# XAT 2020

## Quant

**48.** Nalini has received a total of 600 WhatsApp messages from four friends Anita, Bina, Chaitra and Divya. Bina and Divya have respectively sent 30% and 20% of these messages, while Anita has sent an equal number of messages as Chaitra. Moreover, Nalini finds that of Anita's, Bina's, Chaitra's and Divya's messages, 60%, 40%, 80% and 50% respectively are jokes. What percentage of the jokes, received by Nalini, have been sent neither by Divya nor by Bina?

**A** 65.12

**B** 38.6

**C** 61.4

**D** 57

**E** 34.88

**49.** If $A \odot B = (A + B) \times B$, then what is $(5 \odot 2) \odot 5$?

**A** 125

**B** 200

**C** 95

**D** 74

**E** 275

**50.** Two friends, Ram and Shyam, start at the same point, at the same time. Ram travels straight north at a speed of 10km/hr, while Shyam travels straight east at twice the speed of Ram. After 15 minutes, Shyam messages Ram that he is just passing by a large telephone tower and after another 15 minutes Ram messages Shyam that he is just passing by an old banyan tree. After some more time has elapsed, Ram and Shyam stop. They stop at the same point of time. If the straight-line distance between Ram and Shyam now is 50 km, how far is Shyam from the banyan tree (in km)? (Assume that Ram and Shyam travel on a flat surface.)

**A** 45

**B** $20\sqrt{5} - 5$

**C** $20\sqrt{5} + 5$

**D** $\frac{115}{3}$

**E** $5\sqrt{21}$

**51.** Two lighthouses, located at points A and B on the earth, are 60 feet and 40 feet tall respectively. Each lighthouse is perfectly vertical and the land connecting A and B is perfectly flat. The topmost point of the lighthouse at A is A' and of the lighthouse at B is B'. Draw line segments A'B and B'A, and let them intersect at point C'. Drop a perpendicular from C' to touch the earth at point C. What is the length of CC' in feet?

**A** 20

**B** 25

**C** 30

**D** 24

**E** The distance between A and B is also needed to solve this

**52.** A man is laying stones, from start to end, along the two sides of a 200-meterwalkway. The stones are to be laid 5 meters apart from each other. When he begins, all the stones are present at the start of the walkway. He places the first stone on each side at the walkway's start. For all the other stones, the man lays the stones first along one of the walkway's sides, then along the other side in an exactly similar fashion. However, he can carry only one stone at a time. To lay each stone, the man walks to the spot, lays the stone, and then walks back to pick another. After laying all the stones, the man walks back to the start, which marks the end of his work. What is the total distance that the man walks in executing this work? Assume that the width of the walkway is negligible.

**A** 16400 metres

**B** 4100 metres

**C** 8050 metres

**D** 16200 metres

**E** 8200 metres

**53.** A rectangular swimming pool is 50 meters long and 25 meters wide. Its depth is always the same along its width but linearly increases along its length from 1 meter at one end to 4 meters at the other end. How much water (in cubic meters) is needed to completely fill the pool?

**A** 2500

**B** 3125

**C** 3750

**D** 1875

**E** 1250

**54.** A shop sells bags in three sizes: small, medium and large. A large bag costs Rs.1000, a medium bag costs Rs.200, and a small bag costs Rs.50. Three buyers, Ashish, Banti and Chintu, independently buy some numbers of these types of bags. The respective amounts spent by Ashish, Banti and Chintu are equal. Put together, the shop sells 1 large bag, 15 small bags and some medium bags to these three buyers. What is the minimum number of medium bags that the shop sells to them?

**A** 5

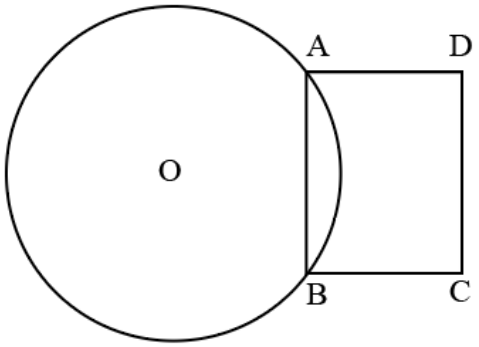
**B** 9

**C** 4

**D** 10

**E** 7

**55.** In the figure given below, the circle has a chord AB of length 12 cm, which makes an angle of $60^\circ$ at the center of the circle, O. ABCD, as shown in the diagram, is a rectangle. OQ is the perpendicular bisector of AB, intersecting the chord AB at P, the arc AB at M and CD at Q. OM = MQ. The area of the region enclosed by the line segments AQ and QB,and the arc BMA, is closest to (in $cm^2$):




**A** 215

**B** 137

**C** 35

**D** 63

**E** 69

**Instructions [56 - 58 ]**

Read the information given below and answer the 3 associated questions.

During 2015-2019, the revenues of four companies P-S were as follows:

| | Revenue(in Rs. lakhs) | | | |
|---|---|---|---|---|
| **Year** | **P** | **Q** | **R** | **S** |
| 2015 | 150 | 125 | 150 | 100 |
| 2016 | 175 | 140 | 160 | 120 |
| 2017 | 200 | 180 | 180 | 140 |
| 2018 | 250 | 210 | 200 | 170 |
| 2019 | 250 | 220 | 240 | 180 |

**56.** Which of the given companies has seen the highest year-on-year growth (in percentage) in any single year during this five-year period?

