

GATE 2022

Mechanical Engineering

► General Aptitude
(Question with Solution
Set-1 & 2)



SET-1

- 1.** After playing _____ hours of tennis, I am feeling _____ tired to walk back.
 A. Too/too B. Too/two
 C. Two/two D. Two/too

Ans. D

Sol. After playing **two** hours of tennis, I am feeling **too** tired to walk back.

- 2.** The average of the monthly salaries of M, N and S is ₹ 4000. The average of the monthly salaries of N, S and P is ₹ 5000. The monthly salary of P is ₹ 6000.

What is the monthly salary of M as a percentage of the monthly salary of P?

- A. 50% B. 75%
 C. 100% D. 125%

Ans. A

Sol. Given,

Average of the monthly salaries of M, N, S = 4000 Rs

Average of monthly salaries of N, S, P = 5000 Rs

Monthly salary of P = 6000 Rs

$$\frac{M+N+S}{3} = 4000 \quad \dots\text{(i)}$$

$$\frac{M+S+P}{3} = 5000 \quad \dots\text{(ii)}$$

From equation (i) and (ii)

$$N + S = 12000 - M$$

$$N + S = 15000 - P$$

$$12000 - M = 15000 - P$$

$$12000 - M = 15000 - 6000$$

$$M = 3000 \text{ Rs}$$

Salary of M as a percentage of the monthly

$$\text{salary of } P = \frac{M}{P} \% = \frac{3000}{6000} \% = 50\%$$

- 3.** A person travelled 80 km in 6 hours. If the person travelled the first part with a uniform speed of 10 kmph and the remaining part with a uniform speed of 18 kmph.

What percentage of the total distance is travelled at a uniform speed of 10 kmph?

- A. 28.25 B. 37.25
 C. 43.75 D. 50.00

Ans. C

Sol. Given,

Total distance $D_1 + D_2 = 80 \text{ km}$,

Total time taken $t_1 + t_2 = 6 \text{ hours}$

First part with a uniform speed = 10 kmph

$$\text{So, } D_1 = 10 \times t_1$$

Remaining part with a uniform speed of 18 kmph

$$\text{So, } D_2 = 18 \times t_2$$

$$\text{as } D_1 + D_2 = 80$$

$$10 t_1 + 18 t_2 = 80$$

$$10 t_1 + 18 (6 - t_1) = 80$$

$$t_1 = \frac{7}{2} \text{ hours}$$

$$\text{First part distance} = 10 \times t_1 = 10 \times \frac{7}{2} = 35 \text{ km}$$

So, percentage of the total distance is travelled at uniform speed of so

$$\text{kmph} = \frac{35}{80} \times 100 = 43.75\%$$

- 4.** Four girls P, Q, R and S are studying languages in a university. P is learning French and Dutch. Q is learning Chinese and Japanese. R is learning Spanish and French. S is learning Dutch and Japanese.

Given that: French is easier than Dutch; Chinese is harder than Japanese; Dutch is

easier than Japanese, and Spanish is easier than French.

Based on the above information, which girl is learning the most difficult pair of languages?

- A. P
- B. Q
- C. R
- D. S

Ans. B

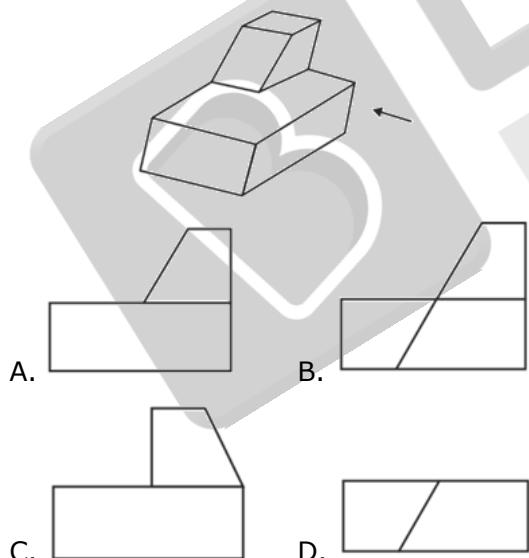
Sol. Languages as per difficulty are arranged as:

Chinese > Japanese > Dutch > French > Spanish

Since Q is learning Chinese and Japanese, Q is learning most difficult pair of language.

