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GENERAL APTITUDE

CIVIL ENGINEERING

Date of Test : 13/09/2024

ANSWER KEY >

- | | | | | |
|--------|---------|---------|---------|---------|
| 1. (d) | 7. (d) | 13. (c) | 19. (b) | 25. (a) |
| 2. (c) | 8. (c) | 14. (a) | 20. (d) | 26. (c) |
| 3. (b) | 9. (b) | 15. (c) | 21. (b) | 27. (d) |
| 4. (b) | 10. (b) | 16. (b) | 22. (d) | 28. (c) |
| 5. (d) | 11. (b) | 17. (d) | 23. (a) | 29. (b) |
| 6. (b) | 12. (c) | 18. (c) | 24. (c) | 30. (c) |

DETAILED EXPLANATIONS

1. (d)

The possibilities are:

4 from part A and 6 from part B.

or 5 from part A and 5 from part B.

or 6 from part A and 4 from part B.

Therefore, the required number of ways is

$$\begin{aligned}
 {}^6C_4 \times {}^7C_6 + {}^6C_5 \times {}^7C_5 + {}^6C_6 \times {}^7C_4 &= \frac{6!}{4! \times 2!} \times \frac{7!}{6! \times 1!} + \frac{6!}{5! \times 1!} \times \frac{7!}{5! \times 2!} + \frac{6!}{6!} \times \frac{7!}{4! \times 3!} \\
 &= 105 + 126 + 35 = 266
 \end{aligned}$$

2. (c)

Series follows the pattern,

$$\begin{aligned}
 a_{n+1} &= a_n \times a_{n+2} \\
 a_2 &= 4 = 2 \times 2 \\
 a_3 &= 2 = 4 \times 0.5 \\
 a_4 &= 0.5 = 2 \times 0.25 \\
 a_5 &= 0.25 = 0.5 \times 0.5 \\
 a_6 &= 0.5 = 0.25 \times x
 \end{aligned}$$

$$\Rightarrow x = \frac{0.5}{0.25} = 2$$

3. (b)

We note that there are 3 consonants M, C and T and 3 vowels E, A and O. Since no two vowels have to be together the possible choice for vowels are the places marked as 'X'.

X M X C X T X,

These vowels can be arranged in 4P_3 ways and 3 consonants can be arranged in $3!$ ways. Hence, the required number of ways = $3! \times {}^4P_3$

$$= 3! \times \frac{4!}{1!} = 144$$

4. (b)

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

$$\Rightarrow x^2 + \frac{1}{x^2} + 2 = 4$$

$$\Rightarrow x^2 + \frac{1}{x^2} = 2$$

$$\Rightarrow x^4 + \frac{1}{x^4} + 2 = 4$$

$$\Rightarrow x^4 + \frac{1}{x^4} = 2$$

5. (d)

Series is following given pattern,

$$\begin{aligned}
 1 \times 7 + 17 &= 24 \\
 2 \times 4 + 24 &= 32 \\
 3 \times 2 + 32 &= 38 \\
 3 \times 8 + 38 &= 62 \\
 6 \times 2 + 62 &= 74 \\
 7 \times 4 + 74 &= 102
 \end{aligned}$$

6. (b)

$$\text{LCM of 3, 4, 6 and 12} = 12$$

$$\sqrt[3]{4} = \sqrt[12]{4^4} = \sqrt[12]{256}$$

$$\sqrt[4]{6} = \sqrt[12]{6^3} = \sqrt[12]{216}$$

$$\sqrt[6]{17} = \sqrt[12]{17^2} = \sqrt[12]{289}$$

$$\sqrt[12]{222} = \sqrt[12]{222}$$

$$\text{Smallest} = \sqrt[12]{216} = \sqrt[4]{6}$$

7. (d)

