CBSE Board
Class X Mathematics
Sample Paper – 10

Section A

1. Correct option : D
Explanation:
HCF of two numbers is 27 and their LCM is 162.
Let the other number be x.
Product of two numbers = HCF × LCM = 27 × 162
$\Rightarrow 54x = 27 \times 162$
$\Rightarrow x = 81$
⇒ The other number is 81.

2. Correct option : C
Explanation:
Mean = 27, median = 33
Mode = 3median – 2mean
Mode = 3 × 33 – 2 × 27
Mode = 45

3. Correct option : B
Explanation:
(a, b) are co-primes, if HCF of the two numbers is 1.

4. Correct option : D
Explanation:
y = 0 is the x-axis.
y = -5 is the line parallel to x-axis at a distance of 5 units.
Both the lines are parallel to each other. They don't meet anywhere.
Hence, no solution exists.

5. Correct option : A
Explanation:

$$\sqrt{\frac{1+\sin A}{1-\sin A}}$$

$$=\sqrt{\frac{1+\sin A}{1-\sin A}\times\frac{1+\sin A}{1+\sin A}}$$

$$=\sqrt{\frac{(1+\sin A)^2}{1-\sin^2 A}}$$

$$=\frac{1+\sin A}{\cos A} \qquad \because \sin^2 A+\cos^2 A=1$$

$$=\frac{1}{\cos A}+\frac{\sin A}{\cos A}=\sec A+\tan A$$

6. Correct option : C

Explanation:

tan 10°tan15°tan75°tan80°

= tan10°tan80° tan15°tan75°

= tan10°tan(90 – 10)° tan15°tan(90 – 15)°

= tan10°cot10° tan15°cot15° $\quad\because \tan(90-\theta) = \cot\theta$

= 1 $\quad\because \tan\theta \times \cot\theta = 1$

7. Correct option : C

Explanation:

Given: $\tan\theta = \frac{a}{b}$

$$\frac{\cos\theta+\sin\theta}{\cos\theta-\sin\theta}$$

$$=\frac{1+\tan\theta}{1-\tan\theta}$$

$$=\frac{1+\frac{a}{b}}{1-\frac{a}{b}}$$

$$=\frac{b+a}{b-a}$$

8. Correct option : C

Explanation:

The distance between the points A(4, p) and B(1, 0) is 5.

⇒ AB = 5

⇒ $AB^2 = 25$

⇒ $(4-1)^2 + p^2 = 25$

⇒ $9 + p^2 = 25$

⇒ $p^2 = 16$

⇒ $p = \pm 4$

9. Correct option : D

Explanation:

The point on y-axis, below x-axis, at a distance of 4 units from x-axis is A(0, -4).

10. Correct option : B

Explanation:

A point P divides the join of A(5, -2) and B(9, 6) in the ratio 3:1.

The coordinates of P are $\left(\frac{mx_2+nx_1}{m+n}, \frac{my_2+ny_1}{m+n}\right) = \left(\frac{3\times9+1\times5}{3+1}, \frac{3\times6+1\times(-2)}{3+1}\right) = (8,4)$

11. The shape of a glass is in the form of <u>frustum of a cone</u>.

12. Zeroes of $p(x) = x^2 - 2x - 3$ are <u>-1, 3</u>.

Explanation:

$x^2 - 2x - 3 = 0$

$\Rightarrow x^2 - 3x + x - 3 = 0$

$\Rightarrow x(x - 3) + (x - 3) = 0$

$\Rightarrow (x - 3)(x + 1) = 0$

$\Rightarrow x = 3$ or $x = -1$

13. In ΔABC and ΔDEF, we have $\frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF} = \frac{5}{7}$ then $\underline{\frac{ar(\Delta ABC)}{ar(\Delta DEF)} = \frac{25}{49}}$.

14. If $a, a - 2, 3a$ are in A.P. then $a =$ <u>-2</u>.

Explanation:

$a, a - 2, 3a$ are in A.P.

$\Rightarrow 2(a - 2) = a + 3a$

$\Rightarrow 2a - 4 = 4a$

$\Rightarrow 2a = -4$

$\Rightarrow a = -2$

OR

If $a = 8$, $T_n = 62$ and $S_n = 210$ then $n =$ <u>6</u>.

