2

TERM-1
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. Find the largest number which divide the numbers 615 and 963 leaving remainder 6 in each case.
(a) 87 (b) 75
(c) 56 (d) 88

2. How many solutions does the pair of equations $x + y = 1$ and $x + y = -5$ have?
(a) Unique (b) No solution
(c) Infinitely many (d) Can't decide

3. Find the value of p for which the following pair of linear equations have infinitely many solutions?
$$(p - 3)x + 3y = p,\ px + py = 12$$
(a) –6 (b) 0
(c) 6 (d) 12

4. In $\triangle ABC$, D is point on side AB and E is a point on side AC such that $\angle ADE = \angle ABC$, AD = 2, BD = 3 and AE = 3, then what is the value of CE?
(a) 6 cm (b) 3 cm
(c) 4.5 cm (d) 5 cm

5. For what value(s) of x, the distance between the points P(2, –3) and Q(x, 5) is 10?
(a) 9, 2 (b) –4, 8
(c) 10, 1 (d) 6, 3

6. Find the diameter of a semi-circular protractor, whose perimeter is 36 cm.
(a) 7 cm (b) 14 cm
(c) 21 cm (d) 42 cm

7. Evaluate the zeroes of the polynomial $2x^2 - 16$.
(a) $2\sqrt{2}, -2\sqrt{2}$ (b) $\sqrt{2}, -\sqrt{2}$
(c) 4, –4 (d) 2, –2

8. What is the value of k in the expression, $\sec^2\theta\,(1 + \sin\theta)(1 - \sin\theta) = k$?
(a) $\frac{1}{5}$ (b) 7
(c) 1 (d) 12

9. If point P(4, 2) lies on the line segment joining the points A(2, 1) and B(8, 4) then:
(a) AP = PB (b) PB = $\frac{1}{3}$AP
(c) AP = $\frac{1}{2}$PB (d) AP = $\frac{1}{3}$PB

10. What is the perimeter of a triangle having vertices (0, 4), (0, 0) and (3, 0)?
(a) 10 units (b) 15 units
(c) 12 units (d) 9 units

11. Evaluate the area of a quadrant of a circle, provided that its circumference is 20 cm.

(a) 127.3 cm^2 (b) 130.2 cm^2
(c) 135.6 cm^2 (d) 143.7 cm^2

12. What is the probability of getting 101 marks out of 100 marks in maths exams?
(a) 1 (b) 0
(c) 0.5 (d) 0.01

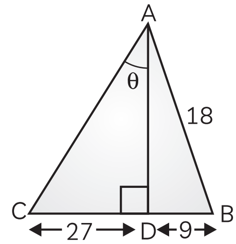
13. What is the value of x in the following equation:
$\sin 2x = \sin 45° \cos 45° + \sin 30°$
(a) 30° (b) 45°
(c) 60° (d) 75°

14. What is the value of a if the mid-point of the line segment joining the points P(6, a –2) and Q(–2, 4) is (2, –4)?
(a) –10 (b) 10
(c) 0 (d) 7

15. What is the probability of chosing a vowel from the word MATCH if a letter is chosen randomly from it?
(a) $\frac{2}{5}$ (b) $\frac{1}{5}$
(c) $\frac{3}{5}$ (d) $\frac{4}{5}$

16. Evaluate the simplified value of $(1 + \cot^2 \theta)(1 - \cos \theta)(1 + \cos \theta)$.
(a) 1 (b) –1
(c) $\cot \theta$ (d) $\sec^2 \theta$

17. Find the value of $\tan \theta$, by using the following figure:



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

18. A ladder which is 17 m long, reaches the window of a building which is 15 m above the ground. What is the distance of the foot of the ladder from the building?
(a) 8 m (b) 12 m
(c) 10 m (d) 13 m

19. If the points (5, 0), (0, –2) and (3, 6) lie on the graph of a polynomial, then, which of the following is a zero of the polynomial?
(a) 5 (b) 6
(c) –2 (d) Data insufficient

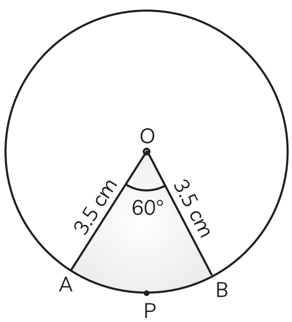
20. Find the value of $\angle BAD$ in $\triangle ABC$, if D is a point on side BC such that $\frac{AB}{AC} = \frac{BD}{DC}$, $\angle B = 70°$ and $\angle C = 50°$.
(a) 30° (b) 45°
(c) 60° (d) 75°

SECTION - B

16 marks

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

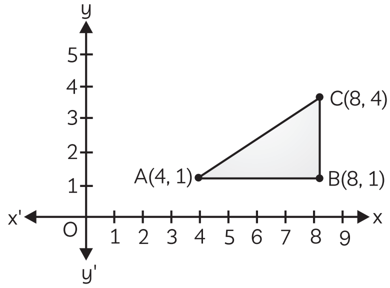
21. What is the length of OAPB, in the given figure? (Use $\pi = 3.14$)



(a) 22 cm (b) 11 cm
(c) 13 cm (d) 17 cm

22. *G.D. Goenka School is a famous CBSE school having many branches in different cities of India. One of the branches of G.D. Goenka School is in Agra, U.P. In that school, thousand of students study.*

One boy of the school is standing on the ground at a point having coordinates (4, 1) facing towards east. He moves 4 units in the straight line then take left and moves 3 units and stop, then he reaches his home. Representation of the above situation on the coordinate axes is shown below.



