CBSE FULL TEST – II

ALL X^TH^ STUDYING BATCHES

MATHS

Time: 3:00 Hours **Max Marks: 80**

General Instructions:

1. This question paper contains two parts A and B.
2. Both Part A and Part B have internal choices.

Part –A:

1. It consists three sections-I and II.
2. Section I has 16 questions of 1 mark each. Internal choice is provided in 5 questions.
3. Section II has 4questions on case study. Each case study has 5 case-based sub-parts. An examinee is to attempt any 4 out of 5 sub-parts.

Part –B:

1. Question No 21to 26are Very short answer Type questions of 2mark each,
2. Question No 27 to 33 are Short Answer Type questions of3 marks each
3. Question No 34 to 36are Long Answer Type questions of 5 marks each.
4. Internal choice is provided in 2 questions of 2 marks, 2 questions of 3 marks and 1 question of 5 marks

Name of the Candidate : ....

Enroll Number : ....

Date of Examination : ....

PART – A
SECTION – I
(16 question, 1 mark each)

1. Graph of $2x - 3y = 7$ does not lies in which of the following quadrant

2 If α, β are zeroes of polynomial $x^2 - \sqrt{2}x + 1 = 0$, then $\alpha^2 + \beta^2$ equal ?

OR

If α, β are zeros of $x^2 - px - 16$. What is the value of p, if $\alpha(1+\beta) = -8$

3. If 2.8333 …. is converted in the form $\frac{p}{q}$ then $(p - q)^2 =$

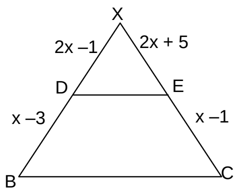
4. Simplify $\left(\frac{x^3}{x-1} - \frac{x^2}{x+1} - \frac{1}{x-1} + \frac{1}{x+1}\right) \times \frac{x}{x^4 + 3x^2 + 2}$

5. If $\frac{x\,\mathrm{cosec}^2 30^\circ . \sec^2 45^\circ}{8\cos^2 45^\circ \sin^2 60^\circ} = \tan^2 60 - \tan^2 30^\circ$, then x =

OR

$\frac{\tan\theta}{\sec\theta - 1} + \frac{\tan\theta}{\sec\theta + 1}$ is equal to

6. If DE || BC, find x



7. The numbers $x, \frac{1}{2}, \frac{1}{3}$ are in A.P. then x =

8. If θ is an acute angle and $\tan\theta + \cot\theta = 2$ find the value of $\tan^9\theta + \cot^9\theta$

9. If $x = \sqrt{7 + 4\sqrt{3}}$, then $x + \frac{1}{x} =$

10. HCF of 2852 and 12121 is

11. Two concentric circles are of radii 5 cm and 3 cm. then the length of the chord of the larger circle which touches the smaller circle is

OR

11. Find the area of the sector of circle with radius 4cm and of angle 30°. (use $\pi = 3.14$)

12. If x+y = 91 and x–y = 65, then x/y is

OR

4 chairs and 3 tables cost Rs. 2100 and 5 chairs and 2 tables cost Rs. 1750. The cost of a chair is

13. Two dice are thrown simultaneously. The probability of obtaining a total score of 5 is

14. What is the angle made by the line formed by points (3,4), (5,6) is

15. The volume of the greatest sphere that can be cut off from a cylindrical log of wood of base radius 1cm & height 5cm is

OR

The total surface area of cube is 216square cm. The length of longest pole that can be kept inside cube is?

16. Find the unit digit of $(24)^{127} \times (29)^{123}$

SECTION – II

17. An equation of the form Ax + By + C = 0 is called a linear equation.
Where A is called coefficient of x, B is called coefficient of y and C is the constant term (free from x & y)
A, B, C, $\in$ R [$\in \rightarrow$ belongs, to R $\rightarrow$ Real No.]

(I) Six years hence a men's age will be three times the age of his son and three years ago he was nine times as old as his son. Find present age of son.

(A) 4 (B) 6
(C) 8 (D) None of these

(II) A boat goes 12 km upstream and 40 km downstream in 8 hrs. It can go 16 km. upstream and 32 km downstream in the same time. Find the speed of the boat it still water (in km/hr).

(A) 8 (B) 6
(C) 12 (D) 10

(III) Ramesh travels 760 km to his home partly by train and partly by car. He taken 8 hr, if he travels 160 km by train and the rest by car. He takes 12 minutes more, if he travels 240 km by train and the rest by car. Find the speed of car (in km/hr).

(A) 60 (B) 70
(C) 80 (D) 100

(IV) Points A and B are 90 km apart from each other on a highway. A car starts from A and another from B at the same time. If they go in the same direction, they meet in 9 hrs and if they go in opposite direction, they meet in $\frac{9}{7}$ hrs. Find difference of their speeds.

(A) 10 km/hr (B) 12 km/hr
(C) 15 km/hr (D) 20 km/hr

(V) Students of a class are made to stand in rows. If one student is extra in a row, there would be 2 rows less. If one students is less in row, there would be 3 rows more. Find the total number of students in the class.

