QUANTITATIVE ABILITY - 90 (SOLUTION)

1. (B) $\left[\frac{1}{1\times2}+\frac{1}{2\times3}+\frac{1}{3\times4}+....+\frac{1}{99\times100}\right]$

$\therefore$ Tn = $\frac{1}{n(n+1)}$ = $\frac{1}{(n)}$ – $\frac{1}{(n+1)}$ [By partial fraction]

Sn = $\left[1-\frac{1}{2}\right]$ + $\left[\frac{1}{2}-\frac{1}{3}\right]$ + ... + $\left[\frac{1}{99}-\frac{1}{100}\right]$

$\therefore$ Sn = $\left[1-\frac{1}{100}\right]$ = [first term + last term] = $\frac{99}{100}$

2. (A) 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 = 9
Sum of the digits of 11,11,11,111 = 9, which is divisible by 3.
Also, 11,11,11,111 is not divisible by 11. [difference of the sum of the digits at odd place and even places is not a multiple of 11]

3. (A) Let the 4 numbers are A, B, C and D.
According to question,
(A + 3) = (B – 3) = (C × 3) = (D ÷ 3)
Let (A + 3) = (B – 2) = (C × 3) = (D ÷ 3) = k (say)

Then, A= (k – 3), B = (k + 3), C = $\left(\frac{k}{3}\right)$, D = 3k

Also, A + B + C + D = 64

$\Rightarrow$ (k – 3) + (k + 3) + $\left(\frac{k}{3}\right)$ + (3k) = 64

$\Rightarrow$ $5K+\frac{K}{3}$ = 64

$\Rightarrow$ 16k = 64 × 3

$\Rightarrow$ k = 12

1st number = (k – 3) = 9 = A
2nd number = (k + 3) = 15 = B

3rd number = $\left(\frac{k}{3}\right)$ = 4 = C

4th number = 3k = 36 = D
Required difference = 36 – 4 = 32

4. (A) Total age of the 4 members of the family, 10 years ago = 24 × 4 = 96 years
Present age of 4 members = 96 + 40 = 136 years
Total age of the 7 members presently = 22 × 7 = 154 years
Age of [twins + youngest – child] = 154 – 136 = 18 years
Let the age of the one of the twins = x years

$\therefore$ Age of the youngest = (x – 3) years
Then,
2x + (x – 3) = 18
or, 3x = 21
$\therefore$ x = 7
$\therefore$ Age of children = (7, 7, 4) years

5. (B) Average of 10 numbers = 40.2

∴ Sum of 10 numbers = 40.2 × 10 = 402

As per Question,

Actual Average $= \frac{402-18+(31-13)}{10} = \frac{402-18+18}{10} = 40.2$

6. (D) Let Ram's rowing rate is 'x' and speed of current is 'y'.

Downstream time taken $= \frac{12}{x+y}$

Upstream time taken $= \frac{12}{x-y}$

According to the question,

$\frac{12}{x-y} - \frac{12}{x+y} = 6 \Rightarrow x^2 - y^2 = 4y$ ______(i)

Now, If speed of boat doubles $\Rightarrow 2x$

Time is 1 hour less as compared to upstream,

$\frac{12}{2x-y} - \frac{12}{2x+y} = 1 \Rightarrow 4x^2 - y^2 = 24y$ _____(ii)

From (i) and (ii) we get,

$y = \frac{8}{3} = 2\frac{2}{3}$ mph

7. (D) Total CP of [25 kg + 35 kg] rice = ₹(25 × 16.50 + 35 × 24.50)

= ₹(412.50 + 857.50) = ₹1270

SP at the rate of 25% profit = ₹[1270 × 1.25] = ₹1587.5

∴ Required rate $= \frac{1587.5}{60} \approx$ ₹26.50 per kg

8. (A) Initial amount of mixture = 8 litres

Oxygen = 16% = 1.28 litres

Nitrogen = 84% = 6.72 litres

Using by option A, total amount released = 2 litres

So, After first release oxygen = 1.28 –16% of 2

After second release, oxygen = 9.96 – 0.24 = 0.72 litres (which is 9% of 81)

9. (A) Let Ram and Shyam weights are = $4x$ and $5x$ respectively.

Now,

Their previous weight (sum) $= \frac{82.8}{115} \times 100 = 72$ kg

According to question,

$\Rightarrow 5x + 4x = 72$

∴ $x = 8$

∴ Ram's weight = 8 × 4 = 32 kg

Shyam's weight = 5 × 4 = 40 kg

Their increased weight = 82.8 – 72 = 10.8 kg

Ram's weight = 32 × 10% = 3.2 kg

Shyam's increased weight = [10.8 – 3.2] = 7.6 kg

∴ % increase = $\frac{7.6}{40} \times 100$ = 19%

10. (A) Let the cost of one saree = ₹ x and the cost one shirt = ₹ y.

According to question,

$20x + 4y = 1600$

⇒ $x + 2y = 800$ .... (i)

and $x + 6y = 1600$ .... (i)

on solving equations (i) and (ii), we get

$x = 400$; $y = 200$

∴ cost of 12 shirts = 12 × 200 = ₹ 2400

11. (C) According to question,

Sohan = 25000 × (36 months) = ₹ 900000

Aditya = [15000 × 30 + 15000 × 24] = ₹ 810000

∴ Profit share of Aditya = $\frac{\text{Sohan}}{\text{Sohan} + \text{Mohan}} \times 247000$

= $\frac{9}{19} \times 247000$ = ₹1,17,000

12. (A) 25 men and 15 women complete a piece of work in 12 days.

∴ Work of 8 days = $\frac{1}{12} \times 8 = \frac{2}{3}$

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

Now,

$\frac{1}{3}$ piece of work completed by 25 men in 6 days.

∴ 1 work can be completed by 25 men in 18 days.

Now,

∴ Total work done by women = $\frac{1}{12} - \frac{1}{18} = \frac{3-12}{36} = \frac{1}{36}$ = 36 days

13. (D) Let the CP of product = ₹ x

∴ SP = $\frac{80}{100}x$ [after discounted 20%]

Again discount of 6.25%, then new selling price

SP = $\frac{83.75}{100} \times \frac{80}{100} \times x$

According to question,

$x - \frac{83.75}{100} \times \frac{80}{100} \times x = 37.50$

or, $(x - 0.75x) = 37.50$

∴ $x = \frac{37.5}{0.25}$ = ₹ 150

Selling price = 150 – 37.50 = 112.50

14. (B) Given that,

$$\frac{1}{x+1} + \frac{2}{y+2} + \frac{1009}{z+1009} = 1 \quad .... (i)$$

Then,

$$\frac{x}{(x+1)} + \frac{y}{(y+2)} + \frac{z}{(1009+z)} \quad .... (A)$$

Now,

x, y and z are distributed or divided over 1.