What is the shortest distance between his school and house?

(a) 7 units (b) 3 units

(c) 5 units (d) 4 units

23. **Consider the two numbers whose sum is 135 and their HCF is 27. If their LCM is 162, then what will be the larger number?**

(a) 81 (b) 78

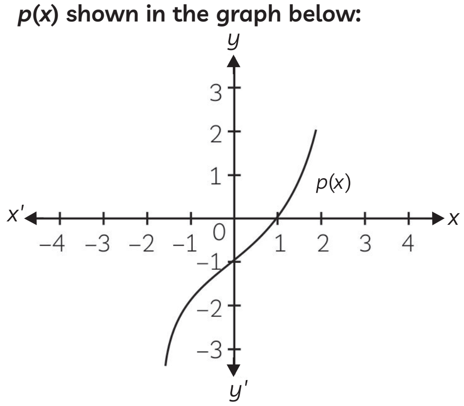
(c) 57 (d) 54

24. **Three coins are tossed simultaneously. The probability of getting at most one tail is:**

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

(c) $\frac{3}{4}$ (d) $\frac{3}{8}$

25. **Find the number of zeroes, for the polynomial $p(x)$ shown in the graph below:**



(a) 0 (b) 1

(c) 2 (d) 3

26. **Polynomial $f(x) = x^2 - 5x + k$ has zeroes α and β such that $\alpha - \beta = 1$. Find the value of $4k$.**

(a) 6 (b) 12

(c) 18 (d) 24

27. **What is the measure of the hypotenuse of a right triangle, when its medians, drawn from the vertices of the acute angles, are 5 cm and $2\sqrt{10}$ cm long?**

(a) $5\sqrt{8}$ cm (b) $2\sqrt{13}$ cm

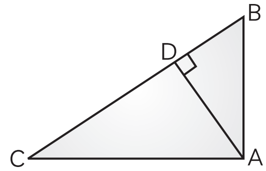
(c) $6\sqrt{10}$ cm (d) $2\sqrt{7}$ cm

28. **Find the value of $\sin 2\theta_1 + \tan 3\theta_2$, if $\tan(\theta_1 + \theta_2) = \sqrt{3}$ and $\sec(\theta_1 - \theta_2) = \frac{2}{\sqrt{3}}$.**

(a) 2 (b) 1

(c) 0 (d) −1

29. **Evaluate the value of $AB^2 + CD^2$ in the given figure, if $AD \perp BC$ and BD = 2, AC = 4.**



(a) 16 (b) 20

(c) 4 (d) 6

30. **What is the probability of getting black face card, if face cards of spades are removed from a well-shuffled pack of 52 cards?**

(a) $\frac{1}{49}$ (b) $\frac{2}{49}$

(c) $\frac{3}{49}$ (d) $\frac{4}{49}$

31. **What are the coordinates of the point C, such that $B\left(\frac{1}{2}, 6\right)$ divides the line segment joining the points A(3, 5) and C in the ratio of 1 : 3?**

(a) (0, 0) (b) (7, 9)

(c) (7, −9) (d) (−7, 9)

32. **Find $x^2 + y^2$, where x and y are related as: $x \sin^3\theta + y \cos^3\theta = \sin\theta \cos\theta$ and $x \sin\theta = y \cos\theta$.**

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

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

33. **If we add 1 to the numerator and subtract 1 from the denominator, a fraction reduces to 1. It becomes $\frac{1}{2}$, if we add 1 to the denominator only. Then the required fraction is:**

(a) $\frac{2}{9}$ (b) $\frac{3}{5}$

(c) $\frac{4}{7}$ (d) $\frac{5}{13}$

34. **In an equilateral triangle PQR, PT is an altitude. Then the value of $4PT^2$ is:**

(a) $3PQ^2$ (b) $(PQ + QR)^2$

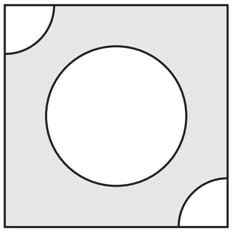
(c) PQ^2 (d) $2PQ^2$

35. **Evaluate $\left(\frac{-101}{\cos^2 A} + \frac{101}{\cot^2 A}\right)$.**

(a) 101 (b) −101

(c) 1 (d) −1

36. From a square of side 8 cm, two quadrants of a circle of radii 1.4 cm are cut from two corners. Another circle of radius 4.2 cm is also cut from the centre as shown in the figure. Find the area of the remaining (shaded) portion of the square. $\left[\text{Take } \pi = \frac{22}{7}\right]$

