QUANTITATIVE ABILITY - 80 (SOLUTION)

1. (C) Ratio of money received by each (Son : Daughter : Nephew) = $5x : 4x : x$

So, Ratio of amount to 5 Sons : 4 daughters : 2 nephews = $25x : 16x : 2x$

$25x : 16x : 2x$ = ₹ 8600

$43x$ = ₹ 8600

x = ₹ 200

∴ Required money to each daughter = 4 × 200 = ₹ 800

2. (C) Repaired gain $= 2\times\left(6\frac{1}{4}-4\right)\%\text{ of }5000 = 2\times 2\frac{1}{4}\%\,of\,5000$

$= 2\times\frac{9}{4\times100}\times5000$ = ₹ 225

3. (D) Let the speed of the bus = x km/hr

Then to take a lead of 60 m, he will have to cover a distance of (60+40)m = 108m, with the speed of (30–x) km/hr in 20 sec.

100m = (30–x) km/hr × 20 sec.

$$100 = \frac{(30-x)\times1000}{3600}\times20$$

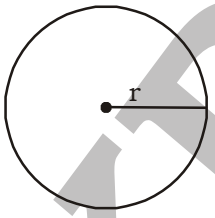
$$\frac{1}{10}=\frac{(30-x)}{180}$$

$180 = 300 - 10x$

$10x = 120$

x = 12 km/hr

4. (C)



Circumference = $2\pi r$

Time taken for one round= $\frac{40}{8}$ = 5 min.

Now, new radius = 10 r

So, New circumference = $2\pi\times10r = 20\pi r$

So Required time = $\frac{20\pi r}{2\pi r}\times5$ minute = 50 minutes

5. (B) In such type of questions, required ratio of the speeds of the two trains = $\frac{\sqrt{9}}{\sqrt{4}} = \frac{3}{2} = 3 : 2$

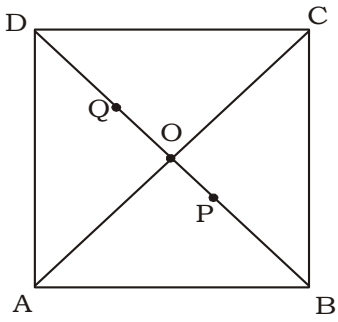
6. (D) $\frac{1-x^4}{1+x} \div \frac{1+x^2}{x} \times \frac{1}{x(1-x)} = A$

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

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

A = 1

7. (B)



ABCD is a ||gm whose diagonal BD=18cm.

Let both the diagonals bisect at 'O'

DO = OB = 9 cm.

∵ DO and BO are medians of ΔADC & ΔABC

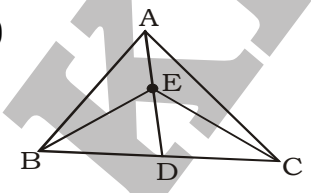
Also P & Q are centroids of ΔADC & ΔABC

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

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

PQ = PO + QO = 3 + 3 = 6 cm

8. (A)



∵ E is the mid point of AD

BE is the median.

∴ ar(ΔBED) = ar(ΔABE) = $\frac{1}{2}$ar(ΔABD) .....(1)

[A medians divides each Δ into two parts of equal areas]

Similarly, we can write

$\text{ar}(\Delta CED) = \text{ar}(AEC) = \frac{1}{2}\text{ar}(\Delta ACD)$

On adding (1) and (2)

$\text{ar}(\Delta BEC) = \frac{1}{2}\text{ar}(\Delta ABD) + \frac{1}{2}\text{ar}(\Delta ACD) = \frac{1}{2}\text{ar}(\Delta ABC)$

9. (A) Let the parallel sides of the trapezium be $5x$ cm & $7x$ cm its area = $\frac{1}{2}[5x+7x]\times 14$

$336 = 12x \times 7$

$\frac{336}{7\times 12} = x$

$x = 4$

Smaller of the parallel sides = $5x$ cm = $5 \times 4 = 20$ cm

10. (D) Let the side of the square be x cm

Length of the rectangle = (x + 5) cm

Its breadth = (x – 3) cm

ATQ,

$x^2 = (x + 5)(x - 3)$

$x^2 = x^2 - 3x + 5x - 15$

$2x = 15$

$x = \frac{15}{2} = 7.5\,cm$

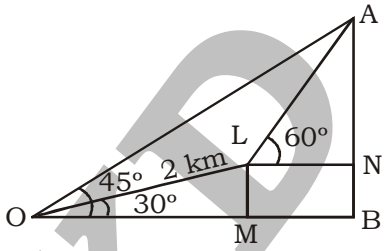
Perimeter of the rectangle = 2 (l + b)

= 2 [(7.5 + 5)+ (7.5 – 3)]

= 2 [12.5 + 4.5]

= 2 × 17 = 34 cm.

11. (B)



Let AB = h km

In Δ OAB,

$\tan 45° = \frac{AB}{OB}$

OB = h km

In Δ OLM,

OM = $2 \cos 30° = \sqrt{3}$ km

$\therefore$ LN = BM = $(h - \sqrt{3})$ km

In ΔOLM,

$\sin 30^\circ = \frac{LM}{OL}$

LM = 2 sin30° = 1 km

BN = LM = 1 km

In ΔALN,

$\tan 60^\circ = \frac{AN}{LN}$

$\sqrt{3} = \frac{AB - BN}{LN}$

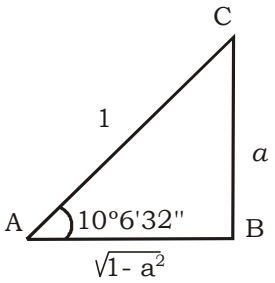
$\sqrt{3} = \frac{h-1}{h-\sqrt{3}}$

$\sqrt{3}h - 3 = h - 1$

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

$h = (\sqrt{3}+1)$ km

12. (A)



sin (10° 6'32'')= a

sin (90° - 79° 53' 28'') = a

cos 79° 53' 28'' = a

$\therefore$ cos (79° 53' 28'') + tan (10° 6'32'') = a + $\frac{a}{\sqrt{1-a^2}} = \frac{a(1+\sqrt{1-a^2})}{\sqrt{1-a^2}}$

13. (B) Suppose B left the work after x days from the start.

