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REASONING & APTITUDE

CIVIL ENGINEERING

Date of Test : 29/09/2022

ANSWER KEY >

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

DETAILED EXPLANATIONS

1. (d)

Let the two consecutive even integers be $2n$ and $(2n + 2)$.

$$\begin{aligned} (2n + 2)^2 - 2n^2 &= (2n + 2 + 2n)(2n + 2 - 2n) \\ &= 2(4n + 2) \\ &= 4(2n + 1) \end{aligned}$$

$4(2n + 1)$ is divisible by 4.

The answer is (d).

2. (b)

$$\text{Number of balls} = 6 + 8 = 14$$

$$\text{Number of white balls} = 8$$

$$P(\text{drawing a white ball}) = \frac{8}{14} = \frac{4}{7} = 0.57$$

3. (d)

Each of the numbers except 80 is a prime number.

Hence, 80 is the odd one out.

4. (c)

Suppose first tap alone takes x hours to empty the tank. Then, second and third taps will take $(x - 5)$ and $(x - 9)$ hours respectively to empty the tank.

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

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

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

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

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

$$\Rightarrow x = 15, 3$$

For $x = 3$, $(x - 5)$ and $(x - 9)$ will be negative. \therefore answer is 15 hours.

5. (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.

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

6. (b)

$$\text{Ankit : Varun} = 100 : 75$$

$$\text{Varun : Abhinav} = 100 : 96$$

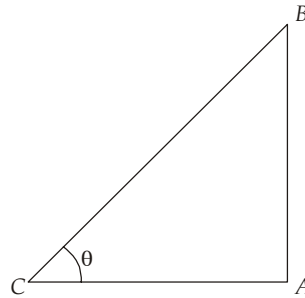
$$\therefore \text{Ankit : Abhinav} = \left(\frac{\text{Ankit}}{\text{Varun}} \times \frac{\text{Varun}}{\text{Abhinav}} \right)$$

$$= \left(\frac{100}{75} \times \frac{100}{96} \right) = \frac{100}{72} = 100 : 72$$

∴ Ankit beats Abhinav by $(100 - 72)m = 28 m$

7. (a)

Let AB be the pole and AC be its shadow on the full moon night



Let $\angle ACB = \theta$

Then $\frac{AC}{AB} = \sqrt{3}$

⇒ $\cot \theta = \sqrt{3}$

∴ $\theta = 30^\circ$

8. (c)

Let the ages of mother and daughter 10 years ago be $3x$ and x years respectively.

Then, $(3x + 10) + 10 = 2[(x + 10) + 10]$

⇒ $3x + 20 = 2x + 40$

⇒ $x = 20$

∴ Sum of present age = $(3x + 10) + (x + 10) = 70 + 30 = 100$

9. (b)

$$3^{x-y} = 27 = 3^3$$

⇒ $x - y = 3$... (i)

$$3^{x+y} = 243 = 3^5$$

⇒ $x + y = 5$... (ii)

Solving (i) and (ii), we get $x = 4$

10. (c)

The given pair of words have similar meaning. Option (c) has a pair of words which have similar meaning. Pinnacle refers to the topmost point and apogee refers to a satellite being at maximum distance.

11. (b)

The 2 speeds are 4 Km/hour and $4 + 50\%$ of 4 i.e. 6 km/hour. If ' D ' is the distance between my home and bus stop, we can write the relationship in the form of an equation as:

$$\frac{D}{4} - \frac{D}{6} = \frac{(7+8)}{60} = \frac{15}{60} = \frac{1}{4}$$

i.e. $\frac{D}{12} = \frac{1}{4}$ which gives $D = 3 \text{ km}$

12. (d)

$$\begin{aligned}x^2 - y^2 &= 702 \\(x - y)(x + y) &= 702 \\ \text{Factors of } 702 &= 2 \times 3 \times 3 \times 3 \times 13\end{aligned}$$

Since x, y are natural numbers.

x, y should be such that either both are even or both are odd.

So, 702 is to be expressed as product of two natural numbers which should be either odd or even.

Here, 702 has only one even factor which leads to no valid solution. Hence, option 'd' is right.

13. (d)

Remainder obtained when we divide 2^1 by 7 is 2; $2^2 / 7$ gives a remainder = 4; $2^3 / 7$ gives a remainder = 1 and this cycle repeats. When we add the first 3 remainders, $2 + 4 + 1 = 7$ implying that a set of 3 consecutive terms will give a remainder = 0. With a total of 20 terms, we need to concentrate on only last 2 terms which are equivalent to the first 2 terms leading to a remainder = $2 + 4 = 6$.

14. (b)

Given

$$3^a = 4, \text{ means } 4^b = (3^a)^b = 3^{ab}; \text{ likewise keep replacing successive values.}$$

We will end up getting $3^{abcdef} = 3^2$ or $abcdef = 2$

15. (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.

16. (b)

Mercury and Zinc - both are metals.

17. (b)

Let us form equations based on the given information. If 'a', 'b', 'c' are the number of marbles in the 3 boxes respectively, we can write

$$a + b + c = 249 \quad \dots(1)$$

$$5 \times (a - 36) = b + 36 \text{ or } b = 5a - 216 \quad \dots(2)$$

$$\text{and } b - 21 = 1.5 \times (c + 21) \quad \dots(3)$$

Solving the 3 equations, we get

$$a = 69, b = 129 \text{ and } c = 51.$$

To get equal number of marbles in 'A' and 'B', we have to transfer from box 'B' and the number

$$\text{of marbles to be transferred} = \frac{129 - 69}{2} = 30.$$

18. (a)

$$\begin{aligned}n(A \cup B \cup C) &= n(A) + n(B) + n(C) - n(A \cap B) - n(A \cap C) - n(B \cap C) + n(A \cap B \cap C) \\ \text{or } n(A \cap B) + n(A \cap C) + n(B \cap C)\end{aligned}$$

$$= 550 - 350 = 200$$

Number of people in exactly two sets is given as

$$\begin{aligned} &= n(A \cap B) + n(A \cap C) + n(B \cap C) - 3n(A \cap B \cap C) \\ &= 200 - 3 \times 50 \\ &= 50 \end{aligned}$$

19. (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.