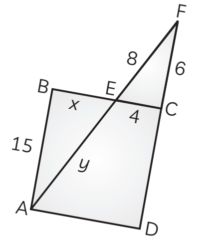


(a) 6.12 cm^2 (b) 5.48 cm^2
(c) 5.76 cm^2 (d) 6.45 cm^2

37. What is the relation between x and y, if the point P(x, y) is equidistant from the points A(7, 0) and B(0, 5)?

(a) $x + 2y = 9$ (b) $7x - 5y = 12$
(c) $5x + 2y = 15$ (d) $3x - 2y = 7$

38. In the given figure, ABCD is a parallelogram in which DC is extended to F such that AF intersects BC at E. Then perimeter of $\triangle$ABE =



(a) 35 cm (b) 36 cm
(c) 40 cm (d) 45 cm

39. What is the ratio in which point P(1, 2) divides the join of A(–2, 1) and B(7, 4)?

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

40. Find the value of k, if $x - 2y + k = 0$ is a median of the triangle ABC whose vertices are A(–1, 3), B(0, 4) and C(–5, 2).

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

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 based on Case Study–1

Case Study–1:

Three friends Ramesh, Suresh and Rajesh step off together. Their steps measuring 240 cm, 90 cm, 120 cm respectively. They went to Rajiv juice shop for getting juice, which is situated nearby.

41. What is the minimum distance of the shop from the point where they start to walk together, so that one can cover the distance in complete steps?

(a) 740 cm (b) 640 cm
(c) 700 cm (d) 720 cm

42. What is the number of common steps cover by all of them to reach the juice shop?

(a) 40 (b) 45
(c) 30 (d) 20

43. If a and b are two numbers, then find the correct relation between their LCM and HCF.

(a) $a \times$ LCM (a, b) = $b \times$ HCF (a, b)

(b) $\frac{a}{b}$ = LCM (a, b) × HCF (a, b)

(c) $a \times b$ = LCM (a, b) × HCF (a, b)

(d) $b \times$ LCM (a, b) = $a \times$ HCF (a, b)

44. What name is given to a largest positive integer that divides given two positive integers completely?

(a) Coprime (b) HCF
(c) LCM (d) Twin Prime

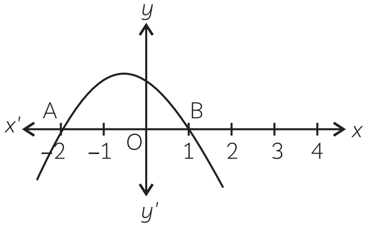
45. Factor tree is a chain of factors, which is represented in the form of a:

(a) flower (b) division
(c) tree (d) leaf

Q. 46-50 are based on Case Study–2

Case Study–2:

Last month, heavy storm came in Kerala. Due to this storm, thousands of trees got broke and electric poles bent out. Some of the electric poles bent *into the shape of parabola. One of the images of bent electric pole is shown in the figure below:*



46. **Calculate the zeroes of the given curve.**

(a) –2 and 1 (b) –2 and –1
(c) 2 and –1 (d) 2 and 1

47. **What is the polynomial expression of the given curve?**

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

48. **If $x = 2$, then what will be the value of the polynomial?**

(a) 3 (b) –4
(c) 2 (d) 4

49. **If the parabola is moved towards the right side by one unit, then find the new polynomial expression.**

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

50. **Suppose the quadratic polynomial for given curve is $ax^2 + bx + c$. Then a is always:**

(a) > 0 (b) < 0
(c) ≥ 0 (d) ≤ 0

SOLUTION

SAMPLE PAPER - 2

SECTION - A

1. *(a) 87*

Explanation: 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

2. *(b) No solution*

Explanation: Given equation of lines are $x + y - 1 = 0$ and $x + y + 5 = 0$

Here, $\frac{a_1}{a_2} = \frac{1}{1}; \frac{b_1}{b_2} = \frac{1}{1}; \frac{c_1}{c_2} = \frac{-1}{5}$

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

So, the given pair of equations has no solution.

3. *(c) 6*

Explanation: Given pair of linear equations is $(p - 3)x + 3y = p$ and $px + py = 12$, which has infinitely many solutions.

$\therefore$ $\frac{p-3}{p} = \frac{3}{p} = \frac{-p}{-12}$

$\Rightarrow$ $\frac{p-3}{p} = \frac{3}{p}$

and $\frac{3}{p} = \frac{p}{12}$

$\Rightarrow$ $p^2 - 3p = 3p$ and $12 \times 3 = p^2$

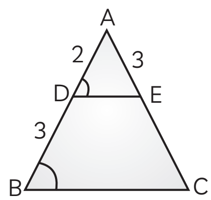
$\Rightarrow$ $p^2 - 6p = 0$ and $p^2 = 36$

$\Rightarrow$ $p = 0, 6$ and $p = \pm 6$

The common value of p is 6.

