CLASS TEST

CLASS TEST 2020-2021

CIVIL ENGINEERING

Date of Test : 16/02/2020

ANSWER KEY ➤ Reasoning & Aptitude

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

DETAILED EXPLANATIONS

2. **(d)**

Option (d) will make the sentence a meaningful sentence.

3. **(d)**

In numbering the pages of the book, we have 9 pages with a single digit page number $\Rightarrow$ 9 digits.

We have Page number 10 to 99 i.e. 90 pages with 2 digit page number $\Rightarrow$ 90 × 2 = 180 digits.

Page number 100 to 999 i.e. 900 pages with 3 digit page number $\Rightarrow$ 900 × 3 = 2700 digits.

So far we have a total of 9 + 180 + 2700 = 2889 digits.

From page number 1000 onwards, each number has 4 digits. We are left with 3089 – 2889 = 200 digits

leading us to have $\dfrac{200}{4} = 50$ more pages which will be 1000 to 1049 giving us 1049 pages in the book.

4. **(b)**

Option (b) will be used to replace the set of words in BOLD so as to make a meaningful and correct sentence.

5. **(b)**

Since M and N are mid points of sides AB and AC of ΔABC, MN, BC and $MN = \dfrac{1}{2} BC$ (mid point theorem).

Area of $\Delta AMN = \dfrac{1}{4} \Delta ABC$ and area of $\Delta AMP = \dfrac{1}{8} \Delta ABC$

Area of $MNBC = \dfrac{3}{4} \Delta ABC$ and area of $PNXC = \dfrac{1}{2} MNBC = \dfrac{3}{8} \Delta ABC$

Hence ratio of area of ΔAMP and area of quadrilateral $PNCX = 1 : 3$.

6. **(c)**

A very simple question!

Let M, C and F be the present age of Mini, Champa and Fatima respectively. The information given in the question can be written in the form of linear equations:

$$M = C + F \qquad \text{...(i)}$$
$$M - 2 = 3(C - 2) \qquad \text{...(ii)}$$
$$F = C + 5 \qquad \text{...(iii)}$$

Solving the 3 linear equations, we get $C = 9$; $F = 14$ and $M = 23$ i.e. present age of Mini is 23 years and after 3 years, she will be 23 + 3 = 26 years old.

7. **(d)**

$7x + 2 < 23$ leads to $x < 3$ i.e. possible integer values of $x = 2, 1, 0, -1, ...$ and $3x - 5 > 1$ leads to $x > 2$ giving possible integer values for $x = 3, 4, 5, ...$

A careful look at the options will lead us to option (d) in which case $7x + 2 \leq 23$ gives possible integer values of $x = 3, 2, 1, 0, -1$ etc and $3x - 5 \geq 1$ gives possible integer values for $x = 2, 3, 4, 5, ...$ leading to 2 common integer values for x.

8. (a)

Let p and q be the number of 2-axled and 3-axled vehicles respectively. Based on the given information, we can form 2 linear equations:

$$p + q = 120$$
$$50p + 80q = 7410$$

On solving, we get $p = 73$ and $q = 47$. In the event of revision of toll charges, the increase in amount collected is $10 \times 73 + 20 \times 47 = ₹\ 1670$ leading to total collection of ₹ 7410 + ₹ 1670 = ₹ 9080.

9. (a)

Candle C1 takes 10 hours to burn completely whereas candle 2 i.e. C2 takes 40% more or 14 hours to burn completely. We can say that C1 burns @ $\frac{1}{10}$ th of its length of the candle whereas C2 burns @ $\frac{1}{14}$ th of its length per hour. Based on the given information, we can form an equation as given:

$2\left(1 - \frac{t}{10}\right) = \left(1 - \frac{t}{14}\right)$ where t is the time in which the length of one candle is twice that of the other.

On solving this relationship, we get $t = 7.77$ hours or 7.8 hours

10. (b)

We can rewrite $x^2 + 3xy + 2y^2 = 60$ as $(x + y)^2 + xy + y^2 = 60$ or $(x + y)^2 + y(x + y) = 60$
If we substitute the value of $x + y = 6$, we can get $y = 4$ and $x = 2$ giving $2x + 3y = 16$.

11. (b)

Since p and q are the roots of the equation $x^2 + px + q = 0$, we can say that $p + q = -p$ and $pq = q$.
This gives us $p = 1$ and $q = -2$.
$p + q = -1$ and $p - q = 3$ (can be $q - p = -3$ also) and $pq = -2$
Product of sum and difference of the roots of the given equation = -3 or $+3$.
Since only $+3$ is given as one of the options, option (b) is the correct option.

