

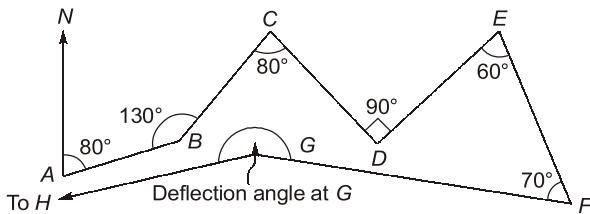
# **Reasoning & Aptitude : GS, Paper-1 (ESE 2018)**

**Q.10** A wall, rectangular in shape, has a perimeter of 72 m. If the length of its diagonal is 18 m, what is the area of the wall?

- (a) 224 m<sup>2</sup>      (b) 486 m<sup>2</sup>  
 (c) 572 m<sup>2</sup>      (d) 606 m<sup>2</sup>

[ESE 2018 : 2 Marks]

**Q.11** To isolate an enclosed area for conservation, an open traverse is run keeping close to (but outside of) the exterior boundary of the area through ground points  $A \rightarrow B \rightarrow C \rightarrow D \rightarrow E \rightarrow F \rightarrow G \rightarrow$  towards  $H$  (to be eventually located).  $AB$  is  $80^\circ$  to the East of the North line at  $A$ . Deflection/Interior angles at  $B, C, D, E, F$  are indicated. What would be the magnitude of the deflection angle at  $G$  (as marked) so that  $GH$  may run parallel to  $BA$ ? (Lengths are immaterial in this case.)



- (a)  $190^\circ$       (b)  $210^\circ$   
 (c)  $200^\circ$       (d)  $230^\circ$

[ESE 2018 : 2 Marks]

**Q.12** The objective function  $z = 3x_1 + 5x_2$  is to be maximized subjected to constraints.

$$\begin{aligned}x_1 + 2x_2 &\leq 200 \\x_1 + x_2 &\leq 150 \\x_1, x_2 &\geq 0\end{aligned}$$

The values of  $x_1$  and  $x_2$  in this context are, respectively

- (a) 100 and 75      (b) 125 and 75  
 (c) 100 and 50      (d) 125 and 50

[ESE 2018 : 2 Marks]

**Q.13** Consider the length of a room is 15 m and width is 10 m. If the sum of the areas of the floor and ceiling is equal to the sum of the areas of the four walls, then the volume of the room is

- (a)  $900 \text{ m}^3$       (b)  $1000 \text{ m}^3$   
 (c)  $1200 \text{ m}^3$       (d)  $1500 \text{ m}^3$

[ESE 2018 : 2 Marks]

**Q.14** A small production unit now works 6 days per

week with  $3\frac{1}{3}$  hours of first shift every one of

the 6 days and 3 hours of second shift for each of the first 5 days. Wage negotiations led to an agreement to work on 5 days a week with

both shifts together clocking  $7\frac{1}{2}$  hours per day

with an 8% increase in weekly wages. How much change in the hourly production would mean parity in the agreement for both management and employees?

- (a) 3.68%      (b) 2.15%  
 (c) 1.82%      (d) 1.33%

[ESE 2018 : 2 Marks]



# **Reasoning & Aptitude : GATE 2018**

**CIVIL ENGINEERING (Shift-1)**

- Q.1** The temperature  $T$  in a room varies as a function of the outside temperature  $T_0$  and the number of persons in the room  $p$ , according to the relation  $T = K(\theta p + T_0)$ , where  $\theta$  is  $K$  are constants. What would be the value of  $\theta$  given the following data?

$T_0$	$p$	$T$
25	2	32.4
30	5	42.0



[GATE 2018 : 1 Mark]

- Q.2** “The driver applied the \_\_\_\_\_ as soon as she approached the hotel where she wanted to take a \_\_\_\_\_.”

The words that best fill the blanks in the above sentence are

- (a) brake, break      (b) break, break  
(c) brake, brake      (d) break, brake

[GATE 2018 : 1 Mark]

- Q.3** Tower A is 90 m tall and tower B is 140 m tall. They are 100 m apart. A horizontal skywalk connects the floors at 70 m in both the towers. If a taut rope connects the top of tower A to the bottom of tower B, at what distance (in meters) from tower A will the rope intersect the skywalk?

[GATE 2018 : 1 Mark]

- Q.4** “It is no surprise that every society has had codes of behaviour; however, the nature of these codes is often .”

The word that best fills the blank in the above sentence is

- (a) unpredictable      (b) simple  
(c) expected      (d) strict

[GATE 2018 : 1 Mark]

- Q.5** Hema's age is 5 years more than twice Hari's age. Suresh's age is 13 years less than 10 times Hari's age. If Suresh is 3 times as old as Hema. How old is Hema?



[GATE 2018 : 1 Mark]

- Q.6** Consider a sequence of number  $a_1, a_2, a_3, \dots$ ,

$a_n$  where  $a_n = \frac{1}{n} - \frac{1}{n+2}$ , for each integer  $n > 0$ .

What is the sum of the first 50 terms?

- (a)  $\left(1 + \frac{1}{2}\right) - \frac{1}{50}$

(b)  $\left(1 + \frac{1}{2}\right) + \frac{1}{50}$

(c)  $\left(1 + \frac{1}{2}\right) - \left(\frac{1}{51} + \frac{1}{52}\right)$

(d)  $1 - \left(\frac{1}{51} + \frac{1}{52}\right)$

[GATE 2018 : 2 Marks]

- Q.7** A fruit seller sold a basket of fruits at 12.5% loss. Had he sold it for Rs. 108 more, he would have made a 10% gain. What is the loss in Rupees incurred by the fruit seller?



[GATE 2018 : 2 Marks]

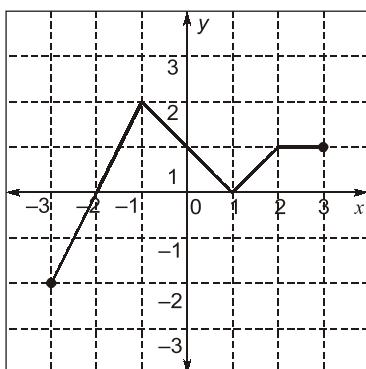
- Q.8** Each of the letters arranged as below represents a unique integer from 1 to 9. The letters are positioned in the figure such that  $(A \times B \times C)$ ,  $(B \times G \times E)$  and  $(D \times E \times F)$  are equal. Which integer among the following choices cannot be represented by the letters A, B, C, D, E, F or G?

A		D
B	G	E
C		F



[GATE 2018 : 2 Marks]

- Q.10** What of the following function(s) in an accurate description of the graph for the range(s) indicated?



- (a)  $y = 2x + 4$  for  $-3 \leq x \leq -1$   
 (b)  $y = |x - 1|$  for  $-1 \leq x \leq 2$   
 (c)  $y = |x| - 1$  for  $-1 \leq x \leq 2$   
 (d)  $y = 1$  for  $2 \leq x \leq 3$

(a) (i), (ii) and (iii) only    (b) (i), (ii) and (iv) only  
 (c) (i) and (iv) only                (d) (ii) and (iv) only

[GATE 2018 : 2 Marks]

**CIVIL ENGINEERING (Shift-2)**



- Q.12** "His face \_\_\_\_\_ with joy when the solution of the puzzle was \_\_\_\_\_ to him." The words that best fill the blanks in the above sentence are

- (a) shone, shown      (b) shone, shone  
 (c) shown, shone      (d) shown, shown






**Q.15**  $\underbrace{a + a + a + \dots + a}_{n \text{ times}} = a^2b$

$$\underbrace{b+b+b+\dots+b}_{m \text{ times}} = ab^2, \text{ where } a, b, n \text{ and } m$$

are natural numbers. What is the value of

$$\left( \underbrace{m + m + m + \dots + m}_{n \text{ times}} \right) \left( \underbrace{n + n + n + \dots + n}_{m \text{ times}} \right) ?$$

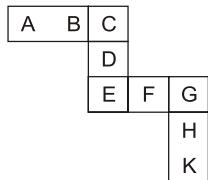
- (a)  $2a^2b^2$       (b)  $a^4b^4$   
 (c)  $ab(a + b)$       (d)  $a^2 + b^2$

- [GATE 2018 : 1 Mark]



- Q.17** Each of the letters in the figure below represents a unique integer from 1 to 9. The letters are positioned in the figure such that each of

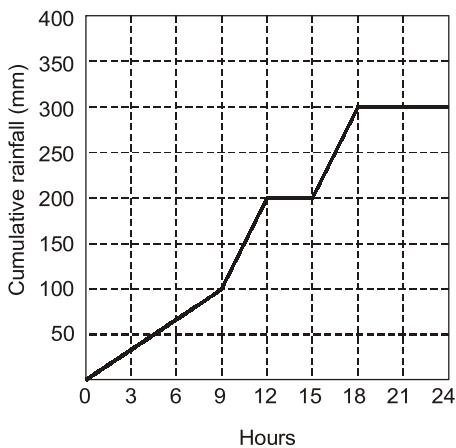
$(A+B+C)$ ,  $(C+D+E)$ ,  $(E+F+G)$  and  $(G+H+K)$  is equal to 13. Which integer does  $E$  represent?






[GATE 2018 : 2 Marks]

**Q.18** The annual average rainfall in a tropical city is 1000 mm. On a particular rainy day (24-hour period), the cumulative rainfall experienced by the city is shown in the graph. Over the 24-hour period, 50% of the rainfall falling on a rooftop, which had an obstruction-free area of  $50 \text{ m}^2$ , was harvested into a tank. What is the total volume of water collected in the tank in liters?






[GATE 2018 : 2 Marks]

**Q.19** Given that  $\frac{\log P}{y-z} = \frac{\log Q}{z-x} = \frac{\log R}{x-y} = 10$  for

$x \neq y \neq z$ , what is the value of the product  $PQR$ ?



