

# GATE 2017

Mechanical Engineering

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



## SET-1

1. He was one of my best \_\_\_\_\_ and I felt his loss \_\_\_\_\_.

A. friend, keenly      B. friends, keen  
C. friend, keener      D. friends, keenly

**Ans.** D

**Sol.** The phrase "one of" is used to determine one out of something else and that something else has to be in plural numbers to part with one of itself.

Thus, one of my best friends will be the correct answer. Further, the word keenly will be used because it is an adverb.

Hence, option (D) is the correct answer.

2. As the two speakers became increasingly agitated, the debate became \_\_\_\_\_.

A. lukewarm      B. poetic  
C. forgiving      D. heated

**Ans.** D

**Sol.** The meaning of the options are given below:  
Lukewarm: not showing much interest; not keen

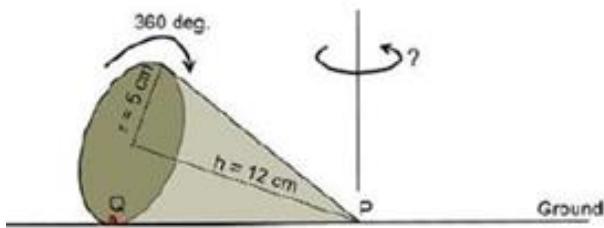
Poetic - characterized by romantic imagery

Forgiving - ready and able to forgive

Heated - angry or excited in great intensity.

The important keywords are "increasingly agitated", which indicate that a situation is becoming greater in intensity and agitated means worried or excited. So, the best **Ans.** will be heated as agitated defines the debate shifting to hard talk between speakers.

3. A right – angled cone (with base radius 5cm and height 12cm), as shown in the figure below, is rolled on the ground keeping the point P fixed until the point Q (at the base of the cone, as shown) touches the ground again.



By what angle (in radians) about P does the cone travel?

- A.  $\frac{5\pi}{12}$   
B.  $\frac{5\pi}{24}$   
C.  $\frac{24\pi}{5}$   
D.  $\frac{10\pi}{13}$

**Ans.** D

**Sol.** From the given data, base radius = 5 cm,  
Height of the cone = 12 cm,  
Slant height of the cone

$$(\ell) = \sqrt{(h^2) + r^2} = \sqrt{(12^2) + (5)^2} \\ = \sqrt{144 + 25} = \sqrt{169} = 13 \text{ cm}$$

It is rolled on the ground through the fixed point 'P'

$$\text{We have relation } r = \frac{\theta}{2\pi} \times R$$

Where, r = radius of the cone,

R = radius on the ground = slant height

$\theta$  = Angle about P does the cone travel

$$5 = \frac{\theta}{2\pi} \times 13 \Rightarrow \theta = \frac{10\pi}{13}$$

4. In a company with 100 employees, 45 earn Rs. 20,000 per month, 25 earn Rs. 30,000, 20 earn Rs. 40,000, 8 earn Rs. 60,000, and 2 earn Rs. 150,000. The median of the salaries is
- A. Rs. 20,000      B. Rs. 30,000  
C. Rs. 32,300      D. Rs. 40,000

**Ans.** B

**Sol.** All the values put either in ascending order first.

45 earn Rs. 20,000

25 earn Rs. 30,000

20 earn Rs. 40,000

8 earn Rs. 60,000

2 earn Rs. 150,000

Now number of observations equal to 100  
[even]

∴ The median of these values = Avg of two middle most observations.

$$\begin{aligned} &= \frac{50^{\text{th}} \text{ observation} + 51^{\text{st}} \text{ observation}}{2} \\ &= \frac{30,000 + 30,000}{2} \\ &= 30,000 \end{aligned}$$

5. P, Q, and R talk about S's car collection. P states that S has at least 3 cars. Q believes that S has less than 3 cars. R indicates that to his knowledge, S has at least one Car. Only one of P, Q and R is right the number cars owned by S is.

A. 0

B. 1

C. 3

D. Cannot be determined

**Ans.** A

**Sol.** P States that S has atleast 3 cars, i.e.,  $\geq 3$

Q believes that S has less than 3 cars, i.e.,  $< 3$

R indicates that S has atleast one car  $\geq 1$

P's and Q's statements are exactly opposite in nature and R's statement is proportional to P's statement.

