## SOLUTIONS

**1.** **(C)**

If the sum of 3 prime is even, then one of the numbers must be 2.
Let the second number be x. Then as per the given condition,

$$x+(x+36)+2=100 \Rightarrow x=31$$

So, the number are 2, 31, 67
Hence largest number is 67

**2.** **(A)**

$$p(x)=4x^4-2x^3-6x^2+x-5$$

If we subtract $ax+b$ it should be exactly divisible
By $2x^2+x-2$

$$\therefore p(x)=4x^4-2x^3-6x^2+x-5-(ax+b)$$

$$=4x^4-2x^3-6x^2+(1-a)x-(5+b)$$

$\therefore p(x)$ should be divisible by $2x^2+x-2$

$$\begin{array}{l} \qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad 2x^2-2x \\ 2x^2+x-2\overline{\big)4x^4-2x^3-6x^2+(1-a)x-(5+b)} \\ \qquad\qquad 4x^4+2x^3-4x^2 \\ \qquad\qquad \;-\quad\; -\qquad +\\ \hline -4x^3-2x^2+(1-a)x-(5+b) \\ -4x^3-2x^2+4x \\ \quad\;+\qquad +\qquad - \\ \hline (1-a)x-4x-(5+b) \end{array}$$

Remainder should be equal to 0

$$\therefore (1-a)x-4x-(5+b)=0$$

$$\Rightarrow (1-a-4)x-(5+b)=0$$

$$\Rightarrow -[(a+3)x+(5+b)]=0$$

$$\Rightarrow (a+3)x+(5+b)=0$$

$\Rightarrow a+3=0$ and $5+b=0$ as $x \neq 0$

$\Rightarrow a=-3, b=-5$

$\therefore$ Required

$=ax+b=-3x-5$

**Alternate :**

The remainder when $4x^4-2x^3-6x^2+x-5$ is divided by $2x^2+x-2$ is the final answer.

**3.** **(B)**

Time taken for entire journey $=\dfrac{1500}{x}$ hr

New speed when it leave half an hour late than scheduled time $=(x+250)$ km/h

Time taken $= \dfrac{1500}{x+250}$h

So, according to question,

$$\frac{1500}{x}-\frac{1500}{x+250}=\frac{30}{60}$$

$$\Rightarrow 1500\left(\frac{1}{x}-\frac{1}{x+250}\right)=\frac{1}{2}\Rightarrow \frac{x+250-x}{x(250+x)}=\frac{1}{3000}$$

$$\Rightarrow x^2+250x=750000\Rightarrow x^2+250x-750000=0$$

$$\Rightarrow x^2+1000x-750x-750000=0$$

$$\Rightarrow x(x+1000)-750(x+1000)=0$$

$$\Rightarrow (x+1000)(x-750)=0\Rightarrow x=-1000,750$$

Speed cannot be negative so we have $x = 750$

$\therefore$ Usual speed = 750 km/h

**4.** **(B)**

Let $x=\sqrt{6+\sqrt{6+\sqrt{6}}}$........squaring both

$$x^2=6+\sqrt{6+\sqrt{6+\sqrt{6}}}\ \ldots\ldots\Rightarrow x^2=6+x$$

$$\Rightarrow x^2-x-6=0\Rightarrow (x-3)(x+2)=0\Rightarrow x=-2,3$$

As -2 is neglected so $x = 3$

**5.** **(A)**

$$\angle A=180^0-\left(70^0+50^0\right)=60^0$$

$\dfrac{BD}{DC}=\dfrac{AB}{AC}$ means AD is the bisector of $\angle A$

$$\therefore \angle BAD=\frac{1}{2}\times 60^0=30^0$$

**6.** **(B)**

In $\Delta BAC$ and $\Delta ADC$, we have

$\angle BAC=\angle ADC=90^0$

And $\angle ACB=\angle DCA=\angle C$

$\therefore \Delta BAC \sim \Delta ADC$ $\quad$ [AA similarity]

$$\therefore \frac{ar(\Delta ABC)}{ar(\Delta DAC)}=\frac{BC^2}{AC^2}=\frac{(13)^2}{(5)^2}=\frac{169}{25}$$