$\therefore$ $x = \frac{1}{3}$, $y = \frac{1}{3}$ and z = $\frac{1}{3}$ .... (ii)

From equation (i) and (ii), we conclude that,

$x = 2$, $y = 4$ and $z = 2 \times 1009$ [from equation (i)]

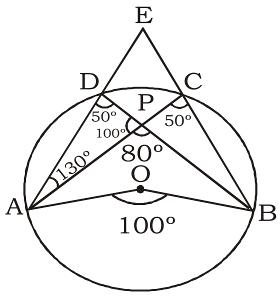
Then the arrangement will divide into three parts.

Now, putting the value of following in equation (A),

$$\Rightarrow \frac{2}{(2+1)} + \frac{4}{(4+2)} + \frac{2\times1009}{2\times1009+1009}$$

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

15. (B)



Given that,

$\angle$AOB = 100°

$\therefore$ $\angle$ADB = 50°

$\angle$ACB = 50° [$\therefore$ angle on minor sections]

Now,

$\angle$DAP = 30° (Given)

In ΔADP,

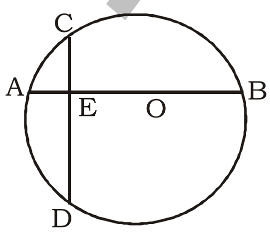
$\angle$A + $\angle$D + $\angle$P = 180°

$\therefore$ $\angle$P = 180° – 30° – 50°

$\angle$P = 100°

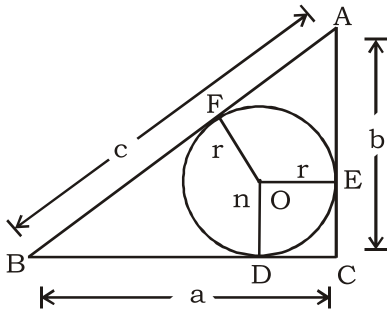
$\therefore$ $\angle$APB = 180° – 100° = 80°

16. (B)



Given that,
AB = 10 cm
∴ AO = [5 cm] = radius
AE = 2 cm
∴ EO = 3 cm
Construction: Join OD,
In ΔOED,
$OD^2 = OE^2 + DE^2$ [Pythagoras theorem]
or, $25 - 9 = ED^2$
∴ ED = 4 cm

17. (A)



AB = AF + FB .... (i)
Now,
AF = AE = $(b - r)$
BF = BD = $(a - r)$
and AB = C
Substitute the value of following in equation (i)
C = $(b - r) + (a - r)$

∴ $r = \dfrac{a+b-c}{2}$

18. (C) Volume = $\frac{4}{3}\pi[R_1^3 + R_2^3 + R_3^3] = \frac{4}{3} \times 3.14\ [1 + 8 + 27]$

$= \frac{4}{3} \times 3.14 \times 36 = 150.72$

25% Reduced $= \frac{75}{100} \times 150.72 = 113.04$

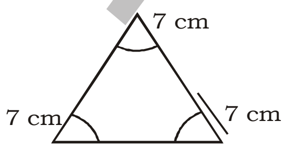
According to question,

$\frac{4}{3}\pi R^3 = 113.04$

$R^3 = 27$

∴ $R = 3$

19. (C)



Area of region gazed $= \dfrac{\angle A + \angle B + \angle C}{360^\circ}(\pi R^2) = \dfrac{180^\circ}{360^\circ}\left[\dfrac{22}{7} \times 7 \times 7\right]$ = 77 sq. meters

20. (D) Let the Radius of sphere = R cm

According to question,

$4\pi(R+2)^2 - 4\pi R^2 = 704$

or, $4\pi[R^2 + 4 + 4R - R^2] = 704$

or, $4\pi[4R + 4] = 704$

or, $16 \times \frac{22}{7}[1 + R] = 704$

$\therefore$ $(R + 1) = \frac{704 \times 7}{16 \times 22} = 14$

$(R + 1) = 14$

R = 13 cm

21. (B) Given that,

tan A – tan B = x, and

cot A – cot B = y, then cot(A – B) = ?

$\Rightarrow$ $\cot(A - B) = \frac{1}{\tan(A - B)} = \frac{1 + \tan A \tan B}{\tan A - \tan B}$

$\cot(A - B) = \frac{1 + \tan A \tan B}{x}$ .... (i)

Now,

$\frac{1}{\tan A} + \frac{1}{\tan B} = y$

$\Rightarrow$ $\frac{\tan A - \tan B}{\tan A.\tan B} = y$

$\Rightarrow$ $\frac{-x}{\tan A.\tan B} = \frac{y}{1}$

$\therefore$ $\tan A.\tan B = \frac{-x}{y}$ .... (ii)

From (i) and (ii),

$\cot(A - B) = \frac{1 - \frac{x}{y}}{x}$

$\cot(A - B) = \frac{1}{x} - \frac{1}{y}$

22. (B) $2\cos\left(\frac{\pi}{13}\right)\cos\left(\frac{9\pi}{13}\right) + \cos\left(\frac{3\pi}{13}\right) + \cos\left(\frac{5\pi}{13}\right)$

or, $2\cos\left(\frac{\pi}{13}\right)\cos\left(\frac{9\pi}{13}\right) + 2\cos\left(\frac{\frac{3\pi}{13} + \frac{5\pi}{13}}{2}\right) + \cos\left(\frac{\frac{5\pi}{13} - \frac{3\pi}{13}}{2}\right)$

or, $2\cos\left(\frac{\pi}{13}\right)\cos\left(\pi - \frac{4\pi}{13}\right) + 2\cos\left(\frac{4\pi}{13}\right)\cos\left(\frac{\pi}{13}\right)$

or, $-2\cos\left(\frac{\pi}{13}\right)\cos\left(\frac{4\pi}{13}\right) + 2\cos\left(\frac{4\pi}{13}\right)\cos\left(\frac{\pi}{13}\right) = 0$

