Sample Question Paper - 3
Class – X Session -2021-22
TERM 1
Subject- Mathematics (Standard) 041

Time Allowed: 1 hour and 30 minutes **Maximum Marks: 40**

General Instructions:

1. The question paper contains three parts A, B and C.
2. Section A consists of 20 questions of 1 mark each. Attempt any 16 questions.
3. Section B consists of 20 questions of 1 mark each. Attempt any 16 questions.
4. Section C consists of 10 questions based on two Case Studies. Attempt any 8 questions.
5. There is no negative marking.

Section A

Attempt any 16 questions

1. If the sum of LCM and HCF of two numbers is 1260 and their LCM is 900 more than their HCF, then the product of two numbers is **[1]**

 a) 205400 b) 203400

 c) 194400 d) 198400

2. Ritu can row downstream 20 km in 2 hours and upstream 4 km in 2 hours. The speed of the current is **[1]**

 a) 12 km/hr b) 6 km/hr

 c) 4 km/hr d) 8 km/hr

3. Consider the following statements: **[1]**

 i. Every equilateral triangle is necessarily an isosceles triangle.
 ii. Every right-angled triangle is necessarily an isosceles triangle.
 iii. A triangle in which one of the median is perpendicular to the side it meets, is necessarily an isosceles triangle.

 The correct statements are:

 a) III only b) I and III

 c) II and III d) I and II

4. If $\frac{2x}{3} - \frac{y}{2} + \frac{1}{6} = 0$ and $\frac{x}{2} + \frac{2y}{3} = 3$ then **[1]**

 a) x = - 2, y = -3 b) x = 2, y = -3

 c) x = -2, y = 3 d) x = 2, y = 3

5. Choose the correct option and justify your choice: $\frac{2\tan 30^0}{1-\tan^2 30^0}$ **[1]**

 a) $\cos 60^o$ b) $\sin 30^o$

c) $\sin 60^{\circ}$ d) $\tan 60^{\circ}$

6. If $\frac{241}{4000} = \frac{241}{2^m \times 5^n}$, then **[1]**

a) m = 3 and n = 2 b) m = 5 and n = 3

c) m = 2 and n = 5 d) m = 4 and n = 5

7. The number polynomials having zeroes as – 2 and 5 is **[1]**

a) 1 b) 2

c) 3 d) more than 3

8. If the radius of a circle is diminished by 10%, then its area is diminished by **[1]**

a) 20% b) 10%

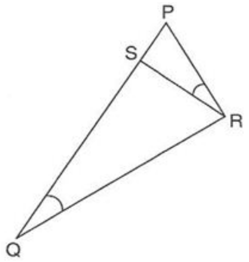
c) 19% d) 36%

9. If α and β are the zeroes of the polynomial $ax^2 + bx + c$, then the value of $\frac{\alpha}{\beta} + \frac{\beta}{\alpha}$ is **[1]**

a) $\frac{b^2 - 2ac}{ac}$ b) $\frac{b^2}{ac}$

c) $\frac{a^2}{bc}$ d) $\frac{c^2}{ab}$

10. In the adjoining figure $\angle PQR = \angle PRS$. If PR = 8cm, PS = 4 cm, then PQ is equal to **[1]**



a) 16 cm. b) 12 cm.

c) 24 cm. d) 32 cm.

11. If the probability of an event is ‘p’, the probability of its complementary event will be **[1]**

a) p b) p – 1

c) 1 – p d) $1 - \frac{1}{p}$

12. Every prime number has exactly ________ factors. **[1]**

a) more than 4 b) 4

c) 3 d) 2

13. The height of an equilateral triangle is $3\sqrt{3}$ cm. Its area is **[1]**

a) $6\sqrt{3}$ cm^2 b) 27 cm^2

c) $9\sqrt{3}$ cm^2 d) $27\sqrt{3}$ cm^2

14. A chord of a circle of radius 10 cm subtends a right angle at the centre. The area of the minor segments (given, π = 3.14) is **[1]**

a) 32.5 cm^2 b) 34.5 cm^2

c) 30.5 cm^2 d) 28.5 cm^2

15. If $\triangle$ABC $\sim$ $\triangle$PQR such that AB = 1.2 cm, PQ = 1.4 cm, then $\frac{ar(\Delta ABC)}{ar(\Delta PQR)}$ is **[1]**

a) $\frac{36}{49}$

b) $\frac{3}{7}$

c) $\frac{6}{7}$

d) $\frac{9}{49}$

16. (1 + tan θ + sec θ) (1 + cotθ – cosecθ) = **[1]**

a) 0

b) 2

c) 1

d) –1

17. The system of linear equations $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ has infinitely many solutions if **[1]**

