CBSE Class 10 Maths Model Paper Solution

1. Number of times he got tail = 560 − 230 = 330

Probability of getting tail = $\dfrac{Number\ of\ times\ of\ tail\ occurence}{Total\ times\ tossed}$ = $\dfrac{330}{560}$ = 0.589

(OR)

Sum of probabilities of all the elementary events = 1

P(white) + P(green) + P(yellow) = 1

$\dfrac{1}{4} + P(g) + \dfrac{5}{8} = 1$

$P(g) = 1\ [-\dfrac{5}{8} - \dfrac{1}{4}]$

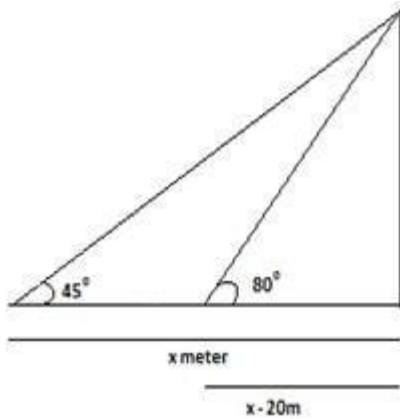$P(g) = 1 - [\dfrac{5}{8} + \dfrac{1}{4}] = 1 - [\dfrac{5}{8} + \dfrac{2}{8}]$

$P(g) = 1 - [\dfrac{7}{8}]$

$P(g) = \dfrac{8-7}{8} = \dfrac{1}{8}$

2. Let the shadow at 45° = x metre

Therefore, the shadow at 80° = x - 20 m

Hence the diagram will be like this,

45° 80°

x meter

x - 20m

3. Scale factor is nothing but the same ratio of the corresponding side lengths of the polygons.

Here the ratios of the corresponding sides are,

$\frac{2}{8} = \frac{1}{4} = 1:4$

$\frac{1.5}{6} = \frac{1}{4} = 1:4$

Hence the scale factor = $1:4$

4. Substituting x = 5 in the equation,

$(5)^2 - 65 + 40 = 0$

$25 + 40 - 65 = 0$

Hence $x = 5$ is the root of the given equation.

5. Euclid's lemma division algorithm states that any two integers can be represented in the form, a = bq + r

For r to maximum q should be minimum. Since q cannot be equal to 0, we can consider the value of q = 1,

Therefore, $23 = 8 \times 1 + 15$

Hence r = 15 is the maximum possible value and corresponding q = 1.

(OR)

Take a rational number "a" and an irrational number "b".

The sum of a and b will give c.

i.e. a + b = c

The resultant "c" is always an irrational number.

6. Given:

$AC \| DE,\ DF \| AE$

Hence we can prove that, $\dfrac{BF}{FE} = \dfrac{BE}{EC}$

$\dfrac{6}{FE} = \dfrac{8}{9}$

$54 = 8\,FE$

$FE = \dfrac{54}{8} = 6.75cm$

Thus, the value of FE is 6.75cm

Section B

7. $3x^2 - 10x - 4 + 12 = 0$

$3x^2 - 10x + 8 = 0$

$3x^2 - 6x - 4x + 8 = 0$
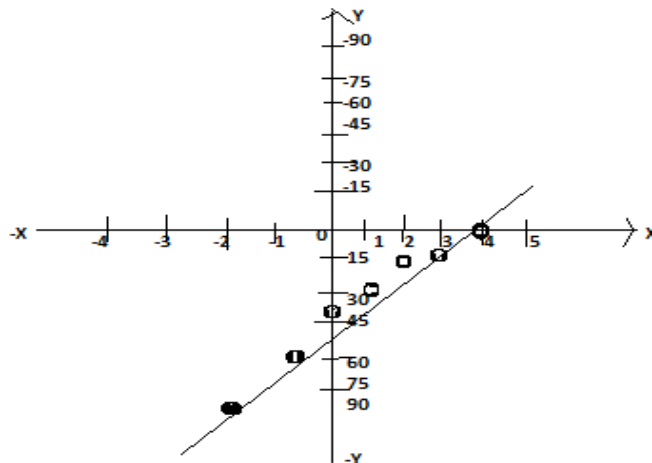
$3x(x - 2) - 4(x - 2) = 0$

$(3x - 4)(x - 2) = 0$

$3x - 4 = 0, x - 2 = 0$

$x = \frac{4}{3}, x = 2$

(OR)

Let $y = x^2 - 15x + 44 = 0$

X value	-4	-3	-2	-1	0	1	2	3	4
Y value	120	98	78	60	44	30	18	8	0

Hence the zero of the equation lies at x = 4.

8. By Lemma's division algorithm, a = bq + r, 0 ≤ r < b.

Let's start solving,

$792 = 402 \times 1 + 390$

$402 = 390 \times 1 + 12$

$390 = 12 \times 32 + 6$

$$12 = 6 \times 2 + 0$$

Hence the HCF (792, 402) = 6

9. We know, the triangle is an isosceles triangle. The lines TP and TQ are equal in length as they are tangents to a circle.