(A) 40 (B) 50
(C) 60 (D) 80

18. A sequence is called an **A.P.,** if the difference of a term and the previous term is always same. **i.e.** $\mathbf{d = t_{n+1} - t_n}$ **= Constant** for all $n \in N$. The constant difference, generally denoted by **'d'** is called the common difference.

If we denote the starting number i.e. the 1st number by **'a'** and a fixed number to the added is **'d'** then **a, a + d, a + 2d, a + 3d, a + 4d, ...** forms an **A.P.**

(I) Which term of the sequence 72, 70, 68, 66, ... is 40 ?

(A) 14th term (B) 15th term
(C) 17th term (D) 16th term

(II) Which term of the sequence 20, $19\frac{1}{2}, 18\frac{1}{2}, 17\frac{3}{4}$ is the 1st negative term.

(A) 26th term (B) 27th term
(C) 28th term (D) None of these

(III) If p^{th}, q^{th} and r^{th} term of an A.P. are a, b, c respectively, then find value of $a(q - r) + b(r - p) + c(p - q)$.

(A) 1 (B) 0
(C) -1 (D) None of these

(IV). If m times the m^{th} term of an A.P. is equal to n times its n^{th} term. then $(m + n)^{th}$ term of the A.P will be:

(A) 1 (B) 0
(C) 2 (D) 3

(V) If the p^{th} term of an A.P. is q and the q^{th} term is p, then its n^{th} term is.

(A) p+q (B) p-q
(C)p+q+n (D) p+q-n

19. The coordinates of the point which divided the line segment joining the pints (x_1, y_1) and (x_2, y_2) internally in the ratio **m : n** are given by $x = \frac{mx_2 + nx_1}{m+n}, y = \frac{my_2 + my_1}{m+n}$

The coordinates of the point which divides the line segment joining the points $\mathbf{(x_1, y_1)}$ and $\mathbf{(x_2, y_2)}$ externally in the ratio **m : n** are given by

$$x = \frac{mx_2 - nx_1}{m-n}, y = \frac{my_2 - ny_1}{m-n}$$

(I) Find the coordinates of the point which divides the line segment joining the points (6, 3) and (-4, 5) in the ratio 3 : 2 externally

(A) (-24, 9) (B) (-21, 9)
(C)(-22, 9) (D) (24, 9)

(II) In which ratio does the point (-1, -1) divides the line segment joining the pints (4, 4) and (7, 7)

(A) 4:7 internally (B) 4:7 externally
(C) 5:8 internally (D) 5:8 externally

(III) In what ratio does the X-axis divide the line segment joining the points (2, -3) and (5, 6) ?

(A) 1:2 (B) 2:3
(C) 2:5 (D) None of these

(IV) A (1, 1) and B(2, -3) are two points and D is a point on AB produced such that AD = 3 AB. Find the coordinates of D.

(A) (4, 9) (B) (4, 11)
(C)(4, -11) (D) (-4, 11)

(V) Determine the ratio in which the line 3x + y - 9 = 0 divides the segment joining the pints (1, 3) and (2, 7).

(A) 1:2 internally (B) 2:3 externally
(C) 3:4 internally (D) 3:4 externally

20. If there are n elementary events associated with a random experiment and m of them are favourable to an event A, then the probability of happening or occurrence of event A is denoted by P(A)

Thus, $P(A) = \dfrac{\text{Total number of favourable outcomes}}{\text{Total number of possible outcomes}} = \dfrac{m}{n}$

And $0 \le P(A) \le 1$

(I) A box contains 5 red balls, 4 green balls and 7 white balls. A ball is drawn at random from the box. Find the probability that the ball drawn is neither red nor white

(A) 1/2 (B) 1/3
(C) 1/4 (D) 1/5

(II) All the three face cards of spades are removed from a well-shuffled pack of 52 cards. A card is then drawn at random from the remaining pack. Find the probability of getting black face card.

(A) 3/49 (B) 6/49
(C) 6/52 (D) 3/52

(III) A die is thrown, Find the probability of multiple of 2 or 3.

(A) 1/2 (B) 2/3
(C) 3/4 (D) None of these

(IV) Two unbiased coins are tossed simultaneously. Find the probability of getting at most one head.

(A) 1/2 (B) 2/3
(C) 3/4 (D) None of these

(V) A box contains 20 balls bearing numbers, 1,2,3,4…...20. A ball is drawn at random from the box. What is the probability that the number of the ball is prime number.

(A) 2/5 (B) 2/3
(C) 2/7 (D) None of these

PART – B
(2 marks each)

21. A road which is 7m wide surround a circular park where circumference is 352m. The area of the road is:

22. The percentage increases in the surface area of cube when each side is tripled is

23. If the mean of a, b, c is M and ab + bc = – ca then the mean of a^2, b^2, c^2 is

24. If sum of first 2n terms of the A.P. 2, 5, 8, …….. is equal to the sum of the first n terms of the A.P. 57, 59, 61, ………. then n =

25. The sum of two co-prime is 43 and their LCM is 450 then find the numbers.

OR

The L.C.M. of two numbers is 48. The numbers are in the ratio 2:3. Find the sum of the two numbers.

