1. (D) Relative speed of both the trains = 90km/hr
   \[ = 90 \times \frac{5}{18} = 25 \text{ m/sec} \]
   Total length of both the trains
   \[ = S \times T = 25 \times 12 = 300 \text{ m} \]

   Distance covered in 45 seconds by the first train
   \[ D = S \times T = 5 \times \frac{5}{18} \times 45 = 600 \text{ m} \]
   \[ D = L_L + L_P \]
   \[ \Rightarrow L_P = 600 - 200 = 400 \text{ m} \]

2. (C) Let the present age of Ram and Shyam be 4x and 5x years.
   After 5 years
   \[ 4x + 5 = 5 \]
   \[ 5x + 5 = 6 \]
   \[ \Rightarrow 24x + 30 = 25x + 25 \]
   \[ \Rightarrow x = 5 \]
   Present age of Ram and Shyam are 20 and 25 years

3. (B) \((4 \times 4 - 3 \times 5)\% \text{ of sum} = 80\)
   \[ 100\% \text{ of sum} = 8000 \]

4. (D) Let the distance from starting point be \(x\)
   Speed of man down stream \(= 5 + 1.5 = 6.5 \text{ km/hr} \)
   Speed of man upstream \(= 5 - 1.5 = 3.5 \text{ km/hr} \)
   Then, we have
   \[ \frac{x}{6.5} + \frac{x}{3.5} = 1 \]
   \[ \Rightarrow 10x = 6.5 \times 3.5 \]
   \[ \Rightarrow x = \frac{22.75}{10} = 2.275 \]

5. (D) ₹ 1 50-P 25-P
   Number : 5 : 6 : 8
   Value : 5 : 3 : 2 = 10
   \[ \times 24 \]
   \[ 240 \]
   Number of 25-P coins = 8 \times 24 = 192

6. (C)

   Here, \(AC = CO = OD = DB = 1 \text{ cm} \)
   \[ \text{radius of large semicircle} = 2 \text{ cm} \]
   Area of the shaded region = (Area of large semicircle) - (2 times area of arc \(\theta = 120^\circ\)) - 2(Area of equilateral triangle) - (area of arc with \(\theta = 60^\circ\))
   \[ \frac{4\pi}{2} - 2 \pi \left( \frac{120}{360} \right) - 2 \left( \frac{\sqrt{3}}{4} \right) \]
   \[ - \pi \times (1)^2 \times \frac{60}{360} \]
   \[ = \frac{4\pi}{2} - \frac{2\pi}{3} \cdot \frac{\sqrt{3}}{2} - \frac{\pi}{6} \]
   \[ = \left[ \frac{7\pi}{6} - \frac{\sqrt{3}}{2} \right] \]

7. (D) \(\frac{3 - 5k}{2k} + \frac{3 - 5l}{2l} + \frac{3 - 5m}{2m} = 0 \)
   \[ \Rightarrow \frac{1}{2} \left( \frac{3 - 5k}{k} + \frac{3 - 5l}{l} + \frac{3 - 5m}{m} \right) = 0 \]
   \[ \Rightarrow \frac{3}{k} = 5 + \frac{3}{l} + \frac{3}{m} - 5 = 0 \]
   \[ \Rightarrow \frac{3}{k} + \frac{3}{l} + \frac{3}{m} = 15 \]
   \[ \Rightarrow \frac{1}{k} \cdot \frac{1}{l} + \frac{1}{m} = 5 \]
   \[ \Rightarrow \frac{lm + mk + lk}{klm} = 5 \]

8. (A)

   : From an external point, tangents of circle are same.
   \(nP = nQ\)
9. (A) \[ x^2 + xy + xz = 20 \] ....(i)
\[ xy + y^2 + zy = 30 \] ....(ii)
\[ xz + yz + z^2 = 50 \] ....(iii)
Adding equation (i), (ii) and (iii).
\[ x^2 + y^2 + z^2 + 2(xy + yz + zx) = 100 \]
\[ (x + y + z)^2 = 100 \]
\[ \therefore 2(x + y + z) = 10 \times 2 = 20 \]

10. (D) Peter’s share = 2x + 13
John’s share = 3x + 9
Amanda’s share = 4x + 15
\[ \therefore 2x + 13 + 3x + 9 + 4x + 15 = 1927 \]
\[ 9x = 1927 \]
\[ x = 219 \]
\[ \therefore 210 \times 4 + 15 = 840 + 15 = ₹ 855 \]

11. (D) \[ \frac{335}{8} + 5A72 \]
Divisibility by 3 = \[ \text{sum of all digits} \]
\[ = \frac{8 + B + 2}{3} \]
Possible values of B = 2, 5, 8
\[ \therefore \text{Minimum value of A} = 1 \]

