Question 1

a. ABCD is a parallelogram with AB ∥ DC. If angle A = (5x +5) and angle B = (4x + 4), find the value of x and the measures of all the angles of parallelogram ABCD. **[3]**

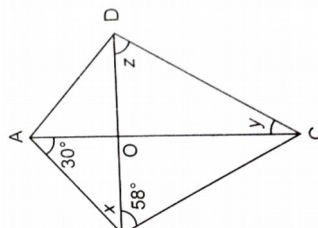**b.** In △ ABC, ∠B = 90° , AB = 8 cm , BC = 6 cm.
Find the radius of the semi circle described on the AC
and the area of the figure (take $\pi = 3.14$) **[3]**
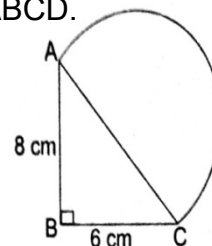
c. Find the solution of following simultaneous equation graphically x + 2y-4 = 0; 2x-y-3 =0 **[4]**

Question 2

a. ABCD is a kite. $\angle BAC = 30°, \angle CBD = 58°$
$find\ x, y \wedge z$ **[3]**

b. The outer surface of a wooden box of dimension 75 cm X 60 cm X 40 cm has to be painted. If the cost of painting 100 Sq cm is Rs 15, find the total cost of painting the box. **[3]**

c. The image of triangle OXY under reflection in the origin O is the triangle OX'Y', where X' (–3, –4) is the image of X and Y' (0, –5) is the image of Y.
   i.   Draw a diagram to represent this information and write down the co-ordinates of X and Y.
   ii.   What kind of figure is the quadrilateral XYX'Y'? Give a reason for your answer.
   iii.   Find the co-ordinates of X'', the image of X under reflection in the origin, followed by reflection in the *y*-axis.
   iv.   Find the co-ordinates of Y'', the image of Y under reflection in *x*-axis, followed by reflection in the origin. **[4]**

Question 3

a. Cards marked with numbers 1, 2, 3, 4, …, 20 are well shuffled & a card is drawn at random. What is the probability that the number on the card is:
   i.   A prime number?
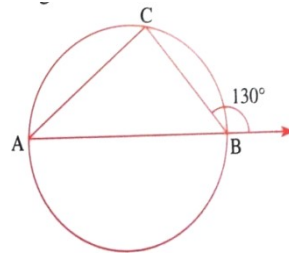   ii.   Divisible by 3?
   iii. A perfect square? **[3]**

b. Without plotting rotate the points p (3,1) and Q(7,9) by 90° clockwise and anticlockwise and also rotate it by 180° . **[3]**

c. The shape of a tile used in construction is an octagon as shown in the figure. Find the area of the tile **[4]**
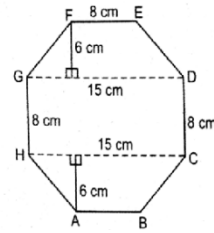
Question 4

a. Find the magnitude of ∠CAB from the given figure. AB is diameter **[3]**

b. Well is dug with 14 m diameter and depth of 10 m. The earth taken out is spread evenly on a plot of land 100 m long and 7 m wide. Find the height of the platform thus formed by the earth. **[3]**

c. Solve the given inequation, $-1 \leq 3 + 4x < 23$ where $x \in R$, & graph the solution on number line **[4]**

Question 5

a. Find two consecutive whole numbers, such that 3 times the first number plus 7 times the second is 217. **[3]**

b. The dimensions of a piece of iron in the shape of cuboid are 270 cm x 100 cm x 64 cm. If the cuboid is melted and cast into cubes of side 12 find the number of cubes obtained. **[3]**

c. Three coins are tossed together. Write all possible outcomes. Now, find the probability of getting:
i.   Exactly two heads
ii.   At least two heads
iii.   All tails
iv.   At least one tail **[4]**