- 5.** A block with a trapezoidal cross-section is placed over a block with rectangular cross section as shown above.

Which one of the following is the correct drawing of the view of the 3D object as viewed in the direction indicated by an arrow in the above figure?



Ans. A



Sol.

This is the correct drawing of the view of the 3D object as viewed in the direction indicated by an arrow in the above figure.

- 6.** Humans are naturally compassionate and honest. In a study using strategically placed wallets that appear "lost", it was found that wallets with money are more likely to be returned than wallets without money. Similarly, wallets that had a key and money are more likely to be returned than wallets with the same amount of money alone. This suggests that the primary reason for this behavior is compassion and empathy. Which one of the following is the CORRECT logical inference based on the information in the above passage?

- A. Wallets with a key are more likely to be returned because people do not care about money
- B. Wallets with a key are more likely to be returned because people relate to suffering of others
- C. Wallets used in experiments are more likely to be returned than wallets that are really lost
- D. Money is always more important than keys

Ans. B

Sol. Empathy and compassion in humans made these relate to suffering of others and here wallets with a key are more likely to be returned.

- 7.** A rhombus is formed by joining the midpoints of the sides of a unit square.

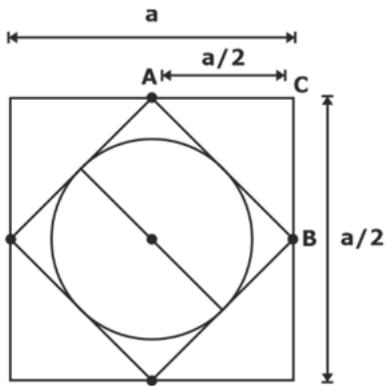
What is the diameter of the largest circle that can be inscribed within the rhombus?

- A. $\frac{1}{\sqrt{2}}$
 B. $\frac{1}{2\sqrt{2}}$
 C. $\sqrt{2}$
 D. $2\sqrt{2}$

Ans. A

Sol. Given,

Unit square $a = 1$ unit



In ΔABC ,

$$AC^2 + BC^2 = AB^2$$

$$AB = D = \sqrt{AC^2 + BC^2}$$

$$= \sqrt{\left(\frac{a}{2}\right)^2 + \left(\frac{a}{2}\right)^2} = \frac{a}{\sqrt{2}}$$

$$\text{Diameter of largest circle} = \frac{a}{\sqrt{2}} = \frac{1}{\sqrt{2}} \text{ unit}$$

- 8.** An equilateral triangle, a square and a circle have equal areas.

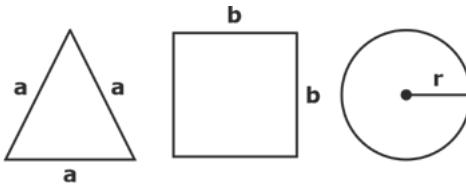
What is the ratio of the perimeters of the equilateral triangle to square to circle?

- A. $3\sqrt{3} : 2 : \sqrt{\pi}$
 B. $\sqrt{(3\sqrt{3})} : 2 : \sqrt{\pi}$
 C. $\sqrt{(3\sqrt{3})} : 4 : 2\sqrt{\pi}$
 D. $\sqrt{(3\sqrt{3})} : 2 : 2\sqrt{\pi}$

