

PISA LIKE TEST ITEMS MATHEMATICAL LITERACY - QUESTIONS



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01. OLD WOMAN'S WILL

An old woman wants to divide her 19 camels among her 3 daughter. According to old woman the oldest daughter should get half of the camels, the middle daughter should get $\frac{1}{4}$ of the camels and the youngest daughter should get $\frac{1}{5}$ of the camels. After her death her daughters were not able to divide the camels as the result was coming in fractions. Just then their aunt arrived. She proposed a solution with which all the daughter got their share in the property. Their aunt added 1 camel to the group of camels.

1. What was the advice given?
2. What is the share of 3 daughters after division?
3. Calculate the ratio of share of three daughters before and after division?
4. Can you justify the above division of camels by LCM
5. 1 Student added $\frac{1}{4} + \frac{1}{5} + \frac{1}{2}$ and got $\frac{19}{20}$ and which is less than 1. How will you justify this?
6. If one camel occupies area of $3m^2$, find what will be area of shed of three daughters if each shed also include one hay stack bundled in cuboids of length 200cm and breadth 100 cm and height 50cm ?

02. BADMINTON TOURNAMENT

Question 1: Rajesh, Meena, Nisha and Yash have formed a practice group in Badminton club. Each player wishes to play against each other player once. They have reserved two practice tables for these matches.

Complete the following match schedule by writing the names of player in each match.

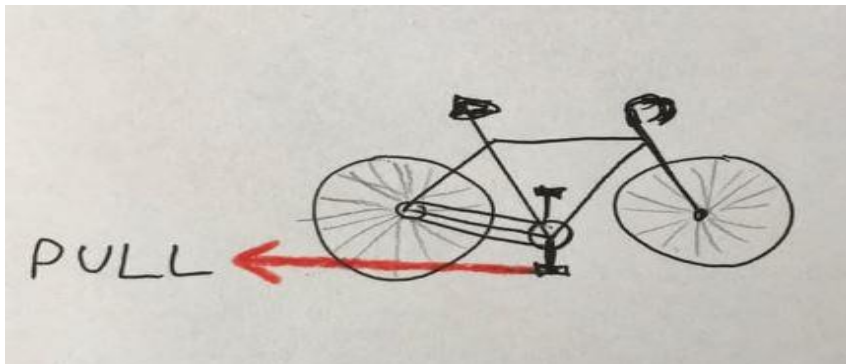
Round	Practice Table-1	Practice Table-2
1	Rajesh - Nisha	
2		
3		

03. BIKE PUZZLE

RIDDLE 1

Vikram was riding his bicycle with his friend Sekhar when he found that his bicycle pedal got entangled with a rope lying on the floor. He got down removing the rope.

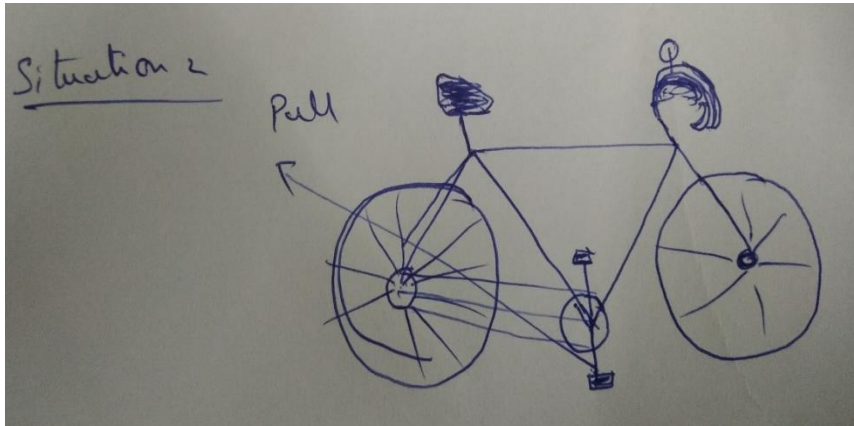
Situation 1



At first he went down and tried to remove the rope by pulling it as illustrated in situation 1.

1. What could have been the effective outcome of the event?
2. Was the outcome as per expected lines?
3. If 'no' then what could have been the reason.

Situation 2

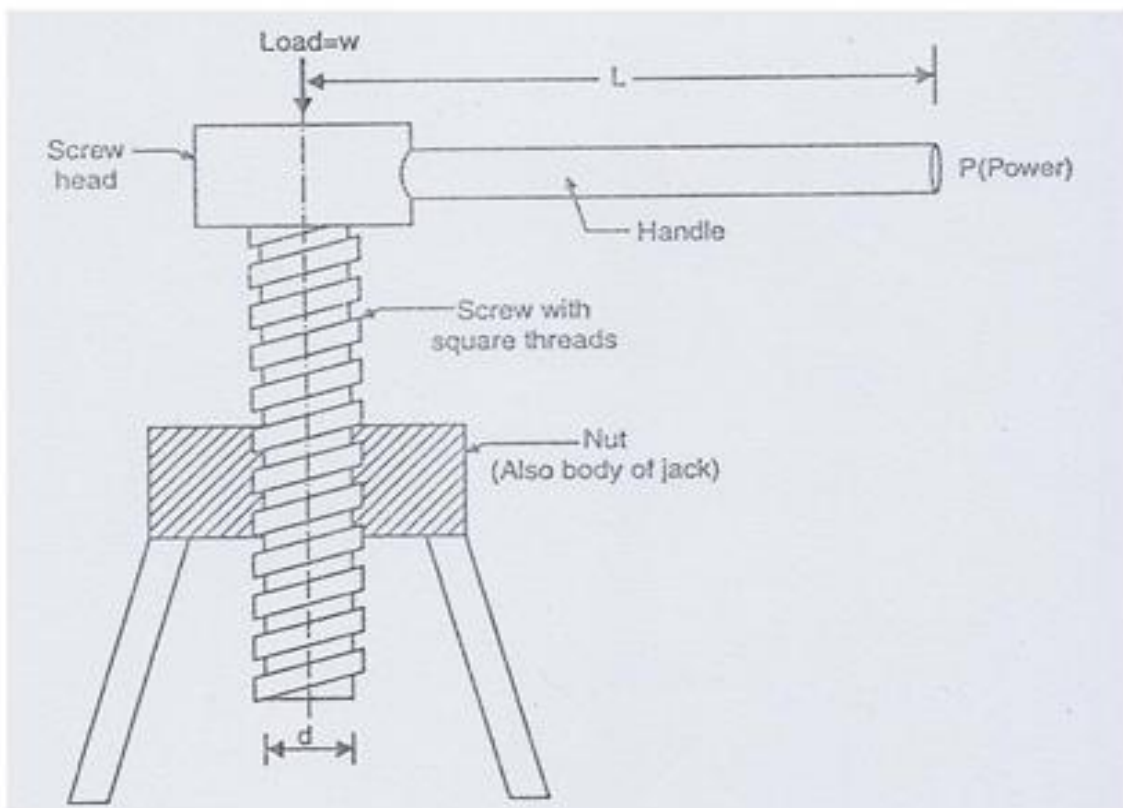


1. What could be the possible outcome now?
2. If the outcome was different from situation then why is it so?

04. Car Jack

A car jack is a mechanical device which is used to raise a car or a heavy load with the help of a small effort applied at its handle.

The figure shows a car jack which consists of a nut, a screw and a handle fitted to the head of the screw.



The load or car to be lifted is placed on the head of the screw. At the end of the handle fitted to the screw head, an effort P is applied in the horizontal direction to lift the car (or Load).

When the handle is rotated through one complete turn, the screw is also rotated through one turn. The Load (or car) is lifted by a height (called pitch of screw).

A Jack is also useful to lower a heavy weight.

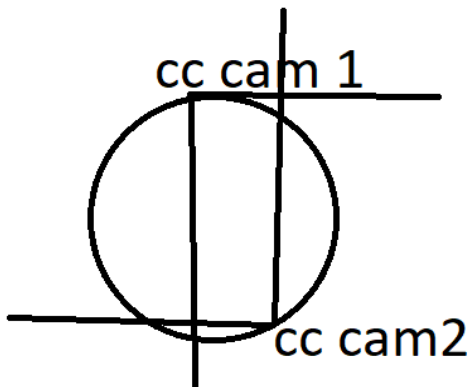
Questions:-

- Q.1. What is the use of Car Jack?
- Q.2. What is the pitch of a screw?
- Q.3. Why does the less effort is required to lift a heavy Load (or a car)by using a jack than the effort required in direct lifting by hand without using jack ?
- Q.4. If the length of the handle is decreased then what change will required on the applied effort on the handle?
- Q.5. If the pitch of the screw is reduced then what change will to do on the applied effort on the handle?
- Q.6. If the diameter of the screw is increased then what change will be required in the effort on the handle?

