SECTION A : SOLUTION

1. (C)

Squaring the terms on both the sides, we get

$\left(\sqrt{x+5}+\sqrt{5-x}\right)^2 = 4^2$

$\Rightarrow x+5+5-x+2\sqrt{(x+5)(5-x)} = 16$

$\Rightarrow 10+2\sqrt{25-x^2} = 16$

$\Rightarrow \sqrt{25-x^2} = 3$

Squaring the terms on both the sides again, we get

$25-x^2 = 3^2$

$\Rightarrow x^2 = 25-9$

$\Rightarrow x^2 = 16 \Rightarrow x = \pm 4$

$\therefore x = \pm 4$ is the required solution of the given equation.

2. (B)

Cost price of the cycle $=$ Rs 1200

Selling price of the cycle $=$ Rs 1500

S.P. $>$ C.P $\Rightarrow$ there is a gain

$\Rightarrow$ Gain = S. P. – C. P. $= 1500-1200 =$ Rs 300

$\therefore$ Gain Percentage $= \dfrac{\text{Gain}}{\text{C.P.}}(100)\% = \dfrac{300}{1200}(100)\% = 25\%$

$\therefore$ The shopkeeper makes a profit of 25%

3. (C)

Let the number of coins of denominations of Rs 1, Rs 2 and Rs 5 be $3x, 5x$ and $7x$ respectively.

The total value of the coins in the bag $=$ Rs$\left[3x+5x(2)+7x(5)\right] =$ Rs$(3x+10x+35x) =$ Rs $48x$.

Given, the total amount in the bag $=$ Rs 144

$\Rightarrow 48x = 144$

$\Rightarrow x = 3$

The number of Rs 1 coins in the bag $= 3x = 9$

$\therefore$ The number of Rs 2 coins in the bag $= 5x = 5(3) = 15$

The number of Rs 5 coins in the bag $= 7x = 21$

$\therefore$ The total value of Rs 2 coins in the bag $=$ Rs $15\times 2 =$ Rs 30.

4. (C)

Assume that 6 taps can do the same work in x hours. As more taps require less hours to do the same work, number of taps vary inversely as the number of hours

$\therefore$ (inverse ratio of number of taps): : (ratio of number of hours)

$\Rightarrow 6:4::10:x$

$\Rightarrow \dfrac{6}{4} = \dfrac{10}{x}$

$\Rightarrow x = \dfrac{40}{6} = 6\dfrac{2}{3}$ hours

$\therefore$ Six taps can fill the tank in $6\frac{2}{3}$ hours.

5. (C)

Let the incomes of grocers, druggist, architect and banker be x, 2x, 4x, 8x respectively
Mr. Flynn makes more than twice the money Mr. Carter makes and income of other two differ by 3776 we have the following cases.

Case 1:

Mr. Flynn $\equiv$ Architect $\equiv$ Income (4x)
Mr. Carter $\equiv$ Grocer $\equiv$ Income (x)

$$8x - 2x = 6x = 3776$$

Here x will not be an integer

Case 2:

Mr. Flynn $\equiv$ Banker $\equiv$ Income (8x)
Mr. Carter $\equiv$ Druggist $\equiv$ Income (4x)

$$4x - x = 3x = 3776$$

Here x will not be an integer

Case 3:

Mr. Flynn $\equiv$ Banker $\equiv$ Income (8x)
Mr. Carter $\equiv$ Grocer $\equiv$ Income (x)

$$4x - 2x = 2x = 3776$$

Here x will be an integer

6. (B)

Two of the given guesses were of by 7
Since no two guesses are same one of the guess will be 7 less and the other will be 7 more than the correct number
Hence the difference of the two offs must be 14 which are 41 and 55. Hence 48 is the correct number.

7. (C)

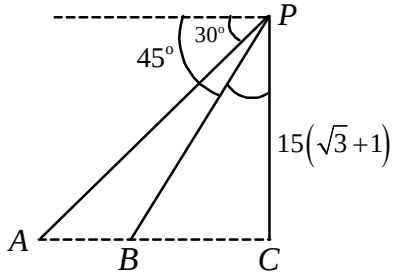
If any gear rotates clockwise then its neighboring gears will rotate anticlockwise. Since the number of wheels are 11, the first gear and the last gear will have to rotate in the same direction which is not possible.

8. (D)

As a rectangle can be inscribed in a circle and since the opposite angles are supplementary, it is a cyclic quadrilateral.

9. (A)

$\angle BPC = 45^\circ$
$\angle APC = 60^\circ$
$\tan 45^\circ = \frac{BC}{PC}$
$\Rightarrow BC = PC = 15\left(\sqrt{3}+1\right)$
$\tan 60^\circ = \frac{AC}{PC} \qquad \Rightarrow \sqrt{3} \times 15\left(\sqrt{3}+1\right)$



$AB = AC - BC = 30$ m

Time = 3 sec $\Rightarrow$ speed $= \dfrac{30}{3} = 10$ m/s $= 36$ km/hr.

10. (C)

Let side length of triangle $= \ell$

G is centroid of Δ as well as centre of larger circle.