From the given data, only one person statement is right as it mean that two persons statements are wrong, i.e., P and R wrong when S has zero cars.

6. "Here, throughout the early 1820s, Stuart continued to fight his losing battle to allow his sepoys to wear their caste-marks and their own choice of facial hair on parade, being again reprimanded by the commander-in-chief. His retort that „A stronger instance than this of European prejudice with relation to this country has never come under my observations“ had no effect on his superiors." According to this paragraph, which of the statements below is most accurate?

- A. Stuart's commander – in chief was moved by this demonstration of his prejudice.
- B. The Europeans were accommodating of the sepoys' desire to wear their caste – marks.
- C. Stuart's losing battle" refers to his inability to succeed in enabling sepoys to wear caste-marks.
- D. The commander- in – Chief was exempt from the European prejudice that dictated how the sepoys were to dress.

**Ans.** C

**Sol.** It is clearly mentioned that "Stuart continued to fight his losing battle to allow his sepoys to wear their caste-marks ". which has same sense as option C. Hence it is the right answer.

Expalition for other options arrer given below:  
It is mentioned that The commander in chief reprimanded Stuart, and Stuart had no effect on his superiors. Reprimanded means to tell somebody officially that they have done something wrong. Hence option A is wrong.

There is no mention of "Europeans were accomodating of the sepoys"desire to wear their caste – marks. Hence option B is wrong.

"A stronger instance than this of European prejudice" points that the commander-in-chief was not exempt from prejudice. Hence option D is wrong.

Correct Option: C

7. What is the sum of the missing digits in the subtraction problem below?

$$\begin{array}{r}
 5 \_ \_ \_ \\
 - 4 8 \_ 8 9 \\
 \hline
 0 1 1 1 1
 \end{array}$$

A. 8      B. 10  
C. 11      D. Cannot be determined

**Ans. D**

**Sol.** By hit and trial we find that the missing digit in lower number can be either 8 or 9.

**50100**

-48989

01111

Sum of the missing digits are= 10

or

**50000**

-48889

01111

Sum of the missing digits are= 8

So, we can't find the unique solution.

Hence unique answer can't be determined.

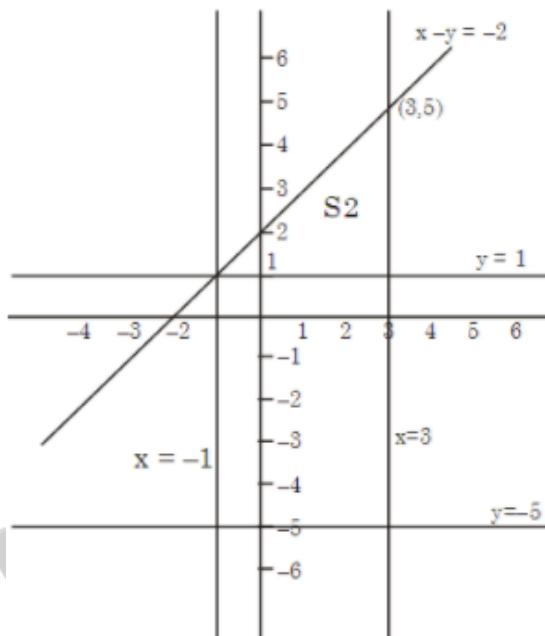
8. Let  $S_1$  be the plane figure consisting of the points  $(x, y)$  given by the inequalities

$|x-1| \leq 2$  and  $|y+2| \leq 3$ . Let  $S_2$  be the plane figure given by the inequalities  $x - y \geq -2$ ,  $y \geq 1$ , and  $x \leq 3$ . Let  $S$  be the union of  $S_1$  and  $S_2$ . The area of  $S$  is.

