KD Campus
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TEST NO. 55

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

Answer Key

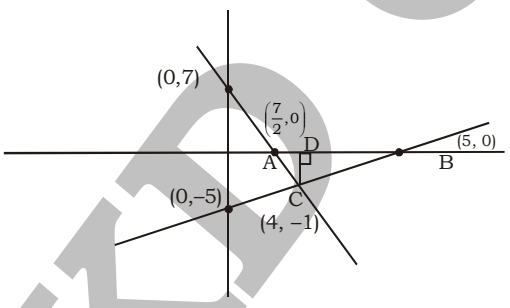
1.	(C)	21.	(D)	41.	(B)	61.	(B)	81.	(A)
2.	(B)	22.	(B)	42.	(A)	62.	(C)	82.	(C)
3.	(A)	23.	(A)	43.	(C)	63.	(A)	83.	(C)
4.	(D)	24.	(C)	44.	(C)	64.	(C)	84.	(B)
5.	(A)	25.	(C)	45.	(A)	65.	(C)	85.	(A)
6.	(C)	26.	(C)	46.	(C)	66.	(D)	86.	(D)
7.	(B)	27.	(D)	47.	(A)	67.	(A)	87.	(C)
8.	(A)	28.	(A)	48.	(B)	68.	(C)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

Answer key with explanations

1. (C) $\dfrac{8 \div 5 \times 10 + 6 - 2 + 24 \div 6}{9 \times 2 \div 6 - 16 + 12 - 20 \div 4}$

$\Rightarrow \dfrac{16 + 4 + 4}{3 - 4 - 5} = \dfrac{24}{-6} = -4$

2. (B)



$AB = 5 - \dfrac{7}{2} = \dfrac{3}{2}$

Area of $\Delta ABC = \dfrac{1}{2} \times AB \times CD$

$= \dfrac{1}{2} \times \dfrac{3}{2} \times 1 = \dfrac{3}{4}$ sq.units

3. (A) The required numbers
= 11, 13, 17, 31, 37, 71, 73, 79, 97
Total number = 9

4. (D) $A = 0.142857142857.... = \dfrac{1}{7}$

and $B = 0.076923076923.... = \dfrac{1}{13}$

Now, $\dfrac{A - B}{A + B} \Rightarrow \dfrac{\frac{1}{7} - \frac{1}{13}}{\frac{1}{7} + \frac{1}{13}}$

$\Rightarrow \dfrac{\frac{13 - 7}{91}}{\frac{13 + 7}{91}} = \dfrac{6}{20} = \dfrac{3}{10}$

5. (A) **Statement I:**

$1\dfrac{1}{2} + 3\dfrac{3}{4} + 5\dfrac{5}{6}$

$\Rightarrow 1 + 3 + 5 + \dfrac{1}{2} + \dfrac{3}{4} + \dfrac{5}{6}$

$\Rightarrow 9 + \dfrac{25}{12} \Rightarrow 11\dfrac{1}{12} > 11$

Statement I is correct.

Statement II:

$6\frac{2}{3}+3\frac{1}{2}-4\frac{3}{4}$

$\Rightarrow 6+3-4+\frac{2}{3}+\frac{1}{2}-\frac{3}{4}$

$\Rightarrow 5+\frac{5}{12}=5\frac{5}{12}<6$

Statement II is incorrect.

6. (C) $2^{40}-1$
$\Rightarrow (2^{20}-1)(2^{20}+1)$
$\Rightarrow (2^{10}-1)(2^{10}+1)(2^{20}+1)$
$\Rightarrow (2^5-1)(2^5+1)(2^{20}+1)$
The required difference
$= (2^5+1)^2-(2^5-1)^2 = 33^2-31^2$
$= (33+31)(33-31)$
$= 64\times 2 = 128$

7. (B) $f(x) = (x+1)(x^2+mx-1)$
$(x+2)$ is a factor of $f(x)$,
then $(-2)^2+m\times(-2)-1=0$
$\Rightarrow 4-2m-1=0$

$\Rightarrow 3=2m \Rightarrow m=\frac{3}{2}$

8. (A) $A:B:C = 3\times 12 : 7\times 8 : 7\times\frac{5}{6}\times 4$

$= 54 : 84 : 35$
B's share = 84 → 10584
A + B + C = 54 + 84 + 35 = 173

Total profit = $\frac{10584}{84}\times 173$

= ₹ 21798

9. (C) $\cos x=\frac{1}{3}\Rightarrow \sin x=\frac{2\sqrt{2}}{3}$

and $\cos y=\frac{3}{4}\Rightarrow \sin y=\frac{\sqrt{7}}{4}$

Now, $\frac{5\cos^2 x-3\sin^2 y}{7\cos^2 x+4\sin^2 y}$

$\Rightarrow \frac{5\times\left(\frac{1}{3}\right)^2-3\left(\frac{\sqrt{7}}{4}\right)^2}{7\times\left(\frac{1}{3}\right)^2+4\left(\frac{\sqrt{7}}{4}\right)^2}$

$\Rightarrow \frac{\frac{5}{9}-\frac{21}{16}}{\frac{7}{9}+\frac{7}{4}}\Rightarrow \frac{-\frac{109}{144}}{\frac{91}{36}}\Rightarrow \frac{-109}{364}$

10. (B) P + Q + R → 28 (5) 140
Q → 35 (4)
P + R → 5 – 4 = 1
Given R = 4P
P + 4P → 1

$5P\to 1\Rightarrow P\to\frac{1}{5}$

and $R\to\frac{4}{5}$

$P+Q\to\frac{1}{5}+4=\frac{21}{5}$

(P + Q) take = $\frac{140\times 5}{21}=33\frac{1}{3}$ days

11. (C) M.P. = ₹ 1500

S.P. = $1500\times\frac{84}{100}=1260$

Cash discount = $\frac{1260-1071}{1260}\times 100$

$=\frac{189}{1260}\times 100 = 15\%$

12. (D) Ram, Shyam and Mohan = 6 : 7 : 9
Let bank balance of Ram, Shyam and Mohan = $6x$, $3x$, $9x$
ATQ.,

$\frac{6x+25000}{5}=\frac{9x-25000}{7}$

$\Rightarrow 42x+175000=45x-125000$
$\Rightarrow 3x=300000\Rightarrow x=100000$
$\therefore$ Shyam's bank balance = 7×100000
= ₹ 700000

13. (B) $\frac{2}{3}=0.67,\ \frac{3}{5}=0.6,\ \frac{4}{7}=0.57$

Hence $\frac{4}{7}<\frac{3}{5}<\frac{2}{3}$

14. (A) $\sqrt[3]{-50653}=-37$

15. (B) $a+b+c=16$ ...(i)
$abc=144$ ...(ii)
$a+b=3c$
from eq. (i)
$3c+c=16\Rightarrow 4c=16\Rightarrow c=4$
From eq. (ii)
$ab\times 4=144\Rightarrow ab=36$
Now, $a^2+b^2+c^2$
$\Rightarrow (a+b)^2-2ab+c^2$
$\Rightarrow (3\times 4)^2-2\times 36+4^2$
$\Rightarrow 144-72+16\Rightarrow 88$

16. (A) Rohit $\left(\frac{1}{3}\text{piece of work}\right)$ in = 10 hrs.