$$\frac{2.32^3 + 1.44^3 + 2.88^3 - 3 \times 2.32 \times 1.44 \times 2.88}{2.32^2 + 1.44^2 + 4 \times 1.44^2 - 2 \times 1.44^2 - 2.32 \times 1.44 - 2.32 \times 2.88}$$

$$\frac{2.32^3 + 1.44^3 + 2.88^3 - 3 \times 2.32 \times 1.44 \times 2.88}{2.32^2 + 1.44^2 + 2.88^2 - 2.88 \times 1.44 - 2.32 \times 1.44 - 2.32 \times 2.88}$$

$$\Rightarrow \frac{a^3 + b^3 + c^3 - 3abc}{a^2 + b^2 + c^2 - ab - bc - ca} = a + b + c$$

$$2.32 + 1.44 + 2.88 = 6.64$$

8. (c)

$$\text{Work done by the waste pipe in 1 min} = \frac{1}{20} - \left(\frac{1}{30} + \frac{1}{36} \right) = -\frac{1}{90} \text{ (-ve means emptying)}$$

$$\therefore \text{Volume of } \frac{1}{90} \text{ part} = 50 \text{ litre}$$

$$\Rightarrow \text{Volume of tank} = 50 \times 90 = 4500 \text{ litre}$$

9. (b)

$$(x + y)\text{'s one hour work} = \frac{1}{6} + \frac{1}{7.5} = \frac{3}{10}$$

$$(x + z)\text{'s one hour work} = \frac{1}{6} + \frac{1}{10} = \frac{4}{15}$$

$$\text{Part filled in 2 hours} = \frac{3}{10} + \frac{4}{15} = \frac{17}{30}$$

$$\text{Part filled in 3 hours} = \frac{17}{30} + \frac{3}{10} = \frac{13}{15}$$

$$\text{Remaining part} = 1 - \frac{13}{15} = \frac{2}{15}$$

$\Rightarrow (x + z)$ will take 30 mins to fill this part.

$$\text{Total time required} = 3 + 0.5 = 3.5 \text{ hours}$$

10. (b)

Time from 4 pm on a day to 9 pm on the following day = 29 hours.

24 hrs 10 min of this clock = 24 hrs of the correct clock

$$29 \text{ hrs of this clock} = \frac{24 \times 29}{24 \frac{1}{6}} = \frac{24 \times 29 \times 6}{145} = \frac{144}{5} = 28 \frac{4}{5} = 28 \text{ hrs } 48 \text{ min}$$

\Rightarrow 48 min past 8

11. (b)

Let the quantity of wine in the cast originally be x litres.

Then, quantity of wine left in the cast after 5 operation

$$= \left[x \left(1 - \frac{24}{x} \right)^5 \right] \text{ litres}$$

$$\therefore \frac{x \left(1 - \frac{24}{x} \right)^5}{x} = \frac{32}{32 + 211} = \frac{32}{243}$$

$$\Rightarrow \left(1 - \frac{24}{x} \right)^5 = \left(\frac{2}{3} \right)^5$$

$$\Rightarrow x = 72 \text{ litres}$$

12. (c)

There are two serieses: (22, 16, 10, 4) and

$$\begin{array}{cccc} \underbrace{22} & \underbrace{16} & \underbrace{10} & \underbrace{4} \\ & -6 & -6 & -6 \end{array}$$

(0, 9, 36, 81)

$0^2, 3^2, 6^2, 9^2$

13. (c)

$$\begin{aligned} 6 \times 6 - 0 &= 36 \\ 36 \times 5 - 1 &= 179 \\ 179 \times 4 - 2 &= 714 \\ 714 \times 3 - 3 &= 2139 \\ 2139 \times 2 - 4 &= 4274 \end{aligned}$$

14. (a)

$$\begin{array}{cccccc} (16, & 16, & 24, & 60, & 240, & 1440) \\ \underbrace{\quad} & \underbrace{\quad} & \underbrace{\quad} & \underbrace{\quad} & \underbrace{\quad} & \underbrace{\quad} \\ \times 1 & \times 1.5 & \times 2.5 & \times 4 & \times 6 & \\ \hline & 0.5 & 1 & 1.5 & 2 & \end{array}$$