- A. 26      B. 28  
C. 32      D. 34

**Ans. C**

**Sol.**



**For Area  $S_1$ , we have**

$$|x-1| \leq 2 \begin{cases} x < 1 ; & x = -1 \\ x > 1 ; & x = 3 \end{cases}$$

$$|y+2| \leq 3 \begin{cases} y < -2 ; & y = -5 \\ y > -2 ; & y = 1 \end{cases}$$

For Area  $S_2$ , we have

Intersection of  $x - y \geq -2$ ,  $y \geq 1$  and  $x \leq 3$

$$\therefore S = S_1 + S_2$$

$$= (6 \times 4) + \frac{1}{2} \times 4 \times 4$$

$ x-1  \leq 2$	
$x < 1$	$x > 1$
$x-1 = -2$	$x-1 = 2$
$x = -1$	$x = 3$

$ y+2  \leq 3$	
$y > -2$	$y < -2$
$y+2 = 3$	$y-2 = -3$
$y = 1$	$y = -5$

$$= 32$$

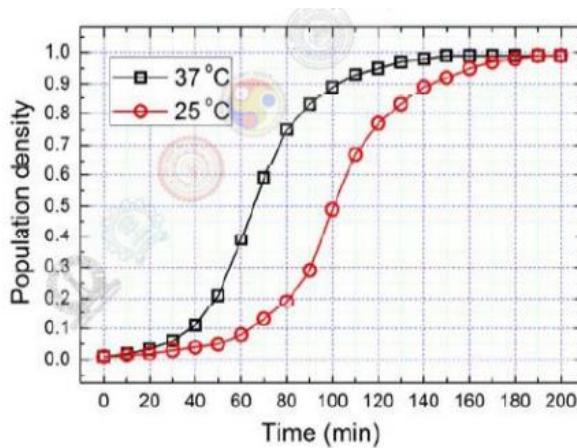
**9.** Two very famous sportsmen Mark and Steve happened to be brothers, and played for country K. Mark teased James, an opponent from country E, "There is no way you are good enough to play for your country." James replied, "Maybe not, but at least I am the best player in my own family." Which one of the following can be inferred from this conversation?

- A. Mark was known to play better than James
- B. Steve was known to play better than Mark
- C. James and Steve were good friends
- D. James played better than Steve

**Ans.** B

**Sol.** James reply was return to Mark's tease. Mark although played for his country but still he was not better player than his brother i.e Steve

**10.** The growth of bacteria (*Lactobacillus*) in milk leads to curd formation. A minimum bacterial population density of 0.8 (in suitable units) is needed to form curd. In the graph below, the population density of *Lactobacillus* in 1 litre of milk is plotted as a function of time, at two different temperatures, 25°C and 37°C.



Consider the following statements based on the data shown above:

- (i) The growth in bacterial population stops earlier at 37 °C as compared to 25 °C
  - (ii) The time taken for curd formation at 25 °C is twice the time taken at 37 °C
- Which one of the following options is correct?
- A. Only i
  - B. only ii
  - C. Both i and ii
  - D. Neither i nor ii

**Ans.** A

**Sol.** From the graph, it can be noticed that the bacterial growth stops after 150 minutes at 37°C while it stops after 180 minutes at 25°C. So, Statement (i) is correct,

The time taken for curd formation @ 25° C = 120 min,

the time taken for curd formation @ 37° C = 80 min, hence (ii) is incorrect.

## SET-2

- 1.** If you choose plan P, you will have to \_\_\_\_\_ plan Q, as these two are mutually \_\_\_\_\_.  
 A. forgo, exclusive  
 B. forget, inclusive  
 C. accept, exhaustive  
 D. adopt, intrusive

**Ans. A**

**Sol.** Forgo means: to refrain from

So, if we choose plan p then we have to forgo plan Q as they are mutually exclusive. Hence, option A is correct.

Mutually exclusive events are the ones when they cannot happen at the same time, that is, there is no outcomes common in these events. For example: getting a head or a tail when a coin is tossed. On tossing a coin, we can never get head or tail together, so these two events are mutually exclusive.

Mutually inclusive events are the ones in which there are some common outcomes in between the given events. Like getting an odd number or getting a prime number when we throw a dice. In these two events, there are common outcomes {3, 5} repeating in both the events. So, these two events are mutually inclusive events.

- 2.** P looks at Q while Q looks at R. P is married, R is not. The number of pairs of people in which a married person is looking at an unmarried person is  
 A. 0                      B. 1  
 C. 2  
 D. Cannot be determine

**Ans. B**

**Sol.**  $P \rightarrow Q \rightarrow R$

P is a married person who is looking Q

But Q is married or unmarried is not given so, we can't say about Q

So only one way is clear that married P is looking a Q(If unmarried) and another case If Q(married) will be looking at R (unmarried) person hence there is only one pair of people in which a married person is looking at an unmarried person.