ATQ,

$\frac{x}{25} + \frac{x+7}{15} = 1$

$\frac{3x+5x+35}{75} = 1$

$8x = 75 - 35$

$\therefore$ $x = \frac{40}{8} = 5$

14. (A) radius of pipe = $\frac{5}{20}$ cm, (given)

height of pipe = 1000 cm

radius of vessel = 20cm

and height = 24cm

Volume of water that flows in one minute through cylindrical pipe = $\pi\left(\frac{5}{20}\right)^2 \times 1000 = \frac{125}{2}\pi \text{ cm}^3$

Also, volume of conical vessel = $\frac{1}{3}\pi(20)^2 \times 24 = 3200\pi \text{ cm}^3$

$\therefore$ Time taken by pipe to fill the vessel = $\frac{3200\pi \times 2}{125\pi} = 51\frac{1}{5}$ or 51 min 12s

15. (C) Let the length, breadth and height of a rectangular parallelepiped be l, b and h cm respectively.

ATQ,

$l = 3b = 5h = a$ (say)

$l = a,\ b = \frac{a}{3},\ h = \frac{a}{5}$

It is given that volume of parallelopiped = 14400cm^3

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

$a^3 = 14400 \times 15$

$\therefore$ $a = \sqrt[3]{14400 \times 15} = 60$ cm

Total surface area of parallelopiped = $2(lb + bh + hl) = 2(60 \times 20 + 20 \times 12 \times 60) = 4320 \text{ cm}^2$

16. (C) Area of the courtyard = $3.78 \times 5.25 = 378 \times 525 = 198450$ sq cm

$\therefore$ $198450 = 21 \times 21 \times 450$

450 sq marble stones shall be used of size 21 cm × 21 cm

17. (C) 1st day = 4 km, 2nd day = $4 \times \frac{1}{2} = 2$ km,

3rd day = $2 \times \frac{1}{2} = 1$ km

$\therefore$ Total distance $S = 4 + 2 + 1 + \frac{1}{2} + \frac{1}{4} + \ldots$

Which is infinite GP with $a = 4$, $r = \frac{1}{2}$

Now, $\because$ $r < 1$

So, Sum; $S = \frac{a}{1-r} = \frac{4}{1-\frac{1}{2}} = \frac{4}{\frac{1}{2}} = 8$ km

18. (B) Milk : water in first glass = $\frac{1}{3}:\frac{2}{3}$ = 4 : 8

and Milk: Water in second glass = $\frac{1}{4}:\frac{3}{4}$ = 3 : 9

Milk in the vessel = 4 + 3 = 7

Water in the vessel = 8 + 9 = 17

Ratio of milk and water in the vessel = 7 : 17

19. (B) Gain = 2 min + 4 min 48s = 6min 48s = 408 seconds

Hour = (7× 24 + 2) = 170 hrs.

Clock gains = $\frac{408}{170}$ = 2.4 s/h

$\therefore$ It will gain 2 min or 120s in $\frac{120}{2.4}$ h. = 50h

Clock will show correct time 2pm to Tuesday

20. (B) $\because$ α,β,γ are the roots of polynomial

$3x^3 - 5x^2 - 11x - 3$

$$\alpha+\beta+\gamma = \frac{-(-5)}{3} = \frac{5}{3}$$

$$\alpha\beta+\beta\gamma+\alpha\gamma = \frac{-11}{3}$$

$$\alpha\beta\gamma = \frac{-(-3)}{3} = \frac{3}{3} = 1$$

Now,

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

$$[\alpha^2+\beta^2+\gamma^2-\alpha\beta-\beta\gamma-\alpha\beta]$$

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

$$[(\alpha+\beta+\gamma)^2-2\alpha\beta-2\beta\gamma-2\alpha\gamma-\alpha\beta-\beta\gamma-\alpha\gamma]$$

$$\alpha^3+\beta^3+\gamma^3-3\times1 = \frac{5}{3}\left[\left(\frac{5}{3}\right)^2-3(\alpha\beta+\gamma\beta+\alpha\gamma\right]$$

$$= \frac{5}{3}\left[\frac{25}{9}-3\times\frac{-11}{3}\right]$$

$$= \frac{5}{3}\left[\frac{25}{9}+11\right] = \frac{5}{3}\left[\frac{25+99}{9}\right]$$

$$\alpha^3+\beta^3+\gamma^3 = \frac{5}{3}\times\frac{124}{4}+3 = \frac{620}{27}+3$$

$$= \frac{620+81}{27} = \frac{701}{27}$$

21. (C) $\because$ $x = \sqrt{2}$ and $x = -\sqrt{2}$ are zeroes of the polynomial $2x^4 - 3x^3 - 3x^2 + 6x - 2$

$(x - \sqrt{2})$ and $(x + \sqrt{2})$ are factors of $2x^4 - 3x^3 - 3x^2 + 6x - 2$

$(x^2 - 2)$ is a factor of $2x^4 - 3x^3 - 3x^2 + 6x - 2$

Now,

$$
\begin{array}{r|l}
x^2 - 2 & 2x^2 - 3x + 1 \\
\hline
 & 2x^4 - 3x^3 - 3x^2 + 6x - 2 \\
 & -2x^4 \quad \mp 4x^2 \\
\hline
 & -3x^3 + x^2 + 6x - 2 \\
 & \mp 3x^3 \quad \pm 6x \\
\hline
 & x^2 - 2 \\
 & -x^2 \quad \mp 2 \\
\hline
 & 0
\end{array}
$$

Other factor = $2x^2 - 3x + 1$

for other zeroes

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

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

$2x(x - 1) - 1(x - 1) = 0$

$(2x - 1)(x - 1) = 0$

$x = \frac{1}{2}, 1$

22. (B) $\because$ QT & RT are bisectors of $\angle PQR$ & $\angle PRS$ respectively.