Explanation:

$a = 8$, $T_n = 62$ and $S_n = 210$

$S_n = 210$

$$\Rightarrow \frac{n}{2}(a + T_n) = 210$$

$$\Rightarrow \frac{n}{2}(8 + 62) = 210$$

$$\Rightarrow 35n = 210 \Rightarrow n = 6$$

15. For an event E, P(E) + P(not E) = <u>1</u>.

16. Let $x = 0.\overline{8}$ ....(i)

$10x = 8.\overline{8}$ ....(ii)

Subtracting (i) from (ii)

$\Rightarrow 9x = 8$

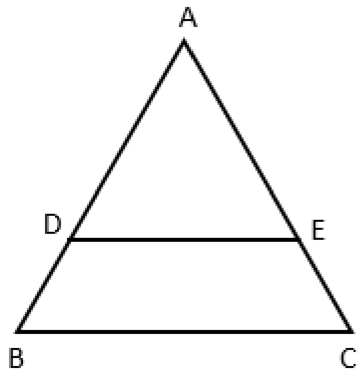
$$\Rightarrow x = \frac{8}{9}$$

17. DE || BC

$$\Rightarrow \frac{AD}{DB} = \frac{AE}{EC}$$

$$\Rightarrow \frac{4}{7} = \frac{6}{EC}$$

$\Rightarrow$ EC = 10.5 cm



18. From the diagram,

In Δ PTO,

$PT^2 + TO^2 = PO^2$

$24^2 + 7^2 = PO^2$

$PO^2 = 576 + 49$

$PO^2 = 625$

PO = 25 cm

19. First n even natural numbers are 2, 4, 6,….2n

$a = 2$, $a_n = 2n$

$$S_n = \frac{n}{2}(2+2n) = n(n+1)$$

OR

$$\sqrt{8}, \sqrt{18}, \sqrt{32}, \ldots.$$

$$\Rightarrow 2\sqrt{2}, 3\sqrt{2}, 4\sqrt{2}, \ldots.$$

$$\Rightarrow a = 2\sqrt{2}, d = \sqrt{2}, n = 4$$

$$\Rightarrow a_3 = 4\sqrt{2}$$

$$\Rightarrow a_4 = a_3 + d = 4\sqrt{2} + \sqrt{2} = 5\sqrt{2}$$

20. $7x^2 - 12x + 18 = 0$

$\Rightarrow a = 7, b = -12, c = 18$

Let α, β be the roots of the equation.

$$\alpha + \beta = \frac{-b}{a} = \frac{12}{7}$$

$$\alpha\beta = \frac{c}{a} = \frac{18}{7}$$

$$\Rightarrow \frac{\alpha + \beta}{\alpha\beta} = \frac{\frac{12}{7}}{\frac{18}{7}} = \frac{12}{18} = \frac{2}{3}$$

Section B

21. A rational number will have a terminating decimal representation only if the denominator can be expressed in terms of prime numbers 2 and 5.

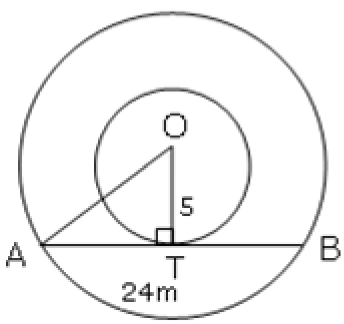
We see that,

$343 = 7 \times 7 \times 7$

So according to the condition given above, the denominator of $\frac{29}{343}$ cannot be expressed fully in terms of 2 and 5.

Hence, the number cannot have a terminating decimal representation.

22. Let O be the centre of circle and AB be the chord of larger circle and OT be the radius of smaller circle.



So $OT \perp AB$ since tangent is $\perp$ to radius at its point of contact.

AT = TB = 12 m

(Since perpendicular from centre to the chord bisects it)

So, in ΔOAT,

$OA^2 = OT^2 + AT^2$

$OA^2 = 5^2 + 12^2 = 169$

$\Rightarrow OA = 13$ cm

Thus, the radius of the larger circle is 13 cm

23. Let n be the required number of spheres.

Since, the spheres are melted to form a cylinder. So, the volume of all the n spheres will be equal to the volume of the cylinder.

$$n \times \frac{4}{3} \times \pi \times 3 \times 3 \times 3 = \pi \times 2 \times 2 \times 45$$

$\therefore$ n = 5

Thus, the required number of spheres which are melted to form the cylinder is 5.

