सफलता की शुरुआत
सिर्फ मोशन के साथ...

CBSE

10th Board

Term 1 - 2021

PAPER WITH SOLUTION

MATHS

Toll Free : 1800-212-1799
Corporate Office :394, Rajeev Gandhi Nagar, Kota

MOTION®

मोशन के परिणाम ही है, सफलता का प्रमाण

JEE MAIN 2021 RESULT

AIR 1 — Guramrit Singh

AIR 11 — Kumar Satyadarshi

AIR 53 — Ayush Agarwal

AIR 90 — Sanket Singh

Students Qualified for **JEE ADVANCED** **2994/4087 = 73.25%**

JEE ADVANCED 2021 RESULT

AIR 26 — Guramrit Singh

AIR 32 — Rudransh Aggarwal

AIR 61 — Harsh Poonia

AIR 88 — Tejas Kumar

AIR 100 — Rajat Golechha

24 Student Under 500

41 Student Under 1000

Motion's Selection **1256/2994 = 41.95%**

NEET 2020 RESULT

AIR 21 — Kartikey Agarwal

AIR 51 — Ronit Singh

AIR 161 — Cyril Joel Deva Asir

AIR 164 — Rahul Yadav

Above 650 Marks **12**

Above 625 Marks **47**

Above 600 Marks **137**

Students Qualified **2663 / 2843 = 93.66%**

ANSWER KEY

Paper Code_030/1/4 (JSK/1)

1.	B	**2.**	B	**3.**	A	**4.**	A	**5.**	D
6.	C	**7.**	D	**8.**	B	**9.**	A	**10.**	D
11.	A	**12.**	A	**13.**	A	**14.**	C	**15.**	C
16.	A	**17.**	C	**18.**	C	**19.**	D	**20.**	C
21.	A	**22.**	D	**23.**	B	**24.**	C	**25.**	D
26.	B	**27.**	A	**28.**	C	**29.**	D	**30.**	D
31.	A	**32.**	B	**33.**	B	**34.**	C	**35.**	A
36.	C	**37.**	B	**38.**	C	**39.**	B	**40.**	B
41.	A	**42.**	D	**43.**	C	**44.**	A	**45.**	B
46.	C	**47.**	B	**48.**	D	**49.**	C	**50.**	B

Paper Code_030/2/4 (JSK/2)

1.	B	**2.**	D	**3.**	A	**4.**	C	**5.**	D
6.	D	**7.**	C	**8.**	A	**9.**	B	**10.**	C
11.	C	**12.**	B	**13.**	B	**14.**	A	**15.**	C
16.	A	**17.**	C	**18.**	A	**19.**	B	**20.**	A
21.	D	**22.**	D	**23.**	B	**24.**	C	**25.**	C
26.	B	**27.**	A	**28.**	C	**29.**	C	**30.**	B
31.	D	**32.**	D	**33.**	B	**34.**	D	**35.**	D
36.	C	**37.**	D	**38.**	A	**39.**	B	**40.**	C
41.	D	**42.**	C	**43.**	B	**44.**	D	**45.**	C
46.	A	**47.**	B	**48.**	D	**49.**	D	**50.**	B

Paper Code_430/1/4

1.	C	**2.**	A	**3.**	B	**4.**	D	**5.**	A
6.	C	**7.**	C	**8.**	D	**9.**	C	**10.**	B
11.	B	**12.**	A	**13.**	B	**14.**	B	**15.**	D
16.	A	**17.**	D	**18.**	C	**19.**	C	**20.**	C
21.	C	**22.**	C	**23.**	C	**24.**	D	**25.**	A
26.	B	**27.**	A	**28.**	D	**29.**	A	**30.**	Bonus
31.	D	**32.**	B	**33.**	D	**34.**	C	**35.**	B
36.	C	**37.**	A	**38.**	B	**39.**	C	**40.**	B
41.	B	**42.**	C	**43.**	B	**44.**	D	**45.**	C
46.	B	**47.**	C	**48.**	B	**49.**	D	**50.**	A

Paper Code_430/2/4

1.	A	**2.**	B	**3.**	B	**4.**	D	**5.**	A
6.	B	**7.**	C	**8.**	B	**9.**	D	**10.**	D
11.	C	**12.**	B	**13.**	D	**14.**	A	**15.**	B
16.	C	**17.**	C	**18.**	B	**19.**	C	**20.**	A
21.	D	**22.**	B	**23.**	B	**24.**	C	**25.**	A
26.	D	**27.**	B	**28.**	C	**29.**	A	**30.**	A
31.	D	**32.**	B	**33.**	C	**34.**	A	**35.**	C
36.	D	**37.**	B	**38.**	A	**39.**	D	**40.**	B
41.	C	**42.**	B	**43.**	C	**44.**	B	**45.**	B
46.	D	**47.**	A	**48.**	C	**49.**	C	**50.**	D

PAPER AND SOLUTION

Paper Code_030/2/4 (JSK/2)

SECTION A

Q.No. 1 to 20 are of 1 mark each. Attempt any 16 from Q.1 to 20

1. The exponent of 5 in the prime factorization of 3750 is

(A) 3 (B) 4 (C) 5 (D) 6

Sol. (B)

$3750 = 125 \times 3 \times 5 \times 2 = 5^3 \times 5^1 \times 2 \times 3 = 5^4 \times 2 \times 3$

2. The graph of a polynomial P(x) cuts the x-axis at 3 points and touches it at 2 other points. The number of zeroes of P(x) is