05. CLOSED CIRCUIT CAMERAS

A CC Camera can cover a distance of 20 meters and can rotate upto 90°. If a room is circular in shape with radius 10 m how many cameras do you need to cover entire room.

Does this set up with cover entire room?



A school has 8 rooms out of which there are 2 are circular 2 are hexagonal 2 are square and 2 are rectangular. If there are total of 3 types of cameras available with following specifications.

Type	Distance range	Rotation range	Cost	Maintenance cost per year
A	20 M	90°	100 ZED	50 ZED
B	20 M	60°	100 ZED	10 ZED
C	20 M	45°	30 ZED	10 ZED

1. How many cameras do you need for entire school if you choose
 - a. Type A
 - b. Type B
 - c. Type C
2. If you ignore maintenance costs which type would you prefer?
3. If you are planning for a period of 10 years which model should be preferred?

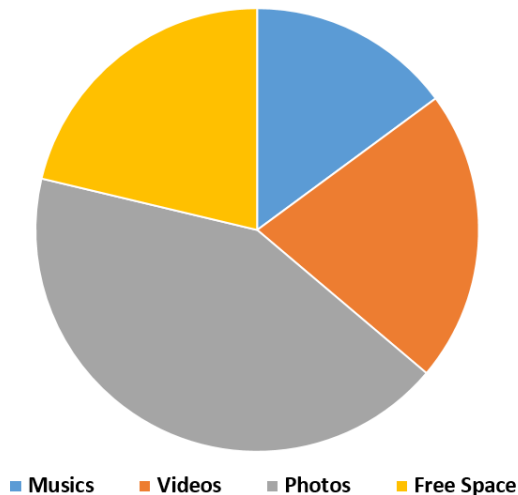
06. DIGITAL VERSATILE COMPACT (DVD)

DVD (an abbreviation of digital versatile disc) is a digital optical disc storage format invented and developed in 1995. The medium can store any kind of digital data and is widely used for software and other computer files as well as video programs watched using DVD players. DVDs offer higher storage capacity than compact discs while having the same dimensions.

DVDs have differing capacities:

- One of the most common DVDs is the single-sided, single-layer disc, capable of holding 4.7 GB.
- The single-sided, double-layer disc is capable of holding between 8.5-8.7 GB.
- The double-sided, single-layer disc is capable of holding 9.4 GB.
- Although rare, the double-sided, double-layer disc is capable of holding up to 17.08 GB.

Kumar has a DVD that storage musics, videos and photos. His DVD has a capacity of 4.7 GB (4700 MB). The graph below shows the current status of his pen drive.



	Space
Musics	700
Videos	1000
Photos	2000
Free Space	1000
Total	4700

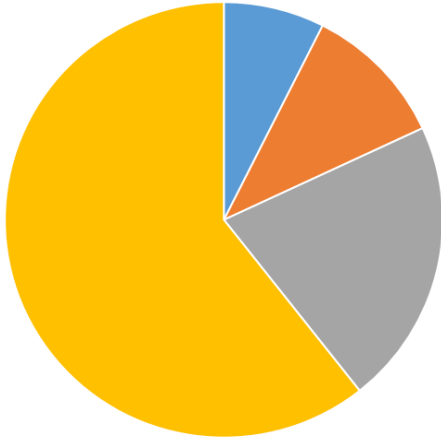
Q 1. During the following weeks. Kumar deletes some photos but also adds some music's. The new status is shown below:

His brother gives him a new DVD of capacity 9.4 GB (9400 MB) which is totally empty. Kumar transfers the content of his old DVD to the new DVD.

	Space
Musics	1200
Videos	1000
Photos	1500
Free Space	1000
Total	4700

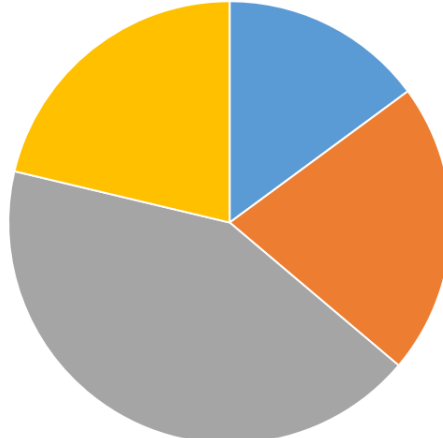
Which one of the following graphs represents the new DVD status?

Circle A, B, C or D.



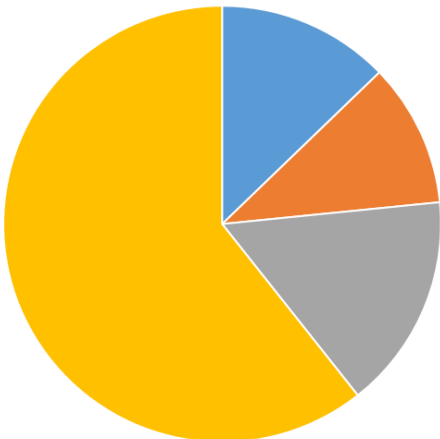
■ Musics ■ Videos ■ Photos ■ Free Space

(A)



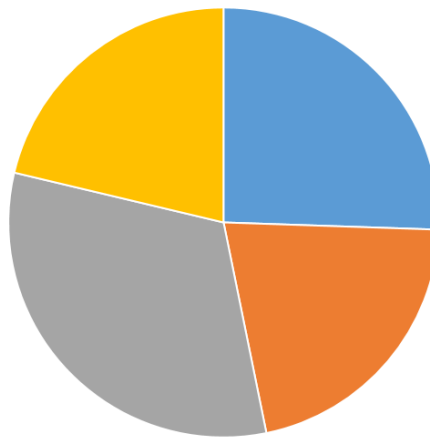
■ Musics ■ Videos ■ Photos ■ Free Space

(B)



■ Musics ■ Videos ■ Photos ■ Free Space

(C)



■ Musics ■ Videos ■ Photos ■ Free Space

(D)

Q 2. The details of the film songs status in the 9.4 GB DVD is given below:

Film (Music)	Space
Film 1	100
Film 2	150
Film 3	125
Film 4	275
Film 5	150
Film 6	225
Film 7	100
Film 8	75

07. DAYS AND NIGHTS

Look at the following.

Which part of the following picture shows day light.

Which part of the picture depicts night?



What is the duration of a day and what is the duration of a night.

Look at the following pictures



Sun rise at Kanyakumari



Sun set at Kanyakumari

What do you see in these pictures?

At any place the time duration between sun rise and sun set is known as the day time while the period from sun set to sun rise is called night.

Sun rise at Gandhinagar on 27 June 2019: 05:55 hours

Sun set at Gandhinagar on 27 June 2019: 19:29 hours

Sun rise at Gandhinagar on 28 June 2019: 05:56 hours

Sun rise at Gandhinagar on 1 January 2019: 7:20 hours

Sun set at Gandhinagar on 1 January 2019: 18:05 hours

Sun rise at Gandhinagar on 2 January 2019 7:20 hours

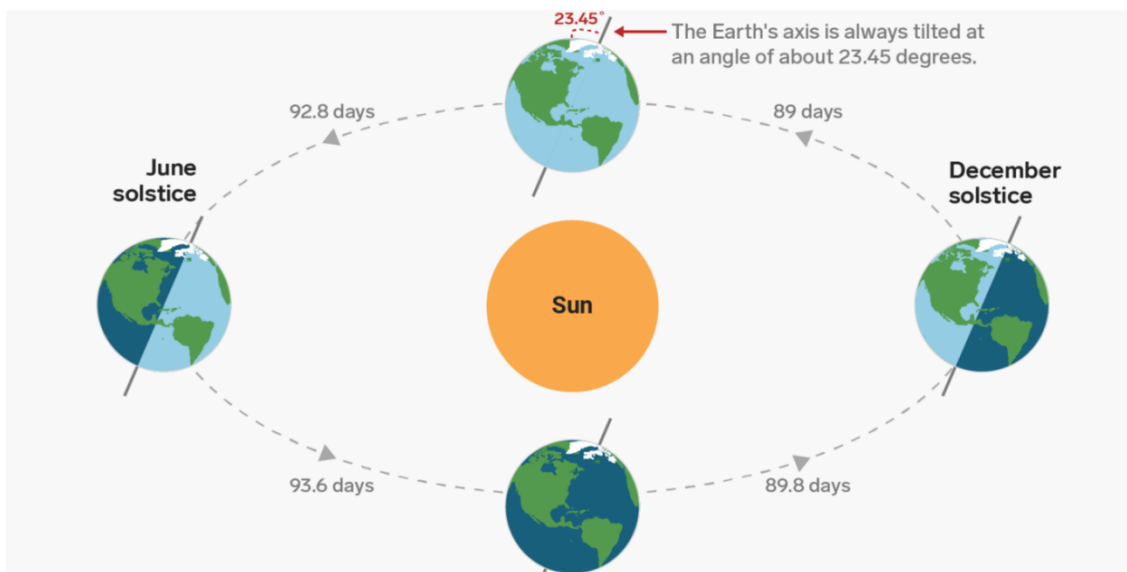


CCL IIT Gandhinagar

Question:

1. How long was the day at IIT Gandhinagar on 27 June 2019.
2. How long was the night at IIT Gandhinagar on 27 June 2019?
3. How long was the day at IIT Gandhinagar on 1 January 2019?
4. How long was the night at IIT Gandhinagar on 1 January 2019?
5. When is the day and when is the night longer?

Effect of tilt of the earth's axis



The axis of the earth is tilted in the same direction throughout the year, however as the earth orbits the sun the hemisphere tilted away from the sun will gradually come to be tilted towards the sun and vice versa. You observed that whichever hemisphere currently tilted towards the sun experiences the more hours of sunlight each day. Due to which sun never sets for several days on this polar region. Similarly on the other polar region nights will be for several days.

Questions:

1. At what angle axis of earth is tilted?
2. What is the difference between the solar day and sidereal day?
3. How does the tilt of axis of earth affect the day length?
4. What is the effect of revolution of earth around the sun on its time of one rotation about its axis?
5. What are the four reasons which affect the length of the day on earth?
6. What will happen if earth stops revolving around the sun?
7. If earth stops spinning how will it affect day and night?

08. DECISION MAKING

In zed country, the government was worried about the health of its citizens. So it conducted a study, the results of which were as follows. The prime focus is on major 3 diseases out of which two are genetic. The diseases are found to be ignorable due to their short term effects and non-fatality.

Disease A is wide spread with around 62% of population getting affected by it every year. It is a non-recurring disease. The survival rate (number of people surviving the disease) of the effected is almost 99.99%. The disease was found to be disturbing productivity of people by confining them home for weeks together.

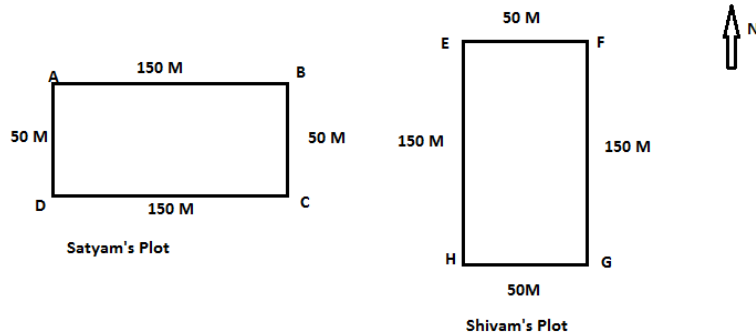
Disease B is known to cause around 55 % of deaths annually caused by illness in the country. Only 5 % of population are getting affected by this disease. The onset of disease cannot be easily recognised and the patient doesn't know that he has this disease until a few hours before his death so the fatality is 100%. The disease can be identified using advance medical technology interventions by doing medical check-up.

Disease C is caused by unclean surroundings and unhealthy eating habits. The disease is a known to affect every 1 out of 5 people of the country. With 1 lac deaths last year, the fatality rate of this disease is calculated as 10%. The disease is known to confine people affected to hospital forever.

1. Which among the above do you think is affecting most percent of population and how much?
2. Which disease is most dangerous and why?
3. Which disease effecting productivity of the country the most?
4. As per the survey, which among the above can be easily avoided?
5. If the government has limited resources and it can spend on only one disease which one do you think the government would focus on?
6. In general a country can be called a healthy nation if less than 40 % of people have diseases then based on that, what do you think the health condition of the country?
 - a. Healthy
 - b. unhealthy
 - c. average
7. What is the population of the country?
8. What is number of people who died because of diseases?

09. DO BIGHA JAMEEN

Two friends Satyam and Shivam wanted to buy plots of land so they decided to meet a property dealer Babu Rao in Ahmedabad. The dealer was really an interesting person. He told them the rate of the land is Rs.1 Crore per minute. Both the friends were stunned and again asked that they wanted to purchase the land. But the dealer repeated the same and explained, "whatever the land covered by you in one minute will be yours". They agreed and next day both the friends started running to cover maximum area and they covered the land as shown below:-



Answer the following questions:-

- What is the shape of each plot?
- Who covered the more area?
- Find the perimeter of Satyam's plot.
- Which plot has more dimensions in North-South direction?
- Find the rate of Shivam's plot per sq. meter.
- Had you been there, in which geometrical shape would you have run to cover maximum area if you have the same speed as of Shivam?
- What is the area covered by you?
- Which shape 150 km X 50 km or 50 km X 150 km of land and where would you like to buy on the earth? Justify your answer?



10. DRILLING A SPHERE

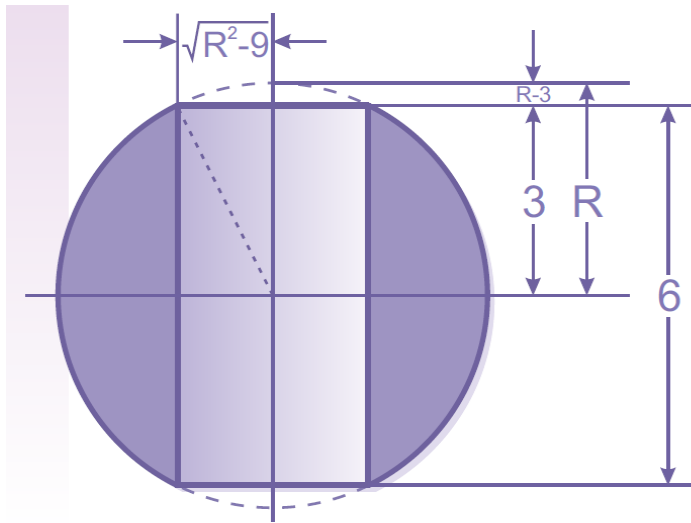
Anand's father offers him an ice cream ball which is spherical. After having fun time with the delicious ice cream when Anand goes for littering the ball to the bin, the father asks him not to throw the ball and says that he has a question for him. The question is : "if you drill a cylindrical hole six inches long straight through the centre of the ball in your hand, What is the volume remaining in the ball?"

SOLUTION FOR THE ACTIVITY

CASE 1—IF THE DIAMETER OF THE BALL IS LESS THAN 6 INCHES.

It is not possible to drill a 6 inches hole through a sphere whose diameter is less than 6 inches.

CASE 2 – IF THE DIAMETER OF THE BALL IS GREATER THAN OR EQUAL TO 6 INCHES.



$R \rightarrow$ Radius of the sphere

$H \rightarrow$ height of the cylinder

Therefore radius of the cylindrical hole = $\sqrt{R^2 - 9}$

Required volume= Volume of sphere – {Volume of the cylinder + 2(Volume of spherical cap)}

$$= \frac{\pi}{6} 6^3 = 36 \pi \text{ cubic units.}$$

PISA QUESTIONS BASED ON THIS ACTIVITY



Question 1: Can this conclusion be drawn from the figures? Circle Yes or No.

Conclusion	Can the conclusion be drawn? Yes/No
1. Can you compare the shape of the object in picture to the shape of earth?	Yes/No
2. Do you think that the surface of ball is flat?	Yes/No
3. Does the ball have a base?	Yes/No
4. Does the ball have a face?	Yes/No

Question2: What is the shape of the ball?

Question 3: How many curved surfaces does the ball have?

Question 4: What is the surface area of the ball?

Question 5: A customer wants to buy water melon for making juice, for which the skin of the water melon has to be peeled off, and therefore is a waste. Which shape should the customer buy?

- (i) Cuboidal
- (ii) Round
- (iii) Cylindrical
- (iv) Spherical

Question 6: When can the ball be taken as two concentric circles as shown in the figure?



