K D Campus
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SSC TIER II (MATHS) MOCK TEST - 24 (ANSWER KEY)

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

SSC TIER II (MATHS) MOCK TEST - 24 (SOLUTION)

1. (B) $\frac{11}{14} = 0.78$, $\frac{7}{9} = 0.77$

$\frac{33}{43} = 0.76$, $\frac{3}{4} = 0.75$

$\therefore \frac{3}{4}$ is the smallest

2. (C) $\frac{Q^{P-1}}{P}$

If P is a prime number and Q is a number co-prime to P, then Q^{P-1} gives a remainder 1 when divided by P.

3. (D) Let the price of watch = ₹ x

According to the question,

$\frac{2000 + 3x}{12} = \frac{1600 + 2x}{9}$

$\Rightarrow 6000 + 9x = 6400 + 8x$

$\Rightarrow x = 400$

4. (B) $(n^3 - n)(n^2 - 4) = n(n^2 - 1)(n - 2)(n + 2)$

$= n(n - 1)(n - 2)(n + 1)(n + 2)$

because $n > 2$, but $n = 3$

$= 3 \times 2 \times 1 \times 4 \times 5$

$= 120$

5. (D) $(4)^{20} \times (49)^3 \times 16^4 \times 121 \times 100$

$= (2)^{40} \times (7)^6 \times (2)^{16} \times (11)^2 \times 2 \times 2 \times 5 \times 5$

Total prime factors = 40 + 6 + 16 + 2 + 4

= 68

6. (B) $\sqrt{\frac{(0.03)^2 + (0.31)^2 + (0.025)^2}{(0.003)^2 + (0.031)^2 + (0.0025)^2}}$

$= \sqrt{\frac{\frac{3^2}{10000} + \frac{31^2}{10000} + \frac{25^2}{1000000}}{\frac{3^2}{1000000} + \frac{31^2}{1000000} + \frac{25^2}{100000000}}}$

$= \sqrt{\frac{100000000}{1000000}} = \sqrt{100} = 10$

7. (B) $667 = 23 \times 29$

$1073 = 29 \times 37$

Sum = 23 + 29 + 37 = 89

8. (B) $\frac{1 + \sin^2\theta}{\cos^2\theta} + \frac{1 + \cos^2\theta}{\sin^2\theta}$

$= \sec^2\theta + \tan^2\theta + \text{cosec}^2\theta + \cot^2\theta$

$= 1 + \tan^2\theta + \tan^2\theta + 1 + \cot^2\theta + \cot^2\theta$

$= 2 + 2(\tan^2\theta + \cot^2\theta)$

$= 2 + 2(2\sqrt{1}) = 6$

9. (C) $\frac{\sin\theta}{M} = \frac{\cos\theta}{N} = \frac{1}{K}$

$M = K\sin\theta$

and, $N = K\cos\theta$

$M^2 + N^2 = K^2(\sin^2\theta + \cos^2\theta) = K^2$

$\Rightarrow K = \sqrt{M^2 + N^2}$

and, $\sin\theta - \cos\theta = \frac{M}{K} - \frac{N}{K} = \frac{M - N}{K}$

$= \frac{M - N}{\sqrt{M^2 + N^2}}$

10. (C) Given, $\frac{\cos^2\theta}{M} + \frac{\sin^2\theta}{N} = \frac{1}{P^2 + Q^2}$ .....(i)

and, $\frac{P\cos\theta}{\sqrt{P^2 + Q^2}} + \frac{-Q\sin\theta}{\sqrt{P^2 + Q^2}} = 1$

$\sin\theta = \frac{-Q}{\sqrt{P^2 + Q^2}}$ $(\cos^2\theta + \sin^2\theta = 1)$

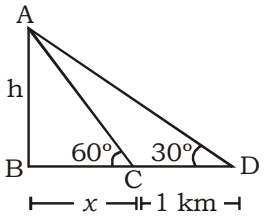
and, $\cos\theta = \frac{P}{\sqrt{P^2 + Q^2}}$

Putting the value of $\sin\theta$ and $\cos\theta$ in equation (i),

$\frac{P^2}{(P^2 + Q^2)M} + \frac{Q^2}{(P^2 + Q^2)N} = \frac{1^2}{P^2 + Q^2}$

$\Rightarrow \frac{P^2}{M} + \frac{Q^2}{N} = 1$

11. (A) In triangle ABC,



$h = \sqrt{3}\,x$

In triangle ABD,

$h = \dfrac{x+1}{\sqrt{3}}$

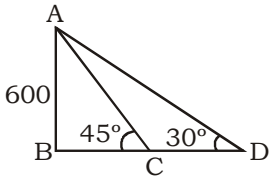
$\Rightarrow \sqrt{3}\,x = \dfrac{x+1}{\sqrt{3}}$

$\Rightarrow 3x = x + 1$

$\Rightarrow x = \dfrac{1}{2}$ km

and, $h = \sqrt{3}\,x = \dfrac{\sqrt{3}}{2}$ km

12. (A)



In triangle ABC,

BC = AB = 600 m

In triangle ABD,

$BD = 600\sqrt{3}$ m

and, CD = length of bridge = $600(\sqrt{3} - 1)$ m

13. (D) $\dfrac{1}{4} \times \dfrac{2}{6} \times \dfrac{3}{8} \times \dfrac{4}{10} \times \dfrac{5}{12} \times \ldots\ldots \times \dfrac{63}{128} = \dfrac{1}{2^x}$

