



ACE

Engineering Academy

TEST ID: 606

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ESE- 2019 (Prelims) - Offline Test Series

Test- 12

GENERAL STUDIES AND ENGINEERING APTITUDE

SUBJECT: ENGINEERING APTITUDE COVERING LOGICAL REASONING AND ANALYTICAL ABILITY SOLUTIONS

01. Ans: (a)

Sol: Let the weight of the car + six people = 100

\Rightarrow Weight of six people = 12,

and the weight of the empty car = 88

\therefore Weight of three people = 6

\therefore The required ratio = $6 : 88 = 3 : 44$

02. Ans: (c)

Sol: Raju has to start off with nitro-boost, which takes him at 180 kmph, to reach his destination in minimum time. As it works for only 2 hrs he travels 360 km. Then for the next 2 hrs he travels at 90 kmph, till the nitro-boost system gets recharged. He covers 180 km in these 2 hours.

After it gets recharged again he travels 360 km in 2 hours. Therefore, in 6 hours he travels $360 + 180 + 360 = 900$ km.

For the rest 60 km he travels at 90 kmph and covers it in $\frac{2}{3}$ hours.

Therefore, for 960 km he takes $6 + \frac{2}{3} = 6\frac{2}{3}$ hours.

Hence, option (c) is correct.

03. Ans: (b)

Sol: Work done in 1st two days of M and N

$$= \frac{1}{10} + \frac{1}{15} = \frac{3+2}{30} = \frac{1}{6} \text{th}$$

Total amount of work done

= L.C.M of 10 and 15 = 60 units

One day work of M and N = 6 and 4 units respectively

\therefore Number of days = $2 \times 6 = 12$

Hence, option (b) is correct.



04. Ans: (a)

Sol: Let the given number be x

$$\text{Then, } (x - 25)^2 = x^2 - 25$$

$$\Rightarrow x^2 + 625 - 50x = x^2 - 25$$

$$\Rightarrow 50x = 650 \Rightarrow x = \frac{650}{50} = 13$$

Hence, option (a) is correct.

05. Ans: (c)

Sol: Let the distance be D km, and actual time taken by man to reached the office at time = x

$$\text{According to the equation, } \frac{D}{10} = x + \frac{6}{60} \dots (i)$$

$$\text{and } \frac{D}{12} = x - \frac{6}{60} \dots (ii)$$

From equations (i) and (ii), we get

$$\frac{D}{10} - \frac{D}{12} = x + \frac{6}{60} - x + \frac{6}{60}$$

$$\frac{12D - 10D}{120} = \frac{1}{10} + \frac{1}{10}$$

$$\Rightarrow \frac{2D}{120} = \frac{2}{10}$$

$$\Rightarrow D = 12 \text{ km}$$

Alternate Method

Here $t_1 = 6$, $t_2 = 6$, $S_1 = 10$ and $S_2 = 12$

$$\text{Distance} = \frac{(t_1 + t_2) S_1 \cdot S_2}{(S_2 - S_1) \times 60} = \frac{(6 + 6) 10 \times 12}{(12 - 10) \times 60}$$

$$= \frac{120 \times 12}{2 \times 60} = \frac{24}{2} = 12 \text{ km}$$

Hence, option (c) is correct.

06. Ans: (a)

Sol: Total requirement of paint = 25 kg

Wastage = 15%

Quantity of paint in each can = 2 kg

Now, 15%, gets wasted

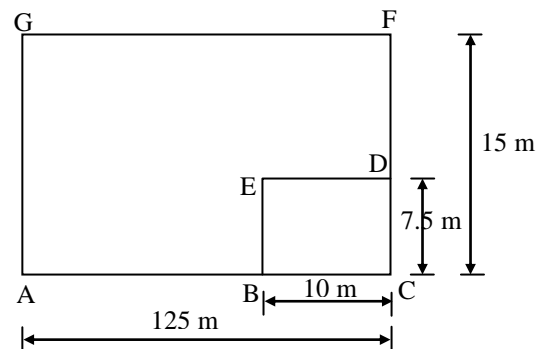
$$\therefore 2 - \frac{15}{100} \times 2 = 2 - 0.3 = 1.7 \text{ kg is used}$$

