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TEST NO. 57

SSC TIER-II : QUANTITATIVE ABILITIES
(Answer with Explanations)

Answer Key

1.	(B)	21.	(C)	41.	(B)	61.	(D)	81.	(B)
2.	(A)	22.	(A)	42.	(A)	62.	(A)	82.	(A)
3.	(D)	23.	(B)	43.	(B)	63.	(D)	83.	(A)
4.	(B)	24.	(C)	44.	(B)	64.	(C)	84.	(A)
5.	(B)	25.	(C)	45.	(D)	65.	(A)	85.	(B)
6.	(C)	26.	(D)	46.	(C)	66.	(A)	86.	(A)
7.	(B)	27.	(D)	47.	(C)	67.	(B)	87.	(B)
8.	(D)	28.	(C)	48.	(A)	68.	(A)	88.	(D)
9.	(C)	29.	(A)	49.	(B)	69.	(A)	89.	(C)
10.	(A)	30.	(B)	50.	(A)	70.	(C)	90.	(C)
11.	(B)	31.	(B)	51.	(B)	71.	(A)	91.	(C)
12.	(A)	32.	(B)	52.	(C)	72.	(C)	92.	(D)
13.	(C)	33.	(D)	53.	(B)	73.	(A)	93.	(C)
14.	(C)	34.	(A)	54.	(D)	74.	(A)	94.	(D)
15.	(C)	35.	(C)	55.	(A)	75.	(D)	95.	(B)
16.	(A)	36.	(D)	56.	(A)	76.	(B)	96.	(D)
17.	(D)	37.	(B)	57.	(C)	77.	(A)	97.	(D)
18.	(C)	38.	(D)	58.	(A)	78.	(D)	98.	(C)
19.	(D)	39.	(D)	59.	(B)	79.	(B)	99.	(C)
20.	(B)	40.	(A)	60.	(C)	80.	(C)	100.	(D)

Answer key with explanations

1. (B) Given that $\cos\theta = \sqrt{3}\sin\theta$

$\Rightarrow \tan\theta = \frac{1}{\sqrt{3}} \Rightarrow \theta = 30°$

Now, $2\operatorname{cosec}^2\theta + \cos^2\theta + \sin\theta.\cos\theta + \tan^2\theta$

$\Rightarrow 2\operatorname{cosec}^2 30° + \cos^2 30 + \sin 30°.\cos 30° + \tan^2 30°$

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

$\Rightarrow 8 + \frac{3}{4} + \frac{\sqrt{3}}{4} + \frac{1}{3}$

$\Rightarrow \frac{96+9+3\sqrt{3}+4}{12} = \frac{109+3\sqrt{3}}{12}$

2. (A) $\sqrt{81-56\sqrt{2}} = a - b\sqrt{2}$

$\Rightarrow \sqrt{(7-4\sqrt{2})^2} = a - b\sqrt{2}$

$\Rightarrow 7 - 4\sqrt{2} = a - b\sqrt{2}$

On comparing

$a = 7$, $b = 4$

Now, $\sqrt{a^2 - b^2} \Rightarrow \sqrt{7^2 - 4^2}$

$\Rightarrow \sqrt{49-16} \Rightarrow \sqrt{33} = 5.7$

3. (D) Given that

$a^2 + b^2 + c^2 + 56 = 4(a - 2b + 3c)$

$\Rightarrow (a^2 - 4a + 4) + (b^2 + 8b + 16) + (c^2 - 12c + 36) = 0$

$\Rightarrow (a-2)^2 + (b+4)^2 + (c-6)^2 = 0$

here $a - 2 = 0 \Rightarrow a = 2$, $b + 4 = 0 \Rightarrow b - 4$ and $c - 6 = 0 \Rightarrow c = 6$

Now, $\sqrt{a^3 + b^3 + c^3 - 3abc}$

$\Rightarrow \sqrt{2^3 + (-4)^3 + 6^3 - 3\times2\times(-4)\times6}$

$\Rightarrow \sqrt{8 + (-64) + 216 + 144}$

$\Rightarrow \sqrt{304} = 4\sqrt{19}$

4. (B) 21.6666666
+ 14.3676767

$\overline{36.0343433} = 36.0\overline{34}$

and 36.0343434
− 35.4999999

$\overline{0.5343435} = 0.5\overline{34}$

Hence $21.\overline{6} + 14.3\overline{67} - 35.4\overline{9} = 0.5\overline{34}$

5. (B) $\text{cosec}(53+\theta) - \sec(37-\theta) + \cos 25.\cos 55.\text{cosec}65.\cos 30.\text{cosec}35$

$\Rightarrow \text{cosec}(53+\theta) - \text{cosec}[90-(37-\theta)] + \cos 25.\cos 55.\sec(90-65).\frac{\sqrt{3}}{2}.\sec(90-35)$

$\Rightarrow \text{cosec}(53+\theta) - \text{cosec}(53+\theta)$

$+ \cos 25.\cos 55.\sec 25.\frac{\sqrt{3}}{2}.\sec 55$

$\Rightarrow 0 + \frac{\sqrt{3}}{2} = \frac{\sqrt{3}}{2}$

6. (C) $ab(a-b) + bc(b-c) + ca(c-a)$

$\Rightarrow ab(a-b) + b^2c - bc^2 + c^2a - ca^2$

$\Rightarrow ab(a-b) + b^2c - ca^2 - bc^2 + c^2a$

$\Rightarrow ab(a-b) - c(a^2-b^2) + c^2(a-b)$

$\Rightarrow ab(a-b) - c(a-b)(a+b) + c^2(a-b)$

$\Rightarrow (a-b)[ab - c(a+b) + c^2]$

$\Rightarrow (a-b)[ab - ca - bc + c^2]$

$\Rightarrow (a-b)[a(b-c) - c(b-c)]$

$\Rightarrow (a-b)(b-c)(a-c) = -(a-b)(b-c)(c-a)$

7. (B) $(4x-3)^3 + 4(x+4)^3 + (2-5x)^3 = 6(3-4x)(x+4)(5x-2)$

$\Rightarrow (4x-3)^3 + \{2(x+4)\}^2 + (2-5x)^3 = 6\times(4x-3)(x+4)(2-5x)$

$\Rightarrow (4x-3)^3 + \{2(x+4)\}^2 + (2-5x)^3 - 3\times(4x-3)\{2(x+4)\}(2-5x) = 0$

We know that, $a^3+b^3+c^3-3abc=0$, then $a+b+c=0$

$\Rightarrow 4x-3+2(x+4)+(2-5x)=0$

$\Rightarrow x+7=0 \Rightarrow x=-7$

Now, $3x-5 \Rightarrow 3\times(-7)-5 = -21-5 = -26$

8. (D) $12\times 2 \div 6 + 12 \div 3 \times 2$ of $(16\div 4\times 2) + (44 \div 11 + 6$ of $5)$

$\Rightarrow 4 + 12 \div 3 \times 2$ of $8 + (4+30)$

$\Rightarrow 4 + 12 \div 3 \times 16 + 34$

$\Rightarrow 4 + 64 + 34 = 102$

9. (C) $24\sqrt{3}x^3 + 54\sqrt{2}y^3 = (Ax + 3\sqrt{2}y)(Bx^2 + Cy^2 - Dxy)$

$\Rightarrow (2\sqrt{3}x)^3 + (3\sqrt{2}y)^3 = (Ax + 3\sqrt{2}y)(Bx^2 + Cy^2 - Dxy)$

We know that

$a^3 + b^3 = (a+b)(a^2+b^2-ab)$

$\Rightarrow (2\sqrt{3}x + 3\sqrt{2}y)(12x^2 + 18y^2 - 6\sqrt{6}xy)$

$= (Ax + 3\sqrt{2}y)(Bx^2 + Cy^2 - Dxy)$

On comparing

$A = 2\sqrt{3}$, $B = 12$, $C = 18$, $D = 6\sqrt{6}$

Now, $A^2 + B^2 - C^2 - D^2$

$\Rightarrow (2\sqrt{3})^2 + (12)^2 - (18)^2 - (6\sqrt{6})^2$

$\Rightarrow 12 + 144 - 324 - 216$

$\Rightarrow 156 - 540 = -384$

10. (A) $\frac{\sin\theta - \cos\theta + 1}{\sin\theta + \cos\theta - 1} \times \frac{\sec\theta - \tan\theta}{\tan^2\theta(\text{cosec}^2\theta - 1)}$

