CAT Quantitative Aptitude Questions for Practice Set 3 - Solutions

Difficulty Level - Difficult

1. (a) : The average age of n men is X year. Total age is given by N years

$$\text{New average age } = \frac{NX + X - 1 + X + 1 + X + 2}{N + 3}$$

$$= \frac{NX + 3X + 2}{N + 3}$$

$$= \frac{X[N + 3]}{N + 3} + \frac{2}{N + 3}$$

$$\Rightarrow X + \frac{2}{N + 3}$$

2. (a) : Volume of tube $= \frac{2}{3}\pi a^3 + \pi a^2 b$

When it is half-full $= \frac{1}{3}\pi a^3 + \frac{1}{2}\pi a^2 b$

Volume of Cylinder

$$= \frac{1}{3}\pi a^3 + \frac{1}{2}\pi a^2 b - \frac{2}{3}\pi a^3 = \frac{1}{2}\pi a^2 b - \frac{1}{3}\pi a^3$$

Length in the cylinder

$$= \left(\frac{1}{2}\pi a^2 b - \frac{1}{3}\pi a^3\right), \pi a^2 = \frac{1}{2}b - \frac{1}{3}a$$

The height above the lowest point

$$\frac{1}{2}b - \frac{1}{3}a + a = \frac{2}{3}a + \frac{1}{2}b$$

When it is $\frac{1}{4}$ full, volume $= \frac{1}{6}\pi a^3 + \frac{1}{4}\pi^{a} b$

Volume of cylinder

$$= \frac{1}{6}\pi a^3 + \frac{1}{4}\pi a^2 b - \frac{2}{3}\pi a^3 = \frac{1}{4}\pi a^2 b - \frac{1}{2}\pi a^3$$

Length in the cylinder

$$= \left(\frac{1}{4}\pi a^2 b - \frac{1}{2}\pi a^3\right), \pi a^2 = \frac{1}{4} b - \frac{1}{2}a$$

The height above the lowest point

$$= \frac{1}{4}b - \frac{1}{2}a + a = \frac{1}{2}a + \frac{1}{4}b$$

When it is full, volume

$$= \frac{3}{4}\left(\frac{2}{3}\pi a^3 + \pi a^2 b\right) = \frac{1}{2}\pi a^3 + \frac{3}{4}\pi a^2 b$$

Volume in cylinder

$$= \frac{1}{2}\pi a^2 + \frac{3}{4}\pi a^2 b - \frac{2}{3}\pi a^3 = \frac{3}{4}\pi a^2 b - \frac{1}{6}\pi a^3$$

Length in the cylinder

$$= \left(\frac{3}{4}\pi a^2 b - \frac{1}{6}\pi a^3\right), \pi a^2 = \frac{3}{4}b - \frac{1}{6}a$$

The height above the lowest point

$$= \frac{3}{4}b - \frac{1}{6}a + a = \frac{5}{6}a + \frac{3}{4}b$$

3. (c) : For $n = 14$, $3^9 (1 + 3^3 + 3^6 + 3^5)$
$= 3^9 (1 + 27 + 729 + 243)$
$= 3^9 \times 10^3$.

4 (c) : Let Gopal's share be G, Abhishek's be A, Sadiq's be S and Pawan's be P.

Given that $G + 3 = A + \frac{A}{3} = \frac{80S}{100} = P - 4$

You get

$G = P - 7$ ..... (1)

$A = \frac{3}{4}(P - 4)$ ..... (2)

$S = \frac{5}{4}(P - 4)$ ….. (3)

Also given that $G + A + P + S = 80$….. (4)

Substituting the values from (1), (2) and (3) in (4), we get

$\left[P + \frac{3P}{4} + \frac{5P}{4} + P\right] - 7 - 3 - 5 = 80$ or $P = 23.75$

5. (a) : Let X = Total Amount of Gold
& Y = Total Amount of Platinum

$\frac{X}{Y} = \frac{2}{5}$ ..... (1)

Given $U_1 + P_1 = U_2 + P_2$ ..... (2)
$U_1 + U_1 = X$ & $P_1 + P_2 = Y$ ..... (3)
Also, given $U_1 = 3U_2$
From (2) $P_2 - P_1 = 2U_2$
Also, $X = 4U_2$ & $2P_1 = Y - 2U_2$

$\frac{X}{Y} = \frac{2}{5} = \frac{4U_2}{2P_1 + 2U_2}$

$4P_1 + 4U_2 = 20U_2$

$4P_1 = 16U_2 = \frac{16}{3}U_1$

$\frac{U_1}{P_1} = \frac{4 \times 3}{16} = \frac{3}{4}$

$U_1 : P_1 = 3 : 4$

Solutions for questions 6 to 8:

$9B + 3 + 5G + 4 = 200$ $9B + 5G = 193$
The positive integer solutions are $(B, G) = (2, 35)$ $(7, 25)$ $(12, 17)$ $(17, 8)$
Only one of the (B, G) gives $G > B$ and $9B + 3 > 100$, i.e. $(B, G) = (12, 17)$

6. (a) : $12 \times 9 - 17 \times 5 = 23$

7. (d) : $17 - 12 = 5$

8. (a) : $17 \times 5 = 85$

9. (a) : Let L be the vertical distance between the centers of two adjacent balls.

