

# CLASS TEST

S.No. : 14 SK1\_CE\_B\_070919

Reasoning & Aptitude



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# CLASS TEST 2019-2020

## CIVIL ENGINEERING

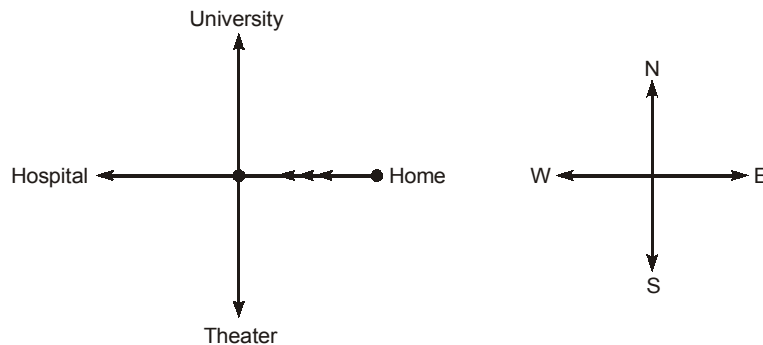
Date of Test : 07/09/2019

### ANSWER KEY > Reasoning & Aptitude

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

## DETAILED EXPLANATIONS

2. (b)  
'A lot of advice' instead of 'many advices'.
3. (b)  
 $(a - c)^2 b$  is odd.
4. (d)



Answer is North.

5. (b)

$$\text{Probability of choosing a defective bulb} = \frac{2}{10} = \frac{1}{5}$$

$$\text{Probability of choosing a non-defective bulb} = 1 - \frac{1}{5} = \frac{4}{5}$$

$$p(\text{not more than 1 out of 4}) = p(0 \text{ defective out of 4}) + p(1 \text{ defective out of 4})$$

$$= {}^4C_0 \left(\frac{1}{5}\right)^0 \left(\frac{4}{5}\right)^4 + {}^4C_1 \left(\frac{1}{5}\right)^1 \left(\frac{4}{5}\right)^3$$

$$= \frac{256}{625} + \frac{4 \cdot 4^3}{625} = \frac{512}{625} = 0.8192$$

7. (a)

Sample space,  $S$  is {HHHH, HHHT, HHTH, HHTT, HTHH, HTHT, HTTH, HTTT, THHH, THHT, THTH, THTT, TTHH, TTHT, TTTH, TTTT} i.e. 16

Favourable cases,  $P$  have been underlined above i.e. {HHTT, HTHT, HTTH, THHT, THTH, TTHH} i.e. 6

$$\text{Required probability} = \frac{P}{S} = \frac{6}{16} = \frac{3}{8} \text{ i.e. (a)}$$

8. (d)

$$5 \times 10 \times 15 \times \dots \dots \dots 45$$

$$(5 \times 1) \times (5 \times 2) \times (5 \times 3) \times (5 \times 4) \dots \dots \dots (5 \times 9)$$

$$= 5^9 \times 9! \text{ will have } 5^{10} \times 2^7 \text{ as factors}$$

and  $5^{10} \times 2^7$  will end with 7 zeros.

9. (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  $1! + 3! = 7$

10. (b)

Let speed of boat in still water =  $x$  km/hr

Let speed of water current =  $y$  km/hr

$$\frac{50}{x-y} + \frac{72}{x+y} = 9$$

$$\frac{70}{x-y} + \frac{90}{x+y} = 12$$

Let  $\frac{1}{x-y} = a$  and  $\frac{1}{x+y} = b$

Solving for  $a$  and  $b$

$$a = \frac{1}{10}$$

$$b = \frac{1}{18}$$

Solving for  $x$  and  $y$

$$x = 14 \text{ km/hr}$$

$$y = 4 \text{ km/hr}$$

11. (d)

Let

$$a^x = b^y = c^z = k$$

$$a = k^{1/x}, b = k^{1/y}$$

$$c = k^{1/z}$$

$$abc = 1$$

$$k^{1/x} k^{1/y} k^{1/z} = 1$$

$$k^{\frac{1}{x} + \frac{1}{y} + \frac{1}{z}} = 1$$

$$\frac{1}{x} + \frac{1}{y} + \frac{1}{z} = 0$$

$$xy + yz + zx = 0$$

12. (c)

Let bus started with  $x$  number of passengers.

