

# GATE 2021

## Civil Engineering

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



**Set-1**

1. Getting to the top is \_\_\_\_ than staying on top.  
 A. easier                      B. much easy  
 C. more easy                D. easiest

**Ans.** A

**Sol.** "Than" is used in the sentence. It means the Comparison is made here. So, the comparative form of "easy" should be used. Hence, **easier** is the most appropriate word. Getting to the top is easier than staying on top.

2.  $\oplus$  and  $\odot$  are two operators on number p and q such that

$$p \oplus q = \frac{p^2 + q^2}{pq} \text{ and } p \odot q = \frac{p^2}{q};$$

If  $x \oplus y = 2 \odot 2$ , then  $x =$

- A. y                              B.  $3y/2$   
 C.  $2y$                          D.  $y/2$

**Ans.** A

**Sol.** Given,

$$p \oplus q = \frac{p^2 + q^2}{pq} \text{ and } p \odot q = \frac{p^2}{q}$$

Also,  $x \oplus x = z \odot z$

Using the above definitions we get

$$\frac{x^2 + y^2}{xy} = \frac{2^2}{2}$$

$$\Rightarrow \frac{x^2 + y^2}{xy} = 2$$

$$\Rightarrow x^2 + y^2 - 2xy = 0$$

$$\Rightarrow (x - y)^2 = 0$$

$$x = y$$

3. Consider two rectangular sheets, Sheet M and Sheet N of dimensions 6 cm x 4 cm each.

Folding operation 1: The sheet is folded into half by joining the short edges of the current shape.

Folding operation 2: The sheet is folded into half by joining the long edges of the current shape.

Folding operation 1 is carried out on Sheet M three times.

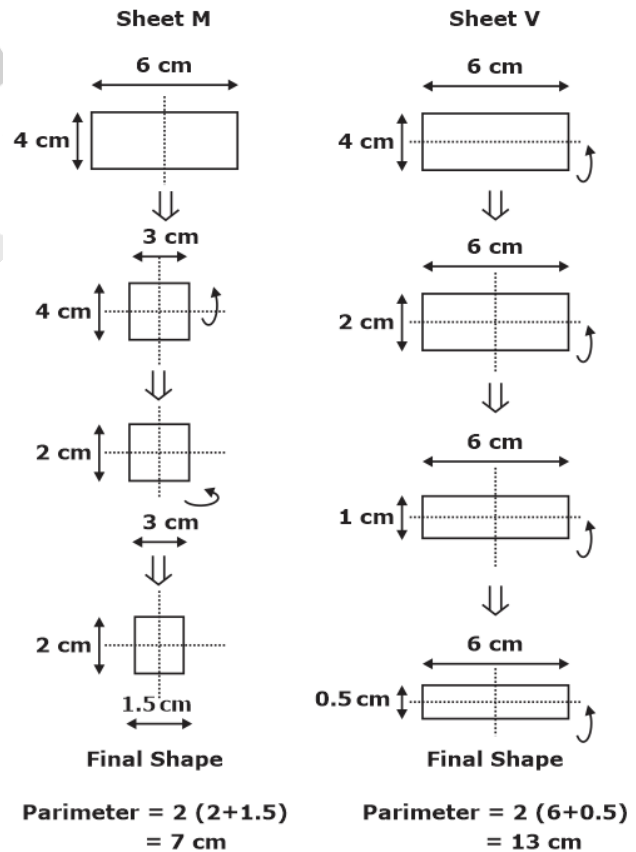
Folding operation 2 is carried out on Sheet N three times.

The ratio of perimeters of the final folded shape of Sheet N to the final folded shape of Sheet M is \_\_\_\_.

- A. 5 : 13                      B. 13 : 7  
 C. 7 : 5                        D. 3 : 2

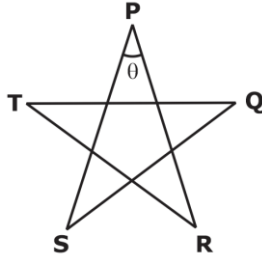
**Ans.** B

**Sol.**



**Required Ratio = 13/7**

4.



