What will be the total cost, to the nearest whole number, required to cover the area by the bricks?** $\left(\text{Use } \pi = \frac{22}{7}\right)$ *[CBSE Question Bank]*

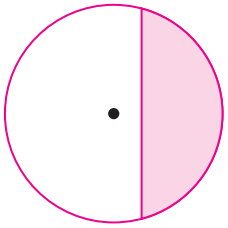
(*a*) ₹ 1,910 (*b*) ₹ 9,878 (*c*) ₹ 39,772 (*d*) ₹ 79,545

49. **Consider a circle below.**

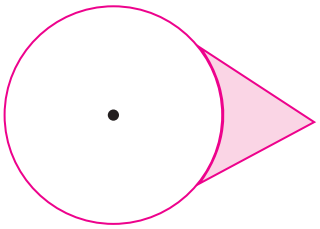


Aman shades a part in the circle which is enclosed by two radii and its corresponding arc. Which of these could he have drawn? *[CBSE Question Bank]*

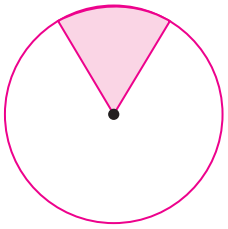
(*a*)



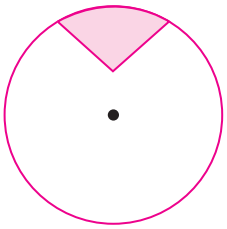
(*b*)



(*c*)



(*d*)



50. **Consider the statements below.**

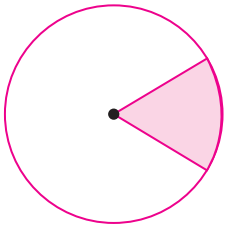
(*i*) A quarter circle represents a sector of the circle.

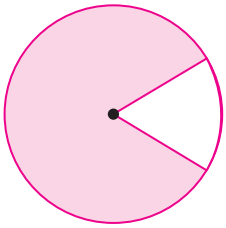
(*ii*) A semicircle represents both sector and segment of the circle.

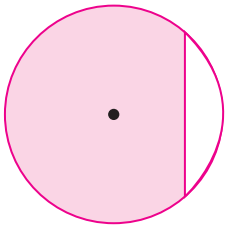
Which of these statements is correct? [*CBSE Question Bank*]

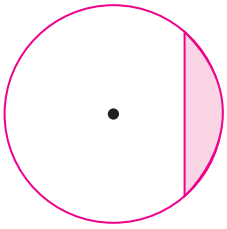
(*a*) Only (*i*) (*b*) Only (*ii*) (*c*) Both (*i*) and (*ii*) (*d*) Neither (*i*) nor (*ii*)

51. Which of the following options represents the shaded region as the major sector and unshaded region as the minor sector? [*CBSE Question Bank*]

(*a*) 

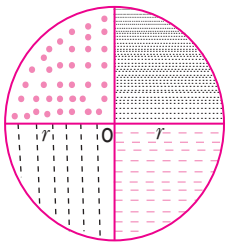
(*b*) 

(*c*) 

(*d*) 

52. To form a circle of radius *r*, four minor sectors of equal measure are joined. Which of these options completes the sentence below? [*CBSE Question Bank*]

The sum of the area of the four minor sectors is equal to the _____.



(*a*) area of the semicircle of diameter $2r$.

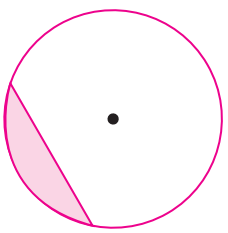
(*b*) area of the circle of diameter $2r$.

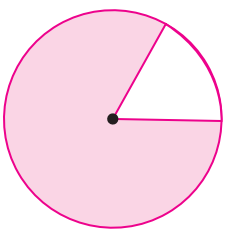
(*c*) circumference of the circle of radius r.

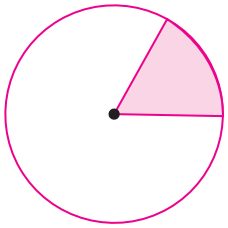
(*d*) circumference of the circle of diameter r.

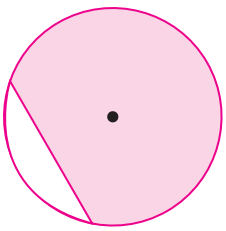
53. To show the minor segment of a circle, a student shades the region enclosed between a chord and the minor arc.

Which of these shows the region the student could have shaded? [*CBSE Question Bank*]

(*a*) 

(*b*) 

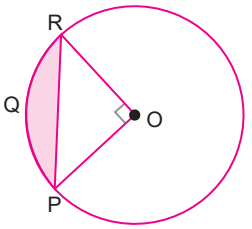
(*c*) 

(*d*) 

54. **Which of these is equivalent to the sum of the lengths of arc corresponding to the minor and major segment of a circle of radius 12 cm?** *[CBSE Question Bank]*

(*a*) 24π cm (*b*) 48π cm (*c*) 12π cm (*d*) 144π cm

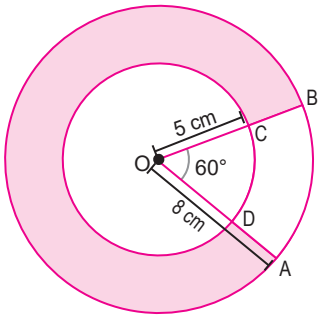
55. **Observe the figure below:**



What is the area of the segment *PQR*, if the radius of the circle is 7 cm? $\left(\textbf{Use } \pi = \frac{22}{7}\right)$ *[CBSE Question Bank]*

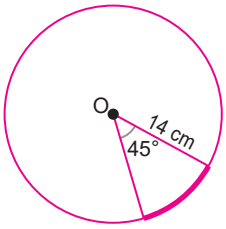
(*a*) 14 cm^2 (*b*) 17.3 cm^2 (*c*) 28 cm^2 (*d*) 91 cm^2

56. **Two concentric circles of radii 8 cm and 5 cm are shown below, and a sector forms an angle of 60° at the centre *O*. What is the area of the shaded region?** *[CBSE Question Bank]*



(*a*) $\frac{38\pi}{2}$ cm^2 (*b*) $\frac{77\pi}{2}$ cm^2 (*c*) $\frac{195\pi}{6}$ cm^2 (*d*) $\frac{295\pi}{6}$ cm^2

57. **An arc of a circle of radius 14 cm, subtends an angle of 45° at the centre as shown:** *[CBSE Question Bank]*



Which of these options is correct?

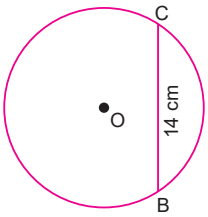
(*a*) The arc shown is a minor arc and its length is 5.5 cm.

(*b*) The arc shown is a major arc and its length is 77 cm.

(*c*) The arc shown is a major arc and its length is 38.5 cm.

(*d*) The arc shown is a minor arc and its length is 11 cm.

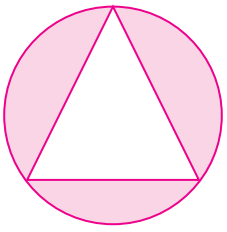
58. **A circle with centre O of diameter 28 cm and a chord BC of length 14 cm is shown below:**



What is the length of the major arc of the circle, to the nearest tenth? *[CBSE Question Bank]*

(*a*) 14.7 cm (*b*) 73.3 cm (*c*) 146.7 cm (*d*) 216.3 cm

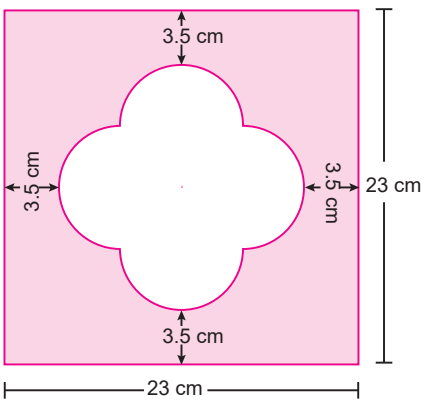
59. **An equilateral triangle of side 28 cm is inscribed in a circle of diameter 32 cm, as shown below:**



What is the area of the shaded region? (Use $\pi = 3.14$ and $\sqrt{3} = 1.73$) *[CBSE Question Bank]*

(*a*) 75.68 cm^2 (*b*) 125.68 cm^2 (*c*) 411.84 cm^2 (*d*) 464.76 cm^2

60. **Smita shaded a square cardboard, as shown below:**



Which of these is closest to the area of the shaded region? *[CBSE Question Bank]*

(*a*) 364.52 cm^2 (*b*) 439.9 cm^2 (*c*) 492.4 cm^2 (*d*) 572.4 cm^2

61. **The area of a square inscribed in a circle of diameter p cm is**

(*a*) p^2 cm^2 (*b*) $\frac{p}{4}$ cm^2 (*c*) $\frac{p^2}{2}$ cm^2 (*d*) $\frac{p}{2}$ cm^2

Answers

1. (*b*)	**2.** (*a*)	**3.** (*b*)	**4.** (*a*)	**5.** (*c*)	**6.** (*a*)
7. (*d*)	**8.** (*b*)	**9.** (*c*)	**10.** (*d*)	**11.** (*c*)	**12.** (*d*)
13. (*b*)	**14.** (*b*)	**15.** (*b*)	**16.** (*b*)	**17.** (*a*)	**18.** (*b*)
19. (*a*)	**20.** (*b*)	**21.** (*a*)	**22.** (*a*)	**23.** (*c*)	**24.** (*c*)
25. (*b*)	**26.** (*a*)	**27.** (*b*)	**28.** (*b*)	**29.** (*c*)	**30.** (*d*)

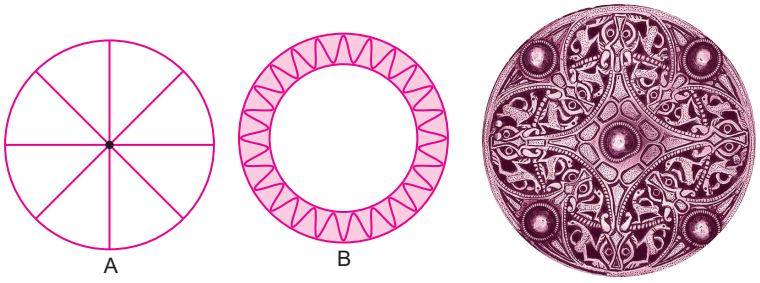
31. (*b*)	**32.** (*c*)	**33.** (*c*)	**34.** (*a*)	**35.** (*d*)	**36.** (*c*)
37. (*c*)	**38.** (*b*)	**39.** (*d*)	**40.** (*c*)	**41.** (*a*)	**42.** (*a*)
43. (*b*)	**44.** (*c*)	**45.** (*b*)	**46.** (*c*)	**47.** (*d*)	**48.** (*a*)
49. (*c*)	**50.** (*c*)	**51.** (*b*)	**52.** (*b*)	**53.** (*a*)	**54.** (*a*)
55. (*a*)	**56.** (*c*)	**57.** (*d*)	**58.** (*b*)	**59.** (*d*)	**60.** (*a*)
61. (*c*)					

CASE-BASED QUESTIONS

1. Read the following and answer any four questions from (*i*) to (*v*).

A brooch is a small piece of jewellery which has a pin at the back so it can be fastened on a dress, blouse or coat.

Designs of some broochs are shown below. Observe them carefully.



Design *A*: Brooch *A* is made with silver wire in the form of a circle with diameter 28 mm. A wire used for making 4 diameters which divide the circle into 8 equal parts.

Design *B*: Brooch *B* is made of two colours gold and silver. Outer part is made with gold. The circumference of silver part is 44 mm and the gold part is 3 mm wide everywhere.

[CBSE Question Bank]

Based on the above information, answer the following questions:

Refer to design *A*

(*i*) The total length of silver wire required is

(*a*) 180 mm (*b*) 200 mm (*c*) 250 mm (*d*) 280 mm

(*ii*) The area of each sector of the brooch is

(*a*) 44 mm^2 (*b*) 52 mm^2 (*c*) 77 mm^2 (*d*) 68 mm^2

Refer to design *B*

(*iii*) The circumference of outer part (golden) is

(*a*) 48.49 mm (*b*) 82.2 mm (*c*) 72.50 mm (*d*) 62.86 mm

(*iv*) The difference of areas of golden and silver parts is

(*a*) 18π (*b*) 44π (*c*) 51π (*d*) 64π

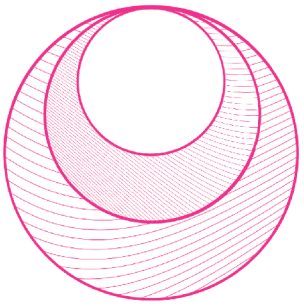
(*v*) A boy is playing with brooch *B*. He makes revolution with it along its edge. How many complete revolutions must it take to cover 80π mm ?

(*a*) 2 (*b*) 3 (*c*) 4 (*d*) 5

2. Read the following and answer any four questions from (*i*) to (*v*).

The art department of a school prepared circular hanging for the annual function of the school. The circle with diameter 42 cm was placed at the bottom and the size of the middle circle was half the size of the bottom one and the smallest circle was half the size of the middle circle.

(*i*) The radius of the smallest circle is



(*a*) 7 cm (*b*) 14 cm (*c*) 10.5 cm (*d*) 5.25 cm

(*ii*) The area of the middle circle is

(*a*) 154 cm^2 (*b*) 616 cm^2 (*c*) 346.5 cm^2 (*d*) 1386 cm^2

(*iii*) The area of the bottom circular region that is visible is

(*a*) $\frac{1323}{2}\pi cm^2$ (*b*) $\frac{1323}{4}\pi cm^2$ (*c*) 245π cm^2 (*d*) 340π cm^2

(*iv*) The ratio of the areas of the three circles, starting from the bottom circle is

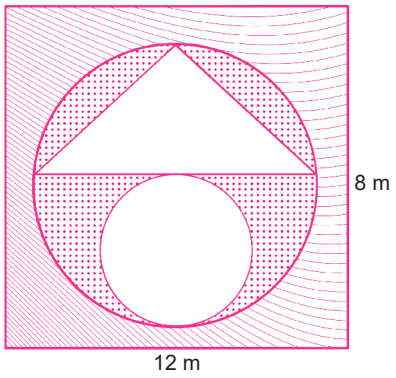
(*a*) 16: 4 : 1 (*b*) 4 : 2 : 1 (*c*) 1: 2 : 4 (*d*) 1 : 4 : 16

(*v*) A colourful tape was used to decorate the boundary of the bottom circle. The length of tape used is

(*a*) 42 cm (*b*) 42π cm (*c*) 21 cm (*d*) 21π cm

3. Read the following and answer any four questions from (*i*) to (*v*).

Gauri got her wall painted in a different manner. The whole wall was painted pink, leaving a circular portion of diameter 4.2m. In this circle, she asked the painter to paint a beautiful scenery in one half of it by drawing a full size triangle possible (as shown in the figure). In the other half of the circle, she drew the largest circle possible and pasted some of her pictures. The remaining part of the big circle was filled with dotted design.



(*i*) The area of the triangular region is

(*a*) 4.41 m^2 (*b*) 8.82 m^2 (*c*) 2.205 m^2 (*d*) 17.64 m^2

(*ii*) The radius of the circle allotted for her pictures is

(*a*) 4.2 m (*b*) 2.1 m (*c*) 1.05m (*d*) cannot be determined

(*iii*) The area of the wall that is not painted pink is given by

(*a*) $(96 - 4.41\pi)$ m^2 (*b*) $(40 - 4.41\pi)$ m^2 (*c*) $(96 - 17.64\pi)$ m^2 (*d*) $(40 - 17.641\pi)$ m^2

(*iv*) The area of the dotted design is approximately

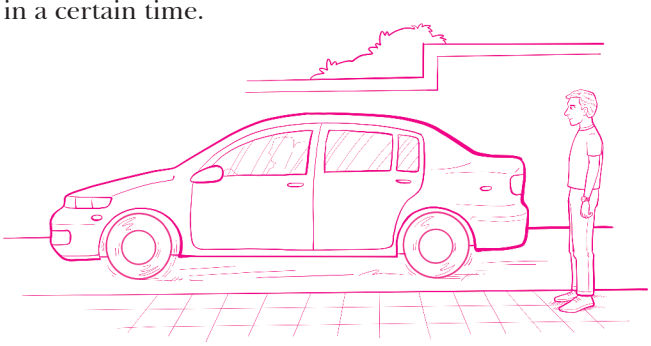
(*a*) 10 m^2 (*b*) 6 m^2 (*c*) 9 m^2 (*d*) 8 m^2

(*v*) The cost of designing the whole circular region at the rate of ₹ 80 per m^2 is

(*a*) ₹4,435.2 (*b*) ₹110.88 (*c*) ₹1,108.80 (*d*) ₹346.50

4. Read the following and answer any four questions from (*i*) to (*v*).

Raghav was standing outside his home. He then tried to find how many times does the wheel of the car move in a certain time.



