4

SAMPLE PAPER
SOLVED

MATHEMATICS
(STANDARD)

Time Allowed: 90 Minutes *Maximum Marks: 40*

General Instructions: Same instructions as given in the Sample Paper 1.

SECTION - A **16 marks**

(Section A consists of 20 questions of 1 mark each. Any 16 questions are to be attempted.)

1. A quadratic polynomial with sum and product of zeroes as $-\frac{1}{4}$ and $\frac{1}{4}$, respectively, is:

(a) $4x^2 - x + 1$ (b) $4x^2 + x + 1$
(c) $4x^2 + x - 1$ (d) $4x^2 - x - 1$

2. In a ΔABC right-angled at B, AB : AC = 1 : 2. Then the value of $\frac{\cot A + \tan C}{\sin B + \cos B}$ is:

(a) $\frac{2}{\sqrt{3}}$ (b) $\frac{\sqrt{3}+1}{2}$
(c) $\frac{2\sqrt{2}-\sqrt{3}}{2}$ (d) $\sqrt{3}-1$

3. The value of $\sin^2 60° + 2 \tan 45° - \cos^2 30°$ is :

(a) 0 (b) 1
(c) 2 (d) $\frac{1}{3}$

4. What will be the decimal expansion of the rational number $\frac{27}{1250}$?

(a) 0.0125 (b) 0.0021
(c) 0.0315 (d) 0.0216

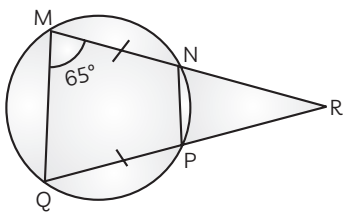
5. What is the point on y-axis which is equidistant from the points (2, 3) and (–4, 1)?

(a) (0, –1) (b) (0, 1)
(c) (0, 2) (d) (0, –2)

6. Ramesh draws a card randomly from a deck of 52 cards. The probability that this card bears an even number in black is:

(a) $\frac{1}{13}$ (b) $\frac{1}{52}$
(c) $\frac{2}{13}$ (d) $\frac{5}{26}$

7. As shown in the figure, MN = QP and on producing MN and QP, they intersect at R. If MQ || NP and $\angle NMQ = 65°$, calculate $\angle R$.



(a) 30° (b) 25°
(c) 35° (d) 50°

8. Find a relation between a and b, for which the system of equations $ax + 2y = 7$ and $3x + by = 16$ represents parallel lines.

(a) $a - b = 5$ (b) $a + 2b = 7$
(c) $ab = 6$ (d) $a = 2b$

9. Calculate the value of $\alpha^2 - \beta^2$, where α, β are zeroes of the polynomial $x^2 - 5x + 6$.

(a) 0 (b) 2
(c) 7 (d) 5.

10. A number is selected from the numbers 1, 2 ..., 15. What is the probability that it is a multiple of 4?

(a) $\frac{7}{15}$ (b) $\frac{2}{5}$

(c) $\frac{1}{5}$ (d) $\frac{2}{15}$

11. From where does the graph of the equation $x - y = 0$ passes?

(a) x-axis

(b) y-axis

(c) Origin

(d) Data insufficient

12. What is the value of $\beta - \alpha$, if $\sin\alpha = \frac{\sqrt{3}}{2}$ and $\cos\beta = 0$?

(a) 0° (b) 30°

(c) 45° (d) 60°

13. If $(x - 2)$ is a factor of polynomial $p(x) = x^3 + 2x^2 - kx + 10$, then the value of k is:

(a) 10 (b) 11

(c) 12 (d) 13

14. A(3, 2) and B(–2, 1) are two vertices of $\triangle ABC$. If $G\left(\frac{5}{3}, -\frac{1}{3}\right)$ is the centroid of $\triangle ABC$, then the coordinates of vertex C are:

(a) (4, –4) (b) (1, –4)

(c) (3, 2) (d) (9, 7)

15. What will be the maximum number of students among whom 1001 pens and 910 pencils can be distributed provided that each student gets the same number of pens and pencils?

(a) 70 (b) 93

(c) 91 (d) 82

16. Calculate the value of a, if $x = a$ and $y = b$ is the solution of the linear equations $x - y = 2$ and $x + y = 4$.