23. (C) $\frac{\cos\theta}{1+\sin\theta} = \frac{\sin\left(\frac{\pi}{2}-\theta\right)}{1+\cos\left(\frac{\pi}{2}-\theta\right)} = \frac{2\sin\left(\frac{\pi}{2}-\frac{\theta}{2}\right)\cos\left(\frac{\pi}{4}-\frac{\theta}{2}\right)}{2\cos^2\left(\frac{\pi}{4}-\frac{\theta}{2}\right)} = \tan\left(\frac{\pi}{4}-\frac{\theta}{2}\right)$

24. (C) Number of digits required = [{(9–1)+1}×1 + {(50–10)+1}×2]
= 9 × 1 + 41 × 2 = 9 + 82 = 91

25. (B) Required height at the 1st bounce $= 32 \times \frac{3}{4}$

Required height at the 2nd bounce $= 32 \times \left(\frac{3}{4}\right)^2$

Required height at the 3rd bounce $= 32 \times \left(\frac{3}{4}\right)^3 = 32 \times \frac{27}{64} = 13\frac{1}{2}$ m

26. (A) Average speed during the entire journey $= \frac{\text{Total distance}}{\text{Total time}} = \frac{3584\,\text{km}}{2\,\text{days}\ 8\,\text{hours}} = \frac{3584\,\text{km}}{56\,\text{hours}}$

= 64 km/hour

Now, Average speed during the remaining part (last 8 hr.) of journey

$= \frac{3584-(1440+1608)}{8}$ km/hr = $\frac{3584-3048}{8}$ = 67 km/hr

So, required difference = (67 – 64) km/hr = 3 km/hr more

27. (B) weight of lead per kg in the new alloy $= \frac{3}{(5+4+3)2} = \frac{3}{24} = \frac{1}{8}$ kg

28. (C) Let the income of Sanjay two years ago = ₹ x

Saving of Sanjay two yrs ago = 20% of ₹ x = ₹ $\frac{x}{5}$

⇒ Expenditure of Sanjay two years ago = $\left(x-\frac{x}{5}\right) = \frac{4}{5}x$

⇒ Two years later now,

Income of Sanjay = ₹$\frac{120}{100}x$ = ₹$\frac{6}{5}x$

and saving of Sanjay = ₹ $\frac{x}{5}$

⇒ Expenditure of Sanjay = ₹$\left(\frac{6}{5}x-\frac{x}{5}\right) = x$

So,

% increase in the expenditure $= \frac{x-\frac{4}{5}x}{\frac{4}{5}x} \times 100\% = \frac{x}{4x} \times 100\% = 25\%$

29. (B) Let the maximum marks = x
Case (i) Pass marks = 32% of x + 16
Case (ii) Pass marks = 36% of x – 10
From Case (i) and Case (ii), we get,
32% of x + 16 = 36% of x – 10
or, 4% of x = 26
or, $\frac{4}{100} \times x = 26$
$\Rightarrow$ $x = \frac{26 \times 100}{4} = 650$
So,
Pass% = $32\% + \left(\frac{16}{650} \times 100\right)\% = 32\% + 2\frac{6}{13}\% = 34\frac{6}{13}\%$

30. (D) Let the original number of boys and girls be $5x$ and $3x$ respectively and that of new boys and girls be $5y$ and $7y$ respectively.
$\therefore$ $5x + 3x + 5y + 7y = 1200$
$\Rightarrow$ 2x + 3y = 300 ……… (i)
and $\frac{5x+5y}{3x+7y} = \frac{7}{5}$
$\Rightarrow$ $25x + 25y = 21x + 49y$
$\Rightarrow$ $4x = 24y$
$\Rightarrow$ $x = 6y$ ……… (i)
From equation (i),
$4x + 6y = 600$
$\Rightarrow$ 5x = 600
$\Rightarrow$ x = 120
$\therefore$ Original number of students = 8x = 960

31. (C) Repaired gain = $2 \times \left(6\frac{1}{4} - 4\right)\% \; of \; 5000 = 2 \times 2\frac{1}{4}\% \; of \; 5000$
$= 2 \times \frac{9}{4 \times 100} \times 5000$ = ₹ 225

32. (C) For the first trader,
Let the CP of the article = ₹ 100
$\Rightarrow$ SP = Rs. 120
Now, For the second trader,
SP of the article = ₹ 120
And gain = 20%
Let the CP be ₹ x.
$\therefore$ $\frac{120 - x}{120} \times 100 = 20$
$\therefore$ $120 - x = 20 \times \frac{6}{5} = 24$

$\therefore$ $x = 120 - 24$ = ₹96

$\therefore$ Gain = ₹ 24

Now when difference of gains = ₹ 4

Then, SP = ₹ 120

So, When the difference = ₹ 85,

Then, SP = $\frac{120}{4} \times 85 =$ ₹ 2550

33. (A) Let the marked price of the article= ₹ x

Single discount for successive discounts of 30% and 20% $= \left(30 + 20 - \frac{30 \times 20}{100}\right)\%$

$= (50 - 6)\% = 44\%$ discount

According to question,

$(100 - 44)\% \; of \; x = 2240$

$\Rightarrow \frac{x \times 56}{100} = 2240$

$\Rightarrow x = \frac{2240 \times 100}{56}$ = ₹4000

34. (C) $x^2 + 8 \Rightarrow x^3 + 2^3 \Rightarrow (x + 2)(x^2 - 2x + 4)$

$x^2 + 5x + 6 \Rightarrow (x + 3)(x + 2)$

$x^3 + 4x^2 + 4x \Rightarrow x(x^2 + 4x + 4) \Rightarrow x(x + 2)(x + 2)$

L.C.M. = $x(x + 2)^2 (x + 3)(x^2 - 2x + 4)$

35. (D) Part of tank filled in one hour by inlet pipe $= \frac{1}{12} - \frac{1}{15} = \frac{1}{60}$ part

So, the inlet pipe can fill the tank in 60 hrs.