(*i*) Raghav measured the diameter of his car's wheel and found it to be 84 cm. The distance travelled by the wheel in one revolution is

(*a*) 84π cm (*b*) 42π cm (*c*) 21π cm (*d*) 176π cm

(*ii*) He observed that an average speed of car in front of his house is 45 km/h. The distance travelled in 1 minute is

(*a*) 450 m (*b*) 750 m (*c*) 500 m (*d*) 760 m

(*iii*) The number of revolutions made by the wheel in eleven minutes is

(*a*) 31 (*b*) 32 (*c*) 18 (*d*) 25

(*iv*) If the circumference and the area of a circle are numerically equal, then diameter of the circle is

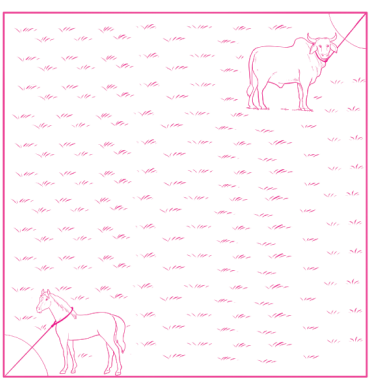
(*a*) 2 units (*b*) 4 units (*c*) 6 units (*d*) 1 unit

(*v*) The area of a circular ring formed by the circles of radii a and b respectively is given by

(*a*) $2\pi(a - b)$ (*b*) $2\pi(a^2 - b^2)$ (*c*) $\pi(a^2 - b^2)$ (*d*) $\pi(a^2 + b^2)$

5. Read the following and answer any four questions from (*i*) to (*v*).

A horse and an ox are tied to a peg at opposite corners of a rectangular field of dimensions 35 m × 20 m by ropes of length 5 m and 10 m respectively. (use $\pi = 3.14$)



(*i*) The area of the field that the horse can graze is given by

(*a*) 25π m^2 (*b*) 10π m^2 (*c*) $\frac{25}{2}\pi$ m^2 (*d*) $\frac{25}{4}\pi$ m^2

(ii) The area of the field the ox can graze is

(a) 78.5 m^2 (b) 157 m^2 (c) 314 m^2 (d) 62.8 m^2

(iii) The area of the field left to be grazed is

(a) $700 - \frac{125\pi}{2}$ m^2 (b) $700 - \frac{125\pi}{4}$ m^2 (c) $110 - \frac{125\pi}{2}$ m^2 (d) $110 - \frac{125\pi}{4}$ m^2

(iv) If the rope to which horse is tied would have been 8 m long, then the increase in the grazing area is given by

(a) $\frac{39}{4}\pi$ m^2 (b) $\frac{35}{4}\pi$ m^2 (c) $\frac{37}{2}\pi$ m^2 (d) $\frac{35}{2}\pi$ m^2

(v) The area of a sector of a circle bounded by an arc of length 5π cm is equal to 20π cm^2, then its radius is

(a) 12 cm (b) 16 cm (c) 8 cm (d) 10 cm

Answers

1.	(i) (b)	(ii) (c)	(iii) (d)	(iv) (c)	(v) (c)
2.	(i) (d)	(ii) (c)	(iii) (b)	(iv) (a)	(v) (b)
3.	(i) (a)	(ii) (c)	(iii) (a)	(iv) (b)	(v) (c)
4.	(i) (a)	(ii) (b)	(iii) (a)	(iv) (b)	(v) (c)
5.	(i) (d)	(ii) (a)	(iii) (b)	(iv) (a)	(v) (c)

ASSERTION-REASON QUESTIONS

The following questions consist of two statements—Assertion(A) and Reason(R). Answer these questions selecting the appropriate option given below:

(a) Both *A* and *R* are true and *R* is the correct explanation for *A*.

(b) Both *A* and *R* are true and *R* is not the correct explanation for *A*.

(c) *A* is true but *R* is false.

(d) *A* is false but *R* is true.

1. Assertion (A) : In a circle of radius 6 cm, the angle of a sector is 60°. Then the area of the sector is $18\frac{6}{7}$ cm^2.

Reason (R) : Area of the circle with radius r is πr^2.

2. Assertion (A) : The length of the minute hand of a clock is 7 cm. Then the area swept by the minute hand in 5 minutes is $12\frac{5}{6}$ cm^2.

Reason (R) : The length of an arc of a sector of angle θ and radius r is given by $l = \frac{\theta}{360} \times 2\pi r$.

3. Assertion (A) : If the circumference of two circles are in the ratio 2 : 3, then ratio of their areas is 4 : 9.

Reason (R) : The circumference of a circle of radius r is $2\pi r$ and its area is πr^2.

4. Assertion (A) : A bicycle wheel makes 5000 revolutions in covering 11 km. Then diameter of the wheel is 35 cm.

Reason (R) : Area of segment of a circle is $\frac{\theta}{360} \times \pi r^2 - \frac{1}{2} r^2 \sin\theta$.

Answers

1. (b) **2.** (b) **3.** (a) **4.** (d)

HINTS/SOLUTIONS OF SELECTED MCQs

1. Perimeter of circle = perimeter of square

$$2\pi r = 4a \qquad \Rightarrow a = \frac{\pi r}{2}$$

$$\frac{\text{Area of circle}}{\text{Area of square}} = \frac{\pi r^2}{\left(\frac{\pi r}{2}\right)^2} = \frac{\pi r^2 \times 4}{11^2 r^2} = \frac{4}{\pi} = \frac{4}{\frac{22}{7}} \Rightarrow \frac{28}{22} = \frac{14}{11}$$

Option (*b*) is correct.

3. According to given condition

Circumference of a circle = Perimeter of square

$$2\pi r = 4a$$

$$r = \frac{4 \times a \times 7}{2 \times 22} \Rightarrow r = \frac{7a}{11} \qquad \ldots(i)$$

Now area of circle,

$$A_1 = \pi r^2 = \pi\left(\frac{7a}{11}\right)^2 = \frac{14a^2}{11} \qquad \ldots(ii)$$

Area of square, $A_2 = a^2$ $\qquad \ldots(iii)$

From equation (*ii*) and (*iii*), we get

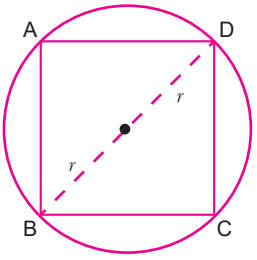
$$A_1 > A_2 .$$

Option (*b*) is correct.

18. $\frac{\text{circumference of circle 1}}{\text{circumference of circle 2}} = \frac{2\pi r_1}{2\pi r_2} = \frac{2}{3} \Rightarrow \frac{r_1}{r_2} = \frac{2}{3}$

$$\frac{\text{Area of cirlce 1}}{\text{Area of circle 2}} = \frac{\pi r_1^2}{\pi r_2^2} = \left(\frac{r_1}{r_2}\right)^2 = \left(\frac{2}{3}\right)^2 = \frac{4}{9} = 4:9$$

Option (*b*) is correct.



19. Perimeter of protractor = $\pi r + d = \pi r + 2r = 36$

$$r = \frac{36}{\pi + 2} = \frac{36}{\frac{22}{7} + 2} = \frac{36 \times 7}{36} = 7 \text{ cm}$$

$d = 2r = 2 \times 7 = 14$ cm

Option (*a*) is correct.

20. Area of sector $= \frac{\pi r^2 \theta}{360}$

$$= \frac{22 \times 14 \times 14 \times 45}{7 \times 360} = \frac{22 \times 2 \times 14}{8} = 77 \text{ cm}^2$$

Option (*b*) is correct.

21. From the formula of area of sector.

Option (*a*) is correct.

22. Length of wire = circumference of circle = $2\pi r = 2 \times \frac{22}{7} \times 35 = 220$ cm

So, the perimeter of square is also 220 cm.

Length of one side = $\frac{220}{4} = 55$ cm

Now, area of square = side × side

$= 55 \times 55 = 3025 \text{ cm}^2$

Option (*a*) is correct.

23. According to question

$2\pi r - r = 37$

$\Rightarrow 2 \times \frac{22}{7} \times r - r = 37 \Rightarrow \frac{44r - 7r}{7} = 37$

$\Rightarrow \frac{37r}{7} = 37 \Rightarrow r = 7 \text{ cm}$

Now area of circle $= \pi r^2 = \frac{22}{7} \times (7)^2 = 154 \text{ cm}^2$

Option (*c*) is correct.

24. Let the distance be d and area be $A = \frac{\pi d^2}{4}$

Now distance $= d + \frac{40}{100}d \Rightarrow d + \frac{2}{5}d \Rightarrow \frac{7d}{5}$

New area $= \pi\left(\frac{7d}{5}\right)^2 \times \frac{1}{4} = \pi\left(\frac{49d^2}{25 \times 4}\right) = \pi\left(\frac{49d^2}{100}\right)$

Area increased $= \frac{\pi 49d^2}{100} - \frac{\pi d^2}{4}$

Area increased $= \pi\left(\frac{49d^2 - 25d^2}{100}\right) = \pi \times \frac{24d^2}{100}$

$\%$ increase $= \frac{\pi \times \frac{24d^2}{100}}{\frac{\pi d^2}{4}} \times 100 = 96\%$

Option (*c*) is correct.

25. Given area of square = area of circle

$(\text{side})^2 = \pi r^2$

$\Rightarrow a^2 = \pi r^2 \qquad \Rightarrow \frac{1}{\sqrt{\pi}} = \frac{r}{a}$

Again $\frac{2\pi r}{4a} = \frac{\pi r}{2a} \Rightarrow \frac{\pi}{2} \times \frac{1}{\sqrt{\pi}} \Rightarrow \frac{\sqrt{\pi}}{2}$

Option (*b*) is correct.

26. Area of remaining paper = area of rectangle – area of semicircle

$= 18 \times 14 - \frac{\pi \times (7)^2}{2}$

$= 252 - \frac{22}{7} \times \frac{7 \times 7}{2} = 252 - 77 = 175 \text{ cm}^2$

Option (*a*) is correct.

27. Area of shaded region = area of circle – area of rectangle

Diagonal of rectangle $= \sqrt{12^2 + 5^2} = \sqrt{144 + 25} = 13 \text{ cm}$

Radius of circle $= \frac{13}{2} \text{ cm}$

Area of shaded region $= \pi \times \left(\frac{13}{2}\right)^2 - 12 \times 5 = \frac{3.14}{100} \times \frac{169}{4} - 60$

$= \frac{53060}{400} - 60 = 132.66 - 60.00 = 72.66 \text{ cm}^2 = 73 \text{ cm}^2 \text{ (approx)}$

Option (*b*) is correct.

28. $\because \quad \angle O = 90°$

$\therefore \quad AD = \sqrt{AO^2 + DO^2} = \sqrt{r^2 + r^2} = r\sqrt{2}$ square units

So, area of square = side × side $= r\sqrt{2} \times r\sqrt{2} = 2r^2$

Option (*b*) is correct.

29. Perimeter of sector = 2 × radius + length of arc

$$27.2 = 2 \times 5.6 + l \quad \Rightarrow \quad l = 27.2 - 11.2 = 16 \text{ cm}$$

$$l = \frac{2\pi r\theta}{360°} \quad \Rightarrow \quad 16 = \frac{\pi r\theta}{180°}$$

$$\Rightarrow \quad \frac{\theta}{180°} = \frac{16}{\pi r} \quad \ldots(i)$$

Now area of sector $= \frac{\pi r^2 \theta}{2 \times 180°} = \frac{\pi r^2}{2} \times \frac{16}{\pi r}$ [From (*i*)]

$= 8r = 8 \times 5.6 = 44.8 \text{ cm}^2$

Option (*c*) is correct.

30. Let radius of outer circle be R m and of inner circle be r m

So, $2\pi R = 396$ and $2\pi r = 352$

$$R = \frac{396 \times 7}{2 \times 22} = 63 \text{ m and } r = \frac{352 \times 7}{2 \times 22} = 56 \text{ m}$$

So, width of the track is $R - r = 63 - 56 = 7$ m

Option (*d*) is correct.

31. Area of minor segment = Area of sector – area of triangle

$$= \frac{\pi r^2 \theta}{360°} - \frac{1}{2} \times OA \times OB = \frac{22}{7} \times \frac{100 \times 90}{360°} - \frac{1}{2} \times 100$$

$$= \frac{550}{7} - 50 = \frac{550 - 350}{7} = \frac{200}{7} \text{ cm}^2$$

Area of major segment = Area of circle – area of minor segment

$$= \pi r^2 - \frac{200}{7}$$

$$= \frac{100 \times 22}{7} - \frac{200}{7} = \frac{2200 - 200}{7} = \frac{2000}{7} = 285.7 \text{ cm}^2$$

Option (*b*) is correct.

32. Let the radius of outer and inner circles be R and r.

So, $\frac{2\pi R}{2\pi r} = \frac{23}{22} \Rightarrow \frac{R}{r} = \frac{23}{22} \Rightarrow R = \frac{23}{22} r$

$\because R - r = 5$

$\Rightarrow \frac{23}{22} r - r = 5 \Rightarrow \frac{23r - 22r}{22} = 5 \quad \Rightarrow r = 110$ m

So, the diameter is equal to 220 m.

Option (*c*) is correct.

33. Here, AM is median and equal to h and side of triangle is a.

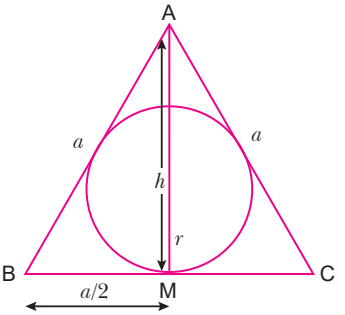
Now in ΔABM

$$a^2 = h^2 + \left(\frac{a}{2}\right)^2$$

$$\Rightarrow h^2 = a^2 - \frac{a^2}{4} = \frac{3a^2}{4} \quad \Rightarrow h = \frac{\sqrt{3}a}{2}$$

But $h = 3r$

$$\frac{\sqrt{3}a}{2} = 3r$$



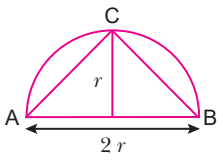
$$\Rightarrow r = \frac{\sqrt{3}a}{2\times 3} \Rightarrow \frac{\sqrt{3}a\times\sqrt{3}}{2\times 3\times\sqrt{3}} \Rightarrow r = \frac{a}{2\sqrt{3}}$$

So, radius of incircle $= \frac{42}{2\sqrt{3}} = \frac{21}{\sqrt{3}}$ cm

Area of incircle $= \pi r^2 = \frac{22}{7}\times\frac{21\times 21}{3} = 462 \text{ cm}^2$

Option (*c*) is correct.

34. Largest triangle inscribed in a semicircle is an isosceles triangle which has diameter as base and height is the radius



So, area of triangle $= \frac{1}{2}\times 2r\times r = r^2$

Option (*a*) is correct.

35. If $C = 4\pi$

$\Rightarrow 2\pi r = 4\pi \Rightarrow r = \frac{4\pi}{2\pi} \Rightarrow r = 2$ units

The area $(A_1) = \pi r^2 = 4\pi$ square units

If $C = 8\pi$ $\Rightarrow 2\pi r = 8\pi \Rightarrow r = \frac{8\pi}{2\pi} \Rightarrow r = 4$ units

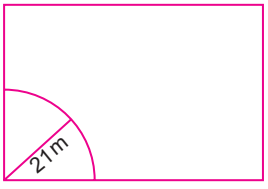
The area $(A_2) = \pi r^2 = 16\pi$ square units

So, the area is quadrupled the previous area.

Option (*d*) is correct.

36. Calculate the required area $= \frac{1}{4}\pi r^2$, where $r = 21$ m

$$= \frac{1}{4}\times\frac{22}{7}\times 21\times 21 = 346.5 \text{ m}$$



Option (*c*) is correct.

37. Find the area of remaining square plate = Area of square metal plate – area of 441 holes

$$= 40\times 40 - 441\times\pi r^2$$

$$= 40\times 40 - 441\times\frac{22}{7}\times .5\times .5$$

$$= 40\times 40 - 63\times 22\times .25 = 1600 - 346.5 = 1253.5 \text{ cm}^2$$

Option (*c*) is correct.

38. We will find the radius by using formula of length of arc by taking $l = 8.8$ cm and $\theta = 30°$.

$$l = \frac{2\pi r\theta}{360°} \Rightarrow 8.8 = \frac{\pi r\times 30}{180}$$

$$\Rightarrow \frac{\pi r}{6} = 8.8 \Rightarrow r = \frac{8.8\times 6\times 7}{22} = 16.8 \text{ cm}$$

Option (*b*) is correct.

39. First find the circumference of the wheel and then find number of revolution

$$= \frac{\text{distance covered}}{\text{circumference of wheel}}$$

Circumference of wheel $= 2\pi r$

$$= 2\times\frac{22}{7}\times 42 = 12\times 22$$

Number of revolution $= \frac{79200}{12\times 22} = 300$

Option (*d*) is correct.

40. Remaining area = area of rectangle – area of circle

$$= 4 \times 2 - \pi \times (1)^2 = (8 - \pi)\ \text{cm}^2$$

Option (*c*) is correct.

41. According to question,

$$l_1 = l_2 \Rightarrow \frac{\theta_1}{360^\circ} \times 2\pi r_1 = \frac{\theta_2}{360} \times 2\pi r_2$$

$$\Rightarrow \theta_1 r_1 = \theta_2 r_2 \qquad \Rightarrow \theta_1 \times r = \theta_2 (2r) [\because r_2 = 2r_1]$$

$$\Rightarrow \theta_1 = \frac{\theta_2 \times 2r}{r} \qquad \Rightarrow \theta_1 = 2\theta_2$$

Option (*a*) is correct.

42. Area of shaded region = area of square + 4 × area of 4 quadrates

= area of square – area of circle.

$$= 12 \times 12 - \pi r^2 = 144 - \frac{22}{7} \times 36$$

$$= 144 - 113.14 = 30.86\ \text{cm}^2$$

Option (*a*) is correct.

43. $\because$ Sum of areas of two circles with radii r_1 and r_2 = area of circle with radius r

$$\Rightarrow \pi r_1^2 + \pi r_2^2 = \pi r^2 \qquad \Rightarrow r_1^2 + r_2^2 = r^2$$

Option (*b*) is correct.

44. Side of triangle = 2 cm

$$\therefore \text{ Area of an equilateral } \Delta = \frac{\sqrt{3}}{4} \times 2^2 = \sqrt{3}\ \text{cm}^2$$

$$\text{Area of 3 sectors } = 3 \times \frac{60^\circ}{360^\circ} \times \pi \times 1^2 = 3 \times \frac{1}{6} \times \pi = \frac{1}{2}\pi\ \text{cm}^2$$

$\therefore$ Area of shaded region = Area of equilateral Δ – area of 3 sectors

$$= \sqrt{3} - \frac{\pi}{2} = \left(\sqrt{3} - \frac{\pi}{2}\right)\text{cm}^2$$

Option (*c*) is correct.

45. We know that circumference of a circle = $2\pi r$

$$\Rightarrow \qquad C = 2\pi r \qquad \Rightarrow \qquad \pi = \frac{C}{2r} = \frac{\text{Circumference}}{\text{Diameter}}$$

$\therefore$ Option (*b*) is correct.

46. Radius of the newly formed circle = 3 + 4 = 7 units

$\therefore$ Its circumference = $2\pi r = 2\pi \times 7 = 14\pi$

$$\therefore \text{ Quotient} = \frac{14\pi}{2 \times 7} = \frac{14\pi}{14} = \pi$$

$\therefore$ Option (*c*) is correct

47. Let r be the radius of circular garden

$$\therefore 2\pi r = 88\ \text{m} \Rightarrow 2 \times \frac{22}{7} \times r = 88 \Rightarrow r = 14\ \text{m}$$

Now, Radius of fence(circular) = 14 + 3.5 = 17.5 m

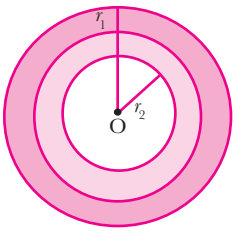
$$\therefore \text{ Circumference of circular fence } = 2\pi r = 2 \times \frac{22}{7} \times 17.5 = 2 \times 22 \times 2.5 = 110\ \text{m}$$

$\therefore$ Cost of fencing = ₹110 × 70 = ₹7700

$\therefore$ Option (*d*) is correct.