(a) 1 (b) 3

(c) 2 (d) 0

17. Evaluate $\tan\theta$, if $\sin\theta + \cos\theta = \sqrt{2}\cos\theta$, $(\theta \neq 90°)$.

(a) 0 (b) $\sqrt{2}$

(c) $\sqrt{2}+1$ (d) $\sqrt{2}-1$

18. A rational number in its decimal expansion is 1.7321. If the number is expressed in the form of $\frac{p}{q}$, then q must be of the form:

(a) $2^m 7^n$ (b) $3^m 5^n$

(c) $2^m 5^n$ (d) $3^m 7^n$

19. What is the value of k in the quadratic polynomial $kx^2 + 4x + 3k$, if the sum of the zeroes is equal to their product ?

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

(c) $\frac{1}{0}$ (d) –5

20. Find the value of k for which the linear equations $x + 2y = 3$ and $5x + ky = 7$, does not have a unique solution.

(a) 5 (b) 7

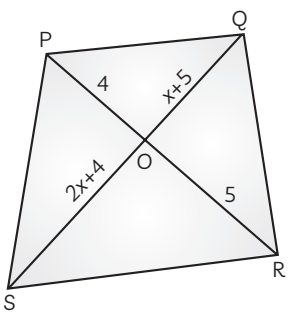
(c) 2 (d) 10

SECTION - B

16 marks

(Section B consists of 20 questions of 1 mark each. Any 16 questions are to be attempted.)

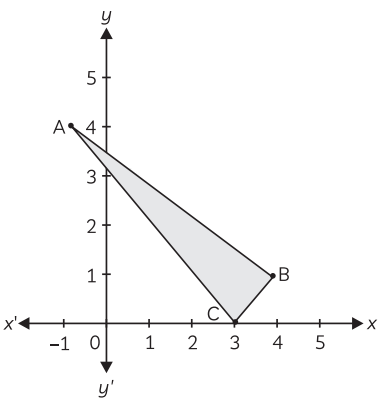
21. In the given figure, PQRS is a trapezium, such that PQ || SR. Find x.



(a) 2 (b) 5

(c) 3 (d) 4

22. In the given figure, the centroid of $\triangle ABC$ is:



(a) $\left(3, \frac{5}{2}\right)$ (b) $\left(\frac{5}{2}, 3\right)$

(c) $\left(2, \frac{5}{3}\right)$ (d) $\left(\frac{5}{3}, 2\right)$

23. Salesman was having a lot of 100 shirts of which 88 are good, 8 have minor defects and 4 have major defects. Suresh, a shopkeeper will buy only those shirts which are good. If a shirt is selected at random from the lot, what is the probability that he will buy the shirt?

(a) $\frac{22}{25}$ (b) $\frac{23}{25}$

(c) $\frac{11}{100}$ (d) $\frac{24}{25}$

24. Consider two numbers as x and y. The sum of them is 33 and their difference is 17. Find the numbers.

(a) 11 and 22 (b) 25 and 8

(c) 17 and 26 (d) 24 and 9

25. The number of solutions of the pair of linear equations $x + 3y = 4$ and $2x + y = 5$ is:

(a) One (b) Infinite

(c) No Solution (d) Two

26. Write the sum of exponents of prime factors in the prime factorisation of 250.

(a) 4 (b) 6

(c) 8 (d) 3

27. Which of the following condition is correct for the graph of a quadratic polynomial $p(x) = ax^2 + bx + c$ to be an upward parabola?

(a) $a < 0$ (b) $a = 0$

(c) $a > 0$ (d) $b = 0$

28. Evaluate $0.\overline{68} + 0.\overline{73}$.

(a) $1.\overline{31}$ (b) $1.\overline{42}$

(c) $1.\overline{21}$ (d) $1.0\overline{1}$

29. Calculate the LCM of two positive integers whose product is 108 and HCF is 3.

(a) 72 (b) 36

(c) 18 (d) 9

30. What is the value of θ in the expression, $\tan 3\theta = \sin 45° \cos 45° + \sin 30°$?

(a) 0° (b) 15°

(c) 30° (d) 45°

31. What is the value of x if the probability of guessing the correct answer to a certain test question is $\frac{x}{12}$ and the probability of not guessing the correct answer to this question is $\frac{2}{3}$?

