Sample Question Paper - 5
Class- X Session- 2021-22 TERM 1
Subject- Mathematics (Basic)

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. Which of the following numbers has non-terminating repeating decimal expansion? **[1]**

a) $\frac{17}{6}$ b) $\frac{35}{50}$

c) $\frac{15}{1600}$ d) $\frac{23}{2}$

2. The value of ‘k’ for which the system of equations 3x + 5y = 0 and kx + 10y = 0 has a non zero solution is **[1]**

a) 0 b) 8

c) 2 d) 6

3. In isosceles triangle ABC, if AB = AC = 25 cm and BC = 14 cm, then the measure of the altitude from A on BC is **[1]**

a) 20 cm b) 18 cm

c) 22 cm d) 24 cm

4. If 4x + 6y = 3xy and 8x + 9y = 5xy then **[1]**

a) x = 3, y = 4 b) x = 2, y = 3

c) x = 1, y = 2 d) x = 1, y = -1

5. If θ is an acute angle such that cos θ = $\frac{3}{5}$, then $\frac{\sin\theta\tan\theta-1}{2\tan^2\theta}$ = **[1]**

a) $\frac{1}{36}$ b) $\frac{16}{625}$

c) $\frac{160}{3}$ d) $\frac{3}{160}$

6. If n is any natural number, then 6^n - 5^n always ends with **[1]**

[Hint: For any $n \in N$, 6^n and 5^n end with 6 and 5 respectively. Therefore, 6^n - 5^n always ends with 6 - 5 = 1.]

a) 1

b) 5

c) 3

d) 7

7. The zeros of the quadratic polynomial $x^2 + 88x + 125$ are **[1]**

a) both negative

b) both positive

c) both equal

d) one positive and one negative

8. The length of the minute hand of a clock is 21 cm. The area swept by the minute hand in 10 minutes is **[1]**

a) 252 cm^2

b) 126 cm^2

c) 231 cm^2

d) 210 cm^2

9. Which of the following expressions is not a polynomial? **[1]**

a) $5x^3 - 3x^2 - \sqrt{x} + 2$

b) $5x^3 - 3x^2 - x + \sqrt{2}$

c) $5x^2 - \frac{2}{3}x + 2\sqrt{5}$

d) $\sqrt{5}x^3 - \frac{3}{5}x + \frac{1}{7}$

10. In $\triangle$ABC and $\triangle$DEF, we have $\frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF} = \frac{5}{7}$, then ar$(\Delta ABC)$: ar(ΔDEF) = ? **[1]**

a) 49 : 25

b) 125 : 343

c) 5 : 7

d) 25 : 49

11. The probability of getting a sum of 13 in a single throw of two dice is **[1]**

a) $\frac{5}{6}$

b) $\frac{1}{6}$

c) 0

d) 1

12. 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

13. If the area of a circle is equal to the sum of the areas of two circles of diameters 10 cm and 24 cm, then diameter of the larger circle (in cm) is **[1]**

a) 34

b) 26

c) 17

d) 14

14. If a chord of a circle of radius 28 cm makes an angle of 90^0 at the centre, then the area of the major segment is **[1]**

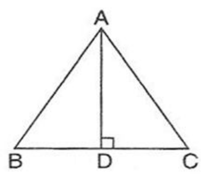
a) 1456 cm^2

b) 1848 cm^2

c) 392 cm^2

d) 2240 cm^2

15. If D is a point on side BC of ΔABC such that BD = CD = AD, and the AD is perpendicular to BC, then **[1]**



a) $AB^2 + AC^2 = BC^2$

b) $BD^2 + AC^2 = AB^2$

c) $CD^2 + BC^2 = AC^2$

d) $AB.AC = AD^2$

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

a) $\tan\theta$

b) $\cot\theta$

c) $\sin\theta$

d) $\cos\theta$

17. The value of k for which the system of equations **[1]**

2x + 3y = 5 and

4x + ky = 10

has infinite number of solutions, is

a) 1

b) 6

c) 0

d) 3

18. Two dice are thrown simultaneously. The probability that the product of the numbers appearing on the dice is 7 is **[1]**

a) 7

b) 2

c) 0

d) 1

19. $7 \times 11 \times 13 + 13$ is a/an: **[1]**

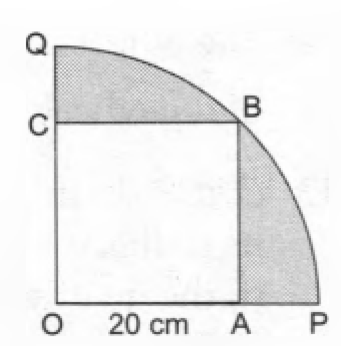
a) odd number but not composite

b) square number

c) prime number

d) composite number

20. In the given figure, a square OABC has been inscribed in the quadrant OPBQ. If OA = 20 cm then the area of the shaded region is **[1]**