a) $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

b) $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

c) None of these

d) $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$

18. A bag contains cards numbered from 1 to 25. A card is drawn at random from the bag. The probability that the number on this card is divisible by both 2 and 3 is **[1]**

a) $\frac{2}{25}$

b) $\frac{1}{5}$

c) $\frac{3}{25}$

d) $\frac{4}{25}$

19. Every point on the number line corresponds to a ________ number which may be either rational or irrational. **[1]**

a) non-terminating

b) decimal

c) real

d) terminating

20. The area of a square that can be inscribed in a circle of radius 10 cm is **[1]**

a) 100 sq. cm

b) 300 sq. cm

c) 200 sq. cm

d) 150 sq. cm

Section B

Attempt any 16 questions

21. If $\frac{1}{x} + \frac{2}{y} = 4$ and $\frac{3}{y} - \frac{1}{x} = 11$ then **[1]**

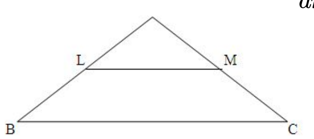
a) $x = \frac{-1}{2}, y = \frac{1}{3}$

b) x = $\frac{-1}{2}$, y = 3

c) x = -2, y = 3

d) x = 2, y = 3

22. In the given figure, if $\frac{ar(\Delta ALM)}{ar(trapezium\ LMCB)} = \frac{9}{16}$, and LM||BC, Then AL:LB is equal to **[1]**



a) 3 : 5

b) 4 : 1

c) 3 : 4

d) 2 : 3

23. The HCF and the LCM of 12, 21, 15 respectively are: **[1]**

a) 3, 140

b) 420, 3

c) 12, 420

d) 3, 420

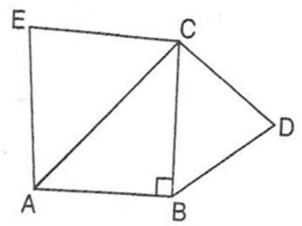
24. If (tan θ + cot θ) = 5 then ($\tan^2\theta + \cot^2\theta$) = ? **[1]**

a) 23
b) 25
c) 24
d) 27

25. A fraction becomes $\frac{9}{11}$, if 2 is added to both the numerator and denominator. If 3 is added to both the numerator and denominator it becomes $\frac{5}{6}$, then the fraction is **[1]**

a) $\frac{9}{7}$
b) $\frac{-9}{7}$
c) $\frac{7}{9}$
d) $\frac{-7}{9}$

26. ABC is an isosceles triangle right-angled at B. Two equilateral triangles are constructed with side BC and AC as shown in the figure. If $ar(\Delta ACE)$ = 20 cm^2 then $ar(\Delta BCD)$ is **[1]**



a) 10 cm^2
b) 16 cm^2
c) 12 cm^2
d) 15 cm^2

27. In a rhombus of side 10 cm, one of the diagonals is 12 cm long. The length of the second diagonal is **[1]**

a) 22 cm
b) 20 cm
c) 16 cm
d) 18 cm

28. A circle drawn with origin as the centre passes through ($\frac{13}{2}$, 0). The point which does not lie in the interior of the circle is **[1]**

a) $\frac{-3}{4}, 1$
b) $2, \frac{7}{3}$
c) $5, \frac{-1}{2}$
d) $\left(-6, \frac{5}{2}\right)$

29. $\cos^4A - \sin^4A$ is equal to **[1]**

a) $2\sin^2 A - 1$
b) $2\sin^2 A + 1$
c) $2\cos^2 A + 1$
d) $2\cos^2 A - 1$

30. If 2x – 3y = 11 and (a + b)x – (a + b – 3)y = 4a + b has infinite number of solutions, then **[1]**

a) a = – 9 and b = 3
b) a = – 9 and b = – 3
c) a = 9 and b = 3
d) a = 9 and b = – 3

31. 0.515115111511115... is **[1]**

a) a rational number
b) a prime number
c) an integer
d) an irrational number

32. If p and q are co-prime numbers, then p^2 and q^2 are **[1]**

a) even
b) coprime

c) not coprime

d) odd

33. $\sqrt{(1-\cos^2\theta)\sec^2\theta}$ = **[1]**

a) tanθ

b) cotθ

c) sinθ

d) cosθ

34. In making 1000 revolutions, a wheel covers 88 km. The diameter of the wheel is **[1]**

a) 40 m

b) 28 m

c) 24 m

d) 14 m

35. A school has five houses A, B, C, D and E. A class has 23 students, 4 from house A, 8 from house B, 5 from house C, 2 from house D and rest from house E. A single student is selected at random to be the class monitor. The probability that the selected student is not from A, B and C is **[1]**

a) $\frac{8}{23}$

b) $\frac{6}{23}$

c) $\frac{4}{23}$

d) $\frac{17}{23}$

36. The lines represented by 3x + y – 12 = 0 and x – 3y + 6 = 0 intersects the y – axis at **[1]**

a) (0, – 2) and (0, 12)

b) (0, 2) and (0, – 12)

c) (0, – 2) and (0, – 12)

d) (0, 2) and (0, 12)