Area of Isosceles triangle = $\dfrac{bh}{2}$

Here b = 2 cm, h = 4 cm

$$Area = \dfrac{8}{2} = 4 \ cm^2$$

10. Given:

Ratio of circumference to area of a circle is 2:5.

i.e. $\dfrac{Circumference}{Area} = \dfrac{2}{5}$

$$\dfrac{2\pi r}{\pi r^2} = \dfrac{2}{5}$$

$$\dfrac{\pi r^2}{2\pi r} = \dfrac{5}{2}$$

$$\dfrac{r}{2} = \dfrac{5}{2}$$

$$r = 5 \ units$$

$$Diameter = 2r = 5 \times 2 = 10 \ units.$$

11. In order to find the height of her opposite side house, she needs three mandatory data. They are,

a. The distance between her foot and the base of her opposite house
b. Her height
c. Angle of elevation which is calculated from her line of sight.

12. The given triangle is right angled triangle.

Hence, AB = BC

Using Pythagoras theorem,

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

$AC^2 = 5^2 + 5^2$

$AC = \sqrt{(25+25)} = \sqrt{50} = \sqrt{25 \times 2} = 5\sqrt{2}\ cm$

(OR)

Substituting the corresponding values:

$$= \frac{[2\left(\frac{1}{2}\right) \times \left(1\right) + \left(\frac{1}{2}\right)(\sqrt{3})]}{\left(\frac{1}{4}\right)\left(\frac{3}{4}\right)}$$

$$= \frac{[1 + \frac{\sqrt{3}}{2}]\,16}{3}$$

$$= \frac{16 + 8\sqrt{3}}{3}$$

$$= \frac{16}{3} + \frac{8\sqrt{3}}{3}$$

$$= 5.33 + 4.62 = 9.95$$

Section C

13. Applying Pythagoras theorem we get,

$PR^2 = PQ^2 + QR^2$

$(25) = (16) + QR^2$

$QR = 3\ cm$

$cos\ P = \frac{adjacent\ side\ to\ P}{hypotenuse} = \frac{4}{5}$

$\sin Q = \dfrac{\text{opposite side to } Q}{Hypotenuse} = \dfrac{5}{5} = 1$

$\cos R = \dfrac{QR}{PR} = \dfrac{3}{5}$
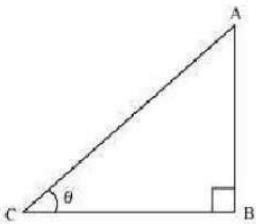
Hence, $\dfrac{\cos^2 P - \sin^2 Q}{\cos^2 R} = \dfrac{\left(\frac{4}{5}\right)^2 - 1}{\left(\frac{3}{5}\right)^2}$

$= \dfrac{16-25}{25} \times \dfrac{25}{9}$

$= -1$

(OR)

Let us consider the right angled triangle,

Given: $\tan \theta = \dfrac{5}{6} = \dfrac{\text{opposite side}}{\text{adjacent side}} = \dfrac{AB}{BC}$

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

$(AC)^2 = (5)^2 + (6)^2 = 25 + 36 = 61$

$AC = \sqrt{61}$

$\sin \theta = \dfrac{\text{opposite}}{hyp} = \dfrac{5}{\sqrt{61}}$

$\cos\theta = \dfrac{\text{adjacent}}{hyp} = \dfrac{6}{\sqrt{61}}$

$\dfrac{2 + 3\sin\theta}{2 + 3\cos\theta} = \left(2 + 3\left(\dfrac{5}{\sqrt{61}}\right)\right)\left(2 + 3\left(\dfrac{6}{\sqrt{61}}\right)\right)$

$= \dfrac{2\sqrt{61}+15}{\sqrt{61}} \times \dfrac{2\sqrt{61}+18}{\sqrt{61}}$

$$= \frac{(2\sqrt{61}+15)(2\sqrt{61}+18)}{61}.$$

14. Since we have to find a point on the y-axis, its x coordinate is 0 and let the point be (0, a)

Distance between (0, a) and (4,-1) = $\sqrt{[(0-4)^2 + (a-1)^2]}$

Distance between (0, a) and (-3, 5) = $\sqrt{[(0+3)^2 + (a-5)^2]}$

Since they are equidistant, both of their distances are equal.

$\sqrt{[(0-4)^2 + (a-1)^2]} = \sqrt{[(0+3)^2 + (a+5)^2]}$

Squaring on both sides,

$16 + a^2 + 1 - 2a = 9 + a^2 - 10a + 25$

$-2a + 17 = -10a + 34$

$8a = 17$

$a = \dfrac{17}{8} = 2.125$

15. $x^2 + 22x = (x^2 + \dfrac{22}{2x}) + \dfrac{22}{2x}$

$= (x^2 + 11x) + 11x$

$= (x + 11)x + 11 \times x$

$= (x + 11)x + 11 \times x + 11 \times 11 - 11 \times 11$

$= (x + 11)x + (x + 11) \times 11 - 11 \times 11$

$= (x + 11)(x + 11) - 11^2$

$= (x + 11)^2 - 11^2$

$= (x + 11)^2 - 121$

Hence $x^2 + 22x - 75 = (x + 11)^2 - 121 - 75 = (x + 11)^2 - 196$

$(x + 11)^2 - 196 = 0$

$(x + 11)^2 = 196$

$x + 11 = 14 \; or \; x + 11 = -14$

$x = 3, x = -25$ are the roots of the given quadratic equation.