48. We have,

Circumference of the outer boundary of the path = 16 m



$\Rightarrow \quad 2\pi r_1 = 16 \Rightarrow r_1 = \frac{8}{\pi}$ m

and, length of decreased fence = 11 – 3 = 8m

$2\pi r_2 = 8 \Rightarrow r_2 = \frac{4}{\pi}$ m

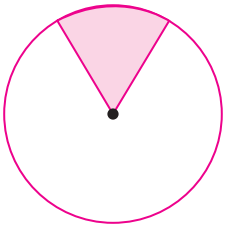
$\therefore$ Area of the path = $\pi\left(r_1^2 - r_2^2\right) = \pi\left(\frac{64-16}{\pi^2}\right) = \frac{48}{\pi}\text{m}^2$

$\therefore$ Total cost to cover the path by bricks

$$= ₹\frac{48}{\pi} \times 125 = ₹\frac{48}{22} \times 7 \times 125 = ₹\ 1909.09 = ₹1910$$

$\therefore$ Option (*a*) is correct.

49.



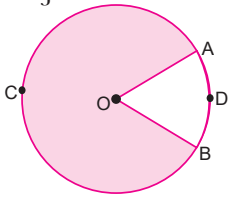
Option (*c*) is correct, because shaded region is enclosed by two radii and its corresponding arc.

50. As we know that a quarter circle also represents a sector of the circle. Also a semi circle represents both sector and segment of the circle.

$\therefore$ Both statements (*i*) and (*ii*) are correct.

$\therefore$ Option (*c*) is correct.

51. In the adjoining figure *OACB* is a major sector and *OADB* is a minor sector.



$\therefore$ Option (*b*) is correct.

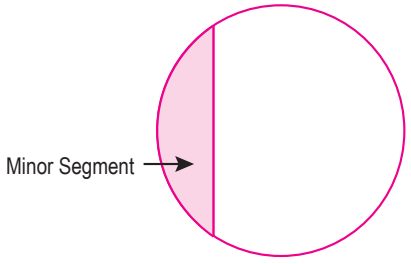
52. The sum of the area of the four minor sectors = $4 \times \frac{1}{4}\pi r^2$

$= \pi r^2$ = Area of circle of radius r.

= Area of circle of diameter $2r$.

$\therefore$ Option (*b*) is correct.

53.



$\therefore$ Option (*a*) is correct.

54. Sum of the lengths of arc corresponding to the minor and major segment of a circle of radius 12 cm

= Circumference of the circle

= $2\pi r = 2\pi \times 12 = 24\pi$ cm

$\therefore$ Option (*a*) is correct.

55. We have, radius of circle = 7 cm

$\Rightarrow r = 7$ cm

$\therefore$ Area of segment PQR = area of sector $OPQRO$ – ar(ΔOPR)

$$= \frac{90}{360^\circ} \times \pi r^2 - \frac{1}{2} \times OP \times OR$$

$$= \frac{1}{4} \times \frac{22}{7} \times (7)^2 - \frac{1}{2} \times 7 \times 7 = \frac{77}{2} - \frac{49}{2} = \frac{28}{2} = 14 \text{ cm}^2$$

$\therefore$ Option (a) is correct.

56. We have,

Area of the shaded region = Area of the circular ring – area of $ABCDA$

$$= \pi\left((8)^2 - (5)^2\right) - \frac{60^\circ}{360^\circ} \times \pi\left((8)^2 - (5)^2\right)$$

$$= \pi \times (64 - 25) - \frac{1}{6} \times \pi \times (64 - 25)$$

$$= 39\pi - \frac{39\pi}{6} = \frac{195\,\pi}{6} \text{ cm}^2$$

$\therefore$ Option (c) is correct.

57. Length of the minor arc $= \frac{\theta}{360^\circ} \times 2\pi r$

$$= \frac{45}{360^\circ} \times 2 \times \frac{22}{7} \times 14 = \frac{1}{8} \times 88 = 11 \text{ cm}$$

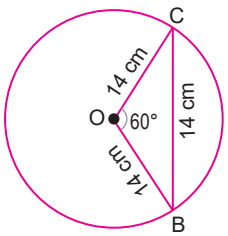
$\therefore$ Option (d) is correct.

58. Given diameter of the circle is 28 cm

$\therefore$ Radius of circle = 14 cm

Since length of chord BC = 14 cm

$\therefore \Delta OBC$ is an equilateral triangle $\Rightarrow \angle BOC = 60^\circ$



Now, length of the major arc $= 2\pi r - \frac{60^\circ}{360^\circ} \times 2\pi r$

$$= 2\pi r\left(1 - \frac{1}{6} \times 1\right) = \frac{5}{6} \times 2\pi r$$

$$= \frac{5}{6} \times 2 \times \frac{22}{7} \times 14 = \frac{220}{3} = 73.3 \text{ cm}$$

$\therefore$ Option (b) is correct.

59. Area of shaded region

= area of circle – area of an equilateral triangle

$$= \pi \times (16)^2 - \frac{\sqrt{3}}{4} \times (28)^2 = 3.14 \times 256 - \frac{1.73 \times 28 \times 28}{4}$$

$$= 803.84 - 339.08 = 464.76 \text{ cm}^2$$

$\therefore$ Option (d) is correct.

60. Given side of square = 23 cm

$\therefore$ Area of largest square = $(23)^2 = 529$ cm^2

There are four semi circles that means we have two complete circles of diameter $2r$ cm.

$\therefore \quad 3.5 + r + 2r + r + 3.5 = 23 \quad \Rightarrow \quad r = 4$ cm

$\therefore$ Radius of circle is 4 cm

Now, area of non shaded region = area of two circle + area of square of side 8 cm

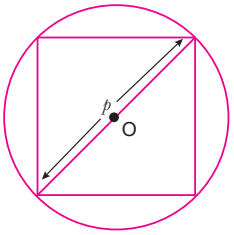
$$= 2\pi \times (4)^2 + (8)^2$$

$$= 2 \times 3.14 \times 16 + 64 = 164.48 \text{ cm}^2$$

$\therefore$ Area of shaded region = $529 - 164.48 = 364.52$ cm^2

$\therefore$ Option (a) is correct.

61. Diameter of circle forms diagonal of the square.



$(\text{Side})^2 + (\text{Side})^2 = p^2$

$2(\text{Side})^2 = p^2 \qquad [\because \text{Diameter} = p]$

$$\text{Side} = \frac{p}{\sqrt{2}}$$

$$\text{Area of square} = (\text{Side})^2 = \frac{p^2}{2} \text{ cm}^2$$

Hence, (*c*) is the correct option.

SOLUTIONS OF CASE-BASED QUESTIONS

1. (*i*) We have diameter of the wire = 28 cm

$\Rightarrow$ $d = 28$ mm

$\therefore$ Radius (r) = 14 mm

Total length of silver wire required = circumference of circle + 4 × diameter of the circle

$= 2r + 4 \times dD$

$= 2 \times \frac{22}{7} \times 14 + 4 \times 28 = 88 + 112 = 200$ mm

$\therefore$ Option (*b*) is correct.

(*ii*) Angle of the each sector $= \frac{360°}{8} = 45°$

$\therefore$ Area of each sector of the brooch $= \frac{\theta}{360°} \times \pi r^2$

$= \frac{45°}{360°} \times \frac{22}{7} \times 14 \times 14 = \frac{1}{8} \times 22 \times 2 \times 14 = 77 \text{ mm}^2$

$\therefore$ Option (*c*) is correct.

(*iii*) Now, refer to design *B*, we have

Circumference of silver part = 44 mm

$2\pi r = 44$ (where r is the radius of inner circle)

$\Rightarrow \quad r = \frac{44}{2\pi} \quad \Rightarrow \quad r = \frac{44}{2 \times \frac{22}{7}} = 7$ mm

$\therefore$ Radius of outer part (R) = (7 + 3) = 10 mm

Circumference of outer part $= 2\pi R = 2\pi \times 10 = 20\pi$

$= 20 \times \frac{22}{7} = \frac{440}{7} = 62.86$ mm

$\therefore$ Option (*d*) is correct.

(*iv*) Difference of areas of golden and silver part $= \pi R^2 - \pi r^2$

$= \pi [(10)^2 - (7)^2] = \pi(100 - 49) = 51\pi \text{ mm}^2$

$\therefore$ Option (*c*) is correct.

(*v*) Circumference of outer part(circular) $= 2\pi R = 2\pi \times 10 = 20\pi$

$\therefore$ Number of revolution $= \frac{80\pi}{20\pi} = 4$.

$\therefore$ Option (*c*) is correct.

2. (*i*) Diameter of middle circle $= \frac{42}{2} = 21$ cm

Diameter of middle circle = 21 cm

Radius of smaller circle $= \frac{21}{4}$ cm = 5.25 cm

Option (*d*) is correct.

(*ii*) Area of middle circle $= \frac{22}{7} \times \frac{21}{2} \times \frac{21}{2} = \frac{693}{2} = 346.5 \text{ cm}^2$

Option (*c*) is correct

(*iii*) Area of bottom circle visible $= \pi\left[21^2 - \left(\frac{21}{2}\right)^2\right]$

$= \pi\left(21 - \frac{21}{2}\right)\left(21 + \frac{21}{2}\right) = \pi \times \frac{21}{2} \times \frac{63}{2} = \frac{1323}{4}\pi \text{ cm}^2$

Option (*b*) is correct.

(*iv*) Ratio of the three circles $= \pi r^2 : \pi\left(\frac{r}{2}\right)^2 : \pi\left(\frac{r}{4}\right)^2 = r^2 : \frac{r^2}{4} : \frac{r^2}{16} = 16 : 4 : 1$

Option (*a*) is correct

(*v*) Length of tape used to decorate outer circle = $2\pi \times 21 = 42\pi$ cm

Option (*b*) is correct.

3. (*i*) Area of triangular region $= \frac{1}{2} \times 4.2 \times 2.1 = 4.41 \text{ m}^2$

Option (*a*) is correct.

(*ii*) Radius of the circle alloted for pictures $= \frac{2.1}{2} = 1.05$ m

Option (*c*) is correct.

(*iii*) Area of the wall painted pink = $12 \times 8 - \pi(2.1)^2 = (96 - 4.41\pi)$ m^2

Option (*a*) is correct.

(*iv*) Area of dotted design = $\pi(2.1)^2$ – Area of triangle – Area of small circle

$= \pi(2.1)^2 - 4.41 - \pi\left(\frac{2.1}{2}\right)^2 = \pi\left[4.41 - \frac{4.41}{4}\right] - 4.41$

$= 4.41\left[\pi\left(1 - \frac{1}{4}\right) - 1\right] = 4.41\left(\frac{3}{4} \times \frac{22}{7} - 1\right)$

$= 4.41 \times \frac{19}{14} = 6 \text{ m}^2$ (approx.)

Option (*b*) is correct.

(*v*) Area of whole circular region $= \pi(2.1)^2 = 4.41 \times \frac{22}{7}$

Cost of designing $= ₹80 \times 4.41 \times \frac{22}{7} = ₹1108.80$

Option (*c*) is correct.

4. (*i*) Distance covered by the wheel in one revolution = $2\pi \times 42 = 84\pi$ cm

Option (*a*) is correct.

(*ii*) Distance covered in one minute $= \frac{45 \times 1000 \text{ m}}{60 \text{ minute}} = 750$ m

Option (*b*) is correct.

(*iii*) Distance covered in 11 min = $11 \times 750 = 8250$ m

Number of revolution made in 11 minute $= \frac{8250}{84\pi} = \frac{8250 \times 7}{84 \times 22} = 31$ revolution (approx)

Option (*a*) is correct.

(*iv*) Given $2\pi r = \pi r^2 \quad \Rightarrow \quad 2 = r \quad \Rightarrow \quad d = 2 \times 2 = 4$ units

Option (*b*) is correct.

(*v*) Area of ring $= \pi(a^2 - b^2)$

Option (*c*) is correct.

5. (*i*) Area of field horse can graze $= \frac{1}{4} \times \pi(5)^2 = \frac{25}{4}\pi \text{ m}^2$

Option (*d*) is correct.

(*ii*) Area of field ox can graze $= \frac{1}{4} \times \pi(10)^2 = 25\pi = 25 \times 3.14 = 78.5 \text{ m}^2$

$\therefore$ Option (*a*) is correct.

(*iii*) Area of the field left to be grazed $= 20 \times 35 - \frac{25}{4}\pi - 25\pi = \left(700 - \frac{125}{4}\pi\right)\text{m}^2$

Option (*b*) is correct.

(*iv*) Increase in grazing area $= \frac{1}{4}\pi(8^2 - 5^2) = \frac{1}{4}\pi(13 \times 3) = \frac{39}{4}\pi \text{ m}^2$

Option (*a*) is correct.

(*v*) Area of sector $= \frac{1}{2}lr \quad \Rightarrow \quad 20\pi = \frac{1}{2} \times 5\pi \times r \quad \Rightarrow \quad r = \frac{40\pi}{5\pi} = 8 \text{ cm}$

Option (*c*) is correct.

SOLUTIONS OF ASSERTION-REASON QUESTIONS

1. Area of the sector $= \frac{\theta}{360^\circ} \times \pi r^2 = \frac{60}{360^\circ} \times \frac{22}{7} \times 6 \times 6$

$= \frac{132}{7} = 18\frac{6}{7} \text{ cm}^2.$

Hence, (*b*) is the correct option.

2. Area swept by minute hand in 5 minutes

$= \frac{\theta}{360^\circ} \times \pi r^2 = \frac{30}{360^\circ} \times \frac{22}{7} \times 7 \times 7$

$= \frac{77}{6} = 12\frac{5}{6} \text{ cm}^2$ ($\because$ Angle in 5 minutes by minute hand is 30°)

Hence, (*b*) is the correct option.

3. Given, $\frac{2\pi r_1}{2\pi r_2} = \frac{2}{3} \quad \Rightarrow \frac{r_1}{r_2} = \frac{2}{3}$

Now, ratio of their areas be $\frac{\pi r_1^2}{\pi r_2^2} = \frac{r_1^2}{r_2^2} = \left(\frac{2}{3}\right)^2 = \frac{4}{9}$

Also, circumference of circle $= 2\pi r$.

Hence, (*a*) is the correct option.

4. We have,

$2\pi r = \frac{11000}{5000} = \frac{11}{5} \text{ m} = \frac{11}{5} \times 100 \text{ cm}$

$\Rightarrow \quad 2r = \frac{11 \times 100}{5 \times \pi} = \frac{11 \times 20}{22} \times 7 \quad \Rightarrow 2r = 70$

$\Rightarrow$ Diameter $= 70$ cm

A is false and *R* is true.

Hence, (*d*) is the correct option.

08 PROBABILITY

BASIC CONCEPTS & FORMULAE

1. Probability is a quantitative measure of certainty.
2. **Random Experiment:** Any activity which is associated to certain outcome is called random experiment, *e.g.*, (*i*) tossing a coin (*ii*) throwing a die.
3. **Elementary Events:** An outcome of a random experiment is called an ***elementary event***.
4. **Sure Events :** Those events whose probability is one.
5. **Impossible Events:** Those events whose probability is zero.
6. Probability of any event always lies between 0 and 1, *i.e.*,
   (*i*) Probability of an event cannot be negative.
   (*ii*) Probability of an event cannot be more than 1.
7. **Negation of an Event:** Corresponding to every event A associated with a random experiment we define an event "**not A or $\overline{A}$** which occurs when and only when does not occur.
8. For any event A, $P(A) + P(\overline{A}) = 1 \Rightarrow P(\overline{A}) = 1 - P(A)$
9. **Probability:** If there are n elementary events associated with a random experiment and m of them are favourable to an event A, then the probability of happening of event A is defined as the ratio $\frac{m}{n}$ and is denoted by $P(A)$.
   $\therefore \quad P(A) = \frac{m}{n}$
10. **Compound Event:** An event associated to a random experiment is a compound event if it is obtained by combining two or more elementary events associated to the random experiment.
11. **Occurrence of an Event:** An event A associated to a random experiment is said to occur if any one of the elementary events associated to the event A is an outcome.
12. **Playing Cards:** The details of playing card having 52 cards are as:
    Total playing cards = 52
    Red cards = 26 and Black cards = 26
    Heart cards = 13, Diamond cards = 13, Club cards = 13, Spade cards = 13
    Each suit consists 1 ace, 1 king, 1 queen, 1 jack and nine number cards 2, 3, 4, 5, 6, 7, 8, 9 and 10.
    Face cards : 3 Jack, 3 queen and 3 king.

MULTIPLE CHOICE QUESTIONS

Choose and write the correct option in the following questions.

