CLASS TEST

Sl.: 02 SP_ME_FGHIS_090822

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REASONING & APTITUDE

MECHANICAL ENGINEERING

Date of Test : 09/08/2022

ANSWER KEY ➤

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

DETAILED EXPLANATIONS

1. (b)

Since '6' and '7' have been used in the product of 53 and 22, the numbers have to be using base '8' or '9'.

If we try with base '8', $(53)_8 = 8 \times 5 + 3 = (43)_{10}$

$(22)_8 = 8 \times 2 + 2 = (18)_{10}$

$43 \times 18 = (774)_{10}$

whereas, $(1276)_8 = 512 \times 1 + 64 \times 2 + 8 \times 7 + 6 = (702)_{10}$ which is NOT = 774

If we try with base '9', $(53)_9 = 9 \times 5 + 3 = (48)_{10}$

$(22)_9 = 9 \times 2 + 2 = (20)_{10}$

$48 \times 20 = (960)_{10}$

whereas, $(1276)_9 = 729 \times 1 + 81 \times 2 + 9 \times 7 + 6 = (960)_{10}$

Converting $(4371)_9 = 4 \times (729) + 3 \times (81) + 7 \times (9) + 1 = 3223$.

2. (d)

Being opposite in degree of measure, Sip is small quantities and gulp is take in large quantity. Similarly for drizzle and rain!

3. (d)

Since $\left(x - \frac{1}{x}\right) = 3\left(x - \frac{1}{x}\right)^2 = x^2 + \frac{1}{x^2} - 2 = 9$ leading to $x^2 + \frac{1}{x^2} = 11$

$$\left(x^3 - \frac{1}{x^3}\right) = \left(x - \frac{1}{x}\right)\left(x^2 + \frac{1}{x^2} + 1\right) = 3 \times 12 = 36$$

4. (b)

Let, Jyoti's age $= x$

Jyoti's mother's age $= 6x$

$\therefore \quad 3(x + 5) = 6x$

$3x + 15 = 6x$

$3x = 15$

$x = 5$

5. (d)

Let the original price be Rs. x

$\therefore$ $(100 - r)\%$ of $(100 + r)\%$ of $x = 1$

$$\frac{(100 - r)}{100} \times \frac{(100 + r)}{100} \times x = 1$$

$$x = \frac{100 \times 100}{(100 - r)(100 + r)} = \frac{10000}{(10000 - r^2)}$$

Alternative :

Let original price = Rs x

After $r\%$ increase, price = $(100 + r)\%$ of x

$$= \frac{(100 + r)x}{1000}$$

New price after $r\%$ decrease,

$$= (100 - r)\% \text{ of } \left[\frac{(100+r)x}{100}\right]$$

$$= \frac{(100-r)(100+r)}{100\times 100}x = 1 \text{ (given)}$$

Hence, $$x = \frac{100\times 100}{(100-r)(100+r)}$$

6. (c)

L.C.M of 5, 6, 7, 8 = 840

$\therefore$ Required number is of the form $840k + 3$

Least value of k for which $(840k + 3)$ is divisible by 9 is $k = 2$.

$\therefore$ Required number = $840 \times 2 + 3 = 1683$

7. (b)

$71 - 5 = 66$;	$66 + 9 = 75$;
$70 + 9 = 79$;	$74 + 9 = 83$
$75 - 5 = 70$;	$79 - 5 = 74$

8. (c)

One clock shows 10 pm (on 21st Jan, 2010)

One clock gains = 2 min

Other clock loses = 5 min

Time period between 10 pm and 4 pm = 18 hrs

$\therefore$ Required difference = $(2 \times 18 + 5 \times 18)$ min = 126 min

9. (b)

P = Rs. 600

A = Rs. 720

T = 4 years

R = ?

$$R = \frac{\text{S.I.}\times 100}{P\times T} = \frac{120\times 100}{600\times 4} = 5\%$$

