QUANTITATIVE ABILITY - 72 (SOLUTION)

1. (C) Interest $= 37500 \times \frac{42}{625} = ₹\,2520$

$\frac{1}{5}$ th of money $= \frac{60000}{5} = ₹\ 12000$

Let rate = r%

ATQ,

$$12000 \times \left(\left(1+\frac{r}{100}\right)^2 - 1\right) = 2520$$

$$\left(1+\frac{r}{100}\right)^2 - 1 = \frac{2520}{12000}$$

$$1+\frac{r^2}{10000}+\frac{2r}{100}-1 = \frac{21}{100}$$

$$r^2 + 200r = \frac{21}{100} \times 10000$$

$r^2 + 200r - 2100 = 0$

$r^2 + 210r - 10r - 2100 = 0$

$r(r + 210) - 10(r + 210) = 0$

$(r - 10)\ (r + 210) = 0$

r = 10% p.a.

Now, money invested by man in business $= 4 \times \frac{60000}{5} - 3000 = ₹\,45000$

Let investment of Q = m

Ratio of share of profit of Man and Q = 37500 : (87400 - 37500) = 375 : 499

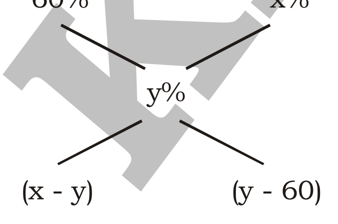
i.e., (45000 × 7 + 45000 × 1.1 × 5) : [m × 5 + (m - 4500) × 7] = 375 : 499

562500 × 499 = 375 × (12m - 31500)

562500 × 499 = 375 × 12m - 375 × 31500

$$m = \frac{562500 \times 499 + 375 \times 31500}{375 \times 12} = ₹\ 65000$$

2. (D) **By Alligation method :**



$$\frac{(x-y)}{(y-60)} = \frac{1}{3}$$

y - 60 = 3x - 3y

4y - 3x = 60 ....(i)

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Also,

$$\frac{\left(\left(\frac{y}{3}\right)+55\right)}{2}=\frac{x}{2}$$

$$\frac{y}{3}+55=x$$

3x - y = 165 ....(ii)

Adding equation (i) and (ii),

3y = 225

y = 75

$$x=\frac{(4\times75-60)}{3}=80$$

So, (I) and (II) can be determined.

(III) cannot be determined as only ratios are given, the volumes of each type of solution mixed is not provided.

(IV) : Volume of 60% spirit solution mixed initially = $\frac{9}{3}=3$ litres

Volume of y% spirit solution thus formed = 3 + 9 = 12 litres

3. (C) Let length of shorter and longer diagonals of the rhombus is 'a' and 'b' respectively.

Height of cylinder = $b\times\left(\frac{100}{40}\right)=2.5\,b$

Volume of sphere = $\left(\frac{4}{3}\right)\pi(a)^3$

Volume of cylinder = $\pi(b)^2(2.5\,b)$

Ratio of volumes = $\left[\left(\frac{4}{3}\right)\pi(a)^3\right]:\left[\pi(b)^2(2.5b)\right]=9:5$

$$\frac{a^3}{b^3}=27:8$$

a : b = 3 : 2

Let length of diagonals of rhombus is 3x and 2x respectively.

Area of rhombus = $\left(\frac{1}{2}\right)\times3x\times2x=147$

$x^2 = 49$

x = 7

Difference between the length of both the diagonals of the rhombus = 3x - 2x = x = 7 cm

4. (A) Here,

$(x + 2)^3 + (2x - 1)^3 + (2x + 3)^3 = (x + 2)(6x - 3)(2x + 3)$

$(x + 2)^3 + (2x - 1)^3 + (2x + 3)^3 - 3(x + 2)(2x - 1)(2x + 3) = 0$

As we know,

$a^3 + b^3 + c^3 - 3abc = (a + b + c)(a^2 + b^2 + c^2 - ab - bc - ac)$

Here,

a = x + 2, b = 2x - 1 and c = 2x + 3

Now, according to the question,

$a^3 + b^3 + c^3 - 3abc = 0$

So, $(a + b + c)(a^2 + b^2 + c^2 - ab - bc - ac) = 0$

And, $(a + b + c) = 0$

Then, $((x + 2) + (2x - 1) + (2x + 3)) = 0$

$x = -\frac{4}{5}$

Therefore, $(5x + 9)^2 = \left(5 \times \left(-\frac{4}{5}\right) + 9\right)^2 = 25$

5. (A) $\frac{5(4x^2 + 1) - 3x}{4x} = 8$

$20x^2 + 5 - 3x = 32x$

$20x^2 + 5 = 35x$

$4x^2 - 7x + 1 = 0$

$4x^2 + 1 = 7x = 0$ ....(i)

Now,

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

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

$$\left(\sqrt{2x} - \frac{1}{\sqrt{2x}}\right)^2 = \frac{(7x - 4x)}{2x} = \frac{3}{2}$$ [From (i)]

Therefore,

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

6. (A) $\left(\sqrt{x} - \frac{1}{\sqrt{x}}\right) = \sqrt{-5}$

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

$$x - 2 + \frac{1}{x} = -5$$

$x^2 - 2x + 1 = -5x$

$x^2 + 3x + 1 = 0$

Then,

$x^2 + 1 = -3x$ ....(i)

Now,

$$\frac{3(x^2 + 3) - 6 - 3x}{4x} = \frac{3(-3x + 2) - 6 - 3x}{4x}$$

$$= \frac{-9x + 6 - 6 - 3x}{4x} = \frac{-12x}{4x} = -3$$

7. (A) We know,

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

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

$(a^4 - b^4) = (a^2 + b^2)(a + b)(a - b)$

Now,

$$\frac{x^4-16}{x^2-6x+9}\times\frac{x^3-27}{(x^2+4)(x+2)}\div\frac{x^2+3x+9}{x-3}=\frac{3}{2}$$

$$\frac{(x^2+4)(x-2)(x+2)}{(x-3)(x-3)}\times\frac{(x-3)(x^2+3x+9)}{(x^2+4)(x+2)}\times\frac{x-3}{x^2+3x+9}=\frac{3}{2}$$

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

$2x - 4 = 3$

$2x = 7$

$$x=\frac{7}{2}=3.5$$

8. (D) We know,

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

$a^4 + b^4 + a^2b^2 = (a^2 - ab + b^2)(a^2 + ab + b^2)$

Then,

$$(x^4+y^4+x^2y^2)\frac{x^2-2xy+y^2}{x^2-xy+y^2}\div(x^3-y^3)$$

$$=(x^4+y^4+x^2y^2)\frac{x^2-2xy+y^2}{x^2-xy+y^2}\left(\frac{1}{x^3-y^3}\right)$$

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

9. (C) Given equation :

$x^2 + 4x - 1 = 0$

Here,

$\alpha\beta=-1$ and $(\alpha+\beta)=-4$

Now,

$$\left(\frac{\alpha^2}{\beta}\right)+\left(\frac{\beta^2}{\alpha}\right)=\alpha\beta=-1$$

And,

$$\left(\frac{\alpha^2}{\beta}\right)+\left(\frac{\beta^2}{\alpha}\right)=\frac{(\alpha^3+\beta^3)}{(\alpha\beta)}$$

We know,

$$(\alpha+\beta)^3=\alpha^3+\beta^3+3\alpha\beta(\alpha+\beta)$$

$$(-4)^3=\alpha^3+\beta^3+3\times(-1)(-4)$$

$$\alpha^3+\beta^3=-76$$

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Now,

$$\left(\frac{\alpha^2}{\beta}\right)+\left(\frac{\beta^2}{\alpha}\right)=\frac{(\alpha^3+\beta^3)}{(\alpha\beta)}=\frac{(-76)}{(-1)}=76$$

Therefore, the new equation:

$$x^2-\left[\left(\frac{\alpha^2}{\beta}\right)+\left(\frac{\beta^2}{\alpha}\right)\right]x+\left(\frac{\alpha^2}{\beta}\right)\left(\frac{\beta^2}{\alpha}\right)=0$$

$x^2 - 76x - 1 = 0$

10. (D) Total number of marbles kept in 50^{th} box = sum of factors for 50

= 1 + 2 + 5 + 10 + 25 + 50 = 93

11. (C) Let x be the required number and a be its first part so, $(x - a)$ will be its second part.

