SECTION A : SOLUTION

1. **(A)**

G.C.D is x – 2 $\Rightarrow$ x = 2 is a root of both polynomials

$(2)^3 - 3\times(2)^2 + p\times 2 + 24 = 0 \Rightarrow p = -10$

& $(2)^2 - 7\times 2 + q = 0 \qquad \Rightarrow q = 10$

$\therefore$ p + q = 0

2. **(D)**

Let ΔABC be an isosceles triangle and let $AL \perp BC$

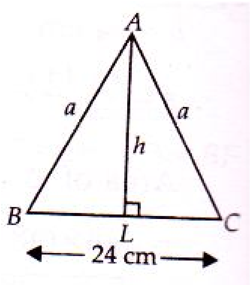
Area = $\frac{1}{2}\times BC\times AL = 192 cm^2$

$\Rightarrow \frac{1}{2}\times 24\times h = 192$

$\Rightarrow h = \left(\frac{192}{12}\right)cm = 16cm$

Now, BL = $\frac{1}{2}(BC) = \left(\frac{1}{2}\times 24\right)cm = 12cm$

And AL = 16 cm



Now, in right angled ΔABL,

$AB = a = \sqrt{BL^2 + AL^2} = \sqrt{(12)^2 + (16)^2} cm$

$= \sqrt{144 + 256} cm$

$\Rightarrow a = \sqrt{400} cm = 20cm$.

Hence perimeter = $(20 + 20 + 24)cm = 64cm$.

3. **(C)**

$OA = OB \Rightarrow \angle OAB = \angle OBA = 28^o$

$\angle ABC = 90^o \Rightarrow \angle OBA + \angle OBC = 90^o$

$\Rightarrow 28^o + \angle OBC = 90^o$

$\Rightarrow \angle OBC = 90^o - 28^o = 62^o$

4. **(C)**

Diagonals of a parallelogram bisect each other

$\therefore \quad \left(\frac{1+5}{2}, \frac{2+7}{2}\right) \equiv \left(\frac{4+a}{2}, \frac{6+b}{2}\right)$

$\therefore$ a = 2, b = 3

5. **(A)**

First, we will simplify each term one by one. We have:

$$\frac{1}{3-\sqrt{8}}=\frac{1}{3-\sqrt{8}}\times\frac{3+\sqrt{8}}{3+\sqrt{8}}$$

$$=\frac{3+\sqrt{8}}{9-8}=3+\sqrt{8}$$

$$\frac{1}{\sqrt{8}-\sqrt{7}}=\frac{1}{\sqrt{8}-\sqrt{7}}\times\frac{\sqrt{8}+\sqrt{7}}{\sqrt{8}+\sqrt{7}}$$

$$=\frac{\sqrt{8}+\sqrt{7}}{8-7}=\sqrt{8}+\sqrt{7}$$

$$\frac{1}{\sqrt{7}-\sqrt{6}}=\frac{1}{\sqrt{7}-\sqrt{6}}\times\frac{\sqrt{7}+\sqrt{6}}{\sqrt{7}+\sqrt{6}}$$

$$=\frac{\sqrt{7}+\sqrt{6}}{7-6}=\sqrt{7}+\sqrt{6}$$

$$\frac{1}{\sqrt{6}-\sqrt{5}}=\frac{1}{\sqrt{6}-\sqrt{5}}\times\frac{\sqrt{6}+\sqrt{5}}{\sqrt{6}+\sqrt{5}}$$

$$=\frac{\sqrt{6}+\sqrt{5}}{6-5}=\sqrt{6}+\sqrt{5}$$

$$\frac{1}{\sqrt{5}-2}=\frac{1}{\sqrt{5}-2}\times\frac{\sqrt{5}+2}{\sqrt{5}+2}$$

$$=\frac{\sqrt{5}+2}{5-4}=\sqrt{5}+2$$

Thus, the given expression is equivalent to:

$$\left(3+\sqrt{8}\right)-\left(\sqrt{8}+\sqrt{7}\right)+\left(\sqrt{7}+\sqrt{6}\right)-\left(\sqrt{6}+\sqrt{5}\right)+\left(\sqrt{5}+2\right)$$