15. (c)

So, $(13^7 - 7^7) + (2^6 - 4^6)$, both are divisible by 6

$$\Rightarrow \text{Remainder} = -2 + 6 = 4$$

$(a^n - b^n)$ is divisible by $(a - b)$

$(a^n - b^n)$ is divisible by $(a + b)$ if 'n' is even natural number

16. (b)

7	729	Remainder
7	104	1
7	14	6
7	2	0
	0	2

$$(729)_{10} = (2061)_7$$

17. (d)

$$SP = 1026$$

$$\text{Profit} = 14\%$$

$$CP = \frac{1026}{1 + 0.14} = \text{Rs. } 900$$

If it had been sold for 693 then,

$$\text{Loss} = 900 - 693 = \text{Rs. } 207$$

18. (c)

Suppose, the quantity sold at loss be y kg.

Let CP per kg = x

$$\begin{aligned} \text{Total SP} &= 1.1 \times (20 - y)x + 0.95 \times y \times x \\ &= (22 - 1.1y + 0.95y) \times x \\ &= (22 - 0.15y) \times x = 1.08x \times 20 \end{aligned}$$

$$22 - 0.15y = 21.6$$

$$y = \frac{0.4}{0.15} = 2.67 \text{ kg}$$

19. (b)

$$SI = 1062 - 750 = 312$$

$$312 = \frac{750 \times 3 \times R}{100} + \frac{750 \times 4 \times 5}{100}$$

$$R = 7.2\%$$

20. (d)

2	11880
2	5940
2	2970
3	1485
3	495
3	165
5	55
11	11
	1

$$11880 = 2^3 \times 3^3 \times 5 \times 11$$

$$\text{Sum of all factors} = \frac{(2^4 - 1)(3^4 - 1)(5^2 - 1)(11^2 - 1)}{(2 - 1)(3 - 1)(5 - 1)(11 - 1)}$$

$$= \frac{15 \times 80 \times 24 \times 120}{1 \times 2 \times 4 \times 10} = 43200$$

Since unity is excluded,

The net sum of all factors = $43200 - 1 = 43199$

21. (b)

It will be along the longest diagonal,

$$d = \sqrt{40^2 + 56^2 + 13^2} = 70.0357 \text{ m}$$

22. (d)

Let equal sides of the isosceles triangle be x ,

Then $x^2 + x^2 = 10^2$

$$x = 5\sqrt{2} \text{ cm}$$

So,

$$\begin{aligned} \text{Final area} &= 8 \times \left(\frac{1}{8} \times \pi \times 10^2 - \frac{1}{2} 5\sqrt{2} \times 5\sqrt{2} \right) \\ &= \pi \times 10^2 - 4 \times 25 \times 2 \\ &= 100\pi - 200 \\ \text{Area} &= 114.16 \text{ cm}^2 \end{aligned}$$

23. (a)

$$\text{man} \times \text{day} = 40 \times 400 = 16000$$

$$\text{After 32 days} \Rightarrow 32 \times 400 = 12800$$

$$\text{So, Remaining, man} \times \text{day} = 3200$$

$$\therefore 80 \times \text{Day} = 3200$$

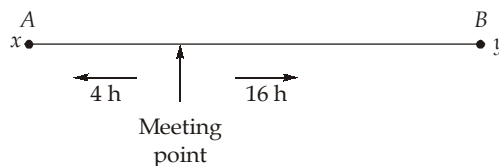
$$\text{Day} = 40 \text{ days}$$

24. (c)

$$\begin{aligned} \frac{\alpha}{\beta} + \frac{\beta}{\alpha} &= \frac{\alpha^2 + \beta^2}{\alpha\beta} = \frac{(\alpha + \beta)^2 - 2\alpha\beta}{\alpha\beta} = \frac{(\alpha + \beta)^2}{\alpha\beta} - 2 \\ &= \frac{(12/8)^2}{a/8} - 2 = \frac{144}{8a} - 2 = \frac{18}{a} - 2 \end{aligned}$$

$$\text{Minimum value} = -2 \text{ (When } a \rightarrow \infty)$$

25. (a)