ATQ,

$0.8a = 0.6\ (x - a) + 3$

$0.8a + 0.6a = 0.6x + 3$

$1.4a = 0.6x + 3$

$$a=\frac{0.6x+3}{1.4} \quad \text{.........(i)}$$

Also,

$0.9a + 6 = 0.8\ (x - a)$

$0.9a + 0.8a = 0.8x - 6$

$1.7a = 0.8x - 6$

$$a=\frac{0.8x-6}{1.7} \quad \text{.........(ii)}$$

From (i) and (ii) ,

$$\frac{0.6x+3}{1.4}=\frac{0.8x-6}{1.7}$$

$1.02x + 5.1 = 1.12x - 8.4$

$0.1x = 13.5$

$$x=\frac{13.5}{0.1}=135$$

Alternative method

$$\frac{4}{5}a=\frac{3}{5}(x-a)+3$$

$$\left(\frac{4}{5}+\frac{3}{5}\right)a=\frac{3}{5}a+3 \quad \text{--------(i)}$$

Also, $\dfrac{9}{10}a+6=\dfrac{4}{5}(x-a)$

$$\left(\frac{9}{10}+\frac{4}{5}\right)a=\frac{4}{5}x-6 \quad \text{--------(ii)}$$

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From (i) and (ii), we get,

$$\left(\frac{3}{5}x+3\right)\times\left(\frac{9+8}{10}\right)=\left(\frac{4}{5}x-6\right)\times\left(\frac{4+3}{5}\right)$$

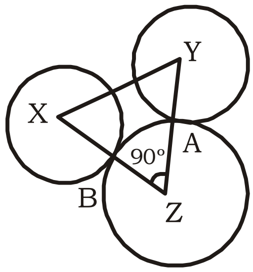
$$\frac{51}{50}x+\frac{51}{10}=\frac{28}{25}x-\frac{42}{5}$$

$$\left(\frac{56}{50}-\frac{51}{50}\right)x=\frac{51}{10}+\frac{42}{5}$$

$$x=\frac{135}{10}\times\frac{50}{5}=135$$

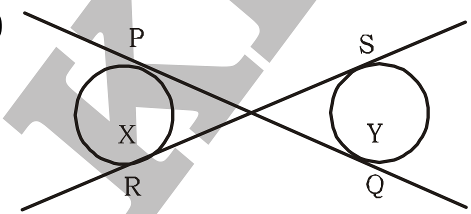
12. (A) Let the two digit number be $10y + x$ where $x > y$.
ATQ,
$10x + y - 10y - x = 63$
$9x - 9y = 63$
$x - y = 7$
$x = 7, 8, 9$ and $y = 0, 1, 2$
$\therefore$ Possible values of x are 7, 8, 9

13. (B) XZ = $r + 9$ and YZ = $r + 2$



$XY^2 = XZ^2 + ZY^2$
$17^2 = (r + 9)^2 + (r + 2)^2$
$289 = r^2 + 18r + 81 + r^2 + 4r + 4$
$2r^2 + 22r + 85 - 289 = 0$
$2r^2 + 22r - 204 = 0$
$r^2 + 11r - 102 = 0$
$r^2 + 17r - 6r - 102 = 0$
$r(r + 17) - 6(r + 17) = 0$
$(r - 6)(r + 17) = 0$
$r = 6$ cm

14. (A)



Length of transverse tangent = $\sqrt{XY^2-(r_1+r_2)^2}$

$8 = \sqrt{XY^2-9^2}$
$64 = XY^2 - 81$
$XY^2 = 64 + 81 = 145$
$XY = \sqrt{145}$

15. (C) AB is diameter

$\angle ADB = 90°$ also $DO \perp AB$ at 'O', the centre of the circle.

$\Delta ADO \cong \Delta BDO$ (by SAS cong. Rule)

AD = DB (by CPCT)

$\angle DAB = \angle ABD = 45°$

But $\angle ACD = \angle ABD = 45°$ (angles in the same segment of a circle)

16. (A) $\angle CAD = \angle CBD = 60°$ (Angles in the same segment of a circle)

Now $\angle BAD = \angle BAC + \angle CAD = 30° + 60° = 90°$

Now $\angle BAD + \angle BCD = 180°$ ($\because$ □ ABCD is cyclic)

$90° + \angle BCD = 180°$

$\angle BCD = 180° - 90° = 90°$

17. (A) Required average age just before the birth of the youngest member = $\frac{(10 \times 20) - (10 \times 10)}{10 - 1}$

$= \frac{100}{9} = 11.11$ years

18. (C) Weight of first member = x kg

Weight of second member = $(x + 2)$

Weight of fifth member = $(x + 8)$ kg

19. (B) $(2m + 4b) \times 10 = (4m + 5b) \times 6$

$20m + 40b = 24m + 30b$

$4m = 10b \Rightarrow 2m = 5b$

$5b = 2 \times 40$

$b = \frac{2 \times 40}{5} = 16$

$\therefore$ Required ratio = 40 : 16 = 5 : 2

20. (B) **In case I.**

Let the number of shirts of brand B be x.

Let the cost of a shirt of brand B be ₹ 1

$\therefore$ Original cost = $4 \times 2 + x$ = ₹ $(8 + x)$

In case II.

$4x + 2x = (8 + x) \times \frac{140}{100} = (8 + x)\frac{7}{5}$

$20 + 10x = 56 + 7x$

$10x - 7x = 56 - 20 = 36$

$3x = 36 \Rightarrow x = 12$

$\therefore$ Required ratio = 4 : 12 = 1 : 3

21. (C) Volume of the ice-cream in cylindrical container = $\pi r^2 h = \frac{22}{7} \times 6 \times 6 \times 15$ cm³

Let r cm be the radius of the cone, its height = $4r$ cm

Volume of 1 cone with hemispherical top = $\frac{1}{3}\pi r^2 h + \frac{2}{3}\pi r^3 = \frac{1}{3}\pi r^2 \times 4r + \frac{2}{3}\pi r^3$

$= \frac{4}{3}\pi r^3 + \frac{2}{3}\pi r^3 = \frac{6}{3}\pi r^3 = 2\pi r^3$

Volume of 10 such cones = $10 \times 2\pi r^3$ cm³

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ATQ,

$\frac{22}{7}\times6\times6\times15 = 10\times2\pi r^3$

$\frac{22}{7}\times6\times6\times15 = 10\times2\times\frac{22}{7}\times r^3$

$r^3 = \frac{6\times6\times15}{10\times2} = \frac{6\times6\times6}{2\times2\times2}$

$r = \frac{6}{2}$ cm = 3 cm

22. (A) Area of rectangular field = $\frac{1000}{\frac{1}{4}}$ m² = 4000 m²

Breadth = 50 m

Length = $\frac{4000}{50}$ = 80 m

New length of field = (80 + 20) m = 100 m

New area = 100 × 50 = 5000 sq. m

∴ Required expenditure = ₹$\left(5000\times\frac{1}{4}\right)$ = ₹ 1250

23. (C) $3^{61284} = (3)^{4*15321} = 81^{15321}$

When 81 is divided by 5, remainder is 1

When 81^{15321} is divided by 5, remainder is $1^{15321} = 1$

So, x = 1

$4^{96} = 4^{4*24}$

When 4^4 is divided by 6, remainder is 4.