12. (d)

Either $P > Q$ or $Q > P$ leading to $\frac{P}{Q} > 1$ or $\frac{Q}{P} > 1$ which means that S1 is NOT NECESSARILY true- eliminating options (a) and (c).

Prime numbers greater than 9 will always be odd integers; and sum of 2 odd integers is always an even even number which will not be a prime number $\Rightarrow$ S2 is true.

P and Q are 2 distinct prime numbers and their product will be a composite positive integer which will have distinct factors as 1, P, Q, $P \times Q$ i.e. 3 distinct positive integer factors other than 1.

13. (b)

Placing the runners on a number line, we see that there is a time lag of 20 seconds between the first and the last runner. Also, it can be concluded that Jiwan was at the end, Sanchit in second being 19 second ahead of Jiwan and one second behind Chetan, who is the winner. Pritam is in third place 12 seconds behind Sanchit.

14. (a)

Let R be the number of red balls and B be the number of black balls in the box.

$$P(\text{both red}) = \frac{R(R-1)}{(R+B)(R+B-1)} \text{ and } P(\text{both blue}) = \frac{B(B-1)}{(R+B)(R+B-1)}$$

$$P(\text{balls are of different colour}) = \frac{2RB}{(R+B)(R+B-1)} \text{ (order can be RB or BR)}$$

As per the information given, $P(\text{both red}) = 5 \times P(\text{both blue})$ and $P(\text{different colour}) = 6 \times P(\text{both blue})$
We can put the values and we get

$$\frac{R(R-1)}{(R+B)(R+B-1)} = 5\frac{B(B-1)}{(R+B)(R+B-1)}$$

$$\Rightarrow \qquad R(R-1) = 5B(5B-1) \qquad \qquad \qquad \text{...(i)}$$

$$\frac{2RB}{(R+B)(R+B-1)} = 6\frac{B(B-1)}{(R+B)(R+B-1)} \text{ or } R = 3B-3$$

which when put in (1) gives $B = 1$ or 3 but for $B = 1$, $R = 0$ which is not possible.
Hence the only possible value of $B = 3$ and $R = 6$.

15. (a)

$$x^2 - 10x + 16 < 0$$

$$\Rightarrow \qquad (x-2)(x-8) < 0$$

Either $(x-2) > 0$ and $(x-8) < 0$ or $(x-2) < 0$ and $(x-8) > 0$
$\Rightarrow$ $x > 2$ and $x < 8$ or $x < 2$ and $x > 8$
$\Rightarrow$ $2 < x < 8$ or not possible
This gives us the minimum value of $x > 2$ and maximum value of $x < 8$
To get the value of $\qquad P = x^2 + 10x + 16$
$\Rightarrow \qquad \qquad \qquad P = (x+2)(x+8)$
To get minimum value of P, put $x = 2$ which gives $P_{min} = 4 \times 10 = 40$
To get maximum value of P, put $x = 8$ which gives $P_{min} = 10 \times 16 = 160$ leading us to conclude that
$40 < P < 160$ i.e. option (a).

16. (d)

Let 'H' be the present number of hours and 'W' be the present hourly rate of pay of Devika

We have $HW = 3 \times (H-12) \times \dfrac{W}{2}$ which when solved gives $H = 36$ i.e. she works 36 hours per week at present.

This means that her weekly earning presently $= 36W$

For the additional 12 hours, her hourly wage rate is 50% more i.e. it is $\dfrac{3W}{2}$ leading to revised weekly

earning $= 36W + 12 \times \dfrac{3W}{2} = 54W$ which is 1.5 times her persent earning weekly or there is 50% increase

in her weekly earnings.

17. (b)

We can arrive at the correct result by adopting process of elimination.

Based on C1, *P* is 1st or last in the sequence which rules out option (c).

Since there is one gap between *L* and *O* and *M* and *P* (order is not important), it leads to elimination of option (a). Since *T* is delivered after *M* and *N* is delivered after *L*, it eliminates option (d) since *N* is coming before *L* in this option; this leads to option (b) as the correct choice.

18. (c)

We can say that a triangular number can be represented as $N = \sum n = \dfrac{n(n+1)}{2} \leq 2100$ which when solved for positive value of n gives $n = 64.31$ or the nearest natural number is 64. Hence, there are 64 triangular natural numbers out of the set of first 2100 natural numbers.