$\Rightarrow \dfrac{1}{2} \times \dfrac{1}{2} \times \dfrac{1}{2} \times \ldots\ldots\ldots \times \dfrac{1}{128} = \dfrac{1}{2^x}$

$\Rightarrow \left(\dfrac{1}{2}\right)^{62} \times \left(\dfrac{1}{2}\right)^{7} = \dfrac{1}{2^x}$

$\Rightarrow \dfrac{1}{(2)^{69}} = \dfrac{1}{2^x}$

$\Rightarrow x = 69$

14. (C) $x = 2 - 2^{1/3} + 2^{2/3}$

$(x - 2) = 2^{2/3} - 2^{1/3}$

Taking cube on both sides,

$x^3 - 8 - 6x\,(x - 2) = 2^2 - 2 - 3 \times 2\,(x - 2)$

$\Rightarrow x^3 + 18x - 6x^2 - 8 - 14 = 0$

$\Rightarrow x^3 + 18x - 6x^2 = 22$

$\Rightarrow x^3 + 18x - 6x^2 + 22 = 22 + 22 = 44$

15. (A) $x = \sqrt{3} + \sqrt{2}$

and, $\dfrac{1}{x} = \sqrt{3} - \sqrt{2}$

$x + \dfrac{1}{x} = 2\sqrt{3}$

Now, $x^5 + \dfrac{1}{x^5} = [((2\sqrt{3})^2 - 2(2\sqrt{3})^3 - 6\sqrt{3}] - 2\sqrt{3}$

$= (10 \times 18\sqrt{3}) - 2\sqrt{3}$

$= 178\sqrt{3}$

16. (A) $x = 5 + 2\sqrt{6}$

$y = \dfrac{1}{x} = 5 - 2\sqrt{6}$

$= \dfrac{x^2 + y^2 + 5xy}{x^2 + y^2 - 5xy}$

$= \dfrac{(5 + 2\sqrt{6})^2 + (5 - 2\sqrt{6})^2 + 5}{(5 + 2\sqrt{6})^2 + (5 - 2\sqrt{6})^2 - 5}$

$= \dfrac{25 + 24 + 20\sqrt{6} + 25 + 24 - 20\sqrt{6} + 5}{25 + 24 + 20\sqrt{6} + 25 + 24 - 20\sqrt{6} - 5}$

$= \dfrac{103}{93} = 1\dfrac{10}{93}$

17. (A) $\dfrac{1}{a^2 + ax + x^2} - \dfrac{1}{a^2 - ax + x^2} + \dfrac{2ax}{a^4 + x^4 + a^2x^2}$

$= \dfrac{1}{(a^2 + x^2) + ax} - \dfrac{1}{(a^2 + x^2) - ax} + \dfrac{2ax}{a^4 + x^4 + a^2x^2}$

$= \dfrac{a^2 + x^2 - ax - a^2 - x^2 - ax}{(a^2 + x^2)^2 - a^2x^2} + \dfrac{2ax}{a^4 + x^4 + a^2x^2}$

$= \dfrac{-2ax}{a^4 + x^4 + a^2x^2} + \dfrac{2ax}{a^4 + x^4 + a^2x^2}$

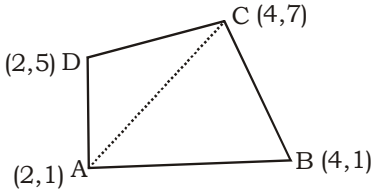
$= 0$

18. (C) Co-ordinates of point $= \left(\dfrac{mx_2 + nx_1}{m+n}, \dfrac{my_2 + ny_1}{m+n}\right)$

$= \left(\dfrac{3 \times 1 + 2 \times 3}{3+2}, \dfrac{3 \times (-2) + 2 \times 7}{3+2}\right)$

$= \left(\dfrac{9}{5}, \dfrac{8}{5}\right)$

19. (D)



Area of triangle ACD,

$\dfrac{1}{2}[x_1\,(y_2 - y_3) + x_2(y_3 - y_1) + x_3\,(y_1 - y_2)]$

$= \dfrac{1}{2}\left|2(7 - 5) + 4(5 - 1) + 2\,(1 - 7)\right| = 4$

Similarly, Area of triangle ABC

$= \dfrac{1}{2}\left|2(1 - 7) + 4(7 - 1) + 4(1 - 1)\right| = 6$

$\therefore$ Area of □ ABCD = 6 + 4 = 10 unit²

20. (B) According to the question,

$\left(\dfrac{8A}{100} + \dfrac{9B}{100}\right) = \dfrac{3}{4}\left(\dfrac{12A}{100} + \dfrac{8B}{100}\right)$

$\Rightarrow 32A + 36B = 36A + 24B$

$\Rightarrow 12B = 4A$

$\Rightarrow B : A = 1 : 3$

21. (B) $10\% \rightarrow 2.5$ kg
$100\% \rightarrow 25$ kg
i.e. Anju can buy 25 kg wheat now, for ₹ 320
Originally, she can buy 25 – 2.5 = 22.5 kg.