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

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

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

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

$$4x = 400 - 200$$

$$x = 50$$

13. (b)

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

$$\text{Final volume} = \frac{1}{3}\pi \left(r + \frac{20}{100}r\right)^2 \times \left(h + \frac{20}{100}h\right)$$

$$= \frac{1}{3}\pi r^2 h \cdot \left(\frac{12}{10}\right)^3$$

$$\% \text{ increase in volume} = \frac{\frac{1}{3}\pi r^2 h \left(\frac{12}{10}\right)^3 - \frac{1}{3}\pi r^2 h}{\frac{1}{3}\pi r^2 h} \times 100 = \frac{\left(\frac{12}{10}\right)^3 - 1}{1} \times 100$$

$$= 72.8\% \approx 73\%$$

14. (c)

$$\text{First term, } a = 16$$

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

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

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

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

$$l = 16, -8$$

$$a + 15d = 16$$

$$a + 15d = -8$$

$$16 + 15d = 16$$

$$15d = -24$$

$$d = 0$$

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

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

15. (c)

Let after  $m$  minutes past 3 O'clock, the hour hand and minute hand are at right angle.

The angle measured are with reference to 12 O'clock.

$$\text{Angle made by hour hand } \theta_1 = \frac{360^\circ}{12 \times 60} \times m + 90^\circ$$

$$\text{Angle made by minute hand } \theta_2 = \frac{360^\circ}{60} \times m$$

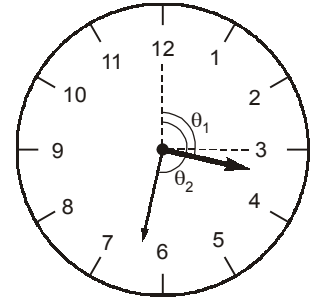
$$\theta_2 - \theta_1 = 90^\circ \quad [\text{right angle}]$$

$$\frac{360^\circ}{60} \times m - \frac{360^\circ}{12 \times 60} \times m - 90^\circ = 90^\circ$$

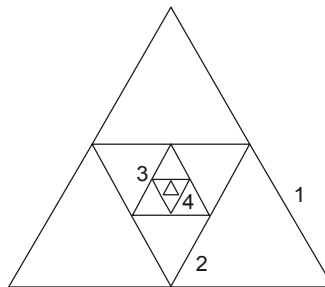
$$\frac{11 \times 360 \times m}{60 \times 12} = 180^\circ$$

$$m = \frac{12 \times 60 \times 180^\circ}{11 \times 360^\circ} = \frac{360}{11} \text{ minutes}$$

So, time at which both the hands will be at  $90^\circ$  is 3 hours  $32\frac{8}{11}$  min



16. (c)



Perimeter of all triangles =  $3 \times 1 + 3 \times 0.5 + 3 \times 0.25 \dots$  [Infinite GP]

$$= \frac{3}{1-0.5} = 6 \text{ units}$$

17. (b)

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

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

Squaring both sides

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

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

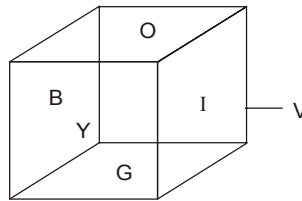
$$(y + 2)(y - 4) = 0$$

$$y = 4, -2$$

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

18. (c)

According to the information, the cube will be of following shape:



Hence, the color of the face opposite to the color of the face O will be G.

19. (d)

Let A, B, C together can do the job task in  $x$  hours.

then A alone can do in  $x + 6$  hours

B alone can do in  $x + 1$  hours

C alone can do in  $2x$  hours

$$\frac{1}{x+6} + \frac{1}{x+1} + \frac{1}{2x} = \frac{1}{x}$$

$$\frac{2x(x+1) + 2x(x+6) + (x+1)(x+6)}{2x(x+6)(x+1)} = \frac{1}{x}$$

$$2x(x+1+x+6) + (x+1)(x+6) = 2(x+1)(x+6)$$

$$2x(2x+7) - (x+1)(x+6) = 0$$

$$3x^2 + 7x - 6 = 0$$

$$x = -3, \frac{2}{3}$$

[ $x$  can't be negative]

$$\Rightarrow C \text{ alone can do the work in } = 2 \times \frac{2}{3} = \frac{4}{3} \text{ hours}$$

20. (b)

Let the volume of cistern =  $V$

$$\text{Portion filled by A in 5 minutes} = \frac{V}{20} \times 5 = \frac{V}{4}$$

$$\text{Portion emptied by B in 5 minutes} = \frac{V}{30} \times 5 = \frac{V}{6}$$

$$\text{Effectively portion filled in 10 minutes} = \frac{V}{4} - \frac{V}{6} = \frac{V}{12}$$

$$\text{To fill volume } V \text{ it required} = \frac{V}{12} \times t = V$$

12 cycles of 10 minutes.

$$\text{But after 11 cycles volume filled} = \frac{V}{12} \times 11 = \frac{11}{12}V$$

After that A is opened

$$\text{A can fill the volume in} = \frac{V}{20} \times t = V - \frac{11}{12}V$$

$$t = \frac{20}{12} = 1 \text{ minute } 40 \text{ seconds}$$

$$\Rightarrow \text{Total time taken} = 11 \times 10 \text{ minutes} + 1 \text{ minute } 40 \text{ seconds} \\ = 111 \text{ min } 40 \text{ sec}$$

