SECTION A : SOLUTION

1. **(C)**

Let a and b be the required numbers

We have

$a+b=55$

$ab = HCF \times LCM = 5\times 120 = 600$

Required sum = $\frac{1}{a}+\frac{1}{b}=\frac{a+b}{ab}=\frac{55}{600}=\frac{11}{120}$

2. **(A)**

$\frac{1}{P}=\frac{1}{7-4\sqrt{3}}=\frac{7+4\sqrt{3}}{49-48}=7+4\sqrt{3}$

$P+\frac{1}{P}=\frac{P^2+1}{P}=7-4\sqrt{3}+7+4\sqrt{3}=14$

$\Rightarrow \quad \frac{P^2+1}{7P}=2$

3. **(C)**

$\log_6 x+\frac{2}{2}\log_6 x+\frac{3}{3}\log_6 x=9.$

$\Rightarrow \quad 3\log_6 x=9 \quad \Rightarrow \quad \log_6 x=3 \quad \Rightarrow \quad x=6^3=216$

4. **(D)**

Let present ages of person and his son be x years and y years respectively

Using information provided we have

$x-4=3(y-4)$

$\Rightarrow \quad x-3y=-8 \qquad$ _____(I)

Also $\qquad x+8=2(y+8)$

$\Rightarrow \quad x-2y=8 \qquad$ _____(II)

Solving (I) and (II) we get x = 40, y = 16.

$\therefore$ Required sum = 56

5. **(D)**

Clearly x = 1 satisfies the given equation

$\therefore x=1$ is a root

$\because$ roots are equal

$\Rightarrow$ product of roots $=1 \Rightarrow \frac{c-a}{a-b}=1 \Rightarrow b+c=2a$

6. **(B)**

Let speed of water flow be x km/hr.

Then, speed of boat going downstream = (9 + x) km/hr

And speed while going upstream = (9 – x) km/hr

Thus., $\frac{15}{9+x}+\frac{15}{9-x}=3\frac{3}{4}=\frac{15}{4}$

$\Rightarrow \quad 81-x^2=72 \Rightarrow x=3$

7. (C)

$\because \quad r=p^2-q^2=(p+q)(p-q)$

$\because$ r is a prime No. $\Rightarrow \quad p-q=1$ and $p+q=r$

$\Rightarrow \quad p=3,\ q=2,\ r=5$

$\therefore \quad p+q+r=10$

8. (B)

If August starts with Tuesday it will have 5 Tuesday out of 31 days

$P(\text{not a Tuesday})=\frac{26}{31}$

9. (C)

$AE=BE=x$ and $BD=DC=y$

In $\Delta ABD \quad AB^2+BD^2=AD^2$

$\Rightarrow \quad 4x^2+y^2=292$ ____(i)

In $\Delta BCE \quad EB^2+BC^2=CE^2$

$\Rightarrow \quad x^2+4y^2=208$ ___(ii)

(i) + (ii) $\quad 5(x^2+y^2)=500 \Rightarrow x^2+y^2=100$

$\therefore \quad AC=\sqrt{4(x^2+y^2)}=\sqrt{400}=20$

10. (D)

16 years ago, Let Tanya's age = x years and her grandfather's age = 8x.

After 8 years from now

$T=(x+24)$

and $G=8x+24$

$\therefore \quad 8x+24=3(x+24)$

$\Rightarrow \quad 5x=48$

or $\quad x=\frac{48}{5}$

Years age, $\frac{T}{G}=\frac{x+8}{8x+8}=\frac{11}{53}$

11. (C)

$x=a+b+c$ satisfies the given equation

12. (C)

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

Each term is equal to $\frac{a+b+c}{2(a+b+c)}$

If then each term is $\frac{1}{2}$

If $a+b+c=0$, then each term $\frac{a}{b+c}=\frac{a}{-a}=-1$

13. (D)