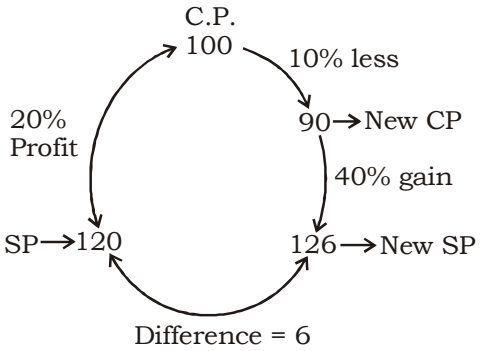
Original price = $\frac{320}{22.5}$ = ₹ 14.22/kg

22. (C) Let total boys = $4x$
Total girls = x
Required percentage

$$= \frac{\left(\frac{x\times 40}{100}\times\frac{80}{100}\right)+\left(4x\times\frac{30}{100}\times\frac{50}{100}\right)}{\left(\frac{x\times 40}{100}\right)+\left(\frac{4x\times 30}{100}\right)}\times 100$$

$$= \frac{32x+60x}{40x+120x}\times 100 = \frac{92}{160}\times 100 = 57.5\%$$

23. (D) Let original CP = ₹ 100



So, CP = 100
To gain 35%

SP = $100 \times \frac{135}{100}$ = ₹ 135

24. (B) Let there is only one mango.
Let CP of one mango = ₹ x
According to the question,

$$\frac{120x}{100} - \frac{110x}{100} = 2$$
$$\Rightarrow 10x = 200$$
$$\Rightarrow x = ₹\ 20$$

To gain 10%

SP = $20 \times \frac{110}{100}$ = ₹ 22

25. (C) A's gain = $(300000 \times \frac{110}{100}) - (330000 \times \frac{95}{100})$
= ₹ 16500

26. (C)

Milk : Water
5 : 2 $\xrightarrow{\times 5}$ 25 : 10 $\xrightarrow{\times\left(3\times\frac{1}{3}\right)}$ 25 : 10

4 : 1 $\xrightarrow{\times 7}$ 28 : 7 $\xrightarrow{\times\left(2\times\frac{1}{2}\right)}$ 28 : 7

4 : 1 $\xrightarrow{\times 7}$ 28 : 7 $\xrightarrow{\times\frac{1}{7}}$ 4 : 1

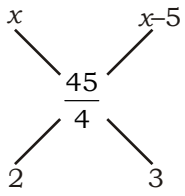
Final ratio of milk and water = 57 : 18

Percentage of milk = $\frac{57}{75}\times 100 = 76\%$

27. (C) CP of mixture = $15 \times \frac{100}{133.33} = 15 \times \frac{100}{400} \times 3$

$$= \frac{45}{4}$$

According to the question,



$$\frac{\left(x-\frac{45}{4}\right)}{\frac{45}{4}-(x-5)} = \frac{3}{2}$$

$$\Rightarrow 2x - \frac{45}{2} = \frac{135}{4} - 3x + 15$$

$$\Rightarrow 5x = \frac{135}{4} + 15 + \frac{45}{2}$$

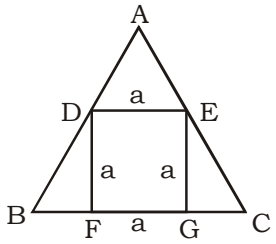
$$\Rightarrow x = \frac{285}{20} = ₹\ 14.25$$

28. (C) a : b = 12 : 7, b : c = 3 : 2, d : c = 30 : 28
a : b : c : d = 36 : 21 : 14 : 15

29. (C) A : B : C : D = 70 : 35 : 40 : 56
Required number of books = 70 + 35 + 40 + 56 = 201

30. (C) Total 7 triangle possible.
(1, 7, 7) (2, 6, 7) (3, 6, 6) (3, 5, 7) (4, 4, 7) (4, 5, 6) & (5, 5, 5)

31. (A)



ADE is an equilateral triangle because DE is parallel to BC.
AD = AE = DE = a
In Δ DBF,
$\angle$ DBF = 60°, $\angle$ BFD = 90°, $\angle$ BDF = 30°

BD = $\frac{2a}{\sqrt{3}}$

$AB = \left(\frac{2a}{\sqrt{3}} + a\right)$

Area of $\Delta ABC = \frac{\sqrt{3}}{4}(AB)^2$

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

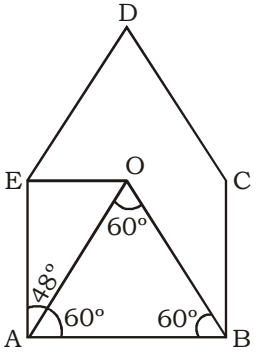
$= \frac{a^2}{12}(12 + 7\sqrt{3})$

Area of □ DEFG = a^2

Required ratio = $\frac{12 + 7\sqrt{3}}{12}$ $a^2 : a^2$

$= (12 + 7\sqrt{3} : 12)$

32. (A)



Interior of pentagon = $\frac{(5-2)180^\circ}{5} = 108^\circ$

ΔOAB is an equilateral triangle

AB = OA = OB

It is a regular polygon so,

AB = AE

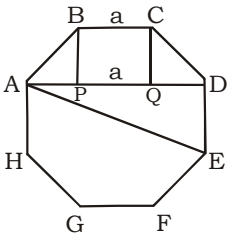
$\therefore$ AE = OA

In ΔOAE, $\angle OAE = 108^\circ - 60^\circ = 48^\circ$

and, OA = AE, So, $\angle AOE = \quad \angle AEO$

$\angle OEA = \frac{180^\circ - 48^\circ}{2} = \frac{132^\circ}{2} = 66^\circ$

33. (B)