$\because$ Inlet pipe fills water at the rate of 5 litres per minute

$\Rightarrow$ Capacity of tank = (60 × 60 × 5) litres = 18000 litres

36. (A) $\theta_1 = \theta_2 = \theta_3 = 0$

$\therefore$ $\sin \theta_1 + \sin \theta_2 + \sin \theta_3 = 0$

37. (C) $(y - z) + (z - x) + (x - y) = 0$ [$\because a^3 + b^3 + c^3 = 3abc$ if $a + b + c = 0$]

$\Rightarrow (y - z)^3 + (z - x)^3 + (x - y)^3 = 3(y - z)(z - x)(x - y)$

38. (C) $\sin B = \frac{1}{2} = \sin 30^o$

$\Rightarrow B = 30^0$

Now, $3 \cos B - 4\cos^3 B = 3 \cos 30^0 - 4\cos^3 30^0$

$= 3 \times \frac{\sqrt{3}}{2} - 4 \times \frac{3\sqrt{3}}{8}$

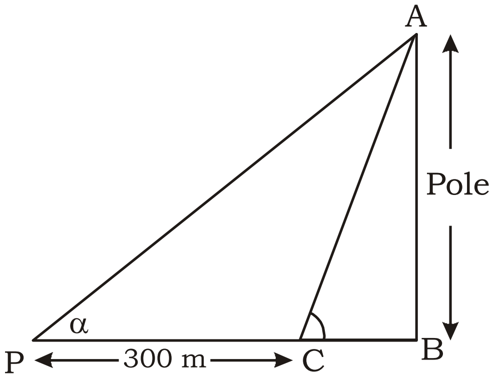
$= \frac{3\sqrt{3}}{2} - \frac{2\sqrt{3}}{2} = 0$

Another method

$3\cos B - 4\cos^3 B = -\cos 3B$

$= -\cos 3 \times 30^0 = -\cos 90^0 = 0$

39. (B)



$\because \quad \tan\alpha = \frac{5}{12}$

$\Rightarrow \quad \frac{AB}{BP} = \frac{5}{12}$

$\Rightarrow \quad \frac{AB}{BC+300} = \frac{5}{12}$ ------------- (i)

$\tan B = \frac{3}{4}$

$\frac{AB}{BC} = \frac{3}{4}$ ------------- (ii)

On dividing (i) by (ii), We have

$\frac{BC}{BC+300} = \frac{5}{12} \times \frac{4}{3} = \frac{5}{9}$

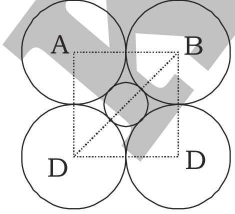
9BC = 5BC + 1500

$BC = \frac{1500}{4} = 375\text{m}$

Height of the pole = AB = $\frac{3}{4} \times BC = \frac{3}{4} \times 375$

$= \frac{1125}{4} = 281\frac{1}{4}$ m

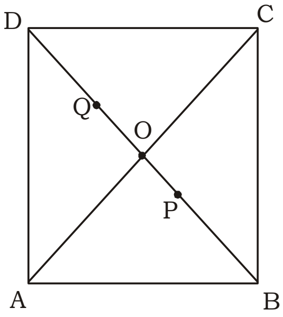
40. (A)



BD = $\sqrt{D^2 + D^2} = \sqrt{2}D$

Required diameter = $\sqrt{2D} - D = \left(\sqrt{2} - 1\right)D$

41. (B)



ABCD is a ||gm whose diagonal BD = 18cm
Let both the diagonals bisect at 'O'.
$\Rightarrow$ DO = OB = 9 cm

$\because$ DO and BO are medians of ΔADC and ΔABC
Also P and Q are centroids of ΔADC and ΔABC

$\Rightarrow$ $PO = \frac{1}{3} \times BO$ and $QO = \frac{1}{3} \times DO$ [centroid of a Δ divides each median in the ratio of 2 : 1]

$PO = \frac{1}{3} \times 9$ and $QO = \frac{1}{3} \times 9$ = 3 cm

$\Rightarrow$ PQ = PO + QO = 3 + 3 = 6 cm

42. (C) AM = MB
$\angle$AMC = $\angle$BMD and $\angle$BAD = $\angle$ABC
$\therefore$ ASA Rule

43. (D) EF || DC (Given)
$\Rightarrow \Delta EGF \sim \Delta CGD$ (by AA Similarity)

$\Rightarrow \frac{EG}{GC} = \frac{EF}{DC}$

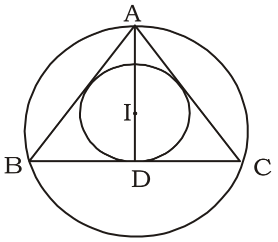
$\frac{5}{10} = \frac{EF}{18}$

$\Rightarrow$ EF = $\frac{18 \times 5}{10}$ = 9 cm

44. (C) $CF \parallel AB$
$\Rightarrow$ $\angle BCF = \angle ABC$ = 85^0 (alternate interior angles)
$\angle$BCE = $\angle$BCF + $\angle$ECF = 85^0 + 20^0 = 105^0
$\angle BAD = \angle BCF$ = 105^0 (Angles in the alternate segment)

45. (B) Volume of the wooden block = 5×10×20 cm^3
Volume of the required solid wooden cube = 5 × 10 × 20 × x^3 cm^3
(where x^3 is an unknown number) `
$\because$ Only ‘8’ is the smallest perfect cube
$\Rightarrow$ x^3 = 8
$\Rightarrow$ Number of wooden block = 8

46. (C)



$\because$ Incentre & circumcentre of an equilateral Δ is same.
let 'a' unit be the side of ΔABC

Then AD = $\sqrt{AB^2 - BD^2} = \sqrt{a^2 - \frac{a^2}{4}} = \frac{\sqrt{3}}{2}a$

$\because$ AI : ID : 2 : 1

$\Rightarrow$ AI= $\frac{2}{3}$ AD= $\frac{2}{3} \times \frac{\sqrt{3}}{2}a = \frac{a}{\sqrt{3}}$ unit.

ID = $\frac{1}{3}AD = \frac{1}{3} \times \frac{\sqrt{3}}{2}a = \frac{1}{2\sqrt{3}}a$ unit.