Question 6

a. If the mean of 6, 4, 7, a & 10 is 8. Find the value of 'a'. **[2]**

b. The adjoining pie chart shows the percentage of buyers of five brands of shampoo P, Q, T, S and R
i.   Which is most and least popular brand of shampoo?
ii.   What is the central angle of the sector of shampoo S?
iii.   What is the number of persons purchasing shampoo P, if the number of person purchasing shampoo T is 270? **[4]**
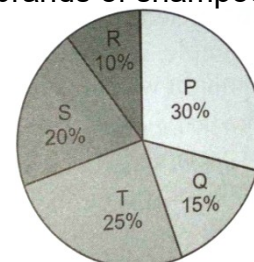
c. Solve 10y = 7x – 4 and 12x + 18y = 1 by eliminating one variable by substitution method **[4]**

Question 7

a. The marks obtained by 19 students of a class are given below:
27, 36, 22, 31, 25, 26, 33, 24, 37, 32, 29, 28, 36, 35, 27, 26, 32, 36 & 28. Find:
i.   Median
ii. Mean
iii. Mode **[3]**

b. Draw a histogram & hence estimate the mode for following frequency distribution: **[3]**

Class	0-10	10-20	20-30	30-40	40-50	50-60
Frequency	2	8	10	5	4	3

c. The sum of the numerator and the denominator of a fraction are equal to 7. Four times the numerator is less than 5 times the denominator. Find the fraction. **[4]**

Question 8

a. Survey was conducted on the favorite pet animal of 72 people. The findings are as follows. Represent this data by a pie chart. **[4]**

Pet Animal	Dog	Cat	Rabbit	Fish
Number of person	27	18	9	18

b. The marks of the students of a class in mathematics test are as follows:
15,24,17,12,27,29,15,16,28,23,21,18,11,29,27,30,23,21,24,13,15,25,21,18,15,19,9,18,25,10,22,
11,17,19,25,27,21,18,15,24,21,22,19,28,29.
Taking class interval 0 – 5, 5 – 10… make grouped frequency distribution table. **[4]**

c. If 25 – 4x ≤ 16. Find:
i.   Smallest value of x, when x is a real number
ii.   Smallest value of x, when x is an integer. **[2]**

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Ans key

Question 1

a.   ABCD is a parallelogram with AB∥DC. If angle A = (5x +5) and angle B = (4x + 4), find the value of x and the measures of all the angles of parallelogram ABCD.   **[3]**

Ans.   angle A + angle B = (4x + 4) + (5x +5) = 180

$$9x + 9 = 180$$
$$x + 1 = 20$$
$$x = 19$$

Angle A = (5x +5) = 100°
B = (4x + 4) = 80°
C = 10°
D = 80°.

b.   In △ ABC, ∠B = 90° , AB = 8 cm , BC = 6 cm.
Find the radius of the semi circle described on the AC
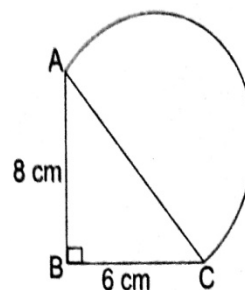and the area of the figure (take $\pi = 3.14$)   **[3]**

Ans.

SOLUTION: AC = $\sqrt{6^2 + 8^2}$ = 10 cm (using
pythagoras theorem)

∴ radius = 5 cm

Area of △ABC = $\frac{1}{2}$ × b × h = $\frac{1}{2}$ × 6 × 8 = 24 cm²

Area of semicircle = $\frac{1}{2} \pi r^2$ = $\frac{1}{2}$ × 3.14 × 5 × 5

= 39.25 cm²

c.   Find the solution of following simultaneous equation graphically x + 2y-4 = 0; 2x-y-3 =0   **[4]**

Ans.   on the graph

Question 2

a.   ABCD is a kite. $\angle BAC = 30°, \angle CBD = 58°\ find\ x, y \wedge z$.   **[3]**