OR

Let x cm be the edge of the new cube.

Volume of the new cube = Sum of the volumes of three cubes

$x^3 = 3^3 + 4^3 + 5^3$

$x^3 = 27 + 64 + 125$

$x^3 = 216$

x = 6.

Edge of the new cube is 6 cm long.

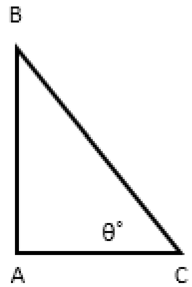
24. A die is thrown at once then S = {1, 2, 3, 4, 5, 6}
$\therefore$ n(S) = 6
Let E be the event of getting a prime number.
$\therefore$ E = {2, 3, 5}
$\therefore$ n(E) = 3
$\therefore$ P(E) = $\frac{n(E)}{n(S)} = \frac{3}{6} = \frac{1}{2}$

OR

Let A be the event of getting a number which is odd.
S = {1, 2, 3, 4, 5, 6, 7, 8, 9} and A = {1, 3, 5, 7, 9}
n(S) = 9 and n(A) = 5
P(A) = 5/9

25. Given sides of a triangle are 9 cm, 18 cm, and 16 cm.
Consider, $9^2 + 16^2 = 81 + 256 = 337 \neq 18^2$.
Hence, these sides cannot form right triangle.

26.



Let AB be the pole and let AC be its shadow.
Let the angle of elevation of the sun be θ°.
$\angle ACB = \theta$, $\angle CAB = 90^\circ$
AB = 10 m and AC = $10\sqrt{3}$ m
In ΔCAB,

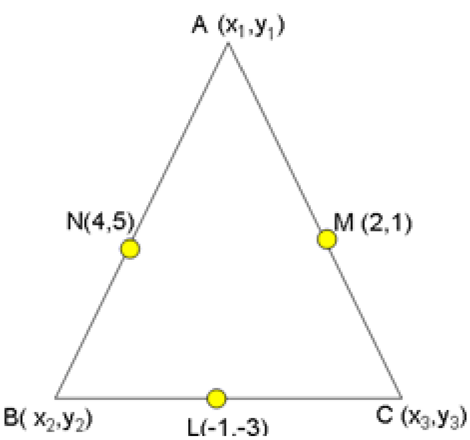
$$\tan\theta = \frac{AB}{AC} = \frac{10}{10\sqrt{3}} = \frac{1}{\sqrt{3}}$$

$$\theta = 30$$

Hence, the angular elevation of the sun is 30°.

Section C

27. Let the vertices of the triangle be $A(x_1, y_1)$, $B(x_2, y_2)$ and $C(x_3, y_3)$
Let the given mid-points of the sides BC, CA and AB be L(–1, –3), M(2, 1) and N(4, 5).



Now, by mid-point formula,

$$-1 = \left(\frac{x_2 + x_3}{2}\right); 4 = \left(\frac{x_1 + x_2}{2}\right); 2 = \left(\frac{x_1 + x_3}{2}\right)$$

$x_2 + x_3 = -2$; $x_1 + x_2 = 8$; $x_1 + x_3 = 4$

Adding these equations,

$2(x_1 + x_2 + x_3) = 10$

On solving, we get

$x_1 = 7, x_2 = 1, x_3 = -3$

Similarly,

$$-3 = \left(\frac{y_2 + y_3}{2}\right); \; 1 = \left(\frac{y_1 + y_3}{2}\right); \; 5 = \left(\frac{y_1 + y_2}{2}\right)$$

$y_2 + y_3 = -6; y_1 + y_3 = 2; y_1 + y_2 = 10$

Adding these equations,

$2\,(y_1 + y_2 + y_3) = 6$

$y_1 + y_2 + y_3 = 3$

On solving, we get:

$y_1 = 9, y_2 = 1, y_3 = -7$

Hence, the vertices of the triangle are (7, 9), (1, 1) and (–3, –7).