$\Rightarrow \frac{\sin\theta - \cos\theta + 1}{\sin\theta + \cos\theta - 1} \times \frac{\sin\theta + \cos\theta + 1}{\sin\theta + \cos\theta + 1}$

$\times \frac{\sec\theta - \tan\theta}{\tan^2\theta.\cot^2\theta}$

$\Rightarrow \frac{(\sin\theta+1)^2 - \cos^2\theta}{(\sin\theta + \cos\theta)^2 - 1} \times \frac{\sec\theta - \tan\theta}{1}$

$\Rightarrow \frac{\sin\theta^2 + 1 + 2\sin\theta - \cos^2\theta}{\sin^2\theta + \cos^2\theta + 2\sin\theta.\cos\theta - 1}$

$\times \left(\frac{1}{\cos\theta} - \frac{\sin\theta}{\cos\theta}\right)$

$\Rightarrow \frac{\sin^2\theta + \sin^2\theta + 2\sin\theta}{1 + 2\sin\theta.\cos\theta - 1} \times \frac{1-\sin\theta}{\cos\theta}$

$\Rightarrow \frac{2\sin^2\theta + 2\sin\theta}{2\sin\theta.\cos\theta} \times \frac{1-\sin\theta}{\cos\theta}$

$\Rightarrow \frac{2\sin\theta(\sin\theta+1)}{2\sin\theta.\cos\theta} \times \frac{1-\sin\theta}{\cos\theta}$

$\Rightarrow \frac{(1+\sin\theta)(1-\sin\theta)}{\cos^2\theta} \Rightarrow \frac{1-\sin^2\theta}{\cos^2\theta}$

$\Rightarrow \frac{\cos^2\theta}{\cos^2\theta} = 1$

11. (B) A.T.Q.,

$5762x13y2$ is divisible by 88 means it's divisible by 11 and 8

Applying both divisibility Rule

$y = 1, 5, 9$ (Because number divisible by 8)

and $7 + 2 + 1 + y = 10 + y$ (11, 15, 29)

$5 + 6 + x + 3 + 2 = 16 + x$

taking $x = 6$ and $y = 1$ is satisfy all,

then $\sqrt{3x+7y} = \sqrt{3\times 6 + 7\times 1} = \sqrt{18+7}$

$= \sqrt{25} = 5$

12. (A) $x + \frac{1}{9x} = 2$

multiplying by 3

$\Rightarrow 3x + \frac{1}{3x} = 6$

On cubing both sides

$\Rightarrow 27x^3 + \frac{1}{27x^3} + 3\times 3x \times \frac{1}{3x}\left(3x + \frac{1}{3x}\right)$

$= 216$

$\Rightarrow 27x^3 + \frac{1}{27x^3} + 3\times 6 = 216$

$\Rightarrow 27x^3 + \frac{1}{27x^3} = 198$

divided by 3

$\Rightarrow 9x^3 + \frac{1}{81x^3} = 66$

13. (C) Let 21st number = x

ATQ,

$21\times 81 + 21\times 89 - x = 41\times 84$

$\Rightarrow 1701 + 1869 - x = 3444$

$\Rightarrow 3570 - x = 3444 \Rightarrow x = 126$

Average of remaining numbers

$= \frac{3444 - 126}{40} = \frac{3318}{40} = 82.95$

14. (C) $\frac{\sin(83+\theta) - \cos(7-\theta) + (\cot^2 40 - \sec^2 50)}{\sin 15 . \cos 75 + \cos 15 . \sin 75}$

$\Rightarrow \frac{\sin(83+\theta) - \sin[90-(7-\theta)] + [(\cot^2 40 - \text{cosec}^2(90-50)]}{\sin(15+75)}$

$\Rightarrow \frac{\sin(83+\theta) - \sin(83+\theta) + (\cot^2 40 - \text{cosec}^2 40)}{\sin 90}$

$\Rightarrow \frac{0-1}{1} = -1$

15. (C) Ratio of capitals = 3 : 4 : 5

Ratio of months = 4 : 5 : 3

Ratio of profits = 3 × 4 : 4 × 5 : 5 × 3

= 12 : 20 : 15

20 – 15 = 5 → 15300

P's share = $\frac{15300}{5} \times 12 =$ ₹36720

16. (A) ATQ,

$2\pi rh = \frac{1}{4} \times 2\pi r(h + r)$

$\Rightarrow 4h = h + r$

$\Rightarrow 3h = r \Rightarrow \frac{r}{h} = \frac{3}{1}$

Hence the required ratio = 3 : 1

17. (D) $3124.75 = P + \frac{P \times 7.35 \times 3.4}{100}$

$\Rightarrow 3124.75 = P \times \frac{124.99}{100}$

$\Rightarrow P = 2500$

Now,

New amount $A = 2500 + \frac{2500 \times 9.6 \times 5}{100}$

$\Rightarrow A = 2500 + 1200 =$ ₹3700

18. (C) Equation

$x - 3y = -6$ ...(i)

$2x - 5y = 7$ ...(ii)

On solving

$x = -9$ and $y = -5$

Hence $A(x_1, y_1) = (-9, -5)$

and equation $3x + 2y = 6$ intersect the y-axis i.e. $x = 0$

$0 + xy = 6 \Rightarrow y = 3$

Hence $B(x_2, y_2) = (0,3)$

Now, $x_1 - x_2 + y_1 - y_2)$

$\Rightarrow -9 - 0 - 5 - 3 = -17$

19. (D) Speed of the boat in still water : speed of the stream = 5 : 3

speed of the stream = 6 km/hr

So the speed of the boat in still water

$= \frac{6}{3} \times 5 = 10$ km/hr

Let the distance travelled by the boat each way = x km

ATQ,

$\frac{x}{10-6} + \frac{x}{10+6} = \frac{50}{60}$

$\Rightarrow \frac{x}{4} + \frac{x}{16} = \frac{5}{6}$

$\Rightarrow \frac{4x + x}{16} = \frac{5}{6}$

$\Rightarrow \frac{5x}{16} = \frac{5}{6}$

$\Rightarrow x = \frac{8}{3}$ km

Therefore the distance travelled by the boat in the whole trip $= \frac{8}{3} + \frac{8}{3} = \frac{16}{3}$ km

20. (B) Let the rate of interest = r% p.a.

ATQ,

$\left(1 + \frac{r}{100}\right)^2 = \frac{8780.8}{7000}$

$\Rightarrow \left(1 + \frac{r}{100}\right)^2 = \left(\frac{28}{25}\right)^2$

$\Rightarrow \frac{r}{100} = \frac{3}{25}$

Simple interest = 12240 – 9000 = 3240

9000 × 12% × t = 3240

$\Rightarrow t = 3$

21. (C) C.P. = ₹8400

Ist S.P. = $\frac{8400 \times 94}{100}$ = ₹7896

2nd S.P. = $\frac{7896 \times 105}{100} = 8290.8$

The required loss = 8400 – 8290.8

= ₹109.2

22. (A) $\sin\theta + \text{cosec}\,\theta + \sin^2\theta + \text{cosec}^2\theta = 0$

$\Rightarrow (\sin\theta + \text{cosec}\,\theta) + (\sin\theta + \text{cosec}\,\theta)^2 - 2\sin\theta.\text{cosec}\,\theta = 0$

$\Rightarrow (\sin\theta + \text{cosec}\,\theta) + (\sin\theta + \text{cosec}\,\theta)^2 - 2 = 0$