Ans. $\angle O = 90° ¿$

X = 180° – 30° - 90° = 60° (angle sum property of △)
Z = 58 (△BCD is isosceles triangle)
Y = 180° – z - 90°(angle sum property of △)
   = 180° – 58° - 90° = 32°
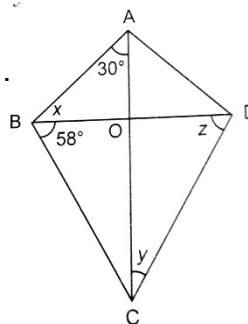
b. The outer surface of a wooden box of dimension 75 cm X 60 cm X 40 cm has to be painted. If the cost of painting 100 Sq cm is Rs 15, find the total cost of painting the box. **[3]**

Ans. SOLUTION: Since the outer surface of the box is to be painted, we need to find out its total surface area.

Given: $l = 75$ cm, $b = 60$ cm, $h = 40$ cm

Total surface area of the box $= 2(lb + bh + lh)$

$= 2\{(75 \times 60) + (60 \times 40) + (75 \times 40)\}$ cm²

$= 2\{4500 + 2400 + 3000\}$ cm²

$= (2 \times 9900)$ cm²

$= 19,800$ cm²

Cost of painting the box $= ₹\dfrac{19,800 \times 15}{100} = ₹2970$

c. The image of triangle OXY under reflection in the origin O is the triangle OX'Y', where X'(–3 , –4) is the image of X and Y' (0 , –5) is the image of Y.
   i.   Draw a diagram to represent this information and write down the co-ordinates of X and Y.
   ii.   What kind of figure is the quadrilateral XYX'Y'? Give a reason for your answer.
   iii. Find the co-ordinates of X'', the image of X under reflection in the origin, followed by reflection in the *y*-axis.
   iv.   Find the co-ordinates of Y'', the image of Y under reflection in *x*-axis, followed by reflection in the origin. **[4]**

Ans .   solution 0n graph

Question 3

a. Cards marked with numbers 1, 2, 3, 4, …, 20 are well shuffled & a card is drawn at random. What is the probability that the number on the card is:
   (i)   A prime number?
   (ii) Divisible by 3?
   (iii) A perfect square? **[3]**

Solution:
   Total possible outcomes = 20
   i)   Favourable outcome = prime number
                             = 2, 3, 5, 7, 11, 13, 17, 19
   No. of favourable outcome = 8

$$P\left(\dfrac{getting\ a}{prime\ no.}\right) = \dfrac{No.\ of\ favourable\ outcome}{Total\ possible\ outcome}$$

$$= \dfrac{8}{20}$$

$$\therefore P\left(\dfrac{getting\ a}{prime\ no.}\right) = \dfrac{2}{5}$$

   ii)   Favourable outcome = 3, 6, 9, 12, 15, 18
           No. of favourable outcome = 6

$$P\left(\begin{array}{c}\text{getting a no.}\\ \text{divisible by 3}\end{array}\right) = \frac{\text{No. of favourable outcome}}{\text{Total possible outcome}}$$

$$= \frac{6}{20}$$

$$P\left(\begin{array}{c}\text{getting a no.}\\ \text{divisible by 3}\end{array}\right) = \frac{3}{10}$$

iii)   Favourable outcome = perfect square
                               = 1, 4, 9, 16
      No. of favourable outcomes = 4

$$P\left(\begin{array}{c}\text{getting a}\\ \text{perfect square}\end{array}\right) = \frac{\text{No. of favourable outcome}}{\text{Total possible outcome}}$$

$$= \frac{4}{20}$$

$$P\left(\begin{array}{c}\text{getting a}\\ \text{perfect square}\end{array}\right) = \frac{1}{5}$$

b.   Without plotting rotate the points p (3,1) and Q(7,9) by 90° clockwise and anticlockwise and also rotate it by 180° .   **[3]**

Ans.   p (3,1) and Q(7,9) on rotation by 90°clockwise we get p' (1, -3) and Q'(9, -7)
       p (3,1) and Q(7,9) on rotation by 90°anti clockwise get p'' (-1, 3) and Q''(-9, 7)
       p (3,1) and Q(7,9) on rotation by 180° we get p''' (-3,-1) and Q'''(-7,-9) c.

c.   The shape of a tile used in construction is an octagon as shown in the figure. Find the area of the tile   **[4]**
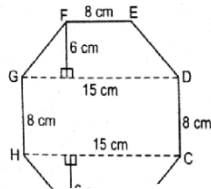
Ans.