**7.** **(C)**

In figure $\angle DAC=180^0-\left(25^0+130^0\right)=25^0$

$\therefore$ AD is the bisector of $\angle BAC$

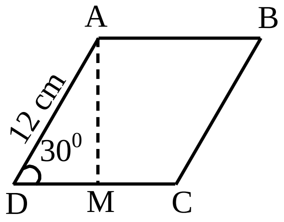
By angle bisector theorem $\dfrac{AB}{AC}=\dfrac{BD}{DC}$

$$\Rightarrow \frac{15}{9} = \frac{x}{6} \Rightarrow x = 10\,\text{cm}$$

**8.** **(C)**

In $\Delta ADM, \sin 30^0 = \frac{AM}{AD}$

$$\Rightarrow \frac{1}{2} = \frac{AM}{12} \Rightarrow AM = 6\,\text{cm}$$



Area of parallelogram ABCD =CD × AM

$\therefore CD \times AM = 60\left[\because \text{Area of } ||^{gm}\ 60\,\text{cm}^2, \text{given}\right]$

$\Rightarrow CD \times 6 = 60 \Rightarrow CD = 10\text{cm}$

**9.** **(A)**

Given $\alpha, \beta$ are the roots of $x^2 + bx + c = 0$

$$\Rightarrow \alpha + \beta = \frac{-b}{a} \text{ and } \alpha\beta = \frac{c}{a}$$

$\therefore$ Equation whose roots are $\frac{-b}{a}$ and $\frac{c}{a}$

Is $x^2 - x\left(\frac{-b}{a} + \frac{c}{a}\right) + \left(\frac{-b}{a}\right)\left(\frac{c}{a}\right) = 0$

$$\Rightarrow x^2 - x\left(\frac{-b+c}{a}\right) + \left(\frac{-bc}{a^2}\right) = 0$$

$$\Rightarrow a^2x^2 + a(b-c)x - bc = 0$$

$\therefore$ answer is (a)

**10.** **(B)**

$25^{x-1} = 5^{2x-1} - 100(\text{given})$

or, $5^{2(x-1)} = 5^{2x-1} - 100$

or, $5^{2x-1} - 5^{2x-2} = 100$

Only $x = 2$ satisfy above equation.

**11.** **(A)**

$$\left(\frac{81}{16}\right)^{-\frac{3}{4}} \times \left[\left(\frac{25}{9}\right)^{-\frac{3}{2}} \div \left(\frac{5}{2}\right)^{-3}\right] = \left[\left(\frac{3}{2}\right)^4\right]^{-\frac{3}{4}} \times \left[\left\{\left(\frac{5}{3}\right)^2\right\}^{-\frac{3}{2}} \div \left(\frac{5}{2}\right)^{-3}\right]$$

$$=\left(\frac{3}{2}\right)^{-3}\times\left[\left(\frac{5}{3}\right)^{-3}\div\left(\frac{5}{2}\right)^{-3}\right]$$

$$=\left(\frac{2}{3}\right)^{3}\times\left[\left(\frac{3}{5}\right)^{3}\div\left(\frac{2}{5}\right)^{3}\right]$$

$$=\frac{8}{27}\times\left[\frac{27}{125}\times\frac{125}{8}\right]$$

$$=\frac{8}{27}\times\frac{27}{8}=1$$

**12.** **(C)**

Let one angle be $\alpha$, other will be $180-\alpha$

By using the relation stated

$$\alpha-20^{o}=\frac{1}{3}\left(180^{o}-\alpha\right)$$

$$3\alpha-60^{o}=180^{o}-\alpha$$

$$\Rightarrow\quad \alpha=60^{o}$$

**13.** **(D)**

$$2^{x}\times4^{x}=(8)^{\frac{1}{3}}\times(32)^{\frac{1}{5}}$$

$$2^{x}\times\left(2^{2}\right)^{x}=\left(2^{3}\right)^{\frac{1}{3}}\times\left(2^{5}\right)^{\frac{1}{5}}$$