At 7% rate,

$$\text{S.I.} = \frac{600\times 7\times 4}{100} = 168$$

$$A = 600 + 168 = 768$$

10. (b)

We have

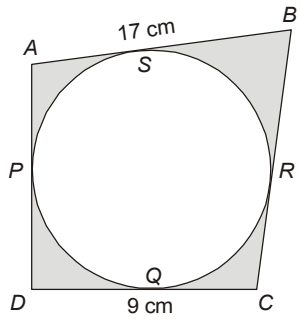
$$\frac{2x}{1+\frac{1}{\frac{(1-x)+x}{1-x}}} = 1$$

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

$$2x = 1 + 1 - x$$

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

11. (b)



A very simple question!

Using the property that the length of a tangents from an external point to thsame circle are equal in length, we can write

$$BS = BR;$$
$$CR = CQ;$$
$$DQ = DP;$$
$$AP = AS$$
$$AB + BC + CD + DA = 17 + (BR + RC) + 9 + (PD + PA)$$
$$= 26 + (BS + SA) + (CQ + DQ)$$

(replacing BR with BS; AP with AS; DP with DQ and CR with CQ being equal)

$$= 26 + 17 + 9 = 52 \text{ cm}$$

12. (d)

'd' i.e. 34

$$N = 126! - 125! = (125!) \times (126 - 1) = 125 \times 125!$$

The number of zeros at the end of N is dependent on the number of times '5' comes in the expansion of 125! which is equal to INTEGER value of $\frac{125}{5} + \frac{25}{5} + \frac{5}{5} = 25 + 5 + 1 = 31$ PLUS 3 more 5's since $125 = 5^3$ which gives total number of 5's as 31 + 3 = 34 which is the number of Zeros at the end of N.

13. (c)

When we want to paint the surfaces of the cube, we are working with the total surface area of all 6 faces. In case of cube of 125 cc volume, each side is 5 cm long. This means that 2 liters of paint is required to cover an area of 6 × (5 × 5) = 150 square cm.

In the second case, the total surface area to be covered is the total surface area of 125 cubes each with a volume of 1 cc i.e. a cube with each side 1 cm long. Total area to be painted in this case is 125 × (1 × 1) = 750 square cm. Additional area to be painted is 750 – 150 = 600 square cm which is 4 times the earlier area. This means that we need 4 × 2 liters = 8 liters as additional quantity of paint required to be used i.e. option (c).

14. (d)

If B is the number of boys and G is the number of girls in the class, we can write a linear equation based on the given data

i.e. $71B + 83G = 80 \times (B + G)$

i.e. $G = 3B$

i.e. the number of girls is 3 times the number of boys in the class.

Observation: Since the average is closer to the score of girls than the score of boys, we can eliminate option 'b' and 'c'.

15. (a)

Given $AB \parallel DE$

$\Rightarrow$ $\angle B = \angle D$

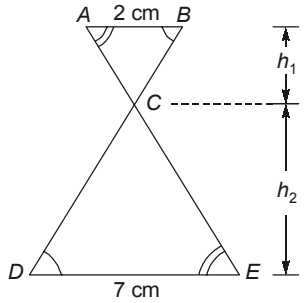
and $\angle A = \angle E$

$\therefore$ $\Delta ABC \sim \Delta EDC$ (AAA similarity)

$\Rightarrow$ $\frac{h_1}{h_2} = \frac{AB}{DE} = \frac{2}{7}$

and $h_1 + h_2 = 7.2$ cm (given)

$\therefore$ $h_1 = 1.6$ cm and $h_2 = 5.6$ cm



Area of $\Delta ABC = \frac{1}{2} \times 2 \times 1.6 = 1.6$ cm^2

Area of $\Delta EDC = \frac{1}{2} \times 7 \times 5.6 = 19.6$ cm^2

$\therefore$ Sum of areas of ΔABC and $\Delta EDC = 21.2$ cm^2

16. (a)

Let the mileage of Jagan's car be n km/liter of petrol when driven in the city and $(n + 3)$ km/liter when driven on the highway. Translating the given information in to an equation, we can write

$$\frac{42}{n+3} + \frac{77}{n} = 10$$

$\Rightarrow$ $42n + 77n + 231 = 10n^2 + 30n$

or $10n^2 - 89n - 231 = 0$ which gives $n = 11$ or -2.1

Hence we can say that Jagan's car runs 11 km/liter in the city.