4. *(c) 4.5 cm*

Explanation: In ΔABC, ∠ADE = ∠ABC



$\therefore$ By converse of corresponding angle axiom DE || BC

$\therefore$ Using basic proportionality theorem in ΔABC

$$\frac{AD}{DB} = \frac{AE}{CE}$$

$\Rightarrow \quad \frac{2}{3} = \frac{3}{CE} \Rightarrow CE = \frac{9}{2} = 4.5$ cm

5. *(b)* $-4, 8$

Explanation:

$$PQ = 10 \Rightarrow PQ^2 = 100$$

$\Rightarrow (x-2)^2 + (5+3)^2 = 100 \Rightarrow (x-2)^2 = 100 - 64$

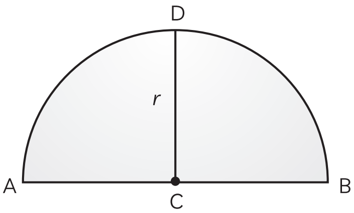
$\Rightarrow \quad (x-2)^2 = 36 \Rightarrow (x-2) = \pm 6$

$\Rightarrow \quad x = 2 \pm 6 \Rightarrow x = 8, -4$

6. *(b) 14 cm*

Explanation: Perimeter of a semi-circular protractor = Diameter + Perimeter of a semi-circle

$$= (2r + \pi r) \text{ cm}$$



Given, $\quad 2r + \pi r = 36$ cm

$\Rightarrow \quad r\left(2 + \frac{22}{7}\right) = 36$

$\Rightarrow \quad r\left(\frac{36}{7}\right) = 36 \Rightarrow r = 7$ cm

$\therefore$ Diameter = $2r = 2 \times 7 = 14$ cm.

7. *(a)* $2\sqrt{2}, -2\sqrt{2}$

Explanation: For zeroes, put $2x^2 - 16 = 0$

$\Rightarrow \quad 2x^2 = 16$

$\Rightarrow \quad x^2 = \frac{16}{2} = 8$

$\Rightarrow \quad x = \pm\sqrt{8} = \pm 2\sqrt{2}$

Hence, zeroes of $2x^2 - 16$ are $2\sqrt{2}$ and $-2\sqrt{2}$.

8. *(c) 1*

Explanation: We have,

$\sec^2\theta\,(1 + \sin\theta)\,(1 - \sin\theta) = k$

$\Rightarrow \quad \sec^2\theta(1 - \sin^2\theta) = k$

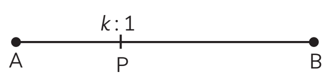
$\Rightarrow \quad \frac{1}{\cos^2\theta} \times \cos^2\theta = k$

$[\because \sin^2\theta + \cos^2\theta = 1]$

$\Rightarrow \quad k = 1$

9. *(c)* $AP = \frac{1}{2}PB$

Explanation: Let point P divides the line segment AB in the ratio $k : 1$.



$\therefore$ Using section formula,

$$4 = \frac{8k+2}{k+1}$$

$\Rightarrow \quad 4k + 4 = 8k + 2$

$\Rightarrow \quad 4k = 2$

$\Rightarrow \quad k = \frac{1}{2}$

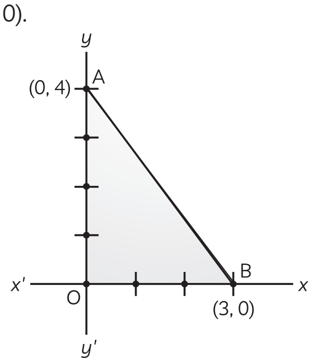
$\therefore \quad$ Ratio $= \frac{1}{2} : 1 = 1 : 2$

$$\frac{AP}{PB} = \frac{1}{2}$$

or $\quad AP = \frac{1}{2}PB$

10. *(c) 12 units*

Explanation: Let the vertices be A(0, 4), O(0, 0) B(3, 0).



Using distance formula, we have

$$AB = \sqrt{(3-0)^2 + (0-4)^2}$$

$$= \sqrt{9+16} = \sqrt{25} = 5 \text{ units}$$

$\therefore$ Perimeter of ΔOAB = OA + AB + OB

$$= 4 + 5 + 3 = 12 \text{ units}$$

⚠ Caution

For finding the perimeter of triangle, first find the measurement of three sides of a triangle.

11. *(a) 127.3 cm²*

Explanation: Given, circumference of quadrant = 20 cm

$\Rightarrow \frac{2\pi r}{4} = 20 \Rightarrow \pi r = 40 \Rightarrow r = \frac{40}{\pi}$

Now, area of a quadrant

$$= \frac{\pi r^2}{4}$$

$$= \frac{\pi}{4} \times \left(\frac{40}{\pi}\right)^2$$

$$= \frac{\pi}{4} \times \frac{1600}{\pi^2} = \frac{400}{22/7}$$

$$= \frac{1400}{11} = 127.27 \text{ cm}^2$$

12. *(b) 0*

Explanation: Out of 100 marks, we cannot get 101 marks, so it is an impossible event, and the probability of impossible event is zero.