Rohit complete work in = 30 hrs.

Remaining work = $\frac{2}{3}$ part

Ashok $\left(\frac{1}{5}\times\frac{2}{3}\text{part}\right)$ in = 6 hrs.

Ashok complete work in = 45 hrs.

Remaining work = $1-\frac{1}{3}-\frac{2}{15}$

$= \frac{8}{15}$

Sonu $\left(\frac{8}{15}\text{part}\right)$ in = 8 hrs.

Sonu complete work in = 15 hrs.

Rohit → 30 — 3
Ashok → 45 — 2 — 90
Sonu → 15 — 6

The required time = $\frac{90}{3+2+6}$

$= \frac{90}{11} = 8\frac{2}{11}$ hrs.

17. (C) ATQ.,

$$\frac{\frac{x}{x+7}\times 8}{\frac{7}{x+7}\times 8+2} = \frac{1}{2}$$

$\Rightarrow \frac{8x}{56+2x+14} = \frac{1}{2}$

$\Rightarrow 16x = 70 + 2x$

$\Rightarrow 14x = 70 \Rightarrow x = 5$

18. (A) Single discount = $15 + 15 - \frac{15\times 15}{100}$

$= 30 - \frac{225}{100} = 27.75\%$

19. (B) 10 years ago,
Let Simi's age = $3x$
Kajal's age = $5x$
ATQ.,

$\frac{3x+15}{5x+15} = \frac{2}{3}$

$\Rightarrow 9x + 45 = 10x + 30 \Rightarrow x = 15$
Kajal's present age = $5 \times 15 + 10$
$= 75 + 10 = 85$ years

20. (A) Let third proportional = x
ATQ.,
$12 : 48 :: 48 : x$
$\Rightarrow 12x = 48 \times 48$
$\Rightarrow x = 48 \times 4 = 192$

21. (D) S : D = $\frac{6}{5} : \frac{5}{4} = 24 : 25$

Daughter's share = $\frac{25}{(24+25)}\times 84084$

$= \frac{25}{49}\times 84084$

= ₹ 42900

22. (B) Let Team's B score now = x
ATQ.,
$50 \times 4.6 = x + 15 \times 5.2$
$\Rightarrow 230 = x + 78$
$\Rightarrow x = 152$

23. (A) $(117)^{213} \times (219)^{177} \times (413)^{119} \times (216)^{765}$
$\Rightarrow (117)^{4\times 53+1} \times (219)^{4\times 44+1} \times (413)^{4\times 29+3} \times (216)^{765}$
Unit digit = $7^1 \times 9^1 \times 3^3 \times 6$
Unit digit = $7 \times 9 \times 27 \times 6$
Unit digit = 6

24. (C) $\frac{1}{1\times 2\times 3}+\frac{1}{2\times 3\times 4}+.....+\frac{1}{15\times 16\times 17}$

$\Rightarrow \left[\left(\frac{1}{1\times 2}-\frac{1}{2\times 3}\right)+\left(\frac{1}{2\times 3}-\frac{1}{3\times 4}\right)+....\left(\frac{1}{15\times 16}-\frac{1}{16\times 17}\right)\right]$

$\Rightarrow \frac{1}{2}\left[\frac{1}{1\times 2}-\frac{1}{16\times 17}\right] \Rightarrow \frac{1}{2}\times\left[\frac{8\times 17-1}{16\times 17}\right]$

$\Rightarrow \frac{1}{2}\times\frac{135}{16\times 17} = \frac{135}{544}$

25. (C) L.C.M. of 12, 15, 28 = 420
Largest number = $420 \times 2 - 9 = 831$
[$\because$ remainder = 3, 6, 19)

The required remainder = $\frac{831}{17} = 15$

26. (C) $S = 22^2 + 24^2 + ...+32^2$
$S = 4(11^2 + 12^2 .....+16^2)$
$S = 4[(1^2 + 2^2....+10^2+11^2+.....16^2) - (1^2 + 2^2 +....+10^2)]$

$S = 4\left[\frac{16}{6}(16+1)(2\times 16+1)-\frac{10}{6}(10+1)(2\times 10+1)\right]$

$S = 4\left[\frac{8}{3}\times 17\times 33-\frac{5}{3}\times 11\times 21\right]$

$S = 4\ [1496 - 385]$
$S = 4 \times 1111 = 4444$

27. (D) $\sqrt{2172+\sqrt{1342+\sqrt{712+\sqrt{282+\sqrt{49}}}}}$

$\Rightarrow \sqrt{2172+\sqrt{1342+\sqrt{712+\sqrt{282+7}}}}$

$\Rightarrow \sqrt{2172+\sqrt{1342+\sqrt{712+17}}}$

$\Rightarrow \sqrt{2172+\sqrt{1342+27}}$

$\Rightarrow \sqrt{2172+37} = \sqrt{2209} = 47$

28. (A) 6 Pens + 7 Pencils + 5 Erasers = ₹ 417 ...(i)

2 Pens + 3 Pencils + 2 Erasers = ₹ 253 ...(ii)

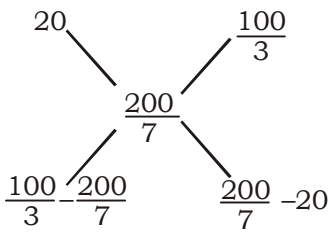
Eq(i)×2 – eq(ii) × 3

6 Pens + 5 Pencils + 4 Erasers

= 2 × 417 – 3 × 253

= 834 – 759 = ₹ 75

29. (D)



$= \frac{100}{21} : \frac{60}{7}$

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

$5 : 9$

The required ratio = 5 : 9

30. (C) The required cost price

$= 16.5 \times \frac{100}{88} \times \frac{128}{100} =$ ₹ 24

31. (D) A : B : C

= 24000 × 8 + 21000 × 8 + 18000 × 2 : 36000 × 8 + 33000 × 2 : 48000 × 2

A : B : C = (32 + 28 + 6) : (48 + 11) : 16

= 66 : 59 : 16

A's share $= \frac{66}{66+59+16} \times 355320$

$= \frac{66}{141} \times 355320 =$ ₹ 166320

32. (C) Let the amount added by Amar = k

After 3 years amount received by Amar = 145% × (14500 + k) = 21025 + 1.45k

After 3 years amount paid by Amar = 136% × 14500 = 19720

Gain of Amar through interest

$\Rightarrow$ 21025 + 1.45k – 19720 – k = 4905

$\Rightarrow$ 0.45k = 3600 $\Rightarrow$ k = 8000

33. (A) let the cost price of each table = 100k

And number of tables = 100

Total cost = 100 × 100k = 10000k

Marked price of each table = 135k

Total sell = 0.8 × 135k × 15 + 73 × 135k

= 1620k + 9855k = 11475k

Profit% $= \left(\frac{1475k}{10000k}\right) \times 100\% = 14.75\%$

34. (B) Let length of the race = x

When A runs for x m, B runs for (x – 24) m and C runs (x – 36) m

When B runs for x m, C runs for (x – 16) m

ATQ.,

$\frac{x-24}{x-36} = \frac{x}{x-16}$

$\Rightarrow x^2 - 36x = x^2 - 40x + 384$

$\Rightarrow 4x = 384 \Rightarrow x = 96$

35. (B) Suppose the total capacity of the tank = x litres.