$\angle TRS = \frac{1}{2}\angle PQR + \angle QTR$ _____(1)

(Ext. angle property)

Also,

$\angle PRS = \angle PQR + \angle QPR$

$\frac{1}{2}\angle PRS = \frac{1}{2}\angle PQR + \frac{1}{2}\angle QPR$ _____(2)

$\angle TRS = \frac{1}{2}\angle PQR + \frac{1}{2}\angle QPR$

From (1) & (2),

$\frac{1}{2}\angle PQR + \angle QTR = \frac{1}{2}\angle PQR + \frac{1}{2}\angle QPR$

$\angle QTR = \frac{1}{2}\angle QPR$

23. (C) $\because$ (llgm ABCD) & (llgm ABMN) are on the same base & between the same parallels.

$\therefore$ ar(llgm ABCD) = ar(llgm ABMN)

$\therefore$ ar(llgm ABCD) = 80 sq. unit

Again, ΔAPN & llgm (ABMN) are on the same base & between the same parallels.

$\therefore$ ar(ΔAPN) = $\frac{1}{2}$ar(llgm ABMN) = $\frac{1}{2}$ × 80 sq. unit = 40 sq unit.

24. (A) Required number of books = $\frac{4400}{100} \times 84 \times \frac{2}{5} = 1478.4 \approx 1478$

25. (D)

26. (D) Total number books sold in A = $\frac{18000}{3} \times 7 = 42{,}000$

Total number of books = $\frac{42000}{16} \times 100$

Total number of books sold in E = $\frac{24000}{2} \times 5 = 60{,}000$

Total number of books = $\frac{60000}{12.5} \times 100$

$\therefore$ Required ratio = $\frac{42000}{16} \times 100 : \frac{60000}{12.5} \times 100 = 105 : 192$

27. (B) Total number of books in B = $\frac{4200}{3} \times 7 \times \frac{100}{14} = 70{,}000$

28. (B) Total number of books unsold in E = $\frac{4800}{3} \times 5 = 8{,}000$

Total number of books in F = $\frac{8000}{32} \times 100 = 25{,}000$

$\therefore$ Total number of Maths books sold in F = $\frac{25000}{5} \times 4 = 20{,}000$

29. (B) $x^y = y^x$

$\therefore$ $y = x$

$$\left(\frac{x}{y}\right)^{\frac{x}{y}} = \left(\frac{x}{x^{\frac{y}{x}}}\right)^{\frac{x}{y}} = x^{\frac{x}{y} - \frac{x}{y} \times \frac{y}{x}} = x^{\frac{x}{y} - 1}$$

30. (B) $\frac{1}{\cos\theta} = \frac{4a^2 + 1}{4a}$

$$\therefore \sin\theta = 1 - \sqrt{1 - \left(\frac{4a}{4a^2+1}\right)^2} = \sqrt{\frac{16a^4 + 1 + 8a^2 - 16a^2}{(4a^2+1)^2}}$$

$$= \sqrt{\frac{16a^4 - 8a^2 + 1}{(4a^2+1)^2}} = \frac{4a^2 - 1}{4a^2 + 1}$$

$$\therefore \tan\theta + \frac{1}{\cos\theta} = \frac{\sin\theta + 1}{\cos\theta} = \frac{\frac{4a^2 - 1^2}{4a^2+1} + 1}{\frac{4a}{4a^2+1}}$$

$$= \frac{8a^2}{4a} = 2a$$

31. (C) Let $x = 3$, $y = 4$

So, $x + y = 3 + 4 = 7$

and $x^2 + y^2 = 3^2 + 4^2 = 25$

$\therefore \quad \frac{1}{x} + \frac{1}{y} = \frac{1}{3} + \frac{1}{4} = \frac{7}{12}$

32. (C) $\sqrt{mn} = 10$, $mn = 100$

If $m = 100$ then $n = 1$

$\therefore \quad m + n = 101$

If $m = 50$, then $n = 2$

$\therefore \quad m + n = 52$

If $m = 25$, then $n = 4$

$m + n = 29$

$\therefore \quad m + n \neq 50$

33. (A) Length of hypotenuse = $\sqrt{24^2 + 7^2} = 25$

$\therefore \quad \frac{1}{2} \times 25 \times h = \frac{1}{2} \times 7 \times 24$

$h = \frac{7 \times 24}{25} = 6.72$ cm

34. (A) $x + y - 4 = 0$

$y = (-x) + 4 \qquad \ldots(i)$

$3x - y - 4 = 0$

$y = 3x - 4 \qquad \ldots(ii)$

$x + 3y - 4 = 0$

$y = \frac{(-x)}{3} + \frac{4}{3} \qquad \ldots(ii)$

Product of gradient of (ii) and (iii) equations are = $3 \times \frac{-1}{3} = -1$

Lines are perpendicular

Triangle formed is a right angled triangle.

35. (D) $\sin\theta + \cos\theta = \sqrt{3}\cos\theta$

$\sin\theta = (\sqrt{3} - 1)\cos\theta$

$\therefore \quad \cos\theta - \sin\theta = \cos\theta - (\sqrt{3} - 1)\cos\theta$

$= \cos\theta[1 - \sqrt{3} + 1] = (2 - \sqrt{3})\cos\theta$

36. (D) If length, breadth and height of the cuboid are l, b, h respectively then

$l \times b = p$

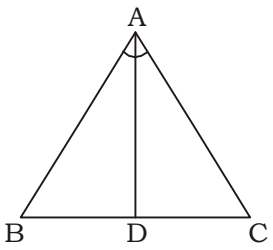
$b \times h = q$

$l \times h = r$

$\therefore (lbh)^2 = pqr$

$lbh = \sqrt{pqr}$

37. (C)



If AD is the angle bisector, then

$$\frac{AB}{AC} = \frac{BD}{DC}$$

$$\therefore \quad \frac{BD}{DC} = \frac{3}{4}$$

38. (A) $a + \frac{1}{a} = -1$

$a^2 + 1 = -a$

$a^2 + a + 1 = 0$

$\therefore \quad a^4 - a = a(a^3 - 1)$

$= a(a-1)(a^2 + a + 1)$

$\therefore \quad 0 \times a(a-1) = 0$

39. (B) $\frac{1-\sin\theta+1+\sin\theta}{\sqrt{1+\sin\theta}\times\sqrt{1-\sin\theta}} = \frac{2}{\cos\theta} = 2\sec\theta$