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

Sol. (D)

P(x) cuts real axis (x-axis) at 3 different points and touches at 2 points so total 5 zeroes

3. The values of x and y satisfying the two equations 32x + 33y = 34, 33x + 32y = 31 respectively are:

(A) −1, 2 (B) −1, 4 (C) 1, −2 (D) −1, −4

Sol. (A)

$32x + 33y = 34, \quad 33x + 32y = 31$

adding both equations

$65x + 65y = 65$

$x + y = 1$

$\boxed{x = 1 - y}$ Put this in equations (1) & (2)

$32(1 - y) + 33y = 34$

$32 - 32y + 33y = 34$

$y = 34 - 32$

$\boxed{y = 2}$

$x = 1 - 2$

$\boxed{x = -1}$

4. If $A(3, \sqrt{3})$, B(0,0) and C(3, k) are the three vertices of an equilateral triangles ABC, then the value of k is

(A) 2 (B) −3 (C) $-\sqrt{3}$ (D) $-\sqrt{2}$

Sol. (C)

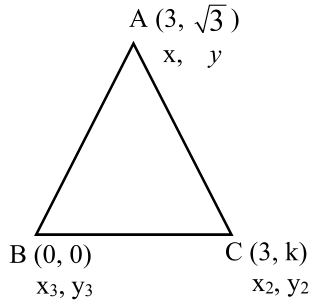
Using distance formula

$AC = \sqrt{(3-3)^2 + (k-\sqrt{3})^2}$

$AC^2 = k^2 + 3 - 2\sqrt{3}\,k$ .... (1)

$BC = \sqrt{(3-0)^2 + (k-0)^2}$

$BC^2 = 9 + k^2$ .... (2)



In equilateral Δ AB = BC = CA

$AC^2 = BC^2$

$k^2 + 3 - 2\sqrt{3}k = 9 + k^2$

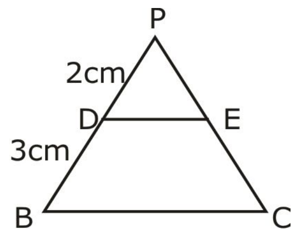
$3 - 9 = 2\sqrt{3}\ k$

$-6 = 2\sqrt{3}\ k$

$k = \frac{-6}{2\sqrt{3}} = \frac{-2\times\sqrt{3}\times\sqrt{3}}{2\sqrt{3}}$

$k = -\sqrt{3}$

5. In figure DE || BC, AD = 2 cm and BD = 3 cm, then ar (ΔABC): ar (ΔADE) is equal to

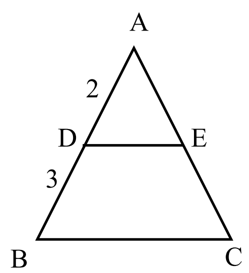


(A) 4 : 25 (B) 2 : 3 (C) 9 : 4 (D) 25 : 4

Sol. **(D)**

Here DC || BC so

In Δ ADE AND Δ ABC



$\angle$ ADE = $\angle$ABC (corresponding angle)

$\angle$AED = $\angle$ACB (--- " ---)

So, $\boxed{\Delta\ ADE \sim \Delta\ ABC}$

Now, $= \frac{\text{Area of}\ \Delta\ ABC}{\text{Area of}\ \Delta\ ADE} = \left(\frac{AB}{AD}\right)^2 = \left(\frac{5}{2}\right)^2 = \frac{25}{4}$

6. If $\cot\theta = \frac{1}{\sqrt{3}}$, the value of $\sec^2\theta + \text{cosec}^2\theta$ is

(A) 1 (B) $\frac{40}{9}$ (C) $\frac{38}{9}$ (D) $5\frac{1}{3}$

Sol. **(D)**

$\text{Cot}\ \theta = \frac{1}{\sqrt{3}}$, $\theta = 60^\circ$

$(\sec 60^\circ)^2 + (\text{cosec}\ 60^\circ)^2$

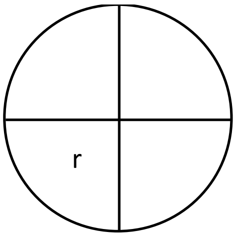
$(2)^2 + \left(\frac{2}{\sqrt{3}}\right)^2 = 4 + \frac{4}{3} = 5\frac{1}{3}$

7. The area of a quadrant of a circle where the circumference of circle is 176 m, is

(A) 2464 m^2 (B) 1232 m^2 (C) 616 m^2 (D) 308 m^2

Sol. (C)

$2\pi r = 176$



$r = \frac{176 \times 7}{2 \times 22}$

$r = 28$ m

Area pf quadrant $= \frac{\pi r^2}{4} = \frac{22}{7} \times \frac{28 \times 28}{4} = 616\ m^2$

8. For an event E, $P(E) + (\bar{E}) = x$, then the value of $x^3 - 3$ is

(A) −2 (B) 2 (C) 1 (D) −1

Sol. (A)

We know that

$\boxed{P(E) + P(E) = 1}$

So $\boxed{x = 1}$

$x^3 - 3 = (1)^3 - 3 = 1 - 3 = -2$

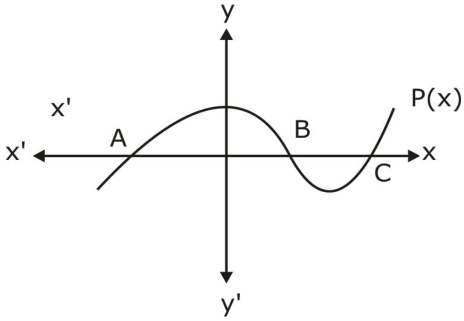
9. What is the greatest possible speed at which a girl can walk 95 m and 171 m in an exact number of minutes?