Question 7: The of the outer circle is the to the inner circle.

Question 8: What is the volume of the ball if the diameter is 6 inches?

Question 9: When the ball is of diameter 3 inches, can a hole of length 4 inches be drilled along the centre of the ball? Why, justify your answer.



Question 10: As shown in the figure, if a hole of length 6 inches is drilled through the centre of the ball, what will be the remaining volume?

Question 11: If the ball is the size of the Earth, and if a hole of 6 inches long is drilled through the centre of the Earth, then will the volume remain same ?.

11. FRACTIONS

PICTURES CAN MAKE THE FRACTIONS EASIER!

Anushka and Madhusmita were on a survey to mark the rate of literacy in two neighbouring villages 'A' and 'B'. They collected the records of literate and illiterate people of different age groups of the villages. They surveyed on three age groups: - 0 to 25 years, 25 years to 50 years and 50 years above. After survey, they analyzed the data. Their observations and related questions are listed below:-

(a) In village 'A', Anushka found that $\frac{3}{4}$ of the total number of villagers were literate whereas, in village 'B', Madhusmita found that $\frac{3}{5}$ of the total number of villagers were literate. Interestingly Anushka claimed that in Village 'A' literate people were more in number than that in Village 'B'. But when they actually saw the numbers, for their surprise, they had found that both the villages had same number of literate people.

(i) Initially, on which basis Anushka claimed that Village 'A' had more number of literate people.

(ii) Analyze the situation pictorially, and find the fraction of number of illiterate people out of total number of people residing in both the villages.

(iii) Verify your answer algebraically.

(b) In village 'B', Madhusmita found that out of 0-25 years age group, $\frac{4}{5}$ of the villagers were literate, whereas in the same age group, Anushka found that $\frac{5}{6}$ of villagers were literate. Surprisingly, again they observed that numerically both the samples were equal.

(i) Represent the situation pictorially, and find the fraction of number of illiterate people out of total number of people residing in both the villages.

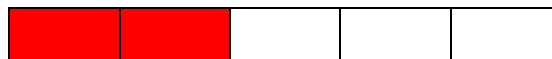
(ii) Can you verify the answer algebraically? If yes, verify that.

(c) In 25-50 years age group, Anushka found that $\frac{3}{4}$ of population is literate whereas $\frac{2}{5}$ of population of the same age group was found literate by Madhusmita.

IN AGE GROUP : 25-50



FRACTION OF LITERATE PEOPLE IN VILLAGE 'A'



FRACTION OF LITERATE PEOPLE IN VILLAGE 'A'

(i) By observing the above figures, can we decide which sample is greater?

(d) Fill in the blank entries in the following table:-

POPULATION	VILLAGE A				
	TOTAL	LITERATE	FRACTION	ILLETERATE	FRACTION
0-25 YEARS	480		$\frac{5}{6}$		
25-50 YEARS		240	$\frac{3}{4}$		
50 & ABOVE	200	110			
TOTAL			$\frac{3}{4}$		
POPULATION	VILLAGE B				
	TOTAL	LITERATE	FRACTION	ILLETERATE	FRACTION
0-25 YEARS		400	$\frac{4}{5}$		
25-50 YEARS	500		$\frac{2}{5}$		
50 & ABOVE	250	150			
TOTAL			$\frac{3}{5}$		
TOTAL (VILL A+B)					

12. Golden Ratio

Fibonacci's Rabbits and Golden Ratio

Suppose a newly-born pair of rabbits, one male, one female, are put in a field. Rabbits are able to mate at the age of one month so that at the end of its second month a female can produce another pair of rabbits. Suppose that our rabbits never die and that the female always produces one new pair (one male, one female) every month from the second month onwards. The puzzle that Fibonacci posed was...

At the end of the first month, they mate, but there is still only 1 pair.

At the end of the second month the female produces a new pair, so now there are 2 pairs of rabbits in the field.

At the end of the third month, the original female produces a second pair, making 3 pairs in all in the field.

At the end of the fourth month, the original female has produced yet another new pair, the female born two months ago produces her first pair also, making 5 pairs. In this way a sequence of number so formed is called Fibonacci's sequence.

Question 1: Complete the following table:

Months	Pairs of Rabbit
0 (Start of Month)	1
1 (End of month)	1
2	2
3	
4	
5	
6	
7	
8	
9	

Question 2: How many pairs of rabbits in the 5th month?

Answer:

Question 3: Write sequence of numbers for 10 months.

Answer:

If we take the ratio of two successive numbers in Fibonacci's sequence and we divide each by the number before it, we will find the series of numbers called Golden Ratio.

Question 4: In what way is the golden ratio related to the Fibonacci sequence?

- a. The ratio of number to the number proceeding it in the Fibonacci sequence.
- b. There is no similarity.
- c. They were discovered by the same person.
- d. The ratio of number to the number following it, in the Fibonacci sequence.

Question 5: Find value of Golden Ratio. Give explanation?

Answer:.....

13. GUESSING THE DAY

ZELLER'S RULE: FIND THE DAY FOR GIVEN DATE QUICKLY

With this technique named after its founder Zeller, you can solve any 'Dates and Calendars' problems. Zeller's Rule can be used to find the day on any particular date in the calendar in the history. All you have to know is the formula given below and how to use it.

Zeller's Rule Formula

$$F = K + [(13 \times M - 1) / 5] + D + [D / 4] + [C / 4] - 2C$$

where,

1) K = Date. So, for 27/06/2019, we take K=27

In Zellers rule, months start from March.

2) M = Month number

Remember that month Starts from March in this formula. So

March = 1,

April = 2,

May = 3

June = 4

July =5,

August = 6,

September = 7,

October = 8,

November = 9

December = 10,

January = 11

February = 12

So, for 27/06/2019, M=4

3) D = Last two digits of the year

So, in our example of 27/06/2019, the value of D is 19

4) C = The first two digits of century

So, in our example of 27/06/2019, the value of C is 20.

Let us now calculate the day for 27/06/2019 with the formula above.

Remember that the values of K, M, D and C are 27, 04, 19 and 20 respectively.

The formula is $F = K + [(13 \times M - 1) / 5] + D + [D / 4] + [C / 4] - 2C$

Replacing the values in the formula, we get

$$F = 27 + [(13 \times 4) - 1] / 5 + 19 + 19 / 4 + 20 / 4 - (2 \times 20)$$

Therefore,

$$F = 27 + 51 / 5 + 19 + 19 / 4 + 20 / 4 - 40$$

$$\text{which gives } F = 27 + 10.2 + 19 + 4.75 + 5 - 40$$

[We have to Consider only the integral value and ignore the value after decimal. So, the equation changes a bit as shown below. We have just removed value after decimal]

$$F = 27 + 10 + 19 + 4 + 5 - 40$$

Therefore, $F = 25$

Now that you have a numerical value for the day, divide the number by 7. We need the remainder only. For example, in this case, the remainder is 4.

Now, match the remainder with the chart below:

0 = Sunday

1 = Monday

2 = Tuesday

3 = Wednesday

4 = Thursday

5 = Friday

6 = Saturday

Here, 4 represents Thursday.

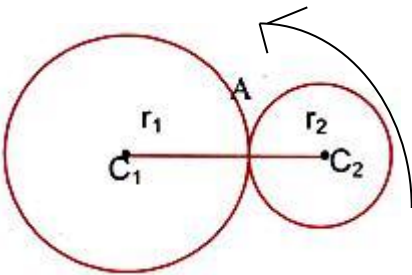
So by Zeller's rule, 27th of June, 2019 is on a Thursday.

Question 1: By using the above Zeller's formula, Find the day for 15/08/1947.

Question 2: By using the above Zeller's formula, Find the day for 26/01/1950.

14. HOW MANY ROUNDS?

➤ A circle of radius r_2 is moved along the circumference of a fixed radius r_1 as shown in the figure given below. The radius of fixed circle is double the radius moving circle. Answer the following questions:



1. Write the relationship between r_1 and r_2 .
2. How much distance is travelled in completing one revolution along a circle?
3. What will happen if r_2 is doubled?
4. Name the points which remain equidistant from each other throughout the activity.
5. If the circles given above represent two circular gears, then in how many ways can we connect them with single rod such that this rod touch each of them externally at one point only.

15. GREAT MATHEMATICIAN

Brahmagupta gave four methods of multiplication and his main contribution was the introduction of zero and the fact that zero (0) stood for 'nothing' in the world of mathematics.