ABCDEFGH is a regular octagon

AE is the longest diagonal from symmetry

BP = AP

$BP^2 + AP^2 = AB^2 = a^2$

and, $AP = \frac{a}{\sqrt{2}}$

now, AD = AP + PQ + QD

$= \frac{a}{\sqrt{2}} + a + \frac{a}{\sqrt{2}}$

$= (\sqrt{2} + 1)a.$

$AE^2 = AD^2 + DE^2$

$= [(\sqrt{2} + 1)a]^2 + a^2$

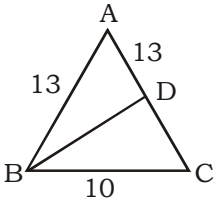
$= a^2(4 + 2\sqrt{2})$

$\therefore$ AE = $\sqrt{4 + 2\sqrt{2}}\,a$

34. (A) Area of $\Delta ABC = \frac{b}{4}\sqrt{4a^2 - b^2}$

$= \frac{10}{4}\sqrt{4 \times (13)^2 - 10^2}$

$= 60$ cm^2



Now, $\frac{1}{2} \times 13 \times BD = 60$

$\Rightarrow BD = \frac{120}{13} = 9\frac{3}{13}$ cm

35. (D) Orthocentre of ΔABC = B

Circumcentre of ΔABC = D

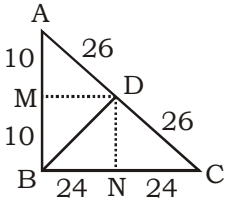
In ΔBDN,

$BD^2 = BN^2 + ND^2$

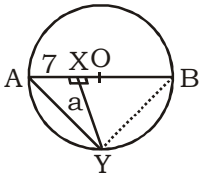
$= 24^2 + 10^2$

$= 576 + 100 = 676$

$\Rightarrow BD = 26$ cm



36. (B)



$\angle AYB = \angle AXY = 90^\circ$

[$\because$ Diametre AB = Diagonal]

and, $\angle A$ is common

$\therefore \Delta AXY$ and ΔAYB are similar

$AY = \sqrt{9^2 + 7^2} = \sqrt{130}$

$\therefore \frac{AB}{AY} = \frac{AY}{AX}$

Now, $AB = \frac{AY^2}{XY} = \frac{130}{7}$ cm

37. (B) Given, each complete equal share.

B work for 10 days & he complete $\frac{1}{3}$ part of the work.

So, B can complete total work in 30 days.

A work for 'N' days i.e. from starting to end.

So, he can complete work in 3N days.

$$\begin{matrix} A \rightarrow 3N \\ A+B \rightarrow N \end{matrix} \Big\rangle \begin{matrix} 1 \\ \frac{1}{3} \end{matrix} \Big\rangle 3N$$

So, B can do 2 work in one day

$= \frac{3N}{2} = 30$

and, $\frac{310}{2} = 30$

$\Rightarrow N = 20$

Means C works for 20 – 10 – 2 = 8 days

C complete whole work in $8 \times 3 = 24$ days.

38. (C) I[st] case, Let women are half efficient as compare to men.

$[12 + (8 \times 2)] \times 12 = [8 + (6 \times 2)] \times x$

$\Rightarrow x = \frac{28 \times 12}{20} = \frac{168}{10} = \frac{84}{5}$ days.

II[nd] case, women are as efficient as men.

$(12 + 8) \times 12 = (8 + 6) \times x$

$\Rightarrow x = \frac{20 \times 12}{14} = \frac{120}{7}$ days.

$\therefore$ Required number of days = $\frac{84}{5}$ to $\frac{120}{7}$ daily.

39. (B) Let A does x work and B does Y work daily.

According to the question,

$\Rightarrow 12(x + y) = 9(\frac{x}{2} + 3y)$

$\Rightarrow 12x + 12y = \frac{9x}{2} + 27y$

$\Rightarrow \frac{15x}{2} = 15y$

$\Rightarrow x = 2y$

x alone will do the work in,

$= \frac{12 \times 3}{2} = 18$ days.

40. (A) Let B take x hours to fill P

$$\begin{matrix} B \rightarrow x \\ A \rightarrow x-12 \end{matrix} \Big\rangle \begin{matrix} x-12 \\ x \end{matrix} \Big\rangle x(x-12)$$

$\frac{x(x-12)}{x+x-12} = x - 16$

$\Rightarrow x = 24.$

So, A & B takes 24 – 16 = 8 hours to fill P, and $8 \times 2 = 16$ hours to fill Q.

41. (D) $$\begin{matrix} A \rightarrow 10 \\ B \rightarrow 15 \end{matrix} \Big\rangle \begin{matrix} 3 \\ 2 \end{matrix} \Big\rangle 30$$

They complete 5 works in 2 days

So, 30 work will be completed in 12 days.