**A** P

**B** There was a tie among multiple companies

**C** R

**D** Q

**E** S

**57.** It was discovered later that one of the companies misreported its revenue of one of the years. If the misreported revenue is replaced by the correct revenue, the revenues of that company over the five-year period will be in an arithmetic progression. The company that misreported its revenue was

**A** R or S

**B** S only

**C** P or R

**D** P or S

**E** P only

**58.** During the period from 2014 to 2015, the revenue increased by 25% for three of the companies and by 50% for the remaining company. The total increase in revenue, for all four companies put together, was Rs. 125 lakhs.
Which of the following CANNOT be true?

**A** From 2014 to 2015, the increases in revenues of at least two companies were the same

**B** The revenue of Q in 2014 was the same as the revenue of R in 2014

**C** The company that experienced the 50% increase in revenue also experienced the maximum increase in revenue in absolute terms

**D** The 2014 revenues of P and R cannot be determined uniquely

**E** From 2014 to 2015, the revenues of P and R increased by different amounts

**59.** A box contains 6 cricket balls, 5 tennis balls and 4 rubber balls. Of these, some balls are defective. The proportion of defective cricket balls is more than the proportion of defective tennis balls but less than the proportion of defective rubber balls.
Moreover, the overall proportion of defective balls is twice the proportion of defective tennis balls. What BEST can be said about the number of defective rubber balls in the box?

**A** It is either 2 or 3

**B** It is exactly 2

**C** It is exactly 3

**D** It is either 3 or 4

**E** It is either 0 or 1

**60.** When expressed in a decimal form, which of the following numbers will be non - terminating as well as non-repeating?

**A** $\left(\frac{\pi}{2}\right)\left[\left(\frac{1}{\pi}\right)+1\right]-\frac{\pi}{2}$

**B** $\sin^2 1^\circ+\sin^2 2^\circ+....+\sin^2 89^\circ$

**C** $\sqrt{2}\left(3\sqrt{2}-\frac{4}{\sqrt{2}}\right)+\sqrt{3}$

**D** $\frac{\left(\sqrt[3]{729}\right)}{3}+\frac{22}{7}$

**E** $(4-\pi)[1+\left(\frac{\pi}{4}\right)+\left(\frac{\pi}{4}\right)^2+\left(\frac{\pi}{4}\right)^3+...$ (infinite terms)]

**61.** A rectangular field is 40 meters long and 30 meters wide. Draw diagonals on this field and then draw circles of radius 1.25 meters, with centers only on the diagonals. Each circle must fall completely within the field. Any two circles can touch each
other but should not overlap. What is the maximum number of such circles that can be drawn in the field?

**A** 38

**B** 39

**C** 36

**D** 37

**E** 40

**62.** A hare and a tortoise run between points O and P located exactly 6 km from each other on a straight line. They start together at O, go straight to P and then return to O along the same line. They run at constant speeds of 12 km/hr and 1 km/hr respectively. Since the tortoise is slower than the hare, the hare shuttles

between O and P until the tortoise goes once to P and returns to O. During the run, how many times are the hare and the tortoise separated by an exact distance of 1 km from each other?

**A** 24

**B** 42

**C** 22

**D** 48

**E** 40

**63.** Consider the four variables A, B, C and D and a function Z of these variables, $Z = 15A^2 - 3B^4 + C + 0.5D$ It is given that A, B, C and D must be non-negative integers and thatall of the following relationships must hold:
i) $2A + B \leq 2$
ii) $4A + 2B + C \leq 12$
iii) $3A + 4B + D \leq 15$
If Z needs to be maximised, then what value must D take?

**A** 15

**B** 12

**C** 0

**D** 10

**E** 5

**64.** XYZ is an equilateral triangle, inscribed in a circle. P is a point on the arc YZ such that X and P are on opposite sides of the chord YZ. Which of the following MUST always be true?

**A** XZ + YP = XY + PZ

**B** XP = XY

**C** XP + PZ = XY + YP

**D** XP = YP + PZ

**E** XP = XY + YZ

**65.** X, Y and Z start a web-based venture together. X invests Rs. 2.5 lakhs, Y invests Rs. 3.5 lakhs, and Z invests Rs. 4 lakhs. In the first year, the venture makes a profit of Rs. 2 lakhs. A part of the profit is shared between Y and Z in the ratio of 2:3, and the remaining profit is divided among X, Y and Z in the ratio of their initial investments. The amount that Z receives is four times the amount that X receives. How much amount does Y receive?

**A** Rs. 102,500

**B** Rs. 93,750

**C** Rs. 74,250

**D** Rs. 75,000

**E** Rs. 80,200

**66.** Mohanlal, a prosperous farmer, has a square land of side 2 km. For the current season, he decides to have some fun. He marks two distinct points on one of the diagonals of the land. Using these points as centers, he constructs two circles. Each of these circles falls completely within the land, and touches at least two sides of the land. To his surprise, the radii of both the circles are exactly equal to $\frac{2}{3}$ km. Mohanlal plants potatoes on the overlapping portion of these circles. Calculate the area on which Mohanlal planted potatoes (in sq. km).

**A** $\frac{5(\pi+4)}{27}$

**B** $\frac{2(2\pi-3\sqrt{3})}{27}$

**C** $\frac{(\pi-2)}{9}$

**D** $\frac{2(\pi-2)}{9}$

**E** $\frac{4(\pi-3\sqrt{3})}{27}$

**Instructions [67 - 68 ]**

Read the information given below and answer the 2 associated questions.