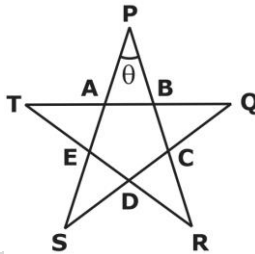
Five line segments of equal lengths, PR, PS, QS, QT and RT are used to form a star as shown in the figure above.

The value of  $\theta$ , in degrees, is

- A. 45
- B. 72
- C. 36
- D. 108

**Ans. C**

**Sol.**



Given,

$$PR = PS = QS = QT = RT$$

ABCDE will be a regular pentagon

$\angle PAB =$  exterior angle for the pentagon

$$\text{Each exterior angle} = \frac{360^\circ}{n} = \frac{360^\circ}{5} = 72^\circ$$

So,  $\angle PAB = \angle PBA = 72^\circ$

In  $\Delta PA$ ,  $\angle PAB + \angle PBA + \theta = 180^\circ$

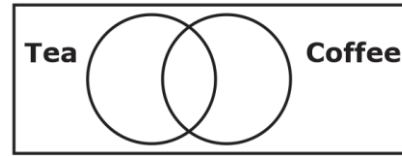
$$\theta = 36^\circ$$

5. In a company, 35% of the employees drink coffee, 40% of the employees drink tea and 10% of the employees drink both tea and coffee. What % of employees drink neither tea nor coffee?

- A. 35
- B. 25
- C. 40
- D. 15

**Ans. A**

**Sol.**



$n(\tau)$ : No. of employees who drink coffee = 35%

$n(T)$ : No. of employees who drink tea = 40%

Then,  $n(T \cap C)$ : No. of employees who drink both tea and coffee = 40%

No. of employees who neither drink tea or, coffee  $n(u) - n(T \cup C)$

$$\begin{aligned} &= 100 - [n(T) + n(C) - n(T \cap C)] \\ &= 100 - (35 + 40 - 10) \\ &= 35\% \end{aligned}$$

Thus, the correct answer is A.

6. A function,  $\lambda$ , is defined by

$$\lambda(p, q) = \begin{cases} (p - q)^2, & \text{if } p \geq q \\ p + q, & \text{if } p < q \end{cases}$$

The value of the expression

$$\frac{\lambda(-(-3+2), (-2+3))}{(-(-2+1))} \text{ is:}$$

- A. 16
- B. - 1
- C. 16/3
- D. 0

**Ans. D**

**Sol.** Given,

$$\lambda(p, q) \begin{cases} (p - q)^2, & p \geq q \\ (p + q), & p < q \end{cases}$$

Then,

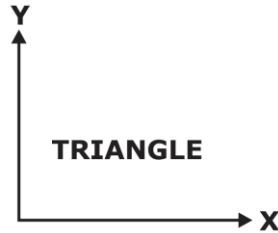
$$\frac{\lambda(-(-3+2), (-2+3))}{(-(-2+1))} = \frac{\lambda(1, 1)}{1} = \lambda(1, 1)$$

Here,  $P = Q = 1$

So,  $\lambda(1, 1) = (1 - 1)^2 = 0$

Thus, option D is the correct answer.

7.



The mirror image of the above text about the X-axis is

- A. **TRIANGLE**
- B. **TRIANGEL**
- C. **TRIANGLE**
- D. **TRIANGEL**

**Ans.** A

**Sol.**

**TRIANGLE**  
  
**TRIANGEL**

8. Statement: Either P marries Q or X marries Y. Among the options below, the logical NEGATION of the above statement is:
- A. Neither P marries Q nor X marries Y.
  - B. X does not marry Y and P marries Q.
  - C. P marries Q and X marries Y.
  - D. P does not marry Q and X marries Y.

**Ans.** A

**Sol.** Negation: the contradiction or denial of something.

So, the logical negation of the Statement is neither P marries Q nor X marries Y.

Only option A states both negation. Hence it is the correct answer.