Again, $4^{24} = 4^{4*6}$

When $4^6 = 4^{2*3}$ is divided by 6, remainder is 4.

So, when 4^{96} is divided by 6, remainder is 4.

So, y = 4

2x - y = 2 - 4 = -2

24. (C) $\frac{2\sqrt{10}}{\sqrt{5}+\sqrt{2}-\sqrt{7}} - \sqrt{\frac{\sqrt{5}-2}{\sqrt{5}+2}} - \frac{2}{\sqrt{7}-2}$

Rationalizing:

$$\frac{2\sqrt{10}\left(\sqrt{5}+\sqrt{2}+\sqrt{7}\right)}{\left(\sqrt{5}+\sqrt{2}-\sqrt{7}\right)\left(\sqrt{5}+\sqrt{2}+\sqrt{7}\right)} - \sqrt{\frac{\left(\sqrt{5}-2\right)\left(\sqrt{5}-2\right)}{\left(\sqrt{5}+2\right)\left(\sqrt{5}-2\right)}} - \frac{3\left(\sqrt{7}+2\right)}{\left(\sqrt{7}-2\right)\left(\sqrt{7}+2\right)}$$

$$= \frac{2\sqrt{10}\left(\sqrt{5}+\sqrt{2}+\sqrt{7}\right)}{\left(\sqrt{5}+\sqrt{2}\right)^2-\left(\sqrt{7}\right)^2} - \frac{\sqrt{5}-2}{\sqrt{\left(\sqrt{5}\right)^2-2^2}} - \frac{3\left(\sqrt{7}+2\right)}{\left(\sqrt{7}\right)^2-2^2}$$

$$= \frac{2\sqrt{10}\left(\sqrt{5}+\sqrt{2}+\sqrt{7}\right)}{\left(5+2+2\sqrt{5}\sqrt{2}\right)-7} - \frac{\sqrt{5}-2}{\sqrt{5-4}} - \frac{3\left(\sqrt{7}+2\right)}{7-4}$$

$$= \frac{2\sqrt{10}\left(\sqrt{5}+\sqrt{2}+\sqrt{7}\right)}{2\sqrt{10}} - \frac{\sqrt{5}-2}{\sqrt{1}} - \frac{3\left(\sqrt{7}+2\right)}{3}$$

$$= \sqrt{5}+\sqrt{2}+\sqrt{7}-\sqrt{5}+2-\sqrt{7}-2 = \sqrt{2}$$

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25. (D) Let the second sum be ₹ x.

Then, $\frac{7500\times6\times1}{100}+\frac{x\times10\times1}{100} = \frac{(7500+x)\times17\times1}{100\times2}$

$450+\frac{x}{10}=\frac{1275}{2}+\frac{17x}{200}$

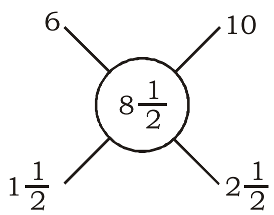
$\frac{x}{10}-\frac{17x}{200}=\frac{1275}{2}-450$

$\frac{3x}{200}=\frac{375}{2}$

x = ₹ 12500

Short trick

From the rule of alligation



Ratio between 1st and 2nd sum = 3 : 5

2nd sum = $\frac{5}{3}\times7500$ = ₹ 12500

26. (C) $\frac{\sin\theta+\cos\theta-1}{\sin\theta+\cos\theta+1}\times\frac{\tan^2\theta\left(\text{cosec}^2\theta-1\right)}{\sec\theta-\tan\theta} = \frac{\frac{\sin\theta+\cos\theta-1}{\cos\theta}}{\frac{\sin\theta-\cos\theta+1}{\cos\theta}}\times\frac{\tan^2\theta\left(\cot^2\theta\right)}{\sec\theta-\tan\theta}$

$= \frac{\tan\theta+1-\sec\theta}{\tan\theta-1+\sec\theta}\times\frac{1}{\text{sac}\,\theta-\tan\theta} = \frac{\sec^2\theta-\tan^2\theta+\tan\theta-\sec\theta}{\tan\theta-1+\sec\theta}\times\frac{1}{\sec\theta-\tan\theta}$

$= \frac{(\sec\theta-\tan\theta)(\sec\theta+\tan\theta)-(\sec\theta-\tan\theta)}{\tan\theta-1+\sec\theta}\times\frac{1}{\sec\theta-\tan\theta}$

$= \frac{(\sec\theta-\tan\theta)(\sec\theta+\tan\theta-1)}{\tan\theta-1+\sec\theta}\times\frac{1}{\sec\theta-\tan\theta} = 1$

27. (A) $x = \sqrt[6]{27}-\sqrt{6\frac{3}{4}} = \sqrt{3}-\sqrt{\frac{27}{4}}$

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

$x^2 = \left(-\frac{\sqrt{3}}{2}\right)^2 = \frac{3}{4}$

And,

$$y = \frac{\sqrt{45}+\sqrt{605}+\sqrt{245}}{\sqrt{80}+\sqrt{125}} = \frac{3\sqrt{5}+11\sqrt{5}+7\sqrt{5}}{4\sqrt{5}+5\sqrt{5}} = \frac{21\sqrt{5}}{9\sqrt{5}} = \frac{7}{3}$$

$$y^2 = \frac{49}{9}$$

Therefore, $x^2 + y^2 = \left(\frac{3}{4}\right)+\left(\frac{49}{9}\right) = \frac{223}{36}$

28. (C) Here, $\angle P = 120°$

PQ + QS = SR

Let, PQ = x, QS = y then SR = x + y

And, let $\angle Q = a$

Then, $\angle QPS = 90° - a$

$\angle SPR = 120° - (90° - a) = 30° + a$

$\angle SRP = 90° - (30° + a) = 60° - a$

Now, $\sin a = \frac{PS}{x}$

$PS = x \sin a$ ....(i)

$\sin(90° - a) = \frac{y}{x}$ ......(ii)

$\sin(30° + a) = \frac{(x+y)}{PR}$ ......(iii)

$\sin(60° - a) = \frac{PS}{PR}$ ......(iv)

Then, from (iii) and (iv), we get

$$\frac{\sin(30°+a)}{\sin(60°-a)} = \frac{(x+y)}{PS} \quad .....(v)$$

Now, from (i) and (v), we get

$$\frac{\sin(30°+a)}{\sin(60°-a)} = \frac{(x+y)}{(x \sin a)}$$

$$\sin a \sin(30° + a) = \left(\frac{1+y}{x}\right)\left[\sin(60°-a)\right]$$

$\sin a \sin(30° + a) = [1 + \sin(90° - a)] [\sin(60° - a)]$ [From (ii)]

$\sin a \sin(30° + a) = \sin(60° - a) + \sin(90° - a) (\sin(60° - a))$

Here, $\sin(30° + a) = \cos(90° - 30° - a) = \cos(60° - a)$

Then,

$\sin a \cos(60° - a) - \cos a (\sin(60° - a)) = \sin(60° - a)$

$\sin [a - (60° - a)] = \sin(60° - a)$

$[a - (60° - a)] = (60° - a)$

$a = 40°$

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29. (D) Since,

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

And, $(a^2 + ab + b^2) = \dfrac{a^3 - b^3}{a + b}$

Also,

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

And, $(a^2 - ab + b^2) = \dfrac{a^3 + b^3}{a + b}$

Then,

$$\frac{(4.6)^4 + (5.4)^4 + (24.84)^2}{(4.6)^4 + (5.4)^4 + (24.84)^2}$$

$$= \frac{\left((4.6)^2\right)^2 + \left((5.4)^2\right)^2 + (24.84)^2}{(4.6)^2 + (5.4)^2 + 24.84} = \frac{\dfrac{\left(4.6^6 - 5.4^6\right)}{\left(4.6^2 - 5.4^2\right)}}{\dfrac{\left(4.6^3 - 5.4^3\right)}{(4.6 - 5.4)}}$$

$$= \frac{\left(4.6^3 - 5.4^3\right)\left(4.6^3 + 5.4^3\right)}{(4.6 - 5.4)(4.6 + 5.4)} \times \frac{(4.6 - 5.4)}{\left(4.6^3 - 5.4^3\right)} = \frac{\left(4.6^3 + 5.4^3\right)}{(4.6 + 5.4)}$$