$= 3+\sqrt{8}-\sqrt{8}-\sqrt{7}+\sqrt{7}+\sqrt{6}-\sqrt{6}-\sqrt{5}+\sqrt{5}+2$

= 3 + 2 = 5

6. **(D)**

Consider Δs , DNR and BMR

$DN = BM$ [Given]

$\angle DNR = \angle BMR$ [Each 90^o]

$\angle DRN = \angle BRM$

[Vertically opposite angles]

$\therefore \Delta DNR \cong \Delta BMR$ [AAS congruency]

$\therefore DR = BR \Rightarrow BD = 2BR$

$\therefore BD = 2\times 8 = 16cm$

7. **(A)**

Let OD = x

$\Rightarrow AD = 5 - x$

In ΔOCD, $OC^2 = OD^2 + CD^2$

$\Rightarrow 5^2 = x^2 + CD^2$

$\Rightarrow CD^2 = 25 - x^2$ …………(1)

In ΔACD, $AC^2 = AD^2 + CD^2$

$\Rightarrow 6^2 = (5-x)^2 + CD^2$

$\Rightarrow CD^2 = 11 + 10x - x^2$ ....(2)

From (1) and (2), we get

$11 + 10x - x^2 = 25 - x^2$

$\Rightarrow 10x = 14$

$\Rightarrow x = 1.4cm$

$CD^2 = 25 - (1.4)^2 = 23.04$

$\Rightarrow CD = 4.8cm$

$\therefore BC = 2 \times CD = 2 \times 4.8cm = 9.6cm$

8. **(D)**

$9^2 + 12^2 = 15^2$

$\Rightarrow$ Right angled Δ

$\Rightarrow$ Area $= \frac{1}{2} \times 9 \times 12$

$= 54\ cm^2$

9. **(A)**

We have:

$$\frac{1}{\alpha} + \frac{1}{\beta} = \frac{\alpha+\beta}{\alpha\beta} = \frac{-\frac{8}{3}}{\frac{2}{3}} = -4$$

10. **(B)**

In ΔABD and ΔACD

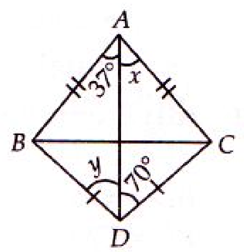
AB = AC [Given]

BD = CD [Given]

AD = AD [Common]

$\Rightarrow \Delta ABD \cong \Delta ACD$

[By SSS Rule]



11. **(A)**

Let h be the height of cylinder

Radius of cylinder = Radius of sphere = r

Then, we have $\frac{4}{3}\pi r^3 = \pi r^2 h \Rightarrow h = \frac{4}{3} r$

$\therefore$ Height of cylinder = $\frac{4}{3}$ times its radius

12. **(D)**

$\tan\theta = \cot(90-\theta)$ & $\tan\theta.\cot\theta = 1$

13. **(D)**

$\sin^2 5^o + \sin^2 10^o + \sin^2 15^o ...... + \sin^2 90^o$

$$=\left(\sin^2 5^o+\sin^2 85^o\right)+\left(\sin^2 10^o+\sin^2 80^o\right)+\ .....+\sin^2 45+\sin^2 90^o\left\{\sin\left(90^o-\theta\right)=\cos\theta\right\}$$

$$=8+\left(\frac{1}{\sqrt{2}}\right)^2+1=9+1/2=19/2$$

14. **(B)**

Required area is the difference of areas of rectangle and sum of areas of two sectors.

15. **(B)**

In a right angled triangle, the vertex containing right angle is the orthocenter

16. **(A)**

We note that $\angle ACB=180^o-\left(70^o+90^o\right)$

$= 20^o$

Now, in $\angle BCD$, we have (using the angle sum property):

$x^o=180^0-\left(90^o+20^o\right)$

$= 70^o$

17. **(D)**

Let G be the centroid of ΔABC

From similar Δs APG and ABR.

$$\frac{AP}{AB}=\frac{AG}{AR}$$

or $\dfrac{AP}{AB-AP}=\dfrac{AG}{AR-AG}$

or $\dfrac{AP}{PB}=\dfrac{AG}{GR}$

$\therefore\ \dfrac{m}{n}=\dfrac{2}{1}$

Hence m = 2

And n= 1

OR

$PQ \parallel BC$

$\Rightarrow \dfrac{AP}{PB}=\dfrac{AG}{GR}=\dfrac{m}{n}=\dfrac{2}{1}$

So, m = 2, n = 1

18. **(A)**

DIAMOND
VQYMKLV } If a letter is n^{th} place from the begining, Coded letter is the $(n+1)^{th}$ place from the end.