Solution: The octagon ABCDEFGH can be divided into three parts— two trapeziums GDEF and HCBA and a rectangle GHCD as shown in Figure.

$$\text{Area of trapezium GDEF} = \frac{1}{2} \times 6 \times (15 + 8) \text{ cm}^2$$
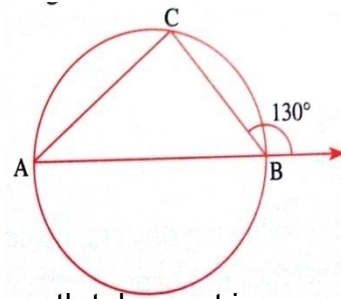
$$= 69 \text{ cm}^2$$

Area of trapezium HCBA = Area of trapezium
                                   GDEF

$$= 69 \text{ cm}^2$$

$$\text{Area of rectangle GHCD} = (15 \times 8) \text{ cm}^2 = 120 \text{ cm}^2$$

Question 4

a. Find the magnitude of ∠CAB from the given figure. [3]

Ans. $\angle ACB = 90$ *angle subtented by semicircle*
130 = $\angle ACB + \angle CAB$ *(exsterior angle property)*
130 = $90 + \angle CAB$
$\angle CAB$ = 40

b. A well is dug with 14 m diameter and depth of 10 m. The earth taken out is spread evenly on a plot of land 100 m long and 7 m wide. Find the height of the platform thus formed by the earth. [3]

Ans. SOLUTION: Since the outer surface of the box is to be painted, we need to find out its total surface area.
Given: $l = 75$ cm, $b = 60$ cm, $h = 40$ cm
Total surface area of the box = $2(lb + bh + lh)$
= $2\{(75 \times 60) + (60 \times 40) + (75 \times 40)\}$ cm²
= $2\{4500 + 2400 + 3000\}$ cm²
= (2×9900) cm²
= 19,800 cm²
Cost of painting the box = ₹$\dfrac{19,800 \times 15}{100}$ = ₹2970

c. Solve the given inequation, $-1 \le 3 + 4x < 23$ where x ∈ R, & graph the solution on number line [4]

Solution:
$-1 \le 3 + 4x < 23$ … given
∴ $-1 \le 3 + 4x$ & $3 + 4x < 23$
$-1 \le 3 + 4x$ & $3 + 4x < 23$
∴ $-1-3 \le 4x$ $4x$ $< 23 - 3$
∴ $-4 \le 4x$ ∴$4x$ < 20
i.e. $4x \le -4$ ∴ x $< \dfrac{20}{4}$
∴ x $\ge -\dfrac{4}{4}$ ∴x < 5
∴x ≥ -1 ∴ x < 5
∴ $-1 \le x < 5$, x ∈ R
S.S. = {x : $-1 \le x < 5$, x ∈ R}

The graph of the solution is:
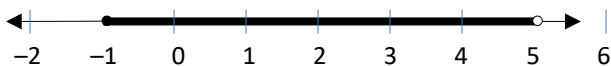
Question 5

a. Find two consecutive whole numbers, such that 3 times the first number plus 7 times the second is 217. [3]

Ans. 3x + 7(x+1) = 217
3x + 7x +7 = 217

10 x = 217- 7
10x = 210
  X = 21
So, smaller no is 21 and greater number is 22

b. The dimensions of a piece of iron in the shape of cuboid are 270 cm x 100 cm x 64 cm. If the cuboid is melted and cast into cubes of side 12 find the number of cubes obtained. **[3]**

Ans. SOLUTION: Since the outer surface of the box is to be painted, we need to find out its total surface area.