[GATE 2018 : 2 Marks]

**Q.20** A faulty wall clock is known to gain 15 minutes every 24 hours. It is synchronized to the correct time at 9 AM on 11<sup>th</sup> July. What will be the correct time to the nearest minute when the clock shows 2 PM on 15<sup>th</sup> July of the same year?



[GATE 2018 : 2 Marks]

**COMPUTER SCIENCE & IT**

**Q.21** What is the missing number in the following sequence?



[GATE 2018 : 1 Mark]

**Q.22** "From where are they bringing their books?  
\_\_\_\_\_ bringing \_\_\_\_\_ books from  
      "

The words that best fill the blanks in the above sentence are

- (a) Their, they're, there
  - (b) They're, their, there
  - (c) There, their, they're
  - (d) They're, there, there

[GATE 2018 : 1 Mark]

**Q.23** What would be the smallest natural number which when divided either by 20 or by 42 or by 76 leaves a remainder of 7 in each case?



[GATE 2018 : 1 Mark]

**Q.24** “A \_\_\_\_\_ investigation can sometimes yield new facts, but typically organized ones are more successful.”

The word that best fills the blank in the above sentence is

- (a) meandering                  (b) timely  
(c) consistent                  (d) systematic

[GATE 2018 : 1 Mark]

**Q.25** The area of a square is  $d$ . What is the area of the circle which has the diagonal of the square as its diameter?

- (a)  $\pi d$       (b)  $\pi d^2$   
 (c)  $\frac{1}{4}\pi d^2$       (d)  $\frac{1}{2}\pi d$

[GATE 2018 : 1 Mark]

**Q.26** In  $pqr \neq 0$  and  $p^{-x} = \frac{1}{q}$ ,  $q^{-y} = \frac{1}{r}$ ,  $r^{-z} = \frac{1}{p}$ ,

what is the value of the product  $xyz'$

- (a)  $-1$       (b)  $\frac{1}{pqr}$   
 (c)  $1$       (d)  $pqr$

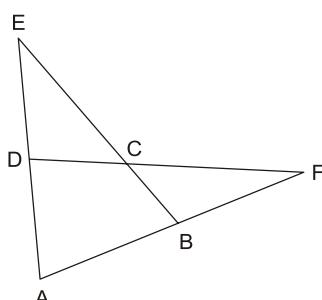
(a)  $\mu_q$   
[GATE 2018 : 2 Marks]

**Q.27** In appreciation of the social improvements completed in a town, a wealthy philanthropist decided to gift Rs 750 to each male senior citizen in the town and Rs 1000 to each female senior citizen. Altogether, there were 300 senior citizens eligible for this gift. However, only  $\frac{8}{9}$ th of the eligible men and  $\frac{2}{3}$ rd of the eligible women claimed the gift. How much money (in Rupees) did the philanthropist give away in total?



[GATE 2018 : 2 Marks]

**Q.28** In the figure below,  $\angle DEC + \angle BFC$  is equal to



- (a)  $\angle BCD - \angle BAD$     (b)  $\angle BAD + \angle BCF$   
 (c)  $\angle BAD + \angle BCD$     (d)  $\angle CBA + \angle ADC$

[GATE 2018 : 2 Marks]

**Q.29** A six sided unbiased die with four green faces and two red faces is rolled seven times. Which of the following combinations is the most likely outcome of the experiment?

- (a) Three green faces and four red faces.
  - (b) Four green faces and three red faces.
  - (c) Five green faces and two red faces.
  - (d) Six green faces and one red face.

[GATE 2018 : 2 Marks]

**Q.30** In a party, 60% of the invited guests are male and 40% are female. If 80% of the invited guests attended the party and if all the invited female guests attended, what would be the ratio of males to females among the attendees in the party?



[GATE 2018 : 2 Marks]

## **ELECTRONICS ENGINEERING**

**Q.31** What is the value of

$$1 + \frac{1}{4} + \frac{1}{16} + \frac{1}{64} + \frac{1}{256} + \dots ?$$

- (a) 2      (b)  $\frac{7}{4}$   
 (c)  $\frac{3}{2}$       (d)  $\frac{4}{3}$

[GATE 2018 : 1 Mark]

**Q.32** “By giving him the last \_\_\_\_\_ of the cake, you will ensure lasting \_\_\_\_\_ in our house today.”

The words that best fill the blanks in the above sentence are

- (a) peas, piece      (b) piece, peace  
(c) peace, piece      (d) peace, peas

[GATE 2018 : 1 Mark]

**Q.33** A 1.5 m tall person is standing at a distance of 3 m from a lamp post. The light from the lamp at the top of the post casts her shadow. The length of the shadow is twice her height. What is the height of the lamp post in meters?

[GATE 2018 : 1 Mark]

**Q.34** “Even though there is a vast scope for its \_\_\_\_\_, tourism has remained a/an \_\_\_\_\_ area.”

The words that best fill the blanks in the above sentence are

- (a) improvement, neglected
  - (b) rejection, approved
  - (c) fame, glum
  - (d) interest, disinterested

[GATE 2018 : 1 Mark]

**Q.35** If the number  $715\ ?423$  is divisible by 3 (? denotes the missing digit in the thousandths place), then the smallest whole number in the place of ? is \_\_\_\_\_.



[GATE 2018 : 1 Mark]

**Q.36** Two alloys A and B contain gold and copper in the ratios of 2 : 3 and 3 : 7 by mass, respectively. Equal masses of alloys A and B are melted to make an alloy C. The ratio of gold to copper in alloy C is \_\_\_\_\_.



[GATE 2018 : 2 Marks]

**Q.37** Leila aspires to buy a car worth Rs.10,00,000 after 5 years. What is the minimum amount in Rupees that she should deposit now in a bank which offers 10% annual rate of interest, if the interest was compounded annually?



[GATE 2018 : 2 Marks]

**Q.38** A cab was involved in a hit and run accident at night. You are given the following data about the cabs in the city and the accident.

- (i) 85% of cabs in the city are green and the remaining cabs are blue.
  - (ii) A witness identified the cab involved in the accident as blue.

- (iii) It is known that a witness can correctly identify the cab colour only 80% of the time.

Which of the following options is closest to the probability that the accident was caused by a blue cab?



[GATE 2018 : 2 Marks]

**Q.39** A coastal region with unparalleled beauty is home to many species of animals. It is dotted with coral reefs and unspoilt white sandy beaches. It has remained inaccessible to tourists due to poor connectivity and lack of accommodation. A company has spotted the opportunity and is planning to develop a luxury resort with helicopter service to the nearest major city airport. Environmentalists are upset that this would lead to the region becoming crowded and polluted like any other major beach resorts.

Which one of the following statements can be logically inferred from the information given in the above paragraph?

- (a) The culture and tradition of the local people will be influenced by the tourists.
  - (b) The region will become crowded and polluted due to tourism.
  - (c) The coral reefs are on the decline and could soon vanish.
  - (d) Helicopter connectivity would lead to an increase in tourists coming to the region.

[GATE 2018 : 2 Marks]

**Q.40** The Cricket Board has long recognized John's potential as a leader of the team. However, his on-field Temper has always been a matter of concern for them since his junior days. While this aggression has filled stadia with die-hard fans, it has taken a toll on his own batting. Until recently, it appeared that he found it difficult to convert his aggression into big scores. Over the past three seasons though, that picture of John has been replaced by a cerebral, calculative and successful batsman-captain.

After many years, it appears that the team has finally found a complete captain.

Which of the following statements can be logically inferred from the above paragraph?

- (i) Even as a junior cricketer, John was considered a good captain.
- (ii) Finding a complete captain is a challenge.
- (iii) Fans and the Cricket Board have differing views on what they want in a captain.
- (iv) Over the past three seasons John has accumulated big scores.
- (a) (i), (ii) and (iii) only
- (b) (iii) and (iv) only
- (c) (ii) and (iv) only
- (d) (i), (ii), (iii) and (v)

[GATE 2018 : 2 Marks]

## ELECTRICAL ENGINEERING

**Q.41** For what values of  $k$  given below is  $\frac{(k+2)^2}{k-3}$

an integer?

- (a) 4, 8, 18
- (b) 4, 10, 16
- (c) 4, 8, 28
- (d) 8, 26, 28

[GATE 2018 : 1 Mark]

**Q.42** “Since you have gone off the \_\_\_\_\_, the \_\_\_\_\_ sand is likely to damage the car”. The words that best fill the blanks in the above sentence are

- (a) course, coarse
- (b) course, course
- (c) coarse, course
- (d) coarse, coarse

[GATE 2018 : 1 Mark]

**Q.43** The three roots of the equation  $f(x) = 0$  are  $x = \{-2, 0, 3\}$ . What are the three values of  $x$  for which  $f(x - 3) = 0$ ?

- (a) -5, -3, 0
- (b) -2, 0, 3
- (c) 0, 6, 8
- (d) 1, 3, 6

[GATE 2018 : 1 Mark]

**Q.44** Functions,  $F(a, b)$  and  $G(a, b)$  are defined as follows:

$$F(a, b) = (a - b)^2 \text{ and } G(a, b) = |a - b|, \text{ where}$$

$|x|$  represents the absolute value of  $x$ . What would be the value of  $G(F(1, 3), G(1, 3))$ ?

- (a) 2
- (b) 4
- (c) 6
- (d) 36

[GATE 2018 : 1 Mark]

**Q.45** “A common misconception among writers is that sentence structure mirrors thought; the more \_\_\_\_\_ the structure, the more complicated the ideas”.

The word that best fills the blank in the above sentence is

- (a) detailed
- (b) simple
- (c) clear
- (d) convoluted

[GATE 2018 : 1 Mark]

**Q.46** In a certain code AMCF is written as EQGJ and NKUF is written as ROYJ. How will DHLP be written in the code?

- (a) RSTN
- (b) TLPH
- (c) HLPT
- (d) XSVR

[GATE 2018 : 2 Marks]

**Q.47** An e-mail password must contain three characters. The password has to contain one numeral from 0 to 9, one upper case and one lower case character from the English alphabet. How many distinct passwords are possible?