OR

Let the required point $P = (x, 0)$

and the required ratio $= k : 1$

Here $m_1 = k$ and $m_2 = 1$

$x_1 = 3, x_2 = -2, y_1 = -3$ and $y_2 = 7$

By the Section formula,

$$(x, 0) = \left[\frac{k(-2) + 1(3)}{k+1}, \frac{k(7) + 1(-3)}{k+1}\right]$$

$$\Rightarrow (x, 0) = \left[\frac{-2k+3}{k+1}, \frac{7k-3}{k+1}\right]$$

$$\text{So, } x = \frac{-2k+3}{k+1} \text{ and } 0 = \frac{7k-3}{k+1}$$

$$\text{From (2)},\; 7k - 3 = 0 \Rightarrow k = \frac{3}{7}$$

$$\text{Substituting in } x = \frac{-2k+3}{k+1}, \text{ we get}$$

$$x = \frac{-2\left(\frac{3}{7}\right) + 3}{\frac{3}{7} + 1} \Rightarrow x = 1.5$$

$$\text{Ratio}\,(k : 1) = \frac{3}{7} : 1 = 3 : 7$$

$$\text{Point of division on x-axis} = (1.5, 0)$$

28. –5, –8, –11, ... –230 forms an A.P. with

$a = -5, d = -8 - (-5) = -3$

Let $-230 = a_n = a + (n - 1)d$

$\Rightarrow -230 = -5 + (n - 1)(-3)$

$\Rightarrow -230 + 5 = (n - 1)(-3)$

$\Rightarrow n - 1 = \frac{-225}{-3}$

$\Rightarrow n - 1 = 75$

$\Rightarrow n = 76$

$S_{76} = \frac{n}{2}(a + l)$

$= \left(\frac{76}{2}\right)[(-5) + (-230)]$

$= 38(-235)$

$= -8930$

29. Let $6 + \sqrt{3}$ be rational and equal to $\frac{a}{b}$.

Then, $\frac{6+\sqrt{2}}{1} = \frac{a}{b}$, where a and b are co primes, $b \neq 0$

$\therefore \sqrt{2} = \frac{a}{b} - 6 = \frac{a-6b}{b}$

Here a and b are integers. So, $\frac{a-6b}{b}$ is rational.

Therefore, $\sqrt{2}$ is rational.

This is a contradiction as $\sqrt{2}$ is irrational.

Hence, our assumption is wrong.

Thus, $6 + \sqrt{2}$ is an irrational number.

OR

Let us assume, on the contrary that $\sqrt{5}$ is a rational number.

Therefore, we can find two integers a, b ($b \neq 0$) such that $\sqrt{5} = \frac{a}{b}$

Where a and b are co-prime integers.

$\sqrt{5} = \frac{a}{b}$

$\Rightarrow a = \sqrt{5}b$

$\Rightarrow a^2 = 5b^2$

Therefore, a^2 is divisible by 5 then a is also divisible by 5.

So a = 5k, for some integer k.

$\text{Now}, a^2 = (5k)^2 = 5(5k^2) = 5b^2$

$\Rightarrow b^2 = 5k^2$

This means that b^2 is divisible by 5 and hence, b is divisible by 5.

This implies that a and b have 5 as a common factor.

And this is a contradiction to the fact that a and b are co-prime.

So our assumption that $\sqrt{5}$ is rational is wrong.

Hence, $\sqrt{5}$ cannot be a rational number. Therefore, $\sqrt{5}$ is irrational.

30. Total number of outcomes = 22

Let A be the event of getting a prime number.

Prime numbers are 5, 7, 11, 13, 17, 19, and 23.