37. The LCM and HCF of two rational numbers are equal, then the numbers must be **[1]**

a) equal

b) prime

c) co-prime

d) composite

38. $\sqrt{\frac{1-\sin A}{1+\sin A}}=?$ **[1]**

a) sec A - tan A

b) sec A + tan A

c) none of these

d) sec A tan A

39. A card is drawn at random from a pack of 52 cards. The probability that the card is drawn is a jack, a queen or a king is **[1]**

a) $\frac{11}{13}$

b) $\frac{1}{26}$

c) $\frac{3}{13}$

d) $\frac{1}{13}$

40. The line segment joining points (-3, -4) and (1, -2) is divided by y-axis in the ratio **[1]**

a) 1:3

b) 2:3

c) 3:2

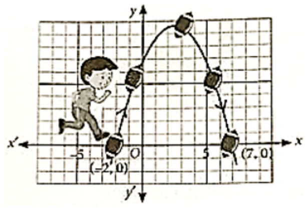
d) 3:1

Section C

Attempt any 8 questions

Question No. 41 to 45 are based on the given text. Read the text carefully and answer the questions:

In a soccer match, the path of the soccer ball in a kick is recorded as shown in the following graph.



41. The zeroes of the polynomial, represented in the given graph, are **[1]**

a) 5, -2 b) -2, 7

c) -3, 8 d) -1, 7

42. Which of the following polynomial has -2 and -3 as its zeroes? **[1]**

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

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

43. For what value of x, the value of the polynomial $f(x) = (x - 3)^2 + 9$ is 9? **[1]**

a) 3 b) 1

c) 4 d) 2

44. The shape of path of the soccer ball is a **[1]**

a) Parabola b) Circle

c) None of these d) Line

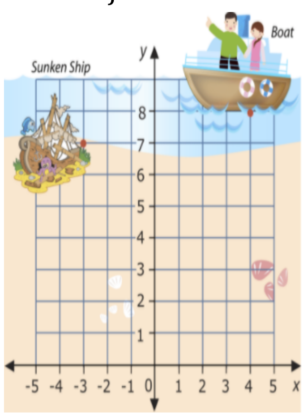
45. The axis of symmetry of the given parabola is **[1]**

a) line parallel to x-axis b) x-axis

c) y-axis d) line parallel to y-axis

Question No. 46 to 50 are based on the given text. Read the text carefully and answer the questions:

Mary and John are very excited because they are going to go on a dive to see a sunken ship. The dive is quite shallow which is unusual because most sunken ship dives are found at depths that are too deep for two junior divers. However, this one is at 40 feet, so the two divers can go to see it.



They have the following map to chart their course. John wants to figure out exactly how far the boat will be from the sunken ship. Use the information in this lesson to help John figure out the following.

46. The coordinates of the boat and the sunken ship respectively **[1]**

a) (-3, 7) and (4, 8)

b) (4, 8) and (-3, 7)

c) (3, -7) and (4, 8)

d) (8, 4) and (7, -3)

47. How much distance will Mary and John swim through the water from the boat to the sunken ship? **[1]**

a) 7 units

b) 8 units

c) 6 units

d) 9 units

48. If each square represents 160 cubic feet of water, how many cubic feet of water will Mary and John swim through from the boat to the sunken ship. **[1]**