a) $214 cm^2$

b) $242 cm^2$

c) $228\ cm^2$

d) $248 cm^2$

Section B

Attempt any 16 questions

21. The area of the triangle formed by x + 3y = 6, 2x – 3y = 12 and the y-axis is **[1]**

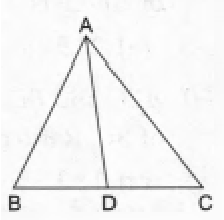
a) 15 sq. units

b) 18 sq. units

c) 16 sq. units

d) 12 sq. units

22. In $\triangle$ABC it is given that $\frac{AB}{AC} = \frac{BD}{DC}$. If $\angle B = 70^\circ$ and $\angle$C = 50° then $\angle$BAD = ? **[1]**



a) 30°
b) 50°
c) 45°
d) 40°

23. The sum of the exponents of the prime factors in the prime factorisation of 196, is **[1]**

a) 2
b) 1
c) 4
d) 6

24. If tan A = n tan B and sin A = m sin B, then $\cos^2 A$ = **[1]**

a) $\frac{m^2-1}{n^2-1}$
b) $\frac{m^2+1}{n^2-1}$
c) $\frac{m^2+1}{n^2+1}$
d) $\frac{m^2-1}{n^2+1}$

25. If 6x + 3y = c - 3 and 12x + cy = c has infinitely many solutions, then c = **[1]**

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

26. A ladder 25 m long just reaches the top of a building 24 m high from the ground. What is the distance of the foot of the ladder from the building? **[1]**

a) 14 m
b) 7 m
c) 21 m
d) 24.5 m

27. The areas of two similar triangles are $121\ cm^2$ and $64\ cm^2$ respectively. If the median of the first triangle is 12.1 cm, then the corresponding median of the other triangle is equal to **[1]**

a) 11 cm.
b) 11.1 cm.
c) 8.1 cm.
d) 8.8 cm.

28. The ratio in which the line segment joining $P(x_1, y_1)$ and $Q(x_2, y_2)$ is divided by x-axis is **[1]**

a) $y_1 : y_2$
b) $-y_1 : y_2$
c) $-x_1 : x_2$
d) $x_1 : x_2$

29. If $\tan^2 45° - \cos^2 30° = x \sin 45° \cos 45°$, then x = **[1]**

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

30. I am three times as old as my son. Five years later, I shall be two and a half times as old as my son. My present age is **[1]**

a) 20 years
b) 45 years
c) 15 years
d) 50 years

31. All non-terminating and non-recurring decimal numbers are **[1]**

a) rational numbers

b) irrational numbers

c) integers

d) natural numbers

32. A rational number can be expressed as a non-terminating repeating decimal if the denominator has the factors **[1]**

a) none of these

b) other than 2 or 5 only

c) 2 or 5 only

d) 2 or 3 only

33. $(cosec\theta - \cot\theta)^2 = ?$ **[1]**

a) $\frac{1+sin\ \theta}{1-sin\ \theta}$

b) $\frac{1-cos\ \theta}{1+cos\ \theta}$

c) None of these

d) $\frac{1+cos\ \theta}{1-cos\ \theta}$

34. The area of a circle inscribed in a square of side ‘a’ units is **[1]**

a) $\frac{1}{3}\pi a^2\ squnits$

b) $\frac{1}{4}\pi a^2\ squnits$

c) $\pi a^2\ squnits$

d) $\frac{1}{2}\pi a^2\ squnits$

35. A bag contains 4 red and 6 black balls. A ball is taken out of the bag at random. What is the probability of getting a black ball? **[1]**

a) $\frac{2}{5}$

b) $\frac{3}{5}$

c) $\frac{1}{10}$

d) None of these

36. Aruna has only Re 1 and Rs 2 coins with her. If the total number of coins that she has is 50 and the amount of money with her is Rs 75, then the number of Rs 1 and Rs 2 coins are, respectively **[1]**

a) 35 and 15

b) 35 and 20

c) 15 and 35

d) 25 and 25

37. The decimal expansion of π: **[1]**

a) is non-terminating and non-recurring

b) is terminating

c) does not exist

d) is non-terminating and recurring

38. $\frac{1+\tan^2\theta}{\sec^2\theta}$ = **[1]**

a) $\sec^2\theta$

b) 1

c) $\frac{1}{\sin^2\theta-\cos^2\theta}$

d) $\frac{1}{3}$

39. A number is selected at random from the numbers 3, 5, 5, 7, 7, 7, 9, 9, 9, 9. The probability that the selected number is their average is **[1]**

a) $\frac{7}{10}$

b) $\frac{3}{10}$

c) $\frac{9}{10}$

d) $\frac{1}{10}$

40. The distance between the points (cosθ, sinθ) and (sinθ, - cosθ) is **[1]**

a) $\sqrt{3}$

b) $\sqrt{2}$

c) 2

d) 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:

While playing badminton Ronit seeing the barrier chains hung between two posts at the edge of the walk way of a street. It is hung in the shape of the parabola. Parabola is the graphical representation of a particular type of polynomial.