Let $\sin\theta + \text{cosec}\,\theta = x$

$\Rightarrow x + x^2 - 2 = 0 \Rightarrow (x+2)(x-1) = 0$

$\Rightarrow x = -2$ or $x = -1$

$\Rightarrow \sin\theta + \text{cosec}\,\theta = -2$ or $\sin\theta + \text{cosec}\,\theta = 1$

taking $\sin\theta + \text{cosec}\,\theta = -2$

$\Rightarrow \sin\theta + \dfrac{1}{\sin\theta} = -2$

$\Rightarrow \sin^2\theta + 1 = -2\sin\theta \Rightarrow (\sin\theta + 1)^2 = 0$

$\Rightarrow \sin\theta = -1 \Rightarrow \theta = \dfrac{3\pi}{2}$

Now, $\sin\theta + \cos\theta$

$\Rightarrow \sin\dfrac{3\pi}{2} + \cos\dfrac{3\pi}{2} \Rightarrow -1 + 0 = -1$

23. (B) Equation $ax^2 + x + b = 0$ has equal roots, then D = 0

$\Rightarrow B^2 - 4AC = 0$

$\Rightarrow 1^2 - 4\times a \times b = 0$

$\Rightarrow 4ab = 1 \Rightarrow 6ab = \dfrac{1}{4}\times 6 = \dfrac{3}{2}$

24. (C) Let speed of train = x kmph

and speed of bus = y kmph

ATQ,

$\dfrac{360}{x} + \dfrac{140}{y} = 9\dfrac{1}{2}$

$\Rightarrow \dfrac{360}{x} + \dfrac{140}{y} = \dfrac{19}{2}$ ...(i)

and $\dfrac{420}{x} + \dfrac{80}{y} = 9$ ...(ii)

On solving

$x = 60$, $y = 40$

Hence speed of bus = 40 kmph

25. (C) Let $2^x = 3^y = 6^{-z} = k$

$2^x = k \Rightarrow 2 = k^{1/x}$

$3^y = k \Rightarrow 3 = k^{1/y}$

and $6^{-z} = k \Rightarrow 6 = k^{-1/z}$

Now, $2 \times 3 = 6 \Rightarrow k^{\frac{1}{x}} \times k^{\frac{1}{y}} = k^{\frac{-1}{z}}$

$\Rightarrow k^{\frac{1}{x}+\frac{1}{y}} = k^{\frac{-1}{z}} \Rightarrow \dfrac{1}{x} + \dfrac{1}{y} = \dfrac{-1}{z}$

$\Rightarrow \dfrac{1}{x} + \dfrac{1}{y} + \dfrac{1}{z} = 0$

26. (D) Percentage growth from 2005-06 to 2006-07 = $\dfrac{100-50}{50}\times 100\% = 100\%$

Percentage growth from 2006-07 to 2007-08 = $\dfrac{200-100}{100}\times 100\% = 100\%$

Percentage growth from 2007-08 to 2008-09 = $\dfrac{250-200}{200}\times 100\% = 25\%$

Percentage growth from 2008-09 to 2009-10 = $\dfrac{400-250}{250}\times 100\% = 60\%$

27. (D) In 2005-06, K = $\dfrac{100-50}{100} = \dfrac{1}{2}$

In 2006-07, K = $\dfrac{150-100}{150} = \dfrac{1}{3}$

In 2007-08, K = $\dfrac{400-200}{400} = \dfrac{1}{2}$

In 2008-09, K = $\dfrac{550-250}{550} = \dfrac{6}{11}$

In 2009-010, K = $\dfrac{700-400}{700} = \dfrac{3}{7}$

28. (C) Percentage increase in the number of girls = $\dfrac{400-50}{50}\times 100\% = 700\%$

Percentage increase in the number of boys = $\dfrac{300-50}{50}\times 100\% = 500\%$

Difference in percentage point = 700% – 500% = 200%

29. (A) Quantity of wine = $40\times\dfrac{5}{8}$ = 25 litre

Quantity of water = $40\times\dfrac{3}{8}$ = 15 litre

Let x litre water to be added in the mixture.

ATQ,

$\dfrac{25}{15+x} = \dfrac{3}{5}$

$\Rightarrow 125 = 45 + 3x$

$\Rightarrow 3x = 80$

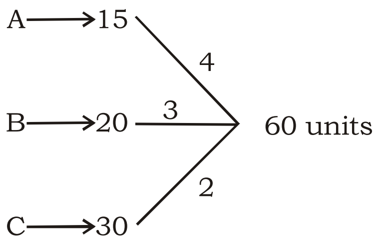
$\Rightarrow x = \dfrac{80}{3}$ litre

Hence $\dfrac{80}{3}$ litre water to be added in the mixture.

30. (B) 1 man = 2 women = 4 boys
(1 man + 1 women + 1 boy)
= (4 + 2 + 1) = 7 boys
4 boys can do it in 20 days
7 boys can do it in
$\left(20 \times 4 \times \frac{1}{7}\right) = \frac{80}{7} \Rightarrow 11\frac{3}{7}$ days

31. (B) Let B = 100
A = 132, C = $132 \times \frac{75}{100} = 99$
The required% = $\frac{100 - 99}{100} \times 100 = 1\%$

32. (B)



Pipe A fills in 1hr (6 am to 7 am)
= 4×1 = 4 units
Pipe A and Pipe B fill in 2 hrs
(7 am to 9 am) = (4 + 3)×2 = 14 units
Remaining work = 60 – 4 – 14
= 42 units
Remaining work done by A, B and C in
= $\frac{42}{4+3+2}$ hours = $\frac{42}{9} \times 60$ minutes
= 4 hours 40 min
Hence tank will be fill at 1 : 40 pm.

33. (D) Ritesh scored 182 marks which is 58 marks less than passing marks.
So passing marks are 182 + 58 = 240 marks
Now, Sanaya scored 60% which is 120 marks more than passing marks
Therefore 60% = 240 + 120 = 360
Therefore, 40% is the passing percentage in the class test.

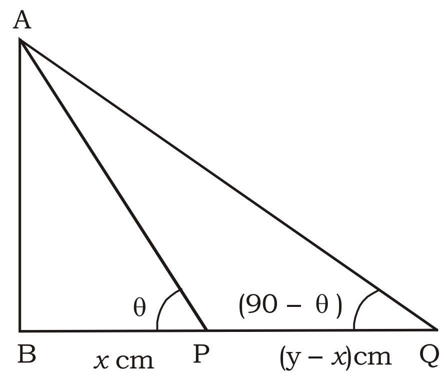
34. (A) Let the number be N.
The quotient when N is divided by 162 is denoted by Q_1
N = $162Q_1$ = 29
When N is divided by 27, the quotient is $6Q_1$ + 1 and the remainder is 2.

35. (C) Let Black and White TV = x, colour TV = $315 - x$
ATQ,
$x \times \left(\frac{100-6}{100}\right) + (315 - x)\left(\frac{100+15}{100}\right)$
$= 315 \times \frac{109}{100}$
$\Rightarrow 94x + 315 \times 115 - 115x = 315 \times 109$
$\Rightarrow 21x = 1890 \Rightarrow x = 90$
Hence no. of black and white TVs = 90

36. (D) Area of the trapezium
$= \frac{1}{2} \times$ (Sum of the lengths of the parallel sides)×(Distance between them)
$= \frac{1}{2}(x^2 - y^2) = \frac{1}{2}(x + y)(x - y)$
x and y are the lengths of the parallel sides, the sum of these sides = $(x + y)$.
So, the distance between these sides = $(x - y)$

37. (B) $\frac{4\cos(90-A).\sin^3(90+A) - 4\sin(90+A).\cos^3(90-A)}{\cos\left(\frac{180+8A}{2}\right)}$
$\Rightarrow \frac{4\sin A.\cos^3 A - 4\cos A.\sin^3 A}{-\sin 4A}$
$\Rightarrow \frac{4\sin A.\cos^3 A - 4\cos A.\sin^3 A}{-2\sin 2A.\cos 2A}$
$\Rightarrow \frac{4\sin A.\cos^3 A - 4\cos A.\sin^3 A}{-4\sin A.\cos A.\cos 2A}$
$\Rightarrow \frac{\cos^2 A - \sin^2 A}{-\cos 2A}$
Since, $\cos 2A = \cos^2 A - \sin^2 A$
$\Rightarrow \frac{\cos 2A}{-\cos 2A}$
$\Rightarrow -1$

38. (D)



In ΔABP,

$\tan\theta = \frac{AB}{x}$ ...(i)

In ΔABQ,

$\tan(90° - \theta) = \frac{AB}{y}$

$\Rightarrow \cot\theta = \frac{AB}{y}$ ...(ii)

From eq(i) and (ii)