12. (B) Given \[ x^3 + \frac{1}{x^3} = 5 \]
\[ x + \frac{1}{x} = 3 \] ....(i)
Taking cube of both sides,
\[ \left( x + \frac{1}{x} \right)^3 = 3^3 \]
\[ \Rightarrow x^3 + \frac{1}{x^3} + 3 \times x \times \frac{1}{x} \left[ x + \frac{1}{x} \right] = 27 \]
\[ \Rightarrow x^3 + \frac{1}{x^3} + 3 \times 3 = 27 \]
\[ \Rightarrow x^3 + \frac{1}{x^3} = 27 - 9 = 18 \] .... (ii)
\[ \Rightarrow x + \frac{1}{x} = 3 \]
Squaring both sides in equation (i)
\[ \Rightarrow x^2 + \frac{1}{x^2} + 2 \times \frac{x}{x} = 9 \]
\[ \Rightarrow x^2 + \frac{1}{x^2} = 9 - 2 \Rightarrow x^2 + \frac{1}{x^2} = 7 \] ....(iii)
Again squaring both side in equation (iii)
\[ \Rightarrow x^4 + \frac{1}{x^4} + 2 = 49 \]
\[ \Rightarrow x^4 + \frac{1}{x^4} = 47 \] ....(iv)
Adding equation (ii) and (iv),
\[ \Rightarrow x^3 + \frac{1}{x^3} + x^4 + \frac{1}{x^4} = 18 + 47 \]
\[ \Rightarrow x^3 + \frac{1}{x^3} + x^4 + \frac{1}{x^4} = 65 \left\{ : \frac{1}{x^3} = 15 \right\} \]
\[ \Rightarrow 15 + x^4 + \frac{1}{x^4} = 65 \]
\[ \Rightarrow x^4 + \frac{1}{x^4} = 65 - 15 \]
\[ \Rightarrow x^4 + \frac{1}{x^4} = 50 \]

13. (A) Let, a person invests ₹x at 4% and average rate of interest be r%,
\[ \frac{x \times 4}{100} = \frac{4500 - x}{100} \times 6 \]
\[ 2x = 45000 \times 3 - 3x \]
\[ x = \frac{45000 \times 3}{5} = ₹ 27000 \]
\[ \therefore 2^{nd} \text{part} = ₹ 18000 \]
Interest of 1\text{st} part in one year,
\[ \frac{27000 \times 4}{100} = ₹ 1080 \]
Similarly, interest of second part in one years = ₹ 1080
Total interest = ₹ 2160
\[ \therefore \frac{45000 \times r}{100} = ₹ 2160 \]
\[ r = \frac{216}{45} = 4.8\% \]
\[ \therefore \text{Average rate of interest} = 4.8\% \]

14. (B) Let the length and breadth of each rectangle is l and b respectively,
18. \( a\sqrt{49} + b\sqrt{7} + c \)

Let \( t = \sqrt{7} \) ⇒ \( t^2 = \frac{1}{\sqrt{7}} \) and \( t^2 = 7 \)

\[
\frac{1}{t^2 + t + 1} = \frac{1}{t^3 + t + 1}
\]

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

\[
\Rightarrow \quad \frac{1}{6} (t - 1) = \frac{a t + b t + c}{t^2 + b t + c}
\]

On comparing coefficient,

\[
a = 0, \quad b = \frac{1}{6}, \quad c = \frac{-1}{6}
\]

\[
a + b + c = 0 + \frac{1}{6} - \frac{1}{6} = 0
\]

19. \( x^2 + y^2 + 2x + 1 = 0 \)  

\[
x^2 + 1^2 + 2x + y^2 = 0
\]

\[
(x + 1)^2 + y^2 = 0
\]

\[
x = -1
\]

\[
y = 0
\]

\[
\Rightarrow \quad x^{30} + y^{43} = (-1)^{30} + (0)^{43} = 1 + 0 = 1
\]

20. \( C \)  

Distance = \( \frac{\text{Product of speeds}}{\text{Difference of speeds}} \times \text{Difference of time} \)

\[
= \frac{7 \times 12}{5} \times (\frac{25}{60}) = 7 \text{ km}
\]

Time taken by Ram when he goes with speed 7 km/h = \( \frac{\text{Distance}}{\text{Speed}} = \frac{7}{7} = 1 \text{ hour} \)

\( \Rightarrow \) 1 hour = 60 minutes

Actual time taken by Ram to reach the station = 60 – 15 = 45 minutes

21. \( C \)  

A.T.Q,

\[
\text{Number (N)} = 9A + 6 = 21B + 12
\]

\[
\Rightarrow A = \frac{7B + 2}{3} \quad (\because A \text{ and } B \text{ are integer})
\]

Put \( B = 1 \)

\[
A = 3
\]

\[
N = 33
\]

\[
\Rightarrow (\text{LCM 9, 21})m + 33
\]
Put \( m = 0, 1, 2 \) .............
\[ P = 63 + 33 = 96 \]
On dividing by 63 in a 1111
Total number is = 17 + 1 = 18
(one value is also obtained for 0)

22. (A) \[ 2 \times 5 \quad 2 \times 5 \quad 3 \]
\[ 10 \quad 20 \quad N \]
\[ 60 \]
\[ 2^2 \times 3 \times 5 \]
3, 6, 12, 15, 30, 60
Total number is = 6

23. (B) A.T.Q,
Mark price = `800
\[ \text{₹ 800} \rightarrow 10\% \rightarrow 720 \rightarrow 5\% \rightarrow 684 \]
Hence,
Selling price = ₹684