26. From a point on the ground the angle of elevation of the top of two tower situated on the same side of a point is q. If the heights of two towers be 40m and 60 m and distance between the two towers be 20m then the distance of the first tower from the point is :

OR

If cotθ + tanθ = x and secθ – cos θ = y prove that $\left(x^2y\right)^{2/3} - \left(xy^2\right)^{2/3} = 1$

(3 marks each)

27. If α and β are the zeros of the polynomial $2x^2 - 3x + 1$, then find the quadratic polynomial whose zeros are $\alpha^2\beta$ *and* $\alpha\beta^2$.

OR

If two zeros of the polynomial $f(x) = x^4 - 6x^3 - 26x^2 + 138x - 35$ are $2 \pm \sqrt{3}$, find other zeros.

28. The area of a rectangle gets reduced by 80 sq. units, if its length is reduced by 5 units and the breadth is increased by 2 units. If we increase the length by 10 units and decrease the breadth by 5 units, its area is increased by 50 square units. Find the length and breadth of the rectangle.

29. Solve the equation:-

$$\frac{4}{x+y} + \frac{6}{x-y} = 4, \text{ and}$$

$$\frac{1}{x+y} + \frac{2}{x-y} = 1\frac{1}{4}$$

30. At a point on level ground, the angle of elevation of a vertical tower is found to be such that its tangent is 5/12. On walking 192 metres towards the tower, the tangent of the angle of elevation is ¾. Find the height of the tower.

OR

If $\cos\theta + \sin\theta = \sqrt{2}\cos\theta$, show that $\cos\theta - \sin\theta = \sqrt{2}\sin\theta$

31. The angle of elevation of a cliff from a fixed point is θ. After going up a distance of k metres towards the top of the cliff at an angle of ϕ, it is found that the angle of elevation is α. Show that the height of the cliff is $\frac{k(\cos\phi - \sin\phi\cot\alpha)}{\cot\theta - \cot\alpha}$ metres.

32. In a trapezium ABCD AB || DC and DC = 2AB. EF drawn parallel to AB cuts AD in F and BC in E. such that $\frac{BE}{EC} = \frac{3}{4}$. Diagonal DB intersects EF at G. Prove that 7EF = 10 AB.

33. If A be the area of a right angled triangle and b be one of the sides containg the right angle prove that length of the altitude on the hypotenuse is $\frac{2Ab}{\sqrt{b^4 + 4A^2}}$.

(5 marks each)

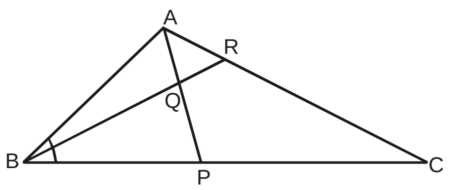
34. The median of the following data is 110 find x and y if total frequency is 100

Class interval	20–40	40–60	60–80	80–100	100–120	120–140	140–160	160–180	180–200
Frequency	6	9	2x + 3	14	20	4y – 5	10	8	7

35. Two spherical balls lie on the ground touching. If one ball has a radius 8 units and the point of contact is 10 units above the ground what is the radius of the other ball :

OR

P is the mid point of BC and Q is mid point of AP. If BQ when produced meets AC at R. Prove that $RA = \frac{1}{3}CA$



36. Through the mid point M of the side CD of a parallelogram ABCD line BM is drawn intersecting AC at L and AD produced at E, then find relation between EL and BL.

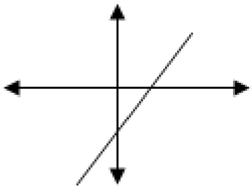
HINTS AND SOLUTIONS

1. 2^{nd} quadrant

Sol. $2x - 3y = 7$

x	0	7/2
y	-7/3	0

Clearly 2^{nd} quadrant



2. 0

Sol.

$$\alpha + \beta = \sqrt{2},\ \alpha\beta = 1$$

$$\alpha^2 + \beta^2 = (\alpha+\beta)^2 - 2\alpha\beta$$

$$= (\sqrt{2})^2 - 2(1) = 0$$

2. p=6

Sol. $\alpha\beta = -16$

$\alpha + \alpha\beta = -8$

$\alpha - 16 = -8$

$\alpha = 8$

$\beta = -2$

$p = 6$

3. 121

Sol. 2.83333 ……

$$\Rightarrow \frac{283-28}{90} = \frac{255}{90} = \frac{85}{30} = \frac{17}{6}$$

$(17-6)^2 = 121$

4. $\frac{x}{x^2+1}$

sol. $$\left(\frac{x^3-1}{x-1} - \frac{(x^2-1)}{x+1}\right) \times \frac{x}{x^4+3a^2+2}$$

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

$$\left(x^2+2\right) \times \frac{x}{(x^2+2)(x^2+1)}$$

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

5. 1

sol. $$\frac{x}{\sin^2 30x\cos^2 45x8x\cos^2 45\sin^2 60} = \tan^2 60 - \tan^2 30$$

$$\frac{x}{\frac{1}{4}\times\frac{1}{2}\times 8\times\frac{1}{2}\times\frac{3}{4}} = 3 - \frac{1}{3} \qquad x = 1$$

5. 2cosecθ

sol. $$\frac{\tan\theta(\sec\theta+1)+\tan\theta\sec\theta-\tan\theta}{\tan^2\theta}$$

$$\frac{2\tan\theta\sec\theta}{\tan^2\theta} = \frac{2}{\cos\theta \times \sin\theta} \times \cos\theta = 2\operatorname{cosec}\theta$$

6. 8

sol. $\frac{2x-1}{x-3} = \frac{2x+5}{x-1}$

$x = 8$

7. 2/3

Sol. as we know that if a,b,c are in AP then

a+c= 2b

$x + \frac{1}{3} = 1$

x= 2/3.