$= 4.6^2 - 4.6 \times 5.4 + 5.4^2 = 25.48$

30. (A) $\dfrac{\sin\theta}{1+\cos\theta} + \dfrac{1+\cos\theta}{\sin\theta} = \dfrac{4}{\sqrt{3}}$

$$\frac{\sin^2\theta + 1 + \cos^2\theta + 2\cos\theta}{\sin\theta(1+\cos\theta)} = \frac{4}{\sqrt{3}}$$

$$\frac{1 + 1 + 2\cos\theta}{\sin\theta(1+\cos\theta)} = \frac{4}{\sqrt{3}}$$

$$\frac{2(1+\cos\theta)}{\sin\theta(1+\cos\theta)} = \frac{4}{\sqrt{3}}$$

$$\sin\theta = \frac{\sqrt{3}}{2}$$

$\sin\theta = \sin 60°$

$\theta = 60°$

Then, $(\tan\theta + \sec\theta)^{-1} = (\tan 60° + \sec 60°)^{-1}$

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

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31. (C) Let R = Age of Randheer,
A = Age of Anup
ATQ,

$\frac{R-6}{18} = A$

Given,
$\because$ Mahesh = 5 years
$\therefore$ Anup = (5 – 2) years = 3 years

$\frac{R-6}{18} = 3$

R = 18 × 3 + 6 = 60 years

32. (A) Cost of 9 lemons = 4 × 48 paise = 144 paise = cost of 4 mangoes

So, cost of 3 mangoes = $\frac{144}{4} \times 3$ = 108 paise = Cost of 5 apples

Cost of 9 oranges = 108 paise

Cost of 1 orange = $\frac{108}{9}$ = 12 paise

33. (A) Sum of digits from numbers 1 to 10 = 46,
Sum of digits from numbers 11 to 20 = 56
Sum of digits from numbers 21 to 29 = 63
Sum of digits of the given numbers = 46 + 56 + 63 = 165
Again,
Sum of digits of the number 165 = 1 + 6 + 5 = 12
Now, when 12 is divided by 9, we get remainder = 3

34. (A) Let x be the number.

Then calculation done by the student = $\frac{x+12}{6} = 112$

$x = 660$

So, the correct answer = $\frac{660}{6} + 12 = 122$

35. (D) Let x be the number of students and w be their average weight.
ATQ,

$\frac{xw+50}{x+1} = w + 1$

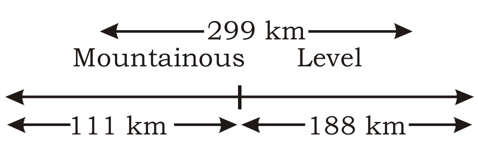
$x + w = 49$ .... (i)

Again, $\frac{xw+50+50}{x+2} = w + 1.5$

$1.5x + 2w = 97$ .... (ii)

From equations (i) and (ii), we get,
$w = 47$

36. (C) Let the speed of train on level terrain = x km/h
So, the speed of train through mountainous terrain = $(x - 10)$km/h



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ATQ,

$\frac{188}{x} + \frac{111}{x-10} = 7$

$\frac{188x - 1880 + 111x}{x(x-10)} = 7$

$7x^2 - 369x + 1880 = 0$

$x = 47$ km/h

37. (B) The total number of men employed = 50

So, total number of women employed = 100

Total number of children employed = 150

Now, let the men, women and children wages are $6x$, $3x$ and $2x$ respectively.

$50 \times 6x + 100 \times 3x + 150 \times 2x = 4500$

$900x = 4500$

$x = 5$

Per day wages paid to a man, a woman and a child are ₹ 30, ₹ 15 and ₹ 10.

Weekly wages paid to a man, a woman and a child are ₹ 210, ₹ 105 and ₹ 70

38. (B) Let the present and last year salaries of Mahesh and Suresh are x, x' and y, y' respectively.

$\frac{x'}{y'} = \frac{3}{5}, \frac{x'}{x} = \frac{2}{3}$

$\frac{y'}{y} = \frac{4}{5}$

$\frac{\frac{x'}{x}}{\frac{y'}{y}} = \frac{\frac{2}{3}}{\frac{4}{5}}$

$\frac{x'}{y'} \times \frac{y}{x} = \frac{10}{12}$

$\frac{3}{5} \times \frac{y}{x} = \frac{10}{12}$

$\frac{y}{x} = \frac{50}{36}$

$x + y = 43000$

$x + \frac{50}{36}x = 43000$

$x = \frac{43000 \times 36}{86} =$ ₹ 18000

39. (A) Let the value of second rate of interest be x% and equal amounts be P each.

ATQ,

$P \times \left(1 + \frac{5}{100}\right)^6 = P \times \left(1 + \frac{x}{100}\right)^3$

$\left(1 + \frac{5}{100}\right)^2 = \left(1 + \frac{x}{100}\right)$

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$\frac{105\times105}{100\times100} = \frac{100+x}{100}$

110.25 = 100 + x

$x = 10\frac{1}{4}\%$

40. (D) Let the man went up stream for x km.
He turned back downstream for (x – 2) km.
ATQ,

$\frac{x}{(4.5-1.5)} + \frac{x-2}{(4.5+1.5)}$ = 2 h 10 min

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

$3x - 2 = 13$
x = 5 km

41. (B) 12.5% of profit = $\frac{12.5}{100}\times 880$ = ₹ 110

Remaining ₹ 770 is divided in the ratio = 5000 : 6000 = 5 : 6

Profit to Anu = $\frac{5}{11}\times 770 + 110$ = ₹ 460

Profit to Bimla = $\frac{6}{11}\times 770$ = ₹ 420

Required profits are ₹ 460 and ₹ 420

42. (B) A's 1 day work = $\frac{1}{40}$

So, A's 5 day work = $\frac{1}{40}\times 5 = \frac{1}{8}$

So, remaining work = $1 - \frac{1}{8} = \frac{7}{8}$

B completed the remaining work in 21 days So, 1 day's work of B = $\frac{7}{8\times21} = \frac{1}{24}$

Both (A + B)'s 1 day work = $\frac{1}{40} + \frac{1}{24} = \frac{3+5}{120} = \frac{8}{120} = \frac{1}{15}$

Hence, both complete the work in 15 days.

43. (D) Let (A + B) together complete the work in x hours.
A completes the work in (x + 8) days.

B completes the work in $\left(x+\frac{9}{2}\right)$ days.