a) 1120 cubic feet

b) 1280 cubic feet

c) 2280 cubic feet

d) 2210 cubic feet

49. The shortest distance (in the map) between the boat and the sunken ship is **[1]**

a) $\sqrt{48}$

b) $\sqrt{49}$

c) $\sqrt{47}$

d) $\sqrt{50}$

50. If the distance between the points (x, -1) and (3, 2) is 5, then the value of x is **[1]**

a) -7 or -1

b) -7 or 1

c) 7 or 1

d) 7 or -1

Solution

Section A

1. **(c)** 194400
   Explanation: Let the HCF of the numbers be x and their LCM be y.
   It is given that the sum of the HCF and LCM is 1260, therefore
   x + y = 1260 ....(i)
   And, LCM is 900 more than HCF.
   y = x + 900 ..... (ii)
   Substituting (ii) in (i), we get:
   x + x + 900 =1260
   $\Rightarrow$ 2x + 900 = 1260
   $\Rightarrow$ 2x = 1260 - 900
   $\Rightarrow$2x = 360
   $\Rightarrow$ x = 180
   Substituting x = 180 in (i), we get:
   y = 180 + 900
   $\Rightarrow$ y = 1080
   We also know that the product the two numbers is equal to the product of their LCM and HCF
   Thus, product of the numbers = 1080(180) = 194400
2. **(c)** 4 km/hr
   Explanation: Let speed of boat = x km/h
   speed of current = y km/h
   $\therefore$ Downstream speed = (x + y) km/h
   and Upstream speed = (x - y) km/h
   $\because$ Speed = $\frac{\text{Distance}}{\text{Time}}$
   $\therefore$ Time = $\frac{\text{Distance}}{\text{Speed}}$
   According to question,
   In downstream, $\frac{20}{x+y}$ = 2
   $\Rightarrow$ x + y =10 ... (i)
   And In upstream, $\frac{4}{x-y}$ = 2
   $\Rightarrow$ x - y = 2 ... (ii)
   Subtracting eq. (ii) from (i),
   we get 2y = 8
   $\Rightarrow$ y = 4
   Therefore, the speed of the current is 4 km/h.
3. **(b)** I and III
   Explanation: I and III
   Every equilateral triangle is necessarily an isosceles triangle.
   A triangle in which one of the median is perpendicular to the side it meets, is necessarily an isosceles triangle.
4. **(d)** x = 2, y = 3
   Explanation: We have,
   $\frac{2x}{3} - \frac{y}{2} = -\frac{1}{6}$ ...(i)
   $\frac{x}{2} + \frac{2y}{3} = 3$ ...(ii)
   Now, multiplying (i) and (ii) by 6 we get:
   4x - 3y = - 1 ...(iii)
   3x + 4y = 18 ...(iv)

Now, multiplying (iii) by 4 and (iv) by 3 and adding them we get:
16x + 9x = - 4 + 54
x = $\frac{50}{25}$ = 2
Putting the value of x in (iv) we get:
3×2 + 4y = 18
y = $\frac{18-6}{4}$
y = 3

5. **(d)** tan60^{0}
Explanation: $\frac{2tan\ 30^{0}}{1-tan^{2}\ 30^{0}}$
= $\frac{2\times\frac{1}{\sqrt{3}}}{1-(\frac{1}{\sqrt{3}})^{2}} = \frac{\frac{2}{\sqrt{3}}}{1-\frac{1}{3}}$
= $\frac{\frac{2}{\sqrt{3}}}{\frac{2}{3}}$ = $\frac{2}{\sqrt{3}} \times \frac{3}{2}$
= $\sqrt{3}$
= tan60^{0}

6. **(b)** m = 5 and n = 3
Explanation: $\frac{241}{4000} = \frac{241}{2^{m}\times5^{n}}$
$\Rightarrow \frac{241}{2^{5}\times5^{3}} = \frac{241}{2^{m}\times5^{n}}$
Comparing the denominators of both fractions, we have m = 5 and n = 3

7. **(d)** more than 3
Explanation: The number polynomials having zeroes as –2 and 5 is more than 3. If ‘S’ is the sum and ‘P’ is the product of the zeroes then the corresponding family of quadratic polynomial is given by $p\left(x\right) = k\left(x^{2} - \mathrm{S}x + \mathrm{P}\right)$where k is any real number. Therefore putting different values of k, we can make more than 3 numbers of polynomials.

8. **(c)** 19%
Explanation: Let x be the initial radius of the circle.
Therefore, its area is πx^{2} ....(1)
It is given that the radius is diminished by 10%, therefore, its new radius is calculated as shown below,
new radius = x - 0.10x = 0.90x
$\therefore$ new area $= \pi(0.90x)^{2}$ = $\pi(0.81)x^{2}$
$\therefore$ Change in area = $\pi(0.81x^{2} - x^{2})$ = -0.19x^{2}
Therefore, its area is diminished by 19%.