16. Let us first form two equations from the given statements,

Let x be the number of flower vases and y be the number of dolls

$x = 3y + 2 \qquad\qquad \rightarrow (1)$

$y = \frac{x}{2} - 2 = \frac{x-4}{2}$

$2y = x - 4 \qquad\qquad \rightarrow (2)$

Substituting (1) in (2),

$(2) \quad \rightarrow 2y = (3y + 2) - 4$

$3y - 2y + 2 = 4$

$y + 2 = 4$

$y = 2$

Substitute value of y in (1)

x = 8

Hence number of vases is 8 and number of dolls is 2.

Cost of single vase is Rs.10, cost of 8 vases = Rs.80

Total cost = 94 - cost of vases = 94-80 =14

Cost of single doll = $\frac{14}{2}$ = $Rs. 7$

17. Here the maximum number of compartments that can hold the same category and same number of coins are asked.

For this first we need to find maximum number of coins that can be arranged in a compartment so that all rooms have same number of coins in the same category. This can be found by computing the HCF of the given three numbers.

$78 = 3 \times 2 \times 13$

$102 = 3 \times 2 \times 17$

$111 = 3 \times 37$

Hence HCF (78, 102, 111) = 3

No of coins in a compartment = 3

Total number of compartments required = $\dfrac{Total\ coins}{Number\ of\ coins\ per\ compartment}$ = $78 + 102 + \dfrac{111}{3}$ =

$\dfrac{291}{3}$ = 97 compartments.

<center>**(OR)**</center>

Area of the given rectangular land = $l \times b = 6 \times 4 = 24\ sq.km$

Area of the circular pool = $\pi r^2 = \dfrac{22}{7} \times \left(\dfrac{7}{22}\right)^2 = \dfrac{7}{22}\ sq.km$

Probability of Diya landing inside the circle = $\dfrac{area\ of\ circle}{total\ area}$

Total area = $24\ km + \dfrac{7}{22}\ sq.km = \dfrac{535}{22}sq.km$

Probability = $\dfrac{\frac{7}{22}}{\frac{535}{22}} = \dfrac{7}{535}$

18. Let "a" be the fixed charge and "b" be the extra charge

According to statement 1,

12a + 5b = 4600 $\longrightarrow$ (1)

According to statement 2,

12a + b = 3800 ⟶ (2)

Solving (1) and (2),

12a + 5b = 4600

12a + b = 3800   (-)

0 + 4b = 800

$b = \dfrac{\overset{80}{\overset{0}{\cancel{}}}}{4} = 200$

Putting it in (1), 12a+5(200) = 4600

12a = 4600-1000

a = 300

Hence fixed charge per hour = Rs.300 and additional charge per hour = Rs.200

19. Given the points quadrasects the line segment, i.e., it divides into four equal parts.

Hence let us consider the ratio of division as 2:2

$x_1 = -3, y_1 = 6, x_2 = 4, y_2 = -2, m_1 = 2, m_2 = 2$

According to section formula,

$[\dfrac{m_1 x_2 + m_2 x_1}{m_1 + m_2}, \dfrac{m_1 y_2 + m_2 y_1}{m_1 + m_2}]$

$= [\dfrac{2(4)+2(-3)}{4}, \dfrac{2(-2)+2(6)}{2+2}]$

$= [\dfrac{8-6}{4}, \dfrac{-4+12}{4}]$

$= [\dfrac{2}{4}, \dfrac{8}{4}]$

$= [\dfrac{1}{2}, 2]$

The point that quadrasects is [0.5, 2]

20. First let us find the class mark and proceed further

Class interval	0-20	20-40	40-60	60-80	80-100	100-120
Number of students(fi)	20	35	52	A	38	31
Class mark (xi)	10	30	50	70	90	110
fi xi	200	1050	2600	70A	3420	3410

Let us compute the summation by direct method.

$\sum f_i x_i = 200 + 1050 + 2600 + 70A + 3420 + 3410 = 10680$

$\sum f_i = 20 + 35 + 52 + A + 38 + 31 = 176 + A$

$\dfrac{\sum f_i x_i}{\sum f_i} = 10680 + \dfrac{70A}{176+A}$

Given mean = 62

$62 = \dfrac{10680+70A}{176+A}$

$10912 + 62A = 10680 + 70A$

$70A - 62A = 10912 - 10680$

$8A = 232$

$A = 29$

(OR)

i)   The vowels that are present on the face of the dice is "A-I-E".

Total sides of the dice = 6

P (getting a vowel) = number of vowel lettered sides/ total number of sides = $\dfrac{3}{6} = \dfrac{1}{2}$

ii)   The letter P is present on two faces of the dice.

Number of sides having letter P = 2

Probability (won't get a letter P) = 1- P (getting a letter P)
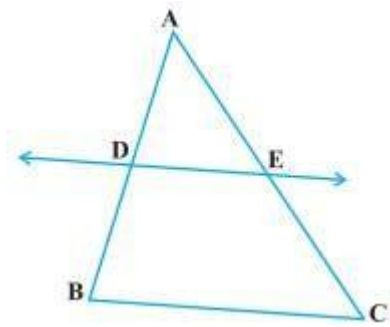
= 1 – number of faces having the letter p/ total sides

$= 1 - \dfrac{2}{6} = 1 - \dfrac{1}{3} = \dfrac{2}{3}$

iii)   The dice has letters "I-P-P" that is present above the letter "H" in the alphabets.
Number of sides the dice has letters above "H" = 3

P (getting letters above H) $= \dfrac{Number\ of\ sides\ having\ letters\ above\ H}{Total\ number\ of\ sides} = \dfrac{3}{6} = \dfrac{1}{2}$