In 24 hours, the leak empties all the x litres.

$\therefore$ In 1 hour the leak empties $\frac{x}{24}$ litres.

According to the problem,

$\Rightarrow x = 50 \times 12 - \frac{12x}{24}$

$\Rightarrow x + \frac{x}{2} = 600 \Rightarrow x = 400$

$\therefore$ The capacity of the tank = 400 litres.

36. (C) Required average

$= \frac{900+840+1050+450}{4} = 810$

37. (A) Average runs per match scored by Virat

$= \left(\frac{900}{16}\right) = \left(\frac{225}{4}\right)$

Average runs per match scored by Suresh $= \left(\frac{450}{12}\right) = \left(\frac{150}{4}\right)$

Required difference $= \left(\frac{225}{4}\right) - \left(\frac{150}{4}\right)$

$= \left(\frac{75}{4}\right) = 18.75$

38. (B) Total number of runs scored by 5Os by 4 batsmen = (4 +5 +6 +4) × 50 = 950
Total number of runs scored by 100s by 4 batsmen = (3 +1+ 2) × 100 = 600
Required total = 950 +600 = 1550

39. (A) $(a^n + b^n)$ is always divisible by $(a + b)$, when n is on odd power.
(47 + 35) = 82
Factors of 82 (1, 2, 41 and 82)
So, $(47^3 + 35^3)$ is completely divided by 41.
Hence, remainder = 0

40. (A) Let the sum be 'x'
ATQ,

$$\frac{x \times 4 \times 4}{100} - \left[x\left(1+\frac{5}{100}\right)^3 - x\right] = 57$$

$$\Rightarrow \frac{16x}{100} - \left(\frac{21}{20}\right)^3 x + x = 57$$

$$\Rightarrow \frac{116x}{100} - \frac{9261x}{8000} = 57$$

$$\Rightarrow \frac{19x}{8000} = 57 \Rightarrow x = 24{,}000$$

$\therefore$ The required sum is ₹ 24,000

41. (B) Let the one root be α and other root is β, then β = 3α

Sum of roots $\alpha + \beta = -\frac{b}{a}$

$$\Rightarrow \alpha + 3\alpha = -\frac{b}{a} \Rightarrow 4\alpha = -\frac{b}{a} \Rightarrow \alpha = -\frac{b}{4a}$$

and Product of roots $\alpha\beta = \frac{c}{a}$

$$\Rightarrow 3\alpha^2 = \frac{c}{a} \Rightarrow 3\left(-\frac{b}{4a}\right)^2 = \frac{c}{a}$$

$$\Rightarrow \frac{3b^2}{16a^2} = \frac{c}{a} \Rightarrow 16ac = 3b^2$$

42. (A) 7500 ÷ 3 = 2500
For first year
2500 + 4% of 7500
= 2500 + 300 = 2800
For second year
= 2500 + 4% of 5000
= 2500 + 200 = 2700
For third year
2500 + 4% of 2500
2500 + 100 = 2600

43. (C) $x^{x\sqrt{x}} = \left(x\sqrt{x}\right)^x \Rightarrow x^{x\sqrt{x}} = \left(x^{3/2}\right)^x$

$$\Rightarrow x^{x\sqrt{x}} = x^{\frac{3x}{2}}$$

On comparing

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

$$\Rightarrow x = \left(\frac{3}{2}\right)^2 = \frac{9}{4}$$

44. (C) $x^3 - 6x^2 + 11x - 6 = (x - 1)(x^2 - 5x + 6)$
$= (x - 1)(x - 3)(x - 2)$
$x^3 + x^2 - 9x - 9 = (x + 1)(x^2 - 9)$
$= (x + 1)(x + 3)(x - 3)$
and $x^3 - 6x^2 + 5x + 12$
$= (x + 1)(x^2 - 7x + 12) = (x + 1)(x - 4)(x - 3)$
Hence H.C.F = x - 3

45. (A) $\frac{5\sqrt{5}x^3 - 81\sqrt{3}y^3}{\sqrt{5}x - 3\sqrt{3}y} = \frac{\left(\sqrt{5}x\right)^3 - \left(3\sqrt{3}y\right)^3}{\sqrt{5}x - 3\sqrt{3}y}$

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

$\Rightarrow 5x^2 + 27y^2 + 3\sqrt{15}xy = Ax^2 + By^2 + Cxy$

On comparing

A = 5, B = 27, C = $3\sqrt{15}$

Now, 6A + B – $\sqrt{15}$C

= 6 × 5 + 27 - $\sqrt{15} \times 3\sqrt{15}$

= 30 + 27 – 45 = 12

46. (C) The number of girls in school A

$$= 400 \times \frac{3}{8} = 150$$

The number of girls in school B

$$= 360 \times \frac{4}{9} = 160$$

The number of girls in school C

$$= 280 \times \frac{1}{4} = 70$$

The number of girls in school D

$$= 300 \times \frac{2}{5} = 120$$

The number of girls in school E

$$= 340 \times \frac{9}{17} = 180$$

Required average

$$= \frac{(150 + 160 + 70 + 120 + 180)}{5} = 136$$

47. (A) The no. of boys in school A

$= 400 \times \frac{5}{8} = 250$

The no. of students in school A, who participated in function

$= 400 \times \frac{70}{100} = 280$

Required percentage $= \left(\frac{280}{250}\right) \times 100$

$= 112\%$

48. (B) The number of boys in school D

$= 300 \times \frac{3}{5} = 180$

The number of girls in school D
$= 300 - 180 = 120$
The number of students in school D, who participated in function

$= 300 \times \frac{80}{100} = 240$

So, the number of girls in school D, who participated in function $= 240 - 180 = 60$

Required percentage $= \left(\frac{60}{120}\right) \times 100$

$= 50\%$

49. (C) The no. of students in school B, who participated in function

$= 360 \times \frac{75}{100} = 270$

The no of girls in school B

$= 360 \times \frac{4}{9} = 160$

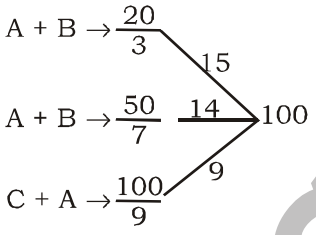
The no. of boys in school B, who participated in function
$= 270 - 160 = 110$
The no. of students in school C, who participated in function

$= 280 \times \frac{65}{100} = 182$

The no. of girls in school C $= 280 \times \frac{1}{4} = 70$

The no. of boys in school C, who participated in function
$= 182 - 70 = 112$
Required ratio $= 110 : 112 = 55 : 56$

50. (C)



2(A + B + C)'s efficiency $\rightarrow (15 + 14 + 9) = 38$
(A + B + C)'s efficiency $\rightarrow 19$
A's efficiency $\rightarrow 5$
B's efficiency $\rightarrow 10$
C's efficiency $\rightarrow 4$
B – C = 6 $\rightarrow$ 900

(A + B + C)'s salary $= \frac{900}{6} \times 19$

$= 2850$

51. (A) Ratio of amount shared by A, B and C initially
$= 3 : 6 : 8$
$= 6 : 12 : 16$
Now, B is 25% less amount than previous amount.
Hence, Amount divided by mistake in the ratio
A : B : C
8 9 17