(A) 17 m/min (B) 19 m/min (C) 23 m/min (D) 13 m/min

Sol. (B)

H.C.F. of 95 and 171 is 19

10. In figure, the graph of a polynomial P(x) is shown. The number of zeroes of P(x) is:



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

Sol. (C)

Here graph cuts x-axis at 3 different point so it has 3 zeroes.

11. Two lines are given to be parallel. The equation of one of the lines is 3x- 2y = 5. The equation of the second line can be

(A) 9x + 8y = 7 (B) -12x - 8y = 7 (C) -12 + 8y = 7 (D) 12x + 8y = 7

Sol. (C)

We know that if pair of lines are parallel to each other then –

$$\boxed{\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}}$$

first equation

3x – 2y – 5 = 0

$a_1 = 3, b_1 = -2, c_1 = -5$

by the option (c)

–12x + 8y – 7 = 0

$a_1 = -12, b_2 = 8, c_2 = -7$

$$\frac{3}{-12} = \frac{-2}{8} \neq \frac{-5}{-7}$$

$$\boxed{\frac{1}{-4} = -\frac{1}{4} \neq \frac{5}{7}}$$

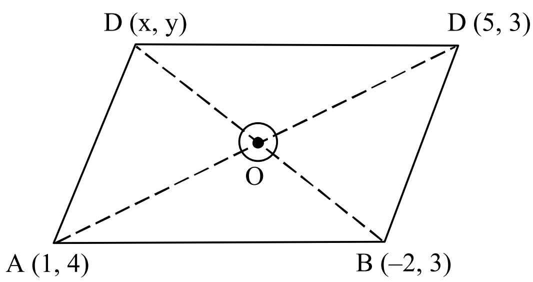
12. Three vaertices of a parallelogram ABCD are A(1,4). B(-2,3) and C(5,8). The ordinate of the fourth vertex D is

(A) 8 (B) 9 (C) 7 (D) 6

Sol. **(B)**

Diagonal of parallelogram bisect each other so O is a mid-point.

When we take AC,O is mid-point so coordinate of O is.



$$C(x, y)\ x = \frac{x_1 + x_2}{2} = \frac{1+5}{2} = \frac{6}{2} = 3$$

$$y = \frac{y_1 + y_2}{2} = \frac{4+8}{2} = \frac{12}{2} = 6$$

Now we will use this coordinate for line BD's mid-point

$$x = \frac{-2+x}{2} \qquad y = \frac{3+4}{2}$$

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

6 = – 2 + x   12 – 3 = 4

$\boxed{8 = x}$ $\boxed{9 = 4}$

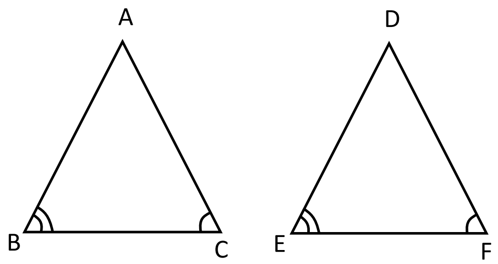
13. In ΔABC and ΔDEF, ∠F = ∠C, ∠B = ∠E and AB = $\frac{1}{2}$DE. Then, the two triangles are

(A) Congruent, but not similar. (B) Similar, but not congruent.

(C) Neither congruent nor similar (D) Congruent as well as similar.

Sol. **(B)**

Here, ∠B = ∠E and ∠C = ∠F



by the AA criteria

both Δ ABC ~ Δ DEF

but side are now equal

as given AB = $\frac{1}{2}$DE

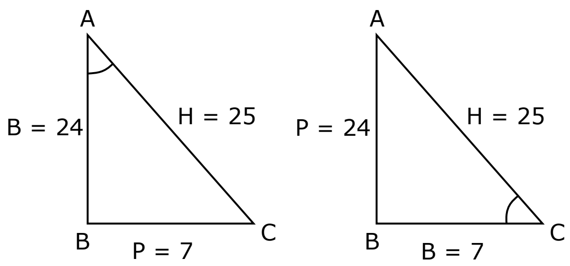
So they are not congruent.

14. In ΔABC right angled at B. sinA = $\frac{7}{25}$. then the value of cosC is

(A) $\frac{7}{25}$ (B) $\frac{24}{25}$ (C) $\frac{7}{24}$ (D) $\frac{24}{7}$

Sol. **(A)**

sin A = $\frac{7}{25} = \frac{P}{H}$



$B^2 = H^2 - P^2$

$= (25)^2 - (7)^2$

$= 625 - 49$

$B^2 = 576$

$\boxed{B = 24}$

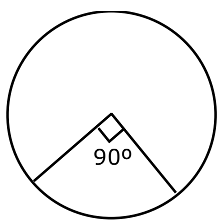
cos C = $\frac{B}{H} = \frac{7}{25}$

15. The minute hand of a clock is 84 cm long. The distance covered by the tip of minute hand from 10:10 am to 10:25 am is

(A) 44 cm (B) 88 cm (C) 132 cm (D) 176 cm

Sol. **(C)**

We know that



Minute Hand makes

angle in 1 minute = 6º

So in 15 minute = 6º × 15 = 90º

Distance covered = $2\pi r \times \frac{\theta}{360}$

$= 2 \times \frac{22}{7} \times 84 \times \frac{90}{360} = 132$ cm

16. The probability that the drawn card from a pack of 52 cards is neither an ace nor a spade is

(A) $\frac{9}{13}$ (B) $\frac{35}{52}$ (C) $\frac{10}{13}$ (D) $\frac{19}{26}$

Sol. **(A)**

Total cards = 52

Total Ace = 4

Total spade = 13 (one Ace of spade included) = 13 – 1= 12

Favorable o/c = 52 – (12 + 4) = 52 – 16 = 36

$P(E) = \frac{36}{52} = \frac{9}{13}$.