13. *(b) 45°*

Explanation: $\sin 2x = \sin 45° \cos 45° + \sin 30°$

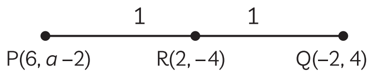
$$\Rightarrow \quad \sin 2x = \frac{1}{\sqrt{2}} \times \frac{1}{\sqrt{2}} + \frac{1}{2}$$

$$\Rightarrow \quad \sin 2x = \frac{1}{2} + \frac{1}{2} = 1 = \sin 90°$$

$$\Rightarrow \quad 2x = 90° \Rightarrow x = 45°$$

14. *(a) –10*

Explanation:



As R is mid-point of PQ.

$\therefore$ Using mid-point formula, we have

$$y = \frac{y_1 + y_2}{2}$$

$$\Rightarrow \quad -4 = \frac{a - 2 + 4}{2}$$

$$\Rightarrow \quad a + 2 = -8$$

$$\Rightarrow \quad a = -10$$

15. *(b)* $\frac{1}{5}$

Explanation: Total number of letters = 5

$\therefore$ Total possible outcomes = 5

Number of vowels in the given word

= 1 (Favourable case)

$\therefore$ Probability of selecting a vowel

$$= \frac{\text{Number of favourable cases}}{\text{Total possible outcomes}}$$

$$= \frac{1}{5}$$

16. *(a) 1*

Explanation: We have,

$(1 + \cot^2 \theta)(1 - \cos \theta)(1 + \cos \theta)$

$= (1 + \cot^2 \theta)(1 - \cos^2 \theta) = \text{cosec}^2 \theta \times \sin^2 \theta$

$[\sin^2 \theta + \cos^2 \theta = 1]$

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

17. *(a)* $\sqrt{3}$

Explanation: In right ΔABD, we have

$AB^2 = AD^2 + BD^2$ [Pythagoras therom]

$$\Rightarrow \quad (18)^2 = AD^2 + (9)^2$$

$$\Rightarrow \quad AD^2 = 324 - 81 = 243$$

$$\Rightarrow \quad AD = \sqrt{243}$$

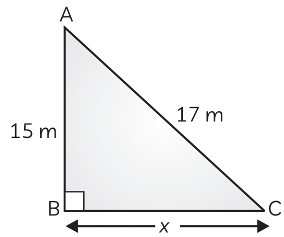
$$\Rightarrow \quad AD = 9\sqrt{3}$$

Now, in ΔADC

$$\tan \theta = \frac{CD}{AD} = \frac{27}{9\sqrt{3}} = \frac{3}{\sqrt{3}} = \sqrt{3}$$

18. *(a) 8 m*

Explanation: Use Pythagoras theorem, to find the distance of the foot of the ladder from the building.



$$\therefore \quad AC^2 = AB^2 + BC^2$$

$$\Rightarrow \quad 17^2 = 15^2 + x^2$$

$$\Rightarrow \quad x = \sqrt{17^2 - 15^2}$$

$$= \sqrt{289 - 225} = \sqrt{64}$$

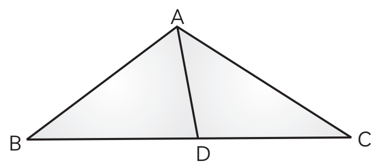
$$= 8$$

19. *(a) 5*

Explanation: As in point (5, 0), y-coordinate is zero. Therefore, 5 is a zero of the polynomial.

20. *(a) 30°*

Explanation:



In a triangle, the sum of all angles is 180°.

$$\therefore \quad \angle A + \angle B + \angle C = 180°$$

$$\Rightarrow \quad \angle A = 180° - (70° + 50°) = 60°$$

Also given, $\frac{BD}{DC} = \frac{AB}{AC}$

It means AD is the bisector of $\angle$A.

$$\therefore \quad \angle BAD = \frac{1}{2} \times 60° = 30°$$

SECTION - B

21. *(b) 11 cm*

Explanation: Here, $r = 3.5$ cm and $\theta = 60°$

Length of OAPB

$$= 2r + \frac{\theta}{360°} \times 2\pi r$$

$= 2 \times 3.5 + 2 \times 3.14 \times 3.5 \times \dfrac{60°}{360°}$

$= 10.66 \text{ cm} \cong 11 \text{ cm}$

22. *(c) 5 units*

Explanation: From the given figure, shortest distance between school and house = AC

$$= \sqrt{(8-4)^2 + (4-1)^2}$$

[using distance formula]

$$= \sqrt{4^2 + 3^2} = \sqrt{16+9}$$

$$= \sqrt{25} = 5 \text{ units}$$

23. *(a) 81*

Explanation: HCF of two numbers is 27.

So, let the numbers be 27*a* and 27*b*.