$BD = \sqrt{\ell^2 - \dfrac{\ell^2}{4}} = \dfrac{\sqrt{3}\ell}{2}$

$\Rightarrow GD = \dfrac{1}{3} \times \dfrac{\sqrt{3}\ell}{2}$

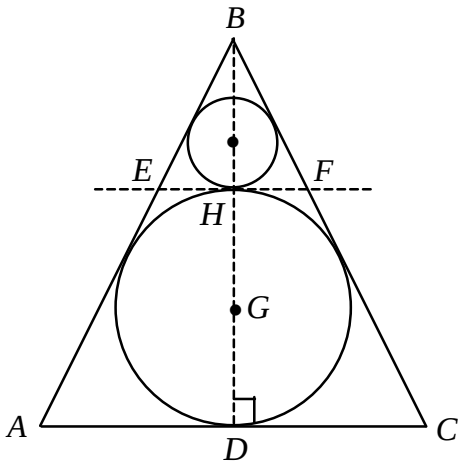
$\Rightarrow BH = BD - 2.GD$

$= \dfrac{\sqrt{3}\ell}{2} - 2 \times \dfrac{1}{3} \times \dfrac{\sqrt{3}\ell}{2} = \dfrac{\sqrt{3}\ell}{6}$

ΔBEF is also equilateral

$\therefore$ r of smaller circle $= \dfrac{1}{3} \times \dfrac{\sqrt{3}\ell}{6}$

Ratio $= \dfrac{\pi r^2}{\frac{\sqrt{3}}{4}\ell^2} = \dfrac{\pi \times \left(\frac{1}{3} \times \frac{\sqrt{3}\ell}{6}\right)^2}{\frac{\sqrt{3}}{4}\ell^2} = \pi : 27\sqrt{3}$



11. (A)

Average weight $= \dfrac{(16 \times 50.25) + (8 \times 45.15)}{16 + 8} = 48.55$

12. (B)

All other letters appear in atleast 2 words but D, U and E appears only in DUE, hence it must be the code

13. (B)

Let total profit = 100P

Charity = 5P $\Rightarrow$ remaining = 95P

A's share $= \dfrac{3}{5} \times 95P = 855$

$P = 1500$

14. (D)

$\angle ABC = 180^\circ - 75^\circ = 105^\circ$

$\angle CDE = 105^\circ$

$\Rightarrow \angle DCE = 180^\circ - (105^\circ + 35^\circ) = 40^\circ$

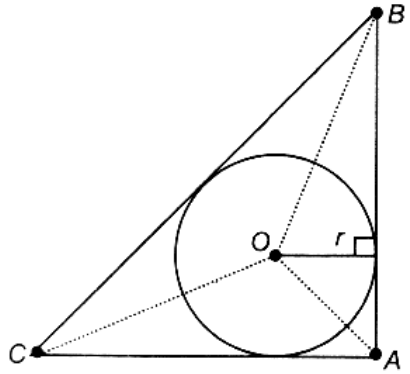
$\Rightarrow \angle BCD = 140^\circ$

$\Rightarrow \angle BAD = 40^\circ$

$\Rightarrow \angle AFD = 180^\circ - (40 + 75) = 65^\circ$

15. (B)

Observe the following figure :



Note that

$BC = \sqrt{AB^2 + AC^2}$

$= 10$ cm

Now, the area of $\angle AOB$ will be

$\Delta_1 = \frac{1}{2} \times AB \times r$

Similarly the areas of ΔBOC and ΔCOA will be

$\Delta_2 = \frac{1}{2} \times BC \times r$

$\Delta_3 = \frac{1}{2} \times CA \times r$

Adding the three areas should give us the area of ΔABC, which is 24 cm^2 :

$\frac{1}{2}(AB + BC + CA)r = 24\ \text{cm}^2$

$\Rightarrow\ r = 2$ cm

16. (D)

Using power of point A

$AD^2 = AP \times AB$

$\therefore \frac{1}{4} AB^2 = AP \times AB$

$\therefore \frac{1}{4} AB = AP$

17. (A)

Let $y = \sqrt{\frac{81}{64}\sqrt{\frac{81}{64}\sqrt{\frac{81}{64}.....\infty}}}$

$y^2 = \frac{81}{64}\sqrt{\frac{81}{64}\sqrt{\frac{81}{64}.....\infty}}$

$\Rightarrow y^2 = \frac{81}{64} y$

18. (A)

Let the number of marbles with Krishna and Sudheer be K and S respectively.

$K+10=S-10+40 \Rightarrow K=S+20$

$K+40=5(S-40) \Rightarrow S+20+40=5(S-40)$

$260=4S$ i.e., $S=65$.