$\Rightarrow \frac{AB}{x} = \frac{y}{AB} \Rightarrow AB^2 = xy$

$\Rightarrow AB = \sqrt{xy}$

Hence height of the building = $\sqrt{xy}$

39. (D) Fraction of work done by A and B together in 6 hour = $\frac{6}{18} = \frac{1}{3}$

After 6 hour, A left

Remaining work = $1 - \frac{1}{3} = \frac{2}{3}$

Since B takes 36 hours to do remaining $\frac{2}{3}$ work,

$\therefore$ Time taken by B to complete the work alone $= 36 \times \frac{3}{2} = 54$

$\therefore$ Time taken by A to complete the work if done alone $= \frac{1}{\left(\frac{1}{18} - \frac{1}{54}\right)} = \frac{54}{2}$

= 27 hours

40. (A)

A	B		A	B
63	96		63	120
	84		84	
(96–84)	: (84 – 63)		(120–84)	: (84 – 63)
12	: 21		36	: 21
4	7		12	7

The required ratio of the quantities of three types of rice

= (12 +36) : 21 : 21 = 16 : 7 : 7

41. (B) Given $\frac{1}{\sqrt{x}+\sqrt{x+1}} + \frac{1}{\sqrt{x+1}+\sqrt{x+2}} + \frac{1}{\sqrt{x+2}+\sqrt{x+3}} + ... + \frac{1}{\sqrt{x+98}+\sqrt{x+99}} = 9$

$\Rightarrow (\sqrt{x+1} - \sqrt{x}) + (\sqrt{x+2} - \sqrt{x+1}) + (\sqrt{x+3} - \sqrt{x+2}) + ...(\sqrt{x+99} - \sqrt{x+98}) = 9$

$\Rightarrow \sqrt{x+99} - \sqrt{x} = 9$

$\Rightarrow (\sqrt{x+99})^2 = (9 + \sqrt{x})^2$

squaring both sides of the equation

$\Rightarrow x + 99 = 81 + x + 18\sqrt{x}$

$\Rightarrow 18 = 18\sqrt{x} \Rightarrow x = 1$

42. (A) C.P. of 1000 gms = 1

S.P. of x gms = 1

S.P. of 1000 gms = $\frac{1000 \times 1}{x} = \frac{1000}{x}$

Profit% = $\frac{\text{S.P.} - \text{C.P}}{\text{C.P.}} \times 100$

$\Rightarrow 25 = \frac{\frac{1000}{x} - 1}{1} \times 100$

$\Rightarrow 25 = \frac{1000 - x}{x} \times 100$

$\Rightarrow \frac{25x}{100} = 1000 - x$

$\Rightarrow \frac{x}{4} = 1000 - x$

$\Rightarrow \frac{5x}{4} = 1000 \Rightarrow x = 800$

43. (B) Length of the paper = $\frac{520}{2}$ = 260 m

Area of the paper = width of the paper × length of the paper = $\frac{75}{100} \times 260$

= 195 sq. m

Given that,

$\Rightarrow$ h : (l + b) = 4 : 7

i.e., h = $4x$ and l + b = $7x$

We know that area of the four walls = 2h(l + b)

Area of the four walls = 195 + 29 = 224 sq.m

So that,

$\Rightarrow$ 2h(l + b) = 224

$\Rightarrow 2 \times 4x \times 7x = 224$

$\Rightarrow x = 2$

Hence height of the room = 4 × 2 = 8 m

44. (B) Let total marks be 100

So, the minimum marks required to pass = 40% of 100 = 40

ATQ,

marks obtained by A = $40 - 40 \times \frac{10}{100}$

= 35 marks

And, marks obtained by B = $36 - 36 \times \frac{100}{900}$

= 36 – 4 = 32 marks
So, marks obtained by C

= $(36 + 32) - (36 + 32) \times \frac{700}{1700}$

= 68 – 28 = 40 marks

The requires percentage = $\frac{40}{100} \times 100$

= 40%

45. (D) Since A finishes $\frac{6}{7}$th of the work in $2z$ hours.

B would finish $\frac{12}{7}$th of the work in $2z$ hours.
Thus, B would finish remaining work ($\frac{1}{7}$th of the work) in= $\frac{2z}{12} = \frac{z}{6}$ hours

46. (C) Let the length of the pendulum= l
ATQ,

length of the arc = $2\pi l \times \frac{\theta}{360°}$

$\Rightarrow 44 = 2 \times \frac{22}{7} \times l \times \frac{60}{360} \Rightarrow l = 42$

Hence the length of pendulum = 42 cm

47. (C) $\left(\sqrt{77}+\sqrt{35}-\sqrt{22}-\sqrt{10}\right)\left(\sqrt{77}-\sqrt{35}+\sqrt{22}-\sqrt{10}\right)$

$\Rightarrow \left\{\left(\sqrt{77}-\sqrt{10}\right)+\left(\sqrt{35}-\sqrt{22}\right)\right\}$

$\left\{\left(\sqrt{77}-\sqrt{10}\right)-\left(\sqrt{35}-\sqrt{22}\right)\right\}$

Using, $(a + b)(a - b) = a^2 - b^2$

$\Rightarrow \left(\sqrt{77}-\sqrt{10}\right)^2-\left(\sqrt{35}-\sqrt{22}\right)^2$

$\Rightarrow (77 + 10 - 2\sqrt{770}) - (35 + 22 - 2\sqrt{770})$

$\Rightarrow 87 - 2\sqrt{770} - 57 + 2\sqrt{770} \Rightarrow 30$

48. (A) Numbers which are divisible by 6 and 11 is the LCM of 6 and 11.
LCM of 6 and 11 = 66
Multiple of 66 between 1120 and 1840 = 1122, 1188, ... 1782

Total numbers = $\left[\frac{(1782 - 1122)}{66}\right] + 1$

= 10 + 1 =11
Numbers which are divisible by 6, 11 and 9 is the LCM of 6, 11 and 9.
LCM of 6, 11 and 9 = 198
Multiple of 198 between 1120 and 1840 = 1188, 1386, ...1782

Total numbers = $\left[\frac{(1782 - 1188)}{198}\right] + 1$

= 3 +1 = 4
Hence, total numbers which are divisible by 6 and 11 but not by 9 = 11 – 4 = 7

49. (B) 12% of 350 + 66.66% of 123 – 37.5% of ? = 31

$\Rightarrow$ 42 + 82 – 37.5% of ? = 31

$\Rightarrow 124 - \frac{3}{8} \times ? = 31 \Rightarrow \frac{3}{8} \times ? = 124 - 31$

$\Rightarrow \frac{3}{8} \times ? = 93 \Rightarrow ? = 93 \times \frac{8}{3} = 248$

50. (A) Distance = $\frac{30 \times 40}{40 - 30} \times \frac{8 + 4}{60} = \frac{1200}{10} \times \frac{12}{60}$

$= 120 \times \frac{1}{5} = 24$

Hence distance between home and his farm = 24 km

51. (B) ATQ,

$\sqrt{8x^2 - 13x + 4} + \sqrt{8x^2 - 13x + 15} = 12$ ...(i)

$\sqrt{8x^2 - 13x + 4} - \sqrt{8x^2 - 13x + 15} = t$(let) ...(ii)

Multiply both eqn (i) and (ii)

$\Rightarrow 8x^2 - 13x + 4 - 8x^2 + 13x - 15 = 12t$

$\Rightarrow 12t = -11$

$t = \frac{-11}{12}$

52. (C) $(x + y)^2 - z^2 = 21$

$\Rightarrow (x + y + z)(x + y - z) = 21$ ...(i)

$(y + z)^2 - x^2 = 32$

$\Rightarrow (y + z + x)(y + z - x) = 32$ ...(ii)

$(z + x)^2 - y^2 = 28$

$\Rightarrow (z + x + y)(z + x - y) = 28$ ...(iii)

Adding all three equations

$(x + y + z)\,[(x + y - z) + (y + z - x) + (z + x - y)]$

$\Rightarrow (x + y + z)^2 = 81$

$(x + y + z) = \pm 9$

53. (B) ATQ,

$$\frac{\sin A}{\sin B} = \frac{\sqrt{3}}{2} \Rightarrow 2\sin A = \sqrt{3}\sin B \quad \ldots(i)$$

$$\frac{\cos A}{\cos B} = \frac{\sqrt{5}}{2} \Rightarrow 2\cos A = \sqrt{5}\cos B \quad \ldots(ii)$$