21. First let us compute the diagram for the given statements.

Since DE || BC, we know, by theorem (6.1),

$\dfrac{AD}{DB} = \dfrac{AE}{EC}$

$\dfrac{DB}{AD} = \dfrac{EC}{AE}$

$\dfrac{DB}{AD} + 1 = \dfrac{EC}{AE} + 1$

$\dfrac{DB+AD}{AD} = \dfrac{EC+AE}{AE}$

$\dfrac{AB}{AD} = \dfrac{AC}{AE} \quad \rightarrow (1)$

Substituting the given values,

$\dfrac{AB}{6} = \dfrac{2AE}{AE}$

$AB = 12 \; cm$

$2AB = 12 \times 2 = 24cm$

22.

i)   The numbers above 6 that is present in the cards is 7, 8, 9, and 10.
Hence each red card pack has 4 cards each.
Hence total number of red number cards which is above the number 6 is,
= 4+4 = 8 cards
Probability of getting a red card with number greater than 6 = number of red cards/total number of cards
$= \dfrac{8}{52}$
$= \dfrac{2}{13}$
ii)   The even number in cards includes 2, 4, 6, 8, 10.
Total number of black even numbered cards = 5+5 =10
Probability of getting even numbered black cards = number of even numbered black cards/total number of cards = $\dfrac{10}{52} = \dfrac{5}{26}$
iii)   The card which is multiple of 3 includes 3, 6 and 9.
Hence total numbered cards = 3 + 3 + 3 + 3 = 12
Probability of getting a card which is multiple of 3 = $\dfrac{12}{52} = \dfrac{3}{13}$

(OR)

To find: 2100 is a leap year or not

$\dfrac{2100}{400}$ = not completely divisible hence it is not a leap year.

The year 2100 is a non-leap year and hence it will have 365 days

i.e. 52 weeks and 1 extra day. This extra day is what we are talking about.

This extra day should be any day apart from Saturday, Friday and Monday.

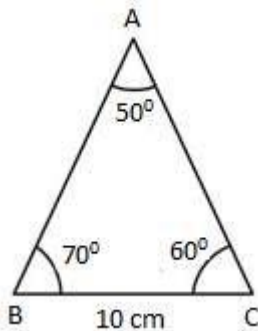Total outcomes = 7

Number of favorable outcomes = 4

Hence probability of getting our favorable result = $\dfrac{Favourable\ outcomes}{Total\ outcomes} = \dfrac{4}{7}$

Section D

(Questions 23 to 30 carry 4 marks each)

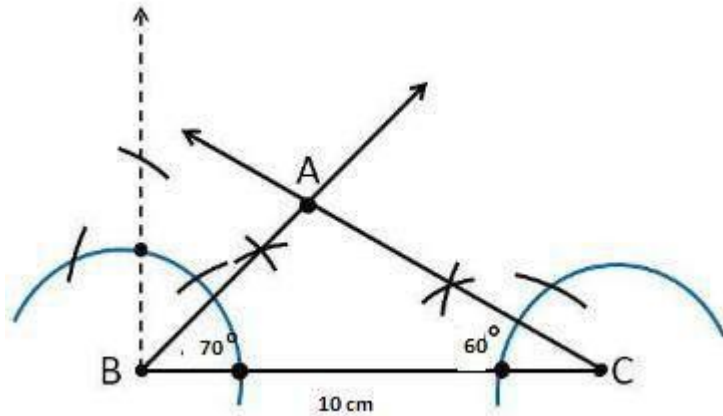23. First let us draw a rough diagram with base BC = 10 cm

Angle A = 180°- 60°- 70° = 50°

Steps to draw triangle ABC:

1) Draw a base BC = 10cm
2) Draw angle B = 70°
3) Draw angle C = 60°
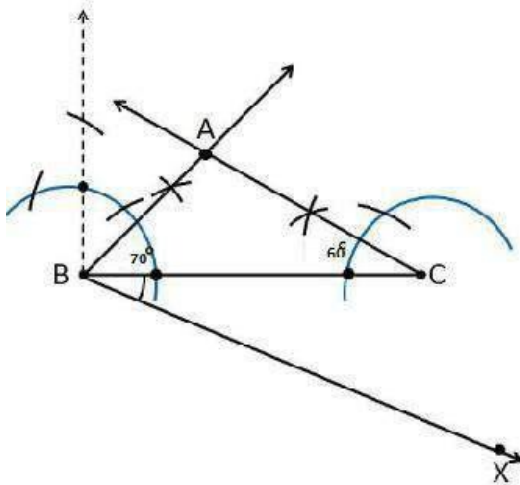4) Mark a point A at the point of intersection of the lines BA and CA.

Now we need to construct a triangle which is 4 times one side and 2 times the other side of the previous triangle.