1. If an event cannot occur, then its probability is [*NCERT Exemplar*]

(*a*) 1 (*b*) $\frac{3}{4}$ (*c*) $\frac{1}{2}$ (*d*) 0

2. **Which of the following cannot be the probability of an event?** [*NCERT Exemplar*]

(*a*) $\frac{1}{3}$ (*b*) 0.1 (*c*) 3% (*d*) $\frac{17}{16}$

3. **An event is very unlikely to happen. Its probability is closest to**

(*a*) 0.0001 (*b*) 0.001 (*c*) 0.01 (*d*) 0.1

4. **The probability that a non-leap year selected at random will contain 53 sunday's is** [*NCERT Exemplar*]

(*a*) $\frac{1}{7}$ (*b*) $\frac{2}{7}$ (*c*) $\frac{3}{7}$ (*d*) $\frac{5}{7}$

5. **A card is selected from a deck of 52 cards. The probability of being a red face card is** [*NCERT Exemplar*]

(*a*) $\frac{3}{26}$ (*b*) $\frac{3}{13}$ (*c*) $\frac{2}{13}$ (*d*) $\frac{1}{2}$

6. **A card is drawn from a deck of 52 cards. The event E is that card is not an ace of hearts. The number of outcomes favourable to E is** [*NCERT Exemplar*]

(*a*) 4 (*b*) 13 (*c*) 48 (*d*) 51

7. **One card is drawn from a well shuffled deck of 52 cards. The probability that it is black queen is**

(*a*) $\frac{1}{26}$ (*b*) $\frac{1}{13}$ (*c*) $\frac{1}{52}$ (*d*) $\frac{2}{13}$

8. **Which of the following can be probability of an event?**

(*a*) 2 (*b*) –1 (*c*) 0.3 (*d*) 1.12

9. **A die is thrown once. The probability of getting an even number is**

(*a*) $\frac{1}{3}$ (*b*) $\frac{1}{6}$ (*c*) $\frac{1}{4}$ (*d*) $\frac{1}{2}$

10. **The probability of throwing a number greater than 2 with a fair die is**

(*a*) $\frac{1}{3}$ (*b*) $\frac{2}{3}$ (*c*) $\frac{1}{4}$ (*d*) $\frac{3}{5}$

11. **The probability of getting exactly one head in tossing a pair of coins is**

(*a*) 0 (*b*) 1 (*c*) $\frac{1}{3}$ (*d*) $\frac{1}{2}$

12. **Which of the following can be the probability of an event?**

(*a*) – 0.04 (*b*) 1.004 (*c*) $\frac{18}{23}$ (*d*) $\frac{8}{7}$

13. **A card is selected at random from a well shuffled deck of 52 playing cards. The probability of its being a face card is**

(*a*) $\frac{3}{13}$ (*b*) $\frac{4}{13}$ (*c*) $\frac{6}{13}$ (*d*) $\frac{9}{13}$

14. **Kirti has a box containing four cards labelled A, B, C and D. She randomly picks a card from the box, records the label on the card and put it back in the box. She repeats this experiment 80 times and records her observation in the table shown below.**

Card A	Card B	Card C	Card D
11	16	25	28

Which of the following shows the empirical probability and theoretical probability of picking Card C the next time? [*CBSE Question Bank*]

(*a*) Empirical probability = $\frac{5}{11}$
Theoretical probability = $\frac{1}{2}$

(*b*) Empirical probability = $\frac{5}{11}$
Theoretical probability = $\frac{1}{4}$

(*c*) Empirical probability = $\frac{5}{16}$
Theoretical probability = $\frac{1}{2}$

(*d*) Empirical probability = $\frac{5}{16}$
Theoretical probability = $\frac{1}{4}$

15. **Smita has a bag containing 1 red, 1 green, 1 yellow, 1 black and 1 blue ball. She randomly picks the ball from the bag notes it colour and keeps it back in the bag. She repeats this 40 times. The table shows the number of times each colour ball she gets. The number of times the black ball is picked is missing in the table.** [*CBSE Question Bank*]

Red ball	Green ball	Yellow ball	Black ball	Blue ball
10	6	5	?	10

She then repeats the experiment 10 more times and gets red ball twice, green ball once, yellow ball thrice, black ball once and blue ball thrice.

Which of these is a valid conclusion as the number of trials of the experiment increases?

(*a*) The empirical probability of picking red ball becomes equal to its theoretical probability.

(*b*) The empirical probability of picking red ball does not get closer to its theoretical probability.

(*c*) The empirical probability of picking yellow ball gets closer to its theoretical probability.

(*d*) The empirical probability of picking yellow ball gets further away from its theoretical probability.

16. **If a card is drawn from a deck of cards, what is the probability of a card drawn to be a red or a black card and what can we say about that event?** [*CBSE Question Bank*]

(*a*) 0 and it is a sure event.

(*b*) 1 and it is a sure event.

(*c*) 0 and it is an impossible event.

(*d*) 1 and it is an impossible event.

17. **A spinner is shown below.**

Some of the events are listed below, when the spinner is spinned.

Event A: The spinner lands on a multiple of 11.

Event B: The spinner lands on a number less than 11.

Event C: The spinner lands on a number more than 10.

Which of the following statement is true about the three events? [*CBSE Question Bank*]

(*a*) Probability of Event A is 1, so A is a sure event while the probabilities of Events B and C are 0, so they are impossible events.

(*b*) Probability of Event B is 1, so B is a sure event while the probabilities of Events A and C are 0, so they are impossible events.

(*c*) Probability of Event A is 1, so A is an impossible event while the probabilities of Events B and C are 0, so they are sure events.

(*d*) Probability of Event B is 1, so B is an impossible event while the probabilities of Events A and C are 0, so they are sure events.

18. When four coins are tossed simultaneously, which of the following represents the sample space? *[CBSE Question Bank]*

(*a*)

HHHH	HHHT	HHTH	HTHH
THHH	HHTT	TTHH	HTTT
THTT	TTHT	TTTH	TTTT

(*b*)

HHHH	HHHT	HHTH	HTHH
THHH	THHT	HTTH	HTTT
THTT	TTHT	TTTH	TTTT

(*c*)

HHHH	HHHT	HHTH	HTHH
THHH	HHTT	HTHT	HTTH
THHT	THTH	TTHH	HTTT
THTT	TTHT	TTTH	TTTT

(*d*)

HHHH	HHHT	HHTH	HTHH
THHH	HHTT	HTHT	HTTH
HTTH	HTHT	TTHH	HTTT
THTT	TTHT	TTTH	TTTT

19. To win a prize in a game, you need to first choose one of the 4 doors, 1, 2, 3, 4 and then need to choose one of the three boxes A, B, C and then need to choose between two colours red and green. How many of the possible outcomes of this game include selecting Box A and red colour? *[CBSE Question Bank]*

(*a*) 2 (*b*) 4 (*c*) 8 (*d*) 12

20. A box has 10 equal size cards. Of the 10 cards, 4 are blue, 3 are green, 2 are yellow and 1 is red. If a card is randomly drawn from the box, which is the colour that the card is most likely to have? *[CBSE Question Bank]*

(*a*) Red (*b*) Green (*c*) Blue (*d*) Yellow

21. Of 50 students in a class, 16 prefer cricket, 8 prefer football, 8 prefer basketball and rest of the students prefer either tennis or hockey. There are twice as many students who prefer tennis as the number of students who prefer hockey. A student is randomly selected from the class. Which statement is correct? *[CBSE Question Bank]*

(*a*) The probability of selecting a student who prefer hockey is more than that of selecting a student who prefer football.

(*b*) The probability of selecting a student who prefer tennis is more than that of selecting a student who prefer football.

(*c*) The probability of selecting a student who prefer hockey is more than that of selecting a student who prefer tennis.

(*d*) The probability of selecting a student who prefer basketball is more than that of selecting a student who prefer cricket.

22. **If a bag contains 3 red and 7 black balls, the probability of getting a black ball is**

(*a*) $\frac{3}{10}$ (*b*) $\frac{4}{10}$ (*c*) $\frac{7}{10}$ (*d*) $\frac{5}{10}$

23. **A coin is tossed 1000 times and 640 times a 'head' occurs. The empirical probability of occurrence of a head in this case is**

(*a*) 0.6 (*b*) 0.64 (*c*) 0.36 (*d*) 0.064

24. **If $P(A)$ denotes the probability of an event A, then** [*NCERT Exemplar*]

(*a*) $P(A) < 0$ (*b*) $P(A) > 1$ (*c*) $0 \le P(A) \le 1$ (*d*) $-1 \le P(A) \le 1$

25. **In a lottery, there are 8 prizes and 16 blanks. The probability of getting a prize is**

(*a*) $\frac{2}{3}$ (*b*) $\frac{1}{3}$ (*c*) $\frac{1}{2}$ (*d*) $\frac{1}{4}$

26. **A bag contains 3 red, 5 black and 7 white balls. A ball is drawn from the bag at random. The probability that the ball drawn is not black, is** [*CBSE* 2020 (30/4/1)]

(*a*) $\frac{1}{3}$ (*b*) $\frac{9}{15}$ (*c*) $\frac{5}{10}$ (*d*) $\frac{2}{3}$

27. **The probability that a number selected at random from the numbers 1, 2, 3 ... 15 is a multiple of 4 is**

(*a*) $\frac{4}{15}$ (*b*) $\frac{2}{15}$ (*c*) $\frac{1}{5}$ (*d*) $\frac{1}{3}$

28. **A bag contains 3 red balls, 5 white balls and 7 black balls. What is the probability that a ball drawn from the bag at random will be neither red nor black?**

(*a*) $\frac{1}{5}$ (*b*) $\frac{1}{3}$ (*c*) $\frac{7}{15}$ (*d*) $\frac{8}{15}$

29. **When a die is thrown, the probability of getting an even number less than 4 is**

(*a*) $\frac{1}{4}$ (*b*) 0 (*c*) $\frac{1}{2}$ (*d*) $\frac{1}{6}$

30. **A card is selected at random from a well shuffled deck of 52 playing cards. The probability of its being a face card is**

(*a*) $\frac{3}{13}$ (*b*) $\frac{4}{13}$ (*c*) $\frac{6}{13}$ (*d*) $\frac{9}{13}$

31. **Which of the following cannot be the probability of an event?**

(*a*) $\frac{1}{3}$ (*b*) 0.1 (*c*) 3% (*d*) $\frac{17}{6}$

32. **Two coins are tossed simultaneously. The probability of getting atmost one head is**

(*a*) $\frac{1}{4}$ (*b*) $\frac{1}{2}$ (*c*) $\frac{3}{4}$ (*d*) 1

33. **A girl calculates that the probability of her winning the first prize in a lottery is 0.08. If 6,000 tickets are sold, how many tickets has she bought?** [*NCERT Exemplar*]

(*a*) 40 (*b*) 240 (*c*) 480 (*d*) 750

34. **If a number x is chosen from the numbers 1, 2, 3 and a number y is selected from the numbers 1, 4, 9. Then $P(xy < 9)$ is** [*NCERT Exemplar*]

(*a*) $\frac{3}{9}$ (*b*) $\frac{4}{9}$ (*c*) $\frac{1}{9}$ (*d*) $\frac{5}{9}$

35. **A card is drawn from a deck of 52 cards. The event E is that card is not an ace of hearts. The number of outcomes favourable to E is**

(*a*) 4 (*b*) 13 (*c*) 48 (*d*) 51

36. **A bag contains three green marbles, four blue marbles and two orange marbles. If a marble is picked at random, then the probability that it is not an orange marble is**

(*a*) $\frac{7}{9}$ (*b*) $\frac{2}{9}$ (*c*) $\frac{4}{9}$ (*d*) none of these

37. **If the probability of an event is p, the probability of its complementary event will be** [*NCERT Exemplar*]

(*a*) $p - 1$ (*b*) $1 - p$ (*c*) $1 - \frac{1}{p}$ (*d*) p

38. **The probability of getting a number from 1 to 100, which is divisible by 7 is**

(*a*) $\frac{1}{7}$ (*b*) $\frac{14}{100}$ (*c*) $\frac{7}{100}$ (*d*) $\frac{23}{98}$

39. **If a pair of dice is thrown, the probability of getting a sum of 10 is**

(*a*) $\frac{1}{12}$ (*b*) $\frac{1}{36}$ (*c*) $\frac{1}{9}$ (*d*) $\frac{1}{4}$

40. **If a pair of dice is thrown, then the probability of getting a doublet is**

(*a*) $\frac{1}{3}$ (*b*) $\frac{1}{6}$ (*c*) $\frac{5}{12}$ (*d*) $\frac{2}{3}$

41. **If a letter of English alphabet is chosen at random, than the probability that the letter is a consonant is**

(*a*) $\frac{21}{23}$ (*b*) $\frac{10}{13}$ (*c*) $\frac{21}{26}$ (*d*) $\frac{5}{26}$

Answers

1. (*d*)	**2.** (*d*)	**3.** (*a*)	**4.** (*a*)	**5.** (*a*)	**6.** (*d*)
7. (*a*)	**8.** (*c*)	**9.** (*d*)	**10.** (*b*)	**11.** (*d*)	**12.** (*c*)
13. (*a*)	**14.** (*d*)	**15.** (*c*)	**16.** (*b*)	**17.** (*b*)	**18.** (*c*)
19. (*b*)	**20.** (*c*)	**21.** (*b*)	**22.** (*c*)	**23.** (*b*)	**24.** (*c*)
25. (*b*)	**26.** (*d*)	**27.** (*c*)	**28.** (*b*)	**29.** (*d*)	**30.** (*a*)
31. (*d*)	**32.** (*c*)	**33.** (*c*)	**34.** (*d*)	**35.** (*d*)	**36.** (*a*)
37. (*b*)	**38.** (*b*)	**39.** (*a*)	**40.** (*b*)	**41.** (*c*)	

CASE-BASED QUESTIONS

1. Read the following and answer any four questions from (*i*) to (*v*).

On a weekend Rani was playing cards with her family .The deck has 52 cards. If her brother drew one card. *[CBSE Question Bank]*

Based on the above information, answer the following questions:

(*i*) The probability of getting a king of red colour is

(*a*) $\frac{1}{26}$ (*b*) $\frac{1}{13}$ (*c*) $\frac{1}{52}$ (*d*) $\frac{1}{4}$

(*ii*) The probability of getting a face card is

(*a*) $\frac{1}{26}$ (*b*) $\frac{1}{13}$ (*c*) $\frac{2}{13}$ (*d*) $\frac{3}{13}$

(*iii*) The probability of getting a jack of hearts is

(*a*) $\frac{1}{26}$ (*b*) $\frac{1}{52}$ (*c*) $\frac{3}{52}$ (*d*) $\frac{3}{26}$

(*iv*) The probability of getting a red face card is

(*a*) $\frac{3}{26}$ (*b*) $\frac{1}{13}$ (*c*) $\frac{1}{52}$ (*d*) $\frac{1}{4}$

(*v*) The probability of getting a spade is

(*a*) $\frac{1}{26}$ (*b*) $\frac{1}{13}$ (*c*) $\frac{1}{52}$ (*d*) $\frac{1}{4}$

2. Read the following and answer any four questions from (*i*) to (*v*).

Rahul and Ravi planned to play Business (board game) in which they were supposed to use two dice. *[CBSE Question Bank]*

Based on the above information, answer the following questions:

(*i*) Ravi got first chance to roll the dice. What is the probability that he got the sum of the two numbers appearing on the top face of the dice as 8?

(*a*) $\frac{1}{26}$ (*b*) $\frac{5}{36}$ (*c*) $\frac{1}{18}$ (*d*) 0

(*ii*) Rahul got next chance. What is the probability that he got the sum of the two numbers appearing on the top face of the dice as 13?

(*a*) 1 (*b*) $\frac{5}{36}$ (*c*) $\frac{1}{18}$ (*d*) 0

(*iii*) Now it was Ravi's turn. He rolled the dice. What is the probability that he got the sum of the two numbers appearing on the top face of the dice less than or equal to 12?

(*a*) 1 (*b*) $\frac{5}{36}$ (*c*) $\frac{1}{18}$ (*d*) 0

(*iv*) Rahul got next chance. What is the probability that he got the sum of the two numbers appearing on the top face of the dice equal to 7?

(*a*) $\frac{5}{9}$ (*b*) $\frac{5}{36}$ (*c*) $\frac{1}{6}$ (*d*) 0

(*v*) Now it was Ravi's turn. He rolled the dice. What is the probability that he got the sum of the two numbers appearing on the top face of the dice greater than 8?

(*a*) 1 (*b*) $\frac{5}{36}$ (*c*) $\frac{1}{18}$ (*d*) $\frac{5}{18}$

3. Read the following and answer any four questions from (*i*) to (*v*).

Vasu's mother bought 3 kg apples and 2 kg oranges from the market. Vasu counted them and found there were 15 apples and 12 oranges.

(*i*) Vasu's brother picks one fruit from the bag. The probability that he picks an apple is

(*a*) $\frac{1}{27}$ (*b*) $\frac{1}{15}$ (*c*) $\frac{1}{2}$ (*d*) $\frac{5}{9}$

(*ii*) After his brother Vasu picks one fruit from the bag. The probability that he picks an orange is (given that his brother picked an apple).

(*a*) $\frac{6}{13}$ (*b*) $\frac{1}{12}$ (*c*) $\frac{1}{11}$ (*d*) $\frac{12}{27}$

(*iii*) Vasu kept remaining apples and oranges in two separate baskets. He found 13 apples were left out of which 2 were rotten. The probability of picking a good apple from the apple basket now, is

(*a*) $\frac{1}{15}$ (*b*) $\frac{1}{13}$ (*c*) $\frac{11}{13}$ (*d*) $\frac{2}{11}$

(*iv*) The probability of an event can never be

(*a*) zero (*b*) less than zero

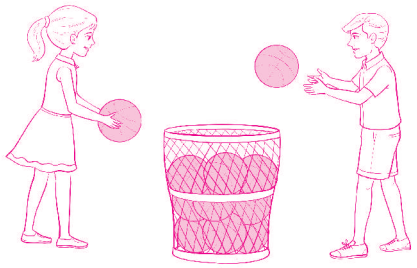
(*c*) one (*d*) greater than zero and less than one

(v) If probability of an event E is 0.75, then P(not E) is

(a) 0.25 (b) 0.75 (c) 0 (d) 1

4. Read the following and answer any four questions from (i) to (v).

Two kids are playing with balls in a playing zone. They both are given basket full of balls.



(i) If the basket contains 9 blue , 6 red and 12 yellow balls, then the probability of picking a yellow ball is

(a) $\frac{1}{12}$ (b) $\frac{12}{27}$ (c) $\frac{1}{3}$ (d) $\frac{12}{15}$

(ii) The probability that the ball drawn from the above basket is not blue is

(a) $\frac{2}{3}$ (b) $\frac{1}{3}$ (c) $\frac{1}{2}$ (d) $\frac{2}{9}$

(iii) The probability that the ball drawn from the basket given is either red or blue, is

(a) $\frac{2}{9}$ (b) $\frac{5}{9}$ (c) $\frac{1}{3}$ (d) $\frac{2}{3}$

(iv) If the probability of getting a red ball from the basket containing 35 balls is 0.2, then number of red balls in the basket is

(a) 2 (b) 5 (c) 7 (d) 10

(v) The probability of drawing a green ball from a bag is $\frac{3}{11}$. If there are 9 green balls in the bag, then the total number of balls in the bag is

(a) 30 (b) 33 (c) 22 (d) 99

5. Read the following and answer any four questions from (i) to (v).

Akriti and Sukriti have to start the game of ludo. They are fighting for who will start the game. They found two coins and decided to toss them simultaneously to know who will start the game.

(i) How many possible outcomes are there?

(a) 2 (b) 1 (c) 4 (d) 0

(ii) Akriti says if I get atleast one head, I will win and start the game. The probability that Akriti will start the game is

(a) $\frac{1}{2}$ (b) $\frac{1}{4}$ (c) $\frac{3}{4}$ (d) 1

(iii) Sukriti says if I get atmost one tail, I will start the game. The probability that Sukriti will start the game is

(a) $\frac{1}{4}$ (b) $\frac{3}{4}$ (c) $\frac{1}{2}$ (d) 0

(*iv*) Which of the following cannot be the probability of an event?