$$\text{Number of cans} = \frac{25}{1.7} \approx 14.7 \approx 15$$

$$\therefore \text{Total price of the paint} = 16 \times 15 = ₹ 240$$

07. Ans: (c)

Sol:



$$\begin{aligned} \text{Area of tank, BCDE} &= 10 \times 7.5 \\ &= 75 \text{ m}^2 \end{aligned}$$

$$\begin{aligned} \text{Area of remaining field} &= 125 \times 15 - 75 \\ &= 1800 \text{ m}^2 \end{aligned}$$

$$\begin{aligned} \text{Volume of earth dug} &= 10 \times 7.5 \times 6 \\ &= 450 \text{ m}^3 \end{aligned}$$

According to the equation, $1800 \times h = 450$

$$h = \frac{1}{4} \text{ m} = \frac{1}{4} \times 100 = 25 \text{ cm}$$



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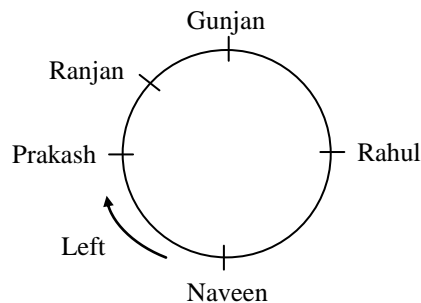
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08. Ans: (a)

Sol: Following seating arrangement is formed from the given information



Clearly, Prakash is to the left of Naveen,

09. Ans: (b)

Sol: Single figure rectangles $= 2 \times 4 = 8$
 Double figure rectangles $= 1 \times 4 = 4$
 Four figure rectangles $= 2 \times 2 = 4$
 Total number of rectangles $= 16$
 \therefore Hence, option (b) is correct.

10. Ans: (b)

Sol: From the given data,

$$A = 17 \text{ years}$$

$$B = 17 - 5 = 12 \text{ years}$$

$$C = 12 - 4 = 8 \text{ years}$$

$$D = 12 + 3 = 15 \text{ years}$$

\therefore Hence, option (b) is correct.

11. Ans: (b)

Sol: Number of defective bulbs produced by the machines A, B and C are respectively, (6% of 25%), (4% of 35%), and (7% of

40%). If the total production is taken as 100, defective bulbs produced by A, B and C are 1.5, 1.4 and 2.8 respectively.

$$\text{Total defective bulbs} = 1.5 + 1.4 + 2.8 = 5.7$$

Probability of the random selection

$$\begin{aligned} \text{belonging to A} &= \frac{\text{Defective of A}}{\text{Defective of A+B+C}} \\ &= \frac{1.5}{5.7} = \frac{5}{19} \end{aligned}$$

Hence, option (b) is correct.

12. Ans: (b)

Sol: $(a + b)^2 - (a - b)^2 = 4ab$
 $\therefore (10^{12} + 25)^2 - (10^{12} - 25)^2 = 4 \times 10^{12} \times 25$
 $= 10^{14}$
 $\Rightarrow 10^{14} = 10^n$
 $\Rightarrow n = 14$

13. Ans: (a)

Sol: Number of persons = Rank from top + Rank from bottom - 1
 $= 13 + 26 - 1$
 $= 38$
 Failed students = 6
 Total = 38 + 6 = 44



14. Ans: (d)

Sol: Value of the coin $(V) \propto r^2 \Rightarrow V = kr^2$

Given $r = 1.5 \text{ cm} \Rightarrow V = \text{Rs. } 2$

$$\therefore 2 = k(1.5)^2 \Rightarrow k = \frac{8}{9}$$

$$\therefore V = \frac{8}{9}r^2 \dots\dots (1)$$

$$(1) \Rightarrow r^2 = \frac{5 \times 9}{8} \Rightarrow r = \frac{3}{2} \times \sqrt{\frac{5}{2}} \approx 2.4 \text{ cm}$$