8 units – 6 units = 2 units $\rightarrow$ ₹ 200

= 1 unit $\rightarrow$ ₹ 100

Share of 16 units $\rightarrow$ ₹ 16 × 100

Hence, Actual share of C was ₹ 1600

52. (C) 1st box = 400 kg

3rd box $= 400 \times \frac{5}{4} = 500$ kg

2nd box $= 500 \times \frac{6}{5} = 600$ kg

4th box = 700 kg

5th box $= 700 \times \frac{100}{70} = 1000$ kg

Required difference $= \frac{(1000 + 700 + 600 + 500)}{4}$

$- \frac{(400 + 500 + 600 + 700)}{4}$

$= 700 - 550$
$= 150$ kg

53. (D) When the speed of a truck is 60 km/hr then truck can travel in one litre 19.5 km
So, total distance covered by truck in 20 litres = 20 × 19.5
But, when speed is increased by 80 km/hr,
So, fuel consumption rate is also increased and it is increased by 30%.
So, total distance covered by

$= \frac{20 \times 19.5}{1.3}$

= 300 km

54. (B)

Article	I	II	III
C.P. —	11	4×2	9
P/L —	–1	+1×2	+1
SP —	10	5×2	10

Total profit = (–1 + 2 + 1) units
2 units → ₹ 1600
10 units → ₹ 8,000
Hence, Selling price of each article is ₹ 8,000

55. (D) $\frac{2(1-\sin^2\theta)\operatorname{cosec}^2\theta}{\cot^2\theta(1+\tan^2\theta)} - 1$

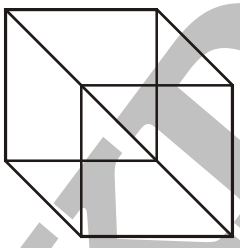
$= \frac{2\cos^2\theta \operatorname{cosec}^2\theta}{\cot^2\theta.\sec^2\theta} - 1$

$= \frac{2\cos^2\theta\sin^2\theta}{\cos^2\theta\sin^2\theta\sec^2\theta} - 1$

$= 2\cos^2\theta - 1$

$= \cos 2\theta$

56. (C) Total surface area = $6a^2$
= 6 × 16 × 16



Cut along with diagonals and divided into 4 parts then

$= 4 \times 16 \times 16\sqrt{2}$

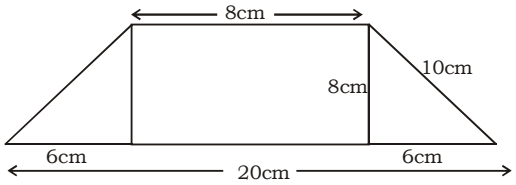
T.S.A. = $6 \times 16 \times 16 + 4 \times 16 \times 16 \times \sqrt{2}$

Total surface area of each part

$= \frac{6 \times 16 \times 16}{4} + \frac{4 \times 16 \times 16\sqrt{2}}{4}$

$= \left(384 + 256\sqrt{2}\right) \text{cm}^2$

57. (B)



Area of base = $\frac{1}{2} \times (8+20) \times 8$

= 112 cm²

Total surface area = 2 × Base area + perimeter of base × h
= 2 × 112 + 48 × 20
= 1184 cm²
Volume of prism = Base area × height
= 112 × 20
= 2240 cm²

58. (A) Volume of sphere = $\frac{4}{3}\pi r^3$

$\Rightarrow 4851 = \frac{4}{3} \times \frac{22}{7} \times r^3$

$\Rightarrow r^3 = \frac{4851 \times 3 \times 7}{4 \times 22}$

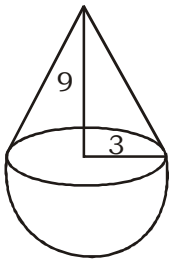
$\Rightarrow r = \frac{21}{2}$

Surface area = $4\pi r^2$

$= 4 \times \frac{22}{7} \times \frac{21}{2} \times \frac{21}{2}$

= 1386 cm²

59. (A)



Volume = $\frac{1}{3}\pi r^2 h + \frac{2}{3}\pi r^3$

$= \frac{1}{3}\pi \times 9 \times 9 + \frac{2}{3}\pi \times 27$

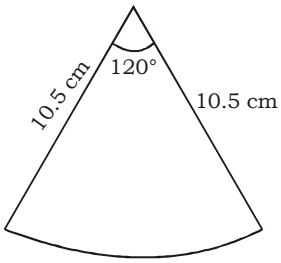
$= 45\pi$

$\pi \times 12 \times 12 \times 15 = n \times 45\pi$

$\Rightarrow n = 48$

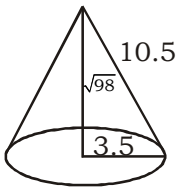
60. (D) ATQ.,

$$\frac{2\pi\theta}{360}\times r = 2\pi R_{cone}$$



$$\Rightarrow \frac{2\pi\times 120}{360}\times 10.5 = 2\pi R_{cone}$$

$$\Rightarrow R_{cone} = 3.5 \text{ cm}$$



$$\text{Volume} = \frac{1}{3}\pi r^2 h$$

$$= \frac{1}{3}\times\pi\times 3.5\times 3.5\times\sqrt{98}$$

$$= \frac{343\sqrt{2}}{12}\pi$$

61. (B) ATQ.,

$$\cos 2\alpha = \frac{1-\tan^2\alpha}{1+\tan^2\alpha} = \frac{1-\frac{1}{49}}{1+\frac{1}{49}} = \frac{48}{50} = \frac{24}{25}$$

$$\sin 2\beta = \frac{2\tan\beta}{1+\tan^2\beta} = \frac{2\times\frac{1}{3}}{1+\frac{1}{9}} = \frac{2}{3}\times\frac{9}{10} = \frac{3}{5}$$

$$\cos^2 2\beta = 1 - \sin^2 2\beta = 1 - \frac{9}{25}$$

$$\cos 2\beta = \frac{4}{5}$$

$$\sin 4\beta = 2\sin 2\beta\cos 2\beta = 2\times\frac{3}{5}\times\frac{4}{5}$$

$$= \frac{24}{25}$$

Hence $\cos 2\alpha = \sin 4\beta$

62. (C) ATQ.,

$$\frac{\cos 12^\circ - \sin 12^\circ}{\cos 12^\circ + \sin 12^\circ} + \frac{\sin 147^\circ}{\cos 147^\circ}$$

$$= \frac{\sin 78^\circ - \sin 12^\circ}{\sin 78^\circ + \sin 12^\circ} - \frac{\sin 33^\circ}{\cos 33^\circ}$$

$$= \frac{2\cos 45^\circ\sin 33^\circ}{2\sin 45^\circ\cos 33^\circ} - \frac{\sin 33^\circ}{\cos 33^\circ}$$