8. 2

Sol. $\tan\theta + \frac{1}{\tan\theta} = 2$

$\tan^2\theta - 2\tan\theta + 1 = 0$

$\tan\theta = 1$

so. $\tan^9\theta + \cot^9\theta = 2$

9. 4

Sol. We have, $x = \sqrt{7+4\sqrt{3}}$

$\therefore \quad \frac{1}{x} = \frac{1}{\sqrt{7+4\sqrt{3}}} = \frac{\sqrt{7-4\sqrt{3}}}{\sqrt{7+4\sqrt{3}}.\sqrt{7-4\sqrt{3}}} = \sqrt{7-4\sqrt{3}}$

$\therefore \quad x + \frac{1}{x} = \sqrt{7+4\sqrt{3}} + \sqrt{7-4\sqrt{3}}$

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

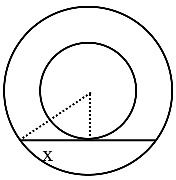
10. 713

Sol. 2852 = 23×31×4, 12121 = 23×31×17

Required HCF = 23 ×31 =713

11. 8 cm

sol.



$5^3 - 3^2 = x^2$

x= 4

required length of chord =8 cm.

11. 4.186 cm^2

sol. Area of sector = $\frac{\pi r^2\theta}{360^o}$

$\therefore \frac{\pi(4)^2 30^o}{360^o} = 4.186\text{cm}^2$

12. 6

Sol. By Adding both

x = 78 and y = 13

Therefore

x/y=6

12. 150

12. Cost of 1 chair = x, cost of 1 table = y

$$\therefore 4x+3y=2100 \quad ....(1)$$

$$5x+2y=1750 \quad ....(2)$$

Multiply (1) by 2 & (2) by 3, and subtract (2) from (1), we get

$$-7x=-1050 \Rightarrow x=150.$$

13. 1/9

Sol. Number of favorable cases {(1,4),(2,3), (3,2),(4,1)} = 4

Total cases = 36

Required probability = 4/36 =1/9

14. 45^o

Sol. Slope of line = $\frac{y_2-y_1}{x_2-x_1}=\frac{6-4}{5-3}=\frac{2}{2}=1$

$\therefore$ $\tan\theta = 1$

$\theta = 45^o$

15. $\frac{4}{3}\pi(1)^3=\frac{4}{3}\pi cm^3$

sol. Volume of sphere = $\frac{4}{3}\pi r^3$

Diameter of sphere of greatest volume that can be cut from a cylindrical log of radius 1cm = 2cm

$\therefore$ Radius of sphere = 1cm

$\therefore$ Volume = $\frac{4}{3}\pi(1)^3=\frac{4}{3}\pi cm^3$

15. $6\sqrt{3}$ cm

sol. Given $6a^2 = 216$

$6a^2 = 6^3$

a = 6cm

Length of largest pole that can be kept inside a cube =

$\sqrt{3}a = 6\sqrt{3}$ cm

16. 6

sol. Unit digit of $(24)^{127}\times(29)^{123}$

= unit digit of $4^{127}\times 9^{123}$

= unit digit of 4×9

$=6$

17.

(I). B

Sol. Let man's present age be x yrs & son's present age be 'y' yrs.

According to problem x + 6 = 3 (y + 6) [After 6 yrs]

and x - 3 = 9 (y - 3) [Before 3 yrs.]

On solving equation (i) & (ii) we gets x = 30, y = 6.

So, the present age of man = 30 years, present age of son = 6 years.

(II). B

Sol. Let the speed of the boat in still water be x km/hr and the speed of the stream be y km/hr then speed of boat in downstream is (x + y) km/hr and the speed of boat upstream is (x - y) km/hr.

Time taken to cover 12 km upstream $= \frac{12}{x-y}$ hrs.

Time taken to cover 40 km downstream $= \frac{40}{x+y}$ hrs.

But, total time taken 8 hr

$\therefore \quad \frac{12}{x-y} + \frac{40}{x+y} = 8$ .....(i)

Time taken to cover 16 km upstream $= \frac{16}{x-y}$ hrs.

Time taken to cover 32 km downstream $= \frac{32}{x+y}$ hrs.

Total time taken = 8 hr

$\therefore \quad \frac{16}{x-y} + \frac{32}{x+y} = 8$ .....(ii)

Solving equation (i) & (ii) we gets x = 6 and y = 2.

Hence, speed of boat in still water = 6 km/hr and speed of stream = 2 km/hr.

(III). D

Sol. Let the speed of train be x km/hr & car be y km/hr respectively.

Acc. to problem $\frac{160}{x} + \frac{600}{y} = 8$ ....(i)

$\frac{240}{x} + \frac{520}{y} = \frac{41}{5}$ ....(ii)

Solving equation (i) & (ii) we gets x = 80 and y = 100.