40. (C) $\sin^2A(1 - \sin^2B) - (1 - \sin^2A)\sin^2B$

$\therefore \quad \sin^2A - \sin^2B$

41. (B) $\angle PBA = 100°$

$\angle PBE = \angle BED = 180° - 100° = 80°$

$\therefore \quad \angle BED = \angle CDS$

$y = 80°$

42. (A) Total number of employees in Account department in all the organisations in the year 2002

$$= (260 + 250 + 220 + 240 + 300 + 300 + 320) \times \frac{120}{100} = 2268$$

Total number of employees in HR department in all the organisations in the year 2002

$$= (200 + 230 + 320 + 160 + 260 + 180 + 360) \times \frac{85}{100} = 1453.5$$

$$\therefore \quad \text{Required\%} = \left(\frac{2268}{1453.5}\times 100\right)\% = 156.03\% \approx 156\%$$

43. (C) Required ratio = (220 + 240 + 320) : (300 + 320 + 360)

= 780 : 880 = 39 : 44

44. (B) Total number of employees in Administration department

= (350 + 280 + 240 + 360 + 160 + 240 + 200) = 1830

Total number of employees in Account department

= (260 + 250 + 220 + 240 + 300 + 300 + 320) = 1890

$\therefore$ Required difference = 1890 – 1830 = 60

45. (D) Required number = $350 \times \frac{112}{100} + 280 \times \frac{120}{100} + 240 \times \frac{115}{100}$

= 392 + 336 + 276 = 1004

46. (A) Total number of employees in organisastion M = 230 + 250 + 280 = 760

$\therefore$ Number of employees having liking music = $\frac{760}{16} \times 4 = 190$

47. (B) Sum of present age of husband, wife and child = (27×3+3×3) years = 90 years.

Sum of present age of wife and child = (20×2×5×2) years = 50 years

Present age of husband = 90 - 50 = 40 years

48. (C) Let the original weight be 100%

Weight of container = 25%, then fluid= 75%

New weight of fluid = 50% - 25% = 25%

$\therefore$ Required fraction = $\frac{75\% - 25\%}{75\%} = \frac{50\%}{75\%} = \frac{2}{3}$

49. (A) Let the C.P. be 100%.

then, SP = 80% [100% – 20%]

Actual C.P. = 100% – 40% = 60%

Profit % = $\frac{80 - 60}{60} \times 100 = \frac{20}{60} \times 100 = 33\frac{1}{3}\%$

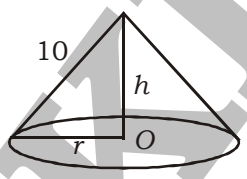
50. (C) Area of regular pentagon = $5a^2 \frac{\sqrt{3}}{4}$

$5a^2 \times \frac{\sqrt{3}}{4} = 125\sqrt{3}$

$a^2 = \frac{125\sqrt{3} \times 4}{5\sqrt{3}} = 100$

Each side = a = 10 cm

51. (D)

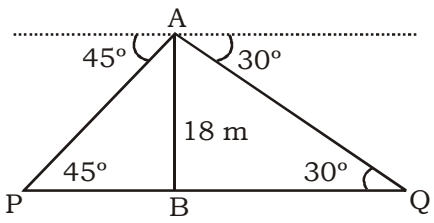


Volume = $\frac{1}{3} \pi r^2 h = \frac{1}{3} \pi r^2 (\sqrt{l^2 - r^2})$

$= \frac{1}{3} \times \frac{22}{7} \times 7 \times 7 \sqrt{100 - 49} = \frac{1}{3} \times 22 \times 7 \times \sqrt{51}$

$= \frac{154}{3}\sqrt{51}$ m³

52. (A)



Let the width of the river = PQ

In Δ ABQ,

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

$\frac{1}{\sqrt{3}} = \frac{18}{BQ}$

BQ = $18\sqrt{3}$ m

In Δ ABP,

$\tan 45^\circ = \frac{AB}{BP}$

$1 = \frac{18}{BP}$

BP = 18 m

So, width of the river = PQ = BP + BQ

= $18\sqrt{3}$ + 18 = 18 ($\sqrt{3}$ +1)m

53. (B) Since, one root = $2 + \sqrt{5}$, then another root = $2 - \sqrt{5}$

Sum of roots = $(2 \sqrt{5}) + (2 - \sqrt{5}) = 4$

Multiplication of the roots = $(2 - \sqrt{5})(2 - \sqrt{5})$

= 4 – 5 = –1

Then, required quadratic equation is

x^2 – (sum of roots) x + (Multiplication of roots) = 0

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

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

54. (A) Let the C.P of article be 100%

then, marked price = 100% +20% = 120%

S.P = $120\% \times \frac{95}{100}$ = 114%

Then Profit = 114% – 100% = 14%

55. (A) Volume of the tank = 20 × 15 × 6 = 1800 m^3

= 1800 × 1000 L

One day requirement = 4000 × 150 L

$\therefore$ Number of days = $\frac{1800 \times 1000}{600 \times 1000}$ = 3 days

56. (A) Let C.P of watch = 100%

Then, marked price = 140%

Then, S.P = $140 \times \frac{90}{100} = 126\%$

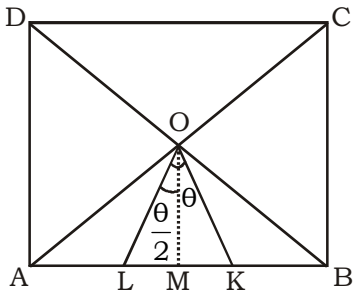
Gross Profit = 26%

Net profit = $26\% \times \frac{90}{100} = \frac{117}{5}\%$

$\frac{117}{5}\%$ = ₹ 468 (Given)

100% = ₹ 2000

57. (C)



Let sides of square be *a*.