17. Three alarm clocks ring their alarms at regualr intervals of 20 min, 25 min and 30 min respectively. If they first beep together at 12 noon, at what time will they again for the first time?

(A) 4: 00 pm (B) 4:30 pm (C) 5 : 00 pm (D) 5: 30 pm

Sol. **(C)**

20 min, 25 min, 30 min

L.C.M. of 20, 25, 30 $\Rightarrow$

L.C.M. = $2 \times 2 \times 3 \times 5 \times 5 = 300$ min

2	20,	25,	30
2	10,	25,	15
3	5,	25,	15
5	5,	25,	5
5	1,	5,	1
	1,	1,	1

$\Rightarrow$ In 1 hr. $\Rightarrow$ 60 min.

or

60 min. $\Rightarrow 1$ hr.

1 min. = $\frac{1}{60}$ hr.

360 min = $\frac{1}{60} \times 300 = 5$ hr.

first 12 noon and they will ring at $\boxed{5 : 00 \text{ pm}}$

18. A quadratic polynomial, the product and sum of whose zeroes are 5 and 8 respectively is

(A) $k[x^2 - 8x + 5]$ (B) $k[x^2 - 8x + 5]$ (C) $k[x^2 - 5x + 8]$ (D) $k[x^2 - 5x + 8]$

Sol. **(A)**

$\alpha\beta = 5$, $\alpha + \beta = 8$

we know that our equation is

$k\{x^2$ – (sum of zeroes)x + product of zeroes$\}$

$k\{x^2 - (8)x + 5\}$

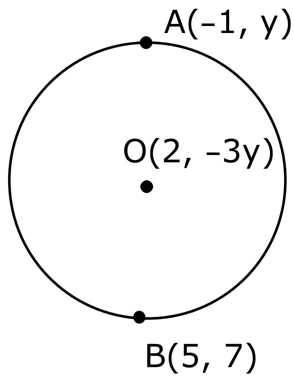
19. Points A (-1, y) and B (5,7) lie on a circle with centre O (2, -3y). The value of y are

(A) 1, -7 (B) -1, 7 (C) 2,7 (D) -2,-7

Sol. **(B)**

OA and OB are radius of circle.

So $\boxed{OA = OB}$



using distance formula

$\sqrt{(2+1)^2+(-3y-y)^2} = \sqrt{(2-5)^2+(-3y-7)^2}$

$9 + 9y^2 + y^2 + 6y^2 = 9 + 9y^2 + 49 + 42y$

$7y^2 - 42y - 49 = 0$

$y^2 - 6y - 7 = 0$

$y^2 - 7y + y + 7 = 0$

$y^2 - 6y - 7 = 0$

$y^2 - 7y + y = 0$

$y(y - 7) + 1(y - 7) = 0$

$(y + 1)(y - 7) = 0$

$y = -1, y = 7$

20. Given that $\sec\theta = \sqrt{2}$, the value of $\frac{1+\tan\theta}{\sin\theta}$ is

(A) $2\sqrt{2}$ (B) $\sqrt{2}$ (C) $3\sqrt{2}$ (D) 2

Sol. (A)

$\sec\theta = \sqrt{2}$

so $\boxed{\theta = 45^\circ}$

now $\frac{1+\tan 45}{\sin 45} = \frac{1+1}{\frac{1}{\sqrt{2}}} = \frac{2}{\frac{1}{\sqrt{2}}}$

$= \frac{2}{1} \times \sqrt{2} = 2\sqrt{2}$

SECTION B

Q.No. 21 to 40 are of 1 mark each. Attempt any 16 from Q.21 to 40

21. The greatest number which when divides 1251, 9377 and 15628 leaves remainder 1, 2 and 3 respectively is

(A) 575 (B) 450 (C) 750 (D) 625

Sol. (D)

H.C.F. of (1251 – 1), (9377 – 2), (15628 – 3)

H.C.F. of (1250, 9375, 15625)

$1250 = 625 \times 2$

$9375 = 625 \times 15$

$15625 = 625 \times 25$

H.C.F. = 625

22. Which of the following cannot be the probability of an event?

(A) 0.01 (B) 3% (C) $\frac{16}{17}$ (D) $\frac{17}{16}$

Sol. **(D)**

$O \le P(E) \le 1$

So option (D) $\frac{17}{16}$ is not possible .