(*a*) $\frac{1}{99}$ (*b*) 1.05 (*c*) 0.07 (*d*) $\frac{49}{50}$

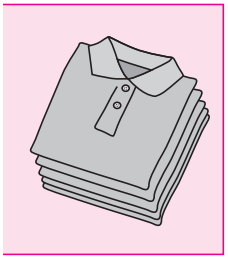
(*v*) The probability of success is 73%. Then the probability of failure is

(*a*) 0.27 (*b*) 0.37 (*c*) 0.73 (*d*) 0.5

6. Read the following and answer any four questions from (*i*) to (*v*).

A lot of garments consists of 30 round neck T-shirts out of which 12 are red and remaining are green and 25 V-neck T-shirts out of which 11 are red and remaining are green. Apoorv will buy either green round neck or red V-neck T-Shirt.

Shekhar will buy only round neck T-shirt. Varun will buy only red colour T-shirt.



(*i*) The total possible outcomes is

(*a*) 30 (*b*) 25 (*c*) 55 (*d*) 78

(*ii*) One T-shirt is selected at random from the lot. The probability that it is acceptable to Shekhar is

(*a*) $\frac{6}{11}$ (*b*) $\frac{42}{55}$ (*c*) $\frac{5}{13}$ (*d*) $\frac{23}{55}$

(*iii*) The probability that the randomly selected T-shirt is acceptable to Varun is

(*a*) $\frac{12}{55}$ (*b*) $\frac{23}{55}$ (*c*) $\frac{11}{55}$ (*d*) $\frac{30}{55}$

(*iv*) The probability that the randomly selected T-shirt is not acceptable to any of them is

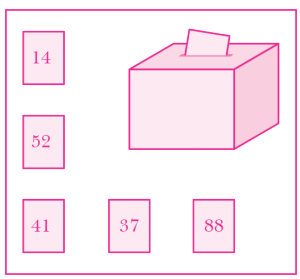
(*a*) $\frac{25}{55}$ (*b*) $\frac{32}{55}$ (*c*) $\frac{14}{55}$ (*d*) $\frac{18}{55}$

(*v*) The selected T-shirt was green round neck, so Apoorv accepted it. Another T-shirt was selected at random. The probability that it is again accepted by Apoorv is

(*a*) $\frac{17}{54}$ (*b*) $\frac{18}{55}$ (*c*) $\frac{30}{54}$ (*d*) $\frac{14}{27}$

7. Read the following and answer any four questions from (*i*) to (*v*).

A teacher conducted a fun activity in the class. She put cards numbered from 9 to 90 in a box. Then she called students one by one, from the teams formed by her. The child speaks out any property related to numbers. If he gets a number satisfying that property, the team scored marks otherwise not.



(*i*) Vanshika speaks out 'divisible by 6'. The probability that her team gets mark is

(*a*) $\frac{1}{6}$ (*b*) $\frac{7}{41}$ (*c*) $\frac{7}{45}$ (*d*) $\frac{5}{27}$

(*ii*) Sam speaks out 'a perfect square number'. The probability of his team getting marks is

(*a*) $\frac{7}{82}$ (*b*) $\frac{8}{82}$ (*c*) $\frac{10}{82}$ (*d*) $\frac{7}{90}$

(*iii*) Preeti says 'a prime number'. The probability of her team getting marks is

(*a*) $\frac{19}{82}$ (*b*) $\frac{11}{41}$ (*c*) $\frac{10}{41}$ (*d*) $\frac{21}{82}$

(*iv*) Karan says 'an odd number'. The probability of getting score in this case is

(*a*) $\frac{20}{41}$ (*b*) $\frac{1}{2}$ (*c*) $\frac{1}{4}$ (*d*) $\frac{1}{3}$

(*v*) Which of the following property will have maximum chances of getting marks?

(*a*) an even prime number (*b*) an even number

(*c*) a one digit number (*d*) a two-digit number

8. Read the following and answer any four questions from (*i*) to (*v*).

Aisha took a pack of 52 cards. She kept aside all the face cards and shuffled the remaining cards well.

(*i*) The number of total possible outcomes is

(*a*) 52 (*b*) 40 (*c*) 36 (*d*) 48

(*ii*) She drew a card from the well-shuffled pack of remaining cards. The probability that the card drawn is a red card is

(*a*) $\frac{1}{4}$ (*b*) $\frac{1}{2}$ (*c*) $\frac{4}{13}$ (*d*) $\frac{2}{13}$

(*iii*) The probability of drawing a black queen is

(*a*) $\frac{1}{26}$ (*b*) $\frac{1}{6}$ (*c*) 0 (*d*) 1

(*iv*) The probability of getting neither a black card nor an ace card is

(*a*) $\frac{9}{20}$ (*b*) $\frac{11}{20}$ (*c*) $\frac{3}{5}$ (*d*) $\frac{7}{13}$

(*v*) The number of favourable outcomes for the event a club card or a '4' is

(*a*) 13 (*b*) 17 (*c*) 14 (*d*) 12

9. Read the following and answer any four questions from (*i*) to (*v*).

Two friends are travelling in a bus. They were feeling bored, so they started playing a game with a pair of dice that one of them had. Each of them started rolling the pair of dice one by one, stating one condition before rolling. If the person gets the numbers according to the condition stated by him, he wins and get a score

(*i*) The number of possible outcomes on rolling a pair of dice is

(*a*) 6 (*b*) 12 (*c*) 36 (*d*) 8

(*ii*) First friend says, "a doublet". The probability of his winning is

(*a*) $\frac{5}{6}$ (*b*) $\frac{1}{6}$ (*c*) $\frac{5}{18}$ (*d*) $\frac{1}{2}$

(*iii*) Second friend says, 'sum less than 9'. The probability of his winning is

(*a*) $\frac{13}{18}$ (*b*) $\frac{31}{36}$ (*c*) $\frac{1}{2}$ (*d*) $\frac{1}{6}$

(*iv*) First one says, "6 will not come up either time". The probability of his losing is

(*a*) $\frac{1}{4}$ (*b*) $\frac{25}{36}$ (*c*) $\frac{11}{36}$ (*d*) $\frac{1}{6}$

(*v*) Second one says, "sum is an even number". The probability of his losing is

(*a*) less than $\frac{1}{2}$ (*b*) more than $\frac{1}{2}$ (*c*) equal to $\frac{1}{2}$ (*d*) 1

Answers

1.	(*i*) (*a*)	(*ii*) (*d*)	(*iii*) (*b*)	(*iv*) (*a*)	(*v*) (*d*)
2.	(*i*) (*b*)	(*ii*) (*d*)	(*iii*) (*a*)	(*iv*) (*c*)	(*v*) (*d*)
3.	(*i*) (*d*)	(*ii*) (*a*)	(*iii*) (*c*)	(*iv*) (*b*)	(*v*) (*a*)
4.	(*i*) (*b*)	(*ii*) (*a*)	(*iii*) (*b*)	(*iv*) (*c*)	(*v*) (*b*)
5.	(*i*) (*c*)	(*ii*) (*c*)	(*iii*) (*b*)	(*iv*) (*b*)	(*v*) (*a*)
6.	(*i*) (*c*)	(*ii*) (*a*)	(*iii*) (*b*)	(*iv*) (*c*)	(*v*) (*d*)
7.	(*i*) (*b*)	(*ii*) (*a*)	(*iii*) (*c*)	(*iv*) (*b*)	(*v*) (*d*)
8.	(*i*) (*b*)	(*ii*) (*b*)	(*iii*) (*c*)	(*iv*) (*a*)	(*v*) (*a*)
9.	(*i*) (*c*)	(*ii*) (*b*)	(*iii*) (*a*)	(*iv*) (*c*)	(*v*) (*c*)

ASSERTION-REASON QUESTIONS

The following questions consist of two statements—Assertion(A) and Reason(R). Answer these questions selecting the appropriate option given below:

(*a*) Both *A* and *R* are true and *R* is the correct explanation for *A*.

(*b*) Both *A* and *R* are true and *R* is not the correct explanation for *A*.

(*c*) *A* is true but *R* is false.

(*d*) *A* is false but *R* is true.

1. Assertion (*A*) : The probability of winning a game is 0.4, then the probability of losing it, is 0.6.

Reason (*R*) : $P(E) + P(\text{not } E) = 1$

2. Assertion (*A*) : When two coins are tossed simultaneously then the probability of getting no tail is $\frac{1}{4}$.

Reason (*R*) : The probability of getting a head (*i.e.*, no tail) in one toss of a coin is $\frac{1}{2}$.

3. Assertion (*A*) : Card numbered as 1, 2, 3 ... 15 are put in a box and mixed thoroughly, one card is then drawn at random. The probability of drawing an even number is $\frac{1}{2}$.

Reason (*R*) : For any event E, we have $0 \le P(E) \le 1$.

4. Assertion (*A*) : In a simultaneously throw of a pair of dice. The probability of getting a double is $\frac{1}{6}$.

Reason (*R*) : Probability of an event may be negative.

Answers

1. (*a*) **2.** (*a*) **3.** (*d*) **4.** (*c*)

HINTS/SOLUTIONS OF SELECTED MCQs

5. Total number of red face cards = 6

$\therefore$ Probability of being a red face cards = $\frac{6}{52} = \frac{3}{26}$

Hence, option (*a*) is correct.

7. Number of black queens = 2

$P(\text{black queen}) = \frac{2}{52} = \frac{1}{26}$

$\therefore$ Option (*a*) is correct.

8. The probability of an event cannot be negative or greater than one.

$\therefore$ Option (*c*) is correct.

9. Total outcomes = 6.

Even numbers on die = 2, 4, 6 *i.e.*, 3

$P(\text{even number}) = \frac{3}{6} = \frac{1}{2}$

$\therefore$ Option (*d*) is correct.

10. Total outcomes = 6

Numbers greater than 2 on die = 3, 4, 5, 6, *i.e.*, 4

$P(\text{number greater than 2}) = \frac{4}{6} = \frac{2}{3}$

$\therefore$ Option (*b*) is correct.

11. Total outcomes = HT, TH, HH, TT = 4

Outcomes of getting exactly one head = (H T), (T H), *i.e.*, 2

$P(\text{getting exactly one head}) = \frac{2}{4} = \frac{1}{2}$

$\therefore$ Option (*d*) is correct.

12. As we know that, $0 \le P \le 1$.

Means probability is +ve and lie between 0 and 1.

Here, $\frac{18}{23}$ only is correct.

$\therefore$ Option (*c*) is correct.

13. Total number of cards = 52

Number of face cards = 12

So, P(face card) = $\frac{12}{52} = \frac{3}{13}$

$\therefore$ Option (*a*) is correct.

14. Empirical probability of picking card $C = \frac{25}{80} = \frac{5}{16}$

and Theoretical probability = $\frac{1}{4}$

$\therefore$ Option (*d*) is correct.

15. When Smita experiments 40 times, we get the table

Red ball	Green ball	Yellow ball	Black ball	Blue ball
10	6	5	9	10

When she repeats 10 more times, we get the table

Red ball	Green ball	Yellow ball	Black ball	Blue ball
12	7	8	10	13

We have,

Theoretical probability of getting a yellow ball = $\frac{1}{5} = 0.2$

Empirical probability of getting yellow ball when experiment is repeated 40 times

$$= \frac{5}{40} = \frac{1}{8} = 0.125$$

and Empirical probability of getting yellow ball when experiment is repeated 50 times

$$= \frac{8}{50} = 0.16$$

$\therefore$ Empirical probability of picking yellow ball gets closer to its theoretical probability.

$\therefore$ Option (*c*) is correct.

16. We know that the card has only two colours red and black.

$\therefore$ When a card is drawn, then it is either red or black so this is a sure event.

$\therefore$ Its probability is 1.

$\therefore$ Option (*b*) is correct.

17. We have,

$A = \phi \Rightarrow n(A) = 0 \Rightarrow P(A) = 0$

$B = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$

$n(B) = 10 \Rightarrow P(B) = 1$

$C = \phi \Rightarrow n(C) = 0 \Rightarrow P(C) = 0$

$\therefore$ Option (*b*) is correct.

18. When four coins are tossed simultaneously, we get the sample space as given in option (*c*).

$\therefore$ Option (*c*) is correct.

19. Since selecting box A and red colour, are prefixed, so there are only four choices to choose doors.

$\therefore$ Total number of possible outcomes is 4.

$\therefore$ Option (b) is correct.

20. Since out of 10 cards, the maximum number of cards are blue *i.e.*, 4.

So, the card is most likely to have blue colour.

$\therefore$ Option (c) is correct.

21. Let the number of students who prefer hockey be x.

Therefore, number of students who prefer tennis $= 2x$

$\therefore \quad x + 2x = 50 - (16 + 8 + 8) = 50 - 32 = 18$

$\Rightarrow \quad 3x = 18 \Rightarrow x = 6$

$\therefore$ Number of students prefer hockey $= 6$

and that of tennis $= 12$

$\therefore$ Probability of selecting a student who prefers hockey $= \frac{6}{50}$

and probability of selecting a student who prefers Tennis $= \frac{12}{50}$

Also, we have probability of selecting a student who prefers football $= \frac{8}{50}$

Clearly, the probability of selecting a student who prefers tennis is more than that of selecting a student who prefers football.

$\therefore$ Option (b) is correct.

22. Total number of balls $= n(S) = 7 + 3 = 10$

Number of black balls $= 7$

P (black ball) $= \frac{7}{10}$

Hence, option (c) is correct.

23. Required probability $= \frac{640}{1000} = 0.64$

Hence, option (b) is correct.

24. We have, $0 \leq P(A) \leq 1$

Hence, option (c) is correct.

25. The probability of getting a prize $= \frac{8}{8+16} = \frac{8}{24} = \frac{1}{3}$

Hence, option (b) is correct.

26. Total number of balls $=$ (3 red + 5 black + 7 white) balls

$= 15$ balls

$\therefore$ Total number of possible outcomes $= 15$

and number of favourable outcomes *i.e.* not black $= 3 + 7 = 10$

$\therefore$ Required probability $= \frac{10}{15} = \frac{2}{3}$

$\therefore$ Option (d) is correct.

27. Total number of possible outcomes $= 15 \quad \Rightarrow n(S) = 15$

and numbers multiple of 4 are $= 4, 8, 12 \quad \Rightarrow n(E) = 3$

$\therefore$ Probability $\frac{n(E)}{n(S)} = \frac{3}{15} = \frac{1}{5}$

Hence, option (c) is correct.

28. Total number of balls = 3 + 5 + 7 = 15

Number of white balls = 5

$\therefore$ Probability of drawn a ball which is neither red nor black *i.e.*, white $= \frac{5}{15} = \frac{1}{3}$

Hence, option (*b*) is correct.

29. When a die is thrown once.

The total number of possible outcomes = 6 $\Rightarrow$ $n(S) = 6$

and, even number less than 4 = {2} $\Rightarrow$ $n(E) = 1$

$\therefore$ Probability $= \frac{1}{6}$

Hence, option (*d*) is correct.

30. Total number of cards = 52

and, total number of face cards = 12

$\therefore$ Required probability $= \frac{12}{52} = \frac{3}{13} = \frac{3}{13}$

Hence, option (*a*) is correct.

31. $\frac{17}{6}$ can not be the probability of an event because $\frac{17}{6} > 1$.

Hence, option (*d*) is correct.

32. When two coins are tossed once then

the total possible outcomes are {HH, HT, TH, TT}.

$\Rightarrow$ $n(S) = 4$

and favourable outcomes = {HT, TH, TT}

$\Rightarrow$ $n(E) = 3$

$\therefore$ Required probability $= \frac{n(E)}{n(S)} = \frac{3}{4}$

Hence, option (*c*) is correct.

33. Number of required tickets = $6000 \times 0.08 = 480$

Hence, option (*c*) is correct.

34. xy = 1, 4, 9, 2, 8, 18, 3, 12, 27

Favourable outcomes = 5

$P(xy < 9) = \frac{5}{9}$

Hence, option (*d*) is correct.

35. Total number of cards in a deck = 52

and number of cards which is ace of hearts = 1

$\therefore$ The number of outcomes favourable to $E = 52 - 1 = 51$.

Hence, option (*d*) is correct.

36. Total number of marbles= 3 green + 4 blue + 2 orange= 9 marbles

and Total number of not orange marbles = 3 green + 4 blue = 7 marbles

$\therefore$ P(not an orange marble) $= \frac{7}{9}$

Hence, option (*a*) is correct.

37. Probability of its complementary event = $1 - p$

$\therefore$ Option (b) is correct.

38. Numbers from 1 to 100, which is divisible by 7 are

7, 14, 21, . . . 98

$\therefore$ Total number of favourable outcomes = 14

and total possible outcomes = 100

Required probability = $\frac{14}{100} = \frac{7}{50}$

$\therefore$ Option (b) is correct.

39. When a pair of dice is thrown once then

total number of possible outcomes = 36

$\Rightarrow$ $n(S) = 36$

Favourable outcomes = {(5, 5), (4, 6), (6, 4)}

$n(E) = 3$

$\therefore$ Required probability = $\frac{n(E)}{n(S)} = \frac{3}{36} = \frac{1}{12}$

Hence, option (a) is correct.

40. When a pair of dice is thrown then

total number of possible outcomes = 36

$\Rightarrow$ $n(S) = 36$

$\therefore$ Doublets are = {(1, 1), (2, 2), (3, 3), (4, 4), (5, 5), (6, 6)}

$n(E) = 6$

$\therefore$ Probability of getting a doublet = $\frac{6}{36} = \frac{1}{6}$

Hence, option (b) is correct.

41. Total number of English alphabets = 26

and number of consonant = 26 – 5 = 21

$\therefore$ Required probability = $\frac{21}{26}$

$\therefore$ Option (c) is correct.

SOLUTIONS OF CASE-BASED QUESTIONS

1. (*i*) Total no. of possible outcomes = 52

and no. of favourable outcomes = 2

$\therefore$ P(getting a king of red colour) = $\frac{2}{52} = \frac{1}{26}$

$\therefore$ Option (a) is correct.

(*ii*) We have, number of face card = 12

$\therefore$ P(getting a face card) = $\frac{12}{52} = \frac{3}{13}$

$\therefore$ Option (d) is correct.

(*iii*) There is only one jack of hearts.