Bhāskara I, contributions are mainly his proof of the fact that zero stood for 'nothing' (the idea initially introduced by Bhramagupta). He made many calculations to prove so; division, permutation and combination theories. He also proved how the earth appears to be flat even though it's a sphere.

Bhaskara II, He is most known for his work in calculus and how it is applied to astronomical problems and computations. Not only did he deal with calculus but had vast knowledge over arithmetic, algebra, mathematics of planets and spheres.

Hemachandra, His most significant contribution in mathematics was his initial version of the Fibonacci sequence (1,1,2,3,5,8,13,21,.....). He was not only a mathematician but also a scholar, polymath, poet who wrote on grammar, philosophy and contemporary history. Therefore his contributions are not only restricted to math but over all the various different fields that he had mastered over.

Shakuntala Devi is known for her extraordinary talents in solving complex mathematical problems without any mechanical aid. She also found her place in the Guinness book of records as a result of her extraordinary talents. Nowadays, apart from solving mathematical problems, she is utilising her amazing talent in the field of astrology. On 18 June 1980, Shakuntala Devi gave the product of two, thirteen digit figures after multiplying them within 28 seconds.

Question 1: Who contributed towards proof of zero?

Answer:.....

Question 2: Which of the above Mathematicians best known as Human Computer?

Answer:.....

Question 3: Who gave initially concept of Fibonacci sequence?

Answer:.....

Question 4: Who introduced the concept of Zero?

Answer:.....

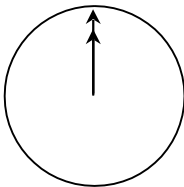
Question 5: Who has mainly dealt with the astronomical work?

Answer:.....

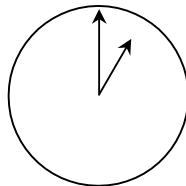
16. INTERNET RELAYCHAT

Mark (from Sydney, Australia) and Hans (from Berlin, Germany) often communicate with each other using “chat” on the Internet. They have to log on to the Internet at the same time to be able to chat.

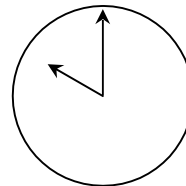
To find a suitable time to chat, Mark looked up a chart of world times and found the following:



Greenwich 12 Midnight



Berlin 1:00AM



Sydney 10:00AM

Question 1: INTERNETRELAYCHAT

At 7:00 PM in Sydney, what time is it in Berlin?

Answer:

INTERNET RELAY CHAT SCORING 1

Answer:

Question 2: INTERNETRELAYCHAT

Mark and Hans are not able to chat between 9:00 AM and 4:30 PM their local time, as they have to go to school. Also, from 11:00 PM till 7:00 AM their local time they won't be able to chat because they will be sleeping.

When would be a good time for Mark and Hans to chat? Write the local times in the table.

Place	Time
Sydney	
Berlin	

INTERNET RELAY CHAT SCORING 2

17. INVESTMENTS



1. Susan invested Rs 1,50,000 in a scheme offering 12% per annum. Find the amount she gets after a year if interest is compounded half yearly.
2. She then invested certain amount of money in two schemes A and B, which offer interest at the rate of 8% per annum and 9% per annum, respectively. She received Rs 1860 as annual interest. However, had she interchanged the amount of investments in the two schemes, she would have received Rs 20 more as annual interest. How much money did she invest in each scheme?
3. She now thought of investing the total money in a single scheme with an interest equal to mean of both the rate of interests. Which of the three is a better scheme?

18. JUICY WATERMELONS

Cubic watermelons are watermelons grown into the shape of a cube. This is generally intended for space efficiency in small refrigerators. The practice of growing cube watermelons is popular in Japan. The melons are grown in boxes and assume the shape of the container. Normal watermelons are round in nature.

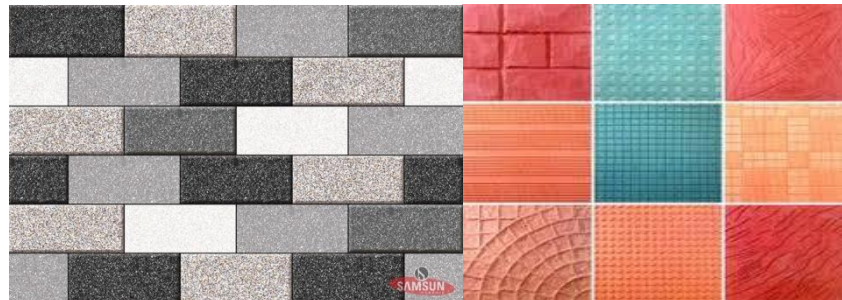


QUESTION 1.1:

If the side of a cubical watermelon is equal to the diameter of a spherical watermelon and they are to be stacked in boxes, then which one would occupy more space than the other?

QUESTION 1.2:

If 90% of the watermelons are full of water, then how much water(juice) will you get from the cubic watermelon of side 15cm?

19. KUTTY'S TILING PROBLEM

Kutty is a floor tile maker .He used to make rectangular or square type of tiles. He prefers to make tiles of regular shapes. so that floorings can be made with these tiles alone without gape by joining them corner to corner

1. How many rectangular tiles of size 30cmX15cm is required to for rectangular hall of size 3.6mX3m
2. How many tiles will be joined at one corner question 1,other than sides of the floor
3. If he uses equi-triangular tiles how many of them join at one corner of tile? Other than sides of the floor
4. What will be the size largest square tile that can be used for the floorings without cutting any tile for rectangular hall of size 24mX15m ?



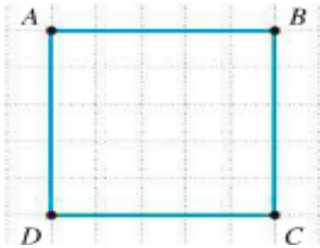
15m

24m

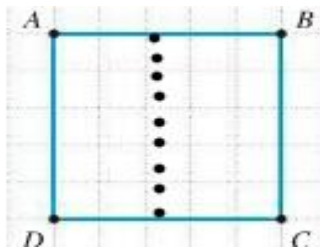
- What will be the highest number of sides of regular polygonal tile he can make so that tiles are joining corner to corner without gap? Why? (other than sides of the room)

20. LARGEST EQUILATERAL TRIANGLE FROM A SQUARE

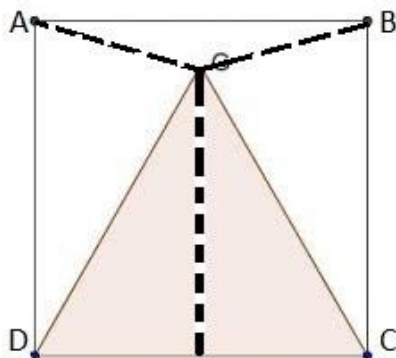
- Take a square piece of paper name it ABCD.



- Fold it in such a way that its opposite edges lie on each other; this folded line is the perpendicular bisector of the sides AB and DC.



- Take a point G on the folded line; now fold the two adjacent vertices B and A of the square on the perpendicular bisector, such that the folded line passes through the other two vertices C and D of the square.



4. Now the triangle at the center is an equilateral triangle as it is formed by taking three sides of the square which are equal.

Questions

1. What type of triangle is formed? What is the measure of each angle of the triangle?
2. Find the area of the square whose side is 12cm?
3. Find the area of equilateral triangle of side 12cm?
4. What is the ratio area of a square of side a cm to area of equilateral triangle of side a?
5. If the side square is halved then it's area will increase or decrease?
6. If the side of square is doubled then it's area will be _____?

21. MAXIMUM AREA

A rectangle is given. By paper folding activity, make an equilateral triangle with one side as breadth of the rectangle. Make another equilateral triangle with maximum area inside it.

- (a) What is the height of maximum area equilateral triangle?
- (b) What is the side of that triangle?
- (c) Find the area of triangle
- (d) What is the ratio of area of these two triangles?

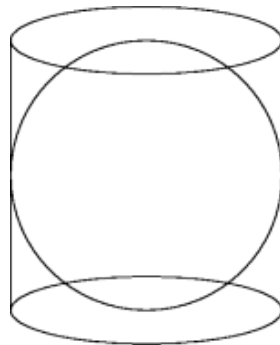
22. SPHERE AND CYLINDER

On the Sphere and Cylinder is a work that was published by [Archimedes](#) in two volumes c. 225 BCE. It most notably details how to find the [surface area](#) of a [sphere](#) and the volume of the contained [ball](#) and the analogous values for a [cylinder](#), and was the first to do so.

He also observed that if a sphere is sliced in to equal parts, then the total surface area of each part will same.