After squaring and adding (i) and (ii)

$4(\sin^2 A + \cos^2 A) = 3\sin^2 B + 5\cos^2 B$

$\Rightarrow 4 = 3\sin^2 B + 5 - 5\sin^2 B$

$\Rightarrow 2\sin^2 B = 1$

$\Rightarrow \sin B = \frac{1}{\sqrt{2}} = \sin 45°$

$\Rightarrow B = 45°$

Divinding eq^n (i) by (ii)

$$\frac{\tan A}{\tan B} = \frac{\sqrt{3}}{\sqrt{5}} \Rightarrow \tan A = \frac{\sqrt{3}}{\sqrt{5}}$$

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

54. (D) Let $\alpha = 90° + \theta_1$ and $\beta = 90 + \theta_2$

$\because \alpha > \beta$

$\therefore 90 + \theta_1 > 90 + \theta_2$

$\Rightarrow \theta_1 > \theta_2$

Taking cos both sides

$\Rightarrow \cos\theta_1 < \cos\theta_2$

$\cos(\alpha - 90) < \cos(\beta - 90)$

$\cos(90 - \alpha) < \cos(90 - \beta)$

$\sin\alpha < \sin\beta$

Now,

$\theta_1 > \theta_2 \Rightarrow \sin\theta_1 > \sin\theta_2$

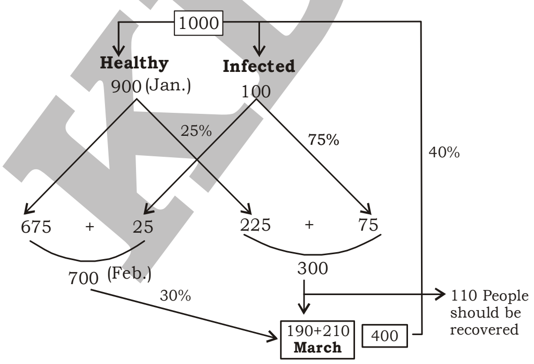
$\sin(\alpha - 90) > \sin(\beta - 90°)$

$-\cos\alpha > -\cos\beta$

$\cos\alpha < \cos\beta$

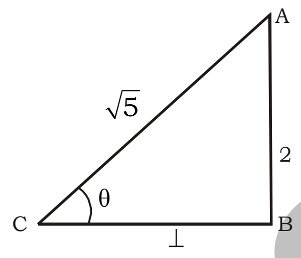
Hence option (D) is correct

55. (A) Let total population of wuhan is 1000



$$\therefore \frac{110}{300} \times 100 = 36.66\%$$

56. (A) $\tan\theta = 2$



$$\sin\theta = \frac{2}{\sqrt{5}}, \cos\theta = \frac{1}{\sqrt{5}}$$

$$\frac{8\sin\theta + 5\cos\theta}{\sin^3\theta + 2\cos^3\theta + 3\cos\theta}$$

$$= \frac{8 \times \frac{2}{\sqrt{5}} + 5 \times \frac{1}{\sqrt{5}}}{\frac{8}{5\sqrt{5}} + \frac{2}{5\sqrt{5}} + \frac{3}{\sqrt{5}}} = \frac{21}{\frac{25}{5}} = \frac{21}{5}$$

57. (C) We know that

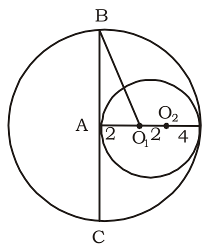
$a^2 + b^2 + c^2 = -ab - bc - ca$

then $a = b = c = 0$

$3a - 2b + 5c = 3\times0 - 2\times0 + 5\times0$

$= 0$

58. (A) ATQ,



In $\triangle BAO$

$BO_1^2 = AO_1^2 + AB^2$

$\Rightarrow 6^2 = 2^2 + AB^2$

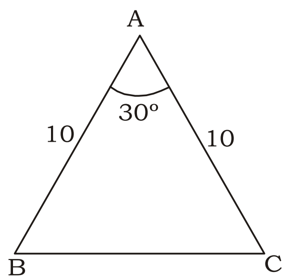
$\Rightarrow AB = 32 \Rightarrow AB = 4\sqrt{2}$

Hence, length of longest chord

BE = 2AB

$= 8\sqrt{2}$ cm

59. (B) ATQ,



Using Co-sine formula

$\cos 30° = \frac{10^2 + 10^2 - BC^2}{2 \times 10 \times 10}$

$\frac{\sqrt{3}}{2} = \frac{200 - BC^2}{2 \times 10 \times 10}$

$BC^2 = 200 - 100\sqrt{3}$

$BC^2 = 100(2 - \sqrt{3})$

$= \frac{100(4 - 2\sqrt{3})}{2}$

$BC^2 = \frac{100(\sqrt{3} - 1)^2}{2}$

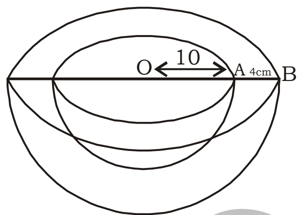
$BC = \frac{10(\sqrt{3} - 1)}{\sqrt{2}}$ cm

Area of $\triangle ABC = \frac{1}{2} \times a \times b \sin\theta$

$= \frac{1}{2} \times 10 \times 10 \times \sin 30°$

$= 25$ cm^2

60. (C) ATQ,



$r_2 = AB = 14$ cm

$r_1 = OA = 10$ cm

Total surface area

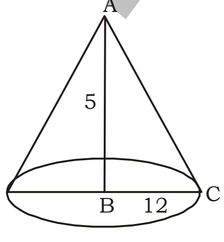
$= 2\pi r_1^2 + 2\pi r_2^2 + (\pi r_2^2 - \pi r_1)^2$

$= 2\pi \times 10^2 + 2\pi \times 14^2 + \pi(14^2 - 10^2)$

$= 592\pi + 96\pi$

$= 688\pi$ cm^2

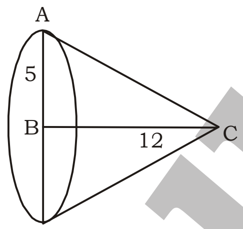
61. (D) **Case I**



$= \frac{1}{3}\pi (BC)^2 \times AB$

$= \frac{1}{3}\pi \times 12^2 \times 5$

Case II



$= \frac{1}{3}\pi (AB)^2 \times BC$

$= \frac{1}{3}\pi \times 5^2 \times 12$

Required percentage

$= \frac{\frac{1}{3}\pi \times 12^2 \times 5 - \frac{1}{3}\pi \times 5^2 \times 12}{\frac{1}{3}\pi \times 5^2 \times 12} \times 100$

$= \frac{144 \times 5 - 25 \times 12}{25 \times 12} \times 100$

$= \frac{720 - 300}{300} \times 100$

$= 140\%$

62. (A) $15\sin^3\alpha + 20\cos^3\alpha = 12$

$\Rightarrow \frac{15}{12}\sin^3\alpha + \frac{20}{12}\cos^3\alpha = 1$

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

Put $\frac{5}{4}\sin\alpha = 1 \Rightarrow \sin\alpha = \frac{4}{5}$

$\frac{5}{3}\cos\alpha = 1 \Rightarrow \cos\alpha = \frac{3}{5}$

then we get indentity $\sin^2\alpha + \cos^2\alpha = 1$

Hence, $10\sin\alpha + 15\cos\alpha$

$= 10 \times \frac{4}{5} + 15 \times \frac{3}{5}$

$= 8 + 9 = 17$

63. (D) $x + \frac{1}{14x} = 7$

Multiplying by 2 both sides

$2x + \frac{1}{7x} = 14$

Taking cube both sides

$\left(2x + \frac{1}{7x}\right)^3 = 8x^3 + \frac{1}{343x^3} + 3 \times 2x \times \frac{1}{7x}$