Either P and Q (if unmarried) or R and Q (if married).

- 3.** If a and b are integers and  $a-b$  is even, which of the following must always be even?  
 A. ab                      B.  $a^2+b^2+1$   
 C.  $a^2+b+1$               D.  $ab-b$

**Ans. D**

**Sol.** According to the given relation of  $a-b=even$ .

we know that odd-odd= even

even-even= even.

so "a" and "b" be either odd or even.

Option (A) when both are odd then ab is odd.

So, option A is wrong.

Option (B) when both are either even or odd then  $a^2+b^2+1$  is always odd. So, it's an incorrect option.

Option (C) when both are either even or odd then  $a^2+b^2+1$  is always odd. So, it's also incorrect. option.

Option (D) It is correct. For  $ab-b$ , odd x odd-odd (or) even x even-even → is always an even number.

**Alternate Method:**

$$Let \ a - b = 2K \Rightarrow a = b + 2K$$

$$ab - b = (b + 2K)b - b = b^2 + 2Kb - b$$

$$= (b^2 - b) + 2Kb = b(b - 1) + 2Kb$$

Even; since  $2Kb$  is always even &  $b(b-1)$  is also even if with  $b$  is odd or even.

4. A couple has 2 children. The probability that both children are boys if the older one is a boy is
- A.  $1/4$       B.  $1/3$   
 C.  $1/2$       D. 1

**Ans. C**

**Sol.** Probability =  $\frac{\text{No. of Favourable cases}}{\text{Total No. of Possible cases}}$

Older is already a boy so second kid being a boy probability =  $\frac{1}{2}$

5. The ways in which this game can be played \_\_\_\_\_ potentially infinite.
- A. is      B. is being  
 C. are      D. are being

**Ans. C**

**Sol.** Since the subject 'The ways' is plural here so the verb also should be plural (are).

6. "If you are looking for a history of India, or for an account of the rise and fall of the British Raj, or for the reason of the cleaving of the subcontinent into two mutually antagonistic parts and the effects this mutilation will have in the respective sections, and ultimately on Asia, you will not find it in these pages; for though I have spent a lifetime in the country, I lived too near the seat of events, and was too intimately associated with the actors, to get the perspective needed for the impartial recording of these matters."

Which of the following closes in meaning to 'cleaving'?

- A. Deteriorating      B. Arguing  
 C. Departing      D. Splitting

**Ans. D**

**Sol.** It is clearly mentioned that "**cleaving** of the subcontinent into **two** mutually antagonistic **parts**". It means dividing/separating/splitting the subcontinent into two opponent parts.

So, "splitting" is the most suitable **Ans.** from the given options.

The meaning of the option are given below:

Cleaving = Splitting, separating

Deteriorating = get worse

Departing= to leave a place

Arguing = to say stuff, often angrily, that determines that you do not agree with somebody about something.

7. There are 4 women P, Q, R, S and 5 men V, W, X, Y, Z in a group. We are required to form pairs each consisting of one woman and one man. P is not to be paired with Z, and Y must necessarily be paired with someone. In how many ways can 4 such pairs be formed?
- A. 74      B. 76  
 C. 78      D. 80

**Ans. C**

**Sol.** Now here two condition are given, so instead of getting confused why not take one condition of "Y must be paired" as the basis of finding out various ways as given below.

**P is paired with Y:**

So, Q can be paired with any 4 men (V or W or X or Z), R with 3 and S with any 2

Hence, Total pairs =  $4 \times 3 \times 2 = 24$

**Q is paired with Y:**

So, P can be paired with any 3 men (V or W or X) as it has total 4 option but it cannot be paired with Z, R with 3 including Z and S with any 2

Hence, Total pairs =  $3 \times 3 \times 2 = 18$

**R is paired with Y:**

So, P can be paired with any 3 men (V or W or X) as it has total 4 option but it cannot be paired with Z, Q with 3 including Z and S with any 2