23. The diameter of a car wheel is 42 cm. the number of complete revolutions it will make in moving 132 km is

(A) 10^4 (B) 10^5 (C) 10^6 (D) 10^3

Sol. **(B)**

Total Distance = 132 km

Diameter of Car Wheel = 42 cm

Radius = 21 cm

Circumference of car wheel = $2\pi r = 2 \times \frac{22}{7} \times 21 = 132$ cm

No. of Revolution $= \frac{\text{Distance}}{\text{Circumference}} = \frac{132 \times 1000 \times 100}{132} = 10^5$

24. If θ is an acute angle and $\tan\theta + \text{cat}\theta = 2$, then the value of $\sin^3\theta + \cos^3\theta$ is

(A) 1 (B) $\frac{1}{2}$ (C) $\frac{\sqrt{2}}{2}$ (D) $\sqrt{2}$

Sol. **(C)**

$\tan\theta + \cot\theta = 2$

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

$\frac{\tan^2\theta + 1}{\tan\theta} = 2$

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

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

$(\tan\theta - 1)^2 = 0$

$\text{Tan}\theta = 1$

$\theta = 45°$

Value of $\sin^3\theta + \cos^3\theta$

Put $\theta = 45°$

$\left(\frac{1}{\sqrt{2}}\right)^3 + \left(\frac{1}{\sqrt{2}}\right)^3$

$\frac{1}{2\sqrt{2}} + \frac{1}{2\sqrt{2}}$

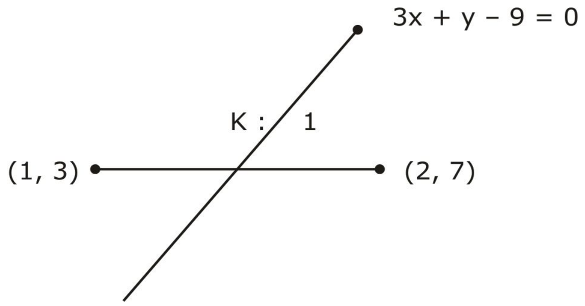
$\frac{1}{\sqrt{2}} = \frac{1}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}}$

$\frac{\sqrt{2}}{2}$

25. The ration in which the line $3x + y - 9 = 0$ divides the line segment joining the points (1, 3) and (2, 7) is

(A) 3 : 2 (B) 2 : 3 (C) 3 : 4 (D) 4 : 3

Sol. **(C)**



lit the line $3x + y - 9$ divides the point in K:1 ratio

$\frac{2K+1}{K+1}, \frac{7K+3}{K+1}$ satisfy the e9^{n} of

Line $3x + y - 9 = 0$

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

$6K + 3 + 7K + 3 - 9K - 9 = 0$

$4K - 3 = 0$

$4K = 3$

$K = \frac{3}{4}$

Required ration = 3:4

26. If x–1 is factor of the polynomial $p(x) = x^3 + ax^2 + 2b$ and $a + b = 4$, then

(A) a = 5, b = –1 (B) a = 9, b = –5 (C) a = 7, b = –3 (D) a = 3, b = 1

Sol. **(B)**

If x–1 is a factor of pdynomial

$P(x) = x^3 + ax^2 + 2b$

So $P(1) = 0$

$(1)^3 + a(1)^2 + 2b = 0$

$1 + a + 2b = 0$

$A + 2b = -1$ …. (1)

$a+b = 4$ (given) …. (2)

Put $a = u - b$

In eg^{n} (1)