$\therefore$ P(getting a jack of hearts) = $\frac{1}{52}$

$\therefore$ Option (b) is correct.

(*iv*) No. of red face card = 6

$\therefore$ P(getting a red face card) = $\frac{6}{52} = \frac{3}{26}$

$\therefore$ Option (*a*) is correct.

(*v*) No. of spade cards = 13

$\therefore$ P(getting a spade card) = $\frac{13}{52} = \frac{1}{4}$

$\therefore$ Option (*d*) is correct.

2. (*i*) When two dice are rolled once, we have

total number of possible outcomes = 36

and favourable outcomes = {(2, 6), (3, 5), (4, 4),), (5, 3), (6, 2)}

$\therefore$ No. of favourable outcomes = 5

$\therefore$ Required probability = $\frac{5}{36}$

$\therefore$ Option (*b*) is correct.

(*ii*) Favourable outcomes for getting sum 13 = ϕ

$\therefore$ No. of favourable event = 0

$\therefore$ Required probability = $\frac{0}{36} = 0$

$\therefore$ Option (*d*) is correct.

(*iii*) No. of favourable outcomes of getting sum less than or equal to 12 = 36

$\therefore$ Required probability = $\frac{36}{36} = 1$

$\therefore$ Option (*a*) is correct.

(*iv*) Favourable outcomes for Rahul = {(3,4), (4, 3), (1, 6), (6, 1), (5, 2), (2, 5)}

No. of favourable outcomes = 6

$\therefore$ Required probability = $\frac{6}{36} = \frac{1}{6}$

$\therefore$ Option (*c*) is correct.

(*v*) Favourable outcomes = {(3, 6), (6, 3), (4, 5), (5, 4), (5, 5), (6, 4), (4, 6), (5, 6), (6, 5), (6, 6)}

No. of favourable outcomes = 10

$\therefore$ Required probability = $\frac{10}{36} = \frac{5}{18}$

$\therefore$ Option (*d*) is correct.

3. (*i*) Total possible outcomes = 27

Favourable outcomes = 15

P(an apple) = $\frac{15}{27} = \frac{5}{9}$

$\therefore$ Option (*d*) is correct.

(*ii*) Total possible outcomes after picking one fruit = 26

Favourable outcomes = 12

P(an orange) = $\frac{12}{26} = \frac{6}{13}$

$\therefore$ Option (*a*) is correct.

(*iii*) Total possible outcomes = 13

Favourable outcome = 11

P(a good apple) $= \frac{11}{13}$

$\therefore$ Option (*c*) is correct.

(*iv*) The value of probability P satisfy

$$0 \leqslant P \leqslant \text{I}$$

$\therefore$ Option (*b*) is correct.

(*v*) $P(E) = 0.75$

P(not E) $= 1 - 0.75 = 0.25$

$\therefore$ Option (*a*) is correct.

4. (*i*) Total possible outcomes = 9 + 6 + 12 = 27

P(yellow ball) $= \frac{12}{27}$

$\therefore$ Option (*b*) is correct.

(*ii*) Favourable outcomes = 6 + 12 = 18

P(not blue) $= \frac{18}{27} = \frac{2}{3}$

$\therefore$ Option (*a*) is correct.

(*iii*) Favourable outcomes = 6 + 9 = 15

P(either red or blue) $= \frac{15}{27} = \frac{5}{9}$

$\therefore$ Option (*b*) is correct.

(*iv*) Total balls = 35,

Let number of red balls be x.

Then, P(red ball) $= \frac{x}{35} = 0.2$

$\Rightarrow \quad x = 0.2 \times 35 = 7$

$\therefore$ Option (*c*) is correct.

(*v*) Let the total number of balls be x.

Then P(green ball) $= \frac{9}{x}$

$\Rightarrow \quad \frac{3}{11} = \frac{9}{x} \qquad \Rightarrow \quad x = \frac{9 \times 11}{3} = 33$

$\therefore$ Option (*b*) is correct.

5. (*i*) Total possible outcomes = 4 that are (HT, TH, TT, HH)

$\therefore$ Option (*c*) is correct.

(*ii*) Favourable outcomes = (HT, TH, HH) = 3

P(Akriti will start) $= \frac{3}{4}$

$\therefore$ Option (*c*) is correct.

(*iii*) Favourable outcomes = (HH, TH, HT) = 3

P(Sukriti will start) $= \frac{3}{4}$

$\therefore$ Option (*b*) is correct.

(*iv*) The value of probability of an event is, $0 \le P \le 1$

$1.05 > 1$

$\therefore$ Option (*b*) is correct.

(*v*) P(success) $= \frac{73}{100} = 0.73$

P(Failure) $= 1 - 0.73 = 0.27$

$\therefore$ Option (*a*) is correct.

6. (*i*) Total possible outcomes = 30 + 25 = 55

$\therefore$ Option (*c*) is correct.

(*ii*) Favourable outcomes for Shekhar = 30

P(T-shirt acceptable to Shekhar) $= \frac{30}{55} = \frac{6}{11}$

$\therefore$ Option (*a*) is correct.

(*iii*) Favourable outcomes for Varun = 12 + 11 = 23

P(T-Shirt acceptable to Varun) $= \frac{23}{55}$

$\therefore$ Option (*b*) is correct.

(*iv*) Favourable outcomes for the event that the T-shirt is not acceptable by any of them = 14

P(T-shirt not acceptable by any three of them) $= \frac{14}{55}$

$\therefore$ Option (*c*) is correct.

(*v*) Total possible outcomes after one T-shirt is selected = 54

Favourable outcomes for Apoorv = 17 + 11 = 28

P(T-shirt is again accepted by Apoorv) $= \frac{28}{54} = \frac{14}{27}$

$\therefore$ Option (*d*) is correct.

7. (*i*) Total possible outcomes = 82

Favourable outcomes (divisible by 6) = 14 that are (12, 18, ...90)

P(Vanshika gets marks) $= \frac{14}{82} = \frac{7}{41}$

$\therefore$ Option (*b*) is correct.

(*ii*) Favourable outcomes (Perfect square number) = 7

P(Sam gets marks) $= \frac{7}{82}$

$\therefore$ Option (*a*) is correct.

(*iii*) Favourable outcomes (Prime number) = 20

P(Preeti gets marks) $= \frac{20}{82} = \frac{10}{41}$

$\therefore$ Option (*c*) is correct.

(*iv*) Favourable outcomes (Odd number) = 41

P(Karan gets marks) $= \frac{41}{82} = \frac{1}{2}$

$\therefore$ Option (*b*) is correct.

(*v*) Favourable outcomes be two digit number = 81

P(a two digit number) will have greatest value.

$\therefore$ Option (*d*) is correct.

8. (*i*) Total possible outcomes = 52 – 12 = 40

$\therefore$ Option (*b*) is correct.

(*ii*) Number of favourable outcomes = 20

P(red card) $= \frac{20}{40} = \frac{1}{2}$

$\therefore$ Option (*b*) is correct.

(*iii*) Number of black queen in the shuffled cards = 0

P(black queen) = 0

$\therefore$ Option (*c*) is correct.

(*iv*) Number of black cards and ace = 20 + 2 = 22

$\therefore$ Number of favourable outcomes = 40 – 22 = 18

P(neither a black card nor an ace) $= \frac{18}{40} = \frac{9}{20}$

$\therefore$ Option (*a*) is correct.

(*v*) Number of favourable outcomes for 'a club card or a 4'

= 10 + 3 = 13

$\therefore$ Option (*a*) is correct.

9. (*i*) Total possible outcomes = 36

$\therefore$ Option (*c*) is correct.

(*ii*) Favourable outcomes (doublet) = 6 that are {(1, 1), (2, 2), (3, 3), (4, 4), (5, 5), (6, 6)}

P(winning) $= \frac{6}{36} = \frac{1}{6}$

$\therefore$ Option (*b*) is correct.

(*iii*) Favourable outcomes are {(1, 1), ... (1, 6), (2, 1), ... (2, 6), (3, 1), ... (3, 5), (4, 1), ... (4, 4), (5, 1), ... (5, 3), (6, 1), (6, 2)}

Number of favourable outcomes = 26

P(Second friend winning) $= \frac{26}{36} = \frac{13}{18}$

$\therefore$ Option (*a*) is correct.

(*iv*) Let E be the event '6 will come atleast once'

Then outcomes favourable to E = {(1, 6), (2, 6), (3, 6), (4, 6), (5, 6) (6, 1), ... (6, 6)}

$P(E) = \frac{11}{36} = P$(First Friend losing)

$\therefore$ Option (*c*) is correct.

(*v*) Outcomes favourable to 'Sum is an even number'

$= \{(1, 1), (1, 3), (1, 5), (2, 2), (2, 4), (2, 6) ....\}$

$P(\text{Sum is an even number}) = \frac{18}{36} = \frac{1}{2}$

$P(\text{Second friend losing}) = 1 - \frac{1}{2} = \frac{1}{2}$

$\therefore$ Option (*c*) is correct.

SOLUTIONS OF ASSERTION-REASON QUESTIONS

1. We have, $P(E) = 0.4$, where E = event of winning

$\therefore \quad P(\text{not } E) = 1 - P(E) = 1 - 0.4 = 0.6$

Hence, option (*a*) is correct.

2. Probability of getting no tail when two coins tossed simultaneously i.e., both are head.

$\therefore \quad$ Probability of both head $= \frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$

Hence, option (*a*) is correct.

3. Total possible outcomes $= 15 \Rightarrow n(S) = 15$

Total favourable numbers are 2, 4, 6, 8, 10, 12, 14.

$E = \{2, 4, 6, 8, 10, 12, 14\}$

$n(E) = 7$

$\therefore$ Probability of drawing an even number $= \frac{7}{15}$

Hence, option (*d*) is correct.

4. When two dice are tossed. Total possible outcomes $= 36 \Rightarrow n(S) = 36$ and total favourable outcomes (doublet) $= \{(1, 1), (2, 2), (3, 3), (4, 4), (5, 5), (6, 6)\}$

$\Rightarrow \qquad n(E) = 6$

$\therefore$ Probability $= \frac{6}{36} = \frac{1}{6}$ and, we know that $0 \le P(E) \le 1$.

Hence, option (*c*) is correct.

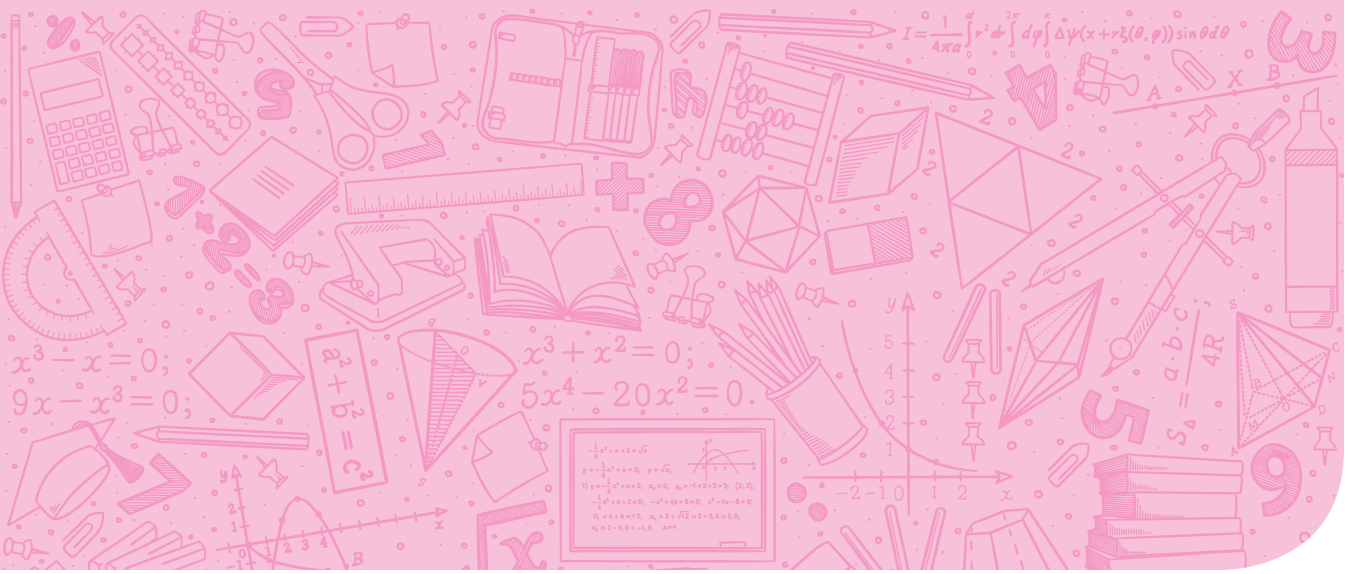
TERM–1

MATHEMATICS

BLUE PRINTS

PRACTICE PAPERS

OMR SHEETS



Blue Print – 01

(FOR PRACTICE PAPER–1)

Units	Chapters	Multiple Choice Questions (1 Mark)	Case-Based Questions (1 Mark)	Assertion-Reason Questions (1 Mark)	Total
I. Number Systems	Real Numbers	5(5)	–	1(1)	6(6)
II. Algebra	Polynomials	1(1)	4(4)		10(10)
	Pair of Linear Equations in Two Variables	5(5)			
III. Coordinate Geometry	Coordinate Geometry	2(2)	4(4)		6(6)
IV. Geometry	Triangles	2(2)	4(4)		6(6)
V. Trigonometry	Introduction to Trigonometry	4(4)	–	1(1)	5(5)
VI. Mensuration	Areas Related to Circles	4(4)	–		4(4)
VII. Statistics and Probability	Probability	3(3)	–		3(3)
	Total	**26(26)**	**12(12)**	**2(2)**	**40(40)**

Blue Print – 02

(FOR PRACTICE PAPER–2)

Units	Chapters	Multiple Choice Questions (1 Mark)	Case-Based Questions (1 Mark)	Assertion-Reason Questions (1 Mark)	Total
I. Number Systems	Real Numbers	2(2)	4(4)	–	6(6)
II. Algebra	Polynomials	5(5)	–	–	10(10)
	Pair of Linear Equations in Two Variables	4(4)	–	1(1)	
III. Coordinate Geometry	Coordinate Geometry	5(5)	–	1(1)	6(6)
IV. Geometry	Triangles	2(2)	4(4)	–	6(6)
V. Trigonometry	Introduction to Trigonometry	5(5)	–	–	5(5)
VI. Mensuration	Areas Related to Circles	–	4(4)	–	4(4)
VII. Statistics and Probability	Probability	3(3)	–	–	3(3)
	Total	**26(26)**	**12(12)**	**2(2)**	**40(40)**

Blue Print – 03

(FOR PRACTICE PAPER–3)

Units	Chapters	Multiple Choice Questions (1 Mark)	Case-Based Questions (1 Mark)	Assertion-Reason Questions (1 Mark)	Total
I. Number Systems	Real Numbers	6(6)	–	–	6(6)
II. Algebra	Polynomials	4(4)	–	1(1)	10(10)
	Pair of Linear Equations in Two Variables	1(1)	4(4)	–	
III. Coordinate Geometry	Coordinate Geometry	2(2)	4(4)	–	6(6)
IV. Geometry	Triangles	5(5)	–	1(1)	6(6)
V. Trigonometry	Introduction to Trigonometry	5(5)	–	–	5(5)
VI. Mensuration	Areas Related to Circles	–	4(4)	–	4(4)
VII. Statistics and Probability	Probability	3(3)	–	–	3(3)
	Total	**26(26)**	**12(12)**	**2(2)**	**40(40)**

Note: 1. Number of question(s) is/are given in the brackets.

2. Case-Based Questions contain Multiple Choice Questions (MCQs).

3. The given Blue Prints are only a sample. Suitable internal variations may be made for generating similar Blue Prints keeping the overall weightage to different form of questions and typology of questions same.

1 PRACTICE PAPER

BASED ON BLUE PRINT-01

Time: 90 Minutes **Max. Marks: 40**

General Instructions:

(i) ***All questions are compulsory.***

(ii) ***There are 40 questions in all.***

(iii) ***This question paper contains Multiple Choice Questions (MCQs), Case-Based MCQs and Assertion-Reason MCQs.***

(iv) ***Only one of the options in every question is correct.***

(v) ***An OMR sheet of every practice paper is given. The candidate has to give his/her answer of the question by darkening the circle against that question.***

Choose and write the correct option in the following questions.