19. (C)

$\angle DAB=50^0 \Rightarrow \angle DCE=50^0$ (exterior angle of a cyclic quadrilateral)

$\angle ABC=80^0 \Rightarrow \angle EDC=80^0$ (exterior angle of a cyclic quadrilateral)

$\therefore$ In $\Delta DEC, \angle DEC=180^0-(50^0+80^0)=50^0$

$\overrightarrow{EG}$ is the bisector of $\angle DEC$

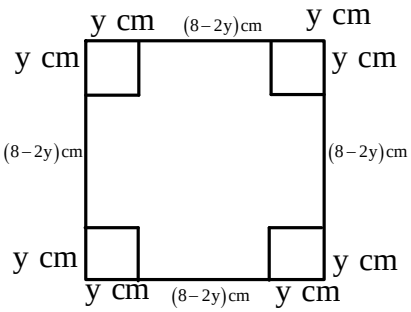
$\Rightarrow \angle DEH=\frac{50^0}{2}=25^0$

$\therefore \angle DHE=180^0-(\angle HDE+\angle DEH)$

$=180^0-(80^0+25^0)=75^0$

$\angle FHG=\angle DHE$ (vertically opposite angles) $\Rightarrow \angle FHG=75^0$

20. (D)



Length $=$ Breadth $=(8-2y)$ cm and height $=y$ cm

Its volume $=(8-2y)(8-2y)\times y$

$y=(8-2y)^2$ y cubic cm.

$8-2y>0$ i.e. $y<4$ and y is an integer.

$\therefore y=1$ or 2 or 3.

Among these values of y, volume is

Minimum when $y=3$. When $y=3$,

Volume $=12\,cm^3$

$\therefore M=12$

21. (A)

As area of square = area of the rectangle $=8\cdot 18=12^2$, hence side of the square is 12. After rearranging $y=\frac{1}{2}$ side of square.

$\therefore y=6$

22. **(C)**

The product, through experimentation, has to be (1)(−1)(3)(−3)(5)

Therefore, we can easily find a, b, c, d, and e.

a = 5; b = 7; c = 3; d = 9; e = 1

A + B + C + D + E = 1 + 3 + 5 + 7 + 9 = 25

23. **(C)**

Let the number be $10a + b$

$\therefore 9(a-b) = 5(a+b) \Rightarrow 2a = 7b$

$\therefore$ The number is 72.

24. **(A)**

The numbers that are 1 less than a multiple of 5 will end with 4or 9. So we need to look for primes ending with 9 that are 1 greater than a multiple of 4.The required sum= 29 + 89 = 118.

25. **(C)**

$\text{sp} = 100 + 25 = 125\%\text{ of CP}$

$\therefore 80 = \frac{125}{100} \times \text{CP}$

$\therefore \text{CP} = \frac{80 \times 4}{5} = \text{Rs } 64$

SECTION B : SOLUTION

26. **(9)**

The possiblities are that makes the product 36 are

a) 1, 4 ,9, Sum=14

b) 1, 2, 18, Sum=21

c) 1, 1, 36,Sum=38

d) 1, 6, 6,Sum=13

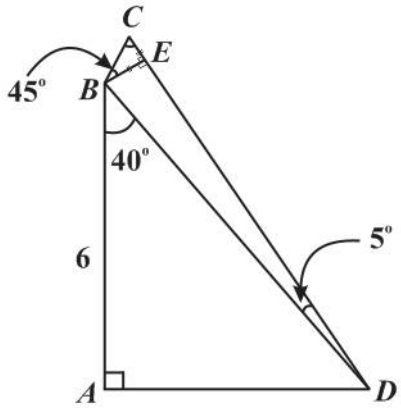
e) 2, 2, 9,Sum=13

f) 2, 3, 6, Sum=11

g) 3, 3, 4, Sum=10

The investigator could not get the answer even after checking the street number of next door neighbor. This gives us the clue that there are more than one case where the sum of their ages is the street number of next door neighbor. From above possibilities, only sum 13 has two cases. The case 2, 2, 9 will be more likely the case because the oldest daughter(age 9) goes to school.

27. **(18)**



In ΔABD

$\frac{6}{3D} = \cos 40^\circ$

$\therefore \ BD = \frac{6}{\cos 40^\circ} = 6\sec 40^\circ$

$\frac{AD}{AB} = \tan 40^\circ \Rightarrow AD = 6\tan 40^\circ$

Similarly in ΔBDE

$DE = 6\sec 40^\circ \cos 5^\circ$

$BE = 6\sec 40^o \sin 5^o$

& In ΔBCE :

$CE = BE = 6\sec 40^o \sin 5^o$

$\therefore$ Area $= \frac{1}{2}\left[36\tan 40^o + 36\sec^2 40^o \cos 5^o \sin 5^o + 36\sec^2 40^o \sin^2 5^o\right]$

$$= \frac{36}{2}\left[\frac{\sin 40^o}{\cos 40^o} + \frac{\sin 10^o}{2\cos^2 40^o} + \frac{1-\cos 10^o}{2\cos^2 40^o}\right]$$

$$= 18\left[\frac{2\sin 48^o \cos 40^o + \sin 10^o + 1 - \cos 10^o}{2\cos^2 40^o}\right] = 18\left[\frac{1+\sin 10^o}{2\cos^2 40^o}\right]$$

$$= 18\left[\frac{1+\cos 80^o}{2\cos^2 40^o}\right] = 18\left[\frac{2\cos^2 40^o}{2\cos^2 40^o}\right] = 18$$