\therefore Hence, required radius = 2.4 cm

15. Ans: (d)

$$\begin{aligned} \text{Sol: } \frac{\text{Milk Quantity}}{\text{Water Quantity}} &= \frac{\frac{3}{4} \times 2 + \frac{3}{5} \times 3 + \frac{5}{7} \times 5}{\frac{1}{4} \times 2 + \frac{2}{5} \times 3 + \frac{2}{7} \times 5} \\ &= \frac{962}{438} \end{aligned}$$

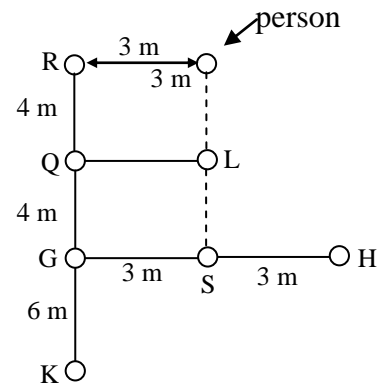
16. Ans: (a)

Sol: Volume of prism = Base Area \times Height

Since, base area is constant and height is being halved therefore volume will also be halved. Hence, its volume will be reduced by 50%.

17. Ans: (c)

Sol:



18. Ans: (b)

Sol: Angle between min hand and hour hand

$$\theta = \left| \frac{11}{2}m - 30h \right|$$

6 : 10

$$\theta = \left| \frac{11}{2}(10) - 30(6) \right| = 55 - 180 = 125^\circ$$

19. Ans: (a)

$$\text{Sol: Required percent} = \frac{6}{20} \times 100 = 30\%$$

20. Ans: (d)

Sol: Let B have x items.

Then, the number of items of D = $x - 4$

The number of items of F = $x - 4 + 3$

$$= x - 1$$

The number of items of E = $x - 1 - 6 = x - 7$

The number of items of C = $x - 7 + 2$

$$= x - 5$$



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The number of items of $A = x - 5 + 3$
 $= x - 2$

The total number of items $= 6x - 19$

Since, x can take only integer values,
 therefore $(6x - 19)$ cannot be 58 as it can
 only attain an odd value.

21. Ans: (c)

Sol: Unit digit of $(2^{170} \times 3^{172} \times 4^{174} \times 6^{176})$
 $= 2^2 \times 3^0 \times 4^0 \times 6^1$
 $= 24$

22. Ans: (b)

Sol: $10800 = 2^4 \times 3^3 \times 5^2$
 \therefore Number of divisors
 $= (4 + 1)(3 + 1)(2 + 1) = 60$

23. Ans: (b)

Sol: $\frac{1}{3} + \frac{1}{9} + \frac{1}{27} + \dots \infty$ is an infinite G.P.

$$S_{\infty} = \frac{a}{1-r} = \frac{\frac{1}{3}}{1-\frac{1}{3}} = \frac{1}{2}$$

$$\therefore 25^{\left(\frac{1}{3} + \frac{1}{9} + \frac{1}{27} + \dots \infty\right)} = 25^{\frac{1}{2}} = 5$$

24. Ans: (d)

Sol: $4^{11111} \times 5^{22222} = (2^2)^{11111} \times 5^{22222}$
 $= 2^{22222} \times 5^{22222} = (10)^{22222}$
 \therefore Number of digits $= 22222 + 1 = 22223$

25. Ans: (d)

Sol: Given $a + b + c + d = 1$

For maximum value a, b, c, d

$$a = b = c = d = \frac{1}{4}$$

$$(1+a)(1+b)(1+c)(1+d)$$

$$= \left(1 + \frac{1}{4}\right) \left(1 + \frac{1}{4}\right) \left(1 + \frac{1}{4}\right) \left(1 + \frac{1}{4}\right)$$

$$= \left(\frac{5}{4}\right)^4$$

26. Ans: (b)

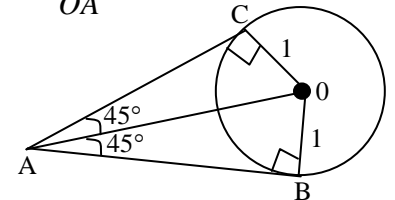
Sol: Let O = Centre of the balloon

$OB = OC$ = Radius of balloon = 1 unit

$$\text{In } \triangle OAB, \sin 45^\circ = \frac{OB}{OA}$$

$$\frac{1}{\sqrt{2}} = \frac{1}{OA}$$

$$OA = \sqrt{2}$$



27. Ans: (b)

$$\text{Sol: } \frac{1}{A} + \frac{1}{B} + \frac{1}{B} + \frac{1}{C} + \frac{1}{C} + \frac{1}{A} = \frac{1}{30} + \frac{1}{24} + \frac{1}{20}$$

