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REASONING & APTITUDE

CIVIL ENGINEERING

Date of Test : 26/12/2022

ANSWER KEY >

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

DETAILED EXPLANATIONS

1. (b)

Because Sohan eats more than Mohan and Raghav eats more than Sohan. Hence, Rathav eats more than Mohan.

2. (b)

The word WORKSPACE contains 9 different letters.

When the vowels (OAE) are always together. They can be supposed to form one letter.

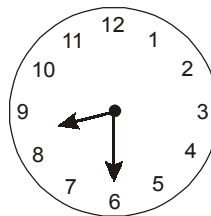
Then, we have to arrange the letters WRKSPC (OAE).

Now, 7 letters can be arranged in $7! = 5040$ ways.

The vowels (OAE) can be arranged among themselves in $3! = 6$ ways.

\therefore Required no. of ways = $(5040 \times 6) = 30240$

3. (c)



Angle between hour and minute hands = Angle between 6 and 7 + angle between 7 and 8 + angle between 8 and 8: 30

$$= 30^\circ + 30^\circ + 15^\circ = 75^\circ$$

4. (b)

The number of polygons = ${}^nC_2 - n$, where n is number of sides

$${}^nC_2 - n = 170$$

$$\frac{(n)(n-1)}{1.2} - n = 170$$

$$n^2 - n - 2n = 340$$

$$n^2 - 3n - 340 = 0$$

$$n = 20, -17$$

n can't be negative, so $n = 20$

5. (a)

Panacea is a solution or remedy for all difficulties or diseases.

Pinnacle is the highest point or level.

Panache is flamboyant confidence of style or manner.

Pangaea was a super-continent in early geologic time.

6. (a)

$$\frac{1}{1+\sqrt{2}} + \frac{1}{\sqrt{2}+\sqrt{3}} \dots\dots\dots \frac{1}{\sqrt{15}+\sqrt{16}}$$

Rationalising each term

$$= \frac{1-\sqrt{2}}{1-2} + \frac{\sqrt{2}-\sqrt{3}}{2-3} + \frac{\sqrt{3}-\sqrt{4}}{3-4} \dots\dots \frac{\sqrt{15}-\sqrt{16}}{15-16}$$

$$= -1[1-\sqrt{2} + \sqrt{2}-\sqrt{3} \dots\dots + \sqrt{15}-\sqrt{16}] = -1[1-4] = 3$$

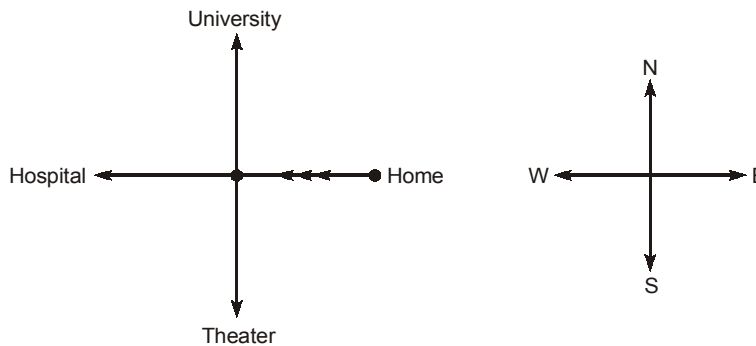
7. (a)

Because 4 + 7 + 7 + 7 means Monday so after Monday is Tuesday.

8. (d)

In given code, first half of the word and second half of the word are reversed. NAGENDGA will be written as EGANAGDN.

9. (d)



Answer is North.

10. (a)

4! onwards every factorial will be a multiple of 24. As 4! = 24

$$5! = 4! \times 5$$

$$6! = 4! \times 5 \times 6 \text{ and so on}$$

So, remainder will be 1! + 3! = 7

11. (c)

Let bus started with x number of passengers.

$$\text{After 1}^{\text{st}} \text{ stop, no. of passengers} = x - \frac{x}{5} + 40 = \frac{4x + 200}{5}$$

$$\text{After 2}^{\text{nd}} \text{ stop, no. of passengers} = \frac{4x + 200}{5} - \frac{4x + 200}{5 \times 2} + 30$$

$$\frac{4x + 200}{5 \times 2} + 30 = 70$$

$$\frac{4x + 200}{10} = 40$$

$$4x = 400 - 200$$

$$x = 50$$

12. (c)