Number of favorable outcomes = 7

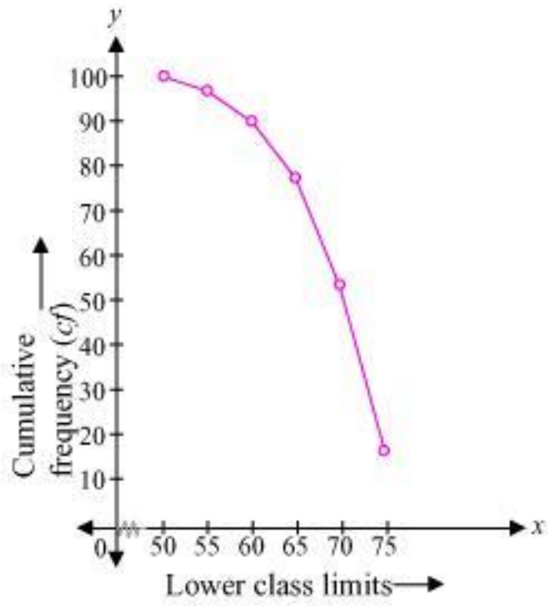
$\therefore P(A) = \frac{7}{22}$

OR

We can obtain cumulative frequency distribution of more than type as following:

Production yield (lower class limits)	Cumulative frequency
More than or equal to 50	100
More than or equal to 55	100 - 2 = 98
More than or equal to 60	98 - 8 = 90
More than or equal to 65	90 - 12 = 78
More than or equal to 70	78 - 24 = 54
More than or equal to 75	54 - 38 = 16

Now, taking lower class limits on x-axis and their respective cumulative frequencies on y-axis, we can obtain the ogive as follows:



31. $\tan 1^\circ \tan 2^\circ \tan 3^\circ \ldots\ldots\tan 89^\circ$

$= \tan(90^\circ - 89^\circ)\tan(90^\circ - 88^\circ)\tan(90^\circ - 87^\circ)\ldots\ldots\tan 87^\circ \tan 88^\circ \tan 89^\circ$

$= \cot 89^\circ \cot 88^\circ \cot 87^\circ\ldots\ldots\tan 87^\circ \tan 88^\circ \tan 89^\circ$

$= \cot 89^\circ \tan 89^\circ \cot 88^\circ \tan 88^\circ \cot 87^\circ \tan 87^\circ\ldots\cot 44^\circ \tan 44^\circ \tan 45^\circ$

$= 1 \times 1 \times 1 \ldots \times 1 = 1$

$\Rightarrow \tan 1^\circ \tan 2^\circ \tan 3^\circ\ldots\ldots\tan 89^\circ = 1$

32. $7x - 2y - 3 = 0$ and $11x - \frac{3}{2}y - 8 = 0$

By cross multification, we have

$$\therefore \frac{x}{\left[(-2)(-8) - \left(\frac{-3}{2}\right)\times(-3)\right]} = \frac{y}{\left[(-3\times 11) - (-8\times 7)\right]}$$

$$= \frac{1}{\left[7\times\left(\frac{-3}{2}\right) - 11\times(-2)\right]}$$

$$\Rightarrow \frac{x}{16 - \frac{9}{2}} = \frac{y}{-33+56} = \frac{1}{\frac{-21}{2}+22}$$

$$\Rightarrow \frac{x}{\left(\frac{23}{2}\right)} = \frac{y}{23} = \frac{1}{\frac{23}{2}}$$

$$\Rightarrow \frac{x}{\left(\frac{23}{2}\right)} = \frac{1}{\frac{23}{2}}, \frac{y}{23} = \frac{1}{\frac{23}{2}}$$

$\therefore$ x = 1, y = 2 is the solution

33. 1 m of fencing costs Rs. 24.

Hence for Rs. 5280, the length of fencing = $\frac{1}{24} \times 5280$ = 220 metres.

Circumference of the field = 220 m

$\therefore 2\pi r = 220$

$2\times \frac{22}{7} \times r = 220 \quad \Rightarrow r = \frac{220\times 7}{44} = 35$ m

Area of the field = $\pi r^2 = \pi (35)^2 = 1225\pi$ m^2

Cost of ploughing = Rs. 0.50 per m^2

Total cost of ploughing the field = Rs. 1225 π x 0.50

$= \frac{1225\times 22\times 1}{7\times 2} = 175\times 11 = \text{Rs. } 1925$

34. $(a - b)x^2 + (b - c)x + (c - a) = 0$

The given equation will have equal roots, if

$(b - c)^2 - 4(a - b)(c - a) = 0$

$b^2 + c^2 - 2bc - 4(ac - bc - a^2 + ab) = 0$

$b^2 + c^2 + 4a^2 + 2bc - 4ab - 4ac = 0$

$(b + c - 2a)^2 = 0$

$b + c - 2a = 0$

$b + c = 2a$

Section D

35. Let the speed of the stream be x km/hr.

Here, the speed of the motor boat is 15km/hr in still water.