21. (a)

$$\begin{aligned} f(1) &= -2 \Rightarrow p + q = -2 \\ f(-5) &= 24 \Rightarrow -5p + q = 24 \end{aligned}$$

Solving the two equations, we get

$$p = -\frac{13}{3} \text{ and } q = \frac{7}{3} \text{ or } f(x) = -\frac{13}{3}x + \frac{7}{3}$$

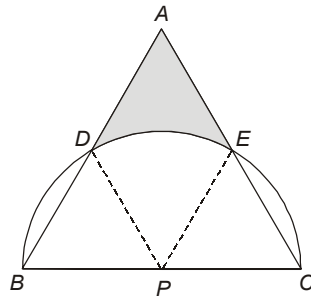
To calculate the change in value of  $f(x)$  for an increase in value of  $x$  by 2, simply compute  $f(3)$  and  $f(-3)$ ,

$$f(3) = -\frac{32}{3} \text{ and } f(-3) = \frac{46}{3} \text{ leading to change in value of } f(x) \text{ as i.e. option (a).}$$

22. (c)

Let  $P$  be the centre of the semi circle. If we join  $PD$  and  $PE$ , we can say that  $PD \cong PE \cong PB \cong PC \cong BD \cong CE \cong DE \cong AD \cong AE$ . (Since  $PD \cong PE \cong PB \cong PC$  being radii of the semi circle). Since  $\angle PBD = 60^\circ$ ,  $\angle DPB = 60^\circ$  giving  $\angle BDP = 60^\circ$ . Similarly,  $\angle PEC = 60^\circ$ .

This leads us to conclude that  $D$  and  $E$  are mid points of  $AB$  and  $AC$  respectively.



$\angle DPE = 60^\circ$  leads to conclude that  $\triangle DPE$  is also an equilateral triangle and so is  $\triangle ADE$ .

Each side of  $\triangle ADE$  and  $\triangle DPE = 7 \text{ cm}$  (= radius of semi circle).

Shaded area = area of  $\triangle DPE$  + area of  $\triangle ADE$  – area of sector  $DPE$  of  $60^\circ$

$$\begin{aligned} &= \frac{\sqrt{3}}{4}7^2 + \frac{\sqrt{3}}{4}7^2 - \frac{1}{6}\pi7^2 \\ &= 7^2 \left( \frac{\sqrt{3}}{2} - \frac{\pi}{6} \right) = 16.7776 \text{ or } 16.778 \end{aligned}$$

23. (c)

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

24. (b)

Let the probability of each of the odd numbers showing up be ' $k$ ' and that of an even number showing up will be ' $2k$ '.

Sum of probability of each of the 6 numbers showing up is 1 i.e.  $3k + 6k = 1$  giving  $k = \frac{1}{9}$ .

Probability of getting 2 or 4 or 6 =  $2k = \frac{2}{9}$  or the odds in favour of getting a '6' will be 2 to  $(9 - 2)$  i.e. 2 to 7 which is Option (b).

25. (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).

26. (d)

Let the capacity of the cistern be 180 L (LCM of 12, 15 and 90)

Pipe A fills  $180/12 = 15$  L/hour

Pipe B fills  $180/15 = 12$  L/hour

Hole empties @  $180/90 = 2$  L/hour

AT 9:00 AM, pipe A and the hole are active i.e.  $12 - 2 = 10$  L/hour is the effective rate of filling up the cistern. In 3 hours, 30 L gets filled up leaving  $180 - 30 = 150$  L.

When pipe A and B as well as the hole is open, the effective rate of filling up is  $15 + 12 - 2 = 25$  L/hour

Time required up to fill up 150 L is  $150/25 = 6$  hours i.e. the cistern will get filled up at 6:00 PM.

27. (b)

Option (a) : Monsoon is not mentioned in the passage.

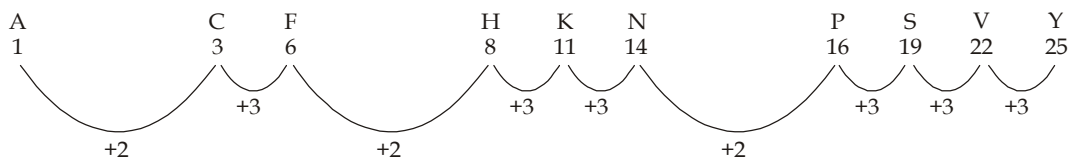
Option (c) : The Himalayas and the Thar Desert are not mentioned in the passage.

Option (d) : The passage talks about variation in rainfall and temperature but does not explicitly say that they are dependent on the season.

Option (b) : It best sums up the passage.

The answer is option (b).

28. (c)



So the required alphabets have to start with P and the common difference in terms is 3.

Hence, PSVY is the answer. The answer is option (c).

29. (c)

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

30. (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.