9. Four persons P, Q, R and S are to be seated in a row, all facing the same direction, but not necessarily in the same order. P and R cannot sit adjacent to each other. S should be seated to the right of Q. The number of distinct seating arrangements possible is:

- A. 6
- B. 8
- C. 4
- D. 2

**Ans.** D

**Sol.** Given that all are facing north.

P and R can not sit together.(adjacent to each other)

S should be seated to the right of Q.

So, the possible way of sitting of P, Q, R and S

PQSR

RQSP

QPSR

QRSP

PQRS

RQPS

Hence there are 6 distinct possible ways of sitting.

10. Humans have the ability to construct worlds entirely in their minds, which don't exist in the physical world. So far as we know, no other species possesses this ability. This skill is so important that we have different words to refer to its different flavors, such as imagination, invention, and innovation.

Based on the above passage, which one of the following is TRUE?

- A. We do not know of any species other than humans who possess the ability to construct mental worlds.
- B. Imagination, invention, and innovation are unrelated to the ability to construct mental worlds.
- C. The terms imagination, invention and innovation refer to unrelated skills.
- D. No species possess the ability to construct worlds in their minds.

**Ans. A**

**Sol.** Since the paragraph states that "This skill is so important that we have different words to refer to its different flavors, such as imagination, invention and innovation" it means three terms are related to the same skill. In options B and C "unrelated" word is used, Hence both are incorrect.

Option D uses "no species" in which human is also included and humans have the ability to construct worlds in their minds. So, it is incorrect.

Option A is correct as the paragraph states that "So far as we know, no other species possess this ability."

Hence, option A is the correct answer.

**Set-2**

1. (i) Arun and Aparna are here
- (ii) Arun and Aparna is here
- (iii) Arun's families is here
- (iv) Arun's family is here

Which of the above sentences are grammatically CORRECT?

- A. (iii) and (iv)      B. (ii) and (iv)  
C. (i) and (ii)      D. (i) and (iv)

**Ans. D**

**Sol.** If two subjects are joined by 'and', plural verb will be used. This make statement I right and statement II wrong.

Singular noun comes after apostrophe'. This make statement III wrong and IV as right.

Hence, option D (i) and (iv) is the correct answer.

2.  $\oplus$  and  $\odot$  are two operators on numbers p and q such that  $p \odot q = p - q$ , and  $p \oplus q = p \times q$

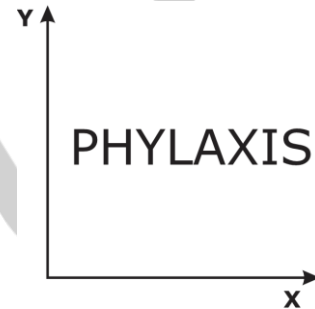
Then,  $(9 \odot (6 \oplus 7)) \odot (7 \oplus (6 \odot 5)) =$

- A. 40                      B. -40  
C. -26                    D. -33

**Ans. B**

**Sol.**  $(9 \odot (6 \oplus 7)) \odot (7 \oplus (6 \odot 5)) = (9 - (6 \times 7)) - (7 \times (6 - 5))$   
 $= (9 - 42) - (7 \times 1)$   
 $= -33 - 7$   
 $= -40$

3.

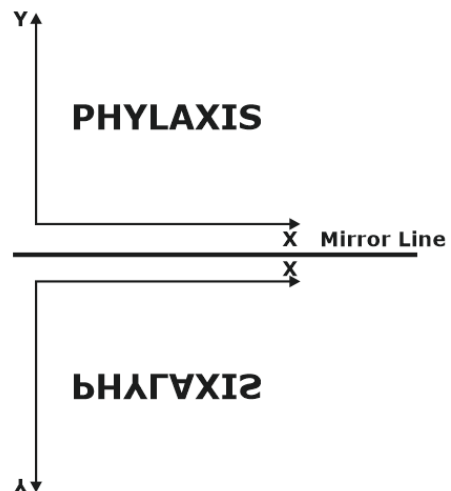


The mirror image of the above text about the X-axis is

- A.  $\text{PHYLGXIS}$   
B.  $\text{PHYLVXIS}$   
C.  $\text{PHYLVXIS}$   
D. None of these