Given, $27a + 27b = 135$

$\Rightarrow \quad a + b = 5$ ...(i)

Also, $27a \times 27b = 27 \times 162$

[$\because$ Product of two numbers = HCF × LCM]

$\Rightarrow \quad ab = 6$

Now, $(a - b)^2 = (a + b)^2 - 4ab$

$\Rightarrow \quad a - b = 1$ ...(ii)

Solving (i) *and* (ii), we get

$a = 3$ *and* $b = 2$

So, numbers are 27 × 3, 27 × 2 *i.e.*, 81, 54.

24. *(a)* $\dfrac{1}{2}$

Explanation: On tossing three coins simultaneously,

Total possible of outcomes

= {HHH, HHT, HTH, THH, TTH, THT, HTT, TTT}

$\Rightarrow$ Total number of outcomes = 8

Also, outcomes with atmost one tail

= {HHH, HHT, HTH, THH}

$\Rightarrow$ Number of favourable outcomes = 4

$\therefore$ P (at most one tail) $= \dfrac{4}{8} = \dfrac{1}{2}$

25. *(b) 1*

Explanation: It is clear that the graph of $p(x)$ cut the x-axis at only one point. Hence, the number of zeroes of $p(x)$ is 1.

Caution

➥ *The points where graph cuts the x-axis are the zeroes of the polynomial.*

26. *(d) 24*

Explanation : Given α and β are the zeroes of the polynomial $f(x) = x^2 - 5x + k$.

$\therefore \quad \alpha + \beta = -\left(-\dfrac{5}{1}\right) = 5$

and $\quad \alpha\beta = \dfrac{k}{1} = k$

Since, $\quad \alpha - \beta = 1$ [given]

$\Rightarrow \quad (\alpha - \beta)^2 = 1$

$\Rightarrow \quad (\alpha + \beta)^2 - 4\alpha\beta = 1$

$\Rightarrow \quad (5)^2 - 4 \times k = 1$

$\Rightarrow \quad 25 - 4k = 1$

$\Rightarrow \quad 4k = 24$

27. *(b)* $2\sqrt{13}$ *cm*

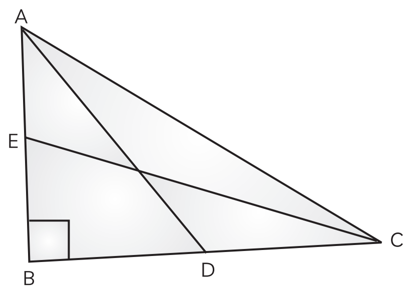
Explanation: Consider the right triangle ABC with $\angle B = 90°$.

$\therefore \quad AC^2 = AB^2 + BC^2$

Also, AD and CE are medians.

[where $BE = \dfrac{1}{2}$ AB and $BD = \dfrac{1}{2}$ BC]

$\Rightarrow \quad AC^2 = 4BE^2 + 4BD^2$



$= 4(CE^2 - BC^2) + 4(AD^2 - AB^2)$

$= 4CE^2 + 4AD^2 - 4(BC^2 + AB^2)$

$\Rightarrow \quad AC^2 = 4CE^2 + 4AD^2 - 4AC^2$

$\Rightarrow \quad 5AC^2 = 4CE^2 + 4AD^2$

Hence,

5 (hypotenuse)^2 = 4 [sum of squares of medians of right tirangle]

$$= 4\left[(5)^2 + \left(2\sqrt{10}\right)^2\right]$$

$\Rightarrow$ hypotenuse $= \sqrt{\dfrac{4(25+40)}{5}} = \sqrt{52}$

$\therefore$ hypotenuse $= 2\sqrt{13}$ cm

28. *(a) 2*

Explanation: We have,

$\tan(\theta_1 + \theta_2) = \sqrt{3} = \tan 60°$

$\Rightarrow \quad \theta_1 + \theta_2 = 60°$ ...(i)

Also, $\quad \sec(\theta_1 - \theta_2) = \dfrac{2}{\sqrt{3}} = \sec 30°$

$\Rightarrow \quad \theta_1 - \theta_2 = 30°$ ...(ii)

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

$$2\theta_1 = 90°$$

$\Rightarrow \theta_1 = 45°$ and $\theta_2 = 15°$

$\therefore \sin 2\theta_1 + \tan 3\theta_2 = \sin 90° + \tan 45°$

$= 1 + 1 = 2$

29. *(b) 20*

Explanation : In right angled ΔBDA

$$(AB)^2 = (AD)^2 + (BD)^2 \quad ...(i)$$

[by Pythagoras theorem]

In right angled ΔCDA,

$$(AC)^2 = (CD)^2 + (AD)^2 \quad ...(ii)$$

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

$$(AB)^2 - (AC)^2 = (BD)^2 - (CD)^2$$

$$\therefore \quad (AB)^2 + (CD)^2 = (BD)^2 + (AC)^2$$

$$= 4 + 16 = 20$$

30. *(c)* $\frac{3}{49}$

Explanation: Total number of cards = 52

Since, three face cards of spades are removed, therefore number of remaining cards

$= 52 - 3 = 49$

$\therefore$ Total number of possible outcomes, $n(S) = 49$.