Now, Area of circumcircle – area of incircle = 44

$$\pi \times \left(\frac{a}{\sqrt{3}}\right)^2 - \pi \times \left(\frac{a}{2\sqrt{3}}\right)^2 = 44$$

$\Rightarrow$ $\frac{22}{7}\left[\frac{1}{3} - \frac{1}{12}\right]a^2 = 44$

$\Rightarrow$ $\frac{22}{7}\left[\frac{4-1}{12}\right]a^2 = 44$

$$a^2 = \frac{44 \times 12 \times 7}{22 \times 3} = 56$$

Area of the Δ = $\frac{\sqrt{3}}{4} \times a^2 = \frac{\sqrt{3}}{4} \times 56 = 14\sqrt{3}cm^2$

47. (B) Area of quad. ABCD = $\frac{1}{2}$ × diagonal × (Sum of offsets on the given diagonal)

= $\frac{1}{2} \times 16 \times (9+7)$ = 8 × 16 = 128 cm^2

48. (C) Let the number be x.
ATQ,
$x^2 = 45x - 350$
Using options, we get $x = 35$

49. (A)

$$\begin{array}{r|l}
 & 889 \\
\hline
8 & 789654 \\
8 & 64 \\
\hline
168 & 1496 \\
8 & 1344 \\
\hline
1769 & -15254 \\
9 & 15921 \\
\hline
 & 667
\end{array}$$

So, 667 must be added to obtain a perfect square.

50. (A)

A → 10   6
B → 5   60   12
C → –20   –3

Work done by A, B and C in one day = 6 + 12 – 3 = 15 units

Now, time taken by A, B and C to complete the work = $\frac{60}{15}$ = 4 days

51. (A) Let pipe B takes x hours to fill the tank
Then, pipe A will take (x + 5) hours
ATQ,

$$\frac{1}{x} + \frac{1}{x+5} = \frac{1}{6}$$

On solving, we get x = 10 hours

52. (B) ATQ,

S.P. after two successive discounts $= 120 \times \frac{19}{20} \times \frac{19}{20} = 108.3$

Profit $\Rightarrow 12\frac{13}{16}\% = \frac{41}{320} \begin{array}{l}\rightarrow \text{Profit} \\ \rightarrow \text{CP}\end{array}$

SP = 320+41=361
CP = 320
Now,
361 units = 108.3

$\Rightarrow$ 1 unit = $\frac{108.3}{361}$

Now, CP = 320 units = $\frac{108.3 \times 320}{361}$ = 96

$\therefore$ CP of the article = ₹ 96

53. (B)

	Milk	Water	
I	5	3 → 8 × 3 × **4**	
II	2	1 → 3 × 8 × **5**	
III	7	5 → 12 × 2 × **6**	[Multiplied according to their capacity]

Now, ratio of milk and water in the new mixture
5 × 12 + 2 × 40 + 7 × 12 : 3 × 12 + 1 × 40 + 5 × 12
$\Rightarrow$ 60 + 80 + 84 : 36 + 40 + 60 = 28 : 17
$\therefore$ Ratio of water and milk = 17 : 28

54. (A) Difference in the temperature of Monday and Thursday = (30 – 27) × 3 = 9°C
Let the temperature of Thursday be T°C
Then, Difference of temperature of Monday and Thursday $= T - \frac{2T}{3} = 9$
$\Rightarrow$ T = 27°C
$\therefore$ Temperature of Thursday = 27°C

55. (A) Abhi Bablu Surbhi
75 100 60
Abhi's goods are 25% costlier than Surbhi's, then
The selling price of the goods of Surbhi $= 75 \times \frac{100}{125} = 60$
Required percentage $= \frac{100-60}{100} \times 100 = 40\%$

56. (D) Let the quantity sold be x and new price per article be y.
ATQ,
$$\frac{3x}{2} \times y = 250x \times \left(\frac{100-17.5}{100}\right)$$
On solving we get, $y = 137.5$
$\therefore$ Reduction in price = 250 – 137.5 = ₹112.5

57. (B) Difference between simple interest and compound interest for 3 years.
$$= P\left(\frac{r}{100}\right)^2\left(3+\frac{r}{100}\right)$$
$$P\left(\frac{1}{8}\right)^2\left(3+\frac{1}{8}\right) = 125$$
$$P = \frac{125 \times 8 \times 8 \times 8}{25} = 2560$$
$\therefore$ Principal amount = ₹ 2560

58. (B) ATQ,
$l + b + h = 25$
and $\sqrt{l^2+b^2+h^2} = 15$
Applying the formula,
$(l+b+h)^2 = l^2 + b^2 + h^2 + 2(lb + bh + hl)$
$\Rightarrow 25^2 = (15)^2 + 2(lb + bh + hl)$
$\Rightarrow 625 - 225 = 2(lb + bh + hl)$
$\therefore$ Surface area of cuboid = 400 cm^2

59. (D) Percentage error $= \frac{\frac{4}{3}-\frac{3}{4}}{\frac{4}{3}} \times 100 = \frac{700}{16} = 43\frac{3}{4}\%$

60. (A) $\sin\theta = \frac{a-b}{a+b}$

Then, $\cos\theta = \frac{2\sqrt{ab}}{a+b}$

$\Rightarrow \quad \frac{1}{\cos\theta} = \frac{a+b}{2\sqrt{ab}}$

Using Componendo and Dividendo, we get

$\frac{1+\cos\theta}{1-\cos\theta} = \frac{(\sqrt{a}+\sqrt{b})^2}{(\sqrt{a}-\sqrt{b})^2}$

$\Rightarrow \quad \frac{2\cos^2\frac{\theta}{2}}{2\sin^2\frac{\theta}{2}} = \left(\frac{\sqrt{a}+\sqrt{b}}{\sqrt{a}-\sqrt{b}}\right)^2$

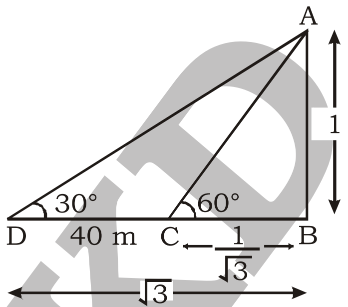
$\Rightarrow \quad \cot\frac{\theta}{2} = \frac{\sqrt{a}+\sqrt{b}}{\sqrt{a}-\sqrt{b}}$

$\Rightarrow \quad \frac{1}{\tan\frac{\theta}{2}} = \frac{\sqrt{a}+\sqrt{b}}{\sqrt{a}-\sqrt{b}}$

$\Rightarrow \quad \frac{1+\tan\frac{\theta}{2}}{1-\tan\frac{\theta}{2}} = \frac{\sqrt{a}}{\sqrt{b}}$

$\Rightarrow \quad \tan\left(\frac{\pi}{4}+\frac{\theta}{2}\right) = \sqrt{\frac{a}{b}}$

61. (A)



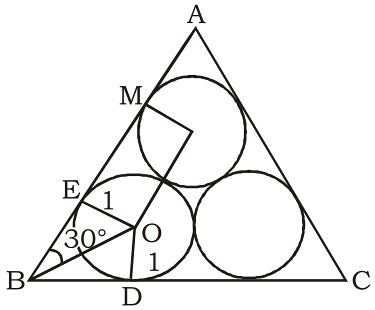
Length of DC= $\left(\sqrt{3}-\frac{1}{\sqrt{3}}\right)$ units = 40

$\left(\frac{2}{\sqrt{3}}\right)$units = 40

Then, width of the river

BC = $\left(\frac{1}{\sqrt{3}}\right)$units = $\frac{40}{2}$ = 20 m

62. (B)



Since ABC is equilateral triangle.