$u - b + 2b = -1$

$b = -5$ & $a = 9$

27. If a and b are two coprime numbers, a^3 and b^3 are

(A) Coprime (B) Not coprime (C) Even (D) Odd

Sol. **(A)**

If a & b are two Co-prime no's a^3 & b^3 are also co-prime

28. The area of a square that can be inscribed in a circle of area $\frac{1408}{7}$ cm^2 is

(A) 321 cm^2 (B) 642 cm^2 (C) 128 cm^2 (D) 256 cm^2

Sol. **(C)**

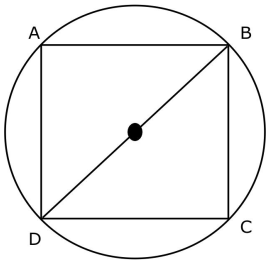
area of circle = $\frac{1408}{7}$

$\pi r^2 = \frac{1408}{7}$

$\frac{22}{7} \times r^2 = \frac{1408}{7}$

$r^2 = 64$

r = 8 cm



BD is diameter of circle and also

Diagonal of square

BD = 16 cm

Lit BC = a cam

By Pythagoras theorem $a^2 + a^2 = 16^2$

$2a^2 = 16^2$

$a^2 = \frac{256}{2}$

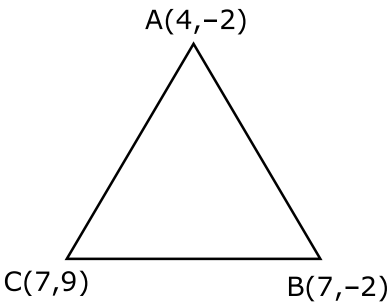
$a^2 = 128$

29. If A (4, –2), B (7, –2) and C (7, 9) are the vertices of a ΔABC, then ΔABC is

(A) Equilateral triangle (B) Isosceles triangle

(C) Right angled triangle (D) Isosceles right angled triangle

Sol. **(C)**



AB = $\sqrt{(7-4)^2 + (-2+2)^2} = \sqrt{3^2} = 3$ cm

BC = $\sqrt{(7-7)^2 + (9+2)^2} = \sqrt{11^2} = 11$ cm

AC = $\sqrt{(7-4)^2 + (9+2)^2} = \sqrt{3^2 + 11^2} = \sqrt{9 + 121}$

$= \sqrt{130}$

Here,

$AB^2 + BC^2 = AC^2$ $\Rightarrow 3^2 + 11^2 = \left(\sqrt{130}\right)^2$

$\Rightarrow 9 + 121 = 130$

$= 130 = 130$

(C) Right angled triangle

30. If α, β are the zeros of the quadratic polynomial p(x) $x^2 - (k + 6)x + 2(2k - 1)$

(A) −7 (B) 7 (C) −3 (D) 3

Sol. **(B)**

α, β are zeros of polynomial

$P(x) = x^2 - (K + 6)x + 2(2K-1)$

$\alpha + \beta = \frac{K+6}{1}$

$\alpha\beta = \frac{2(2K-1)}{1}$

Value of $\alpha + \beta = \frac{1}{2}\alpha\beta$

$K + 6 = \frac{1}{2} \times 2(2K-1)$

$K + 6 = 2K - 1$

$K = 7$

31. If n is a natural number, then $2(5^n + 6^n)$ always ends with

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

Sol. **(D)**

$2(5^n + 6^n)$

n is natural number

5^n is always end with 5

6^n is always end with 6

$2(5 + 6)$

2×11

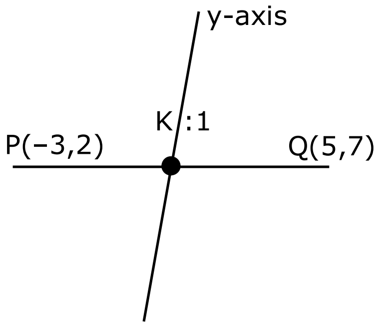
$= 22$

$2(5^n + 6^n)$ always end with 2.

32. The line segment joining the points P (−3, 2) and Q (5, 7) divided by the y-axis in the ratio

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

Sol. **(D)**



Let the required ratio = K : 1

we know that on y-axis x-coordinate always zero

so, $\frac{5K-3}{K+1} = 0$

$5K - 3 = 0 \Rightarrow K = \frac{3}{5}$

Required ratio 3 : 5

33. If a $\cot\theta$ + b $\text{cosec}\theta$ = p and b $\cot\theta$ + a $\text{cosec}\theta$ = q, then $p^2 - q^2$ =

(A) $a^2 - b^2$ (B) $b^2 - a^2$ (C) $a^2 + b^2$ (D) b – a

Sol. **(A)**

$a \cot\theta + b\,\text{cosec}\theta = p$

$b \cot\theta + a\,\text{cosec}\theta = q$

$p^2 = (a \cot\theta + b\,\text{cosec}\theta)^2$

$p^2 = a^2 \cot^2\theta + b^2\,\text{cosec}^2\theta + 2ab \cot\theta\,\text{cosec}\theta$

$q^2 = b^2\cot^2\theta + a^2\,\text{cosec}^2\theta + 2ab \cot\theta\,\text{cosec}\theta$

$p^2 - q^2 = (a^2 - b^2)\cot^2\theta + (b^2-a^2)\,\text{cosec}^2\theta$

$= (a^2-b^2)\cot^2\theta - (a^2-b^2)\text{cosec}^2\theta$

$= (a^2-b^2)\,[\cot^2\theta - \text{cosec}^2\theta]$

$= a^2-b^2$ $[\because \cot^2\theta - \text{cosec}^2\theta = 1]$

34. If the perimeter of a circle is half to that of a square, then the ratio of the area of the circle to the area of the square is

(A) 22 : 7 (B) 11 : 7 (C) 7 : 11 (D) 7 : 22

Sol. **(D)**

Perimeter of circle = $\frac{1}{2}$ perimeter of square

let radius of circle = r

and side of square = a

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

$2\pi r = 2a$

$a = \pi r$

$$\frac{\text{are of circle}}{\text{area of square}} = \frac{\pi r^2}{a^2} = \frac{\pi r^2}{(\pi r)^2}$$

$$= \frac{\pi r^2}{\pi^2 r^2} = \frac{1}{\pi} = \frac{7}{22}$$

35. A dice is rolled twice. The probability that 5 will not come up either time is

(A) $\frac{11}{36}$ (B) $\frac{1}{3}$ (C) $\frac{13}{36}$ (D) $\frac{25}{36}$

Sol. **(D)**

Total no. of outcomes when dies throw twice

$= 6 \times 6$

$= 36$

Number of possible outcomes when 5 will come up either time

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

= 11

Probability that 5 will come up either time

$= \frac{11}{36}$

$= \frac{25}{36}$

36. The LCM of two numbers is 2400. Which of the following CANNOT be their HCF?

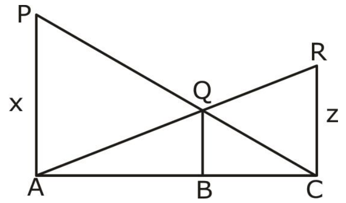
(A) 300 (B) 400 (C) 500 (D) 600

Sol. **(C)**

L.C.M of two numbers = 2400

we know that H.C.F is factor of L.C.M from options 500 is not a factor of 2400

37. In figure, PA, QB and RC are each perpendicular to AC. If x = 8 cm and z = 6 cm, then y is equal to



(A) $\frac{56}{7}$cm (B) $\frac{7}{56}$ (C) $\frac{25}{7}$ (D) $\frac{24}{7}$

Sol. **(D)**

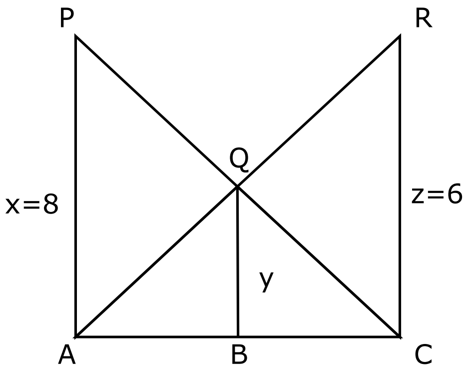
we know, $\frac{1}{y} = \frac{1}{x} + \frac{1}{z}$