First term, $a = 16$

$$\text{Sum of 16 terms} = \frac{n}{2}[a + l] \quad [\text{Here } l \text{ is last term, } n = 16 \text{ no. of terms}]$$

$$l^2 = \frac{16}{2}[16 + l] = 8[16 + l] = 128 + 8l$$

$$l^2 - 8l - 128 = 0$$

$$(l - 16)(l + 8) = 0$$

$$l = 16, -8$$

$$a + 15d = 16$$

$$a + 15d = -8$$

$$16 + 15d = 16$$

$$15d = -24$$

$$d = 0$$

$$d = -\frac{8}{5}$$

So, $d = -\frac{8}{5}$

13. (b)

$$y = \sqrt{8 + 2\sqrt{8 + 2\sqrt{8 + \dots \infty}}}$$

$$y = \sqrt{8 + 2y}$$

Squaring both sides

$$y^2 = 8 + 2y$$

$$y^2 - 2y - 8 = 0$$

$$(y + 2)(y - 4) = 0$$

$$y = 4, -2$$

y can't be negative, so $y = 4$

14. (a)

We know that $P(A \cup B) = P(A) + P(B) - P(A \cap B)$ which means $\frac{5}{6} = \left(1 - \frac{1}{2}\right) + P(B) - \frac{1}{3}$ leading to

$$P(B) = \frac{5}{6} + \frac{1}{3} - \frac{1}{2} = \frac{2}{3}$$

$P(A) \cdot P(B) = \frac{1}{2} \times \frac{2}{3} = \frac{1}{3} = P(A \cap B)$ which means events A and B are independent and are NOT mutually exclusive.

15. (b)

Mercury and Zinc – both are metals.

16. (b)

$$\begin{aligned} \text{Price of 1 pencil} &= ₹ P \\ \text{Quantity bought before reduction} &= Q \\ PQ &= 75 \quad \dots(i) \\ \text{reduced price} &= P - \frac{P \times 33.33}{100} = \frac{2}{3} P \\ \frac{2}{3} P(Q + 25) &= 75 \\ PQ + 25P &= 75 \times \frac{3}{2} \\ 25P &= \frac{75}{2} \\ \text{Original price } P &= \frac{3}{2} = ₹ 1.5 \\ \text{Reduced price} &= \frac{2}{3} \times P = ₹ 1 \end{aligned}$$

17. (d)

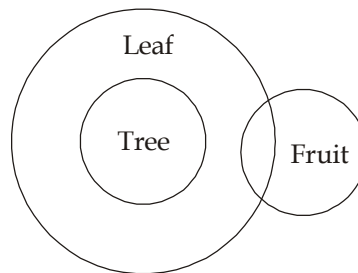
Let original workers be x
 actual number of workers $x - 7$
 Man days required in both cases

$$\begin{aligned} x(24) &= (x - 7)30 \\ \Rightarrow x &= 35 \\ \text{Actual number of workers} &= 35 - 7 = 28 \end{aligned}$$

18. (c)

$$\begin{aligned} 13 + 5 - 5 &= 13 \times 5 + 5 \times 2 = 75, \\ 11 + 7 - 3 &= 11 \times 7 + 3 \times 2 = 83 \\ \text{so } 18 + 6 - 8 &= 18 \times 6 + 8 \times 2 = 124 \end{aligned}$$

19. (b)



20. (c)

Pull is the property that gravity has, and in the same way attraction is the property that magnetism has.

21. (b)

Volume of water flowing through the pipe in 1 sec

$$\begin{aligned} &= 5 \times 30 \times 100 = 15000 \text{ cm}^3/\text{sec} \\ 1000 \text{ cm}^3 &= 1 \text{ L} \\ \text{Volume of water flowing through pipe in 60 sec} &= 1 \text{ min} = 15 \times 60 = 900 \text{ L} \end{aligned}$$

22. (b)

$$\text{Initial volume } V = \frac{1}{3}\pi r^2 h$$

$$\begin{aligned} \text{Final volume} &= \frac{1}{3}\pi \left(r - \frac{50}{100}r\right)^2 \left(h + \frac{200}{100}h\right) = \frac{1}{3}\pi \left(\frac{r}{2}\right)^2 \cdot 3h \\ &= \frac{1}{3}\pi^2 h \cdot \frac{3}{4} = \frac{3}{4}V \end{aligned}$$

$$\% \text{ decrease in volume} = \frac{V - \frac{3}{4}V}{V} \times 100\% = 25\%$$

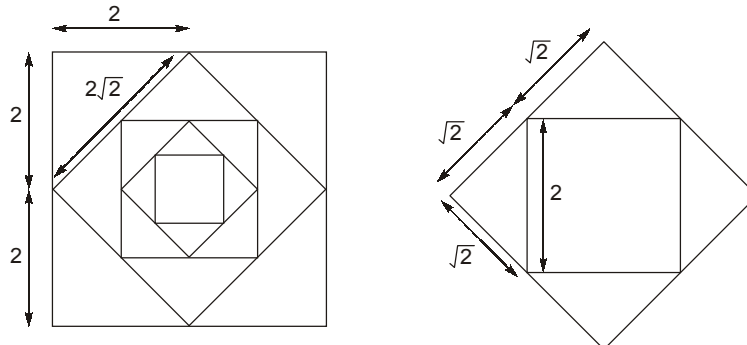
23. (a)

	American	Chinese	Mediterranean	Continental
A	y	y		
B	y		y	
C		y	y	y
D	y	y		y

B and C feel sick and both of them ate Mediterranean. So, it must be Mediterranean which made them sick.