190 students have to choose at least one elective and at most two electives from a list of three electives: E1, E2 and E3. It is found that the number of students choosing E1 is half the number of students choosing E2, and one third the number of students choosing E3.
Moreover, the number of students choosing two electives is 50.

**67.** Which of the following CANNOT be obtained from the given information?

**A** Number of students choosing E1

**B** Number of students choosing either E1 or E2 or both, but not E3

**C** Number of students choosing both E1 and E2

**D** Number of students choosing E3

**E** Number of students choosing exactly one elective

**68.** In addition to the given information, which of the following information is NECESSARY and SUFFICIENT to compute the number of students choosing only E1, only E2 and only E3?

**A** Number of students choosing only E2, and number of students choosing both E2 and E3

**B** Number of students choosing both E1 and E2, number of students choosing both E2 and E3, and number of students choosing both E3 and E1

**C** Number of students choosing only E1, and number of students choosing both E2 and E3

**D** No extra information is necessary

**E** Number of students choosing both E1 and E2

**69.** Ashok has a bag containing 40 cards, numbered with the integers from 1 to 40. No two cards are numbered with the same integer. Likewise, his sister Shilpa has another bag containing only five cards that are numbered with the integers from 1 to 5, with no integer repeating. Their mother, Latha, randomly draws one card each from Ashok's and Shilpa's bags and notes down their respective numbers. If Latha divides the number obtained from Ashok's bag by the number obtained from Shilpa's, what is the probability that the remainder will not be greater than 2?

**A** 0.8

**B** 0.91

**C** 0.73

**D** 0.94

**E** 0.87

**70.** X, Y, and Z are three software experts, who work on upgrading the software in a number of identical systems. X takes a day off after every 3 days of work, Y takes a day off after every 4 days of work and Z takes a day off after every 5 days of work.
Starting afresh after a common day off,
i) X and Y working together can complete one new upgrade job in 6 days
ii) Z and X working together can complete two new upgrade jobs in 8 days
iii) Y and Z working together can complete three new upgrade jobs in 12 days If X, Y and Z together start afresh on a new upgrade job (after a common day off), exactly how many days will be required to complete this job?

**A** 3 days

**B** 4 days

**C** 2 days

**D** 3.5 days

**E** 2.5 days

**71.** What is the remainder if $19^{20} - 20^{19}$ is divided by 7?

**A** 5

**B** 0

**C** 3

**D** 1

**E** 6

**72.** Six drums are used to store water. Five drums are of equal capacity, while the sixth drum has double the capacity of each of these five drums. On one morning, three drums are found half full, two are found two-thirds full and one is found completely full. It is attempted to transfer all the water to the smaller drums. How many smaller drums are adequate to store the water?

**A** Three but not two

**B** Four but not three

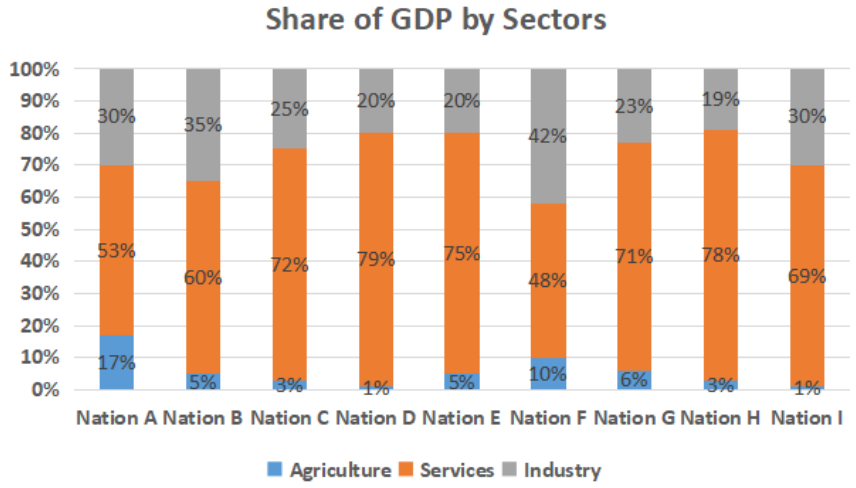
**C** Three or four, depending on which drum had how much water initially

**D** Five but not four

**E** Five may be inadequate, depending on which drum had how much water initially

**Instructions [73 - 75 ]**

Read the information given below and answer the 3 associated questions.
The following graph depicts sector-wise percentage contributions to the gross domestic product (GDP) of nine nations, labelled “Nation A”, “Nation B” and so on. It is known that these nations are Brazil, China, France, Germany,India, Japan, Russia, the UK and the USA, but not necessarily in the same order.




The following, however, are known:
i) The GDPs of the nine nations (in US $ trillion) are:

| **Nation** | Brazil | China | France | Germany | Japan | India | Russia | UK\| | USA |
|---|---|---|---|---|---|---|---|---|---|
| **GDP** | 2 | 10 | 3 | 4 | 5 | 2 | 2 | 3 | 17 |

ii) China has the highest agriculture sector GDP, valued at US $1 trillion, followed respectively by the USA and India
iii) In terms of percentage contribution to the respective nations' GDPs by their service sectors, the UK and France are respectively the first and the second
iv) Nation A, Nation B and Nation G have the same GDP
v) The GDPofIndia's industry sector is lower than the GDP of Russia's industry sector. However,it is larger than that of Brazil's industry sector

**73.** Based on the given information, how many nations can be uniquely identified?

**A** 6

**B** 9

**C** 3

**D** 2

**E** 7

**74.** Based on the given information, which of the following CANNOT be ruled out?

**A** US is Nation I

**B** Russia is Nation G

**C** China is Nation C

**D** Japan is Nation E

**E** India is Nation B

**75.** Which of the following information, when considered in addition to the given information, does not allow us to completely identify the nine nations in the graph?