(a) 4 (b) 6

(c) 5 (d) 3

32. The mid-point of $(3p, 4)$ and $(-2, 2q)$ is $(2, 6)$. The value of $(p + q)$ is:

(a) 5 (b) 6

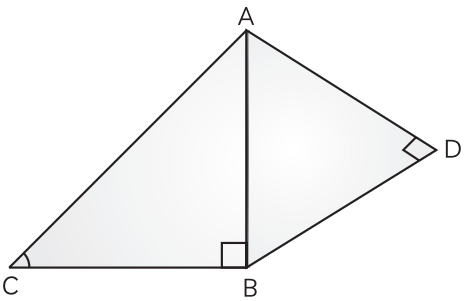
(c) 7 (d) 8

33. Degree of a zero polynomial is:

(a) 0 (b) 1

(c) 2 (d) Not defined

34. In the given figure, AD = 4 cm, BD = 3 cm and CB = 12 cm. Then $\cot\theta$ =



(a) $\frac{3}{4}$ (b) $\frac{5}{12}$

(c) $\frac{4}{3}$ (d) $\frac{12}{5}$

35. The value of $(\tan\theta \operatorname{cosec}\theta)^2 - (\sin\theta \sec\theta)^2$ is :

(a) –1 (b) 0

(c) 1 (d) 2

36. *Priyanka, a X standard student, has only ₹ 1 and ₹ 2 coins in her piggy bank. While counting, she found that total number of coins are 50 and amount of money with her is ₹ 75. Observing that, certain question arises into her mind. She denote the number of ₹ 1 coins by x and ₹ 2 coins by y.*

What are the number of ₹ 1 coins in her piggy bank?

(a) 10 (b) 20

(c) 22 (d) 25

37. Find the value(s) of x, if the distance between the points A$(x, -1)$ and B$(3, 2)$ is 5.

(a) 7, –1 (b) 1, 7

(c) –7, 1 (d) –1, –7

38. In what ratio does x-axis divides the join of A$(2, -3)$ and B$(5, 6)$?

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

39. Calculate the least positive integer which is divisible by 20 and 24.
(a) 120 (b) 200
(c) 150 (d) 480

40. Which among the following is the relation between x and y such that the point (x, y) is equidistant from (7, 1) and (3, 5)?
(a) $x - y = 2$
(b) $3x + 2y = 6$
(c) $7x - 8y = 0$
(d) $3x - 2y = 4$

SECTION - C

8 marks

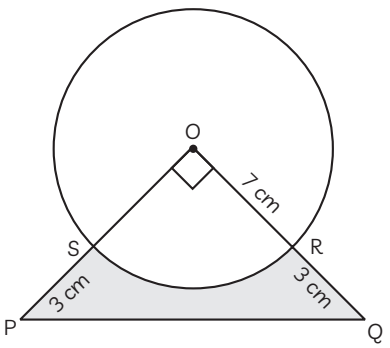
(Case Study Based Questions.)

(Section C consists of 10 questions of 1 mark each. Any 8 questions are to be attempted.)

Q. 41-45 are baded on Case Study–1

Case Study–1:

St. Francis is organising their annual fest. They want to give cash prize along with a momento to their best students. Four identical momento are made by the school to award students for four values i.e. Honesty, Punctuality, Cleanliness and Non-violence. Each momento is made as shown in figure and its base PQRS is shown from the front side. The part PQRS is silver plated. The rate of silver plating is ₹20 per m^2.



41. What is the area of quadrant OSRO?
(a) 36.5 cm^2 (b) 38.5 cm^2
(c) 39 cm^2 (d) 40 cm^2

42. Evaluate the area of ΔPOQ.
(a) 36 cm^2 (b) 48 cm^2
(c) 50 cm^2 (d) 52 cm^2

43. What is the total cost of silver plating the part PQRS?
(a) ₹ 200 (b) ₹ 230
(c) ₹ 280 (d) ₹ 420

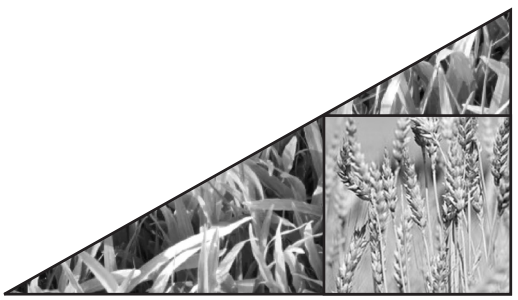
44. Calculate the area of major sector in the figure.
(a) 112 cm^2 (b) 114 cm^2
(c) 100 cm^2 (d) 115.5 cm^2

45. What is the length of arc SR?
(a) 10 cm (b) 11 cm
(c) 12 cm (d) 14 cm

Q. 46-50 are baded on Case Study 2

Case Study-2 :

Rajesh has a field which is in the shape of a right angled triangle. The perpendicular and the base are of lengths 144 m and 84 m respectively. He wants to leave a space in the form of a square of largest size inside the field for growing wheat and the remaining for growing vegetables.