Then, $\angle OBE = 30°$

In ΔOBE,

$BE = OE \cot 30° = 1 \times \sqrt{3} = \sqrt{3}$

Then, length of AB = EM + BE + AM

$= 2 + \sqrt{3} + \sqrt{3} = 2 + 2\sqrt{3}$

Now, Area of triangle = $\frac{\sqrt{3}}{4}(2 + 2\sqrt{3})^2 = \frac{\sqrt{3}}{4} \times 4\,(4 + 2\sqrt{3})$

$= (6 + 4\sqrt{3})$ square units

63. (C) $2R = b$ [$\because$ circumradius is half of hypotenuse of right angled triangle]

and, $2r = a + c - b$

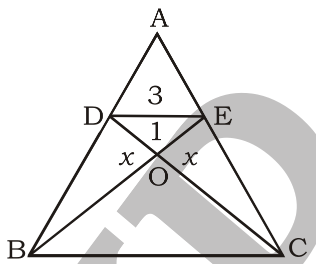
Then,

$2R + 2r = b + a + c - b = c + a$

64. (D) We know that

$ar(\Delta ODB) = ar(\Delta OEC)$

And let $ar(\Delta BOC)$ be t.



Then,

$1 \times t = x^2$

$t = x^2$ .... (i)

Since ΔODE is similar to ΔOBC

Then,

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

$\Rightarrow$ $3t = 4+2x+t$

$\Rightarrow$ $2t = 2x + 4$ ....(ii)

Using (i) and (ii), we get $x = 2$ and $t = 4$

Then, $ar(\Delta ABC) = 3 + 1 + 2x + t = 4 + 4 + 4 = 12$ unit^2

65. (A) Given, $3^{\frac{x}{y}+1} - 3^{\frac{x}{y}-1} = 24$

$\Rightarrow$ $3^{\frac{x}{y}}\left[3 - \frac{1}{3}\right] = 24$

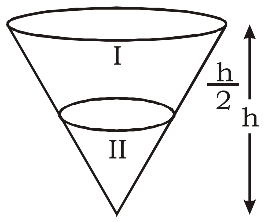
$\Rightarrow$ $3^{\frac{x}{y}} = 3^2$

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

Using Componendo and Dividendo method,

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

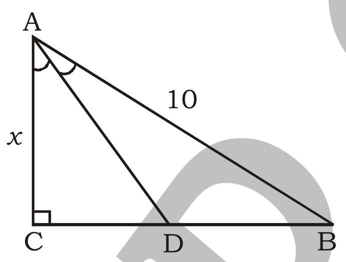
66. (A)



Ratio of the volume of
I and II part = (8 – 1) : 1 = 7 : 1
ATQ,
7 parts are emptied in 28 minutes

Then, time taken to empty part 1 = $\frac{28}{7}$ = 4 minutes

67. (C)



Let AC be x cm
Given ar (Δ ADB) = 15 cm^2

$\Rightarrow$ $\frac{1}{2} \times BD \times AC = 15$

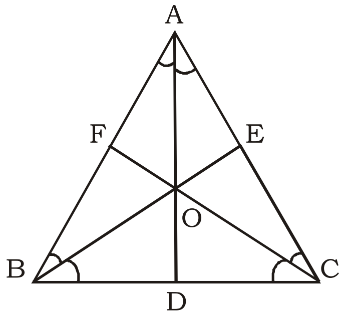
$\Rightarrow$ BD = $\frac{30}{x}$ cm

Using angle bisector theorem,

$\frac{AC}{AB} = \frac{CD}{DB}$ $\Rightarrow \frac{x}{10} = \frac{CD}{\frac{30}{x}}$

$\Rightarrow$ CD = 3 cm

68. (B)



In Δ AOC,

$\angle\frac{A}{2} + \angle\frac{C}{2} + \angle AOC = 180°$ ....(i)

$\angle AOC = \angle DOF$ (vertically opposite angle) ....(ii)

and, $\angle B + \angle DOF = 180°$ (B,D,O,F are concyclic) ....(ii)

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

A+C = 2B

We know that,

A + B + C = 180°

$\Rightarrow$ 2B + B = 180°

$\Rightarrow$ $\angle B = 60°$

69. (D) ATQ,

tan81° – tan63° – tan27° + tan9°

= cot9° – cot27° – tan27° + tan9°

= (tan9° + cot9°) – (tan27° + cot27°)

$= \left(\frac{\sin 9°}{\cos 9°} + \frac{\cos 9°}{\sin 9°}\right) - \left(\frac{\sin 27°}{\cos 27°} + \frac{\cos 27°}{\sin 27°}\right)$

$= \frac{\sin^2 9° + \cos^2 9°}{\sin 9° \cos 9°} - \frac{\sin^2 27° + \cos^2 27°}{\sin 27° \cos 27°}$

$= \frac{2}{\sin 18°} - \frac{2}{\sin 54°} = \frac{2}{\frac{\sqrt{5}-1}{4}} - \frac{2}{\frac{\sqrt{5}+1}{4}} = 4$

70. (B) Average number of people using mobile service for all the years

$= \frac{20+25+10+35+25}{5}$ thousands $= 23000$

71. (C) Required ratio = 20 : 15 = 4 : 3

72. (A) Required percentage = $\frac{40}{50} \times 100 = 80\%$

73. (A) Required percentage = $\frac{15}{75} \times 100 = 20\%$

74. (D) Average number of people using all the mobile service throughout all the year

