

STEP BY STEP

MATHS FOR ALL



Start

Think

Analyse

Plan

Do

Do again

Keep on doing

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ABOUT THE BOOK

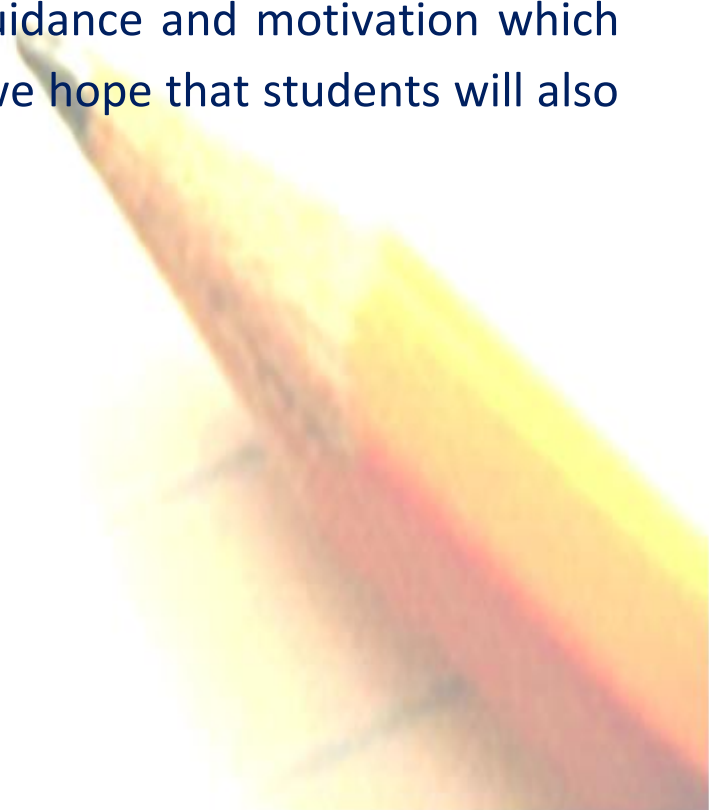
Everything around us can be understood better with Mathematics as it can help children to think about many aspects of their world through its connection with them.

For students, learning usually happens in the best way when they can relate it to real life situations. With each higher class, it becomes more advanced and challenging. Many students find it difficult to understand the abstract mathematical concepts and have to work harder and practice longer for this.

However, by infusing real life examples with mathematical concepts, teachers can help students view mathematics from an entirely different point of view.

The booklet **"STEP BY STEP"** fulfils the objective that concepts in Mathematics can be learnt in a joyful manner. It will also enhance the CCT skill of learning.

We are thankful to the **DIRECTOR OF SCHOOL EDUCATION, SH. RUBINDERJIT SINGH BRAR** for his guidance and motivation which helped us to complete this task and we hope that students will also get benefit from this booklet.





3D Shapes

3D Shapes are fat not flat



A **cone** is like a party hat



A **sphere** is like a bouncy ball



A **prism** is like a building tall



A **cylinder** is like a can of pop



A **cube** is like a dice you drop



3D Shapes are here and there

3D Shapes are everywhere



Hello Students,

Aap sab kaise ho, we have studied about 2-dimension shapes in our previous booklet now we will discuss in detail about 3-dimentional shapes.

Do you know that we can get most of the 3-D shapes from 2-D Shapes.

How can we do it?



First tell me, do you see 3-D objects around the surrounding. Name few of them which you see in your classroom. Remember only 3-Dimensional objects.



TIFFIN
BOX

BOOK

CHALK

WATER
BOTTLE

DUSTER

DOOR





I remembered you told us that the objects we can hold in our hand are 3-dimensional objects.

In geometry, a three-dimensional shape can be defined as a figure or an object that has three dimensions - length, width and height. Unlike two-dimensional shapes, three-dimensional shapes have thickness or depth also.



See, how we convert 2-D into 3-D

1. Draw a square on floor and now keep on adding piece of square paper/square cardboard on it. Keep on adding. What will you get? Is it a CUBE?
2. Draw a rectangle on floor and now keep on adding piece of rectangle paper/cardboard on it. Keep on adding. What will you get? Is it a CUBOID?
3. Draw a Circle on floor and now keep on adding piece of circle paper/cardboard on it. Keep on adding. What will you get? Is it a CYLINDER?

In this way we can convert 2-D shapes into 3-D shapes.



It is very interesting.

Let's try



Conversion of 2-Dimension to 3-Dimension

Cube from square.	Cylinder from circles.	Cuboid from rectangles.



Let's discuss about Vertices, Edges and faces of 3-D Shapes.

CUBE	CYLINDER	CUBOID
CONE	PRISM	SPHERE
		<div> 1 face 0 edges 0 vertices </div>

Bacho, See the above shapes. These all are 3-dimensional, they have edges, vertices and faces but still they are not same.