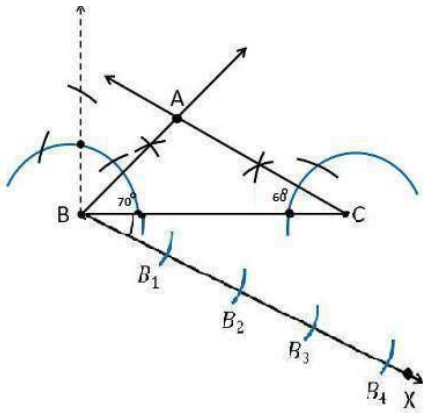Hence the scale factor is $\dfrac{4}{2}$ times

Steps of construction:

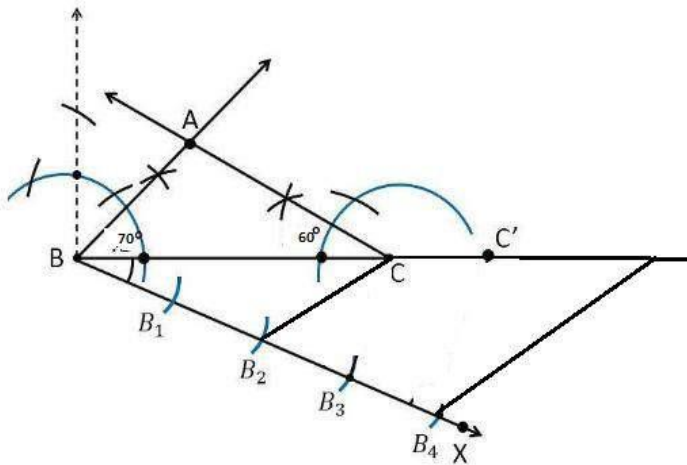a. Draw a ray BX to make an acute angle with the line BC and to the opposite side of the vertex A

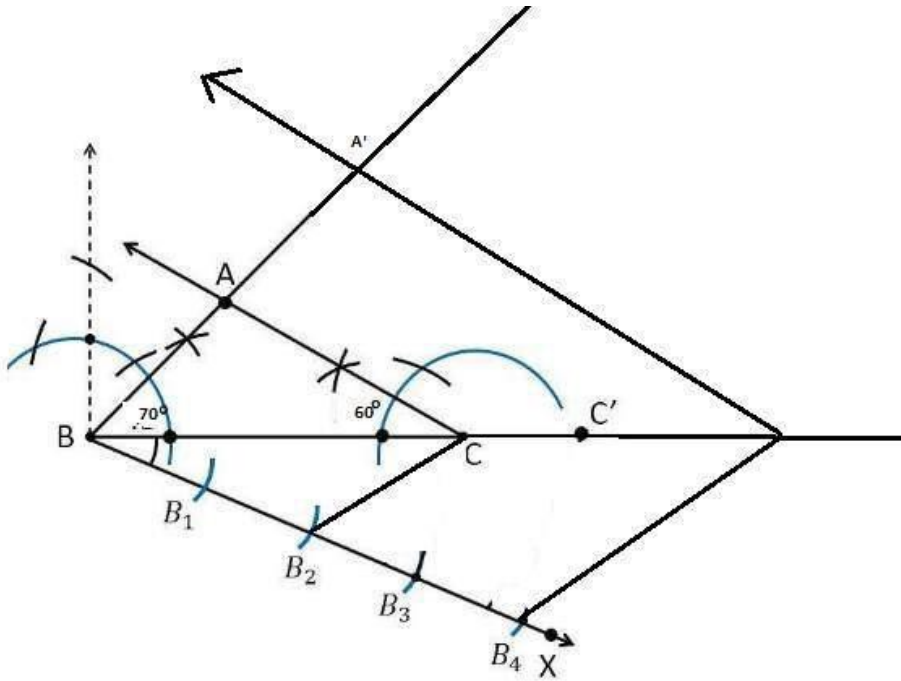b. Mark 4 (among 4 and 2, 4 is greater) points B_1, B_2, B_3, B_4 such that $BB_1 = B_1B_2 = B_2B_3 = B_3B_4$

c. Join B_2C as 2 is smaller among 2 and 4. Now join B_4C parallel to B_2C to intersect BC extended at C'.

d. Draw a line through C' parallel to AC to intersect A at A'.

Hence triangle ABC is the required triangle.

24. For this AP,

a = 980,

$d_2 - d_1$ = 941 – 980 = –39 is the common difference Let

us consider -112 is the nth term of the given A.P

WKT,

$a_n = a + (n-1)d$

$-112 = 980 + (n-1)(-39)$

$-112 - 980 = -39n + 39$

$-1131 = -39n$

$n = \dfrac{1131}{39}$

$n = 29$

Hence the given number is 29th term of the A.P
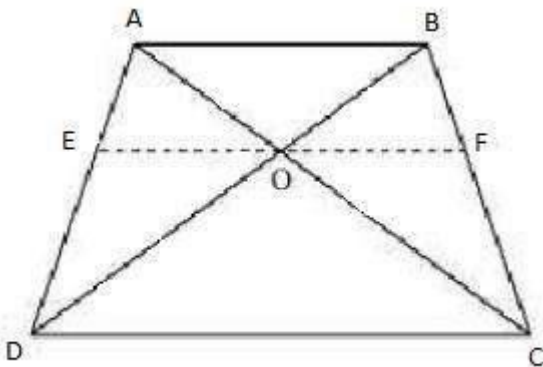
To find the tenth term, let us consider a = -112, d = -39

$a_n = a + (n-1)d$

$a_{10} = -112 + (9)(-39)$

$= -112 - 351$

$= -463$

25. Let us first construct the trapezium as explained in the question and draw a parallel line EF through the point O to intersect AB and CD at E and F.