24. (b)

Outer most square area = 16



$$\text{Area} = (2\sqrt{2})^2 = 4 \times 2 = 8 \text{ units}$$

$$\text{Area of inner square} = 2 \times 2 = 4 \text{ units}$$

$$\text{Area} = 16 + 8 + 4 + 2 + 1 + \dots$$

$$\frac{16}{1 - \frac{1}{2}} = 32 \text{ square units}$$

$$= 32$$

25. (d)

Simple LCM problem. Take the LCM of 12, 16, 24 and 30 which comes out to be 240 minutes i.e. 4 hours.

Add to 6'o clock. The time is 10 : 00 hours.

26. (a)

$$x^3 - \frac{1}{x^3} = 14$$

$$\left(x - \frac{1}{x}\right)^3 + 3x \times \frac{1}{x} \left(x - \frac{1}{x}\right) = 14$$

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

$$z^3 + 3z - 14 = 0$$

Now, $z = 2$, satisfies the equation, hence $(z - 2)$ is a factor. i.e.,

$$z = 2$$

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

27. (b)

The easiest way to solve this problem is to make an assumption that length of each side of the triangular course be 60 km (60 is LCM of 10, 15 and 20 – the 3 speeds at which Radhika covers the 3 sides).

Time taken by her to cover the 3 sides of the course = $\frac{60}{10}, \frac{60}{15}, \frac{60}{20}$ hours respectively or 6 hours, 4 hours

and 3 hours respectively. Total time taken to cover the distance of $3 \times 60 = 180$ km is $6 + 4 + 3 = 13$ hours.

Average speed of Radhika for the entire journey = $\frac{180}{13} = 13.84$ km/hour leading to option (b).

28. (c)

If S is niece of T , i.e., T is brother of father of S , which is shown in option (c).

$$T + M \times S - K :$$

$S - K$ means S is sister of K .

$M \times S$ means M is father of S .

$T + M$ means T is brother of M , T is brother of father of S , hence S is niece of T .

So, option (c) is correct.

29. (c)

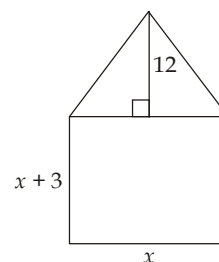
Let the breadth of the rectangular part be x m,

So, its length = $(x + 3)$ m

Therefore, the area of the rectangular park
= $x(x + 3)$ m²

Now, base of the isosceles triangle = x m

Therefore, its area = $\frac{1}{2} \times x \times 12 = 6x$ m²



According to our requirements,

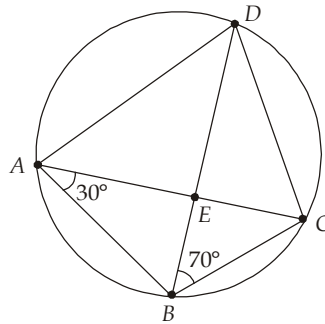
$$x^2 + 3x = 6x + 4$$

$$x^2 - 3x - 4 = 0$$

$$x = \frac{3 \pm \sqrt{25}}{2} = 4 \text{ or } -1$$

∴ Length of the part = $4 + 3 = 7$ m

30. (a)



$$\begin{aligned} \angle CAD &= \angle DBC = 70^\circ && \text{(Angles in the same segment)} \\ \therefore \angle DAB &= \angle CAD + \angle BAC \\ &= 70^\circ + 30^\circ \\ &= 100^\circ \\ \text{But, } \angle DAB + \angle BCD &= 180^\circ && \text{(Opposite angle of cyclic quadrilateral)} \\ \text{So, } \angle BCD &= 180^\circ - 100^\circ = 80^\circ \\ \text{Now, we have } AB &= BC \\ \text{Therefore, } \angle BCA &= 30^\circ \\ \text{Again, } \angle DAB + \angle BCD &= 180^\circ && \text{(Opposite angle of cyclic quadrilateral)} \\ 100^\circ + \angle BCA + \angle ECD &= 180^\circ \\ 100^\circ + 30^\circ + \angle ECD &= 180^\circ \\ \angle ECD &= 50^\circ \end{aligned}$$