**A** Germany's industry GDP is US $1.2 trillion

**B** The nation ranked fourth in terms of agriculture GDP has its agriculture GDP valued at US $150 billion

**C** In terms of percentage contribution to the respective nations' GDP, France and Japan's agriculture sectors contribute the same

**D** Japan's industry GDP is US $1.25 trillion

**E** Both Japan's and Germany's industry GDPs are more than US $1 trillion

## Answers

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 48.**C** | 49.**C** | 50.**A** | 51.**D** | 52.**A** | 53.**B** | 54.**E** | 55.**E** |
| 56.**D** | 57.**D** | 58.**A** | 59.**C** | 60.**C** | 61.**D** | 62.**E** | 63.**B** |
| 64.**D** | 65.**D** | 66.**D** | 67.**C** | 68.**A** | 69.**E** | 70.**E** | 71.**A** |
| 72.**D** | 73.**A** | 74.**D** | 75.**A** | | | | |

## Explanations

48.**C**

Let four friends Anita, Bina, Chaitra and Divya be represented as A,B,C,D respectively.

From the given information, Messages sent by A are 150 out of which 90 are Jokes

Messages sent by B are 180 out of which 72 are Jokes

Messages sent by C are 150 out of which 120 are Jokes

Messages sent by D are 120 out of which 60 are Jokes

∴ Percentage of jokes that were neither sent by D or B is 210*100/342=61.4

49.**C**

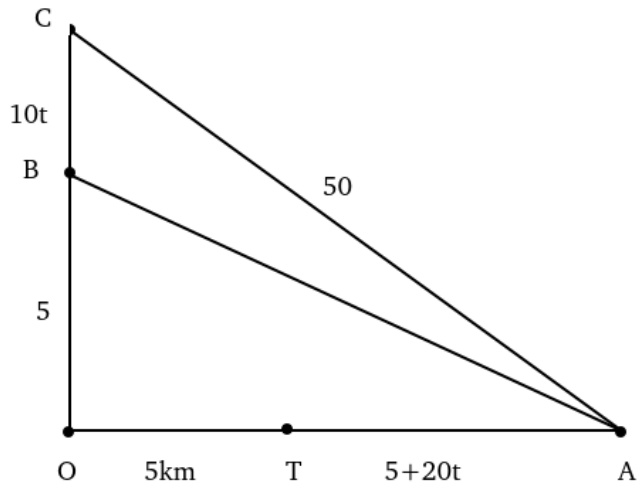
Given that :

(A O B) = (A + B) * B.

For (5 O 2) = ( 5+2 )*2 = 14.

((14) O 5 )= ( 14 + 5 )*5 = 19*5 = 95.

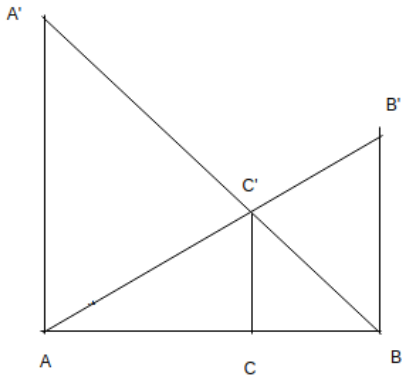
50.**A**




2500=$(5+10t)^2+(10+20t)^2$ => $(1+2t)^2=20$

$AB^2=25+100\,(1+2t)^2$ => AB= 45km.

51. **D**




Triangle ACC' is similar to triangle ABB'

Considering AC = a, BC = b, CC' = h, AA' is given as 60, BB' is given to be 40.

AC/AB = CC'/BB' = h/40.

$\left(\frac{a}{a+b}\right) = \frac{h}{40}$ (1)

Similarly triangle BCC' is similar to BAA'.

BC/AB = CC'/AA' = h/60.

$\left(\frac{b}{a+b}\right) = \frac{h}{60}$ (2)

Adding (1) and (2).

$\frac{h}{40}+\frac{h}{60}=1$

1/h = $\left(\frac{1}{40}+\frac{1}{60}\right)$

h = 24

Using crossed ladder theorem

$\frac{1}{CC'}=\frac{1}{AA'}+\frac{1}{BB'}$=1/60 +1/40 =5/120 =24.

52. **A**

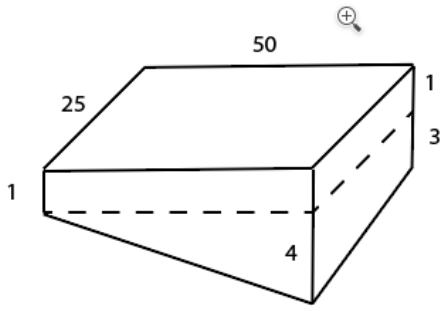
On one side, to place 1st rock, he had to travel 10m. For 2nd rock he had to travel 20m..similarly, till last rock he had to travel 400.

Total sum would be 10+20+30+...+400 = $\frac{40}{2}(410) = 8200$.

Similarly, on the other side it will be 8200.