46. Which among the following is the incorrect criterion of similarity?
(a) ASA (b) SSS
(c) SAS (d) AAA

47. If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, then other two sides are divided in the same ratio. Identify the theorem.
(a) Bisector theorem
(b) Pythagoras theorem
(c) Thales theorem
(d) Alternate segment theorem

48. **What is the length of the side of squared space?**

(a) **55.2 m**

(b) **53.05 m**

(c) **54 m**

(d) **52.05 m**

49. **What is the area of the square field?**

(a) **2850.70 m^2** **(b)** **2820.40 m^2**

(c) **2930 m^2** **(d)** **2814.30 m^2**

50. **Evaluate the area of the remaining field, other than the square field?**

(a) **3232.5 m^2** **(b)** **3645 m^2**

(c) **3250 m^2** **(d)** **3233.7 m^2**

SOLUTION

SAMPLE PAPER - 4

SECTION - A

1. *(b)* $4x^2 + x + 1$

Explanation: We know a quadratic polynomial with S and P as sum and product of zeroes respectively, is gives as

$$p(x) = k(x^2 - Sx + P).$$

where, k is constant

Here, $S = -\frac{1}{4}$ and $P = \frac{1}{4}$

$$\therefore \quad p(x) = k\left[x^2 - \left(-\frac{1}{4}\right)x + \frac{1}{4}\right]$$

$$= \frac{k}{4}\left(4x^2 + x + 1\right)$$

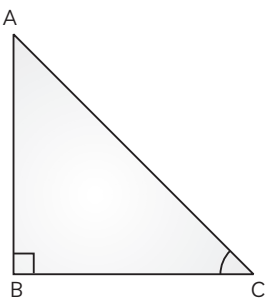
If $k = 4$, then

$$p(x) = 4x^2 + x + 1$$

2. *(a)* $\frac{2}{\sqrt{3}}$

Explanation: In ΔABC,

$$\angle B = 90° \text{ and } \frac{AB}{AC} = \frac{1}{2}$$



$$\because \quad \sin C = \frac{AB}{AC} = \frac{1}{2} = \sin 30°$$

$$\Rightarrow \quad \angle C = 30°$$

So, $\angle A = 180° - (\angle C + \angle B)$

[Using angle sum property]

$$= 180° - (30° + 90°)$$

$$= 60°$$

$$\text{Now, } \frac{\cot A + \tan C}{\sin B + \cos B} = \frac{\cot 60° + \tan 30°}{\sin 90° + \cos 90°}$$

$$= \frac{\frac{1}{\sqrt{3}} + \frac{1}{\sqrt{3}}}{1 + 0} = \frac{2}{\sqrt{3}}$$

3. *(c)* *2*

Explanation: $\sin^2 60° + 2 \tan 45° - \cos^2 30°$

$$= \left(\frac{\sqrt{3}}{2}\right)^2 + 2 \times 1 - \left(\frac{\sqrt{3}}{2}\right)^2$$

$$= 2$$

4. *(d)* *0.0216*

Explanation: We have,

$$\frac{27}{1250} = \frac{27}{2 \times 5^4}$$

$$= \frac{27 \times 2^3}{2 \times 2^3 \times 5^4} = \frac{27 \times 8}{2^4 \times 5^4}$$

$$= \frac{216}{(10)^4} = \frac{216}{10000} = 0.0216$$

5. *(a)* *(0, –1)*

Explanation: We know that x-coordinate on y-axis is zero.

Therefore, let the point on y-axis be P(0, y) and given points are A(2, 3) and B(–4, 1).

$$\therefore \quad PA = PB$$

$\Rightarrow$ $PA^2 = PB^2$

$\Rightarrow (0-2)^2 + (y-3)^2 = (0+4)^2 + (y-1)^2$

$\Rightarrow 4 + y^2 - 6y + 9 = 16 + y^2 - 2y + 1$

$\Rightarrow -4y = 17 - 13 = 4$

$\Rightarrow y = -1$

$\therefore$ Point on y-axis is $(0, -1)$.