41. Which of the following polynomial is graphically represented by a parabola? **[0.71]**

a) Cubic polynomial
b) Linear polynomial
c) None of these
d) Quadratic polynomial

42. If a polynomial, represented by a parabola, intersects the x-axis at -3, 4 and y-axis at -2, then its zero(es) is/are **[0.71]**

a) -3 and 3
b) -1, 2 and -2
c) 2 and -2
d) -1

43. If the barrier chains between two posts is represented by the polynomial $x^2 - x - 12$, then its zeroes are **[0.71]**

a) 4, -5
b) 4, -3
c) -2, 5
d) 4, 3

44. The sum of zeroes of the polynomial $4x^2 - 9x + 2$ is **[0.71]**

a) $\frac{1}{4}$
b) $\frac{-9}{4}$
c) $\frac{2}{4}$
d) $\frac{9}{4}$

45. The reciprocal of the product of zeroes of the polynomial $x^2 - 9x + 20$ is **[0.71]**

a) 20
b) $\frac{1}{8}$
c) 5
d) $\frac{1}{20}$

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

In an examination hall, students are seated at a distance of 2 due to the CORONA virus pandemic. Let three students sit at (7, 3) and (8, 5) respectively.

46. The distance between A and C is **[1]**

i. $\sqrt{5}$ units
ii. $4\sqrt{5}$ units
iii. $3\sqrt{5}$ units
iv. none of the above

a) Option (iv)
b) Option (i)
c) Option (iii)
d) Option (ii)

47. If an invigilator at point 7, lying on the straight line joining B and C such that it divides the distance between them in the ratio of 1 : 2. Then coordinates of I are **[1]**

a) $\left(\frac{22}{3}, \frac{11}{3}\right)$
b) (6, 1)
c) $\left(\frac{23}{3}, \frac{13}{3}\right)$
d) (9, 1)

48. The mid-point of the line segment joining A and C is **[1]**

a) $\left(\frac{11}{2}, 0\right)$
b) none of the above
c) (6, 1)
d) (1, 6)

49. The ratio in which B divides the line segment joining A and C is **[1]**

a) 3 : 1
b) none of these
c) 2 : 1
d) 1 : 2

50. The points A, B and C lie on **[1]**

a) a straight line
b) a scalene triangle
c) an equilateral triangle
d) an isosceles triangle

Solution

Section A

1. **(a)** $\frac{17}{6}$
   Explanation: $\frac{17}{6}$ has a non-terminal repeating decimal expansion.
   $\frac{17}{6}$ = 2.6333...
2. **(d)** 6
   Explanation: For non-zero solution $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2} \Rightarrow \frac{3}{k} = \frac{5}{10} = \frac{0}{0}$
   Taking, $\frac{3}{k} = \frac{5}{10} \Rightarrow k = \frac{3 \times 10}{5} = 6$
3. **(d)** 24 cm
   Explanation: Since in isosceles triangle ABC, the altitudes bisect the opposite side. (The altitude and median coincide)
   $\therefore$ BD = $\frac{\text{BC}}{2} = \frac{14}{2}$ = 7 cm Now, in $\triangle$ABD,
   AD = $\sqrt{\text{AB}^2 - \text{BD}^2}$
   =$\sqrt{(25)^2 - (7)^2}$
   = $\sqrt{625 - 49}$
   = $\sqrt{576}$ = 24 cm
4. **(a)** x = 3, y = 4
   Explanation: Divide throughout by xy and put $\frac{1}{x} = u$ and $\frac{1}{y} = v$ to get
   4v + 6u = 3 ......(i)
   and 8v + 9u = 5 .....(ii)
   This gives u = $\frac{1}{3}$ and v = $\frac{1}{4}$. Hence, x = 3 and y = 4.
5. **(d)** $\frac{3}{160}$
   Explanation: $\cos\theta = \frac{3}{5} = \frac{\text{Base}}{\text{Hypotenuse}}$
   By Pythagoras Theorem, $(\text{Hypotenuse})^2 = (\text{Base})^2 + (\text{Alt.})^2$
   $\Rightarrow (5)^2 = (3)^2 + (alt.)^2$
   $\Rightarrow 25 = 9 + (alt)^2 \Rightarrow (alt)^2 = 25 - 9 = 16 = (4)^2$
   Alt. = 4
   Now, $\sin\theta = \frac{\text{Alt.}}{\text{Hypotenuse}} = \frac{4}{5}$
   and $\tan\theta = \frac{\text{Alt.}}{\text{Base}} = \frac{4}{3}$
   $\therefore \frac{\sin\theta\tan\theta - 1}{2\tan^2\theta} = \frac{\frac{4}{5} \times \frac{4}{3} - 1}{2 \times \left(\frac{4}{3}\right)^2} = \frac{\frac{16}{15} - 1}{2 \times \frac{16}{9}}$
   $= \frac{\frac{1}{15}}{\frac{32}{9}} = \frac{1}{15} \times \frac{9}{32} = \frac{3}{160}$
6. **(a)** 1
   Explanation: We know that 6^n will end in 6
   And 5^n will end in 5
   Now, $6^n - 5^n$ always end with 6 - 5 = 1
7. **(a)** both negative
   Explanation: Given; $x^2 + 88x + 125 = 0$
   $D = (88)^2 - 4(1)(125)$
   $D = 7244$
   Now,