42. (D) Car B & C will cross each other in

$= \frac{220 \times 18}{(45+54) \times 5}$

$= \frac{44 \times 18}{99} = 8$ seconds

So, Car A must overtake B in 8 seconds

Relative speed of A & B = $\frac{50}{8} = \frac{25}{4}$

$= \frac{25}{4} \times \frac{18}{5} = 22.5$ km/h

Minimum speed of A = 45 + 22.5

= 67 .5 km/hr

43. (D) Let in beginning he has ₹ 100,

at the end of the year

he had $100 \times \frac{200}{100}$ = ₹ 200, out of which

he gives $200 \times \frac{20}{100}$ = ₹ 40 as bribe, so

Now he had 200 – 40 = ₹160 left.

at the end of 2 year he had

$160 \times \frac{200}{100}$ = ₹ 320 but he gives $300 \times \frac{20}{100}$ = ₹ 64 as bribe, so he had now 320 – 64 = ₹ 256.

at the end of 3[rd] year i.e. beginning of 4th year he had.

$256 \times \frac{200}{100} \times \frac{80}{100}$ = ₹ 409.6

According to the question,

409.6 units $\rightarrow$ 40900

1 units $\rightarrow \frac{40900}{409.6}$

64 units $\rightarrow 100 \times 64$ = ₹ 6400

$\therefore$ Required amount = ₹ 6400

44. (D) Speed of train B = $\frac{100+45}{9} = \frac{145}{9}$ m/s

Speed of train A = $30 \times \frac{5}{18} = \frac{25}{3}$ m/s

Relative speed = $\frac{145}{9} - \frac{25}{3} = \frac{70}{9}$ m/s

According to the question,

Length of A = $(0.005 \times 60 \times 60) \times \frac{70}{9}$

$= \frac{5}{1000} \times 20 \times 20 \times 70$

= 140 metres.

45. (A) Train A takes 7 hours & train B takes $4\frac{3}{4}$ hours for the whole journey.
Let distance between A and B = 133 km
Speed of A = 19 km/hr
Speed of B = 28 km/hr
Relative speed = 47 km/hr
From 7 to 8:30 A covers = 19 × 1.5
= 28.5 km time after which they met
$= \frac{133-28.5}{47} = \frac{104.5}{47}$
= 2 hours 13.40 minutes.
time = 10 : 44 am

46. (C) Let maximum chocolate in a box = x
$(13 + 14 + 15+.....+39) + x = 28 \times 32$
$\Rightarrow x = 896 - \left(\frac{39+13}{2}\right) \times 27$
$\Rightarrow x = 896 - 702$
$\Rightarrow x = 194.$

47. (D) $\frac{PQ - A - B + C}{(P-1)} = N$
$\Rightarrow PQ - A - B + C = NP - N$
$\Rightarrow P = \left(\frac{A+B-C-N}{Q-N}\right)$
and, $\frac{1}{P} = \frac{Q-N}{A+B-C-N}$

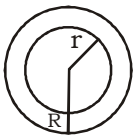
48. (B) At the time of marriage,
Total age = 36 years
After twins were born, total age
= 10.5 × 4 = 42 years
i.e. twin were born was $\frac{42-36}{2}$ = 3 years.
after 3rd child born, total age 10.8 × 5
= 54 years
3rd child was born after = $\frac{54-42}{4}$
= 3 years
after 4th child born, total age = 14 × 6
= 84 years
4th child was born after = $\frac{84-54}{5} = \frac{30}{5}$
= 6 years
Now, total age = 17 × 6 = 102
Required age of twins = 3 + 6 + $\frac{(102-84)}{6}$
= 12 years

49. (C) Let rise in water = h metre
$2.5 \times 10{,}000 \times h = 75 \times 8000 \times \frac{1}{1000}$
$\Rightarrow h = \frac{8 \times 3}{1000} \times 100 = 2.4$ cm

50. (B) Volume = (area of triangle) × h = $\frac{\sqrt{3}a^2}{4} \times h$
L.S.A = (Perimetre of triangle × h) = 3a × h
$\frac{\sqrt{3}a^2}{4} \times h = 60\sqrt{3}$ .....(i)
$\Rightarrow 3a \times h = 90$ .....(ii)
Divide equation (i) by (ii),
$\frac{\sqrt{3}a}{4 \times 3} = \frac{60\sqrt{3}}{90}$
$\Rightarrow a = \frac{4 \times 3 \times 6}{9} = 8$ cm

51. (A) Required part = $\frac{\frac{1}{3} \times 2 \times 2 \times 84 \times 22}{12 \times 33 \times 8 \times 7}$
$= \frac{7 \times 22}{2 \times 3 \times 33 \times 7}$
$= \frac{1}{9}$ part

52. (C) Volume of silver = $\frac{4}{3}\pi r^3$
Volume of diamond = $\frac{4}{3}\pi(R^3 - r^3)$



According to the question,
$\frac{4}{3}\pi (R^3 - r^3) = \frac{4}{3}\pi r^3$
$\Rightarrow R^3 = 2r^3$
$\Rightarrow \sqrt[3]{2}\, r = R$
$\Rightarrow R = 3 \times 1.259$
= 3.777 cm
$\therefore$ Thickness of diamond R – r
= 3.777 – 3
= 0.777 cm

53. (C) Let radius of cone = r
$\pi \times 21 = 2 \times \pi \times r$
$\Rightarrow r = \frac{21}{2}$ cm
Slant right (l) = 21 cm
$\therefore$ Height = $\sqrt{(21)^2 - (\frac{21}{2})^2} = 18.18 \approx 18$ cm

54. (C) Let sides of the triangle be $20x$, $21x$ and $29x$.