6. *(d)* $\frac{5}{26}$

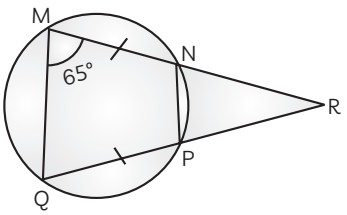
Explanation: Total number of cards = 52

Number of favourable outcomes *i.e.*, card bearing an even number in black = 10

$\therefore$ Required probability = $\frac{10}{52} = \frac{5}{26}$

7. *(d) 50°*

Explanation: In figure,



NP || MQ

$\therefore$ $\angle RNP = \angle M = 65°$ [Corresponding angles]

Also, $\frac{RN}{NM} = \frac{RP}{PQ}$ [By BPT]

$\Rightarrow$ $RN = RP$ [$\because$ MN = PQ]

$\therefore$ $\angle RNP = \angle RPN = 65°$

In ΔRNP,

$\angle R + \angle RNP + \angle RPN = 180°$

$\angle R + 65° + 65° = 180°$

$\angle R + 130° = 180°$

$\angle R = 50°$

8. *(c) ab = 6*

Explanation: We have

$ax + 2y = 7$

and $3x + by = 16$

Condition for parallel lines is:

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

$\Rightarrow \frac{a_1}{a_2} = \frac{b_1}{b_2}$

$\Rightarrow \frac{a}{3} = \frac{2}{b}$

$\Rightarrow ab = 6$

9. *(d) 5*

Explanation : Let $p(x) = x^2 - 5x + 6$

To find zeroes of $p(x)$,

put $p(x) = 0$

$\Rightarrow (x-3)(x-2)$

$\Rightarrow x = 2, 3.$

So, $\alpha = 3$ and $\beta = 2$

Hence, $\alpha^2 - \beta^2 = 9 - 4 = 5$

10. *(c)* $\frac{1}{5}$

Explanation: Numbers divisible by 4 from 1 to 15 are 4, 8, 12.

$\therefore$ Number of favourable cases = 3

Number of total possible outcomes = 15

$\therefore$ Required probability = $\frac{3}{15} = \frac{1}{5}$

11. *(c) origin*

Explanation: As $x - y = 0$

$x = y$

$\therefore$ which represents a line, passing through the origin.

12. *(b) 30°*

Explanation: Given, $\sin\alpha = \frac{\sqrt{3}}{2}$

$\Rightarrow \sin\alpha = \sin 60° \Rightarrow \alpha = 60°$

and $\cos\beta = 0 \Rightarrow \cos\beta = \cos 90°$

$\Rightarrow \beta = 90°$

$\therefore$ $\beta - \alpha = 90° - 60° = 30°$

13. *(d) 13*

Explanation: Since, $(x - 2)$ is a factor of $p(x)$,

$\therefore p(x = 2) = 0$

$\Rightarrow (2)^3 + 2(2)^2 - k(2) + 10 = 0$

$\Rightarrow 8 + 8 - 2k + 10 = 0$

$\Rightarrow 26 - 2k = 0$

$\Rightarrow k = 13$

14. *(c) (4, –4)*

Explanation: Let the coordinates of vertex C be (x, y),

Then,

$$G\left(\frac{5}{3}, -\frac{1}{3}\right) = \left(\frac{3+(-2)+x}{3}, \frac{2+1+y}{3}\right)$$

$\Rightarrow \frac{5}{3} = \frac{1+x}{3}; -\frac{1}{3} = \frac{3+y}{3}$

$\Rightarrow x = 5 - 1;\ y = -1 - 3$

$\Rightarrow x = 4;\ y = -4$

$\therefore$ Vertex C = (4, –4)

15. *(c) 91*

Explanation: Maximum number of students to have same number of pens and pencils

$= \text{HCF}(1001, 910)$

$= \text{HCF}(11 \times 91, 10 \times 91)$

$= 91$

16. *(b) 3*

Explanation: We have $x - y = 2$ and $x + y = 4$

Also $x = a$ and $y = b$ is the solution of given equations.

$\therefore \quad a - b = 2 \quad ...(i)$

and $\quad a + b = 4 \quad ...(ii)$

On adding equations (i) and (ii), we get

$2a = 6$

$\Rightarrow \quad a = 3$

17. *(d) $\sqrt{2} - 1$*

Explanation: We have,

$\sin\theta + \cos\theta = \sqrt{2}\cos\theta$

$\Rightarrow \quad \sin\theta = \sqrt{2}\cos\theta - \cos\theta$

$\Rightarrow \quad \sin\theta = \cos\theta\,(\sqrt{2} - 1)$

$\Rightarrow \quad \frac{\sin\theta}{\cos\theta} = \sqrt{2} - 1$

$\Rightarrow \quad \tan\theta = \sqrt{2} - 1$

18. *(c) $2^m 5^n$*

Explanation: For a rational number to be a terminating decimal, its denominator must be of the form $2^m 5^n$, where, m, n are non-negative integers.