24. (B) Time = 2 years, Rate = 10%
Case (I); when interest compounded annually
2 years CI rate % = \[ 10 + 10 + \frac{10 \times 10}{100} = 21\% \]
2 years SI rate % = \[ 10 + 10 = 20\% \]
A. T. Q
(21 – 20)% of sum = 28
Sum = ₹2800
Case (II); when interest is compounded half yearly,
Rate % = \[ \frac{10}{2} = 5\% \]
Time = 2 + 2 = 4
Effective rate % of CI for 2 half yearly
\[ 5 + 5 + \frac{25}{100} = 10.25 \]
Effective rate of CI for 4 half yearly
\[ = 10.25 + 10.25 + \frac{10.25 \times 10.25}{100} = 21.55\% \]
Difference in rate % = (21.55 – 20) = 1.55%
Required difference = \[ \frac{1.55}{100} \times 2800 = 43.4 \]
Hence,
Required difference = ₹43.4

25. (A) A.T.Q,
yes no
50% 50%
70% 30%

26. (A) \[ x^5 - 16x^4 + 16x^3 - 16x^2 + 16x \]
\[ x^5 - 15x^4 - x^4 + 15x^3 - x^2 + 15x + x = 15 \]
\[ \therefore x = 15, -15x^4 = -x^6 \]
\[ :x^5 - x^6 \text{ similarly all terms will be cancel} \]

27. (A) A.T.Q,
\[ \frac{1}{50} = 3 + \frac{1}{17} = 3 + \frac{1}{8} \]
\[ = 1 + \frac{9}{8} = 1 + \frac{1}{8} \]
Comparing from equation,
\[ a = 3, b = 1, c = 1, d = 8 \]
\[ \Rightarrow a + b + c + d = 3 + 1 + 1 + 8 = 13 \]

28 (B) A.T.Q,
\[ 10 m + 10 w = \frac{1320}{6} = 220 \text{ per day} \ldots (i) \]
\[ 20 m + 40 w = \frac{7000}{10} = 700 \text{ per day} \ldots (ii) \]
Subtracting (i)×2 from (ii)
\[ 20 w = 260 \]
\[ \therefore 1 w = \frac{260}{20} = \text{₹ 13} \]
Now,
\[ 10 m + 10 w = 220 \]
\[ 10 m + 10 \times 13 = 220 \]
\[ \therefore 1m = \frac{260 - 130}{10} = \frac{90}{10} = \text{₹ 9} \]
Now, the required number of days
\[ \frac{2120}{12 \times 9 + 8 \times 13} = \frac{2120}{212} = 10 \text{ days} \]

29. (C) A.T.Q,
Efficiency, \[ \frac{B}{A + B + C} = \frac{240}{900} = \frac{4}{15} \]
\[ \frac{B + C}{A + B + C} : A + B + C \]
time 150 : 100
Effi 2 : 3
\[ \frac{B + C}{A + B + C} = \frac{2 \times 5}{3 \times 5} = \frac{10}{15} = \frac{2}{3} \]
A : B : C
30. (B) A.T.Q,
\[ \frac{5}{6} \text{ done} \]
\[ 5 \times \frac{2}{5} \rightarrow \text{ spoiled due to rain} \]
\[ \therefore \text{ Left work} \]
\[ 5 - 2 = 3 \]
\[ 6 - 3 = 3 \]
\[ 400 \times 20 = 300 \times D \]
\[ D = 16 \text{ days} \]
The whole work will be completed in 16 days.

31. (D) A.T.Q,
\[ \begin{align*}
&\text{A} \quad \text{B} \\
&20 \text{ minutes} \quad 30 \text{ minutes}
\end{align*} \]
\[ 3 \text{ units/minute} \quad 2 \text{ units/minute} \]
\[ 60 \text{ units} \]
\[ A + B = \frac{60}{5} = 12 \text{ minutes} \]
\[ 12 \times \text{ waste pipe} = (A + B) \times 8 \]
\[ \text{ waste pipe} = \frac{40}{12} = \frac{10}{3} \]
\[ \text{ waste pipe will empty} = \frac{60}{10} \times 3 = 18 \text{ minutes} \]

32. (B) Train length = 2L
Tunnel length = L
\[ 3L = 36 \times \frac{5}{18} \times 60 \times 2 \]
\[ L = 400 \text{ metres} \]

The whole work will be completed in 16 days.

33. (C) A.T.Q,
\[ \begin{align*}
&\text{Case – I} \\
&T_A \quad T_B \\
&x + 2 \quad x
\end{align*} \]
\[ \text{ After engine failure for train B} \]
\[ \text{Case – II} \]
\[ \begin{align*}
&\text{old} \quad \text{new} \\
&S_B & 3 & 2 \\
&T_B & 2 & 3
\end{align*} \]
\[ \begin{align*}
&1 \text{ unit} \rightarrow 8 \text{ hours} \\
&2 \text{ units} \rightarrow 16 \text{ hours}
\end{align*} \]
B takes 16 hours
A takes 18 hours
Speed of A = \[ \frac{1440}{18} = 80 \text{ km/hr.} \]