We know,

EF || CD

In triangle ADC, EO || DC

Applying basic proportionality theorem, we get,

$\frac{AE}{ED} = \frac{AO}{OC}$

$\frac{AE}{ED} = \frac{3}{2}$ $\qquad \rightarrow (1)$

Similarly in triangle ABD, OE||AB

Therefore, $\frac{ED}{AE} = \frac{OD}{BO}$ $\rightarrow (2)$

From (1) and (2),

$\frac{AO}{OC} = \frac{BO}{OD}$

$\frac{3}{2} = \frac{BO}{6}$

$BO = \frac{18}{2} = 9\ cm$

In triangle, AOB, applying Pythagoras theorem,

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

$AB^2 = 9 + 81$

$AB^2 = 90$

$AB = 3\sqrt{10}$

Similarly, in triangle DOC,

$DC^2 = OC^2 + DO^2$

$DC^2 = 4 + 6^2$

$DC^2 = 40$

$DC = \sqrt{40} = 2\sqrt{10} = 2\sqrt{10}\ cm.$

26. First let us form the equation.

Statement 1,

Let x be the current age of grandma and y be the current age of Rangeela

Three years later age of grandma will be x+3 and Rangeela will be y+3

$x + 3 = 3.5\ (y + 3)$ $\rightarrow (1)$

Second statement,

Eight years ago, the age of grandma was x-8 and Rangeela was y-8

$$(x - 8) = 6(y - 8) + 5 \qquad \rightarrow (2)$$

Solving (1) and (2),

$\rightarrow \quad x + 3 = 3.5y + 10.5, x = 3.5y + 7.5$

$\rightarrow \quad x - 8 = 6y - 43, \quad x = 6y - 35$

$x = 3.5y + 7.5$

$x = 6y - 35$

$0 = -2.5y + 42.5$

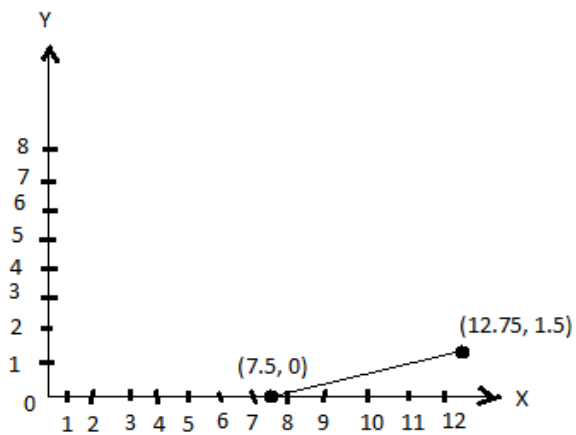$y = \frac{42.5}{2.5}$

$y = 17$

Substitute the value to find x,

$x = 3.5(17) + 7.5 = 59.5 + 7.5 = 67$

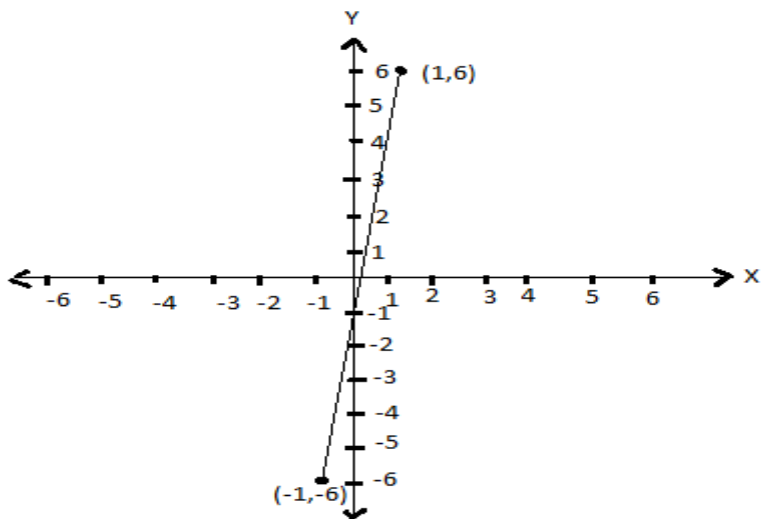The current age of grandma is 67 and Rangeela 17.

For graphical representation:

Equation (1)

Y	0	1.5
X	7.5	12.75

Equation (2)

Y	6	-6
X	1	-1

The points are plotted in the graph.

(OR)