Archimedes was particularly proud of this latter result, and so he asked for a sketch of a sphere inscribed in a cylinder to be inscribed on his grave.

Marcellus saw to it that Archimedes was given a burial in accordance with his wishes, including a monument featuring a stone sphere and cylinder.



1. Observe the above figure: A sphere of radius " r " is enclosed by a cylinder.
 - a) What is the Volume of the sphere as compared to the volume of the cylinder?
 - b) Find the ratio of the Total Surface Area of the sphere to that of the cylinder.

2. SLICING AN ORANGE



2. Using the above knowledge answer the following.

An orange is sliced into six equal slices.

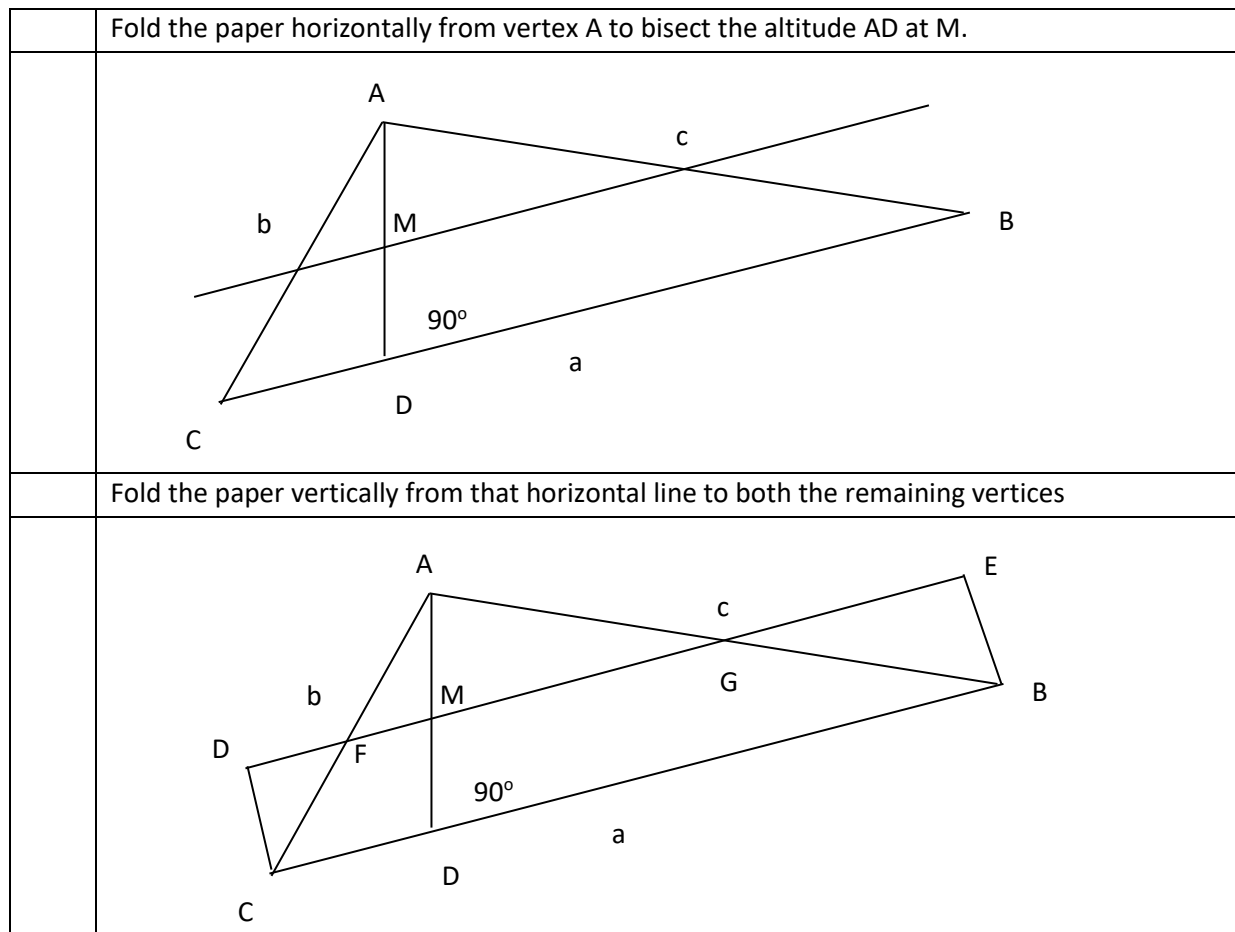
a) Find the volume of each slice.

b) Find the total surface area of each slice of orange.

c) The total surface area of each slice is 6π . Find the radius of the orange.

23. PLOTTING AREA

	Plot Area Activity
	Kamlesh has a triangular shaped plot. One day he had an idea of reshaping this plot with rectangular shape by making it more attractive. So, he was planning to make it in rectangular shape with same area of triangle shape. How will he do it?
	Make a rectangle with same area as a given triangle
	Logical Reasoning: Draw a any triangle ABC on a paper.
	Fold paper vertically from vertex A to form an altitude on BC.



QUESTIONS BASED ON ACTIVITY									
1.	Is the ar $\triangle CDF \cong$ ar $\triangle AMF$?								
2.	Is the ar $\triangle BEG \cong$ ar $\triangle AMG$?								
3.	Is the ar $\triangle AMF \cong$ ar $\triangle AMG$?								
4.	How many triangles are there in this figure?								
5.	Find the length of altitude AD where BC=15, AB=11 and AC=6.								
6.	What is the area of rectangle BCDE?								
7.	What is the perimeter of rectangle BCDE?								
8.	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%; padding: 5px;">No. of lines</th> <th style="padding: 5px;">No. of Triangles</th> </tr> </thead> <tbody> <tr> <td style="text-align: center; padding: 5px;">3</td> <td style="text-align: center; padding: 5px;">1</td> </tr> <tr> <td style="text-align: center; padding: 5px;">5</td> <td style="text-align: center; padding: 5px;">2</td> </tr> <tr> <td style="text-align: center; padding: 5px;">?</td> <td style="text-align: center; padding: 5px;">?</td> </tr> </tbody> </table>	No. of lines	No. of Triangles	3	1	5	2	?	?
No. of lines	No. of Triangles								
3	1								
5	2								
?	?								
9.	Approximately, how many triangles are required to decorate a 10X10 wall of a room?								

24. RATE OF FOREIGN EXCHANGE

Foreign Exchange (forex or FX) is the trading of one currency for another. For example, one can swap the U.S. dollar for the euro. Foreign exchange transactions can take place on the foreign exchange market, also known as the Forex Market.

The forex market is the largest, most liquid market in the world, with trillions of dollars changing hands every day. There is no centralized location, rather the forex market is an electronic network of banks, brokers, institutions, and individual traders (mostly trading through brokers or banks).

How Does Foreign Exchange Work?

The market determines the value, also known as an exchange rate, of the majority of currencies. Foreign exchange can be as simple as changing one currency for another at a local bank. It can also involve trading currency on the foreign exchange market. For example, a trader is betting a central bank will ease or tighten monetary policy and that one currency will strengthen versus the other.

RATES TABLE1 Indian Rupee Rates table

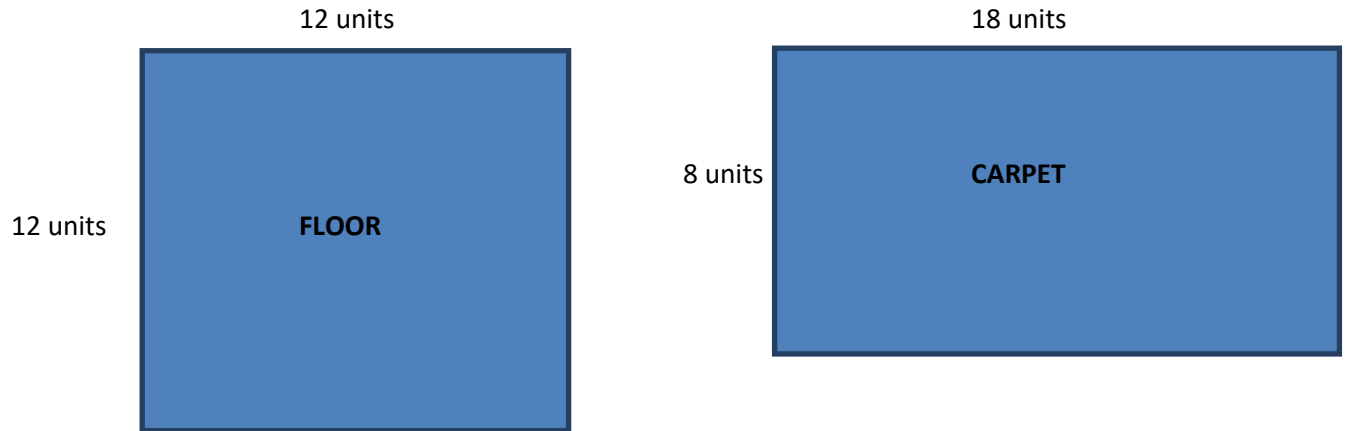
Indian Rupee	inv. 1.00 INR
US Dollar	69.043582
Euro	78.482737
British Pound	87.707768
Australian Dollar	48.299734
Canadian Dollar	52.598734
Singapore Dollar	51.011760
Swiss Franc	70.635194
Malaysian Ringgit	16.664473
Japanese Yen	0.640227
Chinese Yuan Renminbi	10.039203

Now answer the following questions.