**Ans. B**

**Sol.**



4. In an equilateral triangle PQR, side PQ is divided into four equal parts, side QR is divided into six equal parts and side PR is divided into eight equal parts. The length of each subdivided part in cm is an integer. The minimum area of the triangle PQR possible, in  $\text{cm}^2$ , is
- A. 24                                      B. 18  
C.  $144\sqrt{3}$                               D.  $48\sqrt{3}$

**Ans.** C

**Sol.** Let side of Equilateral  $\Delta = x$

So length of each segment of PQ =  $x/4$

QR =  $x/6$

PR =  $x/8$

For min. area,  $x = \text{LCM} \{4, 6, 8\} = 24$

$$\text{So, } A_{\text{min.}} = \frac{\sqrt{3}}{4} x^2 = \frac{\sqrt{3}}{4} \times 24 \times 24$$

$$= 144\sqrt{3}$$

5. Two identical cube shaped dice each with faces numbered 1 to 6 are rolled simultaneously. The probability that an even number is rolled out on each dice is :
- A.  $\frac{1}{36}$                                       B.  $\frac{1}{12}$   
C.  $\frac{1}{4}$                                         D.  $\frac{1}{8}$

**And.** B

**Sol.** Probability of coming an even number on first dice =  $P(E1) = 3/6$

Probability of coming an even number on second dice =  $P(E2) = 3/6$

Since both events are independent.

So,  $P(\text{Even number on both dice})$

$$= P(E1) \times P(E2) = 3/6 \times 3/6$$

$$= 1/4$$

6. The author said, "Musicians rehearse before their concerts. Actors rehearse their roles before the opening of a new play. On the other hand, I find it strange that many public speakers think they can just walk on to the stage and start speaking. In my opinion, it is no less important for public speakers to rehearse their talks."

Based on the above passage, which one of the following is TRUE?

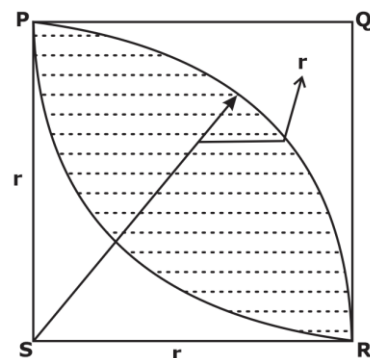
- A. The author is of the opinion that rehearsing is important for musicians, actors and public speakers.  
B. The author is of the opinion that rehearsal is more important for actors than musicians.  
C. The author is of the opinion that rehearsing is more important only for musicians than public speakers.  
D. The author is of the opinion that rehearsing is less important for public speakers than for musicians and actors.

**Ans.** A

**Sol.** As the paragraph states that "In my opinion, it is no less important for public speakers to rehearse their talks." It means that the author considers rehearsal equally important for public speakers, musicians and actors. So, options B, C and D are false, in which comparison is made among them.

Hence option A is the correct answer.

7.





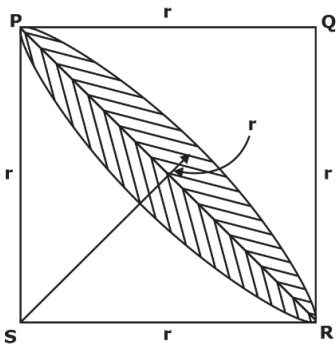
In the figure shown above, PQRS is a square. The shaded portion is formed by the intersection of sectors of circles with radius equal to the side of the square and centers at S and Q.

The probability that any point picked randomly within the square falls in the shaded area is \_\_\_\_\_ .

- A.  $4 - \frac{\pi}{2}$                       B.  $\frac{\pi}{2} - 1$   
C.  $\frac{\pi}{4}$                                 D.  $\frac{1}{2}$

**Ans. B**

**Sol.**



Shaded area = b

$$\begin{aligned} &= \left[ \frac{\pi r^2}{4} - \frac{1}{2} \cdot r^2 \right] \times 2 \\ &= \frac{r^2}{2} \left[ \frac{\pi}{2} - 1 \right] \times 2 \\ &= r^2 \left( \frac{\pi}{2} - 1 \right) \end{aligned}$$

Total area =  $r^2$

For required probability =

$$= \frac{r^2 \left( \frac{\pi}{2} - 1 \right)}{r^2} = \frac{\pi}{2} - 1$$

- 8.** Four persons P, Q, R and S are to be seated in a row. R should not be seated at the second position from the left end of the row. The number of distinct seating arrangements possible is :

- A. 6                                      B. 18  
C. 24                                    D. 9

**Ans. B**

**Sol.** The total sitting arrangement of P, Q, R and S =  $4 \times 3 \times 2 \times 1 = 24$

Given that R should not be seated at the second position from left end of the row.