Hence , speed ot train = 80 km/hr and speed of car = 100km/hr.

(IV). A

Sol. Let the speeds of the cars starting from A and B be x km/hr and y km/hr respectively.

Acc to problem 9 x – 90 = 9 y ……..(i)

& $\frac{9}{7}x + \frac{9}{7}y = 90$ …..(ii)

Solving (i) & (ii) we gets x = 40 & y = 30.

Hence, speed of car starting from point A = 40 km/hr & speed of car starting from point B = 30 km/hr.

Difference of speed = 10km/hr

(V). C

Sol. Let x be the original no. of rows & y be the original no. of students in each row.

$\therefore$ Total no. of students = xy.

Acc. to problem

(y + 1) (x - 2) = x y ....(i)

and $(y - 1)(x + 3) = xy$ ....(ii)

Solving (i) & (ii) to get

$x = 12$ & $y = 5$

$\therefore$ Total no. of students = 60

18.

(I). C

Sol. Here 1^{st} term $x = 72$ and common difference $d = 70 - 72 = -2$

$\therefore$ For finding the value of n

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

$\Rightarrow$ $40 = 72 + (n - 1)(-2)$

$\Rightarrow$ $40 - 72 = -2n + 2$

$\Rightarrow$ $-32 = -2n + 2$

$\Rightarrow$ $-34 = -2n$

$\Rightarrow$ $n = 17$

$\therefore$ 17^{th} term is 40.

(II) C

Sol. Here 1^{st} term (a) = 20, common difference (d) = $19\frac{1}{4} - 20 = -\frac{3}{4}$

Let n^{th} term of the given A.P. be 1^{st} negative term $\therefore$ $a_n < 0$

i.e. $a + (n - 1)d < 0$

$\Rightarrow$ $20 + (n - 1)\left(-\frac{3}{4}\right) < 0 \Rightarrow \frac{83}{4} - \frac{3n}{4} < 0$

$\Rightarrow$ $3n > 83 \Rightarrow n > \frac{83}{3} \Rightarrow n > 27\frac{2}{3}$

Since, 28 is the natural number just greater then $27\frac{2}{3}$.

$\therefore$ 1^{st} negative term is 28^{th}.

(III) B

Sol. $a_p = a \Rightarrow A + (p - 1)D = a$ ......(1)

$a_q = b \Rightarrow A + (q - 1)D = b$ .....(2)

$a_r = c \Rightarrow A + (r + 1)D = c$ ......(3)

Now, L.H.S. $= a(q - r) + b(r - p) + c(p - q)$

$= \{A + (p - 1)D\}(q - r) + \{A + (q - 1)D\}(r - p) + \{A + (r - 1)D\}(p - q)$

$= 0$.

(iv) B

Sol. Let A the 1^{st} term and D be the common difference of the given A.P.

Then, $ma_m = na_n$

$\Rightarrow$ $m[A + (m - 1)D] = n[A + (n - 1)D]$

$\Rightarrow$ $A(m - 1) + D[m + n(m - n) - (m - n)] = 0$

$\Rightarrow$ $A + (m + n - 1)D = 0$

$\Rightarrow$ $a_{m+n} = 0$

(V) D

Sol. $a_p = q \Rightarrow A + (p - 1)D = q$ ......(i)

& $a_q = p \Rightarrow A + (q - 1)D = p$

Solve (i) & (ii) to get $D = -1$ & $A = p + q - 1$

$\therefore$ $a_n = A + (n - 1) D$

$a_n = (p + q - 1) + (n - 1) (-1)$

$a_n = p + q - n.$

19.

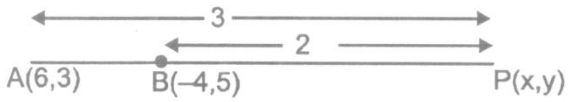
(I) A

Sol. Let P(x, y) be the required point.

For external division, we have

$$x = \frac{3x - 4 - 2\times 6}{3-2}$$

any $$y = \frac{3\times 5 - 2\times 3}{3-2}$$



$\Rightarrow$ x = - 24 and y = 9

So the coordinates of P are (-24, 9).

(II) D

Sol. Suppose the point C(-1, -1) divides the line joining the points A(4, 4) and B(7, 7) in the ratio k : 1 Then, the coordinates of C are $\left(\frac{7k+4}{k+1}, \frac{7k+4}{k+1}\right)$

But, we are given that the coordinates of the points C are (-1, -1).

$\therefore$ $\frac{7k+4}{k+1} = -1 \Rightarrow k = -\frac{5}{8}$

Thus, C divides AB externally in the ratio 5 : 8.

(III) A

Sol. Let the required ratio be k : 1. Then the coordinates of the point of division are $\left(\frac{5\lambda+2}{k+1}, \frac{6\lambda-3}{k+1}\right)$. But, it is a point on X-axis on which y-coordinate of every point is zero.

$\therefore$ $\frac{6\lambda-3}{k+1} = 0$

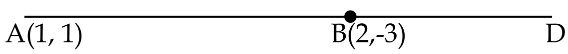
$\Rightarrow$ $k = \frac{1}{2}$

Thus, the required ratio is $\frac{1}{2}$: 1 or 1 : 2.