17. (c)

A question on P and C!

The number of handshakes in a room with 'n' persons present is given by n*(n – 1)/2

276 = n*(n – 1)/2 i.e. 552 = n*(n – 1) which is the product of 2 consecutive integers. The value of 'n' can be an integer which is close to $\sqrt{552}$ which is between 23 and 24 leading to 24 as the required answer.

18. (b)

$$P = \frac{3}{2} \times \frac{4}{3} \times \frac{5}{4} \times \frac{6}{5} \times \_\_\_\_\_ \frac{99}{98} \times \frac{100}{99} = \frac{100}{2} = 50$$

$$Q = \frac{1}{2} \times \frac{2}{3} \times \frac{3}{4} \times \_\_\_\_\_ \frac{98}{99} \times \frac{99}{100} = \frac{1}{100}$$

$$\frac{P}{Q} = 5000$$

19. (a)

The given system of equations can be interpreted as 4 possible pairs of linear equations, namely:
$x + 3y = 7$ and $2x + y - 10 = 3$ for $x \geq 0$ and $y \geq 10$ which leads us to get $y = 1/5$ i.e. NOT VALID
$-x + 3y = 7$ and $2x + y - 10 = 3$ for $x \leq 0$ and $y \geq 10$ which leads us to get $y = 27/7$ i.e. NOT VALID
$x + 3y = 7$ and $2x - (y - 10) = 3$ for $x \geq 0$ and $y \leq 10$ which leads us to get $x = 4$ i.e. NOT VALID
$-x + 3y = 7$ and $2x - (y - 10) = 3$ for $x \leq 0$ and $y \leq 10$ which leads us to get $y = 7/5$ and $x = -14/5$ which is the ONLY valid solution.

20. (b)

Let 'n' be the starting page and 'm' be the number of missing pages.
Since the page numbers form an AP with 'n' as the first term, 'm' as the number of terms and common difference = 1, we can say that $711 = \frac{m}{2} * (2n + m - 1)$

i.e. $1422 = m * (2n + m - 1)$

Write 1422 as the product of 2 numbers, we can say $1422 = 2 * 711 = 6 * 237 = 18 * 79$ giving us 3 possible pairs for values of m and n.
Check for t**hese values** one by one, we can identify that the correct combination for starting page number, n = 31 and number of missing pages, m = 18 i.e. option (b).
Alt: After writing the expression for sum of missing page numbers as $S = \frac{m * (2n + m - 1)}{2}$. All that is needed to be done, now, is to replace m and n carefully using the (choices) to identify the correct ordered pair.

21. (b)

A 4 O'clock, the hands of the watch are 20 minute spaces apart.
To be in opposite directions, they must be 30 min spaces apart.
$\therefore$ Minute hand will have to gain 50 minute spaces
55 minute spaces are gained in 60 min
50 minute space are gained in $\left(\frac{60}{55} \times 50\right)$ min or $54\frac{6}{11}$ min

$\therefore$ Required time = $54\frac{6}{11}$ min past 4

The answer is (b).