$\therefore$ Speed downstream = (15 + x) km/hr and

Speed upstream = (15 – x) km/hr

A boat goes 30 km downstream and comes back,

$\therefore$ Distance covered while going downstream = 30 km and

Distance covered while going upstream = 30 km

Total time taken by a boat = 4 hrs 30 mins = $4\frac{30}{60}$ hrs $= \frac{9}{2}$ hrs

$\therefore \left(\frac{30}{15+x}\right)+\left(\frac{30}{15-x}\right)=\frac{9}{2}$

Taking L.C.M as (15 + x) (15 + x)

$$\therefore \frac{30(15-x)+30(15+x)}{(15+x)(15-x)} = \frac{9}{2}$$

$$\therefore 30\,(15 - x + 15 + x) = \frac{9}{2}\,(15+x)\,(15-x)$$

$$\therefore 30 \times 30 = \frac{9}{2}\,(15^2 - x^2)$$

$$\therefore \frac{900 \times 2}{9} = 225 - x^2$$

$$\therefore \quad 200 = 225 - x^2$$

$\therefore x^2 = 25$

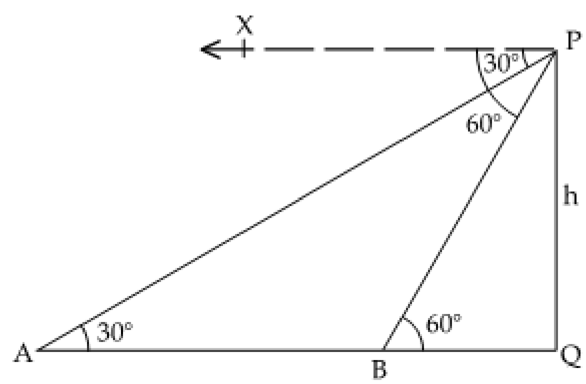
$\therefore x = 5$ or -5

Speed is always positive,

$\therefore x = 5$

Therefore, the speed of stream is 5 km/hr.

36. Let PQ = h meters be the height of the tower. P is the top of the tower. The first and second positions of the car are at A and B respectively.



$\angle APX = 30° \Rightarrow \angle PAQ = 30°$

$\angle BPX = 60° \Rightarrow \angle PBQ = 60°$

Let the speed of the car be x m/second

Then, distance AB = 6x meters

Let the time taken from B to Q be 'n' seconds

$\therefore$ BQ = nx metres

In $\triangle$ PAQ,

$$\frac{h}{6x+nx} = \tan 30^{o} = \frac{1}{\sqrt{3}}$$

$$\therefore h = \frac{(n+6)x}{\sqrt{3}} \qquad ----(1)$$

In $\triangle$ PBQ,

$$\frac{h}{nx} = \tan 60^{o} = \sqrt{3}$$

$$\therefore h = nx\left(\sqrt{3}\right) \qquad ----(2)$$

From (1) and (2),

$$\frac{(n+6)x}{\sqrt{3}} = nx\left(\sqrt{3}\right)$$

$nx + 6x = 3nx \Rightarrow n = 3$

Hence, the time taken by the car to reach the foot of the tower from B is 3 seconds.

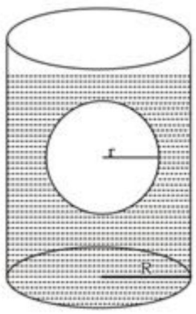
37. Diameter of sphere = 6 cm

$\therefore$ Radius of sphere = r = 3 cm

Radius of cylinder = R = 6 cm

Let height of water raised be h cm.

Then, volume of water thus raised = πR^2h



$\therefore$ Volume of water raised = volume of sphere

$$\therefore \pi R^2h = \frac{4}{3}\pi r^3$$

$$\therefore R^2h = \frac{4}{3}r^3$$

$$\therefore 36h = \frac{4}{3} \times 27 \Rightarrow h = 1 \text{ cm}$$

Therefore, the surface level of water will be raised by 1 cm.