Given: $l = 75$ cm, $b = 60$ cm, $h = 40$ cm

Total surface area of the box = $2(lb + bh + lh)$

= $2\{(75 \times 60) + (60 \times 40) + (75 \times 40)\}$ cm²

= $2\{4500 + 2400 + 3000\}$ cm²

= (2×9900) cm²

= 19,800 cm²

Cost of painting the box = ₹ $\dfrac{19800}{100}$ = ₹2970

c. Three coins are tossed together. Write all possible outcomes. Now, find the probability of getting:
    (i) Exactly two heads
    (ii) At least two heads
    (iii) All tails
    (iv) At least one tail   **[4]**

Solution:
When three coins are tossed together, the possible outcomes are:
{HHH, HHT, HTT, TTT, TTH,
THH, THT, HTH}
Total possible outcomes = 8
i) Favourable outcome = exactly two heads
    i.e. HHT, THH, HTH
    No. of favourable outcome = 3

$$p\left(\begin{array}{c}\text{getting exactly}\\ \text{two heads}\end{array}\right) = \frac{\text{No. of favourable outcomes}}{\text{Total possible outcomes}}$$

$$p\left(\begin{array}{c}\text{getting exactly}\\ \text{two heads}\end{array}\right) = \frac{3}{18}$$

ii) Favourable outcome = at least two heads
    i.e. HHH, HHT, THH, HTH
    No. of favourable outcome = 4

$$p\left(\begin{array}{c}\text{getting at least}\\ \text{two heads}\end{array}\right) = \frac{\text{No. of favourable outcomes}}{\text{Total possible outcomes}}$$

$$p\left(\begin{array}{c}\text{getting at least}\\ \text{two heads}\end{array}\right) = \frac{4}{18} = \frac{1}{2}$$

iii) Favourable outcome = all tails
    i.e. TTT
    No. of favourable outcome = 1

$$p\left(\text{getting all tails}\right) = \frac{\text{No. of favourable outcomes}}{\text{Total possible outcomes}}$$

$$= \frac{1}{8}$$

iv) Favourable outcome = at least one tail
   i.e. HHT, HTH, THH, HTT, THT, TTH, TTT
   No. of favourable outcome = 7

$$p \left(\begin{array}{c} getting\ at\ least \\ one\ tail \end{array} \right) = \frac{No.\ of\ favourable\ outcomes}{Total\ possible\ outcomes}$$

$$= \frac{7}{8}$$

Question 6

a. **If the mean of 6, 4, 7, a & 10 is 8. Find the value of 'a'.** **[3]**

Solution:

$$n = 5$$

$$\sum x = 6 + 4 + 7 + a + 10$$

$$= 27 + a$$

Arithmetic Mean = 8

$$\text{Arithmetic Mean} = \frac{\sum x}{n}$$
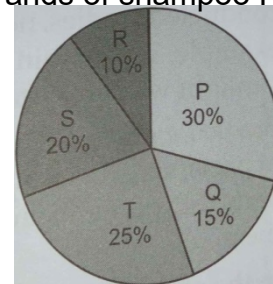
$$\therefore 8 = \frac{27 + a}{5}$$

$$40 = 27 + a$$

$$a = 40 - 27$$

$$\therefore a = \underline{13}$$

b. The adjoining pie chart shows the percentage of buyers of five brands of shampoo P, Q, T, S and R
   i.   Which is most and least popular brand of shampoo?
   ii.   What is the central angle of the sector of shampoo S?
   iii. What is the number of persons purchasing shampoo P, if the number of person purchasing shampoo T is 270? **[3]**

c. Solve $10y = 7x - 4$ and $12x + 18y = 1$ by eliminating one variable by substitution method **[4]**