Using formula,

$$\frac{(x+8)\left(x+\frac{9}{2}\right)}{2x+\frac{25}{2}} = x$$

$x^2 + 8x + \frac{9}{2}x + 36 = 2x^2 + \frac{25}{2}x$

$x^2 = 36$
x = 6 days

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44. (A) $\sin(\alpha+\beta) = \sqrt{1-\cos^2(\alpha+\beta)} = \sqrt{1-\frac{16}{25}} = \sqrt{\frac{19}{25}} = \frac{3}{5}$

$\cos(\alpha-\beta) = \sqrt{1-\sin^2(\alpha-\beta)} = \sqrt{1-\frac{25}{169}} = \sqrt{\frac{144}{169}} = \frac{12}{13}$

$\tan(\alpha+\beta) = \frac{\sin(\alpha+\beta)}{\cos(\alpha+\beta)} = \left(\frac{3}{5}\times\frac{5}{4}\right) = \frac{3}{4}$

$\tan(\alpha-\beta) = \frac{\sin(\alpha-\beta)}{\cos(\alpha-\beta)} = \frac{5}{13}\times\frac{13}{12} = \frac{5}{12}$

$\tan(2\alpha) = \tan[(\alpha+\beta)+(\alpha-\beta)] = \frac{\tan(\alpha+\beta)+\tan(\alpha-\beta)}{1-\tan(\alpha+\beta)\tan(\alpha-\beta)} = \frac{\frac{3}{4}+\frac{5}{12}}{1-\frac{3}{4}\times\frac{5}{12}} = \frac{56}{33}$

45. (A) $\sin 3A = \cos(A-30)$

$\cos(90-3A) = \cos(A-30)$

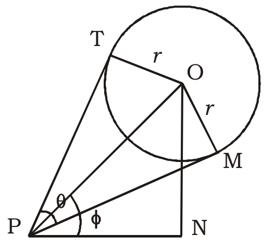
$(90-3A) = A-30$

$120 = 4A$

$A = 30^\circ$

Now, $\tan 2A = \tan 2\times 30^\circ = \tan 60^\circ = \sqrt{3}$

46. (C) Let the balloon subtends an angle θ at the eye of the observer at P.



In ΔOMP,

$\frac{MO}{PO} = \sin\theta/2$

$\frac{r}{PO} = \sin\theta/2$

PO = r cosec $\theta/2$

Now,

In ΔONP,

$\sin\phi = \frac{ON}{PO} = \frac{ON}{r\,\text{cosec}\,\theta/2}$

ON = r cosec $\theta/2\ \sin\phi$

The height of the balloon = $r\sin\phi\,\text{cosec}\,\theta/2$

47. (C) Let 'A' the point h m above the lake where the angle of elevation of the cloud is 'θ' and the angle of depression in the lake is 'ϕ'.

Let MB = x m

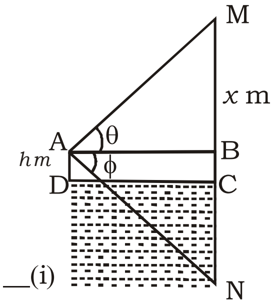
In Δ ABM

$\tan\theta = \frac{MB}{AB}$

$\Rightarrow AB = \frac{MB}{\tan\theta}$

$= \frac{x}{\tan\theta}$

$\therefore AB = x\cot\theta$ __(i)



In Δ ABN,

$\tan\phi = \frac{BN}{AB}$ [Now BN = BC + NC = $h + x + h = (x + 2h)$m

$\tan\phi = \frac{x+2h}{AB}$

AB = $(x + 2h)\cot\phi$ [$\because$ In a plane mirror, image distance = object distance]

$x + h$ = NC

From (i) and (ii), we have

$x\cot\theta\ (x + 2h)\cot\phi$

$x(\cot\theta - \cot\phi) = 2h\cot\phi$

$x = \frac{2h\cot\phi}{\cot\theta - \cot\phi}$

Height of the cloud above the lake = $x + h = \frac{2h\cot\varphi}{\cot\theta - \cot\varphi} + h$

$= \frac{2h\cot\varphi + h\cot\theta - h\cot\varphi}{\cot\theta - \cot\varphi}$

$= \frac{h\cot\phi + h\cot\theta}{\cot\theta - \cot\phi}\ h\left[\frac{\cot\phi + \cot\theta}{\cot\theta - \cot\phi}\right] = h\left[\frac{\tan\phi + \tan\theta}{\tan\phi - \tan\theta}\right]$

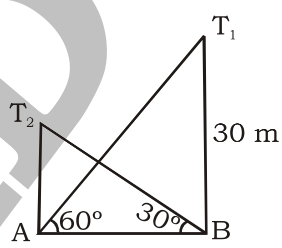
48. (B) Let T_1 & T_2 represents the two towers.

In ΔABT_1

$\tan 60^\circ = \frac{T_1B}{AB}$

$\sqrt{3} = \frac{30}{AB}$

$\Rightarrow AB = \frac{30}{\sqrt{3}}$



In ΔABT_2

$\tan 30^\circ = \frac{T_2A}{AB}$

$\frac{1}{\sqrt{3}} = \frac{T_2A}{10\sqrt{3}}$

$T_2A = \frac{10\sqrt{3}}{\sqrt{3}} = 10$ m

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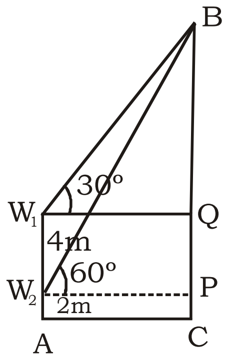
49. (B) Let W_1 and W_2 are two window of a house which are at the height of 6 m and 2 m above the ground.



Let AC = x cm

$W_1P = W_2Q = AC = x$ m

QP = 4 m

In ΔBPW_1

$\tan 60° = \frac{BP}{W_1P}$

$\sqrt{3} = \frac{BQ + 4}{W_1P}$

$BQ + 4 = \sqrt{3} \times W_1P = \sqrt{3} \times x$ m

$BQ = \sqrt{3}\,x - 4$ m

In ΔBQW_2

$\tan 30° = \frac{BQ}{W_2Q}$

$\frac{1}{\sqrt{3}} = \frac{\sqrt{3}x + 4}{x}$

$x = 3x - 4\sqrt{3}$

$-2x = -4\sqrt{3}$

$\therefore$ $x = 2\sqrt{3}$

Height of the balloon = BQ = $\sqrt{3}x - 4$

$= \sqrt{3} \times 2\sqrt{3} - 4 = 6 - 4 = 2$ m

Height of the balloon above the ground = 2 + 4 + 2 = 8 m

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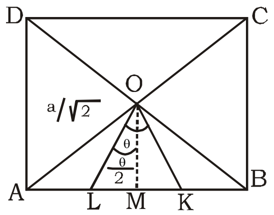
50. (C) Let sides of a square be a.

Then, AC = a $\sqrt{2}$ and AO = OC = $\frac{a}{\sqrt{2}}$

Here, AM = $\frac{a}{2}$



$\therefore$ LM = $\frac{a}{\sqrt{2}} - \frac{a}{2}$ and OM = $\frac{a}{2}$

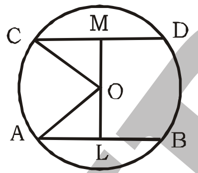
In Δ OML,

$$\tan\frac{\theta}{2} = \frac{\frac{a}{\sqrt{2}} - \frac{a}{2}}{\frac{a}{2}} = \frac{\frac{\sqrt{2}-1}{2}}{\frac{1}{2}} = \sqrt{2} - 1$$

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

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

51. (B) From O draw OL $\perp$ AB and OM $\perp$ CD and join OA and OC.



AL = $\frac{1}{2}$ cm, AB = 5 cm, OA = 13 cm

$OL^2 = OA^2 - AL^2 = (13)^2 - (5)^2 = 144$

OL = $\sqrt{144}$ = 12 cm

Now, CM = $\frac{1}{2}\times$CD = 12 cm and OC = 13 cm

$\therefore$ $OM^2 = OC^2 - CM^2 = (13)^2 - (12)^2 = 25$

OL = $\sqrt{25}$ = 5 cm

ML = OM + OL = (5 + 12) cm = 17 cm

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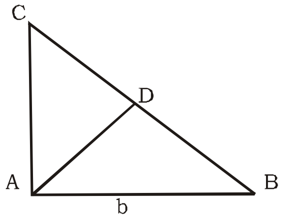
52. (A) In ΔABC,



$A = \frac{1}{2} \times \text{base} \times \text{altitude} = \frac{1}{2} \times b \times AC$

$AC = \frac{2A}{b}$

Using Pythagoras theorem,

$AC^2 + AB^2 = BC^2$

$BC = \sqrt{\frac{4A^2}{b^2} + b^2}$

Again in ΔABC, $A = \frac{1}{2} \times BC \times AD$

$AD = \frac{2A}{\sqrt{\frac{4A^2 + b^4}{b^2}}} = \frac{2Ab}{\sqrt{4A^2 + b^4}}$

53. (C) XY || AC,

ΔBXY & ΔBAC are similar (by AA similarity.)