(IV) C

Sol. We have, AD = 3AB. Therefore, BD = 2AB. Thus D divides AB externally in the ratio AD : BD = 3 : 2 Hence, the coordinates of D are

$\therefore$ $\left(\frac{3\times 2 - 2\times 1}{3-2}, \frac{3x - 3 - 2\times 1}{3-2}\right)$



= (4, -11).

(V) C

Sol. Suppose the line 3x + y - 9 = 0 divides the line segment joining A(1, 3) and B(2, 7) in the ratio k : 1 at point C. The, the coordinates of C are $\left(\frac{2k+1}{k+1}, \frac{7k+3}{k+1}\right)$ But, C lies on 3x + y - 9 = 0, therefore

$$3\left(\frac{2k+1}{k+1}\right)+\frac{7k+3}{k+1}-9=0$$

⇒ 6k + 3 + 7k + 3 - 9k - 9 = 0

⇒ $k = \frac{3}{4}$

So, the required ratio is 3 : 4 internally.

20.

(I) C

Sol. Total number of balls in the bag = 5 + 4 + 7 = 16

∴ Total number of elementary events =16

There are 4 balls that are neither red nor white

∴ Favorable number of elementary events = 4

Hence, P (Getting neither red not white ball) = $\frac{4}{16} = \frac{1}{4}$

(II) A

Sol. After removing three face cards of spades (king, queen, jack) from a deck of 52 playing cards, there are 49 cards left in the pack. Out of these 49 cards one card can be chosen in 49 ways.

∴ Total number of elementary events = 49

There are 6 black face cards out of which 3 face cards of spades are already removed. So, out of remaining 3 black face cards one black face card ban be chosen in 3 ways.

∴ Favorable number of elementary events = 3

Hence, P (Getting a black face card) = $\frac{3}{49}$

(III) B

Sol. In a single throw of die any one of six numbers 1,2,3,4,5,6 can be obtained. Therefore, the tome number of elementary events associated with the random experiment of throwing a die is 6.

An multiple of 2 or 3 is obtained if we obtain one of the numbers 2,3,4,6 as out comes

∴ Favorable number of elementary events = 4

Hence, P (Getting multiple of 2 or 3) = $\frac{4}{6} = \frac{2}{3}$

(IV) C

Sol. If two unbiased coins are tossed simultaneously, we obtain any one of the following as an out come :

HH, HT, TH, TT

∴ Total number of elementary events = 4

If one of the elementary events HT, TH, TT occurs, than at most one head is obtained

∴ favorable number of events = 3

Hence, P (At most one head) = $\frac{3}{4}$

(V) A

Sol. Here, total numbers are 20.

∴ Total number of elementary events = 20

There are 8 prime number from 1 to 20 i.e., 2,3,5,7,11,13,17,19

$\therefore$ Favorable number of elementary events = 8

P (prime number) = $\frac{8}{20} = \frac{2}{5}$

21. $2618m^2$

Sol. Area of Road $\Rightarrow$ Area of bigger circle- Area of smaller circle

$\Rightarrow (\pi R^2 - \pi r^2)$

R = r+7

$\therefore 2\pi r = 352$

$r = \frac{352}{2\pi} = 56m$

R= 56+7 = 63m

$\therefore$ Area of Road = $\pi(632-562) \Rightarrow \pi(63+56)(63-56) = 2618m^2$

22. 800%

Sol. Original side = a

Original surface area = $6a^2$

New side = 3a

New surface area = $6\times 9a^2 = 54a^2$

$\therefore$ Increased surface area = $54a^2 - 6a^2$

% increase = $\frac{48a^2}{6a^2} \times 100 = 800\%$

23. $3M^2$

Sol. a + b + c = 3 M

$a^2 + b^2 + c^2 + 2(ab + bc + ca) = 9M^2$

$a^2 + b^2 + c^2 = 3(3M^2)$

$\frac{a^2+b^2+c^2}{3} = 3M^2$

24. 11

Sol. Given

$\frac{2n}{2}[2\times 2 + (2n-1)3] = \frac{n}{2}[2\times 57 + (n-1)2]$

$2[4+6n-3] = [114+2n-2]$

$2+12n = 112+2n$

$10n = 110$

n=11

25. 25 and 18

sol. A + B = 43 and A – B = 7 then A = 25 and B is 18

25 40

sol. L.C.M = H.C.F $\times$ remaining factors of two numbers

$48 = x \times 2 \times 3$

$\frac{48}{2\times 3} = x$

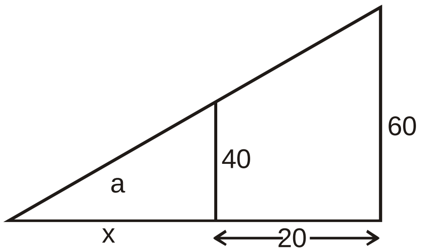
$\therefore$ Numbers are 8×2 & 8×3

$= 16$ & 24

Sum of numbers = 40

26. 40 m

Sol.