1. Ronald, Joy and Chiko are friends from America(US), Singapore and Japan respectively and they reached together Mumbai on tour. Ronald has 9000 US dollars, Joy has 10000 Singapore dollars and Chiko has 580000 Japanese yen. On the exchange rate shown in the above table, who will get more money in terms of indian rupees?
(a) Ronald (b) Joy
(c) Chiko (d) Ronald and Joy

25. RECTANGLE AND SQUARE

We have a floor and a carpet of the dimensions as given below.



We want to cover the whole floor with the carpet.

Try to cover the floor with the carpet.

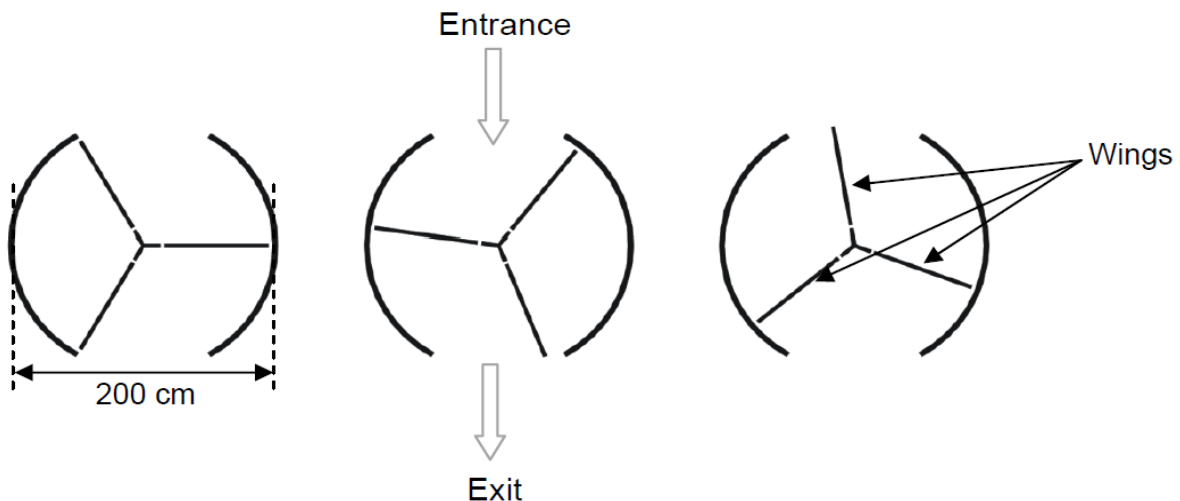
What do you find? Is it possible? Let us discuss the following.

Questions:

1. What are the shapes of floor and carpet?
2. Find the perimeters of floor and carpet.
3. Whose area is greater floor or carpet?
4. How much area of floor can be covered with this carpet?
5. Can we cover the floor with carpet?
6. How can we do it and find the minimum number of pieces in which carpet should be cut to cover the floor?
7. Find the perimeter of each piece of carpet?
8. If we want to join the two pieces using a tape of width 1 unit find the length of tape required.
9. If price of tape is Rs 5 per units. Find the money required to buy the tape.

26. REVOLVING DOOR

A revolving door includes three wings which rotate within a circular-shaped space. The inside diameter of this space is 2 metres . The three door wings divide the space into three equal sectors. The plan below

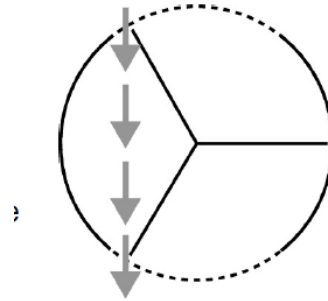


shows the door wings in three different positions viewed from the top.

Q1.

- I. What is the size in degrees of the angle formed by two door wings?
- II. What type of angle?

Q2. The two door openings (the dotted arcs in the diagram) are the same size. If these openings are too wide the revolving wings cannot provide a sealed space and air could then flow freely between the entrance and the exit, causing unwanted heat loss or gain. What is the maximum arc length in centimeters (cm) that each door opening can have, so that air never flows freely between the entrance and the exit?



Q3. The door makes 4 complete rotations in 2 minutes. There is room for a maximum of two people in each of the three door sectors. What is the maximum number of people that can enter the building through the door in 20 minutes?

- A. 60
- B. 240
- C. 480
- D. 720

Q4. If there are n wings in a revolving door which rotate a circular shaped space of diameter of this space is 3 meters. The n door wings divided the space into n equal sectors what is the angle formed by two door wings.

27. SCOUT CAMP

Kendriya Vidyalaya New Allahabad Cantt is going to organize a scout camp of national level from 30 July 2019 to 3 August 2019. The participants of 25 regions are coming. Every region scout team consists of 15 students and 2 escorts.



Question 1. How many people will be there on august 1?

Question 2. The Vidyalaya has a huge playground. For making region wise tent they given 40X40 square meter area in total.



What will be the maximum size of each tent if every tent shape will be square only?

Question 3. How much rope will be required to make fences of each tent?

Question 4: What is the area occupied per person?

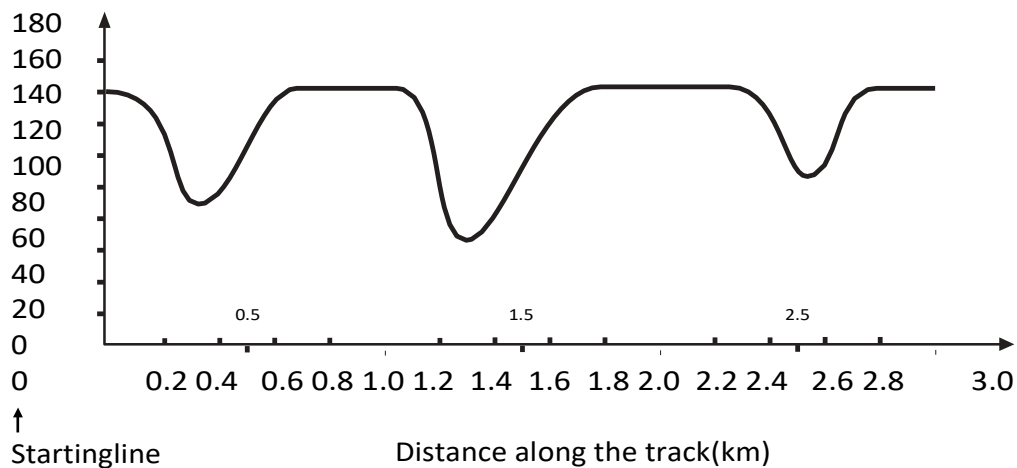
Question 5. During a trekking activity of 6 km a student Ram will to go to Sangam and return back up to 12 noon. He estimates that he can go to the Sangam at 1.5km/h on average, and return at half that speed. These speeds take into account breaks and rest times. Using ram's estimated speeds, what is the latest time he can begin his walk so that he can return by 12 noon?

Question 6. Ram used step count software on his mobile while trekking to count his steps on his walk to Sangam. He found that he walked 13600 steps on return. Estimate average step length for his return walk. Give your answer in centimeters.

28. SPEED OF RACING CAR

This graph shows how the speed of a racing car varies along a flat 3 kilometer track during its second lap.

Speed (km/h) Speed of a racing car along a 3 km track (second lap)



Question 1: SPEED OF RACING CAR

What is the approximate distance from the starting line to the beginning of the longest straight section of the track?

- A. 0.5km
 - B. 1.5km
 - C. 2.3km
 - D. 2.6km
-

Question 2: SPEED OF RACING CAR

Where was the lowest speed recorded during the second lap?

