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REASONING & APTITUDE

CIVIL ENGINEERING

Date of Test : 17/05/2025

ANSWER KEY ➤

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

DETAILED EXPLANATIONS

1. (c)

Let the distance of his home from the station is x km

According to question,

$$\frac{x}{20}-\frac{x}{25} = \frac{9}{60}$$

$$\frac{5x}{500} = \frac{9}{60}$$

$$x = \frac{900}{60} = 15\,\text{km}$$

2. (b)

If we multiply the given expression by 3, we get

$$\left(3x+\frac{1}{3x}\right) = 3$$

$$9x^2+\frac{1}{9x^2}+2 = 9$$

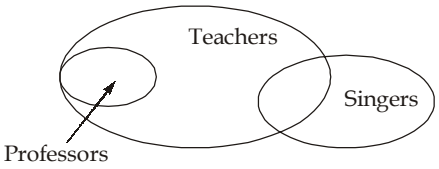
$$9x^2+\frac{1}{9x^2} = 7$$

Required expression, $27x^3+\frac{1}{27x^3} = (3x)^3+\frac{1}{(3x)^3}$

$$= \left(3x+\frac{1}{3x}\right)\left((3x)^2+\frac{1}{(3x)^2}-1\right) = (3)(7-1)$$

$$= 3\times 6 = 18$$

3. (d)



From a look at the Venn diagram we get that it is not necessary that some or all professors are singers. Hence, none of the conclusions follow.

4. (b)

Let the number of students be x. Then,

Number of students of or above 8 years = (100 – 20)% of x

$$= 80\%\text{ of } x$$

$\therefore$ $$80\%\text{ of } x = 48+\frac{2}{3}\times 48 = 80$$

$$\frac{80}{100}x = 80$$

$$x = 100$$

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5. (b)

Suppose C gets ₹x. Then, B gets ₹$(x + 8)$ and A gets ₹$(x + 15)$.

Then, $x + (x + 8) + (x + 15) = 53$

$x = 10$

$\therefore$ A : B : C = $(10 + 15) : (10 + 8) : 10 = 25 : 18 : 10$

6. (b)

Let 1 man's 1 day's work = x and 1 boy's 1 day's work = y

Then, $2x + 3y = \frac{1}{10}$ ...(i)

$3x + 2y = \frac{1}{8}$ ...(ii)

Solving equation (i) and (ii),

$x = \frac{7}{200}$ and $y = \frac{1}{100}$

$\therefore$ (2 men + 1 boy)'s 1 day's work = $2 \times \frac{7}{200} + 1 \times \frac{1}{100} = \frac{16}{200} = \frac{2}{25}$

So, 2 men and 1 boy together can finish the work in $\frac{25}{2} = 12\frac{1}{2}$ days

7. (b)

Let B be closed after x minutes. Then,

Port filled by (A + B) in x minutes + Part filled by A in $(18 - x)$ minutes = 1

$\therefore \quad x\left(\frac{1}{24} + \frac{1}{32}\right) + (18 - x) \times \frac{1}{24} = 1$

$\frac{7x}{96} + \frac{18 - x}{24} = 1$

$\frac{7x + 72 - 4x}{96} = 1$

$3x + 72 = 96$

$3x = 24$

$x = 8$

Hence, B must be closed in 8 minutes.

8. (a)

A square and a rectangle with equal areas will satisfy the relation $P_1 < P_2$.

$a^2 = lb$

$P_1 = 4a = 4\sqrt{lb}$

$P_2 = 2(l + b)$

$A.M. \geq G.M.$

$\frac{l + b}{2} \geq \sqrt{lb}$ $\left(\frac{l + b}{2} = \sqrt{lb} \text{ only when } l = b\right)$

$\therefore \quad \frac{l + b}{2} > \sqrt{lb}$

$P_2 > P_1$

9. (c)

The hands of a clock coincide 11 times in every 12 hours (since between 11 and 1, they coincide only once i.e. at 12 O'clock).

$\therefore$ The hands coincide 22 times in a day.

10. (a)

Let Age of A, B and C are A, B and C respectively.

$$(A + B) - (B + C) = 12$$
$$A - C = 12$$

11. (b)

The number of vowels in the alphabet = 5

Number of consonants = 21

Number of non zero digits = 9

Chosen key can have as many options as the distinct values in the specific ring and the total number of possible combinations is the product of 3 numbers = $5 \times 21 \times 9 = 945$

12. (a)

3	3	2	2	1	1
odd	even	odd	even	odd	even

First odd place can be filled with 3 vowels.

Second odd place can be filled with 2 vowels.

Third odd place can be filled with 1 vowels.