Area = $\frac{1}{2} \times 20x \times 21x = 840$

$\Rightarrow x = 2$

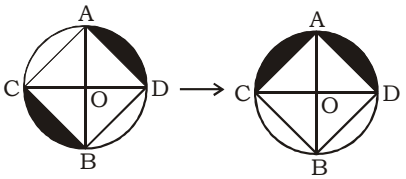
Perimetre = $20 \times 2 + 21 \times 2 + 29 \times 2$

= 140 m

Side of equilateral triangle = $\frac{140}{3}$ m

$\therefore$ Required area = $\frac{\sqrt{3} \times 140 \times 140}{3 \times 3 \times 4} = \frac{(70)^2}{3\sqrt{3}} m^2$

55. (C) From symmetry,



Area of Δ ACD = $\frac{1}{2} \times 2A \times A = A^2$ units^2

Area of circle ACD = $\frac{\pi A^2}{2}$ units^2

Area of shaded region = $\frac{\pi A^2}{2} - A^2$

$= A^2 \left(\frac{\pi}{2} - 1\right)$ units^2

56. (A) Let side of triangle = a

According to the question,

$\frac{a}{\sqrt{3}} - \frac{a}{2\sqrt{3}} = 4\sqrt{3}$

$\Rightarrow \frac{a}{2\sqrt{3}} = 4\sqrt{3}$

$\Rightarrow a = 24$

$\therefore$ Area of triangle = $\frac{\sqrt{3} \times 24 \times 24}{4} = 144\sqrt{3}$

57. (C) $\frac{8}{6} \times \frac{5 \times 3}{1}$

= 20

58. (B) Let total profit = ₹ 100

A get ₹ 44 for managing ₹ 56 will be distribute in ratio 5 : 6 : 3.

A's share = $\left(44 + \frac{5}{14} \times 56\right)$ = ₹ 64

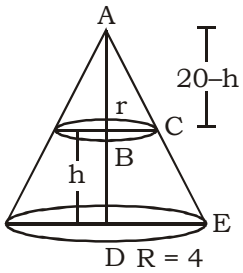
B & C's share = ₹ 36

$64 - 36 = 28 \rightarrow 840$

$1 \rightarrow \frac{840}{28}$

B's share = $24 \rightarrow \frac{840}{28} \times 24$ = ₹ 720

59. (A)



Δ ABC ~ Δ ADE

$\frac{20 - h}{r} = \frac{20}{4}$

$\Rightarrow 20 - h = 5r$

$\Rightarrow h = 20 - 5r$

Volume of frustum = $\frac{1}{3}\pi h(R^2 + r^2 + rR)$

$\Rightarrow 220 = \frac{1}{3} \times \frac{22}{7} \times (20 - 5r)(16 + r^2 + 4r)$

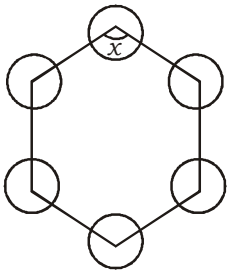
$\Rightarrow 7 \times 3 \times 2 = (4 - r)(16 + r^2 + 4r)$

$\Rightarrow 42 = 4^3 - r^3$

$\Rightarrow r^3 = 64 - 42 = 22$

$\Rightarrow r = \sqrt[3]{22}$ cm

60. (A)



$\angle x = \frac{4 \times 180^\circ}{6} = 120^\circ$

Area of hexagon = $6 \times \sqrt{3} \times \frac{8 \times 8}{4}$

$= 96\sqrt{3}$ cm^2

Area of all circles (inside hexagon)

$= \pi r^2 \times \frac{720^\circ}{360^\circ} = \frac{22}{7} \times 4 \times 2$

$= \frac{176}{7}$ cm^2

Required area = $\left(96\sqrt{3} - \frac{176}{7}\right)$cm^2

61. (A) At the start of 2nd year,

his debt = $12000 \times \frac{130}{100} - 4000$ = ₹11600

At the start of 3rd year, his debt

= $11600 \times \frac{130}{100} - 4000$ = ₹11080

At the end of third year he has to pay,

$11080 \times \frac{130}{100}$ = ₹14404.

62. (C) $A\left(1+\frac{20}{100}\right)^8 = (10230 - A)\left(1+\frac{20}{100}\right)^5$

$\Rightarrow \frac{(10230 - A)}{A} = \left(\frac{5+1}{5}\right)^{8-5}$

$\Rightarrow \left(\frac{10230 - A}{A}\right) = \frac{B}{A} = \left(\frac{6}{5}\right)^3 = \frac{216}{125}$

Given, (216 + 125) units = 10230

1 units = $\frac{10230}{341}$

and, Difference (216 – 125) units

$= \frac{10230}{341} \times 91$

$= 30 \times 91$

$= ₹\ 2730$

63. (A) $A + \frac{A \times 3 \times 4}{100} = B + \frac{B \times 4 \times 4}{100}$

$= C + \frac{C \times 5 \times 4}{100}$

$\Rightarrow 112A = 116B = 120C$

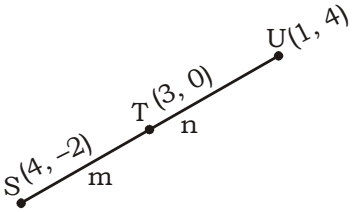
$\Rightarrow 28A = 29B = 30C$

$\Rightarrow A : B : C = 29 \times 30 : 28 \times 30 : 28 \times 29$

$\Rightarrow 870 : 840 : 812$

B's share = $\frac{840 \times 25220}{870 + 840 + 812} = ₹\ 8400$

64. (B) Let the point T cuts the line segment in the ratio of m : n



Then,

$0 = \frac{m \times 4 + n(-2)}{m+n}$

$\Rightarrow 4m - 2n = 0$

$\Rightarrow 2m - n = 0$

$\Rightarrow \frac{m}{n} = \frac{1}{2}$

$\Rightarrow m : n = 1 : 2$

65. (C) Put $\theta = 45°$

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

$\Rightarrow \tan\theta + \sec\theta = \sqrt{2} + 1$

Hence, option C is the correct answer.