$$= 0$$

63. (A) $\frac{3-\tan^2 A}{1-3\tan^2 A} = K$

$$\Rightarrow \tan^2 = \frac{K-3}{3K-1}$$

$\text{cosec } A\,(3\sin A - 4\sin^3 A) = 3 - 4\sin^2 A$

$$\Rightarrow 3 - \frac{4}{\text{cosec}^2 A} = 3 - \frac{4}{1+\cot^2 A}$$

$$= 3 - \frac{4}{1+\frac{3K-1}{K-3}} = 3 - \frac{4(K-3)}{4K-4}$$

$$= \frac{3K-3-K+3}{K-1} = \frac{2K}{K-1}$$

$$\Rightarrow 3 - 4\sin^2 A = \frac{2K}{K-1}$$

$$\Rightarrow \sin^2 A = \frac{K-3}{4(K-1)}$$

$0 \le \sin^2 A < 1$

$$0 \le \frac{K-3}{4(K-1)} \le 1$$

case (i) $K - 3 \ge 0$

$\Rightarrow K \ge 3$

case (ii) $\frac{K-3}{4(K-1)} \le 1$

$\Rightarrow K - 3 \le 4K - 4$

$\Rightarrow 3K - 1 \ge 0$

$$\Rightarrow K \ge \frac{1}{3}$$

64. (C) Put A = 90°, B = 60°, C = 30°

$(\because A + B + C = 180^\circ)$

Now, $\cos 2A + \cos 2B + \cos 2C$

$= \cos 180 - \cos(2\times 60) + \cos(2\times 30)$

$$= -1 - \frac{1}{2} + \frac{1}{2}$$

$= -1$

Put these values in all options

From option (A) = $1 + 4\cos A\cos B\cos C$

$= 1$

From option (B)

$= -1 + 4\sin A\sin B\cos C$

$$= -1 + 4\times 1\times\frac{\sqrt{3}}{2}\times\frac{\sqrt{3}}{2}$$

$= 2$

From option (C) = $-1 - 4\cos A\cos B\cos C$

$= -1 - 0 = -1$

From option (D) = $1 + 4\sin A\sin B\sin C$

$$= 1 + 4\times\frac{\sqrt{3}}{2}\times\frac{1}{2} = 1 + \sqrt{3}$$

Hence option, (C) is correct.

65. (C)

$$\frac{32\cos^6 x - 48\cos^4 x + 18\cos^2 x - 1}{4\sin x \times \cos x \times \sin(60-x) \times \cos(60-x) \times \sin(60+x)\cos(60+x)}$$

adding + 4 and - 4, in numerator.

$\Rightarrow 32\cos^6 x - 4 - 48\cos^4 x + 18\cos^2 x + 3$

$\Rightarrow 32\cos^6 x - 4 - 48\cos^4 x + 24\cos^2 x - 6\cos^2 x + 3$

$\Rightarrow 32\cos^6 x - 4 - 48\cos^4 x + 24\cos^2 x - 3\cos 2x$

$\Rightarrow 4\left(2\cos^2 x - 1\right)^3 - 3\cos 2x$

$\left[\because \cos 2x = 2\cos^2 x - 1\right]$

$\Rightarrow 4\cos^3 2x - 3\cos 2x$

$\Rightarrow \cos 6x$

$\left[\because \cos 3x \to 4\cos^3 x - 3\cos x \text{ and } \because \cos 6x \to 4\cos^3 2x - 3\cos 2x\right]$

Now,

$4\sin x.\cos x.\sin(60-x).\cos(60-x).$

$\sin(60+x).\cos(60+x)$

$\left[\because \sin x.\sin(60-x).\sin(60+x) = \frac{1}{4}\sin 3x\right]$

$\left[\because \cos x.\cos(60-x).\cos(60+x) = \frac{1}{4}\cos 3x\right]$

$$= \frac{\cos 6x}{\frac{1}{4}\sin 3x.\cos 3x}$$

$$= \frac{2}{2} \times \frac{4\cos 6x}{\sin 3x.\cos 3x}$$

$$= \frac{8\cos 6x}{2\sin 3x.\cos 3x}$$

$$= \frac{8\cos 6x}{\sin 6x} = 8\cot 6x$$

66. (D) $\frac{2}{x} + \frac{3}{y} = \frac{9}{xy}$

$2y + 3x = 9$ ...(i)

and $\frac{4}{x} + \frac{9}{y} = \frac{21}{xy}$

$4y + 9x = 21$ ...(ii)

Multiplying equation (i) by 2

$4y + 6x = 18$

$4y + 9x = 21$

$-3x = -3$

$\Rightarrow x = 1$

Put the value of x in equation (i)

$2y + 3 = 9$

$\Rightarrow y = 3$

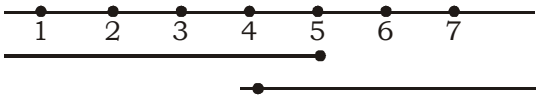
$(x, y) = (1, 3)$

67. (A) $12x - 65 \le 7$

$x \le 6$

and $13x - 47 \ge 5$

$x \ge 4$



The value of x which satisfies both equations are [4, 6]

68. (C) ATQ,.

$4x^2 - 18x - 35 = 0$

$\Rightarrow 4x^2 + 6x - 24x - 35 = 0$

$\Rightarrow 2x(2x + 3) - 12(2x + 3) = -1$

$\Rightarrow (2x + 3)(2x - 12) = -1$

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

$\Rightarrow (2x + 3) - 15 = \frac{-1}{(2x+3)}$

$\Rightarrow (2x + 3) + \frac{1}{2x+3} = 15$

$\Rightarrow \left[(2x+3) - \frac{1}{(2x+3)}\right]^2 = \left[(2x+3) + \frac{1}{(2x+3)}\right]^2 - 4$

$= 225 - 4$

$= 221$

$\left[(2x+3) - \frac{1}{(2x+3)}\right] = \sqrt{221}$

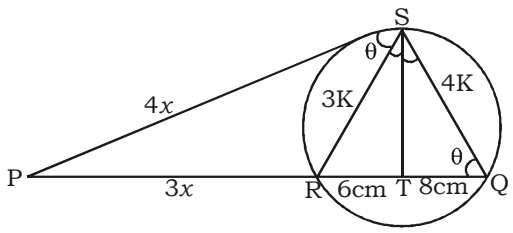
$\Rightarrow (2x + 3)^3 - \frac{1}{(2x+3)^3}$

$= 221\sqrt{221} + 3\sqrt{221}$

$= 224\sqrt{221}$

Hence, $(2x+3)^3 - \frac{1}{(2x+3)^3} = 224\sqrt{221}$

69. (B) ATQ.,



$\Delta PSR \sim \Delta PQS$

$\frac{PR}{PS} = \frac{SR}{QS}$

$\Rightarrow \frac{PR}{PS} = \frac{3}{4}$

PR = 3x and PS = 4x

$PS^2 = PR \times PQ$

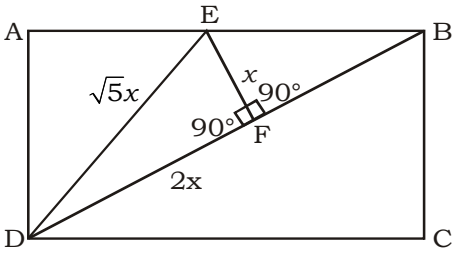
$16x^2 = 3x \times (3x + 14)$

$\Rightarrow 7x^2 = 42x$

$\Rightarrow x = 6$

Hence PR = 18cm

70. (B)