- A. At the starting line.
 - B. At about 0.8km.
 - C. At about 1.3km.
 - D. Halfway around the track.
-

Question 3: SPEED OF RACING CAR

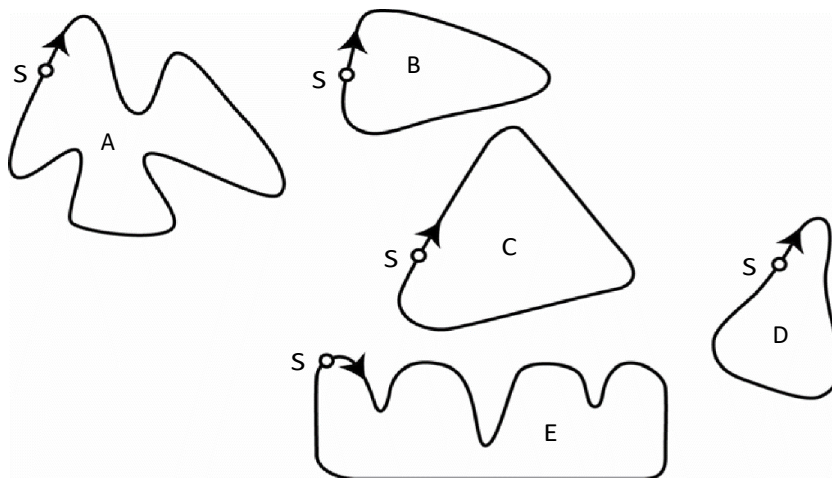
What can you say about the speed of the car between the 2.6 km and 2.8 km marks?

- A. The speed of the car remains constant.
 - B. The speed of the car is increasing.
 - C. The speed of the car is decreasing.
 - D. The speed of the car cannot be determined from the graph.
-

Question 4: SPEED OF RACING CAR

Here are pictures of five tracks:

Along which one of these tracks was the car driven to produce the speed graph shown earlier?

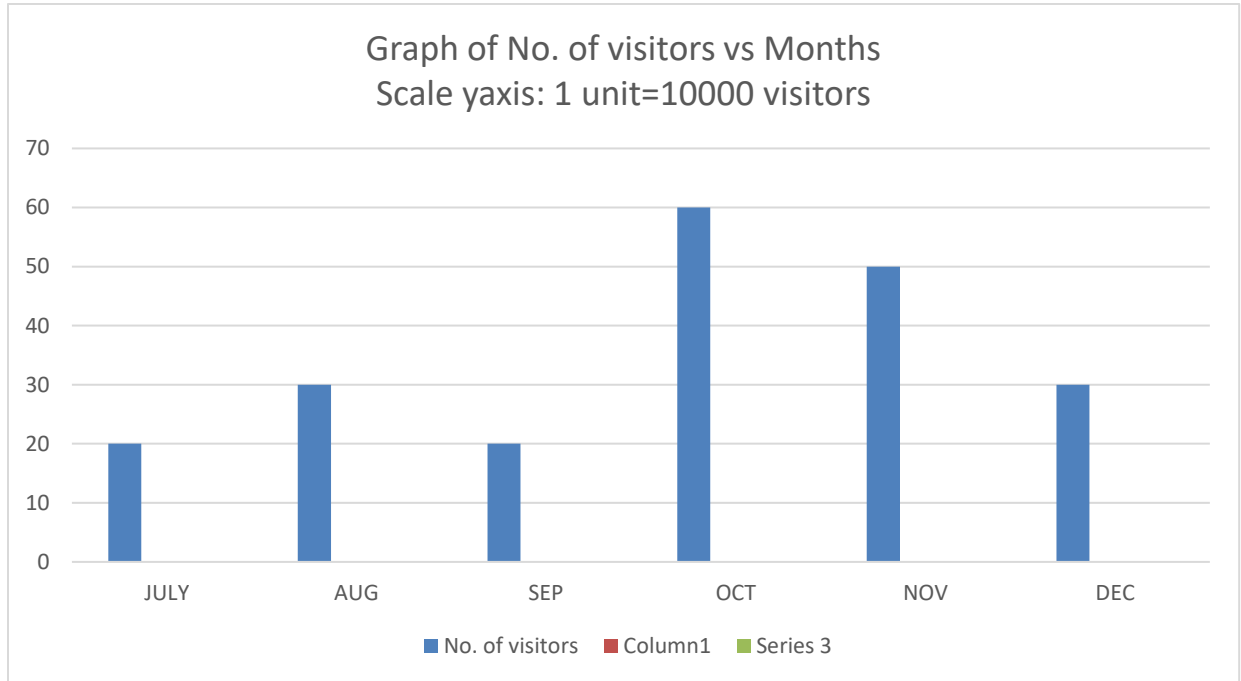


S: Starting point

29. TRAVELLERS' PUZZLE

Every year thousands of visitors throng to see Gandhi Memorial Museum at Gandhinagar. The following graph shows an approximate number of tourists who visited the museum from July to December in 2018.

Graph



Question 1

Which two months recorded the highest number of visitors in the museum?

Question 2

In the year 2018, it was found that around 1,40,000 people visited the museum from 1st October to 20th December. On an average, how many people visited it daily in that period (approx.)?

- a) 4000
- b) 1700
- c) 1000
- d) 2500

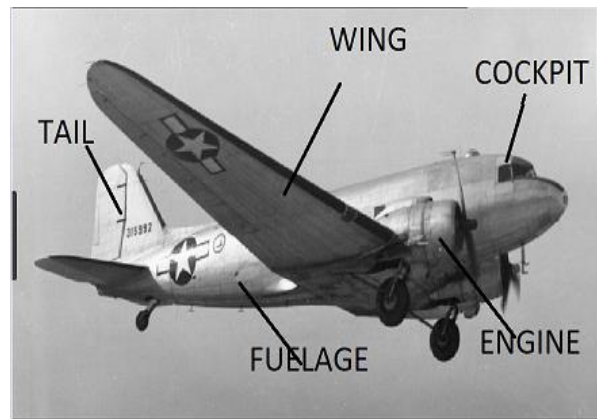
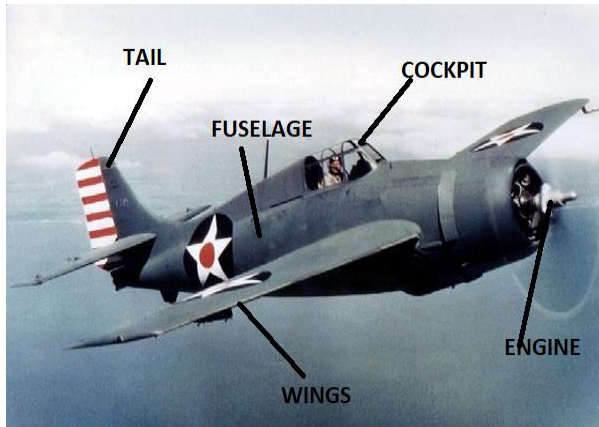
Question 3

There are about 120 important exhibits that a tourist wants to see. But he wonders whether he will be able to see all of them in 4 hours. Can you help him by finding out how many minutes he should spend on each exhibit on an average so that he can cover all the artifacts?

30. WAR PLANES

In World War II, Air forces across the globe fought major battles. In the battles many planes used to be grounded for various repairs. They used to affect the outcomes of battles adversely. So a committee was formed in Great Britain to strengthen the Planes.

The committee met and it was decided to armour (to cover the planes with thick metal sheets) the planes. The only problem was if one armours entire plane then it will burn more gas and oil and the free movement of planes will be effected. So the armouring can be limited to only one part of the plane. So the question arised as to which part of the plane should be armoured. For this to be decided the grounded planes (planes that were damaged in the air fight and successfully returned) must be surveyed for the kind of 'injuries' they had. They did that and the data was as follows.



A Plane That Returned Due To Damage to the Wing



A Plane That Is Trying To Return to Base with A Damaged Engine

Data of The number of planes that returned from battle fields due to damages

TYPE OF DEFECT	NO. OF PLANES
Holes In The FUSELAGE Part	18
Damage to the tail section	7
Planes with Damaged wings	15
Plane with engines damaged	2
Planes with other areas damaged	9

Going by the data

1. Among the planes available for repair maximum number of planes need repair for which part?
2. Minimum number of planes need repair for which part?
3. The committee decided to armour engines instead of nose part and the idea is welcomed by one and all. Why?