Let $x_1 = 5, y_1 = -2$ *and* $x_2 = -1, y_2 = 7, x = k, y = 4$

$\dfrac{m_1}{m_2} = \dfrac{m}{1} \quad \rightarrow (1)$

By, section formula,

$y = \dfrac{m_1 y_2 + m_2 y_1}{m_1} + m_2$

$4 = \dfrac{7m - 2}{m + 1}$

$4m + 4 = 7m - 2$

$7m - 4m = 4 + 2$

$3m = 6$

$m = \dfrac{6}{3} = 2$

$(1) \quad \rightarrow \dfrac{m_1}{m_2} = \dfrac{2}{1}$

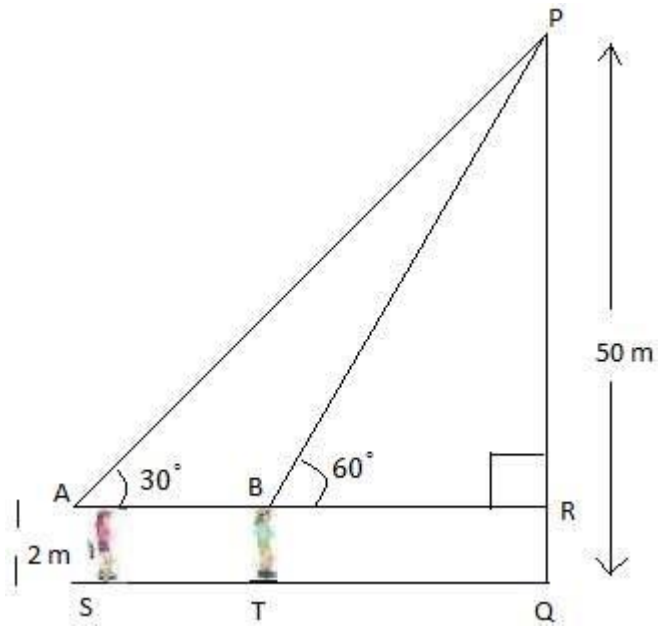Hence the ratio that the point divides the line segment is 2/1

To find the value of k:

$k = \dfrac{m_1 x_2 + m_2 x_1}{m_1} + m_2$

$k = \dfrac{2(-1) + 1(5)}{2} + 1$

$k = \dfrac{-2 + 5}{3}$

$k = \dfrac{3}{3} = 1$

27. First let us draw a rough sketch of the given statements.

From the diagram,

PR = PQ - RQ

= 50 - 2

= 48 m

In triangle PAR,

$\frac{PR}{AR} = tan\,30°$

$\frac{PR}{AR} = \frac{1}{\sqrt{3}}$

$\frac{48}{AR} = \frac{1}{\sqrt{3}}$

$AR = 48\sqrt{3}\,m$

In triangle, PRB,

$\frac{PR}{BR} = tan\,60°$

$\frac{48}{BR} = \sqrt{3}$

$$BR \ = \ \frac{48}{\sqrt{3}} m$$

From the figure, we can be sure that,

$$ST \ = \ AB$$

$$= \ AR - BR$$

$$= \ 48\sqrt{3} - \frac{48}{\sqrt{3}}$$

$$= \ \frac{144-48}{\sqrt{3}}$$
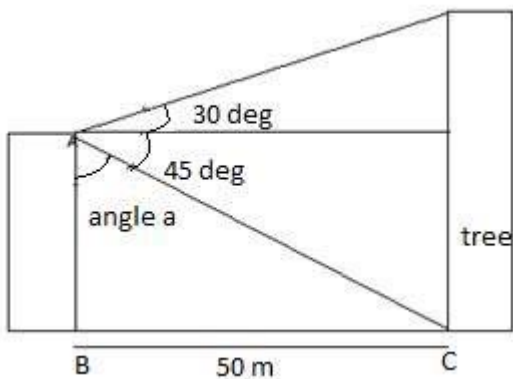
$$= \ \frac{96}{\sqrt{3}}$$

$$= \ \frac{32 \times \sqrt{3} \times \sqrt{3}}{\sqrt{3}}$$

$$= \ 32\sqrt{3} \ m$$

Therefore he walked $32\sqrt{3}$ m towards the lamp post.

(OR)

First let us construct a rough diagram based on the information given in the questions.

First let us find angle a:

Since the line of sight is parallel to the ground, we can conclude that,

Angle a + 45° = 90°

Hence, angle a = 45°

In the triangle ABC,

$$tan\ a\ =\ \frac{BC}{AB}$$

$$tan\ (45) = \frac{50}{AB}$$

$$1 = \frac{50}{AB}$$

AB = 50 m

Hence the height of the building is 50 meters.

Now let us divide the height of tree into two portions, x and y

First let us compute the value of x.

In triangle AED,

$$tan\ 30° \ =\ \frac{x}{AD} \qquad → (1)$$

From the diagram, it is clear that

AD = BC = 50 m

From (1),
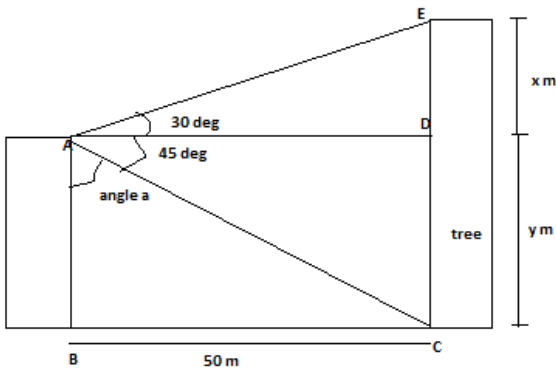
$$(\frac{1}{\sqrt{3}}) = \frac{x}{50}$$

$$\frac{50}{\sqrt{3}}\ =\ x$$

Hence height of the tree = $x + y\ m$

$$=\ \frac{50}{\sqrt{3}}\ +\ 50\ m$$

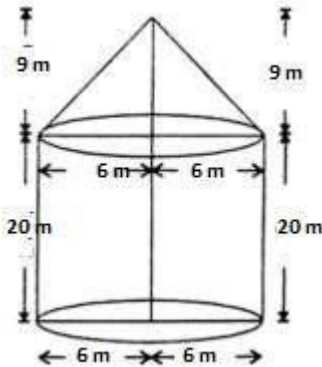Height of tree = $\frac{50(\sqrt{3}+1)}{\sqrt{3}}\ m$