- (a) 6,760
- (b) 13,520
- (c) 40,560
- (d) 1,05,456

[GATE 2018 : 2 Marks]

**Q.48** A designer uses marbles of four different colours for his designs. The cost of each marble is the same, irrespective of the colour. The table below shows the percentage of marbles of each colour used in the current design. The cost of each marble increased by 25%. Therefore, the designer decided to reduce equal numbers of marbles of each colour to keep the total cost unchanged. What is the percentage of blue marbles in the new design?

Blue	Black	Red	Yellow
40%	25%	20%	15%

- (a) 35.75      (b) 40.25  
 (c) 43.75      (d) 46.25  
**[GATE 2018 : 2 Marks]**

**Q.49** P, Q, R and S crossed a lake in a boat that can hold a maximum of two persons, with only one set of oars. The following additional facts are available

- (i) The boat held two persons on each of the three forward trips across lake and one person on each of the two return trips.
  - (ii) P is unable to row when someone else is in the boat.
  - (iii) Q is unable to row with anyone else except R.
  - (iv) Each person rowed for at least one trip.
  - (v) Only one person can row during a trip.
- Who rowed twice?
- (a) P      (b) Q  
 (c) R      (d) S

**[GATE 2018 : 2 Marks]**

**Q.50** A class of twelve children has two more boys than girls. A group of three children are randomly picked from this class to accompany the teacher on a field trip. What is the probability that the group accompanying the teacher contains more girls than boys?

- (a) 0      (b)  $\frac{325}{864}$   
 (c)  $\frac{525}{864}$       (d)  $\frac{5}{12}$

**[GATE 2018 : 2 Marks]**

## INSTRUMENTATION ENGINEERING

**Q.51** For  $0 \leq x \leq 2\pi$ ,  $\sin x$  and  $\cos x$  are both decreasing functions in the interval \_\_\_\_\_.

- (a)  $\left(0, \frac{\pi}{2}\right)$       (b)  $\left(\frac{\pi}{2}, \pi\right)$   
 (c)  $\left(\pi, \frac{\pi}{2}\right)$       (d)  $\left(\frac{3\pi}{2}, 2\pi\right)$

**[GATE 2018 : 1 Mark]**

**Q.52** Arrange the following three-dimensional objects in the descending order of their volumes:

- (i) A cuboid with dimensions 10 cm, 8 cm and 6 cm
  - (ii) A cube of side 8 cm
  - (iii) A cylinder with base radius 7 cm and height 7 cm
  - (iv) A sphere of radius 7 cm
- (a) (i), (ii), (iii), (iv)      (b) (ii), (i), (iv), (iii)  
 (c) (iii), (ii), (i), (iv)      (d) (iv), (iii), (ii), (i)

**[GATE 2018 : 1 Mark]**

**Q.53** “In spite of being warned repeatedly, he failed to correct his \_\_\_\_\_ behaviour.” The word that best fills that blank in the above sentence is

- (a) rational      (b) reasonable  
 (c) errant      (d) good

**[GATE 2018 : 1 Mark]**

**Q.54** The area of an equilateral triangle is  $\sqrt{3}$ . What is the perimeter of the triangle?

- (a) 2      (b) 4  
 (c) 6      (d) 8

**[GATE 2018 : 1 Mark]**

**Q.55** “When she fell down the \_\_\_\_\_. She received many \_\_\_\_\_ but little help.” The words that best fill the blanks in the above sentence are

- (a) stairs, stares      (b) stairs, stairs  
 (c) stares, stairs      (d) stares, stares

**[GATE 2018 : 1 Mark]**

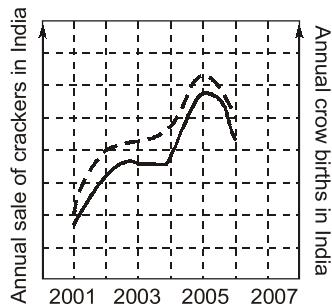
**Q.56** An automobile travels from city A to city B and returns to city A by the same route. The speed of the vehicle during the onward and return journeys were constant at 60 km/h and 90 km/h, respectively. What is the average speed in km/h for the entire journey?

- (a) 72      (b) 73  
 (c) 74      (d) 75

**[GATE 2018 : 2 Marks]**

**Q.57** In a detailed study of annual crow births in India, it was found that there was relatively no growth during the period 2002 to 2004 and a

sudden spike from 2004 to 2005. In another unrelated study, it was found that the revenue from cracker sales in India which remained fairly flat from 2002 to 2004, saw a sudden spike in 2005 before declining again in 2006. The solid line in the graph below refers to annual sale of crackers and the dashed line refers to the annual crow births in India. Choose the most appropriate inference from the above data.



- (a) There is a strong correlation between crow birth and cracker sales.
- (b) Cracker usage increases crow birth rate.
- (c) If cracker sale declines, crow birth will decline.
- (d) Increased birth rate of crows will cause an increase in the sale of crackers.

[GATE 2018 : 2 Marks]

Q.58 If  $x^2 + x - 1 = 0$  what is the value of  $x^4 + \frac{1}{x^4}$ ?

- (a) 1
- (b) 5
- (c) 7
- (d) 9

[GATE 2018 : 2 Marks]

Q.59 To pass a test, a candidate needs or answer at least 2 out of 3 questions correctly. A total of 6,30,000 candidates appeared for the test. Question A was correctly answered by 3,30,000 candidates. Question B was answered correctly by 2,50,000 candidates. Question C was answered correctly by 2,60,000 candidates. Both questions A and B were answered correctly by 1,00,000 candidates. Both questions B and C were answered correctly by 90,000

candidates. Both questions A and C were answered correctly by 80,000 candidates. If the number of students answering all questions correctly is the same as the number answering none, how many candidates failed to clear the test?

- (a) 30,000
- (b) 2,70,000
- (c) 3,90,000
- (d) 4,20,000

[GATE 2018 : 2 Marks]

Q.60 A set of 4 parallel lines intersect with another set of 5 parallel lines. How many parallelograms are formed?

- (a) 20
- (b) 48
- (c) 60
- (d) 72

[GATE 2018 : 2 Marks]

### MECHANICAL ENGINEERING (Shift-1)

Q.61 A rectangle becomes a square when its length and breadth are reduced by 10 m and 5 m, respectively. during this process, the rectangle loses 650 m<sup>2</sup> of area. What is the area of the original rectangle in square meters?

- (a) 1125
- (b) 2250
- (c) 2924
- (d) 4500

[GATE 2018 : 1 Mark]

Q.62 A number consists of two digits. The sum of the digits is 9. If 45 is subtracted from the number, its digits are interchanged. What is the number?

- (a) 63
- (b) 72
- (c) 81
- (d) 90

[GATE 2018 : 1 Mark]

Q.63 Seven machines take 7 minutes to make 7 identical toys. At the same rate, how many minutes would it take for 100 machines to make 100 toys?

- (a) 1
- (b) 7
- (c) 100
- (d) 700

[GATE 2018 : 1 Mark]

Q.64 "Her \_\_\_\_\_ should not be confused with miserliness; she is ever willing to assist those in need."

The word that best fills the blank in the above sentence is:

- (a) cleanliness      (b) punctuality  
(c) frugality      (d) greatness

[GATE 2018 : 1 Mark]

**Q.65** Going by the \_\_\_\_\_ that many hands make light work, the school \_\_\_\_\_ involved all the students in the task."

- (a) principle, principal  
(b) principal, principle  
(c) principle, principle  
(d) principal, principal

[GATE 2018 : 1 Mark]

**Q.66** Given that a and b are integers and  $a + a^2b^3$  is odd, which one of the following statements is correct?

- (a) a and b are both odd  
(b) a and b are both even  
(c) a is even and b is odd  
(d) a is odd and b is even

[GATE 2018 : 2 Marks]

**Q.67** Consider the following three statements:

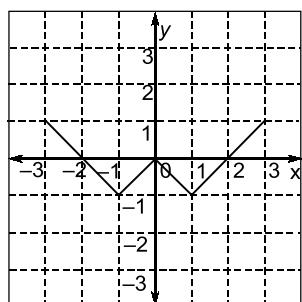
- (i) Some roses are red  
(ii) All red flowers fade quickly.  
(iii) Some roses fade quickly

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

- (a) If (i) is true and (ii) is false, then (iii) is false.  
(b) If (i) is true and (ii) is false, then (iii) is true.  
(c) If (i) and (ii) are true, then (iii) is true.  
(d) If (i) and (ii) are false, then (iii) is false.

[GATE 2018 : 2 Marks]

**Q.68** Which of the following functions describe the graph shown in the below figure.



(a)  $y = |x| + 1 - 2$       (b)  $y = |x| - 1 - 1$

(c)  $y = |x| + 1 - 1$       (d)  $y = |x - 1| - 1$

[GATE 2018 : 2 Marks]

**Q.69** For integers a, b and c, what would be the minimum and maximum values respectively of  $a + b + c$  if  $\log |a| + \log |b| + \log |c| = 0$

- (a) -3 and 3      (b) -1 and 1  
(c) -1 and 3      (d) 1 and 3

[GATE 2018 : 2 Marks]

**Q.70** From the time the front of a train enters a platform, it takes 25 seconds for the back of the train to leave the platform, while travelling at a constant speed of 54 km/h. At the same speed, it takes 14 seconds to pass a man running at 9 km/h in the same direction as the train. What is the length of the train and that of the platform in meters, respectively?

- (a) 210 and 140      (b) 162.5 and 187.5  
(c) 245 and 130      (d) 175 and 200

[GATE 2018 : 2 Marks]

## MECHANICAL ENGINEERING (Shift-2)

**Q.71** "The dress \_\_\_\_\_ her so well that they all immediately \_\_\_\_\_ her on her appearance."

The words that best fill the blanks in the above sentence are

- (a) complemented, complemented  
(b) complimented, complemented  
(c) complimented, complimented  
(d) complemented, complimented

[GATE 2018 : 1 Mark]

**Q.72** "The judge's standing in the legal community, though shaken by false allegations of wrongdoing, remained \_\_\_\_\_."