Let EF = x, DF = $2x$

DE = $\sqrt{5}x$

Ar (ΔDEF) = $\frac{1}{2} \times 2x \times x = 5$

$\Rightarrow$ $x = \sqrt{5}$

$\therefore$ DE = $\sqrt{5} \times \sqrt{5} = 5$

Now,

In ΔAED

$AE^2 = DE^2 - AD^2$

$= 25 - 16$

AE = 3 units

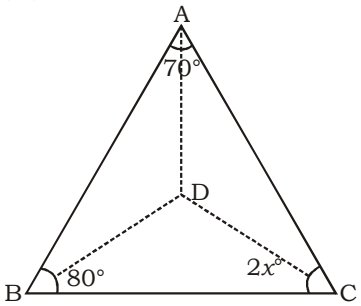
AB = 2 EA = 2 × 3 = 6 units

Hence, Area of Rectangle ABCD

= 6 × 4

= 24 cm^2

71. (D) ATQ.,



$\angle ACB = 30°$

$2x = 30°$

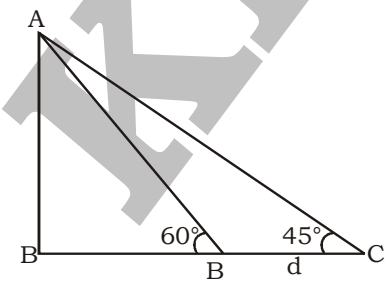
$x = 15°$

$\angle BDC = 90 + \frac{70}{2}$

$= 125°$

Hence, $x = 15°$ and $y = 125°$

72. (B) ATQ,.



Let AB = h

In ΔACB

$\tan 45° = \frac{h}{BC}$

BC = h cot 45°

Similarly in, ΔADB

$\tan 60° = \frac{h}{BD}$

BD = h cot 60°

d = h (cot45° – cot60°)

$d = h\left(\frac{\sqrt{3}-1}{\sqrt{3}}\right)$

When angle of depression changes from 45° to 60° then the speed of vehicle

$S = \frac{d}{10 \times 60} = \frac{\left(\sqrt{3}-1\right)}{\sqrt{3}} \times \frac{h}{600}$ m/sec.

Required time = $\frac{h\ cat60°}{\frac{\sqrt{3}-1}{\sqrt{3}} \times \frac{h}{600}}$

$= \frac{600}{\sqrt{3}-1}$

$= 300\left(\sqrt{3}+1\right)$ minute.

Hence, time required to reach the bottom of hill is 13 min 40 sec.

73. (C) $x = 1 + \sqrt{2} + \sqrt{3}$

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

squaring both sides

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

$x^2 - 2x = 4 + 2\sqrt{6}$ ...(ii)

Again squaring both sides

$\Rightarrow$ $x^4 + 4x^2 - 4x^3 = 16 + 24 + 16\sqrt{6}$

Multiplying above equation by (2) in both sides

$\Rightarrow$ $2x^4 - 8x^3 + 8x^2 = 80 + 32\sqrt{6}$

$\Rightarrow$ $2x^4 - 8x^3 - 5x^2 + 26x - 28 = 52 + 32\sqrt{6} - 5x^2 - 8x^2 + 26x$

$2x^4 - 8x^3 - 5x^2 + 26x - 28$

$= 52 + 32\sqrt{6} - 13\ (x^2 - 2x)$

From eq. putting the value of $x^2 - 2x$

$2x^4 - 8x^3 - 5x^2 + 26x - 28$

$= 52 + 32\sqrt{6} - 13\left(4 + 2\sqrt{6}\right)$

$= 52 + 32\sqrt{6} - 52 - 26\sqrt{6}$

$= 6\sqrt{6}$

74. (A) ATQ.,

Let Breadth = x

Length = $3x$

Area of four walls = 2h (l + b)

$\Rightarrow$ $2 \times 22 \times (3x + x) = 5280$

$\Rightarrow$ $x = 30$

Area of base = 30 × 90

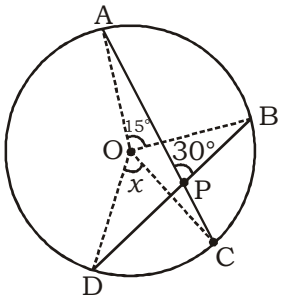
= 2700 m^2

75. (A) ATQ.,
$30 \times 24 \times h = 10 \times 6 \times 50 \times 60 \times 32 \times 10^{-4}$

$\Rightarrow$ $h = \dfrac{10 \times 6 \times 50 \times 60 \times 32 \times 10^{-4}}{30 \times 24}$

$= 0.8$m
Hence, The water level is 80 cm.

76. (D)



Let, $\angle COD = x$
We know that

$\angle APB = \dfrac{x + 15°}{2}$

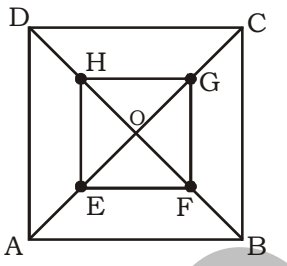
$\Rightarrow$ $30 = \dfrac{x + 15°}{2}$

$x = 45°$

$\therefore$ $\tan^2 30 + \cot^2 45°$

$= \dfrac{1}{3} + 1 = \dfrac{4}{3}$

77. (D)



E, F, G, H are mid points
So, AB = 2EF
BC = 2GF
DC = 2GH
DA = 2EH
$\therefore$ Perimeter of quadrilateral ABCD = 2 × Perimeter EFGH.

$\dfrac{\text{Perimeter of EFGH}}{\text{Perimeter of ABCD}} = \dfrac{1}{2}$

78. (B) $x^4 + y^4 + x^2y^2 = 481$
$x^4 + y^4 + 2x^2y^2 = 481 + x^2y^2$
$(x^2 + y^2)^2 = 481 + 144$
$x^2 + y^2 = 25$
$x^2 + y^2 - xy = 25 - xy$ ..(i)
Putting the value of xy in equation (i)
$x^2 + y^2 - xy = 25 - 12$
$= 13$

79. (B) Let $xyz = a$

$\sqrt{a} - \dfrac{1}{\sqrt{a}} = a^{3/2}$

$\Rightarrow$ $a - 1 = a^{3/2} . a^{1/2}$
$\Rightarrow$ $a - 1 = a^2$
$\Rightarrow$ $a^2 + 1 = a$

Now, $\dfrac{1 + 2a^2 + a^4}{a^2}$

$= \dfrac{(a^2 + 1)^2}{a^2}$

$= \dfrac{a^2}{a^2}$

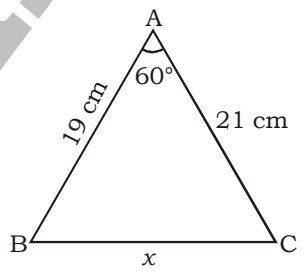
$= 1$

80. (A) h = 34 cm
$\pi r^2 h = 5236$

$\Rightarrow$ $\dfrac{22}{7} \times r^2 \times 34 = 5236$

$\Rightarrow$ $r = 7$
C.S.A. $= 2\pi rh$
$= 2\pi \times 7 \times 34$
$= 1496$ cm^2

81. (A)