Ans. $y = \dfrac{7x-4}{10}$

$12x + 18 \times \dfrac{7x-4}{10} = 1$

$120x + 126x - 72 = 10$

$246x = 86$

   $x = 82/246$

   $x = 1/3$ and

   $y = -1/5$

Question 7

a. The marks obtained by 19 students of a class are given below:
27, 36, 22, 31, 25, 26, 33, 24, 37, 32, 29, 28, 36, 35, 27, 26, 32, 36 & 28. Find:
i. Median
ii. Mean
iii. Mode   **[3]**

Solution:
Ascending order of marks:
22, 24, 25, 26, 26, 27, 27, 28, 28, 29, 31, 32, 32, 33, 35, 35, 36, 36, 37
n = 19 (odd)

i) Median = $\left(\dfrac{n+1}{2}\right)^{th}$ term

= $\left(\dfrac{19+1}{2}\right)^{th}$ term

= $\left(\dfrac{20}{2}\right)^{th}$ term

= 10th term
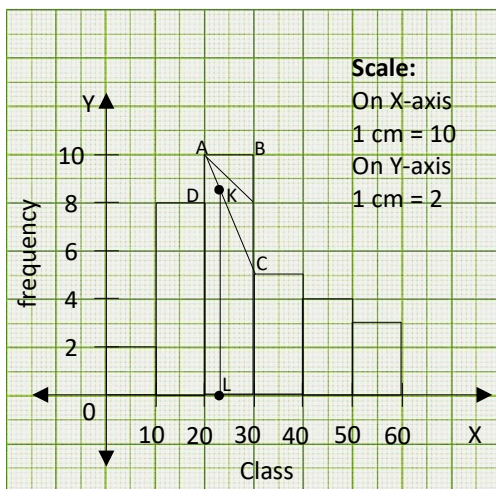
Median = <u>29</u>

iii) mode is 36 with f = 3

b. Draw a histogram & hence estimate the mode for following frequency distribution:

Class	0-10	10-20	20-30	30-40	40-50	50-60
Frequency	2	8	10	5	4	3

Solution:

Scale:
On X-axis
1 cm = 10
On Y-axis
1 cm = 2

From graph : Join AC & BD   Join AC & BD
Mode = <u>23</u>   Draw KL perpendicular axis

c. The sum of the numerator and the denominator of a fraction is equal to 7. Four times the numerator is less than 5 times the denominator. Find the fraction. **[4]**

Ans. let numerator be x and denominator be y

X + Y = 7

4X = 5Y– 8

4X - 5Y = -8

On solving

X =3 and Y = 4

Question 8

a. Survey was conducted on the favorite pet animal of 72 people. The findings are as follows. Represent this data by a pie chart. **[4]**

Pet Animal	Dog	Cat	Rabbit	Fish
Number of person	27	18	9	18

Ans. on graph paper

b. The marks of the students of a class in mathematics test are as follows:
15,24,17,12,27,29,15,16,28,23,21,18,11,29,27,30,23,21,24,13,15,25,21,18,15,19,9,18,25,10,22,
11,17,19,25,27,21,18,15,24,21,22,19,28,29.
Taking class interval 0 – 5, 5 – 10… make grouped frequency distribution table. **[4]**

Ans.

Class interval	Tally marks	Frequency
0 – 5	0	0
5 – 10	I	1
10 – 15	⊞	5
15 – 20	⊞ ⊞ ⊞	15
20 – 25	⊞ ⊞ II	12
25 – 30	⊞ ⊞ I	11
30 – 35	I	1

c. If $25 - 4x \leq 16$. Find:
   i) Smallest value of x, when x is a real number
   ii) Smallest value of x, when x is an integer. **[2]**

Solution:

$25 - 4x \leq 16$ … given

$\therefore 25 - 16 \leq 4x$

$\therefore 9 \leq 4x$

i.e. $4x \geq 9$

$\therefore x \geq \dfrac{9}{4}$

$x \geq 2\dfrac{1}{4}$

or $x \geq 2.25$

i) $\because x \in R$

S.S. = {x:x≥ 2.25, x ∈R}
Smallest value of x = 2.25
ii)   ∵ x∈ I
S.S. = {3, 4, 5, …}