22. (d)

Total possible outcomes = ${}^{27}C_2$

Favorable outcomes = Selecting any two authors × Selecting one book of each author
$= {}^{3}C_2 \times {}^{9}C_1 \times {}^{9}C_1$

Probability = $\frac{3 \times 9 \times 9}{27 \times \frac{26}{2}} = \frac{9}{13}$

23. (b)

$$\text{Man} \times \text{Day} = \text{Man} \times \text{Day}$$
$$20 \times 30 = 600$$

Let workers leave after x days then

$$20x + 15(35 - x) = 600$$
$$20x + 525 - 15x = 600$$
$$5x = 75$$
$$x = 15$$

24. (a)

$$\text{Average speed} = \frac{\text{Distance Covered}}{\text{Time Taken}}$$
$$= \frac{\frac{D}{3}+\frac{D}{3}+\frac{D}{3}}{\frac{D}{3}\times\frac{1}{20}+\frac{D}{3}\times\frac{1}{10}+\frac{D}{3}\times\frac{1}{60}}$$
$$= \frac{3}{\frac{1}{20}+\frac{1}{10}+\frac{1}{60}} = \frac{3}{\frac{3+6+1}{60}}$$
$$= \frac{3\times 60}{10} = 18 \text{ km/h}$$

25. (a)

Suppose he bought 2 kg, 4 kg, and 3 kg of three varieties

$$\text{Cost price of 9 kg} = 2 \times 50 + 4 \times 20 + 3 \times 30$$
$$= \text{Rs } 270$$
$$\text{Selling price of 9 kg} = 9 \times 33 = \text{Rs } 297$$
$$\therefore \quad \%\text{ profit} = \frac{27}{270}\times 100 = 10\%$$

26. (a)

Let the total profit be Rs Z then,

$$\text{B's share} = \text{Rs}\frac{2Z}{3}$$
$$\text{A's share} = \text{Rs}\left(Z - \frac{2Z}{3}\right) = \text{Rs}\frac{Z}{3}$$
$$\therefore \quad \text{A : B} = \frac{Z}{3} : \frac{2Z}{3} = 1 : 2$$

Let the total capital be Rs x and suppose B's money was used for x months.

Then,
$$\frac{\frac{1}{4}\times x \times 15}{\frac{3}{4}\times x \times y} = \frac{1}{2}$$
$$y = 10$$

Thus, B's money was used for 10 months.

27. (d)

100 years contain 5 odd days

$\therefore$ Last day of 1st century is Friday

200 years contain $5 \times 2 = 3$ odd days

$\therefore$ Last day of 2nd century is Wednesday

300 years contain $5 \times 3 = 15 = 1$ odd day

Last day of 3rd century is Monday

400 years contain odd day

$\therefore$ Last day of 4th century is Sunday

This cycle is repeated

$\therefore$ Last day of century can not be Tuesday, Thursday or Saturday.

28. (b)

$$(1+3+5+7+....+50^{th}\text{ term})+\left(\frac{1}{2}+\frac{1}{6}+\frac{1}{12}+\frac{1}{20}+....\right)$$

$$= (1+3+5+7+9+....)+\left(\frac{1}{1\times 2}+\frac{1}{2\times 3}+\frac{1}{3\times 4}+....\right)$$

$$= \frac{50}{2}[2\times 1+(50-1)\times 2]+\left[\frac{1}{1}-\frac{1}{2}+\frac{1}{2}-\frac{1}{3}+\frac{1}{3}-\frac{1}{4}+\frac{1}{50}-\frac{1}{51}\right]$$

$$= 25\times 100+\left(1-\frac{1}{51}\right) = 2500\frac{50}{51}$$

29. (d)

Suppose the present day of Shyam and Puneet is X and Y.

Then, $$\frac{X-6}{Y-6} = \frac{6}{5} \quad ...(i)$$

$$\frac{X+4}{Y+4} = \frac{11}{10} \quad ...(ii)$$

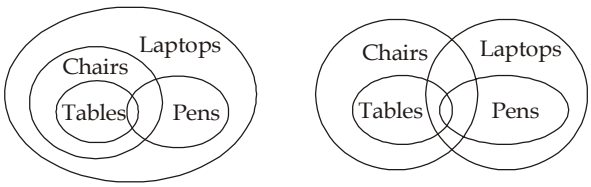
By solving (i) and (ii)

$$Y = 16,\ X = 18$$

Ratio of their present age

$$X : Y \Rightarrow 18 : 16$$
$$\Rightarrow 9 : 8$$

30. (d)



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