66. (C) $\sin\theta + \sin^3\theta = 1 - \sin^2\theta$

$\Rightarrow \sin\theta (1 + \sin^2\theta) = \cos^2\theta$

$\Rightarrow \sin\theta (1 + 1 - \cos^2\theta) = \cos^2\theta$

Squaring both sides,

$\Rightarrow (1 - \cos^2\theta)(4 + \cos^4\theta - 4\cos^2\theta) = \cos^4\theta$

$\Rightarrow 4 + \cos^4\theta - 4\cos^2\theta - 4\cos^2\theta - \cos^6\theta + 4\cos^4\theta = \cos^4\theta$

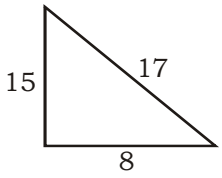
$\Rightarrow \cos^6\theta + 8\cos^2\theta - 4\cos^4\theta - 4 = 0$

$\Rightarrow \cos^6\theta + 8\cos^2\theta - 4\cos^4\theta - 4 + 12 = 12$

$\Rightarrow \cos^6\theta - 4\cos^4\theta + 8\cos^2\theta + 8 = 12$

67. (B) put, A = 2

$\sec\theta = \frac{17}{8}$



$\tan\theta + \sec\theta = \frac{17}{8} + \frac{15}{8} = 4$

option (b) is correct.

68. (B) $A + B \longrightarrow 12$ $\quad 5$

$B + C \longrightarrow \frac{20}{3}$ $\quad 9$ $\quad 60$

(A + B) work for 3 days, (B + C) work for 1 day and C alone work for 6 days.

C alone complete = [60 – (3 × 5) – (9)]

= 36 work in 6 days.

Work done by C in one day complete

$= \frac{36}{6} = 6$ units

Work done by B in one day complete = 9 – 6 = 3 units

Work done by A in one day complete = 5 – 3 = 2 units

A alone can complete work in = $\frac{60}{2} = 30$ days.

69. (B) Let at start business = ₹ 100

and, after increase it become = ₹ x

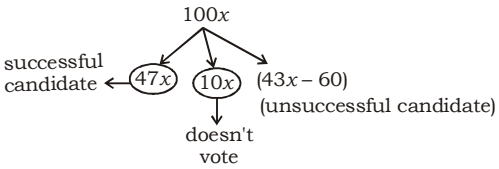
$100 \times \frac{10}{100} = x \times \frac{8}{100}$

$\Rightarrow x = \frac{1000}{8} = ₹\ 125$

Required percentage = $\frac{125 - 100}{100} \times 100$

$= 25$

70. (B) Let total number of votes in the voting list = $100x$



$47x - (43x - 60) = 308$

$\Rightarrow 4x = 308 - 60$

$\Rightarrow x = 62$

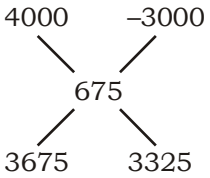
Unsuccessful candidate got = $43 \times 62 - 60$
= 2606 votes

71. (C) 2 orange/one rupee $\rightarrow$ type....(i)
2 orange/4 rupee $\rightarrow$ type ....(ii)
he got 4 orange for ₹ 5, and sell then at 4 orange for ₹ 4

Loss percent = $\frac{5-4}{5} \times 100 = 20\%$

72. (A) $20000 \times \frac{20}{100} = 4000$

$20000 \times \frac{15}{100} = 3000$



Amount spent on horses and dogs are in ratio = 3675 : 3325

Amount spent on dogs = $\frac{3325}{7000} \times 20000$
= ₹ 9500

CP of one dog = $\frac{9500}{5}$ = ₹ 1900

73. (C) Chair 8% loss 8% gain
Table 13% gain 16% gain
29% of table = (476 + 220)
CP of table = 100% of table = 2400
Let CP of chair = x
According to the question,

$x \times \frac{8}{100} + 2400 \times \frac{16}{100} = 476$

$\Rightarrow x$ = ₹ 1150

74. (B) Let CP of B = 100

SP of B = $100 \times \frac{160}{100}$ = ₹ 160

CP of A = $160 \times \frac{50}{100} = 80$

Difference between profit of A & B = 20
According to the question,
20 units $\Rightarrow$ 1600

1unit $\Rightarrow \frac{1600}{20}$

160 units $\Rightarrow \frac{1600}{20} \times 160 = 12800$

$\therefore$ Required selling price = ₹ 12800

75. (B) Put $x = 30°/45°/60°/0°$
option (b) is the correct answer.