AO = $\frac{\sqrt{2}a}{2} = \frac{a}{\sqrt{2}}$ = AK = BL

LM = $\frac{a}{\sqrt{2}} - \frac{a}{2}$ [BL - BM]

OM = $\frac{a}{2}$

In Δ LOM,

$$\tan\frac{O}{2} = \frac{LM}{OM} = \frac{\frac{a}{\sqrt{2}} - \frac{a}{2}}{\frac{a}{2}} = \frac{a\left(\frac{2-\sqrt{2}}{2\sqrt{2}}\right)}{\frac{a}{2}}$$

$$= \frac{2-\sqrt{2}}{2\sqrt{2}} \times 2 = \sqrt{2} - 1$$

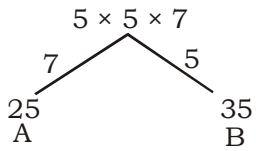
$$\tan\theta = \frac{2\tan\frac{\theta}{2}}{1-\tan^2\frac{\theta}{2}} = \frac{2(\sqrt{2}-1)}{1-(2+1-2\sqrt{2})}$$

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

$\tan\theta = 1 = \tan 45°$

$\theta = 45°$

58. (D)



Ratio of wages = 7 : 5

$A = \frac{7}{12} \times 48132 = ₹\ 28077$

59. (A) Average collection = speed × capacity × occupancy × ticket ratio

Ratio of average collection of truck to that of bus = product of above rates

= (3 × 50 × 1 × 1.5) : (1× 30 × 2 × 1) = 15 : 4

60. (C) $\frac{1}{1+p+\frac{1}{q}} + \frac{1}{1+q+\frac{1}{r}} + \frac{1}{1+r+\frac{1}{p}} = \frac{q}{1+pq+q} + \frac{r}{r+rq+1} + \frac{p}{p+rp+1}$

$= \frac{q}{1+pq+q} + \frac{r}{\frac{1}{pq}+\frac{1}{p}+1} + \frac{p}{p+\frac{1}{q}+1} \qquad [\because pqr = 1]$

$= \frac{q}{1+pq+q} + \frac{rpq}{1+q+pq} + \frac{pq}{pq+1+q} = \frac{q}{1+pq+q} + \frac{rpq}{1+q+pq} + \frac{pq}{pq+1+q}$

$= \frac{q+rpq+pq}{1+pq+q} = \frac{q+1+pq}{1+pq+q} \qquad [\because pqr = 1]$

= 1

61. (C) Given:

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

Now, the value of a, we have on substituting.

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

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

62. (B) Let the pebbles with Manish, Rahul and Bharti be m, r, and b respectively.

Given :

$5r = 7m$ and $5m = 7b$

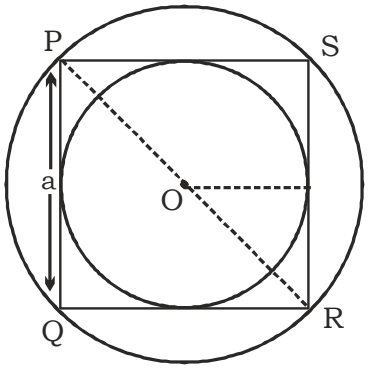
25r = 35m and 35m = 49b

$25r = 35m = 49b$

The least possible integral values of r, m and b will be $r = 49$, $m = 35$ and $b = 25$

$\therefore$ Required Total = 49 + 35 + 25 = 109

63. (A) Let PQRS be any square of length 'a' cm and 'O' be the centre of the two circles drawn inside (in-circle) and outside (cirum-circle) the square.



$\therefore$ Radius of the in circle = Half the length of one side (PQ) of the square = $\left(\frac{a}{2}\right)^2$ cm

Area of in-circle = $\pi \times \left(\frac{a}{2}\right)^2 = \left[\frac{\pi a^2}{4}\right]$ cm^2

And the radius of circum-circle = Half the length of the diagonal (PR) of the square

$= \left[\frac{a\sqrt{2}}{2}\right] = \left[\frac{a}{\sqrt{2}}\right]$ cm

Area of the circum-circle = $\pi\left(\frac{a}{\sqrt{2}}\right)^2 = \left[\frac{\pi a^2}{2}\right]$ cm^2

$\therefore$ Area of in-circle : Area of circum-circle = $\frac{\pi a^2}{4} : \frac{\pi a^2}{2} = 1 : 2$

64. (B) Formula : $S_A : S_B = \sqrt{t_B} : \sqrt{t_A}$ [Where S_A = Speed of A S_B = Speed of B]

Applying this, $\frac{18}{S} = \frac{\sqrt{16}}{\sqrt{4}}$

$S = \frac{18}{2} = 9$ kms/hr

65. (A) The distance travelled by the car in 27 minutes could be travelled by the sound in (28 minutes 30 sec – 27 minutes) i.e. $1\frac{1}{2}$ min

$\therefore$ Distance travelled by the car in 27 minutes = $330 \times 1\frac{1}{2}$ mins

$= 330 \times \frac{3}{2} \times 60$ secs = 330 × 90 min

Speed of the car = $\frac{330 \times 90}{27 \times 60} = \frac{330}{18}$ m/sec

$= \frac{330}{18} \times \frac{18}{5}$ kms/hr = 66 kms/hr

66. (A) Let CP = 100

16 articles cost price = 1600

Profit = $\frac{35}{100} \times 1600 = 560$

Selling price = 2160

Selling price of 15 article's selling price = 2160

Selling price 1 articles = $\frac{2160}{15} = 144$

Cost price = 100

M.P = $\frac{144}{96} \times 100 = 150$

50% above cost price

II Method

C.P.	S.P.	M.P.
$96_{\times 135}$	$100_{\times 135}$	$100_{\times 96}$ $135_{\times 96}$

Let MP = 135 CP = 96

M.P. of 15 articles = 135

M.P of 1 articles = $\frac{135}{15} = 9$

C.P of 16 article = 96

C.P of 1 article = $\frac{96}{16} = 6$

% of M.P. above the C.P. = $\frac{9-6}{6} \times 100 = 50\%$

III Method

$MP \times \frac{15}{16} \times \frac{96}{100} = CP \times \frac{135}{100} \Rightarrow \frac{MP}{MP} = \frac{3}{2}$