Total 8200+8200=16400.

53. **B**




The volume of cuboid will be 50*25*1=1250

The volume of the portion below cuboid will be Area of triangle*width = $\frac{1}{2} \cdot 3 \cdot 50 \cdot 25 = 1875$

∴ Total volume = 1875+1250= 3125.

54. **E**

Let the amount spent by Ashish is 'a', Banti is 'b' and Chintu is 'c'. Given, a = b = c.

One of them has bought a large bag. So, he must have spent at least 1000 rupees. It means, everyone has spent at least a thousand rupees. Or, a +b + c ≥ 3000.

Revenue from small bags = 50*15 = 750.

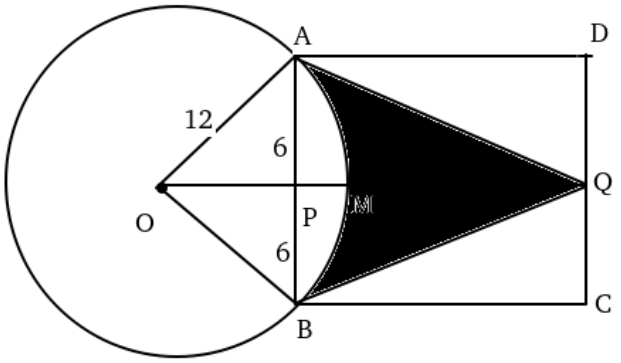
Revenue from large bag = 1000*1 = 1000. Total revenue excluding from medium bag = 750 + 1000 = 1750.

If 4 medium bags are sold, total revenue = 200*4 + 1750 = 2550, which is less than 3000. Hence, not the right answer.

If 5 medium bags are sold, total revenue = 200*5 + 1750 = 2750, which is less than 3000. Hence, not the right answer.

If 7 medium bags are sold, total revenue = 200*7 + 1750 = 3150, which is more than 3000. Hence, 7 is the correct answer.

55. **E**




In triangle OAP, since AP=6, OA will be 12.

Area of AQBMA=Area of Triangle ABQ- (Area of minor arc AMB-Area of OAB)

Length of PQ=MQ+PM = 12+(12-$6\sqrt{3}$)=24-$6\sqrt{3}$

Area of Triangle ABQ=$\frac{1}{2} \cdot 12. \left(24 - 6\sqrt{3}\right) = 6\left(24 - 6\sqrt{3}\right)$.=81.64

Area of minor arc AMB-Area of OAB=$\frac{60}{360} \cdot \pi \cdot 144 - \frac{1}{2} \cdot 12 \cdot 6\sqrt{3}$ = $24\pi - 36\sqrt{3}$.=13.07

∴Area of AQBMA=68.57≈ $69$

56. **D**

By noticing the table we can come to conclusion that either of P in 2018 or Q in 2017 must have highest yoy growth.

YOY of P in 2018=50/200 *100=25%

YOY of Q in 2017 = 40/140 *100 = 28.57%

Hence D is correct answer.

57. **D**

If P's revenue in 2018 is 225 and S's revenue in 2016 is 160 then their revenues will be in A.P.

58. **A**

Let us first compute the individual changes in value in both years before zeroing in on the companies that fall into the 25% increase and 50% increase groups.

For 25% increase:

| Company | 2015 | 2014 | Increase |
|---|---|---|---|
| **P** | 150 | 120 | 30 |
| **Q** | 125 | 100 | 25 |
| **R** | 150 | 120 | 30 |
| **S** | 100 | 80 | 20 |

For 50% increase:

| Company | 2015 | 2014 | Increase |
|---|---|---|---|
| **P** | 150 | 100 | 50 |
| **Q** | 125 | 83.33 | 16.67 |
| **R** | 150 | 100 | 50 |
| **S** | 100 | 66.67 | 33.33 |

We can move forth with the assumption that P saw a 50% increase while the rest of the companies saw a 25% increase. In this case, the total increase in revenue, for all four companies put together, will be Rs. 125 lakhs. Same is the case when we consider company R to have seen a 50% increase, while the rest had a 25% increase. {Hence, Option D is true} We observe that Options B, C and E hold true as well. The increase observed for each of the companies is distinct, based on the given condition. Thus, Option A cannot be true.

59. **C**

| | Defective | Non Defective | Total |
|---|---|---|---|
| Cricket | x | 6-x | 6 |
| Tennis | y | 5-y | 5 |
| Rubber | z | 4-z | 4 |

Given, z/4 > x/6 > y/5 ...(i)

and (x+y+z)/15= 2*y/5 => x+z=5y

The value of y can only be 1.

=> x+z=5.

If z = 1, then z/4 is less than x/6.

If z = 2, then z/4 is equal to x/6.

If z = 4 or 5 then y/5 is greater than x/6.

The only possible value to satisfy (i) condition is z=3. and x=2.