$\frac{1}{y} = \frac{1}{8} + \frac{1}{6}$

$= \frac{3+4}{24} = \frac{7}{24}$

$= \frac{1}{y} = \frac{7}{24}$

$y = \frac{24}{7}$cm



38. In a ΔABC, $\angle$A = x°, $\angle$B = (3x – 2)°, $\angle$C = y°. Also $\angle$C – $\angle$B = 9°. The sum of the greatest and the smallest angles of this triangle is

(A) 107° (B) 135° (C) 155° (D) 145°

Sol. **(A)**

In ΔABC = $\angle A = x°$

$\angle B = (3x-2)°$

$\angle C = y°$

Also $\angle C - \angle B = 9°$

$y - (3x - 2) = 9$

$y - 3x + 2 = 9$

$y - 3x = 7$ ...(1)

By angle sum property

$x + (3x - 2) + y = 180°$

$4x - 2 + y = 180°$

$4x + y = 182$ ...(2)

(2) – (1)

$7x = 175°$ $y - 3 \times 25 = 7$

$x = 25$ $y - 75 = 7$

$y = 82$

$\angle A = x = 25$

$\angle B = 3x - 2 = 3 \times 25 - 2 = 73$

$\angle C = y° = 82$

Required sum = 82 + 25

= 107

39. If sec θ + tan θ = p, then tan θ is

(A) $\frac{p^2+1}{2p}$ (B) $\frac{p^2-1}{2p}$ (C) $\frac{p^2-1}{p^2+1}$ (D) $\frac{p^2+1}{p^2-1}$

Sol. (B)

if secθ + tanθ = p ...(1)

$$\frac{1}{p} = \frac{1}{\sec\theta+\tan\theta}$$

so by Rationalization.

$$\frac{1}{p} \Rightarrow \frac{1}{\sec\theta+\tan\theta} \times \frac{\sec\theta-\tan\theta}{\sec\theta+\tan\theta}$$

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

we know $\sec^2\theta - \tan^2\theta = 1$

$$\frac{1}{p} = \sec\theta - \tan\theta \quad ...(2)$$

secθ – tanθ = 1/p

secθ + tanθ = p

subtract (1) from (2)

$$(\sec\theta - \tan\theta) - (\sec\theta + \tan\theta) = \frac{1}{p} - p$$

$$\sec\theta - \tan\theta - \sec\alpha - \tan\theta = \frac{1-p^2}{p}$$

$$-2\tan\theta = \frac{1-p^2}{p}$$

$$\tan\theta = \frac{p^2-1}{2p}$$

40. The base BC of an equilateral ΔABC lies on the y-axis. The co-ordinates of C are (0,–3). If the origin is the mid-point of the base BC, what are the co-ordinates of A and B?

(A) $A(\sqrt{3},0)$, B(0, 3) (B) $A(\pm3\sqrt{3},0)$, B(3,0)

(C) $A(\pm3\sqrt{3},0)$, B(0,3) (D) $A(-\sqrt{3},0)$, B(3,0)

Sol. (C)

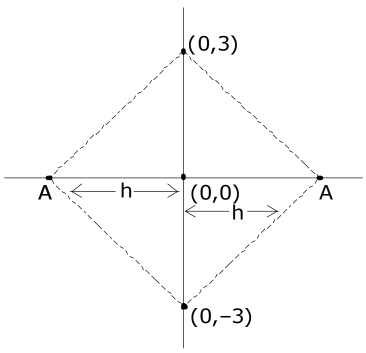
Area of ΔABC is

$$\frac{\sqrt{3}}{4} \times a^2$$

a is side of Δ.

$$\frac{\sqrt{3}}{4} \times 6^2$$

and we know area of $\Delta = \frac{1}{2} \times b \times h$



$$\frac{\sqrt{3}}{4} \times 6^2 = \frac{1}{2} \times b \times h$$

$$\frac{\sqrt{3}}{4} \times 36 = \frac{1}{2} \times 6 \times h$$

$$h = 3\sqrt{3}$$

So, coordinates of $A\left(\pm3\sqrt{3},0\right)$ B(0,3)

SECTION C

Q.No. 41-45 are based on Case Study-I you have to answer any (4) four questions.
Q.No. 46-50 are based on Case Study-II, you have to answer any (4) four questions.

Case Study – I

A book store shopkeeper gives books on rent for reading. He has variety of books in his store related to fiction, stories and quizzes etc. He takes a fixed charge for the first two days and an additional charge for subsequent day. Amruta paid Rs. 22 for a book and kept for 6 days; while Radhika paid Rs. 16 for keeping the book for 4 days.