34. (B) \[ 3 \sin^2 \phi + 4 \cos^2 \phi \]
\[ \Rightarrow 3 \sin^2 \phi + 3 \cos^2 \phi + \cos^2 \phi \]
\[ \Rightarrow 3 + \cos^2 \phi \quad (\because \text{ maximum value of } \cos^2 \phi = 1) \]
\[ \Rightarrow 3 + 1 = 4 \]

35. (D) A.T.Q,
\[ \tan \theta = \frac{3}{4} \]
\[ \therefore \sin \theta = \frac{3}{5}, \cos \theta = \frac{4}{5} \]
\[ 25x \sin^2 \theta \cos \theta = \frac{\sin^2 \theta}{\cos^2 \theta} \]
\[ \Rightarrow x = \frac{1}{25} \times \cos^2 \theta \times \frac{1}{64} \times 125 \]
\[ \Rightarrow x = \frac{5}{64} \]

36. (A) A.T.Q,
Speed of boat in still water = \[ x \text{ km/hr} \]
stream = \[ y \text{ km/hr} \]
Then,
\[ x + y = \frac{2}{15} \times 60 = 8 \text{ and } x - y = \frac{10}{2} = 5 \]
So, Speed of boat = \[ \frac{8 + 5}{2} = 6.5 \text{ km/hr} \]
37. (A) Let oxygen is total minutes
\( 16 : 9 \) (after two times process)
\( 4 : 3 \) (after one time process)
4 units = 8 litres
1 unit = 2 litres

38. (A) A.T.Q,
\[ x^2 - \sqrt{6}x - 1 = 0 \]
\[ \Rightarrow x = \frac{\sqrt{6}}{2} \]
\[ \Rightarrow x^2 + \frac{1}{x^2} = 6 + 2 = 8 \]
\[ \Rightarrow x^4 + \frac{1}{x^4} = 64 - 2 = 62 \]
\[ \Rightarrow x^{10} - 61x^6 - 62x^2 \quad \text{...(i)} \]
Putting the value of 62 and 61 in equal (i)
\[ \Rightarrow x^{10} - \left(x^4 + \frac{1}{x^4} - 1\right)x^4 - \left(x^4 + \frac{1}{x^4}\right)x^2 \]
\[ \Rightarrow -\left(x^2 + \frac{1}{x^2}\right) = -8 \]

39. (C) A.T.Q,
Like | Dislike
---|---
50 | 50
| 80% say like it so 80% dislike it
10 | 40
| 80% dislike

Total persons dislike dancing = 50
\[ = \frac{10}{50} \times 100 = 20\% \]

40. (D) A.T.Q,
\[ 90° - 4a = 2(90° - 5a) \]
\[ \Rightarrow 6a = 90° \]
\[ \Rightarrow a = 15° \]
Sum of two angles,
\[ 5a + 4a = 9a = 135° \]

41. (A) 2015\textsuperscript{2018} - 2019
The unit digit of 2015\textsuperscript{2018} = 5
Hence, tens digit is = 25 – 19 = 06
Tens digit is = 0

42. (C) A.T.Q,
\[ S = a + ar + ar^2 + ar^3 + \cdots \infty \]
\[ = \frac{a}{1-r}, \ (|r|<1) \]
\[ ar = 1 \]
\[ a = \frac{1}{r} \]

43. (D)
\[ \frac{1}{r} = \frac{1}{r(1-r)} \quad \text{...(i)} \]
For S to be smallest denominator should be maximum,
Hence,
\[ \frac{d}{dr}(r - r^2) = 0 \]
\[ 1 - 2r = 0 \]
\[ \Rightarrow r = \frac{1}{2} \]
Putting the value of r in equation (i)
\[ S = 4 \]

44. (B) A.T.Q,
Present age of Ritu = \((x + 3)\) years
Present age of Rahul = \([(x + 3 - 8)]\) years
\[ = (x - 5) \text{ years} \]

45. (D)
A.T.Q,
AB is a common tangent,
46. (B)

\[ \angle QOA = \angle OPA = 90^\circ \]
\[ \angle QOP + \angle QAP = 180^\circ \]
\[ \Rightarrow \angle QOP = 180^\circ - 32^\circ = 148^\circ \]
\[ \angle QOP = \angle SOR = 2\angle STR \]
\[ \therefore \angle RTS = \frac{148^\circ}{2} = 74^\circ \]

47. (C)

Taking power of 12 in all terms,
I. \( 11^4 > 7^6 > 45^3 = 14641 > 117649 > 91125 \)
II. \( 7^6 > 11^4 > 45^3 = 117649 > 14641 > 91125 \)
III. \( 7^6 > 45^3 > 11^4 = 117649 > 91125 > 14641 \)
IV. \( 45^3 > 7^6 > 11^4 = 91125 > 117649 > 14641 \)

Here we can see that statement III is true only.