$\cos 60° = \dfrac{19^2 + 21^2 - x^2}{2 \times 19 \times 21}$

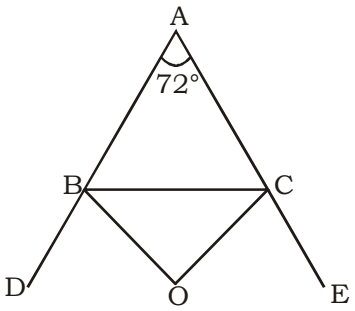
$\dfrac{1}{2} \times 2 \times 19 \times 21 = 19^2 + 21^2 - x^2$

$x^2 = 802 - 399$

$x = \sqrt{403}$

82. (C) $4\pi R_b^2 = 576\pi$
$R_b^2 = = 144$
$R_b = 12$ cm
$D_b = 24$cm
The total surface area of hemisphere $= 3\pi R_h^2$
$3\pi R_h^2 = 36.75\pi$
$R_h^2 = 3.5$
Diameter of small sphere when formed $= 2 \times 3.5 = 7$ cm
Difference in diameter = 24cm – 7cm
= 17 cm

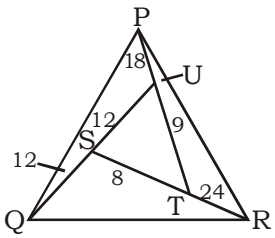
83. (C)

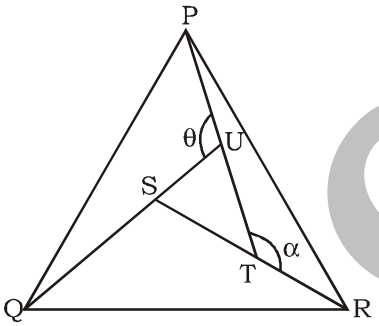


$\angle BOC = 90 - \frac{\angle A}{2} = 90° - 36°$

$= 54°$

84. (B)





Let $\angle PUQ = \theta$

Then $\angle SUT = 180 - \theta$

and Let $\angle RTP = \alpha$

Then $\angle STU = 180 - \alpha$

$\therefore$ Ratio of area of $\frac{\Delta PUQ}{\Delta SUT}$

$$= \frac{\frac{1}{2} \times 18 \times 24 \times \sin\theta}{\frac{1}{2} \times 12 \times 9 \times \sin(180 - \theta)}$$

$$= \frac{4\sin\theta}{\sin\theta}$$

$$\frac{\Delta PUQ}{\Delta SUT} = \frac{4}{1}$$

Now,

Ratio of area of $\frac{\Delta PTR}{\Delta SUT}$

$$= \frac{\frac{1}{2} \times 27 \times 24 \times \sin a}{\frac{1}{2} \times 9 \times 8 \times \sin(180 - a)}$$

$$= \frac{\Delta PTR}{\Delta SUT} = \frac{9\sin a}{\sin a} = \frac{9}{1}$$

$\therefore$ Ratio of Area of $\frac{\Delta PTR}{\Delta SUT} = \frac{4}{9}$

85. (A) ATQ,.

Let, $2021 = x$

$$\frac{x^4 + x^2 + 1}{x^3 + 1} = \frac{x^4 + x + x^2 + 1 - x}{x^3 + 1}$$

$$= \frac{x(x^3 + 1) + x^2 + 1 - x}{x^3 + 1}$$

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

$$= x + \frac{1}{x + 1}$$

Now, $x + \frac{1}{x+1} = p + \frac{q}{r}$

comparing both sides

$p = x$, $q = 1$, and $r = x + 1$

$p + q + r = x + 1 + x + 1$

$= 2x + 2$

Putting the values of

$x = 2021$

$p + q + r = 2 \times 2021 + 2$

$= 4042 + 2$

$= 4044$

86. (D) $x + y + xy = 3$

Adding 1 in both sides

$x + 1 + y(x + 1) = 4$

$(1 + x)(1 + y) = 4$ ...(1)

Similarly,

$(1 + y)(1 + z) = 9$ ...(2)

And, $(1 + z)(1 + x) = 16$ ....(3)

Multiplying eq. (1) × (2) and (3)

$(1 + x)^2 (1 + y)^2 (1 + z)^2 = 4 \times 9 \times 16$

Taking square root both sides

$\Rightarrow (1 + x)(1 + y)(1 + z) = 2 \times 3 \times 4$ ...(4)

From eq. (1)

$$1 + z = \frac{24}{4} = 6$$

$\Rightarrow z = 5$

Now, putting the value of eq. (2) in eq. (4)

$$1 + x = \frac{2 \times 3 \times 4}{9}$$

$$\Rightarrow x = \frac{8}{3} - 1$$

$$\Rightarrow x = \frac{5}{3}$$

From eq. (3)

$$1 + y = \frac{24}{16} = \frac{3}{2}$$

$$\Rightarrow y = \frac{1}{2}$$

$$6 \times xyz = 6 \times \frac{5}{3} \times \frac{1}{2} \times 5$$

$= 25$

87. (C) Volume of cone = $\frac{1}{3}$ × Base area × height

$$\Rightarrow \frac{1}{3} \times \text{base area} \times 24$$

$$= \frac{1}{3} \times 32\pi \times 6 + \frac{1}{3} \times 288\pi \times 10 +$$

$$\frac{1}{3} \times 50\pi \times 24 + \frac{1}{3} \times 128\pi \times 30$$

$\Rightarrow R^2_b \times 24 = 32 \times 6 + 288 \times 10 + 50 \times 24 + 128 \times 30$

$= 192 + 2880 + 1200 + 3840$

$\Rightarrow R^2_b = 338$

Base area of larges cone = πR^2_b

$= 338\pi$ cm^2

88. (A) ATQ.,

Perimeter of triangular base

$= 8 + 15 + 17$

$= 40$ cm

$$S = \frac{40}{2} = 20 \text{ cm}$$

Area of triangular base

$$= \sqrt{20(20-8)(20-15)(20-17)}$$

$$= \sqrt{3600}$$

$= 60$

Total surface area = 2 × L.S.A + Perimeter × Height of Prism

$1440 = 2 \times 60 + 40 \times h$

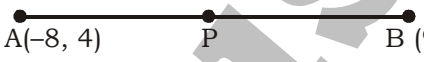
$h = 33$

Volume of prism

$= 60 \times 33$

$= 1980$ cm^3

89. (C) ATQ.,



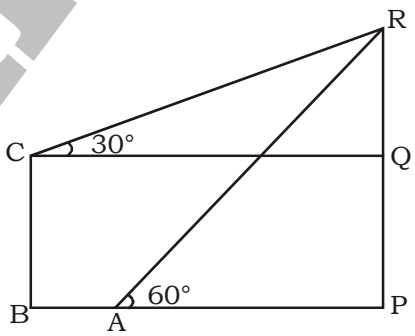
$$x = \frac{-24 + 18}{2 + 3} = \frac{-6}{5}$$

$$y = \frac{12 + 16}{2 + 3} = \frac{28}{5}$$

Co-ordinates of point P

$$= \left(\frac{-6}{5}, \frac{28}{5}\right)$$

90. (A)