28. Let us draw a rough sketch of the given statements.

Let r_1 and r_2 be the radius of the cylinder and the cone

$r_1 = r_2 = 6m$

Let h_1 and h_2 be the heights of the cylinder and the cone

$h_1 = 20m, h_2 = 9m$

Volume of the right circular cylinder = $\pi r_1^2 h_1 \ m^3$

$= (\pi \times 6 \times 6 \times 20)m^3$

$= 720\,\pi\,m^3$

Volume of the right circular cone = $\frac{1}{3} \times \pi\, r_2^2\, h_2\, m^3$

$= (\dfrac{1}{3} \times \pi \times 6 \times 6 \times 9)$

$= 108\,\pi\,m^3$

Total volume of the iron tube = volume of cylinder + volume of cone

$= 720\,\pi \; + \; 108\pi$

$= 828\pi\,m^3$

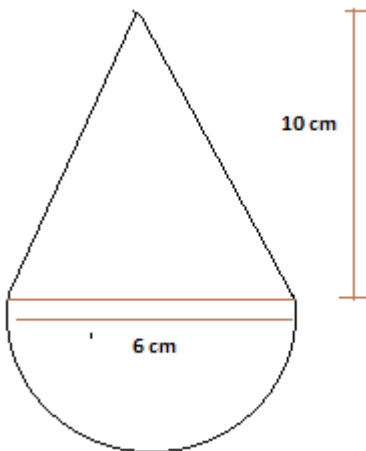Total mass of the drainage tube = total volume × weight per m^3

$= 828\pi \times 7$

$= 828 \times \dfrac{22}{7} \times 7$

$= 828 \times 22$

Total mass = 18216 kg

29. Let us first do a rough sketch of the given statements.

The radius of the hemisphere and cone = 3 cm

Height of the cone = 10 cm

Total volume of the toy = volume of hemisphere + volume of cone

$$= \frac{2}{3}\pi r^3 + \frac{1}{3}\pi r^2 h$$

$$= \frac{2}{3}\pi (3)^3 + \frac{1}{3}\pi (3)^2 (10)$$

$$= 18\pi + 30\pi$$

$$= 48\pi$$

Given, A cube circumscribes the given toy, so the edge of the cube must be minimum 10 cm

Hence, volume of the cube = $(10)^3 = 1000\ cm^3$

Difference between the volume of the toy and the cube = volume of empty space in the cube

$$= 1000 - 48\pi$$

$$= 1000 - 48 \times \frac{22}{7}$$

$$= 1000 - 150.85$$

$$= 849.15\ cm^3$$

Total surface area of the toy = Curved surface area of hemisphere + Curved surface area of cone

$$= \pi rl + 2\pi r^2$$

Where, $l = \sqrt{h^2 + r^2}$

$$l = \sqrt{10^2 + 3^2} = \sqrt{100 + 9} = \sqrt{109}$$

$$= \pi(3)\sqrt{109} + \frac{1}{3}\pi(3)^2$$

$$= \pi(3)(10.44) + \pi(3)$$

$$= 30.44\pi + 3\pi = 33.44\ \pi\ cm^2$$

30. The cumulative frequency distribution of more than type can be obtained as,

Production yield	Cumulative frequency
More than or equal to 50	140

More than or equal to 60	140 - 18 = 122
More than or equal to 70	122 - 20 = 102
More than or equal to 80	102 - 24 = 78
More than or equal to 90	78 - 28 = 50
More than or equal to 100	50 - 34 = 16
More than or equal to 110	16 - 16 = 0

The ogive curve is drawn by taking lower class limits on the x axis and their respective cumulative frequencies on the y-axis.

Its ogive can be obtained as,

Lower class limits ⟶
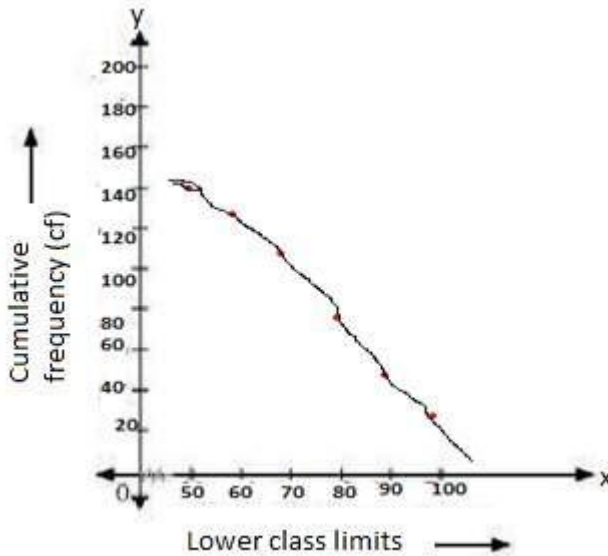
(OR)

Let's find the summation

Marks obtained (x_i)	20	30	40	50	60	70	80	90	total
Number of students (f_i)	3	7	8	9	7	P	4	9	47+P

$f_i\, x_i$	60	210	320	450	420	70P	320	810	2590+70P

We know that,

Mean $= \dfrac{\sum f_i x_i}{\sum f_i}$

$\sum f_i = 47 + P$

$\sum f_i x_i = 2590 + 70P$

$\dfrac{\sum f_i x_i}{\sum f_i} = \dfrac{2590+70P}{47+P}$

Given mean = 56

$56 = \dfrac{2590+70P}{47+P}$

$2632 + 56P = 2590 + 70P$

$70P - 56P = 2632 - 2590$

$14P = 42$

$$P = 3$$