9. **(a)** $\frac{b^{2}-2ac}{ac}$
Explanation: Since
= $\frac{\alpha^{2}+\beta^{2}}{\alpha\beta}$
= $\frac{(\alpha+\beta)^{2}-2\alpha\beta}{\alpha\beta}$
= $\frac{\left(\frac{-b}{a}\right)^{2}-2\times\frac{c}{a}}{\frac{c}{a}}$
= $\frac{\frac{b^{2}}{a^{2}}-\frac{2c}{a}}{\frac{c}{a}}$
= $\frac{b^{2}-2ac}{a^{2}} \times \frac{a}{c}$
= $\frac{b^{2}-2ac}{ac}$

10. **(a)** 16 cm.
Explanation: In ΔPQR and ΔPRS,
$\angle$PRS = $\angle$PQR [Given]
$\angle$P = $\angle$P [Common]

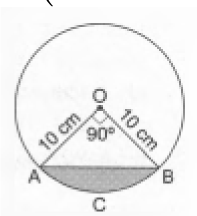
$\therefore \Delta PQR \sim \Delta PRS$ [AA similarity]
$\therefore \frac{PS}{PR} = \frac{PR}{PQ}$
$\Rightarrow \frac{4}{8} = \frac{8}{PQ}$
$\Rightarrow PQ = \frac{8 \times 8}{4} = 16$ cm

11. **(c)** 1 – p
Explanation: If the probability of an event is p, the probability of its complementary event will be 1 - p. because we know that the sum of probability of an event and its complementary event is always 1.
Hence, p + 1 - p = 1

12. **(d)** 2
Explanation: Prime numbers are the numbers which have only two factors, i.e., 1 and number itself.

13. **(c)** $9\sqrt{3}\ \text{cm}^2$
Explanation: $\frac{1}{2} \times a \times h = \frac{\sqrt{3}}{4} a^2$
$\Rightarrow a = \frac{2h}{\sqrt{3}} = \left(\frac{2}{\sqrt{3}} \times 3\sqrt{3}\right) \text{cm} = 6\text{cm}$
$\therefore area = \left(\frac{\sqrt{3}}{4} \times 6 \times 6\right) \text{cm}^2 = 9\sqrt{3}\text{cm}^2$

14. **(d)** $28.5\ \text{cm}^2$
Explanation:
ar(minor segment A C B A)=ar(sector O A C B O) - ar(ΔOAB)
$= \left(\frac{\pi r^2 \theta}{360} - \frac{1}{2} \times r \times r\right)$



$= \left(\frac{3.14 \times 10 \times 10 \times 90}{360} - \frac{1}{2} \times 10 \times 10\right) \text{cm}^2$
$= (78.5 - 50)\text{cm}^2 = 28.5\text{cm}^2$

15. **(a)** $\frac{36}{49}$
Explanation: Given: $\triangle ABC \sim \triangle PQR$
$\therefore \frac{ar(\Delta ABC)}{ar(\Delta PQR)} = \frac{AB^2}{PQ^2}$
$= \frac{(1.2)^2}{(1.4)^2}$
$= \frac{1.44}{1.96}$
$= \frac{36}{49}$

16. **(b)** 2
Explanation: By applying formulae
$\tan\theta = \frac{\sin\theta}{\cos\theta}, \quad \cot\theta = \frac{\cos\theta}{\sin\theta}, \quad \sec\theta = \frac{1}{\cos\theta}, \quad \csc\theta = \frac{1}{\sin\theta}$
$= \left(1 + \frac{\sin\theta}{\cos\theta} + \frac{1}{\cos\theta}\right)\left(1 + \frac{\cos\theta}{\sin\theta} - \frac{1}{\sin\theta}\right)$
$= \left(\frac{1+\cos\theta+\sin\theta}{\cos\theta}\right)\left(\frac{\sin\theta+\cos\theta-1}{\sin\theta}\right)$
Multiplying both terms, we get
$= \frac{\sin\theta+\sin\theta\cos\theta+\sin^2\theta+\cos\theta+\cos^2\theta+\sin\theta\cos\theta-1-\cos\theta-\sin\theta}{\cos\theta\sin\theta}$
$= \frac{\sin^2\theta+\cos^2\theta+2\sin\theta\cos\theta-1}{\cos\theta\sin\theta}$
$= \frac{1+2\sin\theta\cos\theta-1}{\cos\theta\sin\theta}$
$= \frac{2\sin\theta\cos\theta}{\cos\theta\sin\theta}$
= 2
Therefore, (1 + tanθ + secθ)(1 + cotθ - cosecθ) = 2

17. **(b)** $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

Explanation: The system of linear equations $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ has infinitely many solutions because both the equation satisfy the condition i.e $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

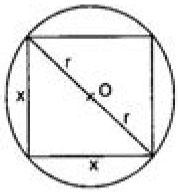
18. **(d)** $\frac{4}{25}$

Explanation: Total number of outcomes = 25
The number which is divisible by both 2 and 3 are 6, 12, 18, 24
Number of favourable outcomes = 4
Probability of number which is divisible by both 2 and 3 = $\frac{4}{25}$

19. **(c)** real

Explanation: Every point on the number line corresponds to a **real** number which may be either rational or irrational.