Hence, Total pairs =  $3 \times 3 \times 2 = 18$

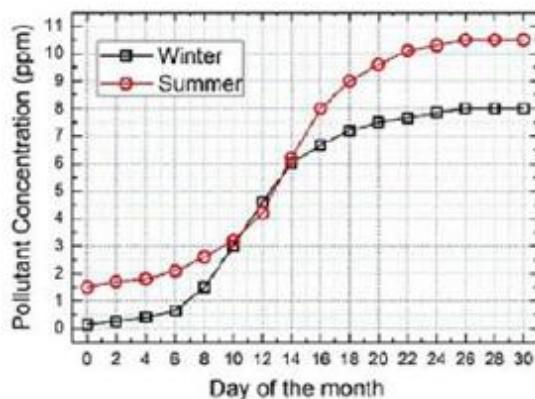
**S is paired with Y:**

So, P can be paired with any 3 men (V or W or X) as it has total 4 option but it cannot be paired with Z, Q with 3 including Z and R with any 2

Total pairs =  $3 \times 3 \times 2 = 18$

Total no. of ways =  $24 + 18 + 18 + 18 = 78$

- 8.** In the graph below, the concentration of a particular pollutant in a lake is plotted over (alternate) days of a month in winter and in summer. (average temperature is  $10^{\circ}\text{C}$  in winter and the average temperature is  $30^{\circ}\text{C}$  in summer).



Consider the following statements based on the data shown above:

(i) Over the given months, the difference between the maximum and the minimum pollutant concentrations is the same in both winter and summer.

(ii) There are at least four days in the summer month such that the pollutant concentrations on those days are within 1 ppm of the pollutant concentrations on the corresponding days in the winter month.

Which one of the following options is correct?

- A. Only i                      B. Only ii  
C. Both i and ii              D. Neither i nor ii

**Ans. B**

**Sol.** (i) The difference between the maximum and the minimum pollutant concentrations in the winter =  $8 - 0 = 8$  ppm

The difference between the maximum and the minimum pollutant concentrations in the summer =  $10.5 - 1.5 = 9$  ppm

Over the given months, these differences are not equal.

Therefore statement (i) is not correct.

(ii) 4 days where ppm difference is within 1 ppm are 8, 10, 12, 14. So, from the given graph, statement (ii) is correct.  
option B seems correct.

- 9.** All people in a certain island are either 'Knights' or 'Knaves' and each person knows every other person's identity. Knights NEVER lie, and Knaves ALWAYS lie.

P says "Both of us are knights". Q says "None of us are Knaves".

Which one of the following can be logically inferred from the above?

- A. Both P and Q are knights  
B. P is a knight; Q is a knave  
C. Both P and Q are knaves  
D. The identities of P, Q cannot be determined

**Ans.** D**Sol.** There are 4 possible cases :

(1) If Both P and Q are knights

It means both statements are true; This justifies our assumption. So, It can be a possible case.

(2) If P is a knight and Q is a knave.

It means the first statement, "Both of us are Knights", is true, but this doesn't justify our assumption as Q is a knave. So, this can't be our possible case.

(3) If P is a knave and Q is a knight.

It means the first statement, "Both of us are Knights", is false, which means either one of them or both are knaves, and the second statement ", None of us is Knaves" is true( means P is king), but this doesn't justify our assumption as P is a knave. So, this can't be our possible case.

(4) If both P and Q are knaves.

It means the first statement, "Both of us are Knights", is false, which means either one of them or both are knaves, and the second statement ", None of us is Knaves", is false, which means both should be a knave. This justifies our assumption as P and Q are knaves. So, It can be a possible case.

There can be more than one possibility. So identities of P, Q can not be determined. Hence, the answer is D.

**10.** X bullocks and Y tractors take 8 days to plough a field. If we halve the number of bullocks and double the number of tractors, it takes 5 days to plough the same field. How many days will it take X bullocks alone to plough the field?

A. 30

B. 35

C. 40

D. 45

**Ans.** A**Sol.** Given 8 days required that X bullocks and Y tractors to plough a field, thenTotal work  $8 * (X+Y) = 1$  work-----equation 15 days required that  $\frac{X}{2}$  bullocks and  $2Y$  tractors, thenTotal work  $5 * (0.5X + 2Y) = 1$  work-----equation 2

From (1) &amp; (2) ; we have

$$Y = \frac{11}{4}X$$

putting value in equation 1, we get

$$(X + \frac{11}{4}X) * 8 = 1 \text{ (total work is 1)}$$

$X = 1/30$  this is one day of work, so total work be done in 30 days.

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