The word that best fill the blanks in the above sentence is

- (a) undiminished      (b) damaged  
(c) illegal      (d) uncertain

[GATE 2018 : 1 Mark]

**Q.73** Find the missing group of letters in the following series:

BC, FGH, LMNO,

- (a) UVWXYZ  
(c) STUVW

(b) TUVWX  
(d) RSTUV

[GATE 2018 : 1 Mark]

**Q.74** The perimeters of a circle, a square and an equilateral triangle are equal. Which one of the following statements is true?

- (a) The circle has the largest area
  - (b) The square has the largest area
  - (c) The equilateral triangle has the largest area
  - (d) All the three shapes have the same area.

[GATE 2018 : 1 Mark]

**Q.75** The value of the expression

$$\frac{1}{1+\log_u vw} + \frac{1}{1+\log_v wu} + \frac{1}{1+\log_w uv}$$

[GATE 2018 : 1 Mark]

**Q.76** An unbiased coin is tossed six times in a row and four different such trials are conducted. One trial implies six tosses of the coin. If  $H$  stands for head and  $T$  stands for tail, the following are the observations from the four trials:

- (1) HTHTHT (2) TTHHHT (3) HTTHHT (4) HHHT  
— — .

Which statement describing the last two coin tosses of the fourth trial has the highest probability of being correct?

  - (a) Two T will occur
  - (b) One H and one T will occur
  - (c) Two H will occur
  - (d) One H will be followed by one T

[GATE 2018 : 2 Marks]

**Q.77** A contract is to be completed in 52 days and 125 identical robots were employed, each operational for 7 hours a day. After 39 days, five-seventh of the work was completed. How

many additional robots would be required to complete the work on time, if each robot is now operational for 8 hours a day?



[GATE 2018 : 2 Marks]

**Q.78** Forty students watched films, A, B and C over a week. Each student watched either only one film or all three. Thirteen students watched film A, sixteen students watched film B and nineteen students watched film C. How many students watched all three films?



[GATE 2018 : 2 Marks]

**Q.79** A wire would enclose an area of  $1936 \text{ m}^2$ , if it is bent into a square. The wire is cut into two pieces. The longer piece is thrice as long as the shorter piece. The long and the short pieces are bent into a square and a circle, respectively. Which of the following choices is closest to the sum of the areas enclosed by the two pieces in square meters?



[GATE 2018 : 2 Marks]

**Q.80** A house has a number which needs to be identified. The following three statements are given that can help in identifying the house number.

1. If the house number is a multiple of 3, then it is a number from 50 to 59.
  2. If the house number is NOT a multiple of 4, then it is a number from 60 to 69.
  3. If the house number is NOT a multiple of 6, then it is a number from 70 to 79.

Which is the house number?



[GATE 2018 : 2 Marks]



## Answer Key

### Reasoning & Aptitude : GS, Paper-1 (ESE 2018)

1. (d)	2. (c)	3. (a)	4. (c)	5. (b)	6. (d)	7. (a)
8. (a)	9. (a)	10. (b)	11. (a)	12. (c)	13. (a)	14. (a)

### Reasoning & Aptitude : GATE 2018

1. (b)	2. (a)	3. (22,22)	4. (a)	5. (d)	6. (c)	7. (c)
8. (b)	9. (b)	10. (b)	11. (d)	12. (a)	13. (a)	14. (a)
15. (b)	16. (c)	17. (b)	18. (c)	19. (b)	20. (b)	21. (b)
22. (b)	23. (c)	24. (a)	25. (d)	26. (c)	27. (b)	28. (a)
29. (c)	30. (b)	31. (d)	32. (b)	33. (b)	34. (a)	35. (b)
36. (b)	37. (b)	38. (c)	39. (b)	40. (c)	41. (c)	42. (a)
43. (d)	44. (a)	45. (d)	46. (c)	47. (c)	48. (c)	49. (c)
50. (b)	51. (b)	52. (d)	53. (c)	54. (c)	55. (a)	56. (a)
57. (a)	58. (c)	59. (d)	60. (c)	61. (b)	62. (b)	63. (b)
64. (c)	65. (a)	66. (d)	67. (c)	68. (b)	69. (a)	70. (d)
71. (d)	72. (a)	73. (b)	74. (a)	75. (c)	76. (b)	77. (*)
78. (c)	79. (c)	80. (d)				

## Explanation

### Reasoning & Aptitude : GS, Paper-1 (ESE 2018)

1. (d)

Apply formula for  $\sum n^2$  to solve this question where  $\sum n^2 = \frac{n(n+1)(2n+1)}{6}$

$$\begin{aligned}\sum_{n=1}^{n=16} n^2 - \sum_{n=1}^{n=7} n^2 &= \frac{16(16+1)(32+1)}{6} - \frac{7(7+1)(14+1)}{6} \\ &= 1496 - 140 = 1356\end{aligned}$$

2. (c)

Use the formulae for sum and product of roots

Given equation is  $x^3 - 0.6x^2 - 1.84x + 1.344 = 0$

Let the roots of this equation be  $\alpha, \beta, \gamma$

$$\alpha + \beta + \gamma = -\frac{b}{a} = 0.6 \quad \dots(i)$$

$$\alpha\beta + \beta\gamma + \gamma\alpha = \frac{c}{a} = 1.84 \quad \dots(ii)$$

$$\alpha\beta\gamma = -\frac{d}{a} = 1.334 \quad \dots(iii)$$

If  $\alpha = 0.8$  then  $\beta + \gamma = 0.6 - 0.8 = -0.2$  which can be picked up as option since numerically greater value should have negative sign.

3. (a)

Use the formulae for sum and product of roots

Given equation is  $x^3 - 8x^2 + 37x - 50 = 0$

Let the roots of this equation be  $\alpha, \beta, \gamma$

With one root  $\alpha$  as  $3 + 4i$ ; the other root  $\beta$  is its conjugate i.e.  $3 - 4i$

$$\alpha + \beta + \gamma = -\frac{b}{a} = 8 \quad \dots(i) \text{ this gives the third root } = 8 - 6 = 2$$

4. (c)

Circumference of circle A =  $4\pi$  as its diameter = 4 cm; Area of circle A =  $4\pi$  or  $\frac{16}{4}\pi$

Circumference of circle B =  $5\pi$  as its diameter = 5 cm; Area of circle B =  $\left(\frac{5}{2}\right)^2\pi$  or  $\frac{25}{4}\pi$

Circumference of circle C = Circumference of circle A + Circumference of circle B =  $4\pi + 5\pi = 9\pi$

Diameter of circle C = 9 cm

$$\text{Area of circle } C = \left(\frac{9}{2}\right)^2 \pi = \frac{81}{4} \pi$$

Ratio of area of circle C w.r.t. area of circle A and that of circle B will be  $\frac{81}{16}, \frac{81}{25}$  or 5.0625 and 3.24.

5. (b)

Care is to be taken to meet the given conditions i.e. least number of 9s and or  $\sqrt{9}$  to be used and preference to be given to use of 9.

$$1 = \frac{9}{9}; \quad 2 = \frac{(9+9)}{9}; \quad 3 = \sqrt{9}; \quad 4 = \sqrt{9} + \frac{9}{9};$$

$$5 = 9 - \sqrt{9} - \frac{9}{9}; \quad 6 = 9 - \sqrt{9}; \quad 7 = 9 - \frac{9+9}{9}; \quad 8 = 9 - \frac{9}{9};$$

$$9 = 9; \quad 10 = 9 + \frac{9}{9}; \quad 11 = \frac{99}{9}; \quad 12 = 9 - \sqrt{9};$$

6. (d)

$$A + B = 100$$

$$C + D = A$$

$$B = 4D$$

$$D = C - 10 \text{ or } C = D + 10$$

$$A + 4D = 100$$

$$\text{and } D + D + 10 = A$$

$$\text{or } A = 2D + 10$$

Solving these 2 equations given  $D = 15$  and  $C = 25$

7. (a)

This question can be solved by just putting values given in various options.

8. (a)

This question can be solved by finding point of intersection of the 2 linear equations representing the constraints.

$$3x + y \leq 12$$

$$\text{and } 2x + 5y \leq 34 \text{ which is } x = 2 \text{ and } y = 6$$

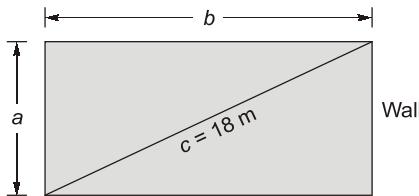
Putting this value in the given objective function i.e.  $z = 10x + 6y$ , we get maximum value of  $z = 56$ .