20. **(c)** 200 sq. cm

Explanation: 

Given: Radius (r) = 10 cm
Let the side of the square be x cm
Now, using Pythagoras theorem,
$x^2 + x^2 = (2r)^2$
$2x^2 = (20)^2$
$\Rightarrow 2x^2 = 400$
$x^2 = 200$ sq. cm
Therefore, the area of the square = 200 sq. cm.

Section B

21. **(a)** $x = \frac{-1}{2}, y = \frac{1}{3}$

Explanation: We have,
$\frac{1}{x} + \frac{2}{y} = 4$ ....(i)
$\frac{3}{y} - \frac{1}{x} = 11$ .....(ii)
Now, adding (i) and (ii) we get:
$\frac{2}{y} + \frac{3}{y} = 15$
$\frac{5}{y} = 15$
$y = \frac{5}{15} = \frac{1}{3}$
Putting the value of y in (i), we get
$\frac{1}{x} + 2 \times 3 = 4$
$\frac{1}{x} = 4 - 6$
$x = -\frac{1}{2}$

22. **(b)** 4 : 1

Explanation: In $\Delta\mathrm{ALM}$ and $\Delta\mathrm{ABC}$, $\angle\mathrm{A} = \angle\mathrm{A}$ [Common] $\angle\mathrm{ALM} = \angle\mathrm{ABC}$ [Corresponding angles as LM||BC]
$\therefore \Delta\mathrm{ALM} \sim \Delta\mathrm{ABC}$ [AA similarity]
$\therefore \frac{\mathrm{ar}(\Delta\mathrm{ALM})}{\mathrm{ar}(\Delta\mathrm{ABC})} = \frac{\mathrm{AL}^2}{\mathrm{AB}^2}$ Now, $\frac{\mathrm{ar(trap.LMCB)}}{\mathrm{ar}(\Delta\mathrm{ALM})} = \frac{9}{16}$
$\Rightarrow \frac{\mathrm{ar}(\Delta\mathrm{ABC}) - \mathrm{ar}(\Delta\mathrm{ALM})}{\mathrm{ar}(\Delta\mathrm{ALM})} = \frac{9}{16}$
$\Rightarrow \frac{\mathrm{ar}(\Delta\mathrm{ABC})}{\mathrm{ar}(\Delta\mathrm{ALM})} - 1 = \frac{9}{16}$

$\Rightarrow \frac{\text{ar}(\Delta\text{ABC})}{\text{ar}(\Delta\text{ALM})} = \frac{9}{16} + 1$

$\Rightarrow \frac{\text{ar}(\Delta\text{ABC})}{\text{ar}(\Delta\text{ALM})} = \frac{25}{16}$

$\Rightarrow \frac{\text{AB}^2}{\text{AL}^2} = \frac{25}{16}$

$\Rightarrow \frac{\text{AB}}{\text{AL}} = \frac{5}{4}$

Let AB = 5x and AL = 4x then LB = AB - AL = 5x - 4x = 1x

$\therefore \frac{\text{AL}}{\text{LB}} = \frac{4x}{1x} = \frac{4}{1}$

$\Rightarrow$ AL : LB = 4 : 1

23. **(d)** 3, 420

Explanation: We have,

12 = 2 $\times$ 2 $\times$ 3

21 = 3 $\times$ 7

15 = 5 $\times$ 3

HCF = 3

and L.C.M = 2 $\times$ 2 $\times$ 3 $\times$ 5 $\times$ 7

= 420

24. **(a)** 23

Explanation: Given, tan θ + cot θ = 5

Now squaring both sides,

(tan θ + cot θ)^2 = 5^2

$\Rightarrow$ tan^2 θ + 2 tan θ cot θ + cot^2 θ = 25

$\Rightarrow$ tan^2 θ + 2 tan θ $\left(\frac{1}{\tan\theta}\right)$ + cot^2 θ = 25

$\Rightarrow$ tan^2 θ + 2 + cot^2 θ = 25

$\Rightarrow$ tan^2 θ + cot^2 θ = 25 - 2

$\Rightarrow$ tan^2 θ + cot^2 θ = 23

$\therefore$ (tan^2 θ + cot^2 θ) = 23

25. **(c)** $\frac{7}{9}$

Explanation: Let the fraction be $\frac{x}{y}$.