$$2^{x}.2^{2x}=2^{1}\times2^{1}$$

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

$$2^{3x}=2^{2}$$

Comparing powers on both sides, we get

$$3x=2$$

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

**14.** **(A)**

Given equation $\sqrt{x+1}-\sqrt{x-1}=\sqrt{4x-1}$

Squaring both sides, we get,

$$x+1+x-1-2\sqrt{(x+1)(x-1)}=4x-1\Rightarrow-2\sqrt{x^{2}-1}=4x-1-2x=2x-1$$

Again squaring both sides we get,

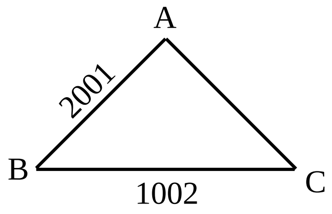
$$4\left(x^{2}-1\right)=4x^{2}+1-4x\Rightarrow4x^{2}-4=4x^{2}+1-4x$$

$$\Rightarrow\ 4x=5\qquad\Rightarrow x=\frac{5}{4}$$

$x=\frac{5}{4}$ does not satisfy the given equation.

Hence it has no solution

**15.** **(C)**



$AC > 2001 - 1002 = 999$

$AC < 2001 + 1002 = 3003$

$\therefore$ AC takes values 1000 to 3002 i.e., 2003 values

$\therefore$ the number of triangles is 2003.

The answer is (C)

**16.** **(B)**

$\text{LCM}(a,b) = 2\times2\times2\times3 = 24$

$\text{LCM}(b,c) = 2\times2\times3\times5 = 60$

$\text{LCM}(c,a) = 2\times2\times2\times5 = 40$

$\therefore \text{LCM}(a,b,c) = 2\times2\times2\times3\times5 = 120$

**17.** **(C)**

Since $AB \| CD$

$\angle BAC + \angle ACD = 180^o$

$\Rightarrow x + 2x + x + 5x = 180^o$

$9x = 180^o$

$\therefore x = 20^o$

**18.** **(A)**

Since, $ABCD$ is a parallelogram.

$\Rightarrow \angle A + \angle B = 180^o$

$\Rightarrow 75^o + \angle DBA + 60^o = 180^o$

$\Rightarrow \angle DBA = 45^o$

In $\Delta ADB, \angle A + \angle ADB + \angle DBA = 180^o$

$\angle ADB = 180^o - 75^o - 45^o = 60^o$

**19.** **(C)**

We have

$\angle AOX + \angle BOX = 180^o$ (Linear Pair)

$\Rightarrow 115^o + x + 25^o = 180^o$

$\Rightarrow x + 140^o = 180^o$

$\Rightarrow x = 40^o$

Now, $\angle AOY + \angle BOY = 180^o$

$\Rightarrow \angle AOY + 3x - 45^o = 180^o$

$\Rightarrow \angle AOY + 120^o - 45^o = 180^o$

$\Rightarrow \angle AOY + 75^o = 180^o$

$\Rightarrow \angle AOY = 180^o - 75^o = 105^o$

**20.** **(B)**

The correct answer is 30. Using the angle sum property in $\Delta ABC$ and $\Delta DEC$, we have

$40^o + 70^o + \angle ACB = 180^o$ and

$80^o + x^0 + \angle DCE = 180^o$

Clearly, $\angle ACB = \angle DCE$, since these are vertically opposite angles. Thus, we have:

$40^o + 70^o = 80^o + x^0$

Thus, $x = 30$