$\sin A=\sin B=\sin C=1$

$\because \quad -1\le \sin\theta \le 1$

$\Rightarrow \quad A=B=C=\frac{\pi}{2}$

$\therefore \quad \cos A+\cos B+\cos C=0$

14. (C)

Given Expression

$\Rightarrow \quad \sin x\left[\frac{(1-\cos x)+(1+\cos x)}{1-\cos^2 x}\right]=4$

$\Rightarrow \quad \sin x\times\frac{2}{\sin^2 x}=4 \qquad \text{or} \qquad \sin x=\frac{1}{2}$

$\Rightarrow \quad x=30^o$

15. (D)

$x=\log_3 27$	$y=\log_9 27$
$\Rightarrow x=\log_3 3^3$	$y=\log_{3^2} 3^3$
$\Rightarrow x=3$	$y=\frac{3}{2}$

$\therefore \frac{1}{x}+\frac{1}{y}=\frac{1}{3}+\frac{1}{\left(\frac{3}{2}\right)}=\frac{1}{3}+\frac{2}{3}=\frac{3}{3}=1$

16. (C)

$(4a+5b+5c)^2-(5a+4b+4c)^2+9a^2$

$=(4a+5b+5c+5a+4b+4c)$

$(4a+5b+5c-5a-4b-4c)+9a^2$

$=(9a+9b+9c)(-a+b+c)+9a^2$

$=9(a+b+c)(-a+b+c)+9a^2$

$=9(b+c)^2-9a^2+9a^2$

$=9(b+c)^2$

$\therefore$ The square root of the given expression is $\sqrt{9(b+c)^2}=3(b+c)$

17. (D)

Let the number of questions attempted correctly by the candidate = C

He attempted all the questions.

$\therefore$ Number of questions attempted wrongly by him = 60 – C

$2C-1(60-C)=90$

$2C-60+C=90$

$C=50$

18. (C)

Let the speed of Ramu = x km/h

Total time taken is = 1h

i.e., $\frac{3}{x-4}+\frac{3}{x+4}=1$

$$\frac{3x+12+3x-12}{x^2-16}=1$$

$6x=x^2-16$

$x^2-6x-16=0$

$x^2-8x+2x-16=0$

$x(x-8)+2(x-8)=0$

$(x-8)(x+2)=0$

$x=8$ kmph ($\because$ speed cannot be -2 kmph)

19. (B)

Given that, $\frac{\text{mean}}{\text{median}}=\frac{5}{7}$

We know that mode = 3 median – 2 mean.

$\text{mode}=\text{mean}\left(\frac{3\,\text{median}}{\text{mean}}-2\right)$

$\frac{\text{mode}}{\text{mean}}=\left(3.\frac{7}{5}-2\right)=\frac{21-10}{5}=\frac{11}{5}$

20. (A)

There are 2 red ball and 3 green balls. The number of possible outcomes = 2 + 3 = 5

The total number of cases = 2 + 3 + 4 = 9

The required probability = 5 / 9

21. (A)

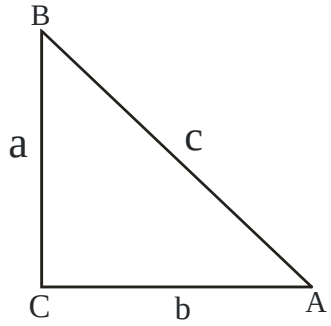
Given $\angle QPR=25^o$

Since QS is the diameter, $\angle QPS = 90^o$

$\Rightarrow \quad \angle SPR=90-25^o=65^o$

$\therefore \quad \angle SOR=2\times 65^o=130^o$.