According to question

$\frac{x+2}{y+2} = \frac{9}{11}$

$\Rightarrow$ 11x + 22 = 9y + 18

$\Rightarrow$ 11x - 9y = -4 ... (i)

And $\frac{x+3}{y+3} = \frac{5}{6}$

$\Rightarrow$ 6x + 18 = 5y + 15

$\Rightarrow$ 6x - 5y = -3 ... (ii)

On solving eq. (i) and eq. (ii), we get

x = 7, y = 9

Therefore, the fraction is $\frac{7}{9}$

26. **(a)** 10 cm^2

Explanation: Since, if equilateral triangles are drawn on the sides of a right-angled triangle, then the area of the triangle on the hypotenuse is equal to the sum of areas of the triangles on the other two sides.

area $(\triangle ACE)$ = 2 $\times$ $(\triangle BCD)$ ... [ABC is an isosceles triangle]

$\Rightarrow$ 20 = 2 $\times$ area $(\triangle BCD)$

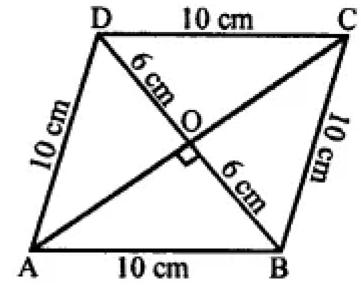
$\Rightarrow$ area$(\triangle BCD)$ = 10 cm^2

27. **(c)** 16 cm

Explanation:

In a rhombus, each side = 10 cm and one diagonal = 12 cm

AB = BC = CD = DA = 10 cm BD = 12 cm



The diagonals of a rhombus bisect each other at right angles.

In $\triangle$AOB,

$AB^2 = AO^2 + BO^2$

$\Rightarrow (10^2 = AO^2 + (6)^2$

$\Rightarrow AO^2 = (10)^2 – (6)^2 = 100 – 36 = 64 = ^2$

AO = 8 cm

Diagonals AC = 2 $\times$ AO = 2 $\times$ 8 = 16 cm

28. **(d)** $\left(-6, \frac{5}{2}\right)$

Explanation: Distance between (0, 0) and $\left(-6, \frac{5}{2}\right)$

d = $\sqrt{(-6-0)^2 + \left(\frac{5}{2}-0\right)^2}$

= $\sqrt{36 + \frac{25}{4}}$

= $\sqrt{\frac{144+25}{4}}$

= $\sqrt{\frac{169}{4}} = \frac{13}{2}$ = 6.5

So, the point $\left(-6, \frac{5}{2}\right)$ does not lie in the circle.

29. **(d)** 2 $\cos^2$ A - 1

Explanation: We have, $\cos^4$ A - $\sin^4$ A = ($\cos^2$ A + $\sin^2$ A) ($\cos^2$ A - $\sin^2$ A)

= 1 ($\cos^2$ A - $\sin^2$ A) = $\cos^2$ A - (1 - $\cos^2$ A)

= $\cos^2$ A - 1 + $\cos^2$ A

= 2 $\cos^2$ A - 1

30. **(a)** a = – 9 and b = 3

Explanation: Given:

$a_1 = 2, a_2 = (a+b), b_1 = -3, b_2 = -(a+b-3), c_1 = 11$ and $c_2 = 4a+b$

Since the pair of given linear equations has infinitely many solutions,

$\therefore \frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

$\Rightarrow \frac{2}{a+b} = \frac{-3}{-(a+b-3)} = \frac{11}{4a+b}$

Taking $\frac{2}{a+b} = \frac{-3}{-(a+b-3)} \Rightarrow 2(a+b-3) = 3(a+b)$

$\Rightarrow 2a + 2b - 6 = 3a + 3b$

$\Rightarrow a + b = -6$ ....(i)

Taking $\frac{2}{a+b} = \frac{11}{4a+b} \Rightarrow 2(4a+b) = 11(a+b)$

$\Rightarrow 8a + 2b = 11a + 11b \Rightarrow a + 3b = 0$ ....(ii)

Subtracting eq. (ii) from eq. (i), we get

$-2b = -6 \Rightarrow b = 3$

Putting the value of b in eq. (i), we get

$a + 3 = -6 \Rightarrow a = -9$

31. **(d)** an irrational number

Explanation: 0.515115111511115... Because it is a non-repeating and non-terminating decimal expression, Hence it is an irrational number.

32. **(b)** coprime

Explanation: We know that the co-prime numbers have no factor in common, or, their HCF is 1.

Thus, p^2 and q^2 have the same factor with exponent 2 each. which again will not have any common factor.

Thus we can conclude that p^2 and q^2 are co-prime numbers.