$\frac{x}{x+20} = \frac{40}{60}$

60x = 40x + 800

20x = 800

x = 40 m

26. $x = \frac{\cos\theta}{\sin\theta} + \frac{\sin\theta}{\cos\theta}$ $y = \sec\theta - \frac{1}{\sec\theta}$

$x = \frac{\cos^2\theta + \sin^2\theta}{\sin\theta\cos\theta}$ $y = \frac{\sec^2\theta - 1}{\sec\theta}$

$x = \frac{1}{\sin\theta\cos\theta}$ $y = \frac{\tan^2\theta}{\sec\theta}$

$\Rightarrow \left(\sec^2\theta\,\mathrm{cosec}^2\theta.\tan^2\theta.\cos\theta\right)^{2/3} - (\sec\theta\ \mathrm{cosec}\theta\ \tan^4\theta\ \cos^2\theta)^{2/3}$

$= 1$

27 $k\left(x^2 - \frac{3}{4}x + \frac{1}{8}\right) = \frac{k}{8}\left(8x^2 - 6x + 1\right)$

sol. $2x^2 - 3x + 1$

$\therefore \alpha + \beta = \frac{3}{2}$

$\alpha\beta = \frac{1}{2}$

Now, if zeroes are $\alpha^2\beta$ & $\alpha\beta^2$

So sum of zeroes $\alpha^2\beta + \alpha\beta^2 = \alpha\beta(\alpha + \beta)$

$= \frac{3}{2} \times \frac{1}{2} = \frac{3}{4}$

& product of zeroes = $\alpha^2\beta \times \alpha\beta^2 = \alpha^3\beta^3$

$= (\alpha\beta)^3$

$= \left(\frac{1}{2}\right)^3 = \frac{1}{8}$

$\therefore$ Polynomial is

$k\left[x^2 - (\text{sum of zeroes})x + \text{Product of zeroes}\right]$

$k\left(x^2 - \frac{3}{4}x + \frac{1}{8}\right) = \frac{k}{8}\left(8x^2 - 6x + 1\right)$

27. 7,-5

sol. Since two zeroes are $2 \pm \sqrt{3}$

$\therefore$ factors are $\left(x-\left(2+\sqrt{3}\right)\right)\left[x-\left(2-\sqrt{3}\right)\right]$

$= x^2-4x+1$

Divide $f\left(x\right)$ by x^2-4x+1

We get quotient = $x^2-2x-35$

$\therefore$ other zeroes are $7 \,\&\, -5$

[$\therefore$ rest factors = $x^2-2x-35$

$= x^2-7x+5x-35$

$=\left(x-7\right)\left(x+5\right)$]

28. length= 40 , breadth = 30

sol. Let length be x unit

Breadth be y unit

$\therefore$ Area = xy

According to question,

$\left(x-5\right)\left(y+2\right) = xy-80$

$\Rightarrow xy-5y+2x-10 = xy \quad \Rightarrow \quad 2x-5y=-70 \qquad ....\left(1\right)$

Also $\left(x+10\right)\left(y-5\right) = xy+50$

$xy-5x+10y-50 = xy+50$

$xy-5x+10y-50 = xy+50$

$\Rightarrow -5x+10y=100 \Rightarrow -x+2y=20 \qquad ....\left(2\right)$

Multiply $\left(2\right)$ by 2 and add (1) & (2), we get

$2x-5y=70$

$-2x+4y=40$

$-y=-30 \Rightarrow y=30$

$\therefore x = 40$

29. x=3 , y=1

sol. Let $\dfrac{1}{x+y}=u,\ \dfrac{1}{x-y}=v$

$\therefore$ equations become

$4u+6v=4 \qquad ....\left(1\right)$

$u + 2v=\dfrac{5}{4} \Rightarrow 4u-8v=5 \qquad .....\left(2\right)$

Subtract $\left(2\right)$ from $\left(1\right)$, we get

$-2v=-1$

$v=\dfrac{1}{2}=\dfrac{1}{x-y}$

$\Rightarrow x-y=2 \qquad ....\left(3\right)$

& $u=\dfrac{5}{4}-1 = \dfrac{1}{4} = \dfrac{1}{x+y}$

$x+y=4 \qquad .....\left(4\right)$

Adding $\left(3\right) \& \left(4\right)$, we get

$2x=6 \Rightarrow x=3$

$\therefore\ y = 1$

30 180 m

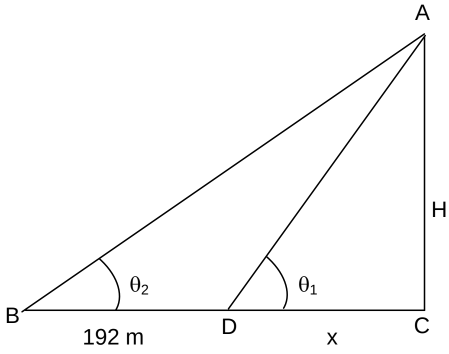
sol.

$$\tan\theta_1 = \frac{H}{x}$$

$$\frac{3}{4} = \frac{H}{x}$$

$$\frac{5}{12} = \frac{H}{x+192}$$

Solving both we get $H = 180\,m$



30 $(\cos\theta + \sin\theta)^2 = (\sqrt{2}\cos\theta)^2$

$$\cos^2\theta + \sin^2\theta + 2\cos\theta\sin\theta = 2\cos^2\theta$$

$$1 + 2\cos\theta\sin\theta = 2(1 - \sin^2\theta)$$

$$\cos^2\theta + \sin^2\theta - 2\cos\theta\sin\theta = 2\sin\theta^2$$

$$\cos\theta - \sin\theta = \sqrt{2}\sin\theta$$

31.