In this case,

$$\frac{S_1}{S_2} = \frac{\sqrt{T_2}}{\sqrt{T_1}}$$

$$\frac{40}{S_2} = \frac{\sqrt{4}}{\sqrt{16}}$$

$$S_2 = 80 \text{ kmph}$$

26. (c)

$$B - 3 = E \quad \dots(i)$$

$$B + 3 = D \quad \dots(ii)$$

$$A + B = D + E + 10 \quad \dots(iii)$$

$$B = C + 2 \quad \dots(iv)$$

$$A + B + C + D + E = 133 \quad \dots(v)$$

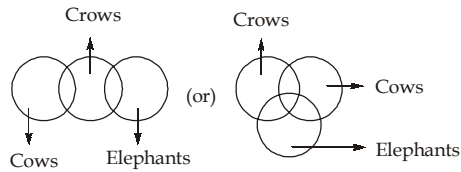
From (i) and (ii), we have : $2B = D + E \quad \dots(vi)$

From (iii) and (vi), we have : $A = B + 10 \quad \dots(vii)$

Using (iv), (vi) and (vii) in (v), we get:

$$(B + 10) + B + (B - 2) + 2B = 133 \Rightarrow 5B = 125 \Rightarrow B = 25.$$

27. (d)



None of the two follows.

28. (c)

Distance travelled when the ball touches the floor 3rd time,

$$h + 0.6h + 0.6h + 0.6 \times 0.6 h + 0.6 \times 0.6h = 292$$

$$h + 2 \times 0.6 \times h + 2 \times 0.36 \times h = 292$$

$$h(1 + 1.2 + 0.72) = 292$$

$$\Rightarrow 2.92h = 292$$

$$\Rightarrow h = 100 \text{ cm}$$

29. (b)

Let total number of members be 100,

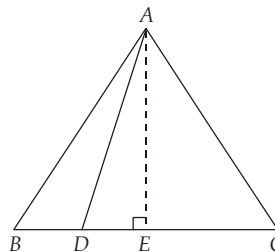
Then, number of members owning only 2 cars = 20

Number of members owning 3 cars = 40% of 80 = 32

Number of members owning only 1 car = $100 - (20 + 32) = 48$

Thus, 48% of the total members own one car each.

30. (c)



Given:

$$AB = AC = 3 \text{ cm and } BD = \frac{1}{2}CD$$

AE is median.

To find:

$$AD = ?$$

$$BD + CD = 3$$

$$\Rightarrow BD + 2BD = 3BD = 3$$

$$\Rightarrow BD = \frac{3}{3} = 1 \text{ cm}$$

Also, since AE is median

$$BE = CE = \frac{3}{2} \text{ cm}$$

$$\Rightarrow DE = BE - BD = \frac{3}{2} - 1 = \frac{1}{2} \text{ cm}$$

Also,

$$AE = \frac{\sqrt{3}}{2} a = \frac{3\sqrt{3}}{2} \text{ cm}$$

in $\triangle ADE$

$$\Rightarrow (AD)^2 = (AE)^2 + (DE)^2$$

$$\Rightarrow (AD)^2 = \left(\frac{3\sqrt{3}}{2}\right)^2 + \left(\frac{1}{2}\right)^2$$

$$\Rightarrow (AD)^2 = \frac{27}{4} + \frac{1}{4} = \frac{28}{4}$$

$$\Rightarrow AD = \sqrt{7} \text{ cm}$$