Assume that the fixed charge be Rs. x and additional charge (per day) be Rs. y.
Based on the above information, answer any four of the following questions:

41. The situation of amount paid by Radhika, is algebraically represented by
(A) $x - 4y = 16$ (B) $x + 4y = 16$ (C) $x - 2y = 16$ (D) $x + 2y = 16$

Sol. **(D)**
Let assume fixed charge be = x
and additional charge be = y
$x + 4y = 22$ ....(1)
$x + 2y = 16$ ....(2)
Subtract (2) from (1)
$2y = 6$
$Y = 3$
Put y in (1)
$x + 12 = 22$
$x = 10$

42. The situation of amount paid by Amruta, is algebraically represented by
(A) $x - 2y = 11$ (B) $x - 2y = 22$ (C) $x + 4y = 22$ (D) $x - 4y = 11$

Sol. **(C)**
$x + 4y = 22$

43. What are the fixed charges for a book?
(A) Rs. 9 (B) Rs. 10 (C) Rs. 13 (D) Rs. 15

Sol. **(B)**
10

44. What are the additional charges for each subsequent day for a book?
(A) Rs. 6 (B) Rs. 5 (C) Rs. 4 (D) Rs. 3

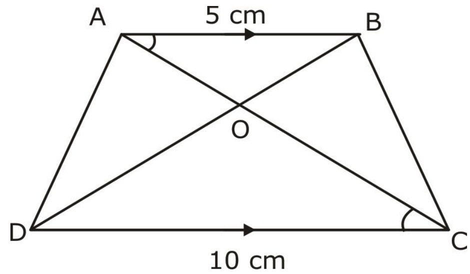
Sol. **(D)**
3

45. What is the total amount paid by both, if both of them have kept the book 2 more days.
(A) Rs. 35 (B) Rs. 52 (C) Rs. 50 (D) Rs. 58

Sol **(C)**
$(x + 6y) + (x + 4y)$
$(10 + 6 \times 3) + (10 + 4\times3)$
$(10 + 18) + (10+12)$
$=28 + 22$
$= 50$

Case Study – II

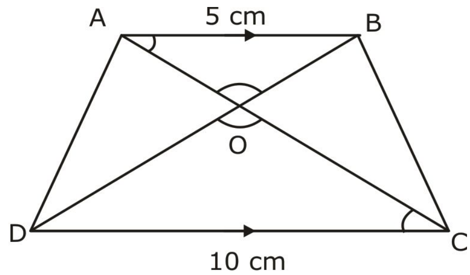
A farmer has a field in the shape of trapezium, whose map with scale 1 cm = 20 m. is given below:
The field is divided into four parts by joining the opposite vertices.



Based on the above information, answer any four of the following questions:

46. The two triangular regions AOB and COD are
(A) Similar by AA criterion (B) Similar by SAS criterion
(C) Similar by RHS criterion (D) Not similar

Sol. **(A)**
AOB and COD



⇒ Similar by AA criteria because
$\angle AOB = \angle DOC$ [V.O.A.]
$\angle BAO = \angle OCD$ [Corresponding angle]
So, by AA $\Delta ABO \sim \Delta COD$

47. The ratio of the area of the ΔAOB to the area of ΔCOD, is
(A) 4:1 (B) 1:4 (C) 1:2 (D) 2:1

Sol. **(B)**
By theorem
(Ratio of Side of Δs)^2 = Ratio of Area of Δs

$$\left(\frac{AB}{CD}\right)^2 = \text{Ratio of Area of } \Delta s$$

$$\left(\frac{5}{10}\right)^2 = \left(\frac{1}{2}\right)^2 = \frac{1}{4}$$

$$\frac{1}{4} = \frac{\text{Area of } \Delta.AOB}{\text{Area of } \Delta COD}$$

48. If the ratio of the perimeter of ΔAOB to the perimeter of ΔCOD would have been 1:4, then

(A) AB = 2 CD (B) AB = 4 CD (C) CD = 2 AB (D) CD = 4 AB

Sol. **(D)**

Δ AOB and Δ COD

Ratio is 1 : 4 then

2AB = CD

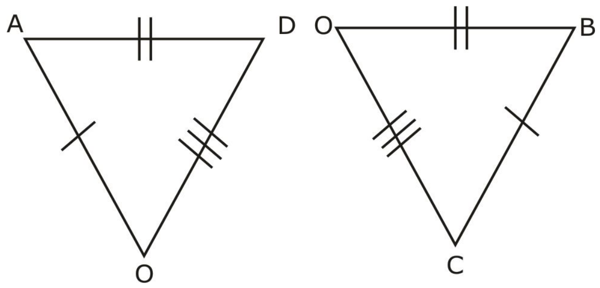
49. If in Δs AOD and BOC $\frac{AO}{BC} = \frac{AD}{BO} = \frac{OD}{OC}$, then

(A) ΔAOD ~ΔBOC (B) ΔAOD ~ΔBCO (C) ΔADO ~ΔBCO (D) ΔODA ~ΔOBC

Sol. **(D)**

Given, $\frac{AO}{BC} = \frac{AD}{BO} = \frac{OD}{OC}$

In ΔAOD and



$\frac{AO}{BC}, \frac{AD}{BO}, \frac{OD}{OC}$

(b) ΔAOD ~ ΔBOC

50. If the ratio of areas of two similar triangles AOB and COD is 1:4, then which of the following statements is true?

(A) The ratio of their perimeters is 3:4

(B) The corresponding altitudes have a ratio 1: 2.

(C) The medians have a ratio 1:4.

(D) The angles bisectors have a ratio 1:16.

Sol. **(B)**

We know that ratio of angle bisector, median, altitude is

$$\frac{\text{Area of } \Delta ABC}{\text{Area of } \Delta DEF} = \frac{(\text{Altitude}_1)^2}{(\text{Altitude}_2)^2}$$

$$\frac{1}{4} = \left(\frac{\text{Altitude}_1}{\text{Altitude}_2}\right)^2$$

$$\frac{\text{Altitude}_1}{\text{Altitude}_2} = \sqrt{\frac{1}{4}} = \frac{1}{2}$$

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