Similarly, even places will be filled by consonants.

$$\text{Number of ways} = 3 \times 3 \times 2 \times 2 \times 1 \times 1$$
$$= 36 \text{ ways}$$

13. (a)

Let rate upstream = x km/h

and rate downstream = y km/hr

Then $$\frac{40}{x} + \frac{55}{y} = 13 \quad \text{...(i)}$$

and $$\frac{30}{x} + \frac{44}{y} = 10 \quad \text{...(ii)}$$

Multiplying (ii) by 4 and (i) by 3 and subtracting, we get

$$\frac{11}{y} = 1$$
$$y = 11$$

Substituting $y = 11$ in equation (i), we get

$$x = 5$$

$$\text{Rate in still water} = \frac{1}{2}(11 + 5) = 8 \text{ kmph}$$

$$\text{Rate of current} = \frac{1}{2}(11 - 5) = 3 \text{ kmph}$$

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14. (b)

$$\frac{1}{1+\frac{x^b}{x^a}+\frac{x^c}{x^a}}+\frac{1}{1+\frac{x^a}{x^b}+\frac{x^c}{x^b}}+\frac{1}{1+\frac{x^b}{x^c}+\frac{x^a}{x^c}} = \frac{x^a}{x^a+x^b+x^c}+\frac{x^b}{x^a+x^b+x^c}+\frac{x^c}{x^c+x^b+x^a}$$

$$= 1$$

15. (b)

$$\text{Sushil} + \text{Mukesh} = 200 \quad ...(1)$$

$$\text{Asim} + \text{Rajesh} = \text{Sushil} \quad ...(2)$$

$$\text{Mukesh} = 4\ \text{Rajesh} \quad ...(3)$$

$$\text{Rajesh} = \text{Asim} - 20$$

$$\Rightarrow \text{Asim} = \text{Rajesh} + 20 \quad ...(4)$$

From equation (1) and (3),

$$\text{Sushil} + 4\ \text{Rajesh} = 200 \quad ...(5)$$

From equation (2) and (4),

$$\text{Rajesh} + \text{Rajesh} + 20 = \text{Sushil}$$

$$\text{Sushil} = 2\ \text{Rajesh} + 20 \quad ...(6)$$

From equation (5) and (6),

$$6\ \text{Rajesh} + 20 = 200$$

$$6\ \text{Rajesh} = 180$$

$$\text{Rajesh} = 30$$

$$\text{Asim} = 30 + 20 = 50$$

16. (d)

Total income project in the year 2007 = 150

When the income in the year 2002 was 100.

∴ Annual compound rate of growth is 8.5%

17. (a)

Let numerator be x and denominator be y.

then, $x = y - 4$

$8(x - 2) = y + 1$

The above equations can be written as

$y - x = 4 \quad ...(i)$

$8x - y = 17 \quad ...(ii)$

$\Rightarrow x = 3$ and $y = 7$

Hence, the required fraction $\frac{x}{y}=\frac{3}{7}$

18. (b)

Ratio of number of men, women and children = $\frac{18}{6}:\frac{10}{5}:\frac{12}{3} = 3x : 2x : 4x$

$\therefore (3x + 2x + 4x) = 18$

$x = 2$

Therefore, number of women = 4

$$\text{Share of all women} = \frac{10}{40} \times 4000 = ₹1000$$

$$\therefore \quad \text{Share of each women} = \frac{1000}{4} = ₹250$$

19. (a)

$$\frac{1}{1\times2\times3} + \frac{1}{2\times3\times4} + \frac{1}{3\times4\times5} + \frac{1}{4\times5\times6} = \frac{4\times5\times6 + 5\times6 + 2\times6 + 2\times3}{1\times2\times3\times4\times5\times6}$$

$$= \frac{120 + 30 + 12 + 6}{720} = \frac{168}{720}$$

$$= \frac{7}{30}$$

20. (d)

Let the number of papers be x.

Then, $63x + 20 + 2 = 65x$

$2x = 22$

$x = 11$

21. (a)

Let 1 woman's 1 day's work $= x$

Then, 1 man's 1 day's work $= \frac{x}{2}$

and 1 child's 1 day's work $= \frac{x}{4}$

So, $\frac{3x}{2} + 4x + \frac{6x}{4} = \frac{1}{7}$

$\frac{6x + 16x + 6x}{4} = \frac{1}{7}$

$\frac{28x}{4} = \frac{1}{7}$

$x = \frac{1}{7} \times \frac{4}{28} = \frac{1}{49}$

$\therefore$ 1 woman alone can complete the work in 49 days.

So, to complete the work in 7 days, number of women required $= \frac{49}{7} = 7$

22. (b)

The area of the triangle formed by joining the middle points of the sides of a triangle is equal to one-fourth area of the given triangle.