20. (d)

Given word : "PRECIOUS"

After rearrangement OQFBJPVR

In alphabetic order from left to right BFJOPQVRV

Thus, P is fourth from the right end.

21. (b)

After comparing we get

the capital \rightarrow veru, miti

in \rightarrow dic

Hence, for crowd code is sik.

22. (c)

Let the breadth of the rectangular part be x m ,

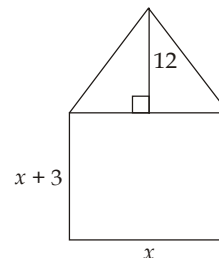
So, its length = $(x + 3)$ m

Therefore, the area of the rectangular park

$$= x(x + 3) \text{ m}^2$$

Now, base of the isosceles triangle = x m

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



According to our requirements,

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

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

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

\therefore Length of the part = $4 + 3 = 7$ m

23. (a)

Total mixture = 48 litres

$M : W = 3 : 1$

Milk = 36

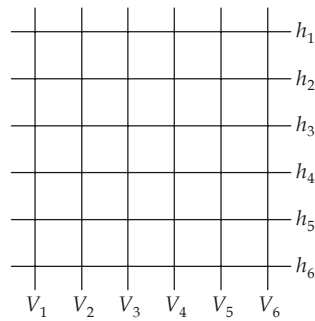
Water = 12

10 litre mixture is taken out and 20 litre pure water is added.

Now,

$$\begin{aligned} \text{Milk} &= 36 - 7.5 = 28.5 \\ \text{Water} &= 12 - 2.5 + 20 \\ &= 29.5 \\ \text{Required difference} &= 29.5 - 28.5 \\ &= 1 \text{ litre} \end{aligned}$$

24. (b)



Here V_1 to V_6 represent six parallel vertical lines and h_1 to h_6 represent six parallel horizontal lines.

To form a rectangle we need to select any two horizontal parallel lines which intersect any two vertical parallel lines. Thus,

$${}^6C_2 \times {}^6C_2 = 15 \times 15 = 225$$

225 rectangles will be formed.

25. (b)

Let the number of sides be n .

$$\begin{aligned} \therefore {}^nC_2 - n &= 44 \\ \frac{n(n-1)}{2} - n &= 44 \\ \frac{n^2 - n - 2n}{2} &= 44 \\ n^2 - 3n - 88 &= 0 \\ n^2 - 11n + 8n - 88 &= 0 \\ n(n-11) + 8(n-11) &= 0 \\ n &= 11, -8 \end{aligned}$$

26. (d)

(i) $46000 \times \frac{23}{100} = 10580$

(ii) 23% of spending is on food

(iii) Required ratio = $15 : 12 = 5 : 4$

(iv) $46000 \times \frac{15}{100} = 6900$

27. (a)

If subtract or multiply every term of an A.P. by a constant resulting sequence will be also A.P. as common difference will still be constant.

28. (c)

Let marked price of article = $100x$

1st case : 10% discount on the MP, so

$$\text{Selling Price} = 100x - 10x = 90x$$

2nd case : 20% discount on the MP so,

$$\text{Selling Price} = 100x - 20x = 80x$$

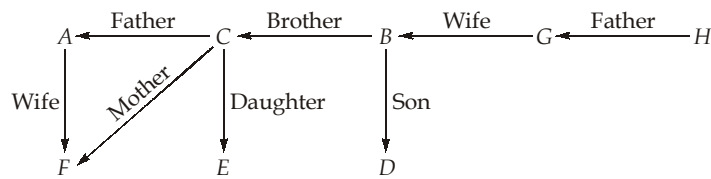
Cost price in both cases will be same.

$$\text{So, } 90x - 400 = 80x - 330$$

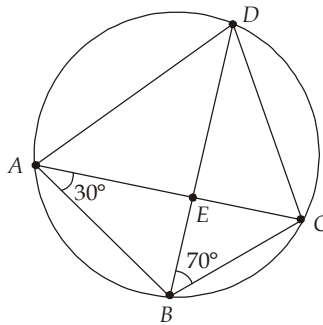
$$\text{or } x = 7$$

So, marked price of article = $100x = 700$.

29. (a)



30. (a)



$$\angle CAD = \angle DBC = 70^\circ \quad (\text{Angles in the same segment})$$

$$\begin{aligned} \therefore \angle DAB &= \angle CAD + \angle BAC \\ &= 70^\circ + 30^\circ \\ &= 100^\circ \end{aligned}$$

$$\text{But, } \angle DAB + \angle BCD = 180^\circ \quad (\text{Opposite angle of cyclic quadrilateral})$$

$$\text{So, } \angle BCD = 180^\circ - 100^\circ = 80^\circ$$

$$\text{Now, we have } AB = BC$$

$$\text{Therefore, } \angle BCA = 30^\circ$$

$$\text{Again, } \angle DAB + \angle BCD = 180^\circ \quad (\text{Opposite angle of cyclic quadrilateral})$$

$$100^\circ + \angle BCA + \angle ECD = 180^\circ$$

$$100^\circ + 30^\circ + \angle ECD = 180^\circ$$

$$\angle ECD = 50^\circ$$