$x = \frac{-(88) \pm \sqrt{7244}}{2(1)}$
$\Rightarrow x = \frac{-88+2\sqrt{1811}}{2}$
There roots are $x = -44 + \sqrt{1811}, -44 - \sqrt{1811}$
Which are both negative.

8. **(c)** 231 cm^2
Explanation: Area swept by minute hand in 60 minutes = πR^2
Area swept by it in 10 minutes
$= \left(\frac{\pi R^2}{60} \times 10\right) \text{cm}^2 = \left(\frac{22}{7} \times 21 \times 21 \times \frac{1}{6}\right) \text{cm}^2$
= 231 cm^2

9. **(a)** $5x^3 - 3x^2 - \sqrt{x} + 2$
Explanation: $5x^3 - 3x^2 - \sqrt{x} + 2$ is not a polynomial because each term of a polynomial should be a product of a constant and one or more variable raised to a positive, zero or integral power. Here $\sqrt{x}$ does not satisfy the condition of being a polynomial.

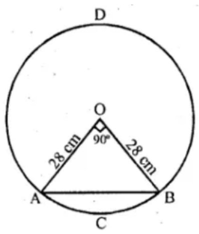
10. **(d)** 25 : 49
Explanation: In $\triangle ABC$ and $\triangle DEF$,
$\frac{\text{AB}}{\text{DE}} = \frac{\text{BC}}{\text{EF}} = \frac{\text{AC}}{\text{DF}} = \frac{5}{7}$
Then, area $(\triangle \text{ABC}) :$ area $(\triangle \text{DEF})$
$= \frac{\text{AB}^2}{\text{DE}^2} = \left(\frac{5}{7}\right)^2 = 25 : 49$

11. **(c)** 0
Explanation: Elementary events are
(1, 1), (1, 2), (1, 3), (1, 4), (1, 5), (1, 6)
(2, 1), (2, 2), (2, 3), (2, 4), (2, 5), (2, 6)
(3, 1), (3, 2), (3, 3), (3, 4), (3, 5), (3, 6)
(4, 1), (4, 2), (4, 3), (4, 4), (4, 5), (4, 6)
(5, 1), (5, 2), (5, 3), (5, 4), (5, 5), (5, 6)
(6, 1), (6, 2), (6, 3), (6, 4), (6, 5), (6, 6)
∴ Number of Total outcomes = 36
And Number of possible outcomes (sum of numbers appearing on die is 13) = 0
∴ Required Probability = $\frac{0}{36} = 0$

12. **(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

13. **(b)** 26
Explanation: Area of first circle of radius = $\frac{10}{2}$ = 5 cm
$= \pi r^2 = \pi \times (5)^2 \text{cm}^2 = 25\pi \text{cm}^2$
and area of second circle of radius = $\frac{24}{2}$ = 12 cm = $\pi(12)^2$ cm^2 = 144π cm^2
∴ Total area = $(25\pi + 144\pi)$ cm^2 = 169π cm^2
∴ Area of larger circle = 169π cm^2
∴ Radius = $\sqrt{\frac{\text{Area}}{\pi}} = \sqrt{\frac{169\pi}{\pi}} = \sqrt{169}$
= 13 cm
∴ Diameter = 2 $\times$ radius = 2 $\times$ 13 = 26 cm^2