33. **(a)** $\tan\theta$

Explanation: Here $\sqrt{(1-\cos^2\theta)\sec^2\theta}$

$=\sqrt{\sin^2\theta \times \frac{1}{\cos^2\theta}}$

$[\because 1 - \cos^2\theta = \sin^2\theta$ and $\sec^2\theta = \frac{1}{cos^2\theta}$

$= \sqrt{\frac{\sin^2\theta}{\cos^2\theta}}$

$= \sqrt{\tan^2\theta}$

$= \tan\theta$

34. **(b)** 28 m

Explanation: Distance moved in 1 revolution $=\frac{88000}{1000}\text{m} = 88\text{m}$

$\pi d = 88 \Rightarrow \frac{22}{7} \times d = 88$

$\Rightarrow d = \left(88 \times \frac{7}{22}\right) = 28\text{m}$

35. **(b)** $\frac{6}{23}$

Explanation: Total number of students = 23

Number of students in house A, B and C = 4 + 8 + 5 = 17

$\therefore$ Remaining students = 23 - 17 = 6

So, probability that the selected student is not from A, B and C = $\frac{6}{23}$

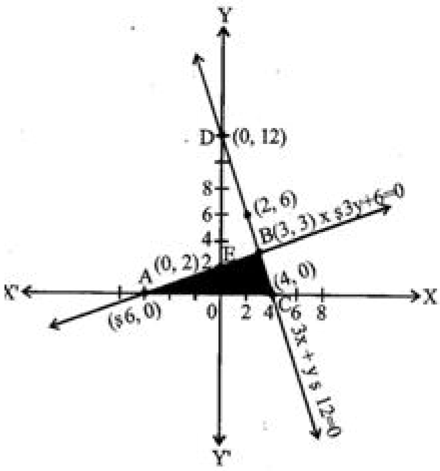
36. **(d)** (0, 2) and (0, 12)

Explanation: Here are the two solutions of each of the given equations. $3x + y - 12 = 0$,

x	0	3	4
y	12	3	0

$x - 3y + 6 = 0$

x	0	3	-6
y	2	3	0



The triangle ABC is formed by the given two lines and x-axis. Therefore, both lines intersect the y-axis at (0, 2) and at (0, 12).

37. **(a)** equal

Explanation: If we assume that a and b are equal and consider a = b = k

Then,

HCF (a, b)= k

LCM (a, b) = k

38. **(a)** sec A - tan A

Explanation: $\sqrt{\frac{1-\sin A}{1+\sin A}}=\sqrt{\frac{(1-\sin A)}{(1+\sin A)}\times\frac{(1-\sin A)}{(1-\sin A)}}=\frac{(1-\sin A)}{\sqrt{1-\sin^2 A}}=\frac{(1-\sin A)}{\sqrt{\cos^2 A}}$
$=\frac{(1-\sin A)}{\cos A}=\left(\frac{1}{\cos A}-\frac{\sin A}{\cos A}\right)=(\sec A-\tan A)$

39. **(c)** $\frac{3}{13}$

Explanation: Total number of outcomes = 52
Favourable outcomes in this case = 4 + 4 + 4 = 12 {4 jacks, 4 queens, 4 kings}
∴ P(a jack, a queen or a king) = $\frac{Favourable\ outcomes}{Total\ outcomes}$ = $\frac{12}{52}$ = $\frac{3}{13}$

40. **(d)** 3:1

Explanation: The point lies on y-axis
Its abscissa will be zero
Let the point divides the line segment joining the points (-3, -4) and (1, -2) in the ratio m:n
$\therefore 0=\frac{mx_2+nx_1}{m+n}\Rightarrow 0=\frac{m\times 1+n\times(-3)}{m+n}$
$\Rightarrow\frac{m-3n}{m+n}=0\Rightarrow m-3n=0$
$\Rightarrow m=3n\Rightarrow\frac{m}{n}=\frac{3}{1}$
∴ Ratio = 3:1

Section C

41. **(b)** -2, 7

Explanation: The zeroes of the polynomial, represented in the given graph, are -2 and 7, since the curve cuts the x-axis at these points.

42. **(b)** x^2 + 5x + 6

Explanation: A polynomial having zeroes -2 and -3 is p(x) = x^2 - (-2 - 3)x + (-2)(-3) = x^2 + 5x + 6

43. **(a)** 3

Explanation: We have, f(x) = $(x - 3)^2$ + 9
Now, 9 = $(x - 3)^2$ + 9
⇒ $(x - 3)^2$ = 0 ⇒ x - 3 = 0 ⇒ x = 3

44. **(a)** Parabola

Explanation: The shape of the path of the soccer ball is a parabola.

45. **(d)** line parallel to y-axis

Explanation: The axis of symmetry of the given curve is a line parallel to y-axis.

46. **(b)** (4, 8) and (-3, 7)

Explanation: (4, 8) and (-3, 7)

47. **(b)** 8 units

Explanation: 8 units

48. **(b)** 1280 cubic feet

Explanation: 1280 cubic feet

49. **(d)** $\sqrt{50}$

Explanation: $\sqrt{50}$

50. **(d)** 7 or -1

Explanation: 7 or -1