$\left(2x + \frac{1}{7x}\right)$

$14^3 = 8x^3 + \frac{1}{343x^3} + \frac{6}{7} \times 7$

$8x^3 + \frac{1}{343x^3} = 14^3 - 6$

$= 2744 - 6$

$= 2738$

64. (C) cot 70° + 4cos70°

= tan20° + 4sin20°

$= \frac{\sin 20°}{\cos 20°} + 4\sin 20°$

$= \frac{\sin 20° + 4\sin 20° \cos 20°}{\cos 20°}$

$= \frac{\sin 20° + 2\sin 40°}{\cos 20°}$

$= \frac{\sin 20° + \sin 40° + \sin 20°}{\cos 20°}$

$= \frac{2\sin 30° \cos 10° + \cos 20°}{\cos 20°}$

$= \frac{2\cos 30° \cos 20°}{\cos 20°}$

$= \sqrt{3}$

65. (A) $\frac{2\sin 68°}{\cos 22°} - \frac{2\cot 15°}{5\tan 75°} - \frac{3\tan 45° \tan 20° \tan 40° \tan 50° \tan 70°}{5}$

$= \frac{2\cos 22°}{\cos 22°} - \frac{2\tan 75°}{5\tan 75°} - \frac{3}{5}$

$= 2 - \frac{2}{5} - \frac{3}{5}$

$= 1$

66. (A) $5^a + 2^{b+1} = 189 \Rightarrow 5^a + 2^b.2 = 189$

$\Rightarrow 5^{a+1} + 2^{b-2} = 633 \Rightarrow 5.5^a + \frac{2^b}{2^2} = 633$

Let $5^a = x$, $2^b = y$

Then $x + 2y = 189$ …(i)

$5x + \frac{y}{4} = 633$ …(ii)

Solving eq^n (i) and (ii)

$x = 125$, $y = 32$

$5^a = 125 \Rightarrow a = 3$

$2^b = 32 = 2^5 \Rightarrow b = 5$

Hence, $\sqrt{a+b} = \sqrt{3+5} = 2\sqrt{2}$

67. (B) $\frac{x^3+1}{x^2-1} = x + \sqrt{\frac{6}{x}}$

$\Rightarrow \frac{x^3+1}{x^2-1} - x = \sqrt{\frac{6}{x}}$

$\Rightarrow \frac{x^3+1-x^3+x}{x^2-1} = \sqrt{\frac{6}{x}}$

$\Rightarrow \frac{1+x}{(x-1)(x+1)} = \sqrt{\frac{6}{x}}$

$\Rightarrow \frac{1}{x-1} = \sqrt{\frac{6}{x}}$

Squaring both sides

$\frac{1}{x^2+1-2x} = \frac{6}{x}$

$\Rightarrow x = 6x^2 + 6 - 12x$

$6x^2 - 13x + 6 = 0$

Dividing by x both sides

$6x - 13 + \frac{6}{x} = 0$

$\Rightarrow x + \frac{1}{x} = \frac{13}{6}$

Taking square both sides

$\left(x + \frac{1}{x}\right)^2 = x^2 + \frac{1}{x^2} + 2$

$\left(\frac{13}{6}\right)^2 - 2 = x^2 + \frac{1}{x^2}$

$\Rightarrow x^2 + \frac{1}{x^2} = \frac{169}{36} - 2$

$\Rightarrow x^2 + \frac{1}{x^2} = \frac{97}{36}$

Hence $\left(x^2 + \frac{1}{x^2}\right) = \frac{97}{36}$

68. (A) ATQ,
Put $b = c = 1$

$\Rightarrow \frac{a}{1} + 1 + \frac{1}{a} = 0$

$a + \frac{1}{a} = -1$

If $a + \frac{1}{a} = -1$ then $a^3 = 1$

Now, $\frac{ac}{b^2} + \frac{b^2}{ac} - \frac{c^3}{a^3} = a + \frac{1}{a} - \frac{1}{a^3}$

$= -1 -1$

$= -2$

69. (A) $x^2 + 2x + 4 = 0$ ...(i)
Multiplying above by $(x-2)$ both sides
$(x-2)(x^2 + 2x + 4) = 0$
$\Rightarrow x^3 - 8 = 0$
$\Rightarrow x^3 = 8$
Now, by putting $x^3 = 8$

$\frac{x^4}{4} + \frac{8}{x} - 3 = \frac{8x}{4} + \frac{x^3}{x} = 3$

$= 2x + x^2 - 3$

Now, from (i) $= -4 - 3 = -7$

70. (C) $9x^4 + 20x^2y^2 + 16y^4 = 91$ ...(i)
$3x^2 + 2xy + 4y^2 = 13$ ...(ii)
From (i)
$(3x^2 + 4y^2)^2 - (2xy)^2 = 91$

$\Rightarrow (3x^2 + 4y^2 - 2xy)(3x^2 + 4y^2 + 2xy) = \frac{91}{13}$

$\Rightarrow (3x^2 + 4y^2 - 2xy) = \frac{91}{13}$

$\Rightarrow 3x^2 + 4y^2 - 2xy = 7$ ...(iii)
Adding (ii) and (iii)
$\Rightarrow 2(3x^2 + 4y^2) = 20$
$\Rightarrow 3x^2 + 4y^2 = 10$
Substracting (iii) from (ii)
$4xy = 6$
Multiplying by (iii) both sides
$12xy = 18$

Now, $\frac{x}{4y} + \frac{y}{3x} = \frac{3x^2 + 4y^2}{12xy}$

$= \frac{10}{18} = \frac{5}{9}$

71. (A) Let roots are α and $\frac{1}{\alpha}$

$\Rightarrow$ Product of roots $= \alpha \times \frac{1}{\alpha} = 1 = \frac{c}{a}$

$\frac{k}{7} = 1 \Rightarrow k = 7$

72. (C) Total area of figure

$= \pi (8)^2 + \frac{\pi(4)^2}{2} + \frac{\pi(4)^2}{2}$

$= 96\pi$

Now, Area of shaded part

$= 96\pi - \frac{1}{2} \times 16 \times 16$

$= 96 \times \frac{22}{7} - 128$

$= 187.42$ cm^2

73. (A) $1 + 4 + 6 + 5 + 11 + 6 + \ldots + 100$ terms
$= [1 + 6 + 11 + \ldots 50 \text{ terms}]$
$+ [4 + 5 + 6 + \ldots + 50 \text{ terms}]$

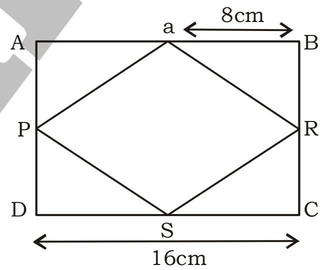
$= \frac{50}{2}[2\times1+(50-1)\times5] + \frac{50}{2}[2\times4+(50-1)\times1]$

$= 25(2 + 49\times5) + 25(8 + 49$

$= 6175 + 1425$

$= 7600$

74. (A) ATQ,

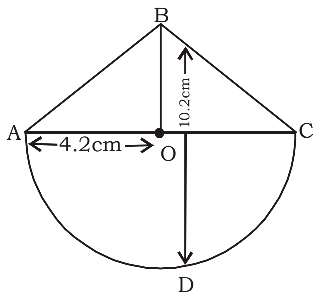


Area of larger square = $16^2 = 256$
Area of square made by joining mid points of the square $= \frac{256}{2} = 128$

Sum of area of square $= 256 + 128 + \ldots + \infty$

$S_\infty = \frac{a}{1-r} = \frac{256}{1-\frac{1}{2}} = 256 \times 2 = 512$ cm^2

75. (D)



Volume of the cone $= \frac{1}{3}\pi r^2 h$

r = 4.2 cm, h = 10.2 – r = 10.2 – 4.2
= 6 cm

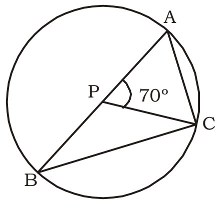
$= \frac{1}{3}\pi \times (4.2)^2 \times 6$

= 110.88 cm^3

Volume of the hemisphere $= \frac{1}{2} \times \frac{4}{3}\pi \times$ 4.2^3 = 155.23

Hence, Total volume = 110.88 + 155.23
= 266.112cm^3

76. (B) ATQ,



∠ABC = 35°

∵ AB is the diameter of circle

∴ ∠C = 90°

In ΔABC ∠A = 180° – 90° – 35° = 55°

Now, In ΔAPC,

∠C = 180° – 70° – 55° = 55°

77. (A) ATQ,

Setting up = ₹2800

Paper and ink = ₹ $\frac{80 \times 2000}{100}$ = ₹1600

Printing cost = ₹ $\frac{160 \times 2000}{100}$ = ₹3200

Total cost price = ₹7600

selling price = ₹5 × 1500

= ₹7500

Let from advertising is ₹a

Total selling price = ₹(7500 + a)

Now, (7500 + a) – 7600 = $\frac{25}{100} \times 7500$

a – 100 = 1875

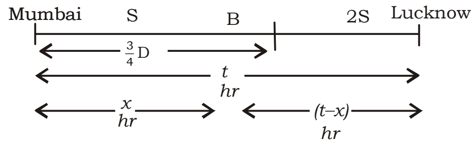
a = ₹1975

Hence

In total profit ₹1975 is obtained from advertising

78. (D) ATQ,

Let total distance is D and time t.