60. **C**

Option A: $\left(\frac{\pi}{2}\right)\left[\left(\frac{1}{\pi}\right)+1\right]-\frac{\pi}{2}$ =1/2

Option B: $\sin^2 1^\circ+\sin^2 2^\circ+....+\sin^2 89^\circ$ =44+1/2 $(\sin^2(89)=\cos^2(1)\ \&\ \sin^2(1)+\cos^2(1)=1$

Option C: $\sqrt{2}\left(3\sqrt{2}-\frac{4}{\sqrt{2}}\right)+\sqrt{3}$ = $6-4+\sqrt{3}$=$2+\sqrt{3}$ **which is non-terminating and non repeating.**

Option D: $\frac{\left(\sqrt[3]{729}\right)}{3}+\frac{22}{7}$ =3+22/7

Option E: $\left(\frac{\pi}{4}\right)+\left(\frac{\pi}{4}\right)^2+\left(\frac{\pi}{4}\right)^3+\ldots$ (infinite terms)= $\frac{1}{1-\frac{\pi}{4}}=\frac{4}{4-\pi}$ => $(4-\pi)[1+\left(\frac{\pi}{4}\right)+\left(\frac{\pi}{4}\right)^2+\left(\frac{\pi}{4}\right)^3+$ ... (infinite terms)] =4

61. **D**

Each circle on the end of the diagonal will touch sides of the rectangular field

Using Pythagoras' theorem, the distance between the vertex of the rectangle and center of the first circle drawn on the diagonal = $1.25\sqrt{2}$

Distance between the vertex of the rectangle and circumference of the first circle drawn on the diagonal = $1.25\sqrt{2}$ - 1.25 = 0.51 meters

Space that cannot be used to draw circle otherwise they will go outside rectangle on every diagonal = 0.51 * 2 = 1.02 meters

Space that can be used to draw circles = length of diagonal - unused space = 50 - 1.02 = 48.98 meters

On every diagonal, maximum number of such circles = usable length/diameter of each circle = 48.98/2.5 = 19

Or, on every diagonal, one circle will be at the center (intersection of diagonals) and 9 circles will be on each half of the diagonal

∴ The circle in center will be common for both diagonals, and 9 circles can be drawn on each half of the diagonal. So total circles = 9*4 + 1 = 37

62. **E**

For hare and tortoise speed is given. Tortoise will take 12 hours to complete 1 round. And during this, hare will make 12 rounds of OP. In the first round, both has started from point O. After some time, hare will cross tortoise and distance between them will be 1 km. After some more time, when hare is returning back from P to O, before and after crossing tortoise, hare will be two more times 1km apart from tortoise. So, in first round, there are three such occurrences.

In the second round, when the hare has started from point O, while going and returning back, there will be four occurrences when before and after crossing the tortoise, the hare will be exactly 1 km apart. But the first occurrence of round 2 is already counted in round 1. So, in second round as well, there will be total 3 occurrences.

In the third, fourth and fifth rounds, there will be 4 such occurrences.

In the sixth round, because the tortoise will be at point P, there will be only 2 cases.

Now, till round 6 there are 20 such occurrences. And from round 7 to 12, it will be exactly the same but in reverse order of 2, 4, 4, 4, 3, 3. Hence, total such occurrences = 20 * 2 = 40.

63. **B**

To maximize Z, B has to be minimized and A,C,D are to be maximised.

The value of B can be 0 or 1.

Case 1:

B=0 => A=1=> C=8 and D=12.

Z= 15+8+6=29.

Case 2:

B=1 => A=0=> C=12 and D=15.

Z=-3+12+7.5=16.5.

∴ D=12 is correct answer.

64. **D**

If we join YP and PZ, XYPZ will become a cyclic quadrilateral. YZ and XP will be diagonals of this quadrilateral.

Ptolemy's theorem states that the product of the length of the diagonals is equal to the sum of products of measures of the pairs of opposite sides.

As per this theorem for the quadrilateral :

XY*PZ +XZ*PY = YZ*XP.

For the equilateral triangle.

Now, in equilateral triangle XYZ, YZ = XZ = XY.

Hence equation 1 becomes, XP = YP + PZ.

65. **D**

Let the part of the amount divided between Y and Z be 5k => Y gets 2k and Z gets 3k.

The overall profit is Rs 200000.

Hence the remaining profit is Rs 200000 - 5k. =

Left over profit of 2-5k is divided in the ratio 2.5:3.5:4

The final profit distribution among X, Y and Z.

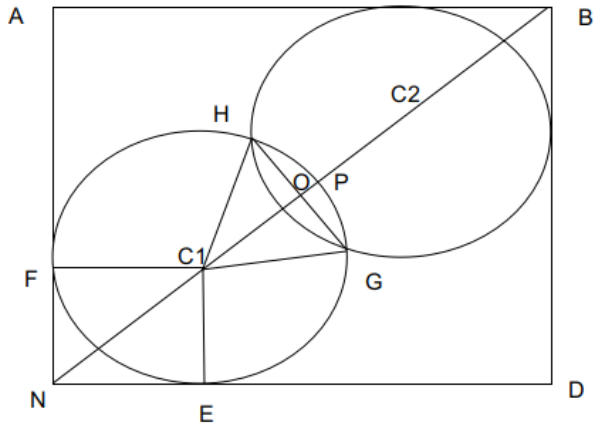
=> Finally, X gets $\frac{2.5}{10}(200000-5k)$ , Y gets $2k+\frac{3.5}{10}(200000-5k)$ and Z gets $3k+\frac{4}{10}(200000-5k)$ .

Given the ratio of profit distribution of X and Z is 1 : 4

Given, $3k+\frac{4}{10}(200000-5k)$ = 4($\frac{2.5}{10}(200000-5k)$ ) => 3k=$\frac{6}{10}(200000-5k)$ =>10k=400000-10k => 20k=400000 => k=20000.

∴ Share of Y = $2k+\frac{3.5}{10}(200000-5k)$ = 75000.

66. **D**




The two circles are symmetric about the diagonal.