14. **(d)** 2240 cm^2
Explanation: A chord AB makes an angle of 90^0 at the centre
Radius of the circle = 28 cm



Area of minor segment ACB

$= \pi r^2 \times \frac{\theta}{360^\circ}$ - area of $\triangle AOB$

$= \pi r^2 \times \frac{90^\circ}{360^\circ} - \frac{1}{2}\mathrm{OA} \times \mathrm{OB}$

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

$= \frac{1}{4} \times \frac{22}{7} \times 28 \times 28 - \frac{1}{2} \times 28 \times 28$

= 616 - 392

= 224 cm^2

∴ Area of the major segment ADB

= Area of circle - area of minor segment

$= \pi r^2 - 224 = \frac{22}{7} \times 28 \times 28 - 224$

= 2464 - 224

= 2240 sq. cm

15. **(a)** $AB^2 + AC^2 = BC^2$

Explanation: In triangle ADC, $AC^2 = AD^2 + CD^2$

In triangle ABD, $AB^2 = AD^2 + BD^2$

Adding both equations,

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

$\Rightarrow AC^2 + AB^2 = 2CD.BD + CD^2 + BD^2$ [Since BD = CD = AD]

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

$\Rightarrow AB^2 + AC^2 = BC^2$

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

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

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

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

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

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

$= \tan\theta$

17. **(b)** 6

Explanation: The given system of equations are

2x + 3y = 5

4x + ky = 10

For the equations to have infinite number of solutions, $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

Here, we must have

Therefore $\frac{2}{4} = \frac{3}{k} = \frac{5}{10}$

$\Rightarrow \frac{2}{4} = \frac{3}{k}$

$\Rightarrow$ 2k = 12

$\Rightarrow$ k = $\frac{12}{2}$

$\Rightarrow$ k = 6

18. **(c)** 0

Explanation: Elementary events are

(1, 1), (1, 2), (1, 3), (1, 4), (1, 5), (1, 6)

(2, 1), (2, 2), (2, 3), (2, 4), (2, 5), (2, 6)
(3, 1), (3, 2), (3, 3), (3, 4), (3, 5), (3, 6)
(4, 1), (4, 2), (4, 3), (4, 4), (4, 5), (4, 6)
(5, 1), (5, 2), (5, 3), (5, 4), (5, 5), (5, 6)
(6, 1), (6, 2), (6, 3), (6, 4), (6, 5), (6, 6)
$\therefore$ Number of Total outcomes = 36
And Number of possible outcomes (product of numbers appearing on die is 7) = 0
$\therefore$ Required Probability = $\frac{0}{36} = 0$

19. **(d)** composite number
Explanation: We have 7 $\times$ 11 $\times$ 13 + 13 = 13 (77 + 1) = 13 $\times$ 78. Since the given number has 2 more factors other than 1 and itself, therefore it is a composite number.

20. **(c)** 228 cm^2
Explanation: Correct option: (b)
Side of a square = 20cm
Area of the square = $(20\times20)cm^2$ = $400cm^2$
Diagonal of square = $\sqrt{(20)^2+(20)^2} = \sqrt{800} = 20\sqrt{2}\text{cm}$
= Radius of the quadrant = $20\sqrt{2}\text{cm}$
Area of a quadrant = $\frac{1}{4} \times 3.14 \times (20\sqrt{2})^2 = 628\text{cm}^2$
Thus, area of the shaded region = Area of a quadrant - Area of the square
=$(628 - 400)cm^2$
= $228cm^2$

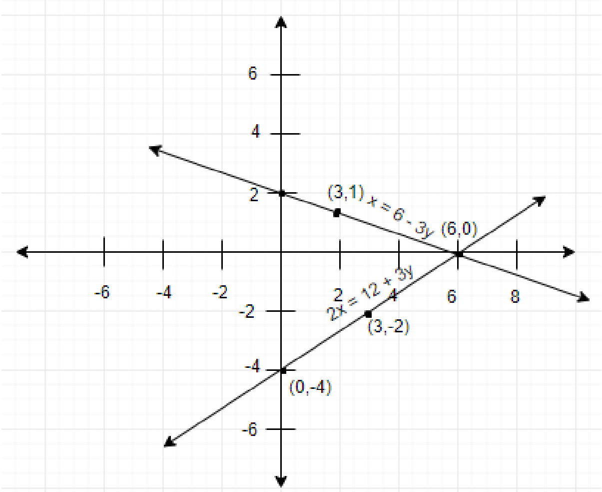
Section B

21. **(b)** 18 sq. units
Explanation: Here are the two solutions of each of the given equations. $x + 3y = 6$