sol. $CE = k\sin\phi = AD$

$$OE = k\cos\phi$$

$$\tan\theta = \frac{AB}{OA} = \frac{h}{OA}$$

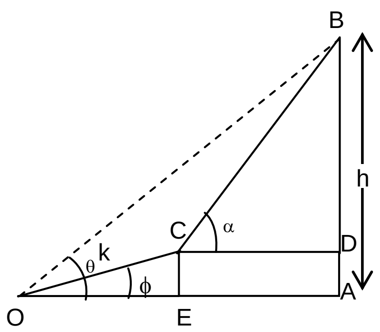
$$OA = h\cot\theta$$

$$CD = h\cot\theta - k\cos\phi$$

$$BD = h - k\sin\theta$$

$$\tan\alpha = \frac{h - k\cos\theta}{h\cot\theta - k\cos\phi}$$

$$h = \frac{k(\cos\phi - \sin\phi\cot\alpha)}{\cot\theta - \cot\alpha}$$



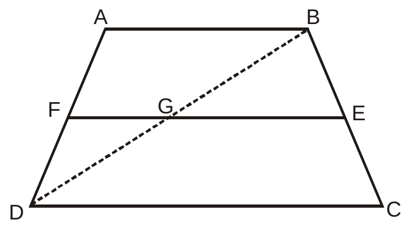
32.

sol. $\frac{EG}{DC} = \frac{3}{7}$

$$\Rightarrow \frac{EG}{AB} = \frac{6}{7} \text{ and } \frac{FG}{AB} = \frac{4}{7}$$

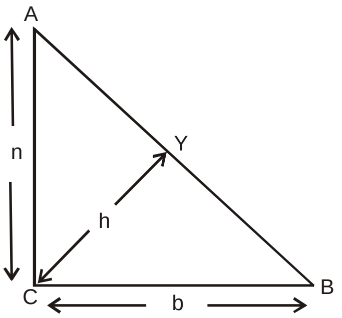
$$\text{so } \Rightarrow \frac{EG}{AB} + \frac{FG}{AB} = \frac{10}{7}$$

$$\Rightarrow \frac{EF}{AB} = \frac{10}{7}$$



33.

sol. $\text{Area} = \frac{1}{2} n \times b = A \ ...(1)$



but $\frac{1}{2} y \times h = A$

h = $\frac{2A}{y}$

$h = \frac{2A}{\sqrt{n^2 + b^2}}$ …(2)

from eq. (1) and (2)

h = $\frac{2Ab}{\sqrt{4A^2 + b^2}}$

34. x ⇒ 4

y ⇒ 5

Sol.

C.I.	F	C.F
20 – 40	6	6
40 – 60	9	15
60 – 80	2x + 3	2x + 18
80 – 100	14	2x + 32
100 –120	20	2x + 52
120 – 140	4y – 5	2x +4y +47
140 – 160	10	2x +4y +57
160 –180	8	2x + 4y + 65
180 – 200	7	2x + 4y + 72

so. 2x + 4y = 28

x + 2y = 14 …..(1)

110 = 100 + $\left(\frac{50 - 2x - 32}{20}\right) \times 20$

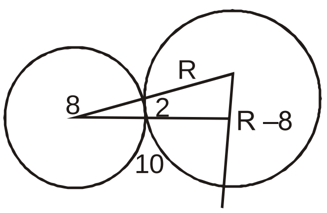
10 = 18 – 2x

2x = 8

x = 4 so y = 5

35. $\frac{40}{3}$ units

Sol.



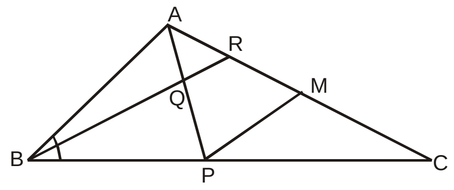
$\frac{8}{8+R} = \frac{2}{R-8}$

8R – 64 = 16 + 2R

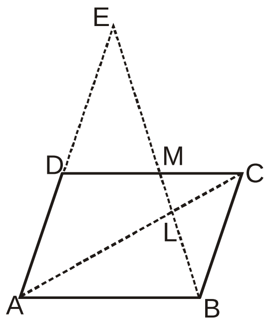
6R = 80

R = $\frac{40}{3}$

35. In ΔAPM Q is the mid point of AP and QR || PM (By construction) R mid point of AM
AR = RM …(1)
similarly CM = MR
So AR = $\frac{1}{3}$ = AC h.p.



36. EL = 2BL
Sol.



In ΔAEL and ΔBLC
$\angle ELA = \angle CLB$
$\angle AEL = \angle CBL$
$\angle EAL = \angle BCL$
$\Delta LEA \sim \Delta LBC$
Now in Δ EDM and Δ CLB
$\angle$ DEM = $\angle$ CBL
$\angle EMD = \angle CMB$ (vertical opp.)
and DM = MC
so ED = CB
so. EA = 2BC
Now.
$$\frac{EL}{BL} = \frac{EA}{BC} = 2$$
EL = 2BL