1. **The product of three consecutive integers is divisible by**

(*a*) 5 (*b*) 6 (*c*) 7 (*d*) none of these

2. **The largest number which divides 615 and 963 leaving remainder 6 in each case is**

(*a*) 82 (*b*) 95 (*c*) 87 (*d*) 93

3. **The decimal expansion of number $\frac{46}{2^2 \times 5 \times 3}$ is**

(*a*) terminating (*b*) non-terminating repeating

(*c*) non-terminating non-repeating (*d*) none of these

4. **If two positive integers a and b are written as $a = x^4y^2$ and , $b = x^2y^3$; x, y are prime numbers, then HCF (a, b) is**

(*a*) x^4y^3 (*b*) xy (*c*) x^2y^3 (*d*) x^2y^2

5. **If the LCM of p and 18 is 36 and the HCF of p and 18 is 2 then p =**

(*a*) 2 (*b*) 3 (*c*) 4 (*d*) 1

6. **If the product of zeroes of the polynomial $x^2 - 9x + a$ is 8, then its zeroes are**

(*a*) –1, –8 (*b*) 1, –8 (*c*) –1, 8 (*d*) 1, 8

7. **The value of k for which the system of equations $2x + ky = 12$, $x + 3y - 4 = 0$ are inconsistent is**

(*a*) $\frac{21}{4}$ (*b*) $\frac{1}{6}$ (*c*) 6 (*d*) $\frac{4}{21}$

8. **One equation of a pair of dependent linear equations is $-5x + 7y = 2$. The second equation can be**

(*a*) $10x + 14y + 4 = 0$ (*b*) $-10x - 14y + 4 = 0$

(*c*) $-10x + 14y + 4 = 0$ (*d*) $10x - 14y = -4$

9. **A pair of linear equation is consistent if their graph lines will be**

(*a*) intersecting or parallel (*b*) intersecting or coincident

(*c*) coincident or parallel (*d*) can't say

10. **The value of k for which the system of equations $2x + 3y = 5$ and $4x + ky = 10$ has infinitely many solutions is**

(*a*) $k = -3$ (*b*) $k \neq -3$

(*c*) $k = 0$ (*d*) none of these

11. **The graph of the equation $x - y = 0$ is**

(*a*) parallel to x-axis (*b*) parallel to y-axis

(*c*) passing through origin (*d*) none of them

12. **The perimeter of triangle formed by the points (0, 0), (2, 0) and (0, 2) is**

(*a*) 4 units (*b*) 6 units

(*c*) $6\sqrt{2}$ units (*d*) $4 + 2\sqrt{2}$ units

13. **The distance of the point P (5, –1) from the y-axis is**

(*a*) 5 units (*b*) 2 units

(*c*) 3 units (*d*) 7 units

14. **If a perpendicular is drawn from the vertex of the right angle of a right triangle to the hypotenuse then triangle on both sides of the perpendicular is similar to**

(*a*) whole triangle (*b*) each other

(*c*) both (*a*) and (*b*) (*d*) none of them

15. **O is any point inside a rectangle $ABCD$. Then $OB^2 + OD^2$ is equal to**

(*a*) $OA^2 + OC^2$ (*b*) $BA^2 + OB^2$

(*c*) $OB^2 + OC^2$ (*d*) none of them

16. **If $\sin\theta - \cos\theta = 0$, then the value of $(\sin^4\theta + \cos^4\theta)$ is:**

(*a*) 1 (*b*) $\frac{3}{4}$ (*c*) $\frac{1}{2}$ (*d*) $\frac{1}{4}$

17. $\frac{\tan\theta}{\sec\theta - 1} + \frac{\tan\theta}{\sec\theta + 1}$ **is equal to**

(*a*) $2\tan\theta$ (*b*) $2\sec\theta$

(*c*) $2\operatorname{cosec}\theta$ (*d*) $2\tan\theta\sec\theta$

18. **$9\sec^2 A - 9\tan^2 A$ is equal to**

(*a*) 1 (*b*) 9 (*c*) 8 (*d*) 0

19. $\sqrt{\frac{1 + \sin\theta}{1 - \sin\theta}}$ **is equal to**

(*a*) $\sec\theta + \tan\theta$ (*b*) $\sec\theta - \tan\theta$

(*c*) $\sec^2\theta + \tan^2\theta$ (*d*) $(\sec^2\theta - \tan^2\theta)$

20. **The ratio of area of two circles whose ratio of circumference is 3:1 will be**

(*a*) 3 : 1 (*b*) 1 : 3 (*c*) 1 : 9 (*d*) 9 : 1

21. **The area of a circle is 49π cm^2. Its circumference is**

(*a*) 7π cm (*b*) 14π cm (*c*) 21π cm (*d*) 28π cm

22. **An arc of a circle is of length 5π cm and the sector it bounds has an area of 20π cm^2. The radius of circle is**

(*a*) 1 cm (*b*) 5 cm (*c*) 8 cm (*d*) 10 cm

23. **A wire can be bent in the form of a circle of radius 35 cm. If it is bent in the form of a square, then its area will be**

(*a*) 3025 cm^2 (*b*) $\frac{3025}{2}$cm^2 (*c*) 1225 cm^2 (*d*) 2450 cm^2

24. **Which of the following cannot be the probability of an event?**

(*a*) $\frac{1}{4}$ (*b*) 0 (*c*) $-\frac{1}{2}$ (*d*) 0.8

25. **The probability expressed as a percentage of a particular occurrence can never be**

(*a*) less than 100 (*b*) less than 0

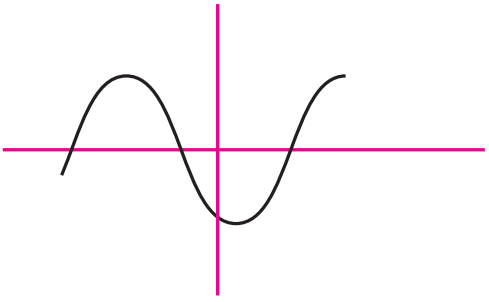
(*c*) greater than 1 (*d*) anything but a whole number

26. **When a die is thrown once, the probability of getting an odd number less than 3 is**

(*a*) $\frac{1}{6}$.(*b*) $\frac{1}{3}$ (*c*) $\frac{1}{2}$ (*d*) 0

Case-based Question–1 :

A piece of ribbon is lying on the table as shown in the figure.



27. **What type of polynomial is represented by the given curve?**

(*a*) linear (*b*) cubic (*c*) quadratic (*d*) None of these

28. **How many zeroes does it have?**

(*a*) 0 (*b*) 1 (*c*) 2 (*d*) 3

29. **If $ax^3 + bx^2 + cx + d$ is a cubic polynomial, tshen sum of its zeros taken two at a time is**

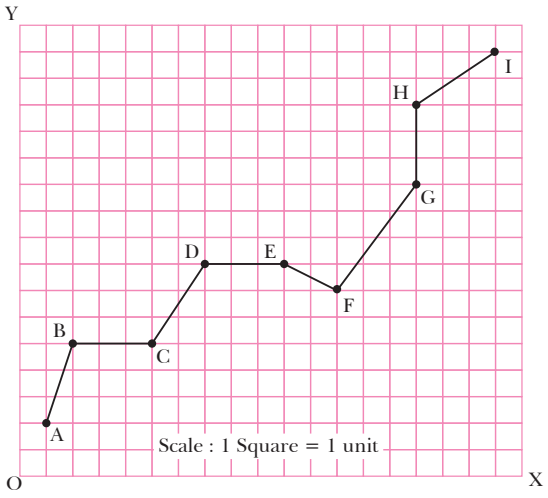
(*a*) $\frac{-b}{a}$ (*b*) $\frac{-c}{a}$ (*c*) $\frac{c}{a}$ (*d*) $\frac{b}{a}$

30. **If one of the zeroes of cubic polynomial $x^3 + ax^2 + bx + c$ is –1, then product of other two zeroes is**

(*a*) $a - b - 1$ (*b*) $a - b + 1$ (*c*) $b - a + 1$ (*d*) $b - a - 1$

Case-based Question–2 :

An officer explains his army men the route they need to follow to reach their target.



31. The distance of the point *B* from the *x*-axis is

(*a*) 2 units (*b*) 5 units (*c*) 1 unit (*d*) 4 units

32. The coordinates of the points *D* and *E* are respectively

(*a*) (8, 7), (8, 10) (*b*) (7, 8), (10, 8) (*c*) (8, 10), (8, 7) (*d*) (10, 8), (7, 8)

33. The coordinates of the point which divides the line segment joining the points *F*(12, 7) and *G*(15, 11) in the ratio 1 : 2 internally, are

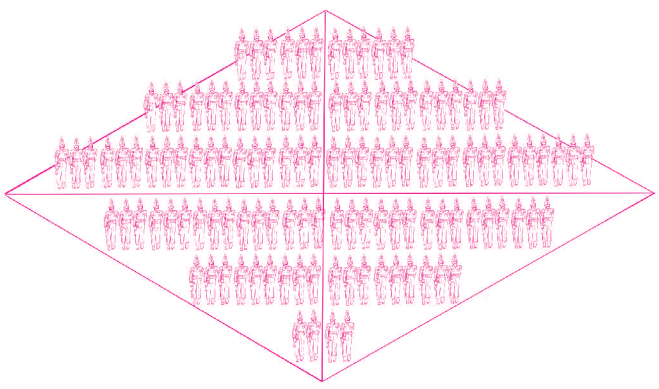
(*a*) (13, 8.3) (*b*) (8.3, 13) (*c*) (14, 9.6) (*d*) (9.6, 14)

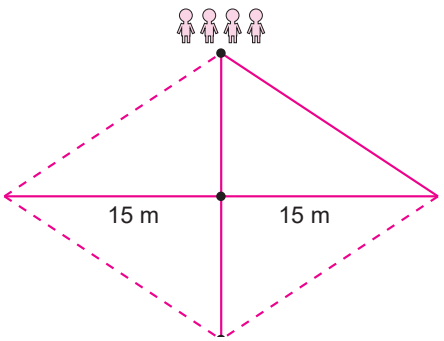
34. A point (*x*, *y*) is equidistant from the points *B* and *C*. Then

(*a*) $2y - 7 = 0$ (*b*) $y - x = 0$ (*c*) $2x - 7 = 0$ (*d*) $x + y = 0$

Case-based Question–3 :

There is a 40 m long boundary in the middle of a playground. In order to perform a marching activity, another boundary was drawn from the middle of the previous boundary as shown in the figure, 15 m each on both the sides. Then the four corners were joined.





35. What special name can be given to the four sided figure?

(*a*) Rectangle (*b*) Rhombus (*c*) Square (*d*) Trapezium

36. What property can be used to justify the name of the figure?

(*a*) Diagonals of a square are equal and bisect each other.

(*b*) Diagonals of a rectangle are equal.

(*c*) Diagonals of a rhombus are perpendicular bisector of each other.

(*d*) One pair of opposite sides of a trapezium is parallel.

37. The theorem that can be used to find the length of each side of the figure is

(*a*) Pythagoras Theorem (*b*) Thales Theorem

(*c*) Converse of Pythagoras Theorem (*d*) Converse of Thales Theorem

38. The perimeter of the four sided figure formed is

(*a*) 20 m (*b*) 40 m (*c*) 60 m (*d*) 100 m

Assertion-Reason Questions:

For question numbers 39 to 40, two statements are given-one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.

(*a*) Both *A* and *R* are true and *R* is the correct explanation for *A*.

(*b*) Both *A* and *R* are true and *R* is not the correct explanation for *A*.

(*c*) *A* is true but *R* is false.

(*d*) *A* is false but *R* is true.

39. Assertion (*A*) : The exponent of 3 in the prime factorisation of 2520 is 2.

Reason (*R*) : If n is an odd natural number greater then 1, then $\sqrt{n}$ is an irrational number.

40. Assertion (*A*) : The value of $\sin\theta = \frac{4}{3}$ is not possible.

Reason (*R*) : Hypotenuse is the largest side in any right angled triangle.

PRACTICE PAPER 2

BASED ON BLUE PRINT-02

Time: 90 Minutes **Max. Marks: 40**

***General Instructions*:** *Same as Practice Paper* - 1.

Choose and write the correct option in the following questions.

1. **If $(-1)^n + (-1)^{4n} = 0$, then n is**

(*a*) any negative integer (*b*) any even natural number

(*c*) any positive integer (*d*) any odd natural number

2. **The largest number which divides 77 and 85 leaving remainder 7 and 5 respectively, is**

(*a*) 25 (*b*) 10 (*c*) 20 (*d*) 8

3. **If α, β are the zeroes of the polynomial $x^2 - px + q$, then $\frac{1}{\alpha^2} + \frac{1}{\beta^2}$ is equal to**

(*a*) $\frac{p^2 - 2q}{p^2}$ (*b*) $\frac{p^2 - 2q}{q^2}$ (*c*) $\frac{p^2 + 2q}{q^2}$ (*d*) $\frac{p^2 + 2q}{p^2}$

4. **If zeroes of polynomial $x^2 + ax - b$ be reciprocal of each other, then b is equal to**

(*a*) 1 (*b*) –1 (*c*) a (*d*) $\frac{1}{a}$

5. **If zeroes of the polynomial $x^2 + ax - b$ are equal and opposite, then a is equal to**

(*a*) 1 (*b*) –1 (*c*) b (*d*) 0

6. **If the product of two zeroes of the polynomial $3x^3 + 5x^2 - 7x - 27$ be 3, then third zero is**

(*a*) 9 (*b*) 1 (*c*) 3 (*d*) $\frac{1}{3}$

7. **The quadratic polynomial $p(x)$ with –24 and 4 as a product and one of the zeroes respectively is**

(*a*) $x^2 + 2x - 24$ (*b*) $x^2 - 2x + 24$ (*c*) $x^2 - 2x - 24$ (*d*) $x^2 - 6x - 24$

8. **Five years ago, A was thrice as old as B and ten years later, A shall be twice as old as B. What is the present age of A?**

(*a*) 20 (*b*) 50 (*c*) 60 (*d*) 40

9. **The value of k for which the lines $(k + 1)x + 3ky + 15 = 0$ and $5x + ky + 5 = 0$ are coincident is**

(*a*) 14 (*b*) 2 (*c*) –14 (*d*) –2

10. **Sum of two numbers is 50 and their difference is 10, then the numbers are**

(*a*) 30 and 20 (*b*) 10 and 40 (*c*) 12 and 38 (*d*) None of these

11. **Graphically, the pair of equations $6x - 3y + 10 = 0$; $2x - y + 9 = 0$ represents two lines which are**

(*a*) intersecting at exactly one point (*b*) intersecting at exactly two points

(*c*) coincident (*d*) parallel

12. **The distance of the point (–8, –7) from y-axis is**

(*a*) 5 units (*b*) 1 units (*c*) 8 units (*d*) 7 units

13. **The point which lies on the perpendicular bisector of the line segment joining the points A (–2, –5) and B (2, 5) is**

(*a*) (0, 0) (*b*) (0, 2) (*c*) (2, 0) (*d*) (–2, 0)

14. **The value of y for which the distance between the points $A(3, -1)$ and $B(11, y)$ is 10 units, is (are)**

(*a*) 5 (*b*) –5, 7 (*c*) 5, – 7 (*d*) 5, 7

15. **The ratio in which the line $2x + y - 4 = 0$ divides the line segment joining $A(2, -2)$ and $B(3, 7)$ is**

(*a*) 5 : 2 (*b*) 2 : 9 (*c*) 7 : 2 (*d*) 2 : 7

16. **$AOBC$ is a rectangle whose three vertices are vertices $A(0, 3)$, $O(0, 0)$ and $B(5, 0)$. The length of its diagonal is**

(*a*) 5 units (*b*) 3 units (*c*) $\sqrt{34}$ units (*d*) 4 units

17. **The perpendicular from A on side BC of a triangle ABC of intersects BC at D such that $DB = 3CD$ then $2AC^2 + BC^2$ is equal to**

(*a*) AB^2 (*b*) $3AB^2$ (*c*) $2AB^2$ (*d*) $4AB^2$

18. **Two similar triangles are congruent only when**

(*a*) their perimeters are equal (*b*) their areas are equal

(*c*) both (*a*) and (*b*) (*d*) none of them

19. **$(\text{cosec}\,\theta - \sin\theta)(\sec\theta - \cos\theta)(\tan\theta + \cot\theta)$ is equal to**

(*a*) 0 (*b*) 1 (*c*) –1 (*d*) none of these

20. **If $a\cos\theta - b\sin\theta = c$, then $a\sin\theta + b\cos\theta$ is equal to**

(*a*) $\pm\sqrt{a^2 + b^2 + c^2}$ (*b*) $\pm\sqrt{a^2 + b^2 - c^2}$ (*c*) $\pm\sqrt{c^2 - a^2 - b^2}$ (*d*) $\frac{1}{3}$

21. **If $x = a\sec\theta\cos\phi$, $y = b\sec\theta\sin\phi$ and $z = c\tan\theta$, then $\frac{x^2}{a^2} + \frac{y^2}{b^2}$**

(*a*) $\frac{z^2}{c^2}$ (*b*) $1 - \frac{z^2}{c^2}$ (*c*) $\frac{z^2}{c^2} - 1$ (*d*) $1 + \frac{z^2}{c^2}$

22. **If $60° + A = 90°$, then the value of $\text{cosec}\,A$ is**

(*a*) 2 (*b*) 1 (*c*) 0 (*d*) $\sqrt{d}$

23. **If $2x = \sec\theta$ and $\frac{2}{x} = \tan\theta$, then the value of $2\left(x^2 - \frac{1}{x^2}\right)$ is**

(*a*) 4 (*b*) $\frac{1}{4}$ (*c*) 2 (*d*) $\frac{1}{2}$

24. **A die is thrown once, the probability of getting a prime number is**

(*a*) $\frac{2}{3}$ (*b*) $\frac{1}{3}$ (*c*) $\frac{1}{2}$ (*d*) $\frac{1}{6}$

25. **The probability of getting a bad egg in a lot of 400 is 0.035. The number of bad eggs in the lot is**

(*a*) 7 (*b*) 14 (*c*) 21 (*d*) 28

26. **The probability that a number selected at random from the numbers 1, 2, 3 ... 15 is a multiple of 4 is**

(*a*) $\frac{4}{15}$ (*b*) $\frac{2}{15}$ (*c*) $\frac{1}{5}$ (*d*) $\frac{1}{3}$

Case-based Question–1 :

A seminar is being conducted by an Educational Organisation, where the participants will be educators of different subjects. The number of participants in Hindi, English and Mathematics are 60, 84 and 108 respectively.

27. **In each room the same number of participants are to be seated and all of them being in the same subject, hence maximum number of participants that can accommodated in each room are**

(*a*) 14 (*b*) 12 (*c*) 16 (*d*) 18

28. **What is the minimum number of rooms required during the event?**

(*a*) 11 (*b*) 31 (*c*) 41 (*d*) 21

29. **The LCM of 60, 84 and 108 is**

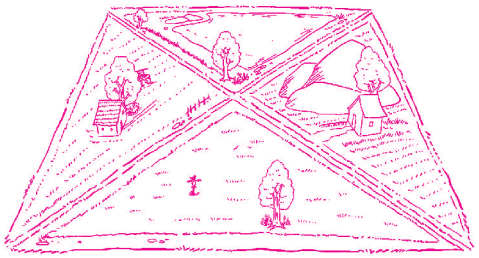
(*a*) 3780 (*b*) 3680 (*c*) 4780 (*d*) 4680

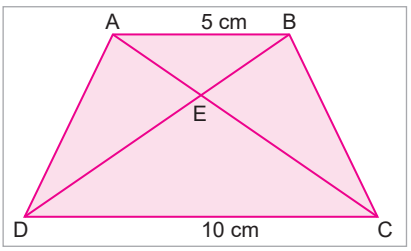
30. **The product of HCF and LCM of 60,84 and 108 is**

(*a*) 55360 (*b*) 35360 (*c*) 45500 (*d*) 45360

Case-based Question–2 :

A farmer has a field in the shape of a trapezium, whose map with scale 1 cm = 20 m, is given below. The field is divided into four parts by joining the opposite vertices.