$\because$ XY divides ΔBAC into two parts of equal area.

$\therefore$ $ar(\Delta BXY) = ar(\text{quad. } XYCA) = \frac{1}{2} ar(\Delta BAC)$

$\frac{ar(\Delta BXY)}{ar(\Delta BAC)} = \frac{BX^2}{BA^2}$

$\frac{ar(\Delta BXY)}{2ar(\Delta BXY)} = \frac{BX^2}{BA^2}$

$\frac{1}{2} = \frac{BX^2}{BA^2}$

$\frac{BX}{BA} = \frac{1}{\sqrt{2}}$

$1 - \frac{BX}{BA} = 1 - \frac{1}{\sqrt{2}}$

$\frac{BA - BX}{BA} = \frac{\sqrt{2} - 1}{\sqrt{2}}$

$\therefore$ $\frac{AX}{AB} = \frac{\sqrt{2} - 1}{\sqrt{2}} = \frac{2 - \sqrt{2}}{2}$

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54. (B) Amount invested at 12% = ₹ x.

Amount invested at 10% = ₹ y.

$$130 = \frac{x \times 12 \times 1}{100} + \frac{y \times 10 \times 1}{100}$$

$$13000 = 12x + 10y \qquad \text{.... (i)}$$

$$134 = \frac{x \times 10 \times 1}{100} + \frac{y \times 12 \times 1}{100}$$

$$13400 = 10x + 12y \qquad \text{.... (ii)}$$

Solving equations (i) and (ii), we get

x = ₹ 500

So, amount invested at 12% of ₹ 500.

55. (B) 15 M = 24 W = 36 B

$$1 \text{ W} = \frac{5}{8} \text{ M and } 1\text{B} = \frac{5}{12} \text{M}$$

$$\therefore \quad 12\text{W} + 6\text{B} = \frac{5}{8} \times 12 + \frac{5}{12} \times 6 = 10 \text{ M}$$

Now, $m_1 \times d_1 \times t_1 \times w_2 = m_2 \times d_2 \times t_2 \times w_1$

Let the number of additional men required be x.

$$15 \times 12 \times 8 \times \frac{9}{4} = (10 + x) \times 30 \times 6$$

$$(10 + x) = \frac{15 \times 3 \times 8 \times 9}{30 \times 6}$$

$x = 18 - 10 = 8$

56. (A) Let the three parts be ₹ x, ₹ y and ₹ z.

According to question,

$$x + \frac{x \times 2 \times 5}{100} = y + \frac{y \times 3 \times 5}{100} = z + \frac{z \times 4 \times 5}{100}$$

$$1.1x = 1.15y = 1.2z$$

$$\frac{x}{y} = \frac{1.15}{1.1} = \frac{23}{22}$$

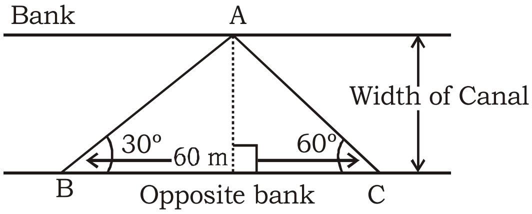
$$\text{And, } \frac{y}{z} = \frac{1.2}{1.15} = \frac{24}{23}$$

$$x : y : z = 276 : 264 : 253$$

$$x = \frac{276}{793} \times 1586 = ₹\ 552$$

Three parts of ₹ 1586 are ₹ 552, ₹ 528, ₹ 506.

57. (C)



In ΔABC,

$\angle B + \angle C = 90°$, $\frac{AC}{BC} = \sin 30°$

$\therefore$ $\angle A = 90°$

$AC = 60 \times \frac{1}{2} = 30$ m

Draw $AM \perp BC$.

In ΔAMC,

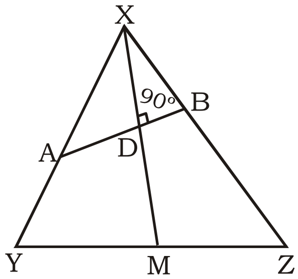
$\sin 60° = \frac{AM}{AC}$

$\frac{\sqrt{3}}{2} = \frac{AM}{30}$

$AM = 15\sqrt{3}$ m $= 15 \times 1.732 = 26$ m

58. (C) Since XM is the bisector of $\angle X$

$\angle YXM = \angle ZXM$



Now,

In ΔADX and ΔADX,

$\angle AXD = \angle BXD$

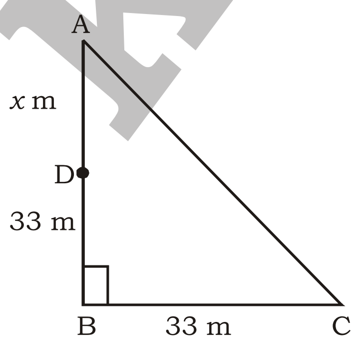
XD is common

$\Delta ADX = \Delta BDX$

XA = XB

So, the relation (C) holds true in this case.

59. (C)



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Let AD = x m

$33 = \frac{1}{2}(AD + AC)$

$33 = \frac{1}{2}(x + AC)$

$66 - x = AC$

$AB = (x + 33)$ m

BC = 33 m

By Pythagoras theorem,

$AC^2 = AB^2 + BC^2$

$(66 - x)^2 = (x + 33)^2 + 33^2$

$(66 - x)^2 - (x + 33)^2 = 33^2$

$99 \times (33 - 2x) = 33 \times 33$

$33 - 2x = \frac{33 \times 33}{99}$

$33 - 11 = 2x$

$x = 11$

AB = 44 m

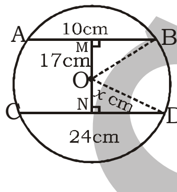
BC = 33 m

Area of $\Delta ABC = \frac{1}{2} \times 33 \times 44 = 33 \times 22 = 726$ m^2

60. (B) $\because$ MN = 17 cm

Let ON = x cm

$\Rightarrow$ MO = $17 - x$ cm



Now,

$ON^2 + ND^2 = OD^2$

$x^2 + 12^2 = OD^2$ ... (i)

And, $MO^2 + MB^2 = OB^2$

$(17 - x)^2 + 5^2 = OB^2$ ... (ii)

$x^2 + 12^2 = (17 - x)^2 + 5^2$

$x^2 - (17 - x)^2 = 5^2 - 12^2$

$(x + 17 - x)(x - 17 + x) = (5 + 12)(5 - 12)$

$17(2x - 17) = 17(-7)$

$2x - 17 = -7$

$2x = 10$

$x = 5$

$\therefore$ $OB^2 = 5^2 + (17 - 5)^2 = 25 + 144 = 169$

OB = 13 cm

61. (B) The top of the pole makes equal angle with each vertex.

Distance of each vertex from the base of the pole is equal.

Hence, the pole is at circumcentre of the triangle.