MP is more than CP = $\frac{3-2}{2} \times 100 = 50\%$

67. (A) Cost Price = 350000

Books = 3000 (Remaining)

If there are 30 books then 29 are sold

If there are 3000 books then 2900 are sold

M.P = 150

S.P = $150 \times \frac{3}{4}$

Total S.P = $150 \times \frac{3}{4} \times 2900 = 326250$

Loss = 350000 – 326250 = 23750

Loss% = $\frac{23750}{350000} \times 100 = 6.78\%$

68. (A) Let number of passengers are $2x$, $3x$ and $5x$

Rate = y, $2y$, $4y$

Since, income = Number of passengers × rate

Ratio of income = 2 : 6 : 20

Income from A.C. sleeper class = $\frac{2}{28} \times 56000 = 4{,}000$

69. (C) Suppose, first pipe alone takes x hours to fill the tank .

Then, second and third pipes will take (x -5) and (x - 9) hours respectively to fill the tank.

$\therefore \quad \frac{1}{x} + \frac{1}{(x-5)} = \frac{1}{(x-9)}$

$\frac{x-5+x}{x(x-5)} = \frac{1}{(x-9)}$

$(2x-5)(x-9) = x(x-5)$

$2x^2 - 23x + 45 = x^2 - 5x$

$x^2 - 18x + 45 = 0$

$(x-15)(x-3) = 0$

$x = 15$ (neglecting $x = 3$)

70. (C) Suppose the container initially contains $7x$ l and $5x$ l of mixtures A and B respectively.

Quantity of A in mixture left = $\left(7x - \frac{7}{12} \times 9\right)$ litres = $\left(7x - \frac{21}{4}\right)$ litres

Quantity of B in mixture left = $\left(5x - \frac{5}{12} \times 9\right)$ litres = $\left(5x - \frac{15}{4}\right)$ litres

$\therefore \quad \frac{\left(7x - \frac{21}{4}\right)}{\left(5x - \frac{15}{4}\right) + 9} = \frac{7}{9}$

$\frac{28x - 21}{20x + 21} = \frac{7}{9}$

$252x - 189 = 140x + 147$

$112x = 336$

$x = 3$

$7x = 21$

So, the container contained 21 litres of mixture A

71. (A) Amount remaining after

1 year = $4000\left(1 + \frac{7.5}{100}\right) - 1500 =$ ₹ 2800

2 years = $2800\left(1 + \frac{7.5}{100}\right) - 1500 =$ ₹ 1510

3 years = $1510\left(1 + \frac{7.5}{100}\right) - 1500 =$ ₹ 123.25

72. (A) If a equilateral Δ is inscribed in a circle, it means the circle is circum-circle of that equilateral triangle.

Area of equilateral $\Delta = \frac{\sqrt{3}}{4} \times (\text{side})^2 = 4\sqrt{3}$ cm^2

side = $\frac{4\sqrt{3}}{\frac{\sqrt{3}}{4}}$ cm = 4 cm

Circum-radius of equilateral $\Delta = \frac{\text{side}}{\sqrt{3}} = \frac{4}{\sqrt{3}}$ cm

So, area of circle = $\pi \times \left(\frac{4}{\sqrt{3}}\right)^2$ cm^2 = $\frac{16}{3}\pi$ cm^2

73. (C) Let the number of students appeared in school X = 100

$\therefore$ Number of students qualified in school X = 70

According to question,

Number of students appeared in School Y = 120

Number of students qualified in School Y = 70 + 50% of 70 = 70 + 35 = 105

$\therefore$ Required percentage = $\frac{105 \times 100}{120} = 87.5\%$

74. (D) Required number of items = $\frac{(3000+1000)}{(60-40)} = \frac{4000}{20} = 200$

75. (B) $\frac{(x-y)^3+(y-z)^3+(z-x)^3}{4(x-y)(y-z)(z-x)}$

$\because$ $x - y + y - z + z - x = 0$

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

$= \frac{3(x-y)\times(y-z)\times(z-x)}{4(x-y)(y-z)(z-x)} = \frac{3}{4}$

76. (C) $x^2 - 2x - 3)\ x^3 - 2x^2 + px - q\ (x$

$x^3 - 2x^2 - 3x$

$- \quad + \quad +$

$3x + px - q$

As per given condition, we have

$(p + 3)x - q = x - 6$

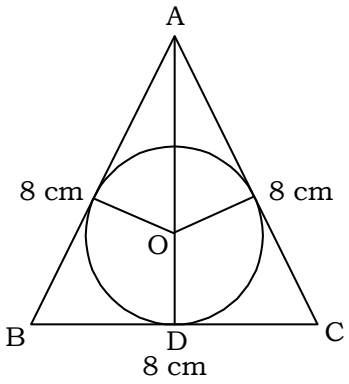
$p + 3 = 1,\ q = 6$

$p = -2,\ q = 6$

77. (B) AD = median = $\frac{\sqrt{3}}{2} \times 8$ cm = $4\sqrt{3}$ cm

OD = radius of the in-circle = $\frac{1}{3} 4\sqrt{3}$ cm

Area of in-circle = $\frac{22}{7} \times \frac{4\sqrt{3}}{3} \times \frac{4\sqrt{3}}{3}$ cm^2 = $\frac{22 \times 16}{21}$ cm^2



Area of triangle = $\frac{\sqrt{3}}{4} \times 8 \times 8 \text{ cm}^2 = 16\sqrt{3} \text{ cm}^2$

Required area of the portion between the triangle and the circle = $\left(16\sqrt{3} - \frac{22 \times 16}{21}\right) \text{cm}^2$

$= 16\left(\sqrt{3} - \frac{22}{21}\right) \text{cm}^2$

$= \frac{16}{21} (21 \times 1.732 - 22) \text{ cm}^2 = \frac{16}{21} (36.372 - 22) \text{ cm}^2$