19. *(a) $-\frac{4}{3}$*

Explanation: Let α and β be the zeroes of polynomial $kx^2 + 4x + 3k$.

According to the question.

$\alpha + \beta = \alpha\beta$

$\Rightarrow \quad \frac{-4}{k} = \frac{3k}{k}$

$\Rightarrow \quad k = -\frac{4}{3} \quad [\because k \neq 0]$

20. *(d) 10*

Explanation: For unique solution, we have

$\frac{1}{5} \neq \frac{2}{k} \Rightarrow k \neq 10$

So, if, $k = 10$, then the given system of linear equations will not have unique solution.

SECTION - B

21. *(c) 3*

Explanation: Since PQ || SR,

$\therefore \quad \Delta POQ \sim \Delta ROS$

[By AAA similarity criteria]

$\therefore \quad \frac{PO}{OR} = \frac{QO}{OS}$

$\Rightarrow \quad \frac{4}{5} = \frac{x+5}{2x+4}$

$\Rightarrow \quad 8x + 16 = 5x + 25$

$\Rightarrow \quad 3x = 9$

$\Rightarrow \quad x = 3$

22. *(d) $\left(2, \frac{5}{3}\right)$*

Explanation: From the graph,

Coordinates of A = (–1, 4)

Coordinates of B = (4, 1)

Coordinates of C = (3, 0)

$\therefore$ Centroid of ΔABC

$= \left(\frac{-1+4+3}{3}, \frac{4+1+0}{3}\right)$

$= \left(\frac{6}{3}, \frac{5}{3}\right) = \left(2, \frac{5}{3}\right)$

23. *(a) $\frac{22}{25}$*

Explanation: Total number of shirts = 100

Number of good shirts = 88

$\therefore$ P(Sumesh buys the shirt) $= \frac{88}{100} = \frac{22}{25}$

24. *(b) 25 and 8*

Explanation: Let the two numbers be x and y. such that $x > y$.

$\therefore \quad x + y = 33 \quad ...(i)$

and $\quad x - y = 17 \quad ...(ii)$

On adding equations (i) and (ii), we get

$2x = 50 \Rightarrow x = 25$

On putting $x = 25$ in equation (i), we get

$25 + y = 33$

$\Rightarrow \quad y = 33 - 25 = 8$

Hence, the two numbers are 25 and 8.

25. *(a) One*

Explanation: Equations are

$x + 3y = 4$

and $\quad 2x + y = 5$

Here, $\quad a_1 = 1, b_1 = 3, c_1 = -4$

$a_2 = 2, b_2 = 1, c_2 = -5$

$\therefore \quad \frac{a_1}{a_2} = \frac{1}{2}; \frac{a_1}{a_2} = \frac{3}{1}; \frac{c_1}{c_2} = \frac{4}{5}$

$\Rightarrow \quad \frac{a_1}{a_2} \neq \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

$\therefore$ Equations have an unique solution.

Caution

Here compare the coefficients of given equations to find the type of solution the pair of equations have.

26. *(a) 4*

Explanation: Prime factorisation of 250 is

$250 = 2 \times 5 \times 5 \times 5$

$= 2^1 \times 5^3$

$\therefore$ Sum of exponents $= 1 + 3 = 4$

27. *(c) $a > 0$*

Explanation: For the graph of a quadratic polynomial $p(x) = ax^2 + bx + c$ to be an upward, parabola, $a > 0$.

28. *(b) $1.\overline{42}$*

Explanation:

Let $x = 0.\overline{68} = 0.6868....$ ...(i)

$\Rightarrow \quad 100x = 68.68....$ ...(ii)

Subtracting (i) from (ii), we get

$99x = 68$

$\Rightarrow \quad x = \frac{68}{99}$

Similarly, let $y = 0.\overline{73} = 0.7373...$ ...(iii)

$\Rightarrow \quad 100\,y = 73.73...$ ...(iv)

Subtracting (iii) from (iv), we get

$99\,y = 73$

$\Rightarrow \quad y = \frac{73}{99}$

Now, $0.\overline{68} + 0.\overline{73} = x + y$

$= \frac{68}{99} + \frac{73}{99}$

$= \frac{141}{99} = 1.424242...$

$= 1.\overline{42}$

Caution

For calculating the sum, first convert the given decimals in rational form. Then, find the final answer in decimal form.