Let area of $15^{th}\ \Delta = A$

Then area of $18^{th}\ \Delta = \frac{A}{64}$

So, required ratio $= \frac{64}{1} = 64$

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23. (c)

Total population, P = 5000

Let the number of males be M

Number of females = 5000 – M

$$\text{New number of males} = M\times\left(1+\frac{10}{100}\right) = 1.1\text{ M}$$

$$\text{New number of females} = (5000-M)\left(1+\frac{15}{100}\right) = (5000-M)1.15$$

Total population = 1.1 M + (5000 – M)(1.15) = 5600

5750 + (1.1 – 1.15)M = 5600

(1.15 – 1.1)M = 5750 – 5600

0.05 M = 150

$$\text{M} = \frac{150}{0.05} = \frac{30}{0.01} = 3000$$

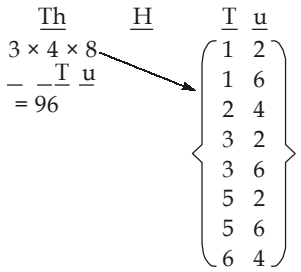
24. (c)

Difference between CI and SI for two years $(\text{CI-SI})_{2y} = P\left(\frac{R}{100}\right)^2$ (which is interest on first year interest)

$$(\text{CI-SI})_{2y} = 400\left(\frac{12}{100}\right)^2 = \text{Rs. } 5.76$$

25. (c)

For a number to be divisible by 4 its last two digit have to be divisible by 4.



[T] and [u] can be filled in given 8 ways.

[H] can be filled in now only 4 ways as two digits are already occupied in [T] and [u].

[Th] can be filled in remaining 3 ways.

Total possible numbers = 3 x 4 x 8 = 96

26. (d)

$S = \log_2 2 + \log_2 2^3 + \log_2 2^5 \ldots. \log_2 2^{13} = 1 + 3 + 5 + 7.....+13 = 49$

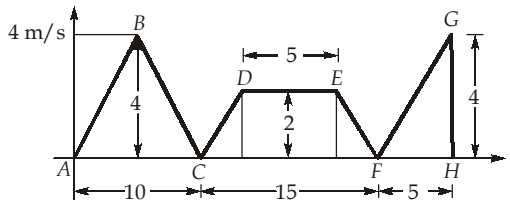
(Sum of odd numbers = n^2)

Alternative method:

$$S_{AP} = \frac{n}{2}[1^{\text{st}}\text{ term} + \text{last term}]$$

$$\therefore \quad S = \frac{7}{2}[1+13] = 49$$

27. (d)



$$\text{Average speed} = \frac{\text{Total distance}}{\text{Total time}} = \frac{\text{Area under } (s-t) \text{ graph}}{\text{Total time}}$$

$$\text{Total area} = Ar(\Delta ABC) + \text{Ar (Trapezium } CDEF) + \text{Ar } (\Delta FGH)$$

$$= \frac{1}{2}\times 10\times 4 + \frac{1}{2}(15+5)\times 2 + \frac{1}{2}\times 5\times 4$$

$$= 50 \text{ m}$$

$$\text{Average speed} = \frac{\text{Total distance}}{\text{Total time}} = \frac{50}{30} = 1.66 \text{ m/sec.}$$

28. (c)

Different types of rectangles are:

$1 \times 1, 1 \times 2, 1 \times 3, 1 \times 4, 1 \times 5, 1 \times 6 \rightarrow 6$ types

$2 \times 2, 2 \times 3, 2 \times 4, 2 \times 5, 2 \times 6 \rightarrow 5$ types

$3 \times 3, 3 \times 4, 3 \times 5, 3 \times 6 \rightarrow 4$ types

$4 \times 4, 4 \times 5, 4 \times 6 \rightarrow 3$ types

Total different types of rectangles are $3 + 4 + 5 + 6 = 18$

Note: Remember (1×2) and (2×1) is regarded same type of rectangle.

29. (a)

Let the work lasted for t days

Raman's 2 days work + Ashok's $(t - 3)$ days work + Satish's t days work = Total work done

$$\frac{2}{8} + \frac{t-3}{16} + \frac{t}{32} = 1$$

$$\frac{1}{4} + \frac{t-3}{16} + \frac{t}{32} = 1$$

$$\frac{8+2(t-3)+t}{32} = 1$$

$$3t + 2 = 32$$

$$3t = 30$$

$$t = 10 \text{ days}$$

30. (a)

Probability of getting atleast 6 heads = Probability of getting 2 tails + Prob. of getting 1 tail + Prob. of getting no tail

$$= {}^8C_2 \times \frac{1}{256} + {}^8C_1 \times \frac{1}{256} + {}^8C_0 \times \frac{1}{256} = \frac{37}{256}.$$

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