NC1=$\frac{2\sqrt{2}}{3}$ = $\sqrt{\left(\frac{2}{3}\right)^2+\left(\frac{2}{3}\right)^2}=\frac{(2\sqrt{2})}{3}$

The lengths FC1, EC1 are the radius of the circle which is 2km/3.

The length C1P is the radius of the circle.

Because of symmetry C1O = C2O and C1N = C2B.

2*(C1N+ C1O) = $2\sqrt{2}$ the length of the diagonal of the square.

C1N+C1O = $\sqrt{2}$

C1O = $\sqrt{2}-\frac{2\sqrt{2}}{3}=\frac{\sqrt{2}}{3}$

OP = $\frac{(2-\sqrt{2})}{3}$

The diagonal perpendicularly bisects the line GH. Hence C1OH is 90 degrees.$C1H^2 = C1O^2+OH^2$

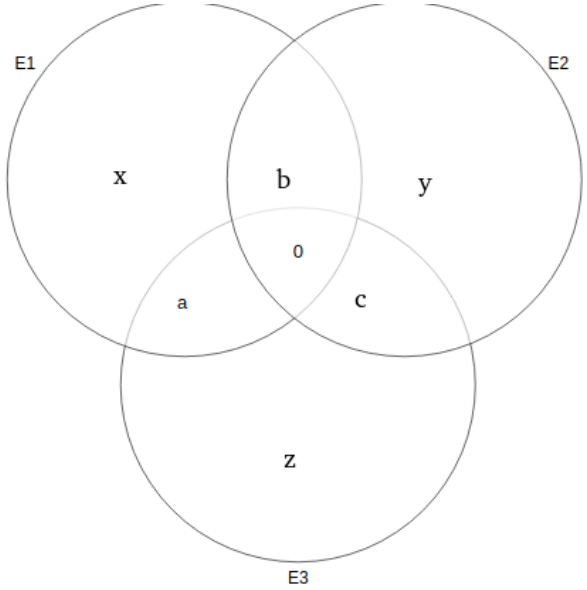
OH = $\frac{\sqrt{2}}{3}$. Similarly OG = $\frac{\sqrt{2}}{3}$

HC1, C1G both are equal to $\frac{2}{3}$ each. H1G is $\frac{2\sqrt{2}}{3}$. HC1G is a raight angled traingle with angle HC1G is 90 degrees.

Area of the region required is 2*(Area of segment OGH)

∴ Area of required region=$2\left(\frac{90}{360}\cdot\frac{4\pi}{9}-\frac{1}{2}\cdot\frac{2\sqrt{2}}{3}\cdot\frac{\sqrt{2}}{3}\right)$=$\frac{2(\pi-2)}{9}$

67. **C**




Given, a+b+c=50 and a+b+c+x+y+z=190 => x+y+z=140.

Also, let E1=k => E2=2k and E3=3k

E1+E2+E3= 6k=190+50=240 => k=40.

Option A, the number of students choosing E1 is 40.

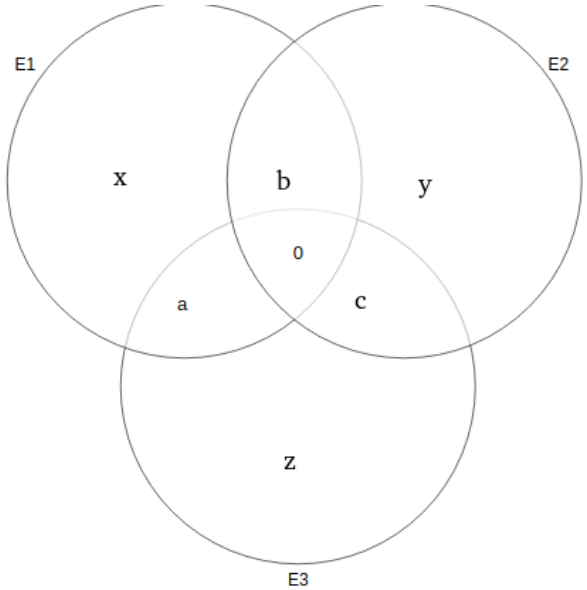
Option B, number of students choosing either E1 or E2 or both, but not E3 = total - E3 = 190-120 = 70.

Option C, number of students choosing both E1 and E2 => this can not be obtained.

Option D, number of students choosing E3 = 3x = 120.

Option E, number of students choosing exactly one elective = Out of 190, 50 are choosing two electives, hence 190-50 = 140 are choosing exactly one elective.

68. **A**




Given, a+b+c=50 and a+b+c+x+y+z=190 => x+y+z=140.

Also, let E1=k => E2=2k and E3=3k

E1+E2+E3= 6k=190+50=240 => k=40.

Option A: If the number of students choosing only E2, the number of students choosing both E2 and E3, are given then the number of students who choose E2 and E1, E1 and E3 can be found. From this only E1, only E3 can be calculated.

Option B: knowing the number of students choosing both E1 and E2, the number of students choosing both E2 and E3, and a number of students choosing both E3 and E1 is insufficient. This information is not enough to calculate the number of students who choose only E1, only E2, and only E3.

Option C: If x and c are known, we can't find y and z.

Option E is not sufficient.