29. *(b) 36*

Explanation: Let a and b be any two positive integers. Then, we have,

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

$\Rightarrow \quad \text{LCM}(a, b) \times 3 = 108$

$\Rightarrow \quad \text{LCM}(a, b) = \frac{108}{3} = 36$

30. *(b) 15°*

Explanation: We have,

$\tan 3\theta = \sin 45° \cos 45° + \sin 30°$

$\Rightarrow \quad \tan 3\theta = \frac{1}{\sqrt{2}} \times \frac{1}{\sqrt{2}} + \frac{1}{2}$

$\Rightarrow \quad \tan 3\theta = \frac{1}{2} + \frac{1}{2} = 1$

$\Rightarrow \quad \tan 3\theta = 1 \Rightarrow \tan 3\theta = \tan 45°$

$\Rightarrow \quad 3\theta = 45°$

$\therefore \quad \theta = 15°$

31. *(a) 4*

Explanation: We have,

P(not guessing correct answer) $= \frac{2}{3}$

$\therefore$ P(guessing correct answer)

$= 1 -$ P(not guessing correct answer)

$= 1 - \frac{2}{3} = \frac{1}{3}$

So, according to the question,

$\frac{x}{12} = \frac{1}{3} \Rightarrow x = 4$

32. *(b) 6*

Explanation: Since, (2, 6) is the mid-point of $(3p, 4)$ and $(-2, 2q)$

$\therefore \quad (2, 6) = \left(\frac{3p + (-2)}{2}, \frac{4 + 2q}{2}\right)$

$\Rightarrow \quad 2 = \frac{3p - 2}{2}; \quad 6 = \frac{4 + 2q}{2}$

$\Rightarrow \quad 3p = 4 + 2 = 6; \quad 2q = 12 - 4 = 8$

$\Rightarrow \quad p = 2; \quad q = 4$

$\therefore \quad p + q = 2 + 4 = 6$

33. *(d) Not defined*

34. *(d) $\frac{12}{5}$*

Explanation: In ΔABD, using Pythagoras theorem

$AB^2 = AD^2 + BD^2$

$= 4^2 + 3^2$

$= 16 + 9 = 25$

$\Rightarrow \quad AB = \sqrt{25} = 5$

Now, in ΔABC

$\cot\theta = \frac{BC}{AB} = \frac{12}{5}$

35. *(c) 1*

Explanation: $(\tan\theta \operatorname{cosec}\theta)^2 - (\sin\theta \sec\theta)^2$

$$= \left(\frac{\sin\theta}{\cos\theta}\times\frac{1}{\sin\theta}\right)^2 - \left(\sin\theta\times\frac{1}{\cos\theta}\right)^2$$

$$= \left(\frac{1}{\cos\theta}\right)^2 - \left(\frac{\sin\theta}{\cos\theta}\right)^2$$

$$= \sec^2\theta - \tan^2\theta$$

$$= 1$$

36. *(d) 25*

Explanation: The system of linear equations, representing the given situation, is

$$x + y = 50 \quad \text{...(i)}$$

and $$x + 2y = 75 \quad \text{...(ii)}$$

On subtracting (i) from (ii), we get

$$y = 25$$

On substituting $y = 25$ in (i), we get

$$x = 25$$

Thus, total number of ₹ 1 coins is 25.

37. *(a) 7, –1*

Explanation: Let A(x, – 1) and B(3, 2) be the given points.

So, $AB = 5$ units [Given]

$$\Rightarrow \sqrt{(x-3)^2 + (-1-2)^2} = 5$$

[Using distance formula]

$$\Rightarrow (x-3)^2 + 9 = 5^2$$

$$\Rightarrow x^2 - 6x + 18 = 25$$

$$\Rightarrow x^2 - 6x - 7 = 0$$

$$\Rightarrow (x-7)(x+1) = 0$$

$$\Rightarrow x = 7 \text{ or } -1.$$

38. *(c) 1 : 2*

Explanation: Let the required ratio be $k : 1$.

We know, y-coordinate of any point on x-axis is zero.