Ans. B

Sol. Given,

Area of equilateral triangle = Area of square
 = Area of circle



$$\text{Area} = \frac{\sqrt{3} a^2}{4} = b^2 = \pi r^2$$

$$\frac{(3)^{1/4} a}{2} = b = \sqrt{\pi} r = k \text{ (let) ... (i)}$$

$$\text{Perimeter} = 3a = 4b = 2\pi r \dots \text{(ii)}$$

From (i)

$$a = \frac{2k}{3^{1/4}}, b = k, r = \frac{k}{\sqrt{\pi}}$$

Putting in equation (ii)

$$\frac{3 \times 2k}{3^{1/4}} = 4k = \frac{2\pi k}{\sqrt{\pi}}$$

$$\frac{3k}{3^{1/4}} = 2k = \sqrt{\pi} k$$

$$\frac{3}{3^{1/4}} : 2 : \sqrt{\pi}$$

$$\sqrt{(3\sqrt{3})} : 2 : \sqrt{\pi}$$

- 9.** Given below are three conclusions drawn based on the following three statements:

Statement 1: All teachers are professors.

Statement 2: No professor is a male.

Statement 3: Some males are engineers.

Conclusion I: No engineer is a professor.

Conclusion II: Some engineers are professors.

Conclusion III: No male is a teacher.

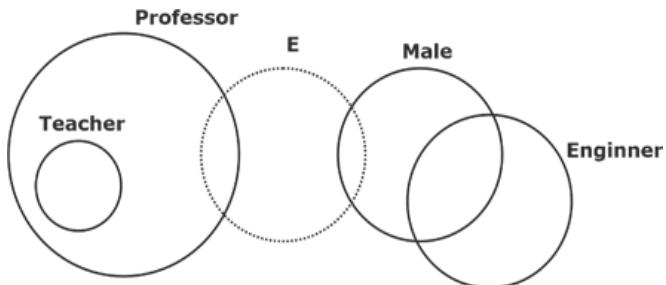
Which one of the following options can be logically inferred?

- A. Only conclusion III is correct
 B. Only conclusion I and conclusion II are correct

- C. Only conclusion II and conclusion III are correct
- D. Only conclusion I and conclusion III are correct

Ans. A

Sol. Given,



So only conclusion III is correct.

Conclusion I & conclusion II may or may not be correct.

- 10.** In a 12-hour clock that runs correctly, how many times do the second, minute, and hour hands of the clock coincide, in a 12-hour duration from 3 PM in a day to 3 AM the next day?

- A. 11
- B. 12
- C. 144
- D. 2

Ans. A

Sol. In 1 hour, the hour and minute hand coincide 1 time. So in 12 hours they should coincide with 12 times. But before 11 AM to 1 AM they coincide 1 times at 12'o-clock so, they coincide 11 times between 3 PM and 3 AM.

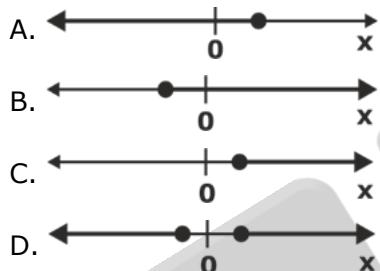
SET-2

1. Writing too many things on the _____ while teaching could make the students get _____.
 A. bored / board B. board / bored
 C. board / board D. bored / bored

Ans. B

Sol. Writing too many things on the board while teaching could make the students get bored.

2. Which one of the following is a representation (not to scale and in bold) of all values of satisfying the inequality $2 - 5x \leq -\frac{6x - 5}{3}$ on the real number line?