$= \frac{16}{21} (14.372) \text{ cm}^2 = 10.95 \text{ cm}^2$

78. (A) Let the shares of Anita, Bindu and Champa are $11x$, $18x$ and $24x$ respectively.
$1105 = 11x + 10 + 18x + 20 + 24x + 15$
$1105 = 53x + 45$
$x = 20$
$\therefore$ Amount received by Champa = $24x + 15$
$= 24 \times 20 + 15 = ₹ 495$

79. (A) Total marks got by the students in 8 subjects = $8 \times 57 = 696$
Total marks got by the student in 6 subjects = $6 \times 85 = 510$
Remaining marks in 2 subjects = $696 - 510 = 186$
Let the highest marks be x, then the second highest marks will be $x - 2$.
$\therefore$ $x + x - 2 = 186$
$2x = 188$
$x = 94$
Highest marks = 94

80. (D) Total score of first three friends = $15 \times 3 = 45$
And total score of last three friends = $16 \times 3 = 48$
Total score of four friends = $45 + 19 = 64$
Score of first friend = $64 - 48 = 16$

So, required percentage = $\frac{16}{48} \times 100\% = 33\frac{1}{3}\%$

81. (A) Given, $a\sec\theta + b\tan\theta = 1$ .... (i)

and, $a^2\sec^2\theta - b^2\tan^2\theta = 5$ ....(ii)

From Eqs. (i) and (ii),

$a\sec\theta - b\tan\theta = 5$ ....(iii)

From Eqs. (i) and (iii),

$a\sec\theta = 3$ ....(iv)

$b\tan\theta = -2$ ....(v)

From Eq. (iv),

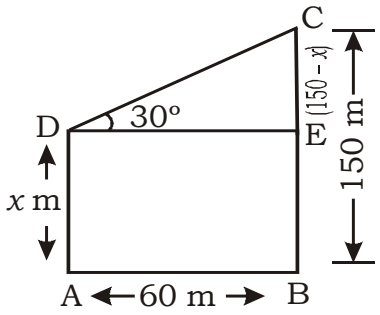
$a^2\sec^2\theta = 9$

$a^2(1 + \tan^2\theta) = 9$

$$a^2\left(1+\frac{4}{b^2}\right) = 9$$

$a^2b^2 + 4a^2 = 9b^2$

82. (A)



Let the height of the shorter tower be x m.

Then, from ΔCDE,

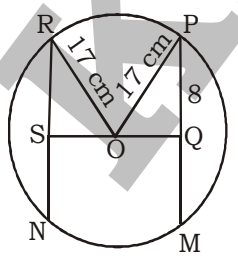
$$\tan 30^\circ = \frac{(150-x)}{60}$$

$$\frac{1}{\sqrt{3}} = \frac{150-x}{60}$$

$$(150 - x) = \frac{60}{\sqrt{3}} = 2\sqrt{3}$$

$\therefore$ $x = 150 - 20\sqrt{3} = 116$ m (approx)

83. (C)



SQ = 23 cm

In ΔPQO,

$(17)^2 = (8)^2 + (OQ)^2$

$(OQ)^2 = 289 - 64 = 225$

OQ = 15

$\therefore$ OS = 23 – 15 = 8

Now in Δ ORS,

$(RS)^2 = (17)^2 - (8)^2 = 289 - 64 = 225$

$\therefore$ RS = 15 cm

Hence, length of other chord = 15 × 2 = 30 cm

84. (D) Let the three points be $A\left(0, \frac{8}{3}\right)$, B(1, 3) and C(82, 30)

Then,

$$AB = \sqrt{(1-0)^2 + \left(3 - \frac{8}{3}\right)^2} = \frac{\sqrt{10}}{3}$$

$$BC = \sqrt{(82-1)^2 + (30-3)^2} = \sqrt{6561 + 729}$$

$$= \sqrt{7290} = 27\sqrt{10}$$

$$CA = \sqrt{(82-0)^2 + \left(30 - \frac{8}{3}\right)^2}$$

$$= \sqrt{\frac{10 \times (82)^2}{9}} = \frac{82}{3}\sqrt{10}$$

Now, $AB + BC = \frac{\sqrt{10}}{3} + 27\sqrt{10} = \frac{82\sqrt{10}}{3}$

Since, AB + BC = AC, it means points A, B and C are collinear.

85. (D) Given,

$$\frac{\sin A}{\cos A} = \frac{4}{7}$$

$$\therefore \quad \frac{7\frac{\sin A}{\cos A} - 3}{7\frac{\sin A}{\cos A} + 2} = \frac{7 \times \frac{4}{7} - 3}{7 \times \frac{4}{7} + 2}$$

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

86. (B) Let x be the total score in the innings.

So, the highest score = $\frac{2}{9}x$

And, the next highest score = $\frac{2}{9}$ of the remaining runs = $\frac{2}{9}\left(x - \frac{2}{9}x\right)$

ATQ,

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

$$x - x + \frac{2}{9}x = \frac{8\times 9}{2}$$

$$x = \frac{8\times 9\times 9}{2\times 2} = 162$$

87. (B) Let total marks be 100.
So, the minimum marks required to be pass = 40% of 100 = 40 marks
ATQ,

Marks obtained by A = $40 - 40 \times \frac{10}{100}$ = 36 marks

And marks obtained by B = $36 - \frac{100}{9} \times \frac{36}{100}$ = 36 – 4 = 32 marks

So, Marks obtained by C = (36 + 32) – (36 + 32) $\times \frac{700}{17\times 100}$

= 68 – 28 = 40 marks

88. (A) Let the rate of filling tank be x m^3 /min.
Then, the rate of empting the tank = $(x + 10)$ m^3/min
ATQ,

$$\therefore \quad \frac{2400}{x} - \frac{2400}{x+10} = 8$$

$$2400\left[\frac{10}{x(x+10)}\right] = 8$$

$x(x + 10) = 3000$
$x = 50$ m^3/min

89. (A) Let the distance covered by the first train be x km/h.
As both trains have travelled for same time.

$$\therefore \quad \frac{x}{50} = \frac{x+120}{60}$$

$60x = 50x + 6000$
$x = 600$
$\therefore$ Total distance = $x + (x + 120)$ = 1320 km