OR

Diameter of graphite = 1mm = 0.1cm

Therefore, radius of graphite = $\frac{0.1}{2}$ = 0.05 cm

Length of pencil = 10 cm

Volume of graphite = $\pi r^2h = \frac{22}{7} \times (.05)^2 \times 10 = 0.0785 \text{ cm}^3$

Therefore, weight of graphite = volume × density
= 0.0785 × 2.3
= 0.180 gm
Diameter of the pencil = 0.7 cm
Therefore, radius of the pencil = 0.35 cm

Therefore, volume of the pencil = $\pi R^2h = \frac{22}{7} \times (0.35)^2 \times 10$

Therefore, volume of wood = Volume of pencil – Volume of graphite

Therefore, Volume of wood = $\pi R^2 h - \pi r^2 h$

$= \pi h(R^2 - r^2)$

$= \frac{22}{7} \times 10[(0.35)^2 - (0.05)^2]$

$= 3.771 \text{ cm}^3$

Weight of wood = Volume × density

$= 3.771 \times 0.6$

$= 2.2626$ gm

Weight of whole pencil = weight of graphite + weight of wood = 0.180 + 2.2626

Hence, the weight of whole pencil is 2.4426 gms.

38.

Marks	Frequency
25 - 35	5
35 - 45	10
45 - 55	20
55 - 65	9
65 - 75	6
75 - 85	2
Total	52

Here, the maximum frequency is 20 and the corresponding class is 45-55.

So, 45-55 is the modal class.

We have, $l = 45$, $h = 10$, $f = 20$, $f_1 = 10$, $f_2 = 9$

$$\text{Mode} = l + \left[\frac{f - f_1}{2f - f_1 - f_2}\right] \times h = 45 + \left[\frac{20 - 10}{40 - 10 - 9}\right] \times 10$$

Thus, Mode = 45 + 4.7 = 49.7

OR

Consider the following table:

C.I	f_i	x_i	d_i	$f_i d_i$
100 - 150	4	125	-2	-8
150 - 200	5	175	-1	-5
200 - 250	12	225	0	0
250 - 300	2	275	1	2
300 - 350	2	325	2	4
Total	25			-7

Let A = 225

$$d_i = \frac{x_i - 225}{50}$$

$$\bar{x} = A + \frac{\sum f_i d_i}{\sum f_i} \times h = 225 - \frac{7}{\cancel{25}} \times \cancel{50}^{2} = 225 - 14 = 211$$

39. Steps of construction :

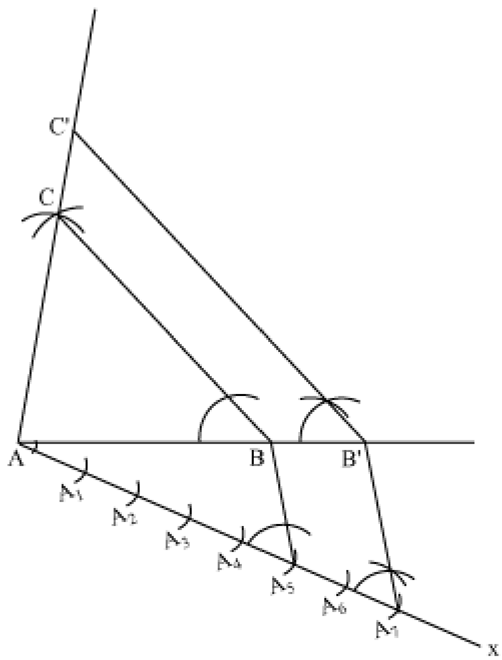
i. Draw a line segment AB of 5 cm. Taking A and B as centres, draw two arcs of 6 cm and 7 cm radius respectively. Let these arcs intersect each other at point C. ΔABC is the required triangle having length of sides as 5 cm, 6 cm and 7 cm respectively.

ii. Draw a ray AX making acute angle with the line AB on opposite side of vertex C.