Let E = Event of getting a black face card.

Then total number of favourable outcomes

= Number of face cards of club = 3

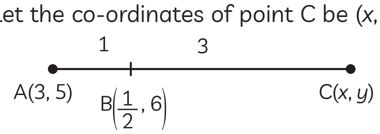
i.e., $n(E) = 3$

$\therefore$ P(getting a black face card) $= \frac{n(E)}{n(S)} = \frac{3}{49}$

31. *(d) (–7, 9)*

Explanation:

Let the co-ordinates of point C be (x, y).



Then, by using section formula, we get

$$\left(\frac{1 \times x + 3 \times 3}{4}, \frac{1 \times y + 3 \times 5}{4}\right) = \left(\frac{1}{2}, 6\right)$$

$$\Rightarrow \frac{x+9}{4} = \frac{1}{2}, \frac{y+15}{4} = 6$$

$\Rightarrow x = -7, y = 24 - 15 = 9$

$\therefore \quad C = (-7, 9)$

32. *(a) 1*

Explanation: We have,

$$x \sin^3\theta + y \cos^3\theta = \sin\theta\cos\theta$$

$\Rightarrow (x \sin\theta)\sin^2\theta + (y\cos\theta)\cos^2\theta = \sin\theta\cos\theta$

$\Rightarrow (x\sin\theta)\sin^2\theta + (x\sin\theta)\cos^2\theta = \sin\theta\cos\theta$

[$\because x\sin\theta = y\cos\theta$]

$\Rightarrow x\sin\theta(\sin^2\theta + \cos^2\theta) = \sin\theta\cos\theta$

$\Rightarrow x\sin\theta = \sin\theta\cos\theta$

[$\because \sin^2\theta + \cos^2\theta = 1$]

$\Rightarrow x = \cos\theta$

Now, $x\sin\theta = y\cos\theta$

$\Rightarrow \cos\theta\sin\theta = y\sin\theta$

$\Rightarrow y = \sin\theta$

Hence, $x^2 + y^2 = \cos^2\theta + \sin^2\theta = 1$

33. *(b)* $\frac{3}{5}$

Explanation: Let the required fraction be $\frac{x}{y}$. Then, according to first condition,

$$\frac{x+1}{y-1} = 1$$

$\Rightarrow x + 1 = y - 1$

$\Rightarrow x - y = -2 \quad ...(i)$

By second condition, we have

$$\frac{x}{y+1} = \frac{1}{2}$$

$\Rightarrow 2x = y + 1$

$\Rightarrow 2x - y = 1 \quad ...(ii)$

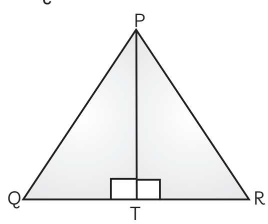
Solving equations (i) and (ii) simultaneously, we get

$$x = 3 ; y = 5$$

$\therefore$ Required fraction $= \frac{x}{y} = \frac{3}{5}$

34. *(a) 3 PQ^2*

Explanation: PT is an altitude of an equilateral triangle PQR.



We know, altitude of an equilateral triangle bisects the base.

$\therefore \quad QT = TR \quad$ [as PT $\perp$ QR]

In ΔPQT,

$$PQ^2 = PT^2 + QT^2$$

[by Pythagoras theorem]

$$\therefore \quad PQ^2 = PT^2 + \left(\frac{QR}{2}\right)^2$$

$$\left[\because QT = \frac{QR}{2}\right]$$

$$\Rightarrow \quad PQ^2 - \frac{PQ^2}{4} = PT^2 \qquad [\because PQ = QR = PR]$$

$$\Rightarrow \quad 3\,PQ^2 = 4\,PT^2$$

35. *(b) –101*

Explanation: We have,

$$\frac{-101}{\cos^2 A} + \frac{101}{\cot^2 A}$$

$$= \left(\frac{-101}{\cos^2 A} + \frac{101 \times \sin^2 A}{\cos^2 A}\right) = \frac{-101\,(1-\sin^2 A)}{\cos^2 A}$$

$$= \frac{-101\cos^2 A}{\cos^2 A} = -101 \quad [\because \sin^2 A + \cos^2 A = 1]$$

36. *(b) 5.48 cm²*

Explanation: Area of shaded portion

= Area of square – 2 × Area of quadrant – Area of circle

$$= 8 \times 8 - 2 \times \frac{1}{4} \times \frac{22}{7} \times 1.4 \times 1.4 - \frac{22}{7} \times 4.2 \times 4.2$$

$= 64 - 11 \times 0.2 \times 1.4 - 22 \times 0.6 \times 4.2$

$= 64 - 3.08 - 55.44$

$= 5.48\ cm^2$

37. *(b) 7x – 5y = 12*

Explanation: Since the point P(x, y) is equidistant from the points A(7, 0) and B(0, 5),

$\therefore \quad PA = PB \quad$ ...(i)