76. (B) $x = \frac{\sqrt{3}}{2}$

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

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

$\therefore \sqrt{1-x} = \sqrt{1-\frac{\sqrt{3}}{2}} = \sqrt{\frac{2-\sqrt{3}}{2} \times \frac{2}{2}} = \frac{\sqrt{3}-1}{2}$

$\frac{\sqrt{1+x}}{1+\sqrt{1+x}} + \frac{\sqrt{1-x}}{1-\sqrt{1-x}}$

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

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

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

77. (A) $6^{51} + 6^{52} + 6^{53} + 6^{54}$
$= 6^{51}(1 + 6 + 6^2 + 6^3)$
$= 6^{51}(259)$
259 is divisible by 7.

78. (B) CP = $810 \times \frac{100}{90}$ = ₹ 900

Required SP = $900 \times \frac{140}{100}$ = ₹1260

79. (A) $65 \times 62 = 4030$
So, units place digit is "0"

80. (B) $x + y = z + z$, $x - z = z - y$

$\frac{x}{x-z} - \frac{z}{z-y} = \frac{x}{x-z} - \frac{z}{x-z}$

$= \frac{x-z}{x-z} = 1$

81. (B) Let 3 year ago population was x
According to the question,
$$x \times \frac{105}{100} \times \frac{105}{100} \times \frac{105}{100} = 18522$$
$\Rightarrow x = 16000$

82. (C) Sale tax is applicable on SP
$$SP \times \frac{110}{100} = 990$$
$\Rightarrow SP = ₹\ 900$
Let discount = $x\%$
$$1000 \times \frac{x}{100} = 100,\ x = 10\%$$

83. (C) A beat C by = 45 seconds
$$1000 \text{ metres in } = \frac{45}{225} \times 1000$$
$$= 200 \text{ seconds}$$
C covers in 200 seconds,
A covers in = 200 – 45 = 155 seconds

84. (A) Let total distance = 1000 km
$$\text{Total time} = \frac{300}{20} + \frac{600}{40} + \frac{100}{10} = 40 \text{ hours}$$
$$\text{Average speed} = \frac{1000}{40} = 25 \text{ km/hr}$$

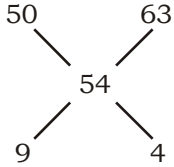
85. (B) downstream, speed of boat = 8 kms/hr
upstream, speed of boat = 2.5 × 2 = 5 kms/hr
speed of boat in still water
$$= \frac{8+5}{2} = 6.5 \text{ km/hr}$$

86. (C) $\left.\begin{array}{l} a^2 + b^2 = -c^2 \\ b^2 + c^2 = -a^2 \\ a^2 + c^2 = -b^2 \end{array}\right| \rightarrow$ Given

$$\frac{1}{(a^2+b^2)(b^2+c^2)} + \frac{1}{(a^2+c^2)(b^2+a^2)} + \frac{1}{(c^2+a^2)(c^2+b^2)}$$
$$= \frac{1}{b^2.a^2} + \frac{1}{b^2c^2} + \frac{1}{b^2a^2}$$
$$= \frac{a^2+b^2+c^2}{a^2b^2c^2} = \frac{0}{a^2b^2c^2} = 0$$

87. (B)

	M		W			M		W
A	5	:	4	$\xrightarrow{\times 10}$		50	:	40
B	7	:	3	$\xrightarrow{\times 9}$		63	:	27
Mixture	6	:	4	$\xrightarrow{\times 9}$		54	:	36



Required ratio = 9 : 4

88. (B) Side of square = 32 m.
$$\text{Speed of person} = \frac{32\sqrt{2}}{6} \text{ m/s}$$
$$\text{Required time} = \frac{4 \times 32 \times 6}{32\sqrt{6}} = 4\sqrt{6} \text{ seconds}$$
$$= \frac{4\sqrt{6}}{60} = \frac{\sqrt{2}}{5\sqrt{3}} \text{ minutes}$$

89. (B) Required average = 86 – 16 × 3 = 38

90. (B) Let original no. of cows = x
According to the question,
$$x \times \frac{94}{100} \times \frac{90}{100} = 1692$$
$\Rightarrow x = 2000$

91. (B) Total no. of boys = 15250
Total no. of girls = 12750
Difference = 2500

92. (C) Required percentage $= \frac{125}{2000} \times 100$
$= 6.25$

93. (A) Required ratio $= \frac{2000+2500+1750}{2500+2000+2000}$
$$= \frac{6250}{6500} = \frac{25}{26}$$

94. (C) Required percentage $= \frac{8750}{6500} \times 100$
$= 134.62\%$

95. (C) Required ratio $= \frac{6250 \times 2}{3 \times 4500} = \frac{625}{675}$
$= 25 : 27$

96. (A) Required percentage $= \frac{100000 \times \frac{6}{100}}{80000 \times \frac{20}{100}} \times 100$
$$= \frac{6000}{16000} \times 100 = 37.5\%$$

97. (B) Required fraction
$$= \frac{100000 \times \frac{10}{100} + 80000 \times \frac{15}{100}}{180000}$$
$$= \frac{22000}{180000} = \frac{11}{90}$$

98. (C) $100000 \times \frac{4}{100} = 80000 \times \frac{5}{100} = 4000$

99. (A)

100. (B) Required percentage
$$= \frac{16000 - 10000}{10000} \times 100$$
$$= \frac{6}{10} \times 100 = 60\%$$