In ΔRCQ

$$\tan 30° = \frac{RQ}{CQ}$$

$\Rightarrow QC = 900\sqrt{3}$ units

$AP = 900\sqrt{3} - 300\sqrt{3}$

$= 600\sqrt{3}$ units

In ΔRAP

$$\tan 60° = \frac{RP}{AP}$$

$$\Rightarrow \sqrt{3} = \frac{RQ}{600\sqrt{3}}$$

$RP = 1800$ units

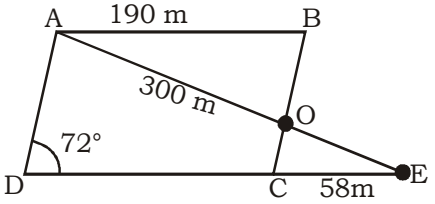
Height of small building = BC = QP

$= RP - RQ$

$= 1800 - 900$

$= 900$ units

91. (C)



$\Delta ABO \sim \Delta ECO$

$\because (\angle ABC = \angle ECO, \angle BAE = \angle AEC \text{ and } \angle AOB = \angle COE)$

$\Rightarrow \frac{AB}{EC} = \frac{OA}{OE}$

$\Rightarrow \frac{190}{58} = \frac{300}{OE}$

$OE = \frac{300 \times 58}{140}$

$= \frac{30 \times 58}{19}$

$= 91\frac{11}{19}$ metres

and $\angle BCE = 72°$

92. (B) since DEAF is rhombus then we have

side of rhombus $= \frac{AB \times AC}{AB + AC}$

$= \frac{12 \times 10}{(12+10)}$

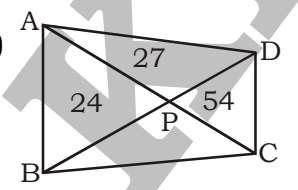
$= \frac{120}{22}$ cm

Now area = side × height

$= \frac{120}{22} \times 11$

$= 60 \text{ cm}^2$

93. (A)



We know in quadrilateral

$A_1 \times A_3 = A_2 \times A_4$

$\therefore 24 \times 54 = A_2 \times 27$

$A_2 = 48 \text{m}^2$

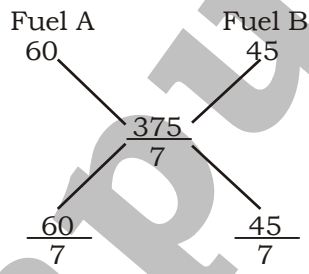
94. (B) ATQ.,

Let cost price of the mixture be ₹ x per/ litre

$\frac{x \times 175}{100} - \frac{x \times 87.5}{100} = 46.875$

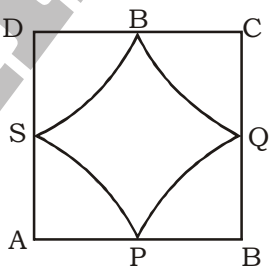
$\Rightarrow x = ₹ \left(\frac{375}{7}\right)$ perliter

Now, from mixture and allegation



Required ratio = A : B = 4 : 3

95. (A)



Required area of field = Area of square – grazed area – area of pond

$= (14)^2 - \left(\frac{90 \times 4}{360}\right)\pi (7)^2 - 20]$

$= 196 - \frac{22}{7} \times 49 - 20$

$= 196 - 154 - 20$

$= 22 \text{ m}^2$

96. (C) ATQ.,

$4x - 5z = 16$

Taking cube both sides

$\Rightarrow (4x - 5z)^3 = (16)^3$

$\Rightarrow 64x^3 - 125z^3 - 3(4x)(5z)(4x - 5z) = 4096$

$\Rightarrow 64x^3 - 125z^3 = 60 \times 12 \times 16 + 4096$

$= 15{,}616$

97. (D) $y = \dfrac{x^2-10x+64}{x^2+10x+64}$

$$\frac{dy}{dx} = \frac{(x^2+10x+64)(2x-10)-(x^2-10x+64)(2x+10)}{(x^2+10x+64)^2}$$

For maxima or mixima

Put $\dfrac{dy}{dx} = 0$

$$\frac{(x^2+10x+64)(2x-10)-(x^2-10x+64)(2x+10)}{(x^2+10x+64)^2} = 0$$

$(x^2 + 10x + 64)(x - 5) - (x^2 - 10x + 64)(x + 5) = 0$

$\Rightarrow x^3 + 10x^2 + 64x - 5x^2 - 50x - 320$
$-x^3 + 10x^2 - 64x - 5x^2 + 50x - 320 = 0$

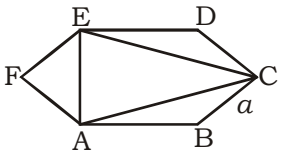
$\Rightarrow 10x^2 = 640$

$\Rightarrow x = 8$

For minimum value put $x = 8$ in given eq.

$$y = \frac{x^2-10x+64}{x^2+10x+64} = \frac{64-80+64}{64+80+64} = \frac{3}{13}$$

98. (A) Let the side of hexagon is a



Area of hexagon = $6 \times \dfrac{\sqrt{3}}{4}a^2$

$= 6\dfrac{\sqrt{3}}{4}a^2$

Area of $\Delta ACE = 6\dfrac{\sqrt{3}}{4}a^2 - \dfrac{a \times a}{2}\sin 120°$

Area of $\Delta ACE = \dfrac{3\sqrt{3}}{4}a^2$

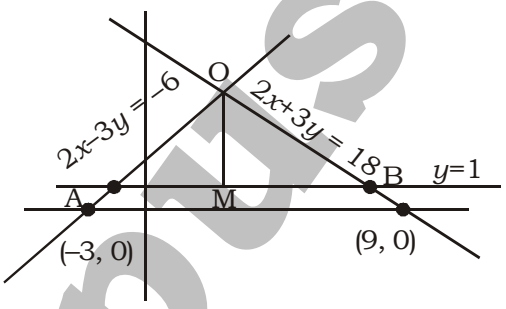
Required ratio = $\dfrac{Ar\ of\ \Delta ACE}{Area\ of\ hexagon\ ABCDEF}$

$= \dfrac{3\frac{\sqrt{3}}{4}a^2}{6 \times \frac{\sqrt{3}}{4}a^2} = \dfrac{1}{2}$

99. (D) ATQ.,

$2(\sin^6\theta + \cos^6\theta) - 3(\sin^4\theta + \cos^4\theta) - 1$
$= [(\sin^2\theta + \cos^2\theta) - 3\sin^2\theta\cos^2\theta]$
$- 3(1 - 2\sin^2\theta\cos^2\theta) - 1$
$= 2 - 6\sin^2\theta\cos^2\theta - 3 + 6\sin^2\theta\cos^2\theta - 1$
$= -2$

100. (A)



$2x - 3y = -6$ ...(1)

$2x + 3y = 18$ ...(2)

Solving eq. (1) and (2) for intersection points of O

$x = 3, y = 4$

Point O $\rightarrow$ (3, 4)

Point A $\rightarrow \left(-\dfrac{3}{2}, 1\right)$ by solving $y = 1$ and $2x - 3y = -6$

Point B $\rightarrow \left(\dfrac{15}{2}, 1\right)$ by solving $y = 1$, and $2x + 3y = 18$

AB = $\dfrac{15}{2} + \dfrac{3}{2} = 9$ units

Height of $\Delta AOB = 4 - 1 = 3$ units

Area of triangle ABC = $\dfrac{1}{2} \times 9 \times 3$

$= 13.5$ units^2