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62. (C) $152[\sin 30^\circ + 2\cos^2 45^\circ + 3\sin 30^\circ + 4\cos^2 45^\circ + \ldots\ldots + 17\sin 30^\circ + 18\cos^2 45^\circ]$

$= 152[\sin 30^\circ (1 + 3 + \ldots.. + 17) + \cos^2 45^\circ(2 + 4 + 6 + \ldots.. + 18]$

$= 152\left[\frac{1}{2}(1 + 3 + \ldots. + 17) + \frac{1}{2}(2 + 4 + \ldots.. 18)\right]$

$= 152 \times \frac{1}{2}\ [1 + 2 + 3 + \ldots\ldots + 18]$

$= 152 \times \frac{1}{2} \times \frac{18 \times 14}{2}$

$= 12996 = 114^2$

63. (A) $x^2 + y^2 = r^2\sin^2\theta\cos^2\phi + r^2\sin^2\theta\sin^2\phi$

$= r^2\sin^2\theta(\cos2\phi + \sin^2\phi) = r^2\sin^2\theta$

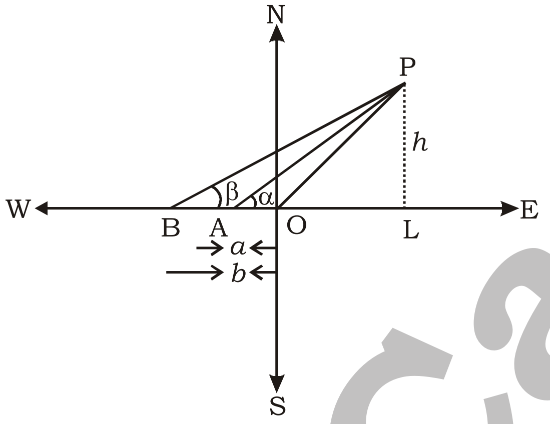
Now,

$x^2 + y^2 + z^2 = r^2\sin^2\theta + r^2\cos^2\theta$

$x^2 + y^2 + z^2 = r^2(\sin^2\theta + \cos^2\theta)$

$x^2 + y^2 + z^2 = r^2$

64. (A) Let OP be the tree and A, B be two points such that OA = a and OB = b.



In Δ's ALP and BLP, we have

$\tan\alpha = \frac{h}{OL + a}$

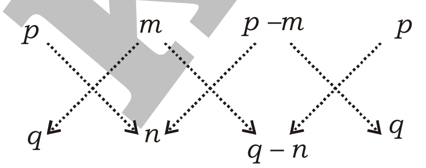
And, $\tan\beta = \frac{h}{OL + b}$

$OL + a = h\cot\alpha$ and $OL + b = h\cot\beta$

$b - a = h\cot\beta - h\cot\alpha$

$h = \frac{(b - a)}{\cot\beta - \cot\alpha} = \frac{(b - a)\tan\alpha\tan\beta}{\tan\alpha - \tan\beta}$

65. (C) Given points are collinear.



$(p \times n + m(q - n) + (p - m)q] - [m \times p + ([p - m)n + p(q - n)] = 0$

$(pn + qm - mn + pq - mq) - (mq + pn - mn + pq - pn) = 0$

$(pn + pq - mn) - (mq - mn + pq) = 0$

$pn - mq = 0$

$pn = qm$

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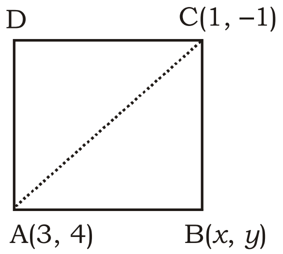
66. (C) Let ABCD be a square and let A(3, 4) and C(1, –1) be the given angular points.
Let B(x, y) be the unknown vertex



Then,

AB = BC

$AB^2 = BC^2$

$(x-3)^2 + (y-4)^2 = (x-1)^2 + (y+1)^2$

$4x + 10y - 23 = 0$

$x = \frac{23-10y}{4}$ ... (i)

In right angled triangle ABC, we have

$AB^2 + BC^2 = AC^2$

$(x-3)^2 + (y-4)^2 + (x-1)^2 + (y+1)^2 = (3-1)^2 + (4+1)^2$

$x^2 + y^2 - 4x - 3y - 1 = 0$ ... (ii)

Subtituting the value of x from (i) into (ii), we get

$\left(\frac{23-10y}{4}\right)^2 + y^2 - (23-10y) - 3y - 1 = 0$

$4y^2 - 12y + 5 = 0$

$(2y-1)(2y-5) = 0$

$y = \frac{1}{2}$ or, $\frac{5}{2}$

Putting, $y = \frac{1}{2}$ and $y = \frac{5}{2}$ respectively in (i), we get

$x = \frac{9}{2}$ and $x = \frac{-1}{2}$

Hence, the required vertices of the square are $\left(\frac{9}{2},\frac{1}{2}\right)$ and $\left(-\frac{1}{2},\frac{5}{2}\right)$.

67. (B) Let the quantity of milk purchased be x and quantity of water added be y.
Then, ratio of water to milk be $y : x$.

CP = $6.4x$

SP = $8(x + y)$

Profit percent = 37.5%

$\therefore$ $8(x + y) = 6.4x \times 1.375$

$8x + 8y = 8.8x$

$8y = 8.8x$

$8y = 0.8x$

$\frac{x}{y} = \frac{80}{8} = \frac{10}{1}$

$y : x = 1 : 10$

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68. (C) Cost price of garments = ₹ 25000

$\therefore$ Original company price = $\frac{25000}{85} \times 100$

S.P = $\frac{25000}{85} \times 100 \times \frac{108}{100}$ = ₹ 31767.71 ≈ ₹ 31000

69. (C) Final amount for giving successive discounts of 25% and 10%.
= 600 × 0.75 × 0.9 = ₹ 405.

70. (A) Let the prices of two houses be ₹ $4x$ and ₹ $5x$ respectively for A and B.
Then, current price of A and B this year was 1.25 × $4x$ and ₹ ($5x$ + 50000) respectively.
Given,

$\frac{1.25 \times 4x}{5x + 50000} = \frac{9}{10}$

$50x - 45x$ = ₹ 450000

$5x$ = ₹ 450000

x = ₹ 90000

$\therefore$ The price of house A last year was $4x$ = ₹ 360000

71. (B) Ratio of capital = 2 : 7 : 9

Ratio of time = $\frac{1}{2} : \frac{1}{7} : \frac{1}{9}$ = 1 : 1 : 1

Ratio of investment = $2 \times \frac{1}{2} : 7 \times \frac{1}{7} : 9 \times \frac{1}{9}$

Share of each partner = $\frac{1}{3} \times 1080$ = ₹ 360

72. (C) Relative speed = (4.5 + 3.75) = 8.25 km/h

Distance = 726 m = $\frac{726}{1000}$ = 0.726 km

$\therefore$ Required time = $\frac{0.726}{8.25} \times 60$ = 5.28 min

73. (C) Let C complete the work in x days.

Work done by (A + B) in day = $\frac{1}{10}$ work

Work done by (B + C) in 1 day = $\frac{1}{18}$ work

A's 5 day's work + B's 10 day's work + C's 15 day's work = 1
OR
(A + B)'s 5 day's work + (B + C)'s 5 day work + C's 10 day's work = 1

$\frac{5}{10} + \frac{5}{18} + \frac{10}{x} = +1$

x = 45 days

74. (A) Percent increase in attendance = $\frac{(100 + 44) - (100 - 20)}{(100 - 20)} \times 100$

$= \frac{144 - 80}{80} = \frac{64}{80} \times 100 = 80\%$

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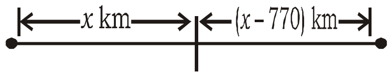
75. (B) Let the plane covers x km with 440 km/h and $(x - 770)$ km at a speed of 660 km/h. Hence, it covers a total distance of
$(2x - 770)$ km at a speed of 500 km/h.



$$\text{Average speed} = \frac{\text{Total distance}}{\text{Total time}}$$

$$500 = \frac{2x - 770}{\frac{4}{440} + \frac{x - 770}{660}}$$

$$\frac{2x - 770}{500} = \frac{x}{440} + \frac{x - 770}{660}$$

$x = 1760$

$\therefore$ Total distance covered $= 2x - 770$
$= 2 \times 1760 - 770 = 2750$ km

76. (D) Number of students who opted for all the three subjects in 2009
= (20 + 20 + 5) thousands = 45000

$$\text{Number of boys} = \frac{45000 \times 62}{100} = 27900$$

Since, we do not know the number of girls in mathematics, number of boys opted for Mathematics cannot be determined.