But why they are not same?

Few of these are not polyhedron as they have curved faces and edges.

A polyhedron is a closed shape which has flat faces and straight edges.

OKAY!

So, cylinder and cone are not polyhedron as they have curved surface and edges.



EXACTLY!!! VERY GOOD...

For any polyhedron, the sum of number of vertices and faces is exactly two more than the number of edges. This formula is called **EULER'S FORMULA** and it is true for any polyhedron.

The Euler's formula for polyhedron is as given.

$$F + V - E = 2$$

Where,

$F \rightarrow$ number of faces

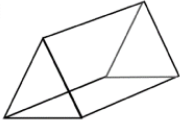

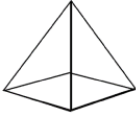
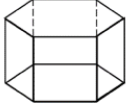
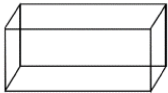

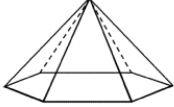
$V \rightarrow$ number of vertices

$E \rightarrow$ number of edges

ACTIVITY



Bacho, now verify Euler's formula for the given figures.

	Shape	faces	edges	vertices
1)		<u>5</u>	<u>9</u>	<u>6</u>
2)		<u>6</u>	<u>12</u>	<u>8</u>
3)		<u>5</u>	<u>8</u>	<u>5</u>
4)		<u>8</u>	<u>18</u>	<u>12</u>
5)		<u>6</u>	<u>12</u>	<u>8</u>
6)		<u>8</u>	<u>12</u>	<u>6</u>
7)		<u>7</u>	<u>12</u>	<u>7</u>



Now tell me what is $F+V-E$?