48. (C) \( a^3 + 3a^2 + 9a = 1 \) .......(i)

Multiply the equation by \( \frac{3}{a} \) on both the sides.
\[ \Rightarrow 3a^2 + 9a + 27 = \frac{3}{a} \] .......(ii)

Subtracting the equation,
\[ \Rightarrow a^2 - 27 = 1 - \frac{3}{a} \]
\[ \Rightarrow a^3 + \frac{3}{a} = 28 \]

49. (D) A.T.Q,

Suppose \( x = y = 0 \), then \( Z^2 = 3 \),
\[ P = Z, Q = Z \text{ and } R = -Z, \]
Putting these values in below given equation,
\[ P^3 + Q^3 + R^3 - 3PQR = Z^3 + Z^3 - Z^3 + 3Z^3 = 4Z^3 \]
Putting \( Z^3 = 3 \),
\[ P^3 + Q^3 + R^3 - 3PQR = 12 \]
50. (A) \( x_1x_2x_3 = 4 \left( 4 + x_1 + x_2 + x_3 \right) \)

Putting \( x_1 = 1 \) and \( x_2 = 1 \)
\[ \Rightarrow x_1 = 4 \left( 4 + x_1 + 1 + 1 \right) \]
\[ \Rightarrow x_1 = 24 + 4x_1 \]
\[ \Rightarrow x_1 = -8 \]

Putting all these values;
\[ \frac{1}{(3 + x_1)} + \frac{1}{(3 + x_2)} + \frac{1}{(3 + x_3)} \]
\[ \Rightarrow -\frac{1}{5} + \frac{1}{4} + \frac{1}{4} \]
\[ \Rightarrow -\frac{1}{5} + \frac{3}{10} = \frac{3}{10} \]

51. (B) \( x^2 - x + 1 = 0 \)

When \( \alpha \) and \( \beta \) are the roots of this equation;
\[ \alpha + \beta = 1 \]
\[ \alpha \beta = 1 \]

If the roots are \( \alpha^3 \) and \( \beta^3 \);

Sum of roots = \( \alpha^3 + \beta^3 \)
\[ \Rightarrow \alpha^3 + \beta^3 = (\alpha + \beta) \left( \alpha^2 - \alpha \beta + \beta^2 \right) \]
\[ \Rightarrow \alpha^3 + \beta^3 = 1 \times \left( |(\alpha + \beta)^2 - 3\alpha \beta| \right) \]
\[ = (1 - 3) = -2 \]

Multiplication of roots = \( \alpha^3 \times \beta^3 = 1 \)
\[ \therefore \text{The question will be,} \]
\[ x^2 - \text{SOR}x + \text{POR} = 0 \]
\[ x^2 + 2x + 1 = 0 \]

52. (B)

Area of semicircle,
\[ = \frac{\pi}{2} \times (14)^2 \]
\[ = 308 \text{ cm}^2 \]

Diagonal of square LMNO = 14 cm

Side of square \( \triangle \text{MNO} \),
\[ = \frac{14}{\sqrt{2}} \text{ cm} \]
53. (B) Let present worth = 100 units

True discount = \( \frac{100 \times 4 \times 5}{100} \) = 20 units

Due debt = 100 + 20 = 120 units

120 units \( \rightarrow \) Rs 4800

1 unit \( \rightarrow \) Rs 40

True discount, 20 units \( \rightarrow \) Rs 20\times40

\( \rightarrow \) Rs 800

Present worth 100 units \( \rightarrow \) 100\times40

\( \rightarrow \) Rs 4000

54. (B) Ratio of two years before these

Ratio Age before 2 years

\( \begin{align*}
8 & : 2 \\
1 & : 3
\end{align*} \)

9 units \( \rightarrow \) 18 years

3 units \( \rightarrow \) 6 years

Now, A.T.Q,

\[ 18 + x = \frac{2}{6 + x} \]

\[ 18 + x = 12 + 2x \]

\[ x = 6 \text{ years} \]

After 4 years, age of Saurabh and Shalini is

\((18 + 6 = 24), (6 + 6) = 12 \text{ in ratio } 2 : 1\)

So, ans is 4 years

55. (A) Given OA = 13 cm

AB = 10 cm

\( \Rightarrow \) AZ = 5 cm

Now in \( \Delta AO_1Z \)

\[ AO_1^2 = AZ^2 + O_1Z^2 \]

\[ (13)^2 = (5)^2 + O_1Z^2 \]
\[ Q = \frac{p + q + r}{2} = 30k \]

Now put value of Q in equation (i), (ii) and (iii) we get,
\[ P = 13k, q = 25k, r = 22k \]
\[ \Rightarrow p : q : r = 13 : 25 : 22 \]

58. (A) \((3^{123} - 3^{122} - 3^{121})(2^{121} - 2^{120} - 2^{119})\)
\[ = 3^{121}(3^3 - 3 - 1)2^{119}(2^2 - 2 - 1) \]
\[ = 3^{121} \times 2^{119} \times 5 \]
We know that we have only one pair of \((2 \times 5)\)
\[ \Rightarrow \text{Only 1 zero in unit digit} \]

59. (B) We know that when number repeated by 6 times is always divisible by 13
Now, \((777 \ldots \ldots \ldots 100 \text{ times})\)
\[ \Rightarrow (777 \ldots \ldots \ldots 96 \text{ times})\]
\[ \text{is always divisible by 13} \]
\[ \Rightarrow (777 \ldots \ldots \ldots 96 \text{ times})0000 + 7777 \]
Now, 7777 divided by 13 get remainder
\[ R = 3 \]