9. (a)

$$\text{Ignoring 1st term, } \frac{c}{s} = \frac{\sum n^3}{\sum n^2} = \frac{\frac{1}{6}n(n+1)^2}{\frac{2}{6}n(n+1)(2n+1)}$$

Putting,  $n = 8$  we get  $\frac{c}{s} = \frac{108}{17}$

10. (b)



Perimeter = 72 m

$$\Rightarrow (a + b) \times 2 = 72 \text{ m} \quad \dots \text{(i)}$$

$$a + b = 36 \text{ m}$$

$$a^2 + b^2 = c^2$$

$$\Rightarrow a^2 + b^2 = 18^2 = 324 \quad \dots \text{(ii)}$$

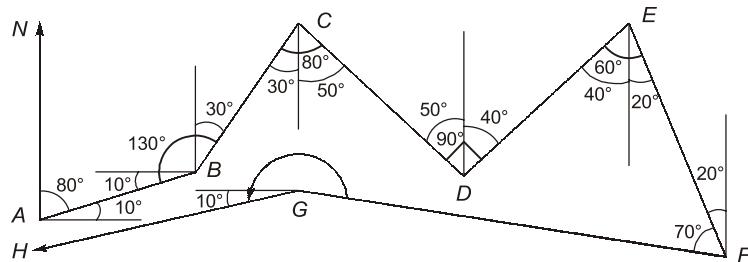
$$\text{Area} = a \times b$$

$$\text{we know, } (a + b)^2 = a^2 + b^2 + 2ab \quad \dots \text{(iii)}$$

$$\Rightarrow 36^2 = 324 + 2 \times (\text{Area})$$

$$\Rightarrow \text{Area} = 486 \text{ m}^2$$

11. (a)



$$\angle FGH = 190^\circ$$

**Note:** Line FG will be horizontal and not inclined as given in question.

12. (c)

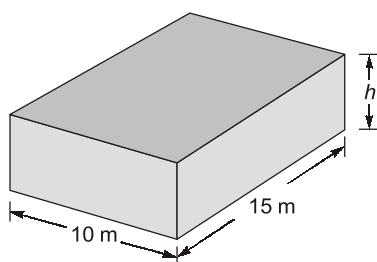
This question can be solved by finding point of intersection of the 2 linear equations representing the constraints

$$x_1 + 2x_2 \leq 200$$

$$\text{and } x_1 + x_2 \leq 150$$

$$\text{which is } x_1 = 100 \text{ and } x_2 = 50$$

13. (a)



Given information is

Area of floor + Area of ceiling = Sum of area of four walls

$$\Rightarrow (10 \times 15) + (10 \times 15) = (15 \times h \times 2) + (10 \times h \times 2)$$

$$\Rightarrow 300 = 50h$$

$$\Rightarrow h = 6 \text{ m}$$

$$\begin{aligned} \text{Volume of room} &= 10 \text{ m} \times 15 \text{ m} \times 6 \text{ m} \\ &= 900 \text{ m}^3 \end{aligned}$$

14. (a)

In the first case, total number of hours per week =  $3.5 \times 6 + 3 \times 5 = 36$  hours

In the second case, total number of hours =  $7.5 \times 5 = 37.5$  hours

With increased wages, the effective hourly rate is  $\frac{(36 \times 1.08)}{37.5} = 1.0368$  implying 3.68% as the increase in expected productivity.

## Reasoning & Aptitude : GATE 2018

1. (b)

$$32.4 = K(2\theta + 25) \quad \dots(i)$$

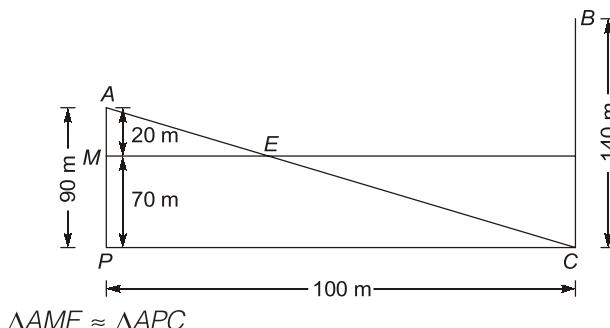
$$42 = K(5\theta + 30) \quad \dots(ii)$$

$$\theta = 1$$

2. (a)

- Brake is a device which is used for stopping or moving a vehicle.
- Break refers to a pause in work or during an activity.

3. (22.22)



$$\frac{AM}{AP} = \frac{ME}{PC}$$

$$\Rightarrow \frac{20}{90} = \frac{ME}{100}$$

$$\Rightarrow ME = 22.22$$

4. (a)

Unpredictable - Contrary word required

## 5. (d)

Using options (a) and (c) cannot be answer.

As Hema's age =  $2n + 5$ , where  $n$  is a natural number.

$$\left. \begin{array}{l} (2n + 5 \neq 14) \\ (2n + 5 \neq 18) \end{array} \right\} \text{for any natural number } n$$

(b) and (d) remains

Let us take Hema's age as option (d) which is 19.

So, Hari's age = 7 and Suresh age = 57

Verifies all condition "answer (d)"

**Alternate Method**

$$\text{Hema} = 2 \text{ Hari} + 5$$

$$\text{Suresh} = 10 \text{ Hari} - 13 = 3 \text{ Hema}$$

Solving equations.

$$\text{Hari} = 7$$

$$\text{Hema} = 19$$

$$\text{Suresh} = 57$$

## 6. (c)

Sum of series will be

$$\left(1 - \frac{1}{3}\right) + \left(\frac{1}{2} - \frac{1}{4}\right) + \left(\frac{1}{3} - \frac{1}{5}\right) + \dots + \left(\frac{1}{48} - \frac{1}{50}\right) + \left(\frac{1}{49} - \frac{1}{51}\right) + \left(\frac{1}{50} - \frac{1}{52}\right)$$

All like terms will cancel out and we will be left with

$$\left(1 + \frac{1}{2}\right) - \left(\frac{1}{51} + \frac{1}{52}\right)$$

## 7. (c)

$$12.5\%x + 10\%x = 108$$

$$x = \frac{108}{22.5}$$

$$\text{So loss} \quad 108 \times \frac{12.5}{22.5} = 60$$

## 8. (b)

$$A \times B \times C = B \times G \times E = D \times E \times F = 72$$

$$8 \times 9 \times 1 = 9 \times 2 \times 4 = 3 \times 4 \times 6 = 72$$

Any of  $A, B, C, D, E, F, G$  cannot be 5.

## 9. (b)

$$C \propto W^2$$

$$C = kW^2$$

$$\Rightarrow C = k(10)^2 = 100k = 1600 \Rightarrow k = 16$$

$$C_1 = k(4)^2 = 16k$$

$$C_2 = k(6)^2 = 36k$$

Now total cost =  $52k = 52 \times 16 = 832$

10. (b)

Put value and verify

- (i)  $y = 2x + 4$  is true in  $-3 \leq x \leq -1$

On putting  $x = -3, y = -2$  and  $x = -2, y = 0$  and  $x = -1, y = 2$

- (ii)  $y = |x - 1|$  is also true ( $x = -1, y = 2$ ), ( $x = 0, y = 1$ ) and ( $x = 1, y = 0$ )

- (iv)  $y = 1$  in  $(2 \leq x \leq 3)$  always true

(i), (ii) and (iv) are true.

11. (d)

$${}^9C_3 = \frac{9!}{6! \times 3!} = \frac{9 \times 8 \times 7}{6} = 84$$

12. (a)

Shone - It is past - participle and past form of shine.

Shown - To show means to reveal and point out something.

13. (a)

As  $a, b, c$  are non-negative integers and given  $\log a + \log b + \log c = 0$

$$\log(a \times b \times c) = \log 1$$

$$\Rightarrow a \times b \times c = 1$$

Which can be possible for simple values.

$$a = b = c = 1$$

$$\text{Hence } a + b + c = 1 + 1 + 1 = 3$$

#### Alternate Method:

Given,

$$\log a + \log b + \log c = 0$$

As we know  $\log 1 = 0$ , so each one of them can be zero if  $a = b = c = 1$

$$\log 1 + \log 1 + \log 1 = 0$$

By putting  $a = b = 1$  equation satisfies

$$a + b + c = 1 + 1 + 1 = 3$$

14. (a)

Innovative is similar to pioneer.

15. (b)

$$\underbrace{a + a + a + \dots + a}_{n \text{ times}} = na = a^2b$$

$$\Rightarrow n = ab$$

... (i)

$$\underbrace{b + b + b + \dots + b}_{m \text{ times}} = mb = b^2a$$

$$\Rightarrow m = ab \quad \dots(\text{ii})$$

$$\text{So, } \underbrace{[m+m+\dots+m]}_{n \text{ times}} \times \underbrace{[n+n+\dots+n]}_{m \text{ times}}$$

$$\text{i.e., } mn \times mn = (mn)^2$$

$$\text{from (i) and (ii)} \quad mn = a^2b^2$$

$$\text{So, result, } (mn)^2 = (a^2b^2) = a^4b^4$$

16. (c)

$$\text{Loss} = kd^2 \quad \text{For duration of 7 units}$$

$$4900 = k(7)^2 \Rightarrow k = 100$$

$$\text{Loss} = kd^2 \quad \text{For duration of 4 units}$$

$$= k(4)^2 \Rightarrow 16k = 1600$$

17. (b)

$$A + B + C = 13 \quad \dots(\text{i})$$

$$C + D + E = 13 \quad \dots(\text{ii})$$

$$E + F + G = 13 \quad \dots(\text{iii})$$

$$G + H + K = 13 \quad \dots(\text{iv})$$

Adding [(i) + (ii) + (iii) + (iv)]

$$A + B + C + D + E + F + G + H + K + (C + E + G) = 13 \times 4 = 52 \quad \dots(\text{v})$$

Also A, B, C, D, E, F, G, H & K represents natural numbers from (1 to 9)

$$\text{There sum will be given by } \frac{n(n+1)}{2} = 45$$

Substituting (iv)  $C + E + G = 7$

$\dots(\text{vi})$

Only possibly for sum 7 will be (1, 2, 4)

Now, C + E cannot be (1 and 2)

As eq. (ii) is  $C + D + E = 13$

Now, D will become equal to 10 (which is not possible because digits 1 to 9 given)

$C \& E$  can be either  $\begin{bmatrix} (1, 4) \\ (2, 4) \end{bmatrix} \quad \dots(\text{vii})$

If  $C = H$  from eq. (vi)  $C + E + G = 7$

Now,  $E + G = 3$

(Not possible in eq. (iii)  $E + F + G = 10$ ,  $F = 10$  which is not possible)

So from eq. (vii) only possibility remains is  $E = H$ .