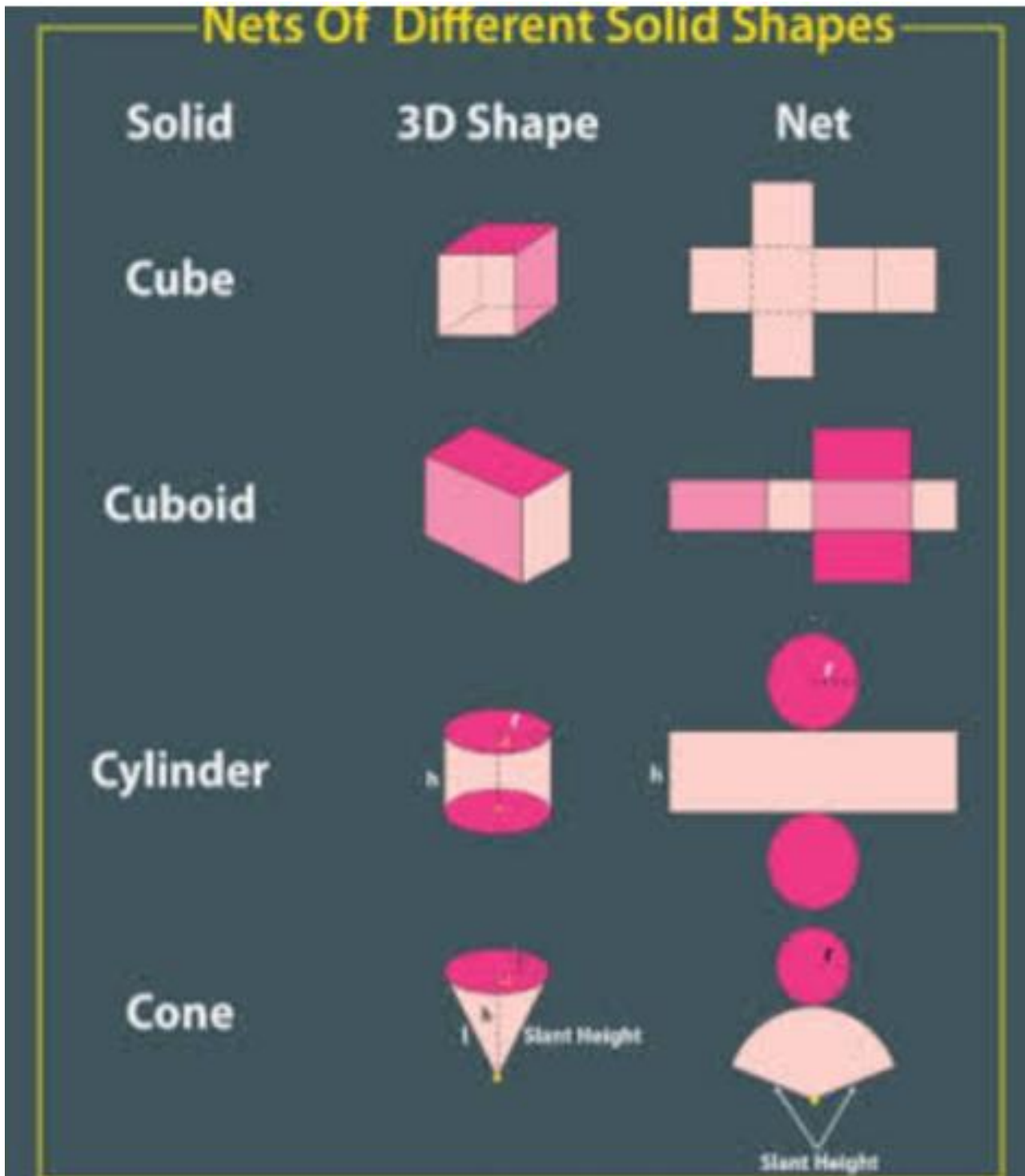
In all cases the answer is 2

Well done!!!



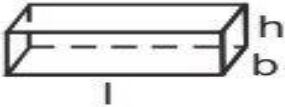
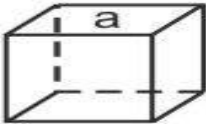
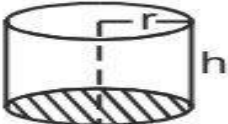

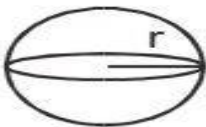
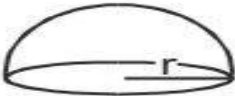


Dear Students, I hope that concept will be more clear when you see the net of 3D Shapes.



Now you can easily drive the formula of surface area and volume of 3d objects.



Name	Figure	Curved Surface area	Total surface area	Volume
Cuboid		$2h(l + b)$	$2(lb + bh + lh)$	lbh
Cube		$4a^2$	$6a^2$	a^3
Right circular cylinder		$2\pi rh$	$2\pi r(r + h)$	$\pi r^2 h$
Right circular cone		πrl	$\pi r(l + r)$	$\frac{1}{3}\pi r^2 h$
Sphere		—	$4\pi r^2$	$\left(\frac{4}{3}\right)\pi r^3$
Hemi-sphere		$2\pi r^2$	$3\pi r^2$	$\left(\frac{2}{3}\right)\pi r^3$

WOW!!!

It's so interesting



Yeah, It's so easy



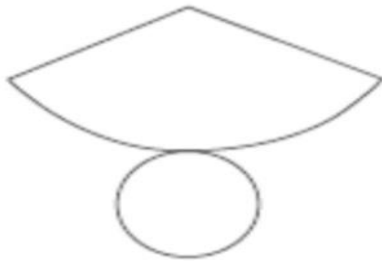
Now, It's time for some brain teasers...

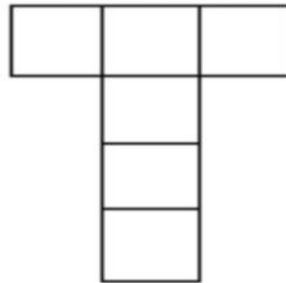


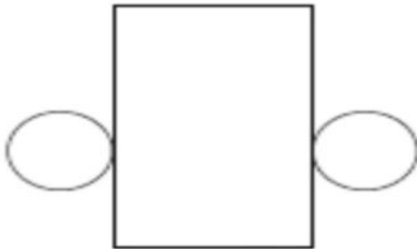
CHALLENGE 1



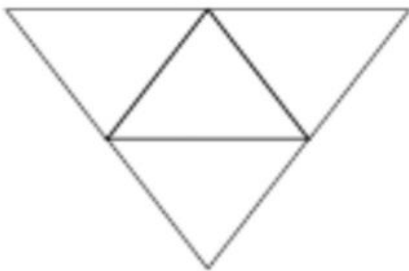
Friends, Name the solid shape that can be formed by each net.

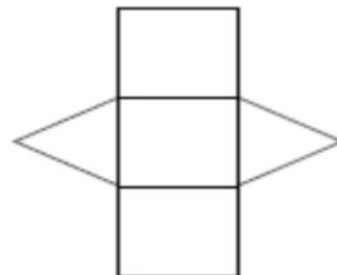












CHALLENGE 2



Friends, Match the shapes with the net.

	Cube	
	Cuboid	
	Tetrahedron (triangular based pyramid)	
	Square-based pyramid	
	Hexagonal prism	
	Triangular prism	

CHALLENGE 3

Sameer wants to paint front wall of his house. Find the surface area that he wants to paint. However, he does not want paint on the windows, door, chimney, or roof.

1. Find the surface area needed to be painted if the sides of the house are 10 feet by 12 feet.

2. If capacity of one Paint container is 2 liters and it can paint only 28 square feet. How

many containers required to paint the wall of house?