60. (D) If accident occurs after 111 km \(\Rightarrow 1\) h save
\[ 444 \rightarrow 4 \text{ h save} \]
\[ +333 \]
\[ = \frac{777}{3} \text{ km} \]

61. (C) 23 Boggies \(\Rightarrow 115\) seconds
1 Boggys \(\Rightarrow 5\) seconds
14 Boggies \(\Rightarrow 70\) seconds

62. (A) \[ \sqrt{3x^2 - 12x + 19} + \sqrt{3x^2 - 12x - 11} = 6 \]
......(i)
\[ \sqrt{3x^2 - 12x + 19} - \sqrt{3x^2 - 12x - 11} = t \]
......(ii)

On multiplying equation (i) and (ii) we get,
\[ 19 - (-11) = 6t \]
\[ \therefore t = 5 \]

63. (A) Let
\[ 6 - x = 2x \]
\[ 6 = 3x \Rightarrow x = 2 \text{ litres} \]

64. (A) Answers is independent of \(x\)
So, Put \(x = 1\)
\[ 4(a^3 - b^3) = 4 \Rightarrow a^3 - b^3 = 1 \] ....(i)

By solving equation (i) and (ii) we get,
\[ a = 1 \text{ and } b = 0 \]
By putting these value in
\[ 4(a^2 - b^2) = 4(1 - 0) = 4 \]

65. (C) Answer is independent of \(b\),
So put \(b = 0\)
Then, \[ x = (2a)^{1/3} \]
\[ x^3 = 2a \Rightarrow x^3 - 2a = 0 \]

66. (A) \[ 10\sin^4\alpha + 15\cos^4\alpha = 6 \]
\[ \left(\frac{10}{6}\sin^2\alpha\right)\sin^2\alpha + \left(\frac{15}{6}\cos^2\alpha\right)\cos^2\alpha = 1 \] ....(i)

We know that, \[ \sin^2\alpha + \cos^2\alpha = 1 \]
To make the equation (i) in the from given identity above, we put
\[ \frac{10}{6}\sin^2\alpha = 1 \Rightarrow \sin^2\alpha = \frac{6}{10} \]
and, \[ \cos^2\alpha = \frac{6}{15} \]
\[ \Rightarrow \sec^2\alpha = \frac{5}{3} \text{ and } \sec^2\alpha = \frac{5}{2} \]
\[ \Rightarrow 27 \sec^2\alpha + 8 \sec^2\alpha = 27 \times \frac{125}{27} + \]
\[ 8 \times \frac{125}{8} \]
\[ = 125 + 125 = 250 \]

67. (A) Put \( A = 135^\circ \) (tan 135 = cot 135 = -1)
\[ \frac{-1}{1+1} + \frac{-1}{1+1} = k - 1 - 1 \]
\[ k = 1 \]

68. (C) 100% Winner (47%)
10% Lose
90% invalid votes(43%)

4% \(\rightarrow\) 308 - 60
1% \(\rightarrow\) 62
100% \(\rightarrow\) 6200

69. (D)
\[ \Delta ABCD \sim \Delta ABC \]
\[ \Delta ABC \quad \alpha \quad \beta \quad \gamma \]
\[ \Delta ABCD \quad \frac{20}{16} = \frac{b}{8} = \frac{a+16}{20} \]
\[ \Rightarrow a = 9, \ b = 10 \]

On solving perimeter of BDA = 9 + 10 + 8 = 27

70. (A) \( \sqrt{x + \sqrt{x - \sqrt{x + \ldots \infty}}} = \frac{\sqrt{4x - 3} + 1}{2} \)

\( \sqrt{4 + \sqrt{4 - \sqrt{4 + \ldots \infty}}} = \frac{\sqrt{4 \times 4 - 3} + 1}{2} \)

\[ = \frac{\sqrt{13} + 1}{2} \]

71. (A) \begin{align*}
3\sqrt{2} & \quad 90^\circ \\
3\sqrt{2} & \quad 3\sqrt{2} \\
6cm & \quad 3cm
\end{align*}

Area of base, \[
= \frac{1}{2} \times 3\sqrt{2} \times 3\sqrt{2} + 3 \times 6 = 27 \text{ cm}^2
\]

Volume \[ = \text{area of base} \times \text{height} = 27 \times 10 = 270 \text{ cm}^3 \]

72. (A) \[ \begin{align*}
A & \quad B \quad C \\
O & \quad 4 \text{ cm} \\
D & \quad 4 \text{ cm}
\end{align*} \]

Let base of pyramid is a triangle of vertices A, B, C, O is a point on the base at which height is standing and P is top of heights,

\[ \frac{\sqrt{3}a^2}{4} = 16\sqrt{3} \]

\[ a = 8 \text{ cm} \]

PD = \( \sqrt{5^2 - 4^2} = 3 \text{ cm} \) = Slant height

TSA = \( \frac{1}{2} \times \text{base of prism} \times \text{slant height} + \text{Area of base} \)

\[ = \frac{1}{2} \times 24 \times 3 + 16\sqrt{3} \]

\[ = (36 + 16\sqrt{3}) \text{ cm}^2 \]

73. (C) Total work done by (A + B + C) in 3 days is 37% and work done by (A + B) in 7 days is 63%.