Using distance formula, we have

$$PA = \sqrt{(x-7)^2 + (y-0)^2}$$

$$= \sqrt{x^2 + y^2 + 49 - 14x}$$

Similarly, we have

$$PB = \sqrt{(x-0)^2 + (y-5)^2}$$

$$= \sqrt{x^2 + y^2 + 25 - 10y}$$

Substituting the values of PA and PB in (i), we get

$$\sqrt{x^2 + y^2 + 49 - 14x} = \sqrt{x^2 + y^2 + 25 - 10y}$$

Squaring both sides, we get

$$x^2 + y^2 + 49 - 14x = x^2 + y^2 + 25 - 10y$$

$$\Rightarrow \quad 14x - 10y = 24$$

$$\Rightarrow \quad 7x - 5y = 12$$

38. *(d) 45 cm*

Explanation: Clearly, $\angle AEB = \angle FEC$ [vertically opposite angles]

and $\quad \angle ABC = \angle FCE$ [Alternate interior angles]

$\therefore \quad \Delta ABE \sim \Delta FCE$ [By AA-similarity criterion]

$$\therefore \quad \frac{AB}{FC} = \frac{BE}{CE} = \frac{AE}{FE}$$

$$\therefore \quad \frac{AB}{FC} = \frac{BE}{CE} \Rightarrow \frac{15}{6} = \frac{x}{4}$$

$$\Rightarrow \quad x = 10$$

$$\text{Also,} \quad \frac{AB}{FC} = \frac{AE}{FE} \Rightarrow \frac{15}{6} = \frac{y}{8}$$

$$\Rightarrow \quad y = \frac{15 \times 8}{6} = \frac{15 \times 4}{3}$$

$$= 5 \times 4 = 20 \text{ cm}$$

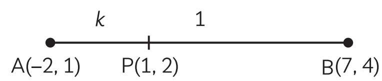
$\therefore$ Perimeter of ΔABE = AB + AE + BE

= AB + y + x

= 15 + 20 + 10 = 45 cm

39. *(a) 1 : 2*

Explanation: Let the required ratio be k : 1.



Then, using section formula,

$$\frac{7k-2}{k+1} = 1$$

$$\Rightarrow \quad 7k - 2 = k + 1 \Rightarrow 6k = 3$$

$$\therefore \quad k = \frac{1}{2}$$

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

40. *(a) 8*

Explanation: Coordinates of the centroid G of

$$\Delta ABC = \left(\frac{-1+0-5}{3}, \frac{3+4+2}{3}\right) = (-2, 3)$$

Since, centroid lies on median of the triangle,

So, G(–2, 3) satisfy the equation $x - 2y + k = 0$.

$$\therefore \quad -2 - 6 + k = 0$$

$$\Rightarrow \quad k = 8$$

SECTION - C

41. *(d) 720 cm*

Explanation: Minimum required distance to reach the juice shop

= LCM (240, 90, 120)

$\because \quad 240 = 2 \times 2 \times 2 \times 2 \times 3 \times 5$

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

and $\quad 120 = 2 \times 2 \times 2 \times 3 \times 5$

$\therefore$ LCM (240, 90, 120)

$= 2^4 \times 3^2 \times 5$

$= 16 \times 9 \times 5 = 720$

Hence, the minimum distance to be walked is 720 cm.

42. *(c) 30*

Explanation: The number of common steps cover by each of them

= HCF (240, 90, 120)

= 2 × 3 × 5 = 30

43. *(c)* $a \times b = LCM\ (a, b) \times HCF\ (a, b)$

44. *(b) HCF*

Explanation: A largest positive integer that divides given two positive integers completely is their HCF.

45. *(c) tree*

Explanation: Factor tree is a chain of factors, which is represented in the form of a tree.

46. *(a) –2 and 1*

Explanation: Given curve intersect the *x*-axis at two points *i.e.,* – 2 and 1, so, zeroes of the curve are – 2 and 1.

Hence, zeroes of the given curve are –2 and 1.

47. *(a)* $x^2 + x - 2$

Explanation: Since, zeroes of the given polynomial are – 2 and 1.

∴ Polynomial expression is:

$p(x) = x^2 -$ (sum of zeroes) $x +$ product of zeroes

$= x^2 - (-2 + 1)x + (-2)\ (1)$

$= x^2 + x - 2$

48. *(d) 4*

Explanation: From Q. 47, we have,

$$p(x) = x^2 + x - 2$$

When $x = 2$, then

$$p(2) = 2^2 + 2 - 2 = 4$$

49. *(d)* $x^2 - x - 2$

Explanation: If we move the parabola towards the right side by one unit, then zeroes of the polynomial becomes –1 and 2.

∴ Polynomial is:

$x^2 - (-1 + 2)x + (-1)(2)$

i.e., $x^2 - x - 2$

50. *(b) < 0*

Explanation: Here, we see that shape of the parabola is downward.

So, in the given quadratic polynomial $ax^2 + bx + c$, a is less than 0.