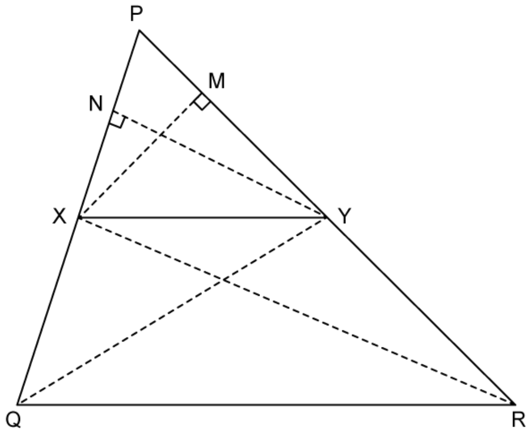
iii. Locate 7 points $A_1, A_2, A_3, A_4, A_5, A_6, A_7$ (as 7 is greater between 5 and 7) on line AX such that $AA_1 = A_1A_2 = A_2A_3 = A_3A_4 = A_4A_5 = A_5A_6 = A_6A_7$.

iv. Join BA_5 and draw a line through A_7 parallel to BA_5 to intersect extended line segment AB at point B'.

v. Draw a line through B' parallel to BC intersecting the extended line segment AC at C'. ΔAB'C' is the required triangle.



40.



Given : ΔPQR in which XY || QR, XY intersects PQ and PR at X and Y respectively.

To prove : $\frac{PX}{XQ} = \frac{PY}{YR}$

Construction : Join RX and QY and draw YN perpendicular to PQ and XM perpendicular to PR.

Proof :

Since, ar(ΔPXY) = $\frac{1}{2} \times PX \times YN$ .....(i)

ar(ΔPXY) = $\frac{1}{2} \times PY \times XM$ ....(ii)

Similarly, ar(ΔQXY) = $\frac{1}{2} \times QX \times NY$ .....(iii)

ar(ΔRXY) = $\frac{1}{2} \times YR \times XM$ .....(iv)

Dividing (i) by (iii) we get,

$$\therefore \frac{ar(PXY)}{ar(QXY)} = \frac{\frac{1}{2} \times PX \times YN}{\frac{1}{2} \times QX \times YN} = \frac{PX}{QX} \quad ....(v)$$

Again dividing (ii) by (iv)

$$\therefore \frac{ar(PXY)}{ar(RXY)} = \frac{\frac{1}{2} \times PY \times XM}{\frac{1}{2} \times YR \times XM} = \frac{PY}{YR} \quad ....(vi)$$

Since the area of triangles with same base and between same parallel lines are equal, so

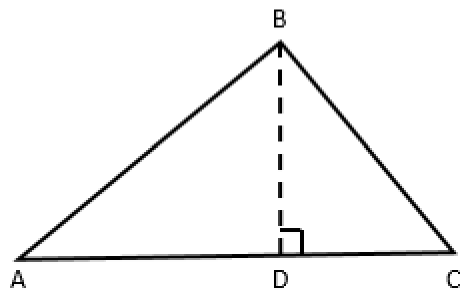
$\therefore$ ar(ΔQXY) = ar(ΔRXY) .....(vii)

As ΔQXY and ΔRXY are on same base XY and between same parallel lines XY and QR.

Therefore, from (v), (vi) and (vii) we get

$\therefore \frac{PX}{XQ} = \frac{PY}{YR}$

OR



Given : A right angled triangle ABC right angled at B.

To prove : $AC^2 = AB^2 + BC^2$

Construction : Draw BD perpendicular to AC.

Proof :

If a perpendicular is drawn from the vertex of the right angle of a right triangle to the hypotenuse, then triangles on both sides of the perpendicular are similar to the whole triangle and to each other.

$\therefore \Delta ADB \sim \Delta ABC$

$\therefore \frac{AD}{AB} = \frac{AB}{AC}$ $\because$ c. p. c. t.

$\therefore\ AD \times AC = AB^2$ .....(i)

$\Delta BDC \sim \Delta ABC$

$\therefore \frac{DC}{BC} = \frac{BC}{AC}$ $\because$ c. p. c. t.

$\therefore\ CD \times AC = BC^2$ .....(ii)

Adding (i) and (ii)

$\therefore AD \times AC + CD \times AC = AB^2 + BC^2$

$\therefore AC(AD + CD) = AB^2 + BC^2$

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

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