31. **The two triangular regions *AOB* and *COD* are**

(*a*) similar by AA criteria (*b*) similar by SAS criteria
(*c*) similar by RHS criteria (*d*) not similar

32. **The ratio of the areas of ΔAOB and ΔCOD is**

(*a*) 4 : 1 (*b*) 1 : 4 (*c*) 1 : 2 (*d*) 2 : 1

33. **If the ratio of the perimeters of ΔAOB and ΔCOD would have been 1 : 4, then which of the following would be true?**

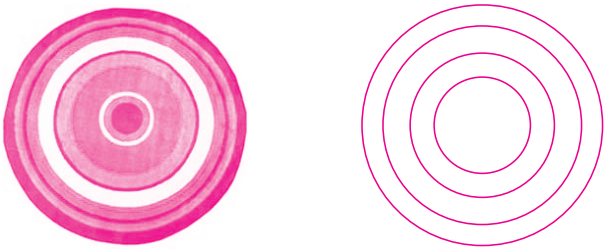
(*a*) $AB = 2\,CD$ (*b*) $AB = 4\,CD$ (*c*) $CD = 2\,AB$ (*d*) $CD = 4\,AB$

34. **If in triangles *PQR* and *XYZ*, $\frac{PQ}{XZ} = \frac{PR}{YX} = \frac{QR}{YZ}$, then**

(*a*) $\Delta PQR \sim \Delta XYZ$ (*b*) $\Delta PRQ \sim \Delta XZY$ (*c*) $\Delta PQR \sim \Delta XZY$ (*d*) $\Delta QRP \sim \Delta YXZ$

Case-based Question–3 :

A circular race - track was formed in the playground of a school for the sports day.



35. **If the circumference of the outer circle is 220 m. Its diameter is equal to**

(*a*) 42 m (*b*) 35 m (*c*) 21 m (*d*) 70 m

36. **The width of the track is 3.5 m, then the radius of the inner circle is**

(*a*) 66.5 m (*b*) 63 m (*c*) 31.5 m (*d*) 35 m

37. **The area covered in the track is equal to**

(*a*) 731.5 m^2 (*b*) 1155 m^2 (*c*) 2926 m^2 (*d*) 1463 m^2

38. **The circumference of the inner circle is given by**

(*a*) 63π m (*b*) $70\,\pi$ m (*c*) $\frac{63\pi}{2}$ m (*d*) 31.5π m

Assertion-Reason Questions:

For question numbers 39 to 40, two statements are given-one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.

(*a*) Both *A* and *R* are true and *R* is the correct explanation for *A*.

(*b*) Both *A* and *R* are true and *R* is not the correct explanation for *A*.

(*c*) *A* is true but *R* is false.

(*d*) *A* is false but *R* is true.

39. **Assertion (*A*) :** The lines $2x - 5y = 7$ and $6x - 15y = 8$ are parallel lines.

Reason (*R*) : The system of linear equations $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ have infinitely many solutions if $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$.

40. **Assertion (*A*) :** If the distance between $(x, 3)$ and $(4, 5)$ is $\sqrt{5}$, then $x = 3$ or 5.

Reason (*R*) : The third vertex of a triangle, if two of its vertices are at $(-3, 1)$ and $(0, -2)$ and the centroid is at $(0, 0)$ is $(3, 1)$.

PRACTICE PAPER 3

BASED ON BLUE PRINT-03

Time: 90 Minutes **Max. Marks: 40**

***General Instructions*:** *Same as Practice Paper* - 1.

Choose and write the correct option in the following questions.

1. **The decimal representation of $\frac{6}{1250}$ will terminate after how many places of decimal?**

(*a*) three (*b*) four (*c*) two (*d*) one

2. **The LCM of two numbers is 1200. Which of the following cannot be their HCF ?**

(*a*) 600 (*b*) 500 (*c*) 400 (*d*) 200

3. **If n is any natural number then $6^n - 5^n$ always ends with**

(*a*) 1 (*b*) 3 (*c*) 5 (*d*) 7

4. **Which of these rational number is a terminating decimal?**

(*a*) $\frac{7}{18}$ (*b*) $\frac{13}{21}$ (*c*) $\frac{8}{200}$ (*d*) $\frac{16}{225}$

5. **The HCF and the LCM of 12, 21, 15 respectively are**

(*a*) 3,140 (*b*) 12,420 (*c*) 3,420 (*d*) 420, 3

6. **LCM $(x, 18) = 36$ and HCF $(x, 18) = 2$ then x is**

(*a*) 2 (*b*) 3 (*c*) 4 (*d*) 1

7. **Seven times a two digit number is equal to four times the number obtained by reversing the order of its digit. If the difference between the digits is 3, then the number is**

(*a*) 36 (*b*) 33 (*c*) 66 (*d*) None of them

8. **The degree of polynomial $(x - 1)(x^4 + x^3 + x^2 + 1)$ is**

(*a*) 4 (*b*) 5 (*c*) 3 (*d*) 2

9. **If $x + 2$ is a factor of $x^2 + ax + 2ab$ and $a + b = 4$ then**

(*a*) $a = 5, b = -1$ (*b*) $a = -1, b = 5$ (*c*) $a = 3, b = 1$ (*d*) $a = 1, b = 3$

10. **If α, β, γ are the zeroes of the polynomial $f(x) = ax^3 + bx^2 + cx + d$ then $\frac{1}{\alpha} + \frac{1}{\beta} + \frac{1}{\gamma}$ is equal to**

(*a*) $-c/d$ (*b*) $-c/a$ (*c*) $-b/d$ (*d*) c/d

11. **If 2 is zero of polynomials $p(x) = ax^2 - 3(a - 1)x - 2$ then value of a is**

(*a*) 1 (*b*) 2 (*c*) –1 (*d*) –2

12. **The distance between the points A (0, 7) and B (0, –3) is**

(*a*) 4 units (*b*) 10 units (*c*) 7 units (*d*) 3 units

13. **The line segment joining points (– 3, – 4) and (1, – 2) is divided by y-axis in the ratio**

(*a*) 2 : 3 (*b*) 3 : 1

(*c*) 1 : 3 (*d*) none of these

14. **If AD and PM are medians of triangles ABC and PQR respectively where $\Delta ABC \sim \Delta PQR$ then $\frac{AB}{PQ}$ is equal to**

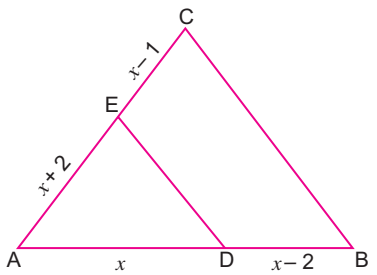
(*a*) $\frac{BC}{QR}$ (*b*) $\frac{AC}{PR}$ (*c*) $\frac{AD}{PM}$ (*d*) all of them

15. **D is point on the side BC of a triangle ABC such that $\angle ADC = \angle BAC$ then CA^2 equals**

(*a*) $AB.BC$ (*b*) $AB.CD$

(*c*) $CB.CD$ (*d*) none of them

16. **In the given figure $DE \,||\, BC$. If $AD = x$, $BD = x - 2$, $AE = x+2$ and $EC = x - 1$ the value of x is**



(*a*) 4 (*b*) 8 (*c*) 16 (*d*) 32

17. **Two polygons of the same number of sides are similar, if their corresponding angles are _____ and their corresponding sides are _____.**

(*a*) equal, proportional (*b*) equal, equal

(*c*) proportional, equal (*d*) none of them

18. **A girl of height 90 cm is walking away from the base of lamp post at a speed of 1.2 m/s. If the lamp is 3.6 m above the ground then the length of her shadow after 4 seconds is**

(*a*) 1.2 m (*b*) 1.6 m (*c*) 2 m (*d*) none of them

19. **If $8 \tan x = 15$, then the value of $\sin^2 x - \cos^2 x$ is**

(*a*) $\frac{161}{289}$ (*b*) $\frac{289}{161}$ (*c*) $\frac{161}{64}$ (*d*) $\frac{64}{225}$

20. **If $4 \cot \theta = 3$, then the value of $\frac{\sin\theta + \cos\theta}{\sin\theta - \cos\theta}$ is**

(*a*) $\frac{1}{7}$ (*b*) 7 (*c*) –7 (*d*) $-\frac{1}{7}$

21. **If $x = a \cos \theta$ and $y = b \sin \theta$, then the value of $b^2x^2 + a^2y^2$ is**

(*a*) $\frac{a^2}{b^2}$ (*b*) a^2b^2 (*c*) $a^2 + b^2$ (*d*) ab^2

22. **If $\sqrt{3} \tan \theta = 3 \sin \theta$, then the value of $\sin^2\theta - \cos^2\theta$ is**

(*a*) $\frac{1}{3}$ (*b*) 3 (*c*) $\frac{2}{3}$ (*d*) $\frac{3}{2}$

23. **If $\sin\theta = \frac{4}{5}$, then the value of $\frac{\sin\theta - \cot\theta}{2\sin\theta}$ is**

(*a*) 32 (*b*) $\frac{1}{32}$ (*c*) 23 (*d*) $\frac{1}{23}$

24. **A coin is tossed 1000 times and 640 times a 'head' occurs. The empirical probability of occurrence of a head in this case is**

(*a*) 0.6 (*b*) 0.64 (*c*) 0.36 (*d*) 0.064

25. **A bag contains three green marbles, four blue marbles and two orange marbles. If a marble is picked at random, then the probability that it is not an orange marble is**

(*a*) $\frac{7}{9}$ (*b*) $\frac{2}{9}$ (*c*) $\frac{4}{9}$ (*d*) none of these

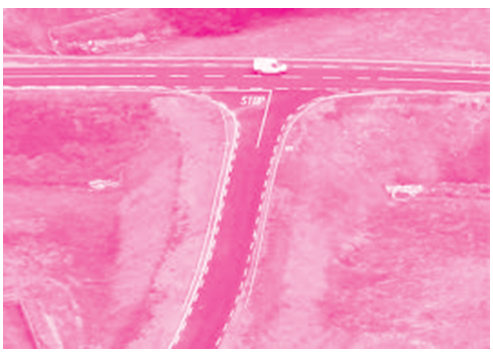
26. **If a number x is chosen from the numbers 1, 2, 3 and a number y is selected from the numbers 1, 4, 9. Then $P(xy < 9)$ is**

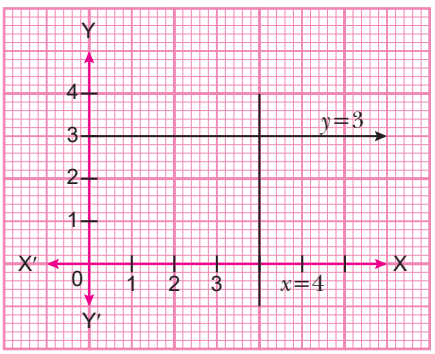
(*a*) $\frac{3}{9}$ (*b*) $\frac{4}{9}$ (*c*) $\frac{1}{9}$ (*d*) $\frac{5}{9}$

Case-based Question–1 :

Two roads cross each other, these two roads represent the pair of linear equations.

Let the pair of linear equations be represented by the roads is given by $x = 4$ and $y = 3$.





27. **Point of intersection of the pair of linear equations $x = 4$ and $y = 3$ is**

(*a*) (4, 0) (*b*) (3, 4) (*c*) (4, 3) (*d*) (3, 3)

28. **If the system of linear equations $x + 3y - 4 = 0$ and $2x + 6y - 7 = 0$ represent the two roads respectively then the roads are**

(*a*) parallel (*b*) intersecting

(*c*) coincident (*d*) can't say

29. **The value of k for which the system of linear equations $2x + 3y - 5 = 0$ and $6x + ky - 15 = 0$ has infinitely many solutions.**

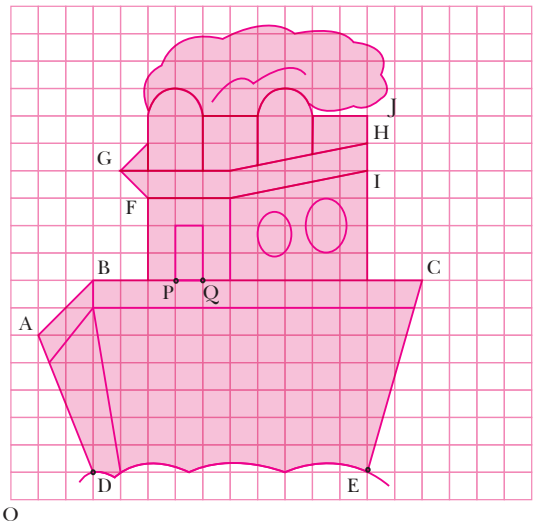
(*a*) 3 (*b*) 6 (*c*) 9 (*d*) –3

30. **The line $y = 3$ intersects y–axis at the point**

(*a*) (–3, 0) (*b*) (3, 0) (*c*) (0, 3) (*d*) (0, –3)

Case-based Question–2 :

Chintu made a drawing with the help of grid formed by mutually perpendicular lines drawn horizontally and vertically.



31. **If *O* is the origin, then the distance of point *B* from *x* axis is**

(*a*) 8 units (*b*) 6 units (*c*) 3 units (*d*) 2 units

32. **The coordinates (5, 11) represent the point**

(*a*) G (*b*) I (*c*) F (*d*) B

33. **The distance *AD* is**

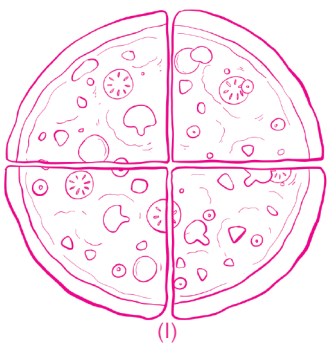
(*a*) 9 units (*b*) $\sqrt{29}$ units (*c*) 5 units (*d*) $\sqrt{27}$ units

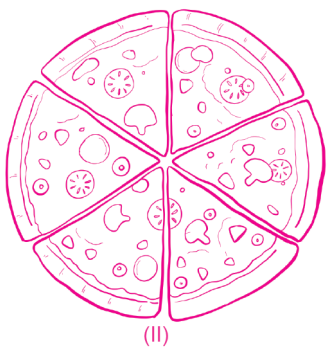
34. **The point *Q* divides the line segment *BC* in the ratio**

(*a*) 1 : 1 (*b*) 1 : 2 (*c*) 2 : 1 (*d*) 1 : 3

Case-based Question–3 :

A group of friends ordered two pizzas for them. One of them was divided into four equal parts while the other in six equal parts. The pizzas were served in pans, exactly the size of pizza, having diameter of 35 cm each.





35. **The area of the pan covered by one part of pizza I is**

(*a*) 962.5 cm^2 (*b*) 240.625 cm^2 (*c*) 481.25 cm^2 (*d*) 120.32 cm^2

36. **The area of the pan covered by each part of pizza II is**

(*a*) 160.42 cm^2 (*b*) 240.625 cm^2 (*c*) 962.5 cm^2 (*d*) 481.25 cm^2

37. **The circumference of the pan is**

(*a*) 440 cm (*b*) 3850 cm (*c*) 220 cm (*d*) 110 cm

38. **The ratio of area of two circles when ratio of circumference is 3 : 1 will be**

(*a*) 9 : 1 (*b*) 1 : 9 (*c*) 3 : 1 (*d*) 1 : 3

Assertion-Reason Questions:

For question numbers 39 to 40, two statements are given-one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.

(*a*) **Both *A* and *R* are true and *R* is the correct explanation for *A*.**

(*b*) **Both *A* and *R* are true and *R* is not the correct explanation for *A*.**

(*c*) ***A* is true but *R* is false.**

(*d*) ***A* is false but *R* is true.**

39. Assertion (*A*) : The sum and product of the zeros of a quadratic polynomial are $-\frac{1}{4}$ and $\frac{1}{4}$ respectively. Then the quadratic polynomial is $4x^2 + x + 1$.

Reason (*R*) : The quadratic polynomial whose sum and product of zeros are given is x^2 – (sum of zeros). x + product of zeros.

40. Assertion (*A*) : Two similar triangles are always congruent.

Reason (*R*) : If the areas of two similar triangles are equal then the triangles are congruent.

Answers of Practice Paper–1

1. (*b*)	**2.** (*c*)	**3.** (*b*)	**4.** (*d*)	**5.** (*c*)	**6.** (*d*)
7. (*c*)	**8.** (*d*)	**9.** (*b*)	**10.** (*d*)	**11.** (*c*)	**12.** (*d*)
13. (*a*)	**14.** (*c*)	**15.** (*a*)	**16.** (*c*)	**17.** (*c*)	**18.** (*b*)
19. (*a*)	**20.** (*d*)	**21.** (*b*)	**22.** (*c*)	**23.** (*a*)	**24.** (*c*)
25. (*b*)	**26.** (*a*)	**27.** (*b*)	**28.** (*d*)	**29.** (*c*)	**30.** (*c*)
31. (*b*)	**32.** (*b*)	**33.** (*a*)	**34.** (*c*)	**35.** (*b*)	**36.** (*c*)
37. (*a*)	**38.** (*d*)	**39.** (*c*)	**40.** (*a*)		

Answers of Practice Paper–2

1. (*d*)	**2.** (*b*)	**3.** (*b*)	**4.** (*b*)	**5.** (*d*)	**6.** (*c*)
7. (*a*)	**8.** (*b*)	**9.** (*a*)	**10.** (*a*)	**11.** (*d*)	**12.** (*c*)
13. (*a*)	**14.** (*c*)	**15.** (*b*)	**16.** (*c*)	**17.** (*c*)	**18.** (*b*)
19. (*b*)	**20.** (*b*)	**21.** (*d*)	**22.** (*a*)	**23.** (*d*)	**24.** (*c*)
25. (*b*)	**26.** (*c*)	**27.** (*b*)	**28.** (*d*)	**29.** (*a*)	**30.** (*d*)
31. (*a*)	**32.** (*b*)	**33.** (*d*)	**34.** (*c*)	**35.** (*d*)	**36.** (*c*)
37. (*a*)	**38.** (*a*)	**39.** (*b*)	**40.** (*b*)		

Answers of Practice Paper–3

1. (*b*)	**2.** (*b*)	**3.** (*a*)	**4.** (*c*)	**5.** (*c*)	**6.** (*c*)
7. (*a*)	**8.** (*b*)	**9.** (*c*)	**10.** (*a*)	**11.** (*b*)	**12.** (*b*)
13. (*b*)	**14.** (*c*)	**15.** (*c*)	**16.** (*a*)	**17.** (*a*)	**18.** (*b*)
19. (*a*)	**20.** (*b*)	**21.** (*b*)	**22.** (*a*)	**23.** (*b*)	**24.** (*b*)
25. (*a*)	**26.** (*d*)	**27.** (*c*)	**28.** (*a*)	**29.** (*c*)	**30.** (*c*)
31. (*a*)	**32.** (*c*)	**33.** (*b*)	**34.** (*b*)	**35.** (*b*)	**36.** (*a*)
37. (*d*)	**38.** (*a*)	**39.** (*a*)	**40.** (*d*)		