18. (c)

Cumulative rainfall = 300 mm

$$50\% \text{ of rainfall} = 300 \times \frac{50}{100} = 150 \text{ mm}$$

$$\text{Area} = 50 \text{ m}^2$$

$$\Rightarrow \text{Volume stored in tank} = 150 \times 10^{-3} \times 50 \text{ m}^3 \\ \text{or} \\ = 7500 \text{ l}$$

19. (b)

$$\begin{aligned}\log P &= 10(y - z) \\ \log Q &= 10(z - x) \\ \log R &= 10(x - y) \\ \log P + \log Q + \log R &= 0 \\ \log(PQR) &= \log 1 \\ PQR &= 1\end{aligned}$$

20. (b)

9 Am of 11 July of 2 PM on 15<sup>th</sup> July = 101 hours

$$\left(24 + \frac{15}{60}\right) \text{ hours of incorrect clock} = 24 \text{ hours of correct clock}$$

$$\left(24 + \frac{15}{60}\right) \text{ hours of IC} = 24 \text{ hours of correct clock}$$

$$1 \text{ hour of IC} = \frac{96}{97} \text{ hours of correct clock}$$

$$\begin{aligned}101 \text{ hour of IC} &= \frac{96}{97} \times 101 \text{ hours of correct clock} \\ &= 99.958 \text{ hours of correct clock} \\ &= 99 \text{ hours} + 0.95876 \times 60 \text{ minutes of correct clock} \\ &= 99 \text{ hours} + 57.525 \text{ minutes} \\ &= 99 \text{ hours and approx 58 minutes}\end{aligned}$$

So, correct time will be

2 PM, 11<sup>th</sup> July + (99 hours and 58 minutes) = 12 : 58 PM on 15<sup>th</sup> July

21. (b)

$$\begin{array}{ccccccccccccc} 2 & & 12 & & 60 & & 240 & & 720 & & 1440 & & 1440 & & 0 \\ & \searrow & \\ & (2 \times 6) & (12 \times 5) & (60 \times 4) & (240 \times 3) & (720 \times 2) & (1440 \times 1) & (1440 \times 0) & & & & & & & \end{array}$$

So, 1440 must be answer.

22. (b)

They're used for pointing group.

Their is pointing people.

There is used for place.

23. (c)

Number is divided by either by 20 or 42 or by 76

 $K \times \text{LCM}(20, 42, 76) + \text{constant difference}$ 

$$= 7890 K + 7 \quad (K \text{ is natural number})$$

Least number will be  $7890 + 7 = 7897$ .

24. (a)

Meandering : wandering aimlessly/indirect.

25. (d)

Area of square =  $d$

Side one side of square =  $\sqrt{d}$

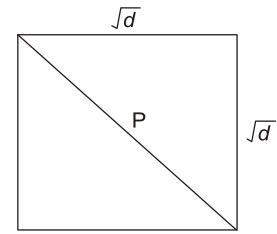
Diagonal of square =  $\sqrt{d+d} = \sqrt{2d}$

Area of circle =  $\pi r^2$

$$= \pi \left( \frac{\sqrt{2d}}{2} \right)^2$$

$$= \pi \frac{d}{2}$$

$$= \frac{1}{2} \pi d$$



26. (c)

$$p^{-x} = \frac{1}{q}, \quad q^{-y} = \frac{1}{r}, \quad r^{-z} = \frac{1}{p}$$

Put

$$x = 1, \quad y = 1, \quad z = 1$$

$$p^{-1} = \frac{1}{q}, \quad q^{-1} = \frac{1}{r}, \quad r^{-1} = \frac{1}{p}$$

i.e.

$$\frac{1}{p} = \frac{1}{q}, \quad \frac{1}{q} = \frac{1}{r}, \quad \frac{1}{r} = \frac{1}{p}$$

Which is true i.e.

$$\frac{1}{p} = \frac{1}{q} = \frac{1}{r}$$

So,

$$xyz = 1$$

**Alternate Solution:**

$$p^x = q$$

$$q^y = r$$

$$r^z = p$$

$$x \log p = \log q$$

$$y \log q = \log r$$

$$z \log r = \log p$$

$$x = \frac{\log q}{y p}$$

$$y = \frac{y r}{\log q}$$

$$z = \frac{\log p}{y r}$$

$$x \times y \times z = 1$$

27. (b)

$$\text{Male} + \text{Female} = 300$$

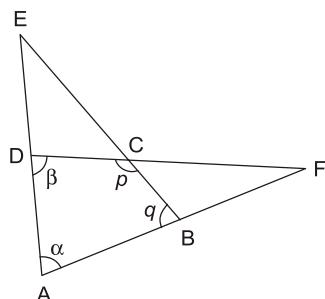
... (i)

$$\begin{aligned}\text{Total money} &= \frac{8}{9}M \times 750 + \frac{2}{3}F \times 1000 \\ &= \frac{6000}{9}M + \frac{6000}{9}F \\ &= \frac{6000}{9}(M+F)\end{aligned}$$

From equation (i)

$$\text{Total money} = \frac{6000}{9}(300) = 2,00,000$$

28. (a)



$$\angle E + \angle F = ?$$

$$\alpha + q + E = 180$$

... (i)

$$\alpha + \beta + F = 180$$

... (ii)

$$\alpha + \beta + p + q = 360$$

... (iii)

Equation (i) + (ii) = (iii)

$$\alpha + q + E + \alpha + \beta + F = \alpha + \beta + p + q$$

$$E + F = p - \alpha$$

29. (c)

Four green, two red face

$$P(G) = \frac{4}{6} = \frac{2}{3}$$

$$q(R) = \frac{1}{3}$$

$$n = 7$$

$$\text{Option (1)}, \quad P(G = 3) = {}^7C_3 \left(\frac{2}{3}\right)^3 \left(\frac{1}{4}\right)^4 = \frac{35 \times 2^3}{(3)^7} = \frac{35 \times 2^3}{(3)^7}$$

$$(2), \quad P(G = 4) = {}^7C_4 \times \left(\frac{2}{3}\right)^4 \times \left(\frac{1}{3}\right)^3 = \frac{35 \times 2^4}{(3)^7} = \frac{35 \times 2^4}{(3)^7}$$

$$(3), \quad P(G = 5) = {}^7C_5 \times \left(\frac{2}{3}\right)^5 \times \left(\frac{1}{3}\right)^2 = \frac{21 \times 2^5}{(3)^7} = \frac{42 \times 2^4}{(3)^7}$$

$$(4), \quad P(G = 6) = {}^7C_6 \times \left(\frac{2}{3}\right)^6 \times \left(\frac{1}{3}\right)^1 = \frac{7 \times 2^6}{(3)^7} = \frac{28 \times 2^4}{(3)^7}$$

Option 3 is maximum value.

So, five green faces and two red faces.

30. (b)

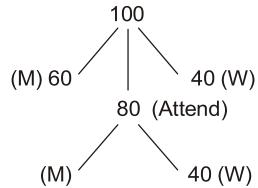
Let total number of people are 100.

So, M must be  $80 - 40 = 40$

Ratio of male to female

$40 : 40$

$1 : 1$



31. (d)

This is a infinite Geometric progression with first term  $(a) = 1$

and common ratio  $(r) = \frac{1}{4}$

The formula for finding the sum of infinite G.P is given by  $\frac{a}{1-r}$

$$\frac{1}{1-\frac{1}{4}} = \frac{1}{3/4} = \frac{4}{3}$$

32. (b)

- Peace is a situation when there is no war or fighting and things are calm and quiet.
- Piece is a part of something.

33. (b)

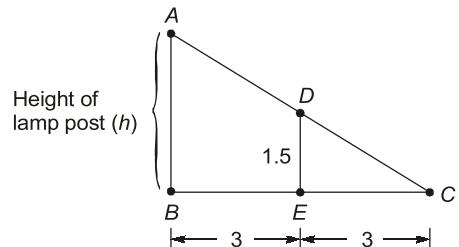
$ABC$  and  $DEC$  are similar triangles,

$$\frac{AB}{DE} = \frac{BC}{EC}$$

$$\frac{h}{1.5} = \frac{6}{3}$$

$$\frac{h}{1.5} = 2$$

$$h = 3 \text{ meter}$$



34. (a)

Even though there is a vast scope for its improvement, tourism has remained a neglected area.

35. (b)

715 ? 423

We know that the divisibility rule for 3 is sum of all digits should be divisible by 3.

$$7 + 1 + 5 + 4 + 2 + 3 = 22$$

So, the next number after sum 22 which are divisible by 3 are 24, 27, 30 etc.

$$\text{So, } 22 + 2 = 24$$

$$22 + 5 = 27$$

But according to minimum condition 2 is right answer.

**36. (b)**

Alloy A contains Gold and Copper.

Let  $2x : 3x$

Which is same as  $4x : 6x$

Alloy B contains Copper  $3x : 7x$

As masses of Alloy A is equal to Alloy of mass B.

i.e.

Gold      Copper

$$\text{i.e. Alloy 1} \quad 4x : 6x \Rightarrow 10x \text{ (mass)}$$

$$\text{Alloy 2} \quad 3x : 7x \Rightarrow 10x \text{ (mass)}$$

$\therefore$  Ratio of Gold to Copper is,

$$\frac{\text{Gold from alloy 1} + \text{Gold of alloy 2}}{\text{Copper from alloy 1} + \text{Copper of alloy 2}} = \frac{4x+3x}{6x+7x} = \frac{7x}{13x} = \frac{7}{13}$$

**37. (b)**

$$A = P \left(1 + \frac{r}{100}\right)^n$$

$$1000000 = P \left(1 + \frac{10}{100}\right)^5$$

$$1000000 = P \left(\frac{11}{10}\right)^5$$

$$1000000 = P \left(\frac{11^5}{10^5}\right)$$

$$P = 1000000 \times \frac{10^5}{11^5} = \frac{10^{11}}{11^5} = 620921.323 \approx 621000$$

**38. (c)**

Let us suppose total number of cabs are 100.

85 are green and rest 15 are blue.

Witness is correct 80% of times in identifying.