$= \frac{50+60+40+75+65}{5}$ thousands $= 58000$

75. (C) $\frac{5}{6} = 0.8\overline{3}$, $\frac{8}{11} = 0.\overline{72}$, $\frac{7}{9} = 0.\overline{7}$, $\frac{15}{17} = 0.88$

$\therefore$ Required order = $\frac{15}{17} > \frac{5}{6} > \frac{7}{9} > \frac{8}{11}$

76. (B) r = 32 (given)

$\therefore$ d = 32 × 7 = 224

And, q = $\frac{224}{16}$ = 14

dividend = (divisor × quotient) + remainder

$\Rightarrow$ Dividend = (224 × 14) + 32

$\Rightarrow$ Dividend = 3168

77. (B) Let P = $(x + y)^3 - (x^3 + y^3)$

we know that,

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

$\therefore$ P = $x^3 + y^3 + 3xy(x + y) - x^3 - y^3$

$\Rightarrow$ P = $3xy(x + y)$

$\therefore$ Required factor = $3xy$

78. (A) Time taken by Meenu in doing whole work = 4 × 3 = 12 hours

Time taken by Komal in doing whole work = 4 × 4 = 16 hours

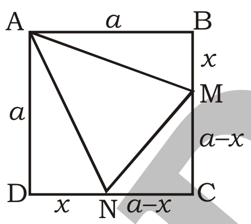
Time taken by Nisha in doing whole work = 2 × 3 = 6 hours

Meenu–12 — 4
Komal–16 — 3 — 48
Nisha –6 — 8

Work done by them together in 1 hour = 15 units

Time taken by them together doing the double work = $\frac{48 \times 2}{15} = \frac{96}{15} = 6\frac{2}{5}$ hours

79. (D)



$\Delta ADN \cong \Delta ABM$

Now,

$$\frac{\text{Area of } \Delta ABM}{\text{Area of } \Delta MNC} = \frac{\frac{1}{2} \times a \times x}{\frac{1}{2} \times (a - x)(a - x)}$$

$\Rightarrow$ $\frac{\text{Area of } \Delta ABM}{\text{Area of } \Delta MNC} = \frac{a \times x}{(a - x)^2}$ .... (i)

ΔAMN is equilateral triangle

$\therefore$ AM = MN = y

In ΔABM,

$AM^2 = AB^2 + BM^2$

$y^2 = a^2 + x^2$ .... (ii)

In ΔMNC

$MN^2 = NC^2 + MC^2$

$y^2 = (a-x)^2 + (a-x)^2$

$\Rightarrow$ $y^2 = 2(a-x)^2$ .... (iii)

From equation (ii) and (iii), we get

$a^2 + x^2 = 2\,(a-x)^2$

$\Rightarrow$ $a^2 + x^2 = 2\,(a-x)^2$

$\Rightarrow$ $2ax = a^2 + x^2 - 2ax$

$\Rightarrow$ $2ax = (a-x)^2$

$$\frac{\text{Area of }\Delta ABM}{\text{Area of }\Delta MNC} = \frac{ax}{2ax} = \frac{1}{2}$$

$\therefore$ Required ratio = 1 : 2

80. (A) Let the tomatoes produce this year = x^2

and, the tomatoes produce last year = y^2

ATQ,

$x^2 - y^2 = 143$

$\Rightarrow$ $(x-y)(x+y) = 143$

$\Rightarrow$ $(x+y)(x-y) = 143 \times 1$

$\Rightarrow$ $x + y = 143$

$\underline{x - y = 1}$

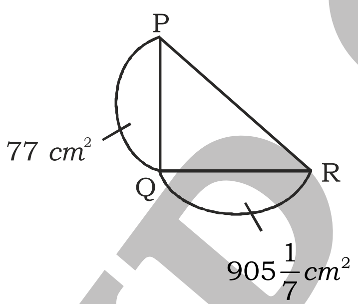
$\Rightarrow$ $2x = 144$

$\Rightarrow$ $x = 72$

and $y = 71$

$\therefore$ Tomatoes produce this year = $(72)^2 = 5184$

81. (D)



Radius of semi-circle on PQ = $\frac{1}{2}$PQ

and Radius semi-circle on QR = $\frac{1}{2}$QR

Area of semi-circle on PQ = $\frac{\pi}{2}\left(\frac{PQ}{2}\right)^2$

$\Rightarrow$ $77 = \frac{22}{7\times 2} \times \frac{PQ^2}{4}$

$\Rightarrow$ PQ = 14 cm

Area of semi-circle on QR = $\frac{\pi}{2}\left(\frac{QR}{2}\right)^2$

$\Rightarrow \frac{6336}{7} = \frac{22}{7\times2} \times \frac{QR^2}{4}$

QR = 48 cm

Now, ΔPQR is right angled triangle

$\therefore$ $PQ^2 + QR^2 = PR^2$

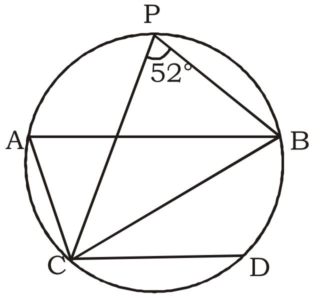
$\Rightarrow$ $PR^2 = (14)^2 + (48)^2$

$\Rightarrow$ $PR^2 = 256 + 2304$

$\Rightarrow$ $PR^2 = 2560$

$\therefore$ Required area = $\frac{\pi}{2}\times\frac{2560}{4} = 320\pi\ cm^2$

82. (C)



$\because$ AB is the diameter of circle

So, $\angle ACB = 90°$ (angle made in semi-circle)

and $AB \parallel CD$

$\therefore$ $\angle ACD + \angle BAC = 180°$

and $\angle BAC = \angle BPC = 52°$

$\therefore$ $\angle BCD = 180° - 90° - 52° = 38°$

83. (C) We know that,

d = $\frac{|Am + Bn + C|}{\sqrt{A^2 + B^2}}$

$\therefore$ Length of perpendicular = $\frac{|15\times4+8\times3+18|}{\sqrt{15^2+8^2}} = \frac{60+24+18}{\sqrt{225+64}} = \frac{102}{17}$ = 6 units

84. (B) Distance travel by first man in 1 hour = 6 km

$\therefore$ Time taken by second man to meet first man = $\frac{6}{8-6}$ = 3 hours

Total distance travel by first man in (3 + 1) hours = 4 × 6 = 24 km

At 2 p.m first man will be 24 km away from the starting point.

and, At 2 pm third man will be 12 km away from the starting point.