**Ans.** C

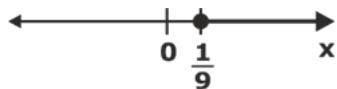
Sol. Given,

$$2 - 5x \leq -\left(\frac{6x - 5}{3}\right)$$

$$(2 - 5x)3 \leq -6x + 5$$

$$9x \geq 1$$

$$x \geq \frac{1}{9}$$



3. If $f(x) = 2 \ln(\sqrt{e^x})$, what is the area bounded by $f(x)$ for the interval $[0, 2]$ on the x axis?

- A. $1/2$ B. 1
 C. 2 D. 4

Ans. C

Sol. $f(x) = 2 \ln(\sqrt{e^x}) = 2 \ln e^{x/2} = \frac{x}{2} \times 2$

$$f(x) = x$$

$$\text{Area} = \int_0^2 f(x)dx = \int_0^2 x dx = \frac{x^2}{2} = \frac{4}{2} = 2$$

4. A person was born on the fifth Monday of February in a particular year. Which one of the following statements is correct based on the above information?
 A. The 2nd February of that year is a Tuesday
 B. There will be five Sundays in the month of February in that year
 C. The 1st February of that year is a Sunday
 D. All Mondays of February in that year have even dates

Ans. A

Sol. Given,

February has 5 Mondays.

Possibility of number of days in February month are 28 or 29.

To have 5th Monday February should have 5 weeks, 4 complete weeks and minimum one Monday.

So,

$$29 = 4 \times 7 + 1$$

So,

First day will be Monday and second day will be Tuesday.

5. Fish belonging to species S in the deep sea have skins that are extremely black (ultra-black skin). This helps them not only to avoid predators but also sneakily attack their prey. However, having this extra layer of black pigment results in lower collagen on their skin, making their skin more fragile.

Which one of the following is the CORRECT logical inference based on the information in the above passage?

- A. Having ultra-black skin is only advantageous to species S
- B. Species S with lower collagen in their skin are at an advantage because it helps them avoid predators
- C. Having ultra-black skin has both advantages and disadvantages to species S
- D. Having ultra-black skin is only disadvantageous to species S but advantageous only to their predators

Ans. C

Sol. Fragile means easily broken or damaged which is a disadvantage.

So, ultra-black skin has both advantage and disadvantage.

- 6.** For the past days, the average daily production at a company was 100 units per day.

If today's production of 180 units changes the average to 110 units per day, what is the value of m?

- A. 18
- B. 10
- C. 7
- D. 5

Ans. C

Sol. Given,

For m days average is 100

For $(m + 1)$ days average is 110 with $(m + 1)^{th}$ term 180.

So,

$$\frac{m \times 100 + 180}{m + 1} = 110$$

$$100m + 180 = 110m + 110$$

$$70 = 10m$$

$$m = 7$$

- 7.** Consider the following functions for non-zero positive integers, p and q

$$f(p, q) = \underbrace{p \times p \times p \times \dots \dots \dots \times p}_{q \text{ terms}} = p^q; f(p, 1) = p$$

$$g(p, q) = p; g(p, 1) = p$$

Which one of the following options is correct based on the above?

- A. $f(2, 2) = g(2, 2)$
- B. $f(g(2, 2), 2) < f(2, g(2, 2))$
- C. $g(2, 1) \neq f(2, 1)$
- D. $f(3, 2) > g(3, 2)$

Ans. A

$$f(2, 2) = 2^2 = 4$$

$$g(2, 2) = 2^2 = 4$$

$$f(2, 1) = 2^1 = 2$$

$$g(2, 1) = 2$$

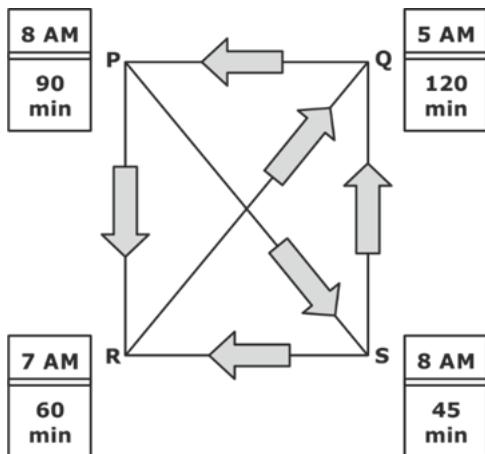
$$f(g(2, 2), 2) = f(4, 2) = 4^2 = 16$$

$$f(2, g(2, 2)) = f(2, 4) = 2^4 = 16$$

So, answer A will be correct.