Total number of blue cabs identified correctly.

$$(80\% \text{ of } 15) \Rightarrow \frac{80}{100} \times 15 = 12$$

Witness is incorrect 20% of times

That incorrectness should happen for green

$$(20\% \text{ of } 85) \Rightarrow \frac{20}{100} \times 85 = 17$$

Witness identifies  $12 + 17 = 29$  Cabs in total.

$$\text{Probability} = \frac{\text{Required}}{\text{Total}} = \frac{12}{12+17} = \frac{12}{29} = 41.3\% \approx 41\%$$

**39. (b)**

(a) is beyond the scope of given information option (c) can also be discarded on the same grounds. The argument deals with the coastal region becoming crowded and polluted because of the upcoming luxury resort. Option (b) precisely underlines the theme of the para.

**40. (c)**

Statement (i) is not true as nowhere it is mentioned that John was a captain in junior team. The introductory line emphasizes on the board recognizing John's potential (Latent quality/possibility) as leader of the team.

Statement (iii) also manipulates the facts mentioned in the argument.

The 3<sup>rd</sup> statement of the argument while this aggression has filled stadia with die-hard fans does not indicate fans expectations from John as a caption.

Statement (ii) The concluding statement of the para suggests that finding a completer captain is a

tough task as it took John many years to become a successful and calculative batsman - captain.

Statement (iv) can be explicitly concluded from the last 4 lines of the para.

**41. (c)**

$$\left. \begin{array}{l} K = 4 \Rightarrow \frac{(4+2)^2}{4-3} = 36 \\ K = 8 \Rightarrow \frac{(8+2)^2}{8-3} = \frac{100}{5} = 20 \\ K = 28 \Rightarrow \frac{(28+2)^2}{28-3} = \frac{900}{25} = 36 \end{array} \right\} \text{Integers}$$

So, option (c)  $\Rightarrow 4, 8, 28$

**42. (a)**

- Going off the course - not following the intended route.
- Coarse sand - harsh in texture

**43. (d)**

$$\begin{aligned} f(x) &= 0 \\ x &= \{-2, 0, 3\} \\ f(-2) &= 0, f(0) = 0, f(3) = 0 \\ f(x-3) &= 0 \end{aligned}$$

1, 3, 6

$$\begin{aligned} f(1-3) &= f(-2) = 0 \\ f(3-3) &= f(0) = 0 \\ f(6-3) &= f(3) = 0 \end{aligned}$$

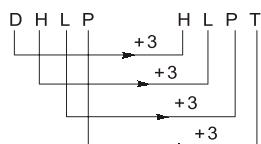
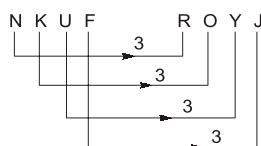
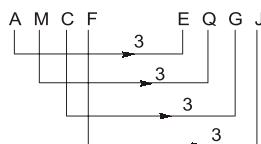
**44. (a)**

$$F(a, b) = (a - b)^2$$

$$G(a, b) = |a - b|$$

$$\begin{aligned}
 G(F(1, 3) G(1, 3)) &= G((1 - 3)^2, |1 - 3|) \\
 &= G(4, 2) \\
 &= |4 - 2| = 2
 \end{aligned}$$

46. (c)



47. (c)

Numeral can be selected in 10 ways (0 - 9).

Each of upper case and lower case alphabets can be done in 26 ways each.

All three chosen (1 numeral and 2 alphabets) can be arranged in 3! ways.

So, total number of ways will be  $10 \times 26 \times 26 \times 3! = 40560$  ways

48. (c)

Assume number of marbles = 100

Cost of marbles increased = 25

New cost = Rs. 125

$$\text{Number of marbles in Rs. 100} = \frac{100}{125} \times 100 = 80 \text{ marbles}$$

$$\text{now, } (40 - x) + (25 - x) + (20 - x) + (15 - x) = 80$$

$$100 - 4x = 80$$

$$x = 5$$

$$\% \text{ blue marbles in new design} = \frac{(40 - 5)}{80} \times 100 = 35 \times \frac{5}{4} = 43.75\%$$

49. (c)

(i) Q and R moves first.

In forward trip Q rowed.

In return trip R rowed.

(ii) P and R moves in second trip

R rowed in forward trip

P rowed in return trip

(iii) P and S moves in last trip

S rowed in forward trip.

R rowed twice.

50. (b)

$$B + G = 12$$

$$B = G + 2$$

$\Rightarrow$

$$B = 7$$

$$G = 5$$

7 Boys and 5 Girls are there is 12 students. Among 3 students selected boys have to be more than girls.

So only two cases arise.

$G$ 2 3	$B$ 1 0
---------------	---------------

As case (i)       $GGG \rightarrow \frac{5}{12} \times \frac{5}{12} \times \frac{5}{12}$

case (ii)       $\begin{matrix} G & G & B \\ G & B & G \\ B & G & G \end{matrix} \rightarrow 3 \times \frac{5}{12} \times \frac{5}{12} \times \frac{7}{12}$

$$\text{Required prob.} = \left(\frac{5}{12}\right)^3 + 3\left(\frac{5}{12}\right)^2 \times \left(\frac{7}{12}\right) = \frac{650}{1728} = \frac{325}{864} = 0.3761574 \approx 0.376$$

Alternative Method :

There are 7B and 5G

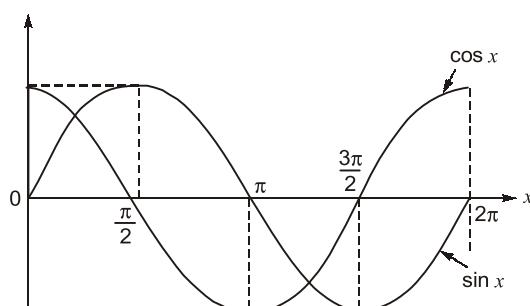
Through as question is stating 3 students are taken at random.

This can be a possible way to approach it.

$$\begin{aligned} & \begin{matrix} G & B \\ 2 & 1 \\ 3 & 0 \end{matrix} \\ &= \frac{^5C_2 + ^7C_1 + ^5C_3 + ^7C_0}{^{12}C_3} \end{aligned}$$

$$= \frac{10 \times 7 + 10 \times 1}{12 \times 10 \times 11} = \frac{80}{220} = \frac{4}{11} \approx 0.3636$$

51. (b)



From the curve it is clear that  $\sin x$  and  $\cos x$  both are decreasing in the interval  $\left(\frac{\pi}{2}, \pi\right)$ .

52. (d)

- (i) Cuboid volume =  $8 \times 10 \times 6 = 480 \text{ cm}^3$
- (ii) Cube volume =  $8 \times 8 \times 8 = 512 \text{ cm}^3$
- (iii) Cylinder volume =  $\pi r^2 h = \frac{22}{7} \times 7 \times 7 \times 7 = 1078 \text{ cm}^3$
- (iv) Sphere volume =  $\frac{4}{3}\pi r^3 = \frac{4}{3}\pi \times (7)^3 = 1436.75 \text{ cm}^3$

Hence, the descending order of their volumes is

(iv), (iii), (ii), (i).

53. (c)

Errant means misbehaving, exhibiting inappropriate behavior / offending conduct.

54. (c)

Area of equilateral triangle =  $\sqrt{3}$

$$\frac{\sqrt{3}}{4}a^2 = \sqrt{3}$$

$$a^2 = 4$$

$$a = 2$$

$$\text{Perimeter} = 3a = 3 \times 2 = 6$$

55. (a)

Stairs - A construction designed to bridge a large vertical distance by dividing it into smaller vertical distances, called steps

Stares - To look at someone for a long time

56. (a)

Total distance =  $x$

(Onward journey)  $S_1 = 60 \text{ km/h}$

(Return journey)  $S_2 = 90 \text{ km/h}$

$$\text{Average speed} = \frac{\text{Total distance}}{\text{Total time}} = \frac{x+x}{\frac{x}{60} + \frac{x}{90}} = \frac{2x}{x \left[ \frac{3+2}{90 \times 2} \right]}$$

$$= \frac{2 \times 90 \times 2}{5} = 72 \text{ km/h}$$

58. (c)

$$x^2 + x = 1$$

$$x(x + 1) = 1$$

$$x + 1 = \frac{1}{x}$$

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

Squaring above equation,

$$x^2 + \frac{1}{x^2} - 2 = (+1)$$

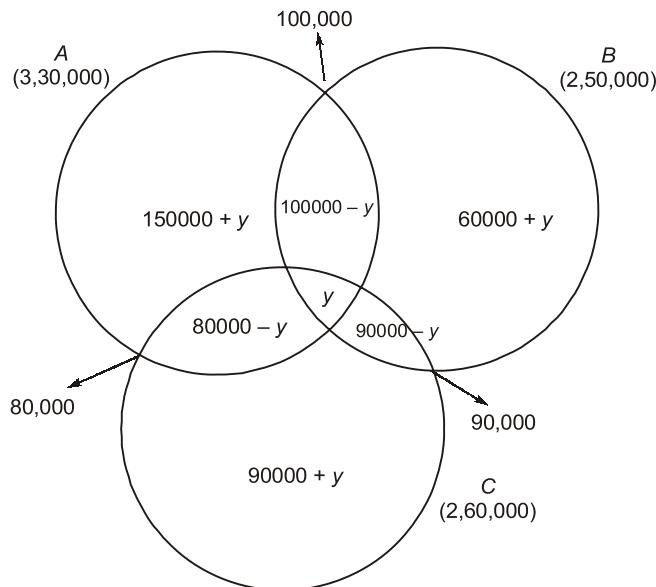
$$x^2 + \frac{1}{x^2} = 3$$

Squaring above equation,

$$x^4 + \frac{1}{x^4} + 2 = 9$$

$$x^4 + \frac{1}{x^4} = 7$$

59. (d)



$$6,30,000 = 2y + 1,50,000 + 100,000 + 80,000 + 60,000 + 90,000 + 90,000$$

$$6,30,000 - 5,70,000 = 2y$$

$$y = 30000$$

$$\begin{aligned} \text{Students who failed to clear the test} &= 150,000 + 60,000 + 90,000 + 4y \\ &= 300,000 + 4 \times 30,000 \end{aligned}$$

$$\text{Students who failed to clear the test} = 420,000$$

60. (c)

$$\begin{aligned} \text{Number of parallelogram} &= {}^4C_2 \times {}^5C_2 \\ &= 6 \times 10 = 60 \end{aligned}$$

61. (b)

Rectangle initial length is  $l$  and breath is  $b$ . If  $l$  is reduced by 10 m and breath reduced by 5 m then it becomes square.