Alphabet →	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
Code →	Y	X	W	V	U	T	S	R	Q	P	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A	

FEMALE $\xrightarrow{\text{Code}}$ TUMYNU

19. **(A)**

$\sqrt{x+1}+\sqrt{2x+3}=5$

$\Rightarrow \quad 2x+3=25+x+1-10\sqrt{x+1}$

$\Rightarrow \quad x-23=-10\sqrt{x+1}$

$\Rightarrow \quad x^2+529-46x=100x+100$

$\Rightarrow \quad x^2-146x+429=0$

$\Rightarrow \quad (x-3)(x-143)=0$

x = 3 or x = 143

cannot be 143 (it doesn't satisfy)

$\therefore$ x = 3

20. **(B)**

Using the property HCF $\times$ LCM = Product of the two numbers, we get:

12 $\times$ 144 = 36 $\times$ $N_2 \Rightarrow N_2$ = 48. Option (B) is correct.

21. **(A)**

Required distance

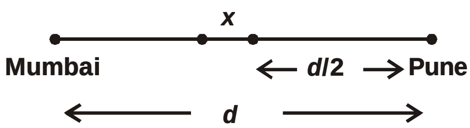
$=\sqrt{(20)^2+(20)^2}$

$=20\sqrt{2}$ km South-East

22. **(C)**

13 spades + 3 kings + 3 queens $\rightarrow$19/52.

23. **(C)**



Let *d* be the distance between Mumbai & Pune.

So the speeds of the trains are $\frac{d}{4}$ and $\frac{d}{(7/2)}$ respectively.

At 9.30 a.m. , first train has already covered distance $\frac{d}{2}$.

$$\frac{\frac{d}{2}-x}{\left(\frac{2d}{7}\right)}=\frac{x}{\left(\frac{d}{4}\right)}$$

$$\frac{7\left(\frac{d}{2}-x\right)}{2d}=\frac{4x}{d}$$

$$\Leftrightarrow \frac{7}{4}=\left(\frac{x}{d}\right)\left(4+\frac{7}{2}\right) \qquad \Leftrightarrow \qquad x=\frac{7d}{30}$$

To cover distance *x*, first train takes

$\frac{28}{30}$ hr. = 56 minutes.

24. **(A)**

$$\frac{a}{b}\times\frac{b}{c}\times\frac{c}{d}=\frac{3}{4}\times\frac{7}{9}\times\frac{5}{7}=\frac{5}{12}=\frac{a}{d}$$

25. **(C)**

$2(x + y + z) = 6 + 7 + 9$

$= 22$

$\Rightarrow\ x + y + z = 11$

$\Rightarrow$ Average $= \frac{11}{3}$.

SECTION B : SOLUTION

26. **374 cm^2**

The radius of the cylinder $(r) = 3.5\,cm$

The height of the cylinder $(h) = 10\,cm$

$\therefore$ The curved surface area of a cylinder $= 2\times\frac{22}{7}\times\frac{35}{10}\times 10\,cm^2 = 220\,cm^2$

The curved surface area of a hemisphere $= 2\pi r^2$

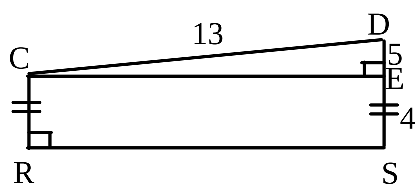
$\therefore$ The curved surface area of both hemispheres

$= 2\times 2\pi r^2 = 4\pi r^2 = 4\times\frac{22}{7}\times\frac{35}{10}\times\frac{35}{10}\,cm^2 = 154\,cm^2$

Total surface area of the resultant solid

$= (220 + 154)\,cm^2 = 374\,cm^2$

27. **12 cm**



Draw $CE \perp DS$

Then $ES = CR = 4$

$\therefore DE = 5$

$\therefore CE = 12$