77. (B) Required percentage $= \left[\frac{(15 + 19 + 15)}{455030} \times 100\right]\%$

$= 8.79\% \approx 9\%$

78. (D) Required number of students = (5 + 35 + 15 + 15 + 20 + 5) × 1000
= 95 × 1000 = 95000

79. (D) Required percentage $= \left[\frac{(15 + 30) \times 1000}{\{(5 + 35 + 15) + (25 + 30 + 30)\} \times 1000} \times 100\right]\%$

$= 32.14\% \approx 32\%$

80. (A) Required ratio = (25 +30) : (5 + 20) = 55 : 25 = 11 : 5

81. (D) Required total $= 4675 \times \frac{144}{360} = 1870$

82. (A) Total no of candidates of SSC in institute P $= 8500 \times \frac{25}{100} - 4675 \times \frac{115.2}{360}$

$= 2125 - 1496 = 629$

$\therefore$ Total fees $= 629 \times 12000 + 1496 \times 12000 \times \frac{120}{100}$

= 7548000 + 21542400 = ₹ 2,90,90,400

83. (A) Required answer is P.

84. (B) Total number of candidates in institute S $= 8500 \times \frac{15}{100} = 1275$

Total number of candidates in Banking in institute S $= 4675 \times \frac{43.2}{360} = 561$

$\therefore$ Total no. of candidates in SSC = 1275 – 561 = 714

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Now, Total no. of candidates in institute S in the year 2017 = $1275 \times \frac{120}{100} = 1530$

And total number of candidates in Banking in institute S = $561 \times \frac{150}{100} = 841.50$

Total number of candidates in SSC in institute S in the year 2017 = 1530 – 841.50 = 688.50

∴ Required less number = 714 – 688.50 = 25.5 ≈ 26

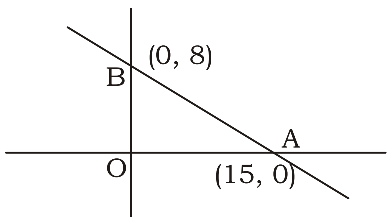
85. (C) Required % = $\left[\frac{\left(4675 \times \frac{100.8}{360}\right)}{8500} \times 100\right]\% = \left(\frac{1309}{8500} \times 100\right)\% = 15.4\%$

86. (C) $2\pi R_1 (R_1 + h) = \pi(12^2 - 8^2)$

$R_1 + h = \frac{80}{2R_1} = \frac{40}{R_1}$

$h = \frac{40}{R_1} - R_1 = \frac{40 - R_1^2}{R_1}$

87. (D)



AB = $\sqrt{(15-0)^2 + (0-8)^2} = \sqrt{289} = 17$ units

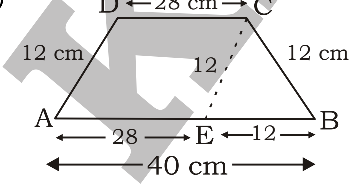
88. (A) If a, b, c are lengths of perpendiculars
Then,

Side of the triangle = $\frac{2}{\sqrt{3}}(a + b + c)$

∴ Area = $\frac{\sqrt{3}}{4}(\text{side})^2 = \frac{\sqrt{3}}{4}\left\{\frac{2}{\sqrt{3}}(a+b+c)\right\}^2$

$= \frac{\sqrt{3}}{4} \times \frac{4}{3}(a + b + c)^2 = \frac{\sqrt{3}}{3}(a + b + c)^2$

89. (B)



ABCD is a Trapezium
A line CE is drawn parallel to DA intersecting, CE = 12 cm, AE = 28 cm
ΔCEB is equilateral triangle

∴ $h = \frac{\sqrt{3}}{2} \times 12 = 6\sqrt{3}$

Area of trapezium $= \frac{1}{2} \times$ sum of parallel side $\times h$

$= \frac{1}{2} \times (28 + 40) \times 6\sqrt{3} = 204\sqrt{3}$ cm^2

90. (C) $l = b \times 3$

$b = \frac{l}{3}$

$l = h \times 5$

$h = \frac{l}{5}$

$\therefore$ V = lbh

$14400 = l \times \frac{l}{3} \times \frac{l}{5}$

$l^3 = 144 \times 1500$

$l = \sqrt[3]{216000}$

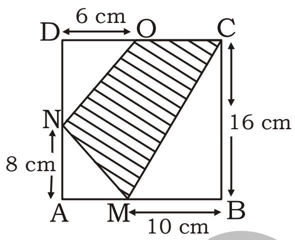
$l = 60$

$b = \frac{60}{3} = 20$

$h = \frac{60}{5} = 12$

$\therefore$ Total surface area $= 2(lb + bh + lh) = 2(60 \times 20 + 20 \times 12 + 12 \times 60)$
$= 2(1200 + 240 + 720) = 4320$ cm^2

91. (A)



Area of square ABCD = 16 × 16 = 256 cm^2

Area of ΔMBC $= \frac{1}{2} \times 10 \times 16 = 80$ cm^2

Area of ΔNAM $= \frac{1}{2} \times 8 \times 6 = 24$ cm^2

Area of ΔNDO $= \frac{1}{2} \times 6 \times 8 = 24$ cm^2

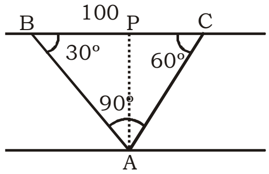
$\therefore$ Required area = 256 – 80 – 24 – 24 = 128 cm^2

92. (B)

```
  5 E 9
  2 F 8
  3 G 7
 -------
 1 1 1 4
```

If F is maximum then E & G are minimum or E + G = 0
Then 0 + F + 0 + 2 = 1
Then F will be 9

93. (B)



$\angle BAC = 90^\circ$

$\sin 30^\circ = \frac{AC}{100}$

$\frac{1}{2} = \frac{AC}{100}$

AC = 50 m,

$\sin 60^\circ = \frac{AP}{AC}$

$\frac{\sqrt{3}}{2} = \frac{AP}{50}$

AP = $25\sqrt{3}$ m

94. (C) Required Area = $\frac{\theta}{360^\circ}\pi r_1^2 - \frac{\theta}{360^\circ}\pi r_2^2$

$= \frac{45^\circ}{360^\circ}\pi \times 4^2 - \frac{45^\circ}{360^\circ}\pi \times 3^2 = \frac{45^\circ}{360^\circ} \times \pi(16-9)$

$= \frac{45^\circ}{360^\circ} \times \frac{22}{7} \times 7 = \frac{11}{4}$ m²

95. (D)

96. (A) Distance between A and B = 120 km = 120 × 1000 m

Time = 10 a.m. – 6 a.m. = 4 hr = 4 × 60 × 60 sec

Speed (m/sec) = $\frac{120 \times 1000}{4 \times 60 \times 60} = \frac{25}{3} = 8\frac{1}{3}$ m/sec

97. (C) Distance between B and A = 120 km = 120 × 1000 m

Time = 9 a.m. – 7 a.m. = 2 hr = 2 × 60 min

Speed = $\frac{120 \times 1000}{2 \times 60}$ = 1000 m/min

98. (B) Right time is 8 : 30 a.m.

99. (A) Required value of x = 100 – 55 = 45 km

100. (A) Distance = 120 km

Time = 10 a.m. – 6 a.m. = 4 hr = 240 min

Speed = $\frac{120}{240} = \frac{1}{2}$ = 0.5 km/min

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QUANTITATIVE ABILITY - 72 (ANSWER KEY)

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

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