So,  $I - 10 = b - 5$

$$I - b = 5$$

Given, initial,  $I \times b = A$

... (i)

2nd condition,

$$(I - 10)(b - 5) = A - 650$$

$$Ib - 10b - 5I + 50 = A - 650$$

$$A - 10b - 5I = A - 700$$

$$10b + 5I = 700$$

$$10b + 5(b + 5) = 700$$

$$15b + 25 = 700$$

$$15b = 700 - 25$$

$$15b = 675 \Rightarrow b = 45 \text{ m}$$

$$l = 45 + 5 = 50 \text{ m}$$

Area of original rectangle =  $45 \times 50 = 2250 \text{ m}^2$

**62. (b)**

Let two digit no is  $xy$

$$x + y = 9$$

$$10x + y - 45 = 10y + x$$

or

$$x - 5 = y$$

$$x - y = 5$$

... (i)

... (ii)

Adding (i) and (ii)

$$x = 7$$

Subtracting (i) and (ii)

$$y = 2$$

Therefore the number is 72.

**63. (b)**

7 machine  $\rightarrow$  7 toys  $\rightarrow$  7 minutes

1 machine  $\rightarrow$  1 toy  $\rightarrow$  7 minutes

Because one machine takes 7 minute for making 1 toy.

So, 100 machines will take 7 minute for making 100 toys.

**64. (c)**

Frugality is synonymous to miserliness

**65. (a)**

Principle - A moral rule / belief

Principal - The person in-charge of an educational institution.

**66. (d)**

Given,  $a$  and  $b$  are integers

$a + a^2b^3$  is odd

$a(1 + ab^3)$  is odd

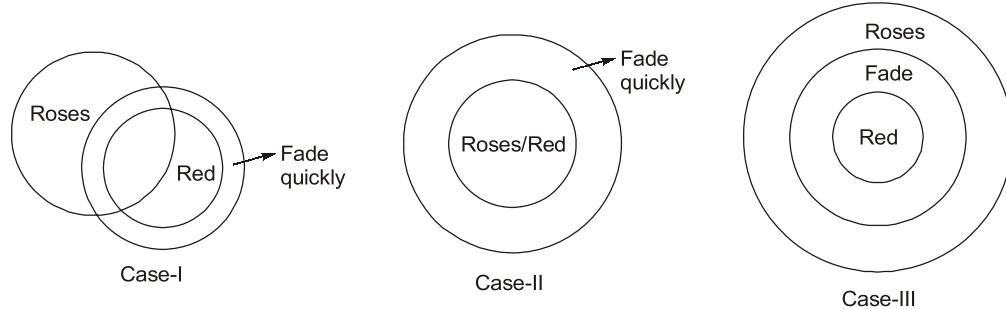
Multiplication of odd and odd number is odd.

So,  $a$  is odd and  $1 + ab^3$  is odd.

$1 + ab^3$  is odd, so  $ab^3$  will be even.

Because  $a$  is odd so for  $ab^3$  to be even  $b$  must be even.  
So,  $a$  is odd and  $b$  is even.

67. (c)



68. (b)

$x$	0	$\pm 1$	$\pm 2$
$y$	0	-1	0

Solving through options,

(a)  $y = ||x| + 1| - 2$

Putting,  $x = 1$

$$y = 2 - 2 = 0 \quad \text{Not satisfied}$$

(b)  $y = ||x| - 1| - 1$

Putting,  $x = 1$

$$y = |1 - 1| - 1$$

$$y = -1 \quad \text{Satisfied}$$

(c)  $y = ||x| + 1| - 1$

Putting,  $x = 1$

$$y = |1 + 1| - 1$$

$$y = -1 \quad \text{Not satisfied}$$

(d)  $y = ||x - 1| - 1|$

Putting,  $x = 1$

$$y = ||1 - 1| - 1|$$

$$y = |0 - 1|$$

$$y = 1 \quad \text{Not satisfied}$$

69. (a)

$$\log|a| + \log|b| + \log|c| = 0$$

It is possible only,

if  $|a|, |b|$  and  $|c|$  all are equal to 1.

So,  $a, b, c$  may be  $\pm 1, \pm 1, \pm 1$  respectively.]

For minimum value all three will be negative.

So, minimum value = -3

For maximum value all three will be positive,

So, maximum value = +3.

70. (d)

Train speed = 54 km/h

Time = 25 sec for travelling length of train and length of platform

Man speed = 9 km/h

Speed of train to man = 45 km/h

Time = 14 sec

So, length of train = time × speed

$$= 14 \times 45 \times \frac{5}{18}$$

Length of train =  $35 \times 5$  m = 175 m

Length of platform + length of train = speed × time

$$= 54 \times \frac{5}{18} \times 25 = 15 \times 25 = 375 \text{ m}$$

Length of platform =  $375 - 175 = 200$  m

71. (d)

Complemented - Complete

Complimented - Remark of admiration

72. (a)

Undiminished - Unambitious / unskilled.

73. (b)

BC, FGH, LMNO, TUVWX

74. (a)

$$\begin{aligned} P_C &= P_S = P_T \\ \pi D &= 4a = 3s \end{aligned}$$

now, Area of circle =  $\frac{\pi}{4}D^2$  [ $\pi D = 4a$ ]

Area of square =  $a^2$

$$= \frac{\pi^2 D^2}{16} = \frac{\pi^2}{16} D^2$$

$$\text{Area of triangle} = \frac{\sqrt{3}}{4}s^2 = \frac{\sqrt{3}}{4} \left( \frac{\pi D}{3} \right)^2 \quad \{ \because \pi D = 3s \}$$

$$= \frac{(\sqrt{3})\pi^2 D^2}{36}$$

$$\therefore \frac{\pi}{4} > \frac{\pi^2}{16} > \frac{\sqrt{3}\pi^2}{36}$$

So, circle has the largest area.

75. (c)

$$\begin{aligned}
 & \frac{1}{1+\log_u vw} + \frac{1}{1+\log_v wu} + \frac{1}{1+\log_w uv} \\
 &= \frac{1}{\log_u u + \log_u vw} + \frac{1}{\log_v v + \log_v wu} + \frac{1}{\log_w w + \log_w uv} \\
 &= \frac{1}{\log_u uvw} + \frac{1}{\log_v uvw} + \frac{1}{\log_w uvw} \\
 &= \log_{uvw} u + \log_{uvw} v + \log_{uvw} w = \log_{uvw} uvw = 1
 \end{aligned}$$

76. (b)

For remaining two trials highest probability is, that

H H

H T

T H

T T

Out of 4 possible cases one head and T will be have the highest probability of occurrence.

77. (\*) (This question is to be challenged)

$$125 \times 7 \times 39 = \frac{5}{7}W$$

$$W = 47775 \text{ Robot hrs.}$$

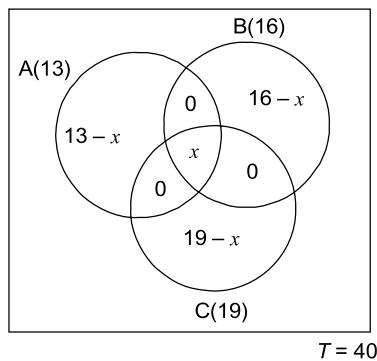
$$\begin{aligned}
 \text{Left work} &= 47775 - 125 \times 7 \times 39 \\
 &= 13650 \text{ Robot hrs.}
 \end{aligned}$$

$$13 \times x \times 8 = 13650$$

$$x = 131.25$$

$$\text{Addition robot required} = 131.25 - 125 = 6.25 \approx 7$$

78. (c)



$$\text{Total student} = 40$$

$$13 - x + 16 - x + 19 - x + x = 40$$

Students watches all three movies,

$$x = 4$$

79. (c)

$$\text{Area} = 1936 \text{ m}^2$$

$$a^2 = 1936 \text{ m}^2$$

$$a = 44 \text{ m}$$

$$\text{Length of wire} = 4a$$

$$= 4 \times 44 = 176 \text{ m}$$

Now, part-1 length =  $3 \times 44 = 132 \text{ m}$   
 part-2 length =  $1 \times 44 = 44 \text{ m}$

Long wire is bent in square,

So,  $4a = 132$

$$a = 33 \text{ m}$$

$$\text{Area of square} = 33^2 = 1089 \text{ m}^2$$

Now, small wire is bent in circle,

So,  $\pi D = 44$

$$\frac{22}{7} \times D = 44$$

$$D = 14 \text{ m}$$

$$\text{Area of circle} = \frac{\pi}{4} \times D^2 = \frac{\pi}{4} \times 14^2$$

$$= 153.94 \text{ m}^2$$

$$\begin{aligned}\text{Total area enclosed} &= \text{Area of square} + \text{Area of circle} \\ &= 1089 + 153.94 \\ &= 1242.97 \approx 1243 \text{ m}^2\end{aligned}$$

80. (d)

By condition 1  $\Rightarrow$

Possible numbers are  $\rightarrow 51, 54, 57$

By condition 2  $\Rightarrow$

Possible numbers are  $\rightarrow 61, 62, 63, 65, 66, 67, 69$

By condition 3  $\Rightarrow$

Possible numbers are  $\rightarrow 70, 71, 73, 74, 75, 76, 77, 79$

$\Rightarrow 66$  is multiple of 3, it does not belong to 50 to 59. So it is not the answer.

$\Rightarrow 54$  is multiple of 3 and 6. But it is not the multiple of 4. So according to second condition it cannot be the answer.

$\Rightarrow$  Because 65 is not the multiple of 6. So condition 3 is not satisfied. So it cannot be the answer.

$\Rightarrow$  For 76. All three conditions are satisfied. So it is the answer.