$$2 \left[\frac{1}{A} + \frac{1}{B} + \frac{1}{C} \right] = \frac{1}{8}$$

$$\frac{1}{A} + \frac{1}{B} + \frac{1}{C} = \frac{1}{16}$$

$$\text{Work done by A, B \& C in 10 days} = \frac{10}{16}$$

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



$$\therefore \text{Remaining work} = \frac{3}{8}$$

Work done by A in one day

$$= \left[\frac{1}{A} + \frac{1}{B} + \frac{1}{C} \right] - \left[\frac{1}{B} + \frac{1}{C} \right]$$

$$= \frac{1}{16} - \frac{1}{24} = \frac{1}{48}$$

\therefore Time required by A to finish the

$$\text{remaining work} = \frac{\frac{3}{8}}{\frac{1}{48}} = \frac{3}{8} \times 48 = 18 \text{ days}$$

28. Ans: (b)

Sol: Upstream rate = x km/hr

Downstream rate = y km/hr

$$\text{Then } \frac{30}{x} + \frac{44}{y} = 10 \text{ and } \frac{40}{x} + \frac{55}{y} = 13;$$

$$u = \frac{1}{x}; v = \frac{1}{y}$$

$$\text{Then, } 30u + 44v = 10$$

$$40u + 55v = 13$$

By solving we get,

$$x = 5; y = 11$$

$$\text{Speed of man in still water} = \frac{5+11}{2}$$

$$= 8 \text{ km/hr}$$

29. Ans: (c)

Sol: Let the cost price be Rs. 1

$$\therefore \text{Selling price (loss)} = \text{Rs. } \frac{75x}{100}$$

$$\text{Selling price (profit)} = \text{Rs. } \frac{125x}{100}$$

$$\therefore \text{Required percentage} = \frac{\frac{75x}{100}}{\frac{125x}{100}} \times 100 = 60\%$$

30. Ans: (b)

$$\text{Sol: Required number of circles} = {}^{10}C_3 - {}^7C_3$$

$$= 85$$

31. Ans: (d)

$$\text{Sol: Age of the teacher} = 26 \times 26 - 25 \times 25$$

$$= 51 \text{ years}$$

32. Ans: (b)

$$\text{Sol: } A + B + C + D = 4 \times 40 = 160$$

$$A + B + C + D + E = 5 \times 41 = 205$$

$$B + C + D + E + F = 5 \times 42 = 210$$

$$\therefore E = (A + B + C + D + E)$$

$$- (A + B + C + D)$$

$$= 205 - 160 = 45$$

Hence,

$$F + B + C + D = (B + C + D + E + F) - E$$

$$= 210 - 45 = 165$$

$$\text{Avg} = \frac{165}{4} = 41.25$$



33. Ans: (d)

Sol: Length of train A

= distance travel to cross pole

$$= S \times T$$

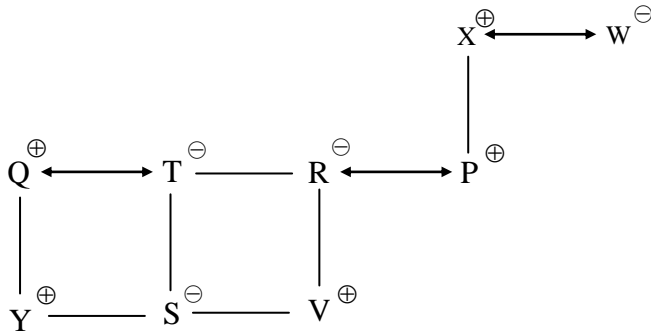
$$= \left(108 \times \frac{5}{18}\right) \times 16 = 480 \text{ m}$$

$$\therefore \text{Length of train B} = 480 + 25\% \text{ of } 480 \\ = 600 \text{ m}$$

$$\text{i.e. Time taken by train B} = \frac{600}{60 \times \frac{5}{18}} \\ \approx 36 \text{ sec}$$