$\frac{3}{4}D = s \times t$ ...(i)

$D = s \times (t + 3)$ ...(ii)

D = st + 3S

from (i)

$D = \frac{3}{4}D + 3s$

$\frac{D}{4} = 3s$

If s = 1 km/hr

D = 12 km

Putting the value of D in eq^n (i)

$\frac{3}{4} \times 12 = 1 \times t$

t = 9 hours

Now,

$D = s_1 x + S_2 t_2$

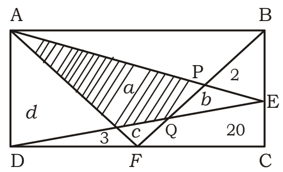
12 = 1× x + (2 ×1)×(9 – x)

Þ 12 = x + 18 – 2x

x = 6 hours

Hence, He increases his car speed after 6 hours.

79. (B)



Ar ΔDRF = 3 cm^2

Ar ΔPBE = 2 cm^2

Ar ΔFCE = 3 cm^2

Ar(ΔABP) + Ar(ΔDEC) = Ar(ΔAED)

(a + 2) + (3 + c + 20) = d + b + shaded region

⇒ 25 + (a + c) = b + d + shaded region ...(i)

Similarly

Ar(ΔADE) + Ar(ΔBEC) = Ar(ΔAFB)

(d + 3) + (b + 2 + 20) = a + shaded region + c

(b + d) + 25 = a + shaded region + c ...(ii)

From (i) and (ii)

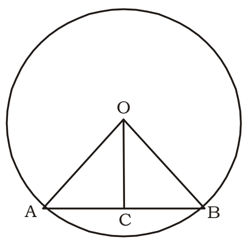
25 + 25 + (a + c) – shaded region = (a + c) + shaded region

shaded region = 25 cm^2

80. (C) LCM of (15, 7, 9 and 21)
LCM of (5×3, 7×1, 3×3 and 7×3)
LCM = 5×7×3×3 = 315
The least number = 315 + 5 = 320
Sum of digit = 3 + 2 + 0
= 5

81. (B) In right angled triangle APD
$AD^2 = AP^2 + DP^2$
$DP^2 = 40^2 - 24^2$
$= 1600 - 576$
DP = 32 cm
Now, In ΔBQC
$BC^2 = QC^2 + BQ^2$
$QC^2 = BC^2 - BQ^2$
$QC^2 = 30^2 - 24^2$
QC = 18 cm
Area of trapezium ABCD
$= \frac{1}{2} \times (AB + DC) \times 24$
$= \frac{1}{2}(20 + 70) \times 24$
$= 1080\ cm^2$

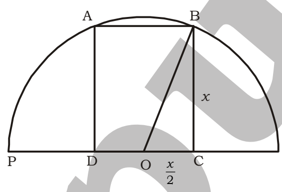
82. (A) Let the radius of the circle = OA = OB = r



$\angle AOB = 90°$ and OA = OB
$\angle OAB = \angle OBA = 45°$
Now, In ΔOCA
$\sin A = \frac{OC}{OA} = \frac{OC}{r}$
$OC = \frac{r}{\sqrt{2}}$
Required ratio = OA : OC = r : $\frac{r}{\sqrt{2}}$
$= \sqrt{2} : 1$

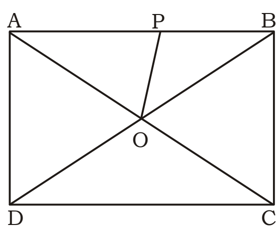
83. (A) $3x - y = 17$ ...(i)
and $x - 4y = 13$ ...(ii)
for intersection point A
Putting the value of x in eq^n (i)
from eq^n (ii)
$3(13 + 4y) - y = 17$
$\Rightarrow 39 - 12y - y = 17$
$\Rightarrow y = -2$
Putting the value of y in eq^n (i)
$3x + 2 = 17 \Rightarrow x = 5$
Point A is (5, –2)
Distance of point A from point B
$= \sqrt{(5-(-3))^2 + (-2-13)^2}$
$= \sqrt{8^2 + (-15)^2}$
$= \sqrt{64 + 225}$
= 17 units

84. (A)



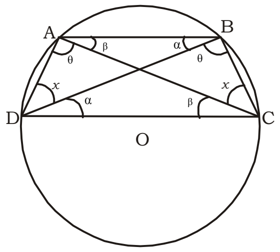
Let the side of square ABCD is x
$OC = \frac{x}{2}$, BC = x, OB = Radius = 10 cm
In ΔOCB
$OB^2 = OC^2 + BC^2$
$10^2 = \left(\frac{x}{2}\right)^2 + x^2$
$100 = \frac{5x^2}{4}$
$\Rightarrow x^2 = 80$
$\Rightarrow x = 4\sqrt{5}$
Hence perimeter of square (ABCD)
$= 4 \times 4\sqrt{5} = 16\sqrt{5}$

85. (B)



$\angle OAP = 45°$ and $\angle AOB = 90°$
In ΔAOP
$\because AO = AP$
$\therefore \angle AOP = \angle OPA$
Now, $\angle AOP + \angle OPA + \angle OAP = 180°$
$2\angle AOP + 45° = 180°$
$\angle AOP = \frac{135°}{2} = 67.5°$
Now, $\angle AOP + \angle BOP = 90°$
$\angle BOP = 90° - 67.5° = 22.5°$

86. (A)



Let CD = $2x$

AB = x

$\Delta AED \sim \Delta BEC$

$$\frac{AD}{BC} = \frac{DE}{CE}$$

$$\frac{AD}{\frac{15}{2}} = \frac{4}{10} \Rightarrow AD = 3 \text{ cm}$$

$\Delta AEB \sim \Delta CED$

$$\frac{AB}{CD} = \frac{BE}{CE}$$

$$\frac{AB}{CD} = \frac{5}{10} \Rightarrow 2AB = CD$$

Now,

AB × CD + AD × BC = BD × AC

$$\Rightarrow x \times 2x + 3\times\frac{5}{12} = 9\times12$$

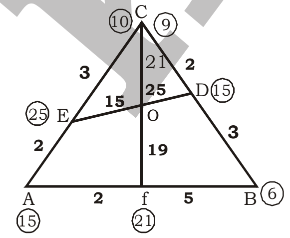
$$\Rightarrow 2x^2 + \frac{45}{2} = 108$$

$$\Rightarrow 2x^2 = 108 - \frac{45}{2} = \frac{171}{2}$$

$$\Rightarrow x^2 = \frac{171}{4}$$

$$\Rightarrow x = \frac{\sqrt{171}}{2} \text{ cm}$$

87. (B) Using mass point theorem



Start with point A

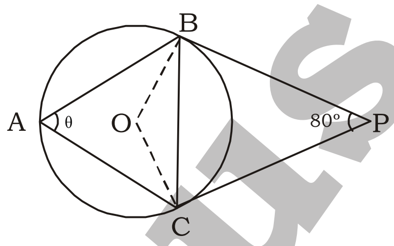
Taking mass at A = 3×5 = 15 kg

From figure

$$\frac{OD}{OE} = \frac{25}{15} = \frac{5}{3}$$

And $\frac{OC}{OF} = \frac{21}{19}$

88. (D)