x	0	3	6
y	2	1	0

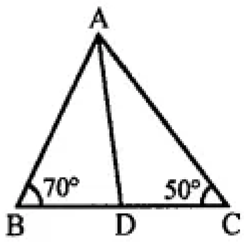
$2x - 3y = 12$

x	0	3	6
y	-4	-2	0



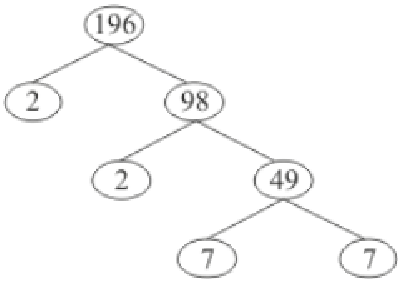
$\therefore$ Area of triangle = $\frac{1}{2}$ $\times$ Base $\times$ Height = $\frac{1}{2} \times 6 \times 6$ = 18 sq. units

22. **(a)** 30°
Explanation:



$\frac{AB}{AC} = \frac{BD}{DC}$
$\angle$B = 70° $\angle$C = 50°
But $\angle$A + $\angle$B + $\angle$C = 180° (Angles of a triangle)
$\angle$A = 180° – ($\angle$B + $\angle$C)
= 180° – (70° + 50°)
= 180° – 120° = 60°
$\frac{AB}{AC} = \frac{BD}{DC}$
AD is the bisector of $\angle$A
$\angle$BAD = $\frac{60}{2}$ = 30°

23. **(c)** 4
Explanation:
Using the factor tree for prime factorisation, we have:



Therefore,
$196 = 2 \times 2 \times 7 \times 7$
$196 = 2^2 \times 7^2$
The exponents of 2 and 7 are 2 and 2 respectively.
Thus the sum of the exponents is 4.

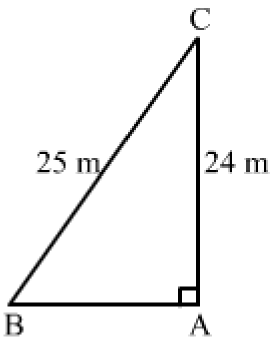
24. **(a)** $\frac{m^2-1}{n^2-1}$
Explanation: Given: tanA = n tanB
$\Rightarrow \frac{1}{\tan B} = \frac{n}{\tan A}$
$\Rightarrow \cot B = \frac{n}{\tan A}$
And sin A = m sin B
$\Rightarrow \frac{1}{\sin B} = \frac{m}{\sin A}$
$\Rightarrow$ cosec B = $\frac{n}{\sin A}$
Now, $\operatorname{cosec}^2B - \cot^2B = 1$
$\Rightarrow \frac{m^2}{\sin^2 A} - \frac{n^2}{\tan^2 A}$ = 1
$\Rightarrow \frac{m^2}{\sin^2 A} - \frac{n^2\cos^2 A}{\sin^2 A}$ = 1
$\Rightarrow m^2 - n^2\cos^2A = \sin^2A$
$\Rightarrow m^2 - n^2\cos^2A = 1 - \cos^2A$
$\Rightarrow m^2 - 1 = (n^2 - 1)\cos^2A$
$\Rightarrow \cos^2A = \frac{m^2-1}{n^2-1}$

25. **(a)** 6
Explanation: Given: $a_1 = 6$, $a_2 = 12$, $b_1 = 3$, $b_2 = c$, $c_1 = c - 3$, $c_2 = c$
Since the pair of given linear equations has infinitely many solutions,

$\therefore \frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$
$\Rightarrow \frac{6}{12} = \frac{3}{c} = \frac{c-3}{c}$
Taking $\frac{6}{12} = \frac{3}{c}$
$\Rightarrow$ c = $\frac{3\times12}{6}$ = 6

26. **(b)** 7 m

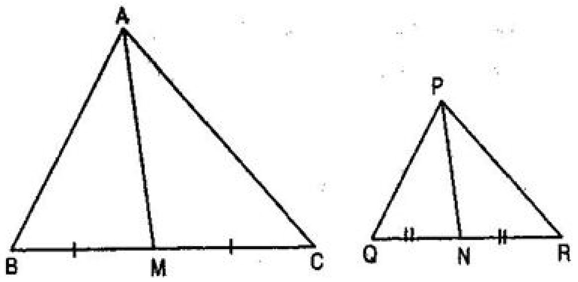
Explanation:



Let the ladder BC reaches the building at C.
Let the height of building where the ladder reaches be AC.
According to the question:
BC = 25 m
AC = 24 m
In right-angled triangle CAB, we apply Pythagoras theorem to find the value of AB.
$BC^2 = AC^2 + AB^2$
$\Rightarrow AB^2 = BC^2 - AC^2 = 25^2 - 24^2$
$\Rightarrow AB^2 = 625 - 576 = 49$
$\Rightarrow AB = \sqrt{49} = 7\text{m}$

27. **(d)** 8.8 cm.