- 8.** Four cities P, Q, R and S are connected through one-way routes as shown in the figure. The travel time between any two connected cities is one hour. The boxes beside each city name describe the starting time of first train of the day and their frequency of operation. For example, from city P, the first trains of the day start at 8 AM with a frequency of 90 minutes to each of R and S. A person does not spend additional time at any city other than the waiting time for the next connecting train.

If the person starts from R at 7 AM and is required to visit S and return to R, what is the minimum time required?

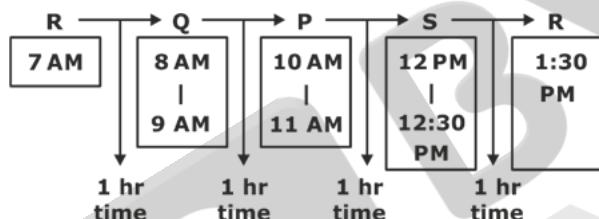


- A. 6 hours 30 minutes
 B. 3 hours 45 minutes
 C. 4 hours 30 minutes
 D. 5 hours 15 minutes

Ans. A

Sol. Required answer is

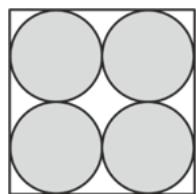
$$R \rightarrow S \rightarrow R$$



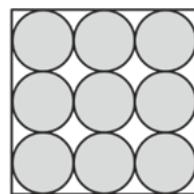
$$1 + 1 + 1 + 1 + 1 + (30 \text{ min}) + 1 = 6 \text{ hr. 30 min.}$$

9. Equal sized circular regions are shaded in a square sheet of paper of 1 cm side length. Two cases, case M and case N, are considered as shown in the figures below. In the case M, four circles are shaded in the square sheet and in the case N, nine circles are shaded in the square sheet as shown.

What is the ratio of the areas of unshaded regions of case M to that of case N?



Case M



Case N

- A. 2 : 3
 B. 1 : 1
 C. 3 : 2
 D. 2 : 1

Ans. B

Sol. Case 1

$$6r = 1$$

$$r = \frac{1}{6}$$

Case 2

$$4R = 1$$

$$R = \frac{1}{4}$$

$$\text{Area of square} = 1^2 = 1$$

$$= 9 \times \pi \times \left(\frac{1}{6}\right)^2 = \frac{\pi}{4}$$

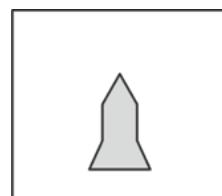
Area of small circle

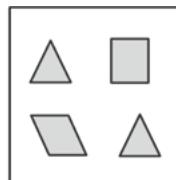
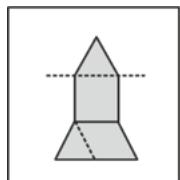
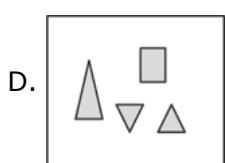
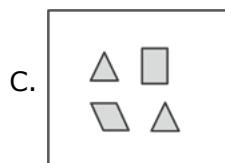
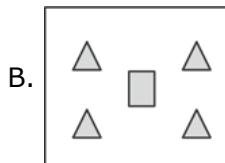
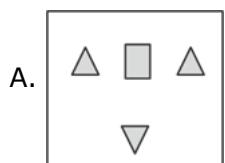
$$= 4 \times \pi \times \left(\frac{1}{4}\right)^2 = \frac{\pi}{4}$$

Area of large circle

Shaded area is same, so ratio of unshaded part will also be same.

10. Which one of the groups given below can be assembled to get the shape that is shown above using each piece only once without overlapping with each other?
 (Rotation and translation operations may be used).





Both options B and C are correct but only option B is given in the GATE 2022 official answer key.

Ans. B, C

Sol.