69. **E**

The number of ways of selecting one card from Ashok's bag and other from Shilpa bag = $40_{C_1} \times 5_{C_1}$ = 200
Now, if the card taken from Shilpa's bag shows 1, then 1 will divide all the numbers on Ashok's card. Hence, the number of ways = 40
If the card taken from Shilpa's bag shows 2, then the remainder will be either 0 or 1. Hence, the number of ways = 40
If the card taken from Shilpa's bag shows 3, then the remainder will be 0, 1 or 2. Hence, the number of ways = 40
If the card taken from Shilpa's bag shows 4, then the remainder will be 0, 1, 2 or 3. So the numbers having 3 as remainder will be rejected. So the number of form 4n+3 will be rejected. Total number of such numbers = $\frac{(39-3)}{4} + 1$ = 10
If the card taken from Shilpa's bag shows 5, then the remainder will be 0, 1, 2, 3 or 4. So the numbers having 3 or 4 as remainder will be rejected. So the number of form 5n+3, 5n+4 will be rejected. Total number of such terms = $\frac{(39-3)}{4} + 1$ = 10
The numbers left = 40-10 = 30
The total numbers having 5n+3 form = $\frac{(39-4)}{5} + 1 = 8$
The total numbers having 5n+4 form = $\frac{(38-3)}{5} + 1 = 8$
The numbers left = 40-8-8=24

Hence, the probability = $\frac{(40+40+40+30+24)}{200} = \frac{174}{200} = 0.87$

70. **E**

Let the work done per day by X, Y and Z is respectively 'x', 'y' and 'z' units.

According to the first statement, out of 6 days, X works for 5 days, and Y works for 5 days. Total work done = 5x + 5y = 1...(i)

According to the second statement, out of 8 days, Z works for 7 days and X works for 6 days and they complete two jobs. 7z + 6x = 2...(ii)

According to the third statement, out of 12 days, Y works for 10 days and Z works for 10 days and they complete three jobs. 10y + 10z = 3...(iii)

Solving, we get x = 1/10, y = 1/10, z = 2/10.

=> every day, X does 10% of the job, Y does 10% of the job and Z does 20% of the job.

Together, every day they can do 40% of the job. Hence to complete 100% of the job, they will take 100/40 = 2.5 days.

71. **A**

Using Fermat's theorem :

If p is a prime number and a, p are co primes $\left(a^{p-1}\right)\ mod\ p = 1$

Remainder when $19^{20}$ is divided by 7 = $19^2$ mod 7 =4. ( Here $19^{20} = \left((19)^6\right)^3 \cdot (19)^2$

Since the remainder for $19^6$ is 1 the remainder for $19^{20}$ is equivalent to the $\frac{19^2}{7}$ = 4.

Remainder when $20^{19}$ is divided by 7 = $20^1$ mod 7 =6.( Here $\frac{20^6}{7}$ the remainder is 1 and since $20^{19} = \left(20^6\right)^3 \cdot (20)^1 = \frac{(1 \cdot 20)}{7}$. The remainder is 6.

Remainder when $19^{20} - 20^{19}$ is divided by 7=4-6=-2=> 5.

72. **D**

Let's five small drums have a capacity of 1 unit capacity each and one bigger drum has that of 2 units capacity. We need to consider two cases here. One with minimum volume and the other with maximum volume.

Case 1: Minimum value is possible if the bigger drum is half filled. So, total volume of water = 1 + 2 * (1/2) + 2 * (2/3) + 1 = 26/6 ~ 4.3

Case 2: Maximum value is possible if the bigger drum is completely full. So, total volume of water = 2 + 3 * (1/2) + 2 * (2/3) = 29/6 = 4.833

In any case volume of water is more than 4 units and less than 5 units. Hence, exactly 5 smaller drums are adequate to store the water.

73. **A**

FRom ii, **China** is F.

FRom iv and v, **India** must be A, **Brazil** must be G and **Russia** must be B.

India's GDP due to agriculture = 17% of 2 trillion =0.34 trillion.

FRom i, USA GDP due to agriculture> 0.34 trillion and <1 trillion i.e. it's percentage must be >2% and less than 5.8%

So, USA can be C/E/H.

From point 3, **UK** must be D and **France** must be H=> U.S.A must be C/E.

Now, Germany and Japan can be C or I.

6 nations can be uniquely identified.

74. **D**

FRom ii, China is F.

FRom iv and v, India must be A, Brazil must be G and Russia must be B.

India's GDP due to agriculture = 17% of 2 trillion =0.34 trillion.

FRom i, USA GDP due to agriculture> 0.34 trillion and <1 trillion i.e. it's percentage must be >2% and less than 5.8%

So, USA can be C/E/H.

From point 3, UK must be D and France must be H=> U.S.A must be C/E.

Now, Germany and Japan can be C or I or E.

∴ Everything except option D can be ruled out.

75. **A**

FRom ii, China is F.

FRom iv and v, India must be A, Brazil must be G and Russia must be B.

India's GDP due to agriculture = 17% of 2 trillion =0.34 trillion.

FRom i, USA GDP due to agriculture> 0.34 trillion and <1 trillion i.e. it's percentage must be >2% and less than 5.8%

So, USA can be C/E/H.

From point 3, UK must be D and France must be H=> U.S.A must be C/E.

Now, Germany and Japan can be C or I.

Option A: If Germany is C, then its GDP will be 1 but given its gdp is 1.2 So, C is not Germany. If Germany is I, then its GDP will be 1.2trillion. Hence, Germany is I => Japan is C/E and USA is C/E. If USA is C then its GDP due to agriculture is not 3rd highest. So, USA is E and Japan is C.

Option A is correct.