1 day \[ \rightarrow 9\% \]

And, A + B \[ \rightarrow 27\% \]

C \[ \rightarrow 37 - 27 = 10\% \text{ in 3 days} \]

100\% \[ \rightarrow 30 \text{ days} \]

74. (A) \[ a^4 + a^3 + a^2 + a + 1 = 0 \]

Multiply by a
\[ a^5 + a^4 + a^3 + a^2 + a = 0 \]

\[ a^5 - 1 = 0 \text{ or } a^5 = 1 \]

\[ a^{100} + a^{100} + a^{10} = (a^5)^{20} + (a^2)^{20} + (a^5)^2 = 1 + 1 + 1 = 3 \]

75. (A) \[ x + y = 5, \ x - y + 1 = 0 \]

Both lines are perpendicular.

\[ \therefore \text{Triangle is right angle triangle.} \]

\[ \text{Circumcentre will be on hypotenuse.} \]

\[ y - 1 = 0 \]

So, y co-ordinate of circumcentre is 1,

76. (B) \[ \left[ (\sec 2\theta + 1)\left(\frac{\cos^2 \theta - 1}{\sec^2 \theta - 1}\right) \right] \times \frac{1}{2} \left( \cot \theta - \tan \theta \right) \]

\[ = \left( \frac{1 + \cos 2\theta}{\cos 2\theta} \right) \left( \frac{1}{2} \left( \frac{\cos \theta - \sin \theta}{\sin \theta} \right) \right) \]

\[ = 1 + 2 \cos^2 \theta \left( \frac{1}{2} \tan \theta \times \frac{1}{2} \sin \theta \cos \theta \right) \]

\[ = \frac{2 \cos^2 \theta \sin \theta}{\cos \theta \sin \theta} \times \frac{1}{\sin \theta \cos \theta} = 1 \]

77. (C) Let, the work is 100 units

A.T.Q,

Efficiency fall by 19% so work will complete in 10 days.

100, 81, ............ , 10 days

When work increases by 90% and efficiency falls by 10% then one day work will complete in 2 days

100, 90, 81, ............ , 20 days

Hence, whole work will be completed in 20 days
78. (C) A.T.Q,
\[ x^2 - 2x + 4 = 0 \]  
... (i)
Multiply equation (i) by \((x + 2)\) both side,
\[ (x + 2)(x^2 - 2x + 4) = 0 \]
\[ x^3 + 8 = 0 \]
\[ x^3 = -8 \]
\[ x^3 - 2x^2 + 30 \]
\[ = -8x^2 + 16x + 30 \]
\[ \Rightarrow -8(x^2 - 2x) + 30 \]
\[ \Rightarrow 32 + 30 = 62 \]

79. (D) A.T.Q,
\[ (2a - 1)^2 + (3a + 2)^2 + (4a + 5)^2 = 3(2a - 1)(3a + 2)(4a + 5) \]
\[ \Rightarrow 2a - 1 = 3a + 2 = 4a + 5 \]
\[ \Rightarrow a = -3 \]
\[ \Rightarrow a^3 + b^3 + c^3 = 3abc \]
when \(a + b + c = 0\) and \(a = b = c\)

80. (C) \[ \sin^2 \theta = \frac{x^2 + y^2 + 1}{2x} \]
\[ 0 \leq \sin^2 \theta \leq 1 \]
\[ \frac{x^2 + y^2 + 1}{2x} \leq 1 \]
\[ x^2 + y^2 + 1 \leq 2x \]
\[ (x - 1)^2 + y^2 \leq 0 \]
Only number square not equal to zero possible,
Now,
\[ (x - 1)^2 = 0 \]
\[ x = 1 \]

81. (A) \[ \sec^2 \theta - \frac{\sin^2 \theta - 2\sin^4 \theta}{2\cos^2 \theta - \cos 2\theta} \]
\[ = \sec^2 \theta - \frac{\sin^2 \theta(1 - 2\sin^2 \theta)}{\cos^2 \theta(2\cos^2 \theta - 1)} \]
\[ = \sec^2 \theta - \tan^2 \theta = 1 \]

82. (A)
\[
\begin{align*}
\text{BD} &= 160 \text{ m} \\
\angle ACB &= \angle CAD + \angle ADC \\
\Rightarrow 20 &= \angle CAD + \theta \\
\Rightarrow \angle CAD &= 0 \\
\therefore AC &= CD \\
AC &= 100 \text{ metres} \\
In \triangle ABC: \\
AC &= 100 \text{ metres} \\
BC &= 160 - 100 = 60 \text{ metres} \\
Then, AB &= 80 \text{ metres} \\
\text{[By pythagoras theorem]} \\
BD &= 160 \text{ m} \\
\angle ACB &= \angle CAD + \angle ADC \\
\Rightarrow 20 &= \angle CAD + \theta \\
\Rightarrow \angle CAD &= 0 \\
\therefore AC &= CD \\
AC &= 100 \text{ metres} \\
BC &= 160 - 100 = 60 \text{ metres} \\
Then, AB &= 80 \text{ metres} \\
\text{[By pythagoras theorem]} \\
\end{align*}
\]