$\angle BPC + \angle BOC = 180°$

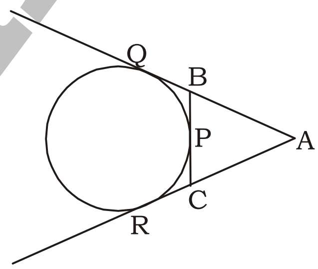
$\angle BOC = 180 - 80°$

$= 100°$

$$\angle BAC = \theta = \frac{\angle BOC}{2}$$

$$= \frac{100}{2} = 50°$$

89. (C)



AB + BP + PC + CA = 32 cm ...(i)

Hence BP = BQ and PC = CR,

AQ = AR

From eqn(i)

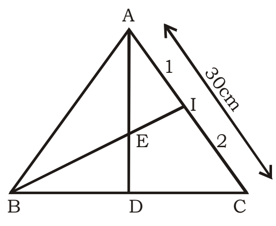
(AB + BQ) + (CR + AC) = 32 cm

AQ + AR = 32 cm

2AQ = 32

AQ = 16 cm

90. (C)

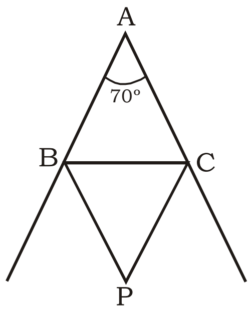


I Divide AC in 1 : 2

then

$$CI = \frac{30}{3} \times 2 = 20 \text{ cm}$$

91. (C)



$\angle BPC = 90 - \frac{\angle A}{2}$

$= 90 - \frac{70°}{2} = 55°$

92. (D) ATQ,

$\sqrt{24-\sqrt{572}} + \sqrt{24+\sqrt{572}}$

$= \sqrt{24-\sqrt{143\times 4}} + \sqrt{24+\sqrt{143\times 4}}$

$= \sqrt{24-2\sqrt{143}} + \sqrt{24+2\sqrt{143}}$

$= \sqrt{24-2\sqrt{11\times 13}} + \sqrt{24+2\sqrt{11\times 13}}$

$= \sqrt{\left(\sqrt{13}-\sqrt{11}\right)^2} + \sqrt{\left(\sqrt{13}+\sqrt{11}\right)^2}$

$= \sqrt{13} - \sqrt{11} + \sqrt{13} + \sqrt{11}$

$= 2\sqrt{13}$

93. (C) ATQ,
The number of 5's will be given by the power of 5 in the product
$= 5^4 \times 10^8 \times 15^{12} \times 20^{16} \times 10^{18} \times 25^{20}$
= 4 + 8 + 12 + 16 + 18 + 40
= 98

94. (D) $x = (\sqrt{5} - 1)^{-1/5}$

$\Rightarrow x^5 = (\sqrt{5}-1)^{-1} = \frac{1}{\sqrt{5}-1}$

$8x^5 = \frac{8}{\sqrt{5}-1}$ ...(i)

$\frac{1}{x^5} = \sqrt{5}-1$ ...(ii)

Now,

$8x^5 - \frac{1}{x^5} = \frac{8}{\sqrt{5}-1} - (\sqrt{5}-1)$

$= \frac{8-\left(\sqrt{5}-1\right)^2}{(\sqrt{5}-1)} = \frac{8-5-1+2\sqrt{5}}{\sqrt{5}-1} = \frac{2(\sqrt{5}+1)}{\sqrt{5}-1}$

Hence $8x^5 - \frac{1}{x^5} = \frac{2(\sqrt{5}+1)}{(\sqrt{5}-1)}$

95. (B) Let breadth of the original cuboid is b cm.
to cut this coboid into 8 equal parts, its should be bisected or cut in the middle in each plane.
Then we will get 8 small cuboids with dimensions 30 cm × $\frac{b}{2}$ cm × 25 cm
Surface area of each small cuboid

$= \frac{19920}{8} = 2490$

$\Rightarrow 2(L \times B + B \times H + H \times L) = 2490$

$\Rightarrow (30 + \frac{b}{2} + \frac{b}{2} - 25 + 25 \times 30) = 1245$

$\Rightarrow \frac{b}{2} \times (30 + 25) + 750 = 1245$

$\Rightarrow \frac{b}{2} \times 55 = 495$

$\Rightarrow b = 495 \times \frac{2}{55}$

$\Rightarrow b = 18$ cm

96. (D) Unit digit of $344^{31} = 4^{31} = 4^1 = 4$
Unit digit of $723^{27} = 3^{27} = 3^3 = 7$
Unit digit of $546^{39} = 6^{39} = 6^1 = 6$
Unit digit of $237^{21} = 7^{21} = 7^1 = 7$
Required units digit = 4 + 7 – 6 + 7 = 32
= 2

97. (D) Lateral Surface Area (LSA) of a pyramid

$= \frac{1}{2} \times$ Base perimeter × Slant Height

And, Total Surface Area (TSA) of the pyramid = LSA + Base Area

$\Rightarrow 756\sqrt{3} = \frac{1}{2} \times 6 \times 12 \times$ Slant Height

$+ \left(\frac{3\sqrt{3}}{2}\right) \times 12^2$

$\Rightarrow 756\sqrt{3} = 36 \times$ Slant Height $+ 216\sqrt{3}$

$\Rightarrow$ Slant Height $= 540\frac{\sqrt{3}}{36}$

$\Rightarrow$ Slant Height $= 15\sqrt{3}$ cm

98. (C) LCM of 9, 13 and 18 = 234
(9 – 4) = (13– 8) = (18 –13) = 5
5 is the common difference between

given divisor and remainders.
So, 5 is to be deducted from the 234.
So, the number A is 234 – 5 = 229
And, LCM of 12, 15 and 22 = 660
(12 – 9) = (15– 12) = (22 – 19) = 3
3 is the common difference between given divisor and remainders.
So, 3 is to be deducted from the 660
So, the number B is 660 – 3 = 657
So, sum of A and B = 229 + 657 = 886

99. (C) $\dfrac{\frac{1}{3}+\left[4\frac{3}{4}-\left(3\frac{1}{6}-2\frac{1}{3}\right)\right]}{\left(\frac{1}{5}\text{ of }\frac{1}{5}\div\frac{1}{5}\right)\div\left(\frac{1}{5}\div\frac{1}{5}\times\frac{1}{5}\right)}$

$=\dfrac{\frac{1}{3}+\left[\frac{19}{4}-\left(\frac{19}{6}-\frac{7}{3}\right)\right]}{\left(\frac{1}{25}\div\frac{1}{5}\right)\div\left(1\times\frac{1}{5}\right)}$

$=\dfrac{\frac{1}{3}+\left[\frac{19}{4}-\left(\frac{19-14}{6}\right)\right]}{\frac{1}{5}\div\frac{1}{5}}$

$=\frac{1}{3}+\left[\frac{19}{4}-\frac{5}{6}\right]$

$=\frac{1}{3}+\left[\frac{57-10}{12}\right]$

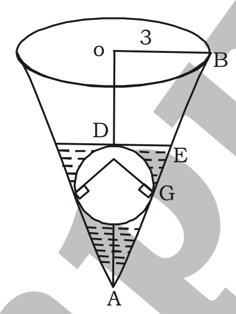
$=\frac{1}{3}+\frac{47}{12}$

$=\frac{4+47}{12}$

$=\left(\frac{51}{12}\right)$

= 4.25

100. (D)



OA = $\sqrt{6^2-3^2}$

= $3\sqrt{3}$

Now, ΔAGA~ ΔBOD ΔDAB ~ ΔDAE

$\frac{GF}{GB}=\frac{AF}{AB}$ $\frac{OA}{AD}=\frac{OB}{DE}$

AF = 2 DE = $\sqrt{3}$

AD = AF + 1

= 3

Volume of water required

$=\frac{1}{3}\pi(3)^2\times 3-\frac{4}{3}\pi(1)^3$

$=\frac{5\pi}{3}$

Corrections of Mock Test – 56

73. (A) The solution of question number 73 was correct. But the option should be 'D' $70\sqrt{2}$ cm in place of (B)

84. (B) The solution of question number 84 was correct. But the option should be (B) 665 in place of (A)

85. (D) The solution of question number 85 was correct. But the option should be (D) $60m^2$ in place of (B)

89. (*) The solution of question number 89 was correct. But all the given options were wrong. The correct answer should be 850 cm^2 / 850 मी^{2}