22. (A)



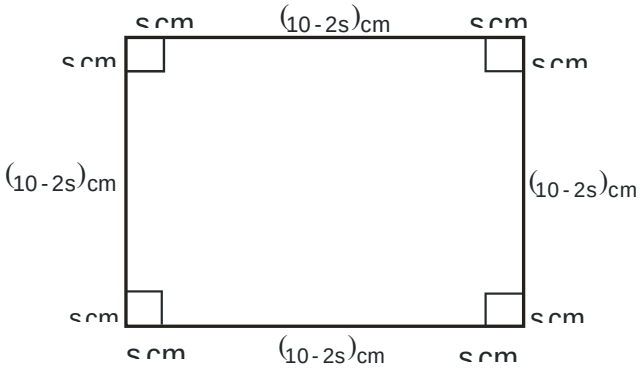
Given that, c = 2a and $b^2 - 3a^2 = 0. \Rightarrow b = \sqrt{3}a.$

$a : b : c = a : \sqrt{3}a : 2a = 1 : \sqrt{3} : 2$

$\therefore \quad \angle A = 30^o, \angle B = 60^o$ and $\angle C = 90^o$

So, $\angle ABC = 60^o$

23. (D)



The dimension of cuboid are l = b = (10 – 2s)cm and h = s cm

Volume of cuboid = (10 – 2s) (10 – 2s) s

i.e., $(10 - 2s)^2$s cubic cm.

$10 - 2s > 0$ i.e., s < 5 and s is an integer.

$\therefore s = 1, 2, 3$ or 4

When s = 1, C = 64

When s = 2, C = 72

When s = 3, C = 48

When s = 4, C = 16

Only choice (4) cannot be a possible value of C.

24. (B)

Slope of the line perpendicular to 3x – 8y + 4 = 0 is $\dfrac{-1}{\text{slope of } 3x - 8y + 4 = 0} = \dfrac{-1}{\frac{3}{8}} = \dfrac{-8}{3}$

Given that, x – intercept of the required line is 11.

$\therefore$ It passes through (11,0)

Hence, the required line is $-\dfrac{8}{3} = \dfrac{y - 0}{x - 11}$

i.e. $y - 0 = \dfrac{-8}{3}(x - 11)$

i.e. $8x + 3y - 88 = 0$

25. (B)

Let the cost price for P be Rs 100x

P's profit = $\frac{20}{100}(\text{Rs}100x) = \text{Rs } 20x$

The selling price for P = Rs 120x

The cost price for Q = The selling price for P = Rs 120x

Q's profit = $\frac{10}{100}(\text{Rs}120x) = \text{Rs}12x$

Given, $12x = 20x - 24$

$\Rightarrow 3 = x \Rightarrow 100x = 300$

SECTION B : SOLUTION

26. 48000

Let the sum withdrew be Rs x.

His balance at the end of two years (in Rs)

$= (60000)\left(1+\frac{20}{100}\right)^2 = 60000(1.2)^2$

$= 60000(1.44) = 86400$

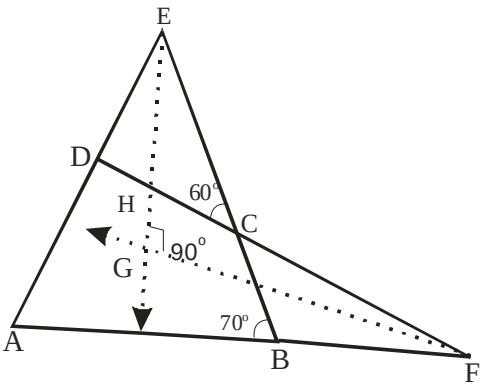
$\therefore$ Rs (86400 – x) must have amounted to Rs 46080 at the end of the third year

$(84600 - x)\left(1+\frac{20}{100}\right) = 46080$

$86400 - x = \frac{46080}{1.2} = 38400$

$x = 48000$

27. 25^o



$\angle DAB = \angle DCE = 60^o$ and $\angle EDC =$

$\angle CBA = 70^o$ (exterior angle of a cyclic quadrilateral)

In $\Delta ABE, \angle DEC = 180 - (60^o + 70^o) =$ Since $\overline{FG}$ bisects $\angle F$,

$\therefore \quad \angle HEC = \frac{\angle DEC}{2} = \frac{50^o}{2} = 25^o$