83. (D) \[ a^2 + a^2b^2 + b^4 = 8 \]
\[ a^2 + b^2 + ab = 4 \]
\[ a^2 + b^2 = 4 - ab \]
Squaring both side \[a^2 + b^2 + 2a^2b^2 = 16 + a^2b^2 - 8ab \]
\[a^2 + b^2 + a^2b^2 = 16 - 8ab \]
\[8 = 16 - 8ab \]
\[8ab = 8 \]
\[ab = 1 \]

84. (A) 5th term is = 81
A.T.Q,
\[ a = 16 \]
\[ r^4 = \frac{81}{16} \]
\[ r = \frac{3}{2} \]
Then, 4th term is
\[ ar^3 = 16\times\left(\frac{3}{2}\right)^3 = 54 \]

85. (B) A.T.Q,
\[ T_7 = 6 \]
\[ \Rightarrow a + 6d = 6 \]
\[ ... \text{ (i)} \]
\[ T_{21} = -22 \]
\[ a + 20d = -22 \]
\[ ... \text{ (ii)} \]
Subtracting equation (i) and (ii)
\[ 14d = -28 \]
\[ \Rightarrow d = -2 \]
Putting the value of d equation in (ii)
\[ a = 40 - 22 \]
\[ a = 18 \]
\[ T_{26} = 18 + 25 \times (-2) = -32 \]

86. (D) A.T.Q,
Milk and water are in the ratio is \( \frac{7}{2} \)
Quantity of milk in 729 litres of mixture
 Quantity of water = 729 – 567 = 162 litres

Let, \( x \) litres of water be added to mixture

become ratio = \( \frac{7}{3} \)

\[ \Rightarrow \frac{567}{162 + x} = \frac{7}{3} \]

\( x \) = 81 litres water is to be added

87. (A) CI : SI = 25 : 24 for 2 years

SI = \( \frac{24}{2} \) = 12 for 2 years

difference between CI and SI = 1

rate of interest = \( \frac{1}{12} \times 100 = 8\frac{1}{3} \\% \)

for 3 years,

12
12 1
12 1 1 1

CI : SI = \( \left[ \frac{39 + \frac{1}{12}}{12} \right] : 36 \)

= 469 : 432

88. (B) Let the C.P = 100 units

Now, M.P = 120 units

S.P = \( \frac{120 \times 80}{100} \) = 96

Loss = 100 – 96 = 4

Loss % = \( \frac{4}{100} \times 100 \) = 4\%

89. (C) \( A = 2^{32} \)

\( B = 2^0 + 2^1 + 2^2 + \ldots \ldots + 2^{31} \)

\( a = 1, r = 2 \)

B = sum of G.P is = \( \frac{a[r^n - 1]}{r - 1} \)

\( \Rightarrow B = \frac{1[2^{31} - 1]}{2 - 1} \)

\( \Rightarrow B = 2^{31} - 1 \)

And,

C = \( 3^0 + 3^1 + 3^2 + 3^3 + \ldots \ldots + 3^{15} \)

It is in a G.P

Hence,

C = sum of GP = \( a = 1, r = 3 \)

\( \Rightarrow C = \frac{[3^{15} - 1]}{2} \)

Hence proved

\( \Rightarrow A > B > C \)

90. (A) Let amount 100 units

Suresh \( \rightarrow \) 100 \( \times \) \( \frac{30}{100} \) \( \rightarrow \) 30 units

Friend

Remaining \( \rightarrow \) 70 units

\( 70 \times \frac{40}{100} \) = 28 units \( \rightarrow \) chit fund

Remaining \( \rightarrow \) 70 – 28 =

42 units

Insurance Scheme 24 units

P P F 18 units

(Chit fund + Insurance scheme) – (Friend)

28 + 24 – 30

22 units \( \rightarrow \) 30

22 units \( \rightarrow \) 19800

100 units \( \rightarrow \) \( \frac{19800 \times 100}{22} \) = 90000

91. (B) Number of employees in HR department

\( = \frac{10}{100} \times 800 = 80 \)

Number of females = 80 – 12 = 68

Ratio = 68 : 80

= 17 : 20

92. (A) Number of employees in marketing departments,

\( = \frac{24}{100} \times 800 = 192 \)

\( : \) Required percentage = \( \frac{165}{192} \times 100 = 86\% \)

93. (A) Number of employees in IT departments,

\( = \frac{800 \times 15}{100} = 120 \)

Number of females = 120 – 74 = 46

\( : \) Required percentage = \( \frac{46}{800} \times 100 = 5.75\% \)

94. (A) Total employees in marketing department = 192

Males = 165
Join the group and you may also share your suggestions and experience of Sunday Mock

Note:- If your opinion differs regarding any answer, please message the mock test and question number to 8860330003

Note:- Whatsapp with Mock Test No. and Question No. at 7053606571 for any of the doubts. Join the group and you may also share your suggestions and experience of Sunday Mock

Note:- If you face any problem regarding result or marks scored, please contact 9313111777

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