19. (d)

Option (d) will be used to replace the set of words in BOLD so as to make a meaningful and correct sentence.

20. (c)

We can try to infer that $125 = \dfrac{245 + 5}{2}$; which can be verified for the 2nd pair of numbers in the sequence i.e. 35 and 20 where $20 = \dfrac{35 + 5}{2}$. Based on this observation, $\dfrac{965 + 5}{2} = 485$ and $\dfrac{125 + 5}{2} = 65$ or the missing 2 numbers are 485 and 65 respectively i.e. Option (c). These values verify the numbers following these values.

21. (c)

It is given that

$$\frac{u + v + w + x + y + z}{6} = 10$$

$$\frac{u + 10 + v + 20 + w + 30 + x + 40 + y + 50 + z + 60}{6} = \frac{u + v + w + x + y + z}{6} + \frac{10 + 20 + 30 + 40 + 50 + 60}{6}$$

$$= 10 + 35 = 45$$

22. (c)

$$(\log_3 x)^2 = \log_2 x \cdot \log_x 16$$
$$(\log_3 x)^2 = \log_2 16 = 4$$
$$\log_3 x = \pm 2$$

$$x = \frac{1}{9} \text{ or } 9$$

Since, $x > 1$, so $x = 9$

23. (c)

Let the cost price of the article $= x$

$$x + \frac{20x}{100} = 3600$$

$$x = ₹3000$$

$$\text{New selling price} = ₹3150$$
$$\text{Gain} = 3150 - 3000$$
$$= ₹150$$

$$\text{Gain\%} = \frac{150}{3000} \times 100 = 5\%$$

24. (b)

$$2^x - 2^{x-1} = 4$$

$$2^x \left[1 - \frac{1}{2} \right] = 4$$

$$2x = 8$$

From here, $\quad x = 3$

$$2^{x+1} + 2^x + 2^{x-1} = 2^{3+1} + 2^3 + 2^{3-1}$$
$$= 16 + 8 + 4 = 28$$

25. (c)

$$\text{Let cost of one book} = x$$
$$\text{Let cost of one pencil} = y$$
$$4x + 3y = 8x + y$$
$$4x = 2y$$
$$y = 2x$$

(a) $5x + 5y = 5x + 10x = 15x \neq 10x$

(b) $8x + 4y = 8x + 8y = 16x \neq 10x$

(c) $6x + 2y = 6x + 4y = 10x$

26. (c)

'Sundry European powers' in the passage refers to various European governments. 'Extra', 'assorted' and 'random', though close in meaning to 'sundry' do not fit in the sentence.

The correct answer is option (c).

27. (c)

Writing the given information as equations:

$$xy + z = 29 \qquad \text{...(i)}$$
$$xz + y = 59 \qquad \text{...(ii)}$$
$$(x + y)z = 80 \qquad \text{...(iii)}$$

Subtracting (ii) from (iii), we get

$$yz - y = 21$$

or $\quad y(z - 1) = 21$

$$= 1 \times 21 \text{ or } 21 \times 1 \text{ or } 3 \times 7 \text{ or } 7 \times 3$$

We can make a table to compute x, y, z as follows:

$z-1$	y	z	x	$x+y+z$	
1	21	2	Not an integer		
21	1	22	7	30	Not a multiple of 9
3	7	4	Not an integer		
7	3	8	7	18	A multiple of 9 which is the answer

28. (c)

The presence of 'but' indicates something to the contrary. If the sound waves are not absorbed means they will continue to travel _indefinitely_ BUT their intensity _diminishes_ (decreases).

29. (b)

$$5 \times 3 + 1 = 16$$
$$16 \times 3 + 1 = 49$$
$$9 \times 3 + 2 = 29$$
$$29 \times 3 + 2 = 89$$
$$15 \times 3 + 3 = 48$$
$$48 \times 3 + 3 = 147$$

30. (b)

LCM of 24, 36, 54 is 216.

$\Rightarrow$ The lights change simultaneously after 216 seconds or multiple of 216 seconds.

option (a) = $16 \times 60 + 54 = 1014$

option (b) = $18 \times 60 + 00 = 1080$

option (c) = $17 \times 60 + 02 = 1022$

option (d) = $22 \times 60 + 12 = 1332$

only option (b) is multiple of 216.

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