90. (B) Total candidates = 2000
Number of boys = 900
Number of girls = 1100

Number of students who passed = $\frac{32\times 900}{100} + \frac{38\times 1100}{100}$

= 288 + 418 = 706
Number of students who failed = 2000 – 706 = 1294

Required percentage = $\frac{1294}{2000} \times 100 = 64.7\%$

91. (B) Avg. Speed = $\frac{\text{Total distance}}{\text{Total time}}$

ATQ,

$$53 + \frac{1}{3} = \frac{200}{\frac{50}{40} + \frac{150}{x}}$$

$$\frac{160}{3} = \frac{200 \times 40x}{50x + 600}$$

$200x = 24000 = 600x$

$400x = 24000$

$x = 60$ Km/h

92. (C) Required difference = $(l \times b \times h) - \pi r^2 h$

$$= 10 \times 10 \times 21 - \frac{22}{7}\left(\frac{10}{2}\right)^2 \times 21$$

$= 2100 - 1650 = 450$ cm^3

93. (D) $u_n = \cos^n\alpha + \sin^n\alpha$

Now,

$2u_6 - 3u_4 + 1$

$= 2(\cos^6\alpha + \sin^6\alpha) - 3(\sin^4\alpha + \cos^4\alpha) + 1$

$= 2(\cos^2\alpha + \cos^2\alpha)^3 - 3\sin^2\alpha\cos^2\alpha\ (\sin^2\alpha + \cos^2\alpha) - 3\{(\sin^2\alpha + \cos^2\alpha)^2 - 2\sin^2\alpha\cos^2\alpha)\} + 1$

$= 2 - 6\sin^2\alpha.\cos^2\alpha + 6\sin^2\alpha\cos^2\alpha - 3 + 1$

$= 2 - 3 + 1 = 0$

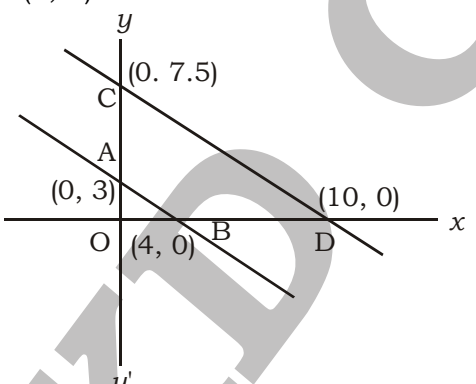
94. (A) $3x + 4y = 12$

$x = 0$, y = 3

A(0, 3)

$y = 0$, $x = 4$

B(4, 0)



$6y + 8y = 60$

$x = 0$, $y = 7.5$

C(0, 7.5)

$y = 0$, $x = 10$

D(10, 0)

Area of Trapezium = Area of ΔCOD – Area of ΔAOB

$$= \frac{1}{2} \times 10 \times 7.5 - \frac{1}{2} \times 4 \times 3$$

$= 37.5 - 6 = 31.5$

95. (C) Curved surface area of cone = Area of sector of circle

$\pi rl = \pi R^2 \times \frac{120}{360}$

Here,
$l = R$

$\therefore$ $r = 15 \times \frac{120}{360} = 5$ cm

$\therefore$ $h = \sqrt{225-25} = 10\sqrt{2}$ cm

Volume of cone = $\frac{1}{3}\pi r^2 h = \frac{1}{3} \times \pi \times 25 \times 10\sqrt{2} = 250\sqrt{2}\,\pi/3$ cm^3

96. (C) Let marks obtained by A in Chemistry = x and in Physics = y

$\left(\frac{95}{100}\times 100\right)+\left(\frac{86}{100}\times 50\right)+\left(\frac{70}{100}\times 150\right)+ x + y + \left(\frac{96}{100}\times 50\right)+\left(\frac{60}{100}\times 75\right) = 536$

$x + y = 536 - 336 = 220$
$x : y = 2 : 3$
$x = 80,\ y = 120$

Marks obtained by B in Physics = $\frac{88}{100}\times 150 = 132$

$\therefore$ Required percentage = $\left(\frac{120}{132}\times 100\right)\% = 90.90\%$

97. (D) Let score of F in Chemistry = x

$\frac{(100+25)}{100} \times x = 140$

$\therefore$ $x = 112$

Average score in Chemistry

$= \frac{80+\left(\frac{96}{100}\times 125\right)+\left(\frac{80}{100}\times 125\right)+\left(\frac{64}{100}\times 125\right)+\left(\frac{60}{100}\times 125\right)+112}{6} = \frac{567}{6} \approx 95$

98. (D) Marks obtained by D in Hindi = 583 – (74 + 88 + 64 + 92 + 94 + 84) = 87

$\therefore$ Required averge = $\frac{95+78+82+87+88+92}{6} = \frac{522}{6} = 87$

99. (A) Marks obtained by E in Hindi, Maths and Chemistry

$=\left(\frac{88}{100}\times 100\right)+\left(\frac{70}{100}\times 150\right)+\left(\frac{60}{100}\times 125\right) = 268$

Marks obtained by F in Botany, Physics and Biology

$=\left(\frac{88}{100}\times 75\right)+\left(\frac{88}{100}\times 150\right)+\left(\frac{68}{100}\times 50\right) = 232$

Required percentage = $\left(\frac{268-232}{232}\right)\times 100\% = 15.51\% \approx 15\%$ more

100. (C) Marks obtained by F in Maths and English = $\frac{92}{100}\times 150 + \frac{94}{100}\times 50 = 185$

Marks obtained by C in Maths and Botany = 185 – 1 = 184
Total marks of C in all the Subject

$= \left(\frac{82}{100}\times 100\right)+\left(\frac{88}{100}\times 50\right)+\left(\frac{80}{100}\times 125\right)+\left(\frac{70}{100}\times 150\right)+\left(\frac{86}{100}\times 50\right)+184 = 558$

Required Percentage = $\left(\frac{558}{700}\times 100\right)\% \approx 80\%$

QUANTITATIVE ABILITY - 80 (ANSWER KEY)

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