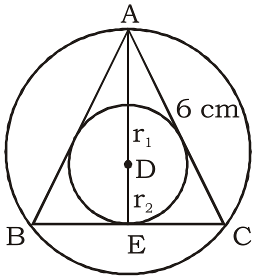
$\therefore$ Distance between first man and third man = 24 – 12 = 12 km

$\therefore$ They meet after= $\frac{12}{12+6} = \frac{12}{18}$ = 40 minutes

Required time = 2 : 40 pm

So, first man meets to third man at 2 : 40 p.m.

85. (C)



Circum-radius of ΔABC (AD) = $\frac{6}{\sqrt{3}}$ cm = $2\sqrt{3}$ cm

And, In radius of ΔABC (DE) = $\frac{6}{2\sqrt{3}}$ = $\sqrt{3}$ cm

Hence, required difference = $\pi (r_1)^2 - \pi (r_2)^2 = \pi\left[\left(2\sqrt{3}\right)^2 - \left(\sqrt{3}\right)^2\right]$

= $\pi [12 - 3] = 9\pi$ cm^2

86. (A) $\cot\theta + \cos\theta = p$

$\cot\theta - \cos\theta = q$

Now,

$p^2 - q^2 = \cot^2\theta + \cos^2\theta + 2\cot\theta\cos\theta - \cot^2\theta - \cos^2\theta + 2\cos\theta\cot\theta$

$\Rightarrow p^2 - q^2 = 4\left(\frac{\cos^2\theta}{\sin\theta}\right) = 4\left(\frac{1-\sin^2\theta}{\sin\theta}\right) = 4(\operatorname{cosec}\theta - \sin\theta)$

87. (B) $\frac{1}{\operatorname{cosec}^2\theta} + \frac{\sin^2\theta\left(2\cos^4 - \cos^2\theta\right)}{\sin^2\theta - 2\sin^4\theta} = \sin^2\theta + \frac{\sin^2\theta\cos^2\theta\left(2\cos^2\theta - 1\right)}{\sin^2\theta\left(1 - 2\sin^2\theta\right)}$

$= \sin^2\theta + \cos^2\theta = 1$

88. (B) $a^3 + b^3 + c^3 - 3abc = (a + b + c)(a^2 + b^2 + c^2 - ab - bc - ca)$

$= \frac{1}{2}(a+b+c)[2a^2 + 2b^2 + 2c^2 - 2ab - 2bc - 2ca]$

$= \frac{1}{2}(a+b+c)[(a-b)^2 + (b-c)^2 + (c-a^2)]$

now,

$$\frac{a^3 + b^3 + c^3 - 3abc}{(a-b)^2 + (b-c)^2 + (c-a)^2}$$

$$= \frac{\frac{(a+b+c)}{2}\left[(a-b)^2 + (b-c)^2 + (c-a)\right]^2}{(a-b)^2 + (b-c)^2 + (c-a)^2}$$

$$= \frac{35 + 20 - 15}{2} = 20$$

89. (C)

TV A.C
17% –5%
3%
8 : 14

$\therefore$ Ratio of cost price of T.V. and A.C = 4 : 7

So, cost price of A.C. $= \frac{22000}{11} \times 7$ = ₹14000

90. (A) Ratio of their savings = 4 : 1

$\therefore$ Savings of Ram and Shyam = $\frac{5000}{5} \times 4$ and $\frac{5000}{5} \times 1$ = ₹4000 and ₹1000

Now,
$2x - 5y = 4000$ .... (i)
$x - 3y = 1000$ .... (ii)
Solving equation (i) and (ii), we get
$x = 7000$
Hence, monthly income of Mohan = ₹7000

91. (B) Let total number of article = ₹ x
ATQ,

$$\frac{36}{12} \times x + \frac{24}{12} \times x - \frac{27}{12} \times 2x = 90$$

$\Rightarrow$ $\frac{60x - 54x}{12} = 90$

$\Rightarrow$ $6x = 90 \times 12$
$\Rightarrow$ $2x = 360$
$\therefore$ Total number of articles = 360

92. (B) Let profit = x
CP = 100
ATQ,
$2(100 + x) = 100 + 3x$
$\Rightarrow$ $x = 100$
Profit = 100%

93. (B)
A – 21 → 8
B – 24 → 7 → 168
C – 28 → 6

Work done by (A + B + C) in 6 days = (8 + 15 + 14 + 15 + 8 + 21)
$\therefore$ Work done in 12 days = 81 × 2 = 162
Now, remaining work = 168 – 162 = 6

Hence, work must be done = $12 + \frac{6}{8} = 12\frac{3}{4}$ days

94. (B) Let the speed of the trains be $3x$ m/s and $4x$ m/s

Then, length of each train = $\frac{(3x+4x)\times 20}{2}$ = $70x$

Now,

Distance travelled by faster train in 35 seconds = 35 × $4x$ = $140x$

and, $70x + 700 = 140x$

$\Rightarrow 70x = 700$

Length of each train = $700m$

95. (A) $\frac{x\times Q\times t}{100} + x = \frac{y\times P\times t}{100} + y$

$\Rightarrow \frac{(Qx-Py)\times t}{100} = y - x$

$\Rightarrow t = \frac{(y-x)\times 100}{Qx-Py}$

$\Rightarrow t = \frac{100(x-y)}{Py-Qx}$

96. (C) Required percentage increase = $\frac{120-100}{100}\times 100 = 20\%$

97. (B) Average production at given years = $\frac{100+120+110+140+75+130}{6}$

$= \frac{675}{6} = 112.5$

Hence, required years = 2013, 2015 and 2017

98. (D) Sum of production during odd years = 120 + 140 + 130 = 390

Sum of production during even years = 100 + 110 + 75 = 285

∴ Required difference = $\frac{390}{285}$ = 1.37 times

99. (C) Total production in 2013 and 2015 = 120 + 140 = 260

Production in 2017 = 130

100. (B) Average production during given years = $\frac{100+120+110+140+75+130}{6}$ = 112.5

∴ Required production = 113000 tones

QUANTITATIVE ABILITY - 90 (ANSWER KEY)

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