$\therefore$ Using section formula,

$$\frac{6k-3}{k+1} = 0$$

$$\Rightarrow 6k - 3 = 0 \Rightarrow k = \frac{1}{2}$$

$\therefore$ Required ratio $= k : 1 = \frac{1}{2} : 1 = 1 : 2$

39. *(a) 120*

Explanation: We have,

$$20 = 2^2 \times 5 \text{ and } 24 = 2^3 \times 3$$

$\therefore$ Required number = LCM(20, 24)

$$= 2^3 \times 3 \times 5 = 120$$

40. *(a) $x - y = 2$*

Explanation: As point P(x, y) is equidistant from A(7, 1) and B(3, 5)

$\therefore$ $PA = PB$

or $PA^2 = PB^2$

$$\Rightarrow (x-7)^2 + (y-1)^2 = (3-x)^2 + (5-y)^2$$

$$\Rightarrow x^2 - 14x + 49 + y^2 - 2y + 1 = 9 - 6x + x^2 + 25 - 10y + y^2$$

$$\Rightarrow -14x - 2y + 50 = -6x - 10y + 34$$

$$\Rightarrow 8x - 8y = 16$$

$$\Rightarrow x - y = 2$$

SECTION - C

41. *(b) 38.5 cm^2*

Explanation:

$$\text{Area of quadrant OSRO} = \frac{1}{4}\pi r^2$$

$$= \frac{1}{4}\times\frac{22}{7}\times 7\times 7$$

$$= 38.5 \text{ cm}^2$$

42. (c) *50 cm^2*

Explanation: Area of $\Delta POQ = \frac{1}{2} \times OP \times OQ$

$$= \frac{1}{2}\times 10\times 10$$

[$\because$ OS = OR = 7 cm and OQ = OR + RQ = 10 cm]

$$= 50 \text{ cm}^2$$

43. *(b) ₹ 230*

Explanation: Area of region which is to be silver plated

= Area of ΔOPQ – Area of sector OSRO

= 50 – 38.5 [from Q 41 and Q 42]

$$= 11.5 \text{ cm}^2$$

$\therefore$ Total cost of silver plating

= ₹ 20 × 11.5 = ₹ 230

44. *(d) 115.5 cm^2*

Explanation:

Area of major sector = Area of circle – Area of minor sector

$$= \pi r^2 - \frac{1}{4}\pi r^2 = \frac{3}{4}\pi r^2$$

$$= \frac{3}{4} \times \frac{22}{7} \times 7 \times 7$$

$$= 115.5 \text{ cm}^2$$

45. *(b) 11 cm*

Explanation:

$$\text{Length of arc SR} = \frac{\theta}{360°} \times 2\pi r$$

$$= \frac{90°}{360°} \times 2 \times \frac{22}{7} \times 7$$

$$= 11 \text{ cm}$$

46. *(a) ASA*

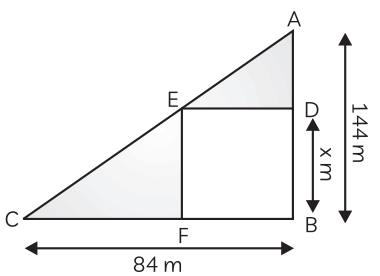
Explanation: ASA criterion of similarity does not exist.

47. *(c) Thales theorem*

Explanation: Given statement is a statement of Thales theorem (BPT theorem).

48. *(b) 53.05 m*

Explanation: Let ABC be the right triangular field. Also, let BDEF be the required square space of the largest size for growing the wheat and let BD = x m.



So, AD = (144 – x) m

In ΔADE and ΔABC,

$\angle ADE = \angle ABC$ [each 90°]

$\angle AED = \angle ACB$

[corresponding angles]

$\angle A = \angle A$

[common angles]

$\therefore$ $\Delta ADE = \Delta ABC$

[by AAA similarity criterion]

So, $\frac{AD}{AB} = \frac{DE}{BC}$

$\Rightarrow \frac{144 - x}{144} = \frac{x}{84}$

$\Rightarrow 144 \times 84 - 84x = 144x$

$\Rightarrow 144 \times 84 = 144x + 84x$

$\Rightarrow 228x = 144 \times 84$

$\Rightarrow x = \frac{144 \times 84}{228}$

$= 53.05$ m

Thus, side of the required square space is 53.05 m.

49. *(d) 2814.30 m^2*

Explanation: Area of square field

$= (\text{Side})^2 = (x)^2$

$= (53.05)^2 = 2814.30 \text{ m}^2$

[$\because x = 53.05$ m (from Q 48)]

50. *(d) 3233.7 m^2*

Explanation: Area of the field other than the square field

= Area of ΔABC – Area of square BDEF

$= \frac{1}{2} \times 84 \times 144 - (53.05)^2$

[Using Q. 48]

$= 6048 - 2814.30$

$= 3233.7 \text{ m}^2$