$L = \sqrt{\left[(2r)^2 - r^2\right]} = r\sqrt{3}$

Also, if the box can hold n sphere then $(n-1)L + 2r$

$\le 9r$ [the last ball height = $2r$]

$(n-1)\sqrt{3}\,r \le 7r$

$n \le \frac{7}{\sqrt{3}} + 1$

$n \le 5.04$

Since, n is a natural number.

$n = 5$

So, the box can hold maximum of 5 spheres.

10. (d) : Every number between 1000 and 2000, which is divisible by five and which can be formed by the given digits, must contains 5 in unit's place and 1 in thousand's place. Thus we are left with four digits out of which we are to place two between 1 and 5, which can be done in ${}^4P_2 = 12$ ways. Hence, 12 numbers can be formed.

11. (d) : In the first group, one question can be selected or can be rejected; so three questions can be dealt with in $2 \times 2 \times 2$ ways, but this includes the case when all three questions have been left; so they can be selected in $2^3 - 1 = 7$ ways. Similarly four questions of the second group can be selected in $2^4 - 1 = 15$ ways. Thus all seven questions can be selected in $15 \times 7 = 105$ ways; but this includes the case when all questions have been solved; hence leaving that case, total number of ways required is $105 - 1 = 104$

12. (b) : Let us assume that each receives 100 when 21.

$100 = P_1\,(1.0625)^3$ ….. (1)

$100 = P_2\,(1.0625)^2$ ….. (2)

From (1) & (2), $P_1 : P_2 = 16 : 17$

Now A's share $= \text{Rs. } 8448 \times \frac{16}{33} = \text{Rs. } 4096$

B's share = Rs. 4352

Now amount of A & B at 21 =

$(4096)\left(\frac{17}{16}\right)^3 = \text{Rs. } 4913.$

13. (a) : Let the solutions added be 2, 4 and 1 litre, respectively. Then quantity of ethanol in the solution is

$2 \times \frac{1}{3} + 4 \times \frac{2}{5} + 1 \times \frac{3}{7}$

$= \frac{2}{3} + \frac{8}{5} + \frac{3}{7}$

$= \frac{70 + 168 + 45}{105}$

$= \frac{283}{105}$

So, the quantity of methanol

$= 7 - \frac{283}{105}$

$= \frac{735 - 283}{105}$

$= \frac{452}{105}$

So the ratio of ethanol to methanol in the resultant solution is 283: 452.

14. (c) : After x hours $\frac{x}{12}$ of the first candle is burnt out = $\frac{x}{8}$ of the second is burnt out.

Remaining parts are $\left(1-\frac{x}{12}\right)$ and $\left(1-\frac{x}{8}\right)$

Now, $\left(1-\frac{x}{12}\right)=2\left(1-\frac{x}{8}\right)$ or $x=6$ hrs.

15. (d) : If Capital = X, then

$\left(\frac{X}{2}\right)\times\left(3\times\frac{1}{100}\right)+\frac{X}{3}\times\left(5\times\frac{1}{100}\right)+\left(\frac{X}{6}\right)\left(6\times\frac{1}{100}\right)$

= 250

X = Rs. 6000

16. (b) : $\frac{x}{5}+\frac{x}{6}$ = CP (x oranges of each type) = $\frac{11x}{30}$ and SP = $\frac{2x}{7}$

On selling $2x$ oranges, loss = $\frac{x}{5}+\frac{x}{6}-\frac{2x}{7}=\frac{17x}{210}$

If loss is 34, Total oranges = $\frac{2x\times 34}{\left(\frac{17x}{210}\right)}=840$

17. (b) : $P(1.05)^2-P=369$ or $P=3600$

18. (d) : 150/- wax; 8.5/- thread; 12.5/- coloured paper; 9/- silver powder

Profit = 40%.

Net input = 150 + 8.5 + 12.5 + 9 = 180/-

Net profit = 180 × .4 = 72/-

$\frac{1}{2}$ the candles = $\frac{1}{2}$ (180) = 90/-

At 50% profit = 45.

90 + 45 = 135/-

Let the remaining $\frac{1}{2}=x$

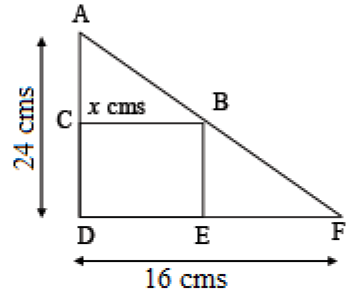
Net price = (72 + 180) = 135 + x

x = 117

Profit on second $\frac{1}{2}$ = 117 – 90 = 27

$\frac{27}{90}\times 100=30\%$

19. (d) : Let x cm be the side of the square, in the figure.



ABC and BFE are similar triangles, $AC = 24 - x$ cm

$EF = 16 - x$ cm $\Rightarrow \dfrac{BC}{AC} = \dfrac{EF}{BE}$

$\Rightarrow \dfrac{x}{(12-x)} = \dfrac{(8-x)}{x}$

$x^2 = (16 - x)\ (24 - x) = x = 9.6$ cm

20. (b) : Let weight of body by fourth experiment = x
Net total of seven experiments = 53.735 × 7
= 376.145 gms.
Net total of first three = 3 × 54.005 = 162.015 gms.
Net total of 6th & 7th = 2 × 53.991 = 107.982 gms.
$W_5 + W_4 = (x + 0.004) + x = 2x + 0.004$
$162.015 + 2x + 0.004 + 107.982 = 376.145$
$x = 53.072$ gms