So, we have to subtract that sitting arrangement in which R placed at 2nd from left end. (take this arrangement as A) as \_ R

--  
possible ways of that sitting arrangement A =  $3 \times 2 \times 1 = 6$

Thus, possible ways of distinct sitting arrangement with condition A =  $24 - 6 = 18$  ways

**Alternate Method:**

Total distinct ways of sitting arrangements = 18 (4 each for P, Q, S and 6 for R)

Given that R should not be seated at the second position from left end of the row.

So, we have to subtract that sitting arrangement in which R placed at 2nd from left end. (take this arrangement as A) as \_ R

- when P is on the leftmost side  
PQRS, PQSR, PSQR, PSRQ  
when Q is on the leftmost side  
QPRS, QPSR, QSPR, QSRP  
when R is on the leftmost side  
RPQS, RPSQ, RQPS, RQSP, RSPQ, RSQP  
when S is on the leftmost side  
SPQR, SPQR, SQPR, SQRP

- 9.** On a planar field, you travelled 3 units East from a point O. Next you travelled 4 units South to arrive at point P. Then you travelled

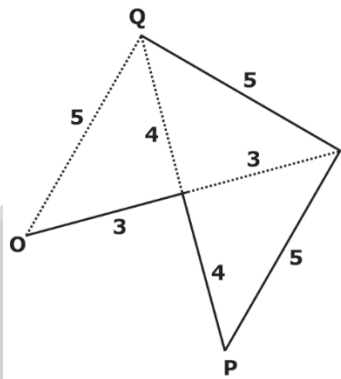
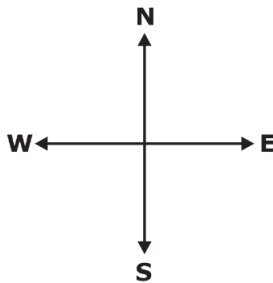
from P in the North-East direction such that you arrive at a point that is 6 units East of point P. Next, you travelled in the North-West direction, so that you arrive at point Q that is 8 units North of point P.

The distance of point Q to point O, in the same units, should be \_\_\_\_\_ .

- A. 4
- B. 5
- C. 3
- D. 3

**Ans. C**

**Sol.**



Required distance = OQ

$$\sqrt{(3)^2 + (4)^2} = 5$$

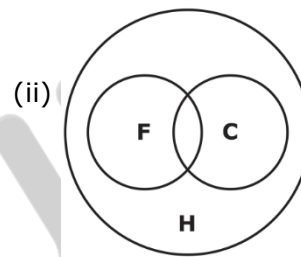
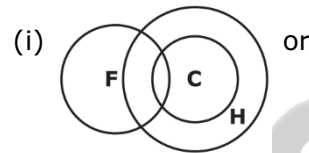
- 10.** 1. Some football players play cricket.  
2. All cricket players play hockey.

Among the options given below, the statement that logically follows from the two statements 1 and 2 above, is :

- A. All hockey players play football.
- B. All football players play hockey.
- C. Some football players play hockey.
- D. No football player plays hockey.

**Ans. C**

**Sol.**



Two arrangements are possible according to statements given for any option to be true, it should be true in both.

All hockey players play football  $\Rightarrow$  This is false in both (i) and (ii)

All football players play hockey  $\Rightarrow$  This is true in (ii) but false in (i)  $\Rightarrow$  This is a false statement.

Some football play hockey  $\Rightarrow$  This is true in both.

No football player plays hockey  $\Rightarrow$  This is false in both (i) and (ii)

$\Rightarrow$  Option C is correct.

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