Explanation: Let the two similar triangles be ΔABC and ΔPQR such that ar (ΔABC) = 121 cm^2 and ar (ΔPQR) = 64 cm^2. Let AM and PN be the respective medians of ΔABC and ΔPQR. Since the ratio of the areas of two similar triangles is equal to the ratio of the squares of their corresponding medians



$\therefore \frac{\text{ar}(\Delta\text{ABC})}{\text{ar}(\Delta\text{PQR})} = \frac{\text{AM}^2}{\text{PN}^2} \Rightarrow \frac{121}{64} = \frac{(12.1)^2}{\text{PN}^2}$
$\Rightarrow \text{PN}^2 = \frac{146.41\times64}{121}$
$\Rightarrow \text{PN} = 8.8\text{cm}$

28. **(b)** $-y_1 : y_2$

Explanation: Let a point A on x-axis divides the line segment joining the points P(x_1, y_1) Q(x_2, y_2) in the ratio $m_1 : m_2$ and
let co-ordinates of A be (x, 0)
$\therefore 0 = \frac{m_1y_2+m_2y_1}{m_1+m_2} \Rightarrow 0 = m_1y_2 + m_2y_1$
$\Rightarrow m_1y_2 = -m_2y_1 \Rightarrow \frac{m_1}{m_2} = \frac{-y_1}{y_2}$
$\therefore$ Ratio is $-y_1 : y_2$

29. **(a)** $\frac{1}{2}$

Explanation: $\tan^2 45^\circ - \cos^2 30^\circ = x \sin 45^\circ \cos 45^\circ$

$\Rightarrow (1)^2 - \left(\frac{\sqrt{3}}{2}\right)^2 = x\frac{1}{\sqrt{2}} \times \frac{1}{\sqrt{2}} \Rightarrow 1 - \frac{3}{4} = x \times \frac{1}{2}$

$\Rightarrow \frac{1}{4} = \frac{1}{2}x \Rightarrow x = \frac{1}{4} \times \frac{2}{1} = \frac{1}{2}$

30. **(b)** 45 years

Explanation: Let my age and son's age be x and y years.

Given, x = 3y

x + 5 = $\frac{5(y+5)}{2}$

$\Rightarrow$ 3y + 5 = $\frac{5(y+5)}{2}$

$\Rightarrow$ 6y + 10 = 5y + 25

$\Rightarrow$ y = 15

x = 3 $\times$ 15 = 45

Hence, my age and son's age are 45 years and 15 years.

31. **(b)** irrational numbers

Explanation: All non-terminating and non-recurring decimal numbers are irrational numbers. A number is rational if and only if its decimal representation is repeating or terminating.

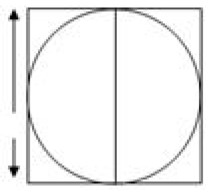
32. **(b)** other than 2 or 5 only

Explanation: A rational number can be expressed as a **non-terminating** repeating decimal if the denominator has the factors other than 2 or 5 only.

33. **(b)** $\frac{1-cos\ \theta}{1+cos\ \theta}$

Explanation: $(\ cosec\theta - \cot\theta)^2 = \left(\frac{1}{\sin\theta} - \frac{\cos\theta}{\sin\theta}\right)^2 = \frac{(1-\cos\theta)^2}{\sin^2\theta} = \frac{(1-\cos\theta)^2}{(1-\cos^2\theta)} = \frac{(1-\cos\theta)}{(1+\cos\theta)}$

34. **(b)** $\frac{1}{4}\pi a^2\ squnits$

Explanation: 

According to the question,

Diameter of circle = side of a square

$\Rightarrow d = a$

$\Rightarrow\ r = \frac{a}{2}$

Now, Area of the circle = πr^2 = $\pi\left(\frac{a}{2}\right)^2$

$\Rightarrow$ Area of the circle = $\frac{1}{4}\pi a^2$ sq. units

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

Explanation: Total number of balls in the bag = 4 + 6 = 10.

Number of black balls = 6.

$\therefore$ P (getting a black ball) = $\frac{6}{10} = \frac{3}{5}$.