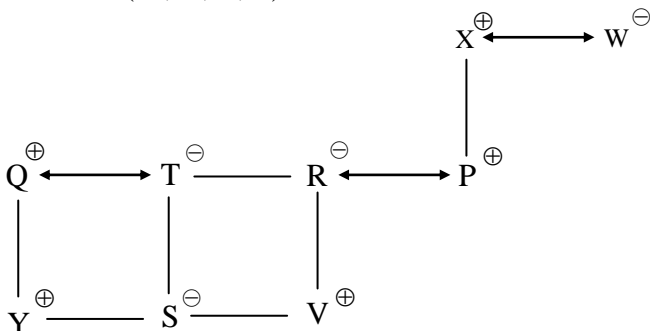
34. Ans: (b)

Sol: X is Grand Father of V



35. Ans: (d)

Sol: Four (W, R, T, S)



36. Ans: (d)

$$\text{Sol: } \frac{\text{CSA of the cylinder}}{\text{Vol of the cylinder}} = \frac{1}{5}$$

$$\text{i.e. } \frac{2\pi rh}{\pi r^2 h} = \frac{1}{5}$$

$$\therefore r = 10 \text{ m}$$

$$\frac{\text{diameter of the cylinder}}{\text{height of the cylinder}} = \frac{3}{5}$$

$$d = \frac{3h}{5}$$

$$\text{i.e. } 20 = \frac{3h}{5}$$

$$h = \frac{100}{3} \text{ m}$$

$$\therefore \text{TSA of the cylinder} = 2\pi r(h + r)$$

$$= 2 \times \frac{22}{7} \times 10 \left(\frac{100}{3} + 10 \right) = 2723.80 \text{ sq.m}$$

37. Ans: (c)

Sol: If sum triples itself, then interest obtained is 200% in 16 yrs

$$\therefore r_1 = \frac{200\%}{16}$$

If sum quadruples itself in 20 years,

Then interest obtained is 300% in 20 years.

$$\therefore r_2 = \frac{300\%}{20}$$

$$\therefore r_1 : r_2 = \frac{200\%}{16} : \frac{300\%}{20} \\ = 5 : 6$$



38. Ans: (d)

Sol: Take some values or x & y

Let $x = 2, y = 50$

$50 - 2 = 48$ is even; $\frac{50-2}{2} = 24$ which is

even

$50 \times 2 = 100$ is even;

None of the 1st 3 options hold good.

\therefore Answer choice is (d)

39. Ans: (d)

Sol: Let, total number of votes = x

Then, votes counted = $\frac{2x}{3}$

Votes to be counted = $x - \frac{2x}{3} \Rightarrow \frac{x}{3}$

Votes required to win = $\frac{3x}{4}$

Votes got by the candidates so far

$$= \frac{5}{6} \times \frac{3x}{4}$$

$$= \frac{5x}{8}$$

Votes still required by candidate = $\frac{1}{6} \times \frac{3x}{4}$

$$= \frac{x}{8}$$

$$\therefore \text{Ans} = \frac{\left(\frac{x}{8}\right)}{\left(\frac{x}{3}\right)} = \frac{3}{8}$$

40. Ans: (d)

Sol: Take the help of options, only option (d) satisfies the given conditions.

\therefore Answer (d) is correct.