36. **(d)** 25 and 25

Explanation: Let number of Rs 1 coins = x

and number of Rs 2 coins = y

Now, by given conditions:

Total number of coins = x + y = 50 ...(i)

Also, Amount of money with her = (Number of Rs 1 $\times$1) + (Number of Rs 2 $\times$ coin 2)

= x(1) + y(2) = 75

= x + 2y = 75 ...(ii)

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

(x + 2y) - (x + y) = (75 - 50)

So, y = 25

Putting y = 25 we get x = 25.
Hence he has 25 one-rupee coins and 25 2-rupee coins.

37. **(a)** is non-terminating and non-recurring
Explanation: The value of π = 3.141592653589...
Therefore the value of π is not-repeating decimal, non-terminating and non-recurring numbers.

38. **(b)** 1
Explanation: Given: $\frac{1+\tan^2\theta}{\sec^2\theta}$
= $\frac{\sec^2\theta}{\sec^2\theta}$ = 1
[$\because$ $\sec^2\theta$ = 1 + $\tan^2\theta$]

39. **(b)** $\frac{3}{10}$
Explanation: Total numbers are $\Sigma x_i = 10$

x	f
3	1
5	2
7	3
9	4

Average = $\frac{3\times1+5\times2+7\times3+9\times4}{10}$
= $\frac{3+10+21+36}{10} = \frac{70}{10} = 7$
$\therefore$ m = 3
$\therefore$ Probability of average number = $\frac{3}{10}$

40. **(b)** $\sqrt{2}$
Explanation: Distance between $(\cos\theta, \sin\theta)$ and $(\sin\theta, -\cos\theta)$
$= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
$= \sqrt{(-\cos\theta - \sin\theta)^2 + (\sin\theta - \cos\theta)^2}$
$= \sqrt{1+1} = \sqrt{2}\ \{\because \sin^2\theta + \cos^2\theta = 1\}$

Section C

41. **(d)** Quadratic polynomial
Explanation: Quadratic polynomial

42. **(a)** -3 and 3
Explanation: Since, the parabola intersects the x-axis at = -3 and 4. So, zeroes of the polynomial are -3 and 4.

43. **(b)** 4, -3
Explanation: Let f(x) = x^2 - x - 12
= x^2 - 4x + 3x - 12 = (x + 3)(x - 4)
Consider f(x) = 0 $\Rightarrow$ (x + 3)(x - 4) = 0 $\Rightarrow$ x = 4, -3

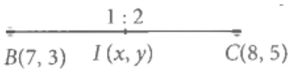
44. **(d)** $\frac{9}{4}$
Explanation: Sum of zeroes = $-\frac{\text{Coefficient of } x}{\text{Coefficient of } x^2}$
= $-\frac{(-9)}{4} = \frac{9}{4}$

45. **(d)** $\frac{1}{20}$
Explanation: Product of zeroes = $\frac{20}{1}$ = 20
$\therefore$ Reciprocal of product of zeroes = $\frac{1}{20}$

46. **(d)** Option (ii)
Explanation: The distance between A and C

= $\sqrt{(8-4)^2+(5+3)^2}$ = $\sqrt{4^2+8^2}$
= $\sqrt{16+64}$ = $\sqrt{80}=4\sqrt{5}$ units

47. **(a)** $\left(\frac{22}{3},\frac{11}{3}\right)$
Explanation: Let the coordinates of I be (x, y)



Then, by section formula,
x = $\frac{1\times8+2\times7}{1+2}$ = $\frac{8+14}{3}=\frac{22}{3}$
and y = $\frac{1\times5+2\times3}{1+2}$ = $\frac{5+6}{3}=\frac{11}{3}$
Thus, the coordinates of I is $\left(\frac{22}{3},\frac{11}{3}\right)$

48. **(c)** (6, 1)
Explanation: The mid-point of A and C
= $\left(\frac{8+4}{2},\frac{5-3}{2}\right)$ = (6, 1)

49. **(a)** 3 : 1
Explanation: Let B divides the line segment joining A and C in the ratio k : 1. Then, the coordinates of B will be $\left(\frac{8k+4}{k+1},\frac{5k-3}{k+1}\right)$.
Thus, we have $\left(\frac{8k+4}{k+1},\frac{5k-3}{k+1}\right)$ = (7, 3)
$\Rightarrow$ $\frac{8k+4}{k+1}$ = 7 and $\frac{5k-3}{k+1}$ = 3
Consider, $\frac{8k+4}{k+1}$ = 7 $\Rightarrow$ 8k + 4 = 7k + 7 $\Rightarrow$ k = 3
Hence, the required ratio is 3 : 1.

50. **(a)** a straight line
Explanation: $\because$ B divides AC in the ratio 3 : 4.
$\therefore$ A, B, C lie on a straight line.