41. Ans: (d)

Sol: Total bogies initially = $12 + 12 = 24$

Total bogies after the increase = $24 + 4 = 28$

Now, 24 bogies takes 120 sec

28 bogies takes ? sec

$$\frac{120}{24} \times 28 \Rightarrow 140 \text{ sec}$$

\therefore Extra time taken = $140 - 120 = 20 \text{ sec}$

Hence, answer choice is (d)

42. Ans: (b)

Sol: Let the sum be ₹ x .

$$SI = \frac{P \times r \times t}{100}$$

$$\text{Then, } \frac{x \times 10 \times 4}{100} - \frac{x \times 6 \times 4}{100} = 640$$

$$\text{or } 40x - 24x = 640 \times 100$$

$$\text{or } 16x = 640 \times 100$$

$$\therefore x = ₹ 4000$$

Another Method:

$$(10 \times 4 - 6 \times 4)\% = 640$$

$$\Rightarrow 16\% = 640$$

$$\Rightarrow 100\% = \frac{640}{16} \times 100 = ₹ 4000$$



43. Ans: (c)

Sol: Let the work be completed in x days.

According to the question,

$$\frac{x-5}{10} + \frac{x-3}{12} + \frac{x}{15} = 1$$

$$\Rightarrow \frac{6x-30+5x-15+4x}{60} = 1$$

$$\Rightarrow 15x - 45 = 60$$

$$\Rightarrow 15x = 105 \Rightarrow x = \frac{105}{15} = 7$$

Hence, the work will be completed in 7 days.

44. Ans: (a)

Sol: From option (a),

All flowers are plants (iii). All Plants need air (v) \Rightarrow All flowers need air (iv).

45. Ans (b)

Sol: We can observe two series in the question

Series 1 (S1):

$$\frac{1}{2} - \frac{1}{4} + \frac{1}{8} - \frac{1}{16} + \frac{1}{32} - \frac{1}{64} + \dots = \frac{\frac{1}{2}}{1 - \left(-\frac{1}{2}\right)}$$

$$= \frac{1}{3}$$

Series 2 (S2):

$$\frac{1}{3} + \frac{1}{9} + \frac{1}{27} + \dots = \frac{\frac{1}{3}}{1 - \left(\frac{1}{3}\right)} = \frac{1}{2}$$

$$\text{The sum of series} = S1 + S2 = \frac{1}{3} + \frac{1}{2} = \frac{5}{6}$$

46. Ans: (c)

Sol: Let there be x peacocks and y rabbits

$$\therefore x + y = 400$$

$$\Rightarrow 2x + 4y = 1350 \Rightarrow 2x + 2y = 800$$

$$\therefore 2y = 550$$

$$y = 275$$

47. Ans: (c)

Sol: Let the number be x.

$$\frac{3a + 4 + x}{2} = 2a$$

$$\Rightarrow 3a + 4 + x = 4a$$

$$\Rightarrow x = a - 4$$

$$\therefore \text{Required average} = \frac{a + a - 4}{2} = a - 2$$

48. Ans: (a)

Sol: Let a be the side of the square.

The side of the square will be the diameter of the inscribed circle.

$$\text{Radius of inscribed circle} = \frac{a}{2}$$

$$\text{Area of inscribed circle} = \pi \left(\frac{a}{2}\right)^2 = \frac{1}{4} a^2 \pi$$

The diagonal of the square will be the diameter of the circumscribed circle.

$$\text{Radius of circumscribed circle}$$

$$= \sqrt{2} \frac{a}{2} = \frac{a}{\sqrt{2}}$$



$$\begin{aligned}\text{Area of circumscribed circle} &= \pi \left(\frac{a}{\sqrt{2}} \right)^2 \\ &= \frac{1}{2} a^2 \pi\end{aligned}$$

The ratio of the area is 1 : 2

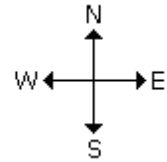
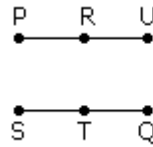
49. Ans: (a)

$$\begin{aligned}\text{Sol: Amount of milk left} &= 60 \left(1 - \frac{6}{60} \right)^3 \\ &= 60 \times \left(\frac{54}{60} \right)^3 \\ &= 60 \times \frac{9}{10} \times \frac{9}{10} \times \frac{9}{10}\end{aligned}$$

$$= 43.74 \text{ kg}$$

50. Ans: (c)

Sol:



Hence, URP flat combination get south facing flats.

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TOTAL SELECTIONS
in Top 10

34

E & T
TOP 10
10

E
TOP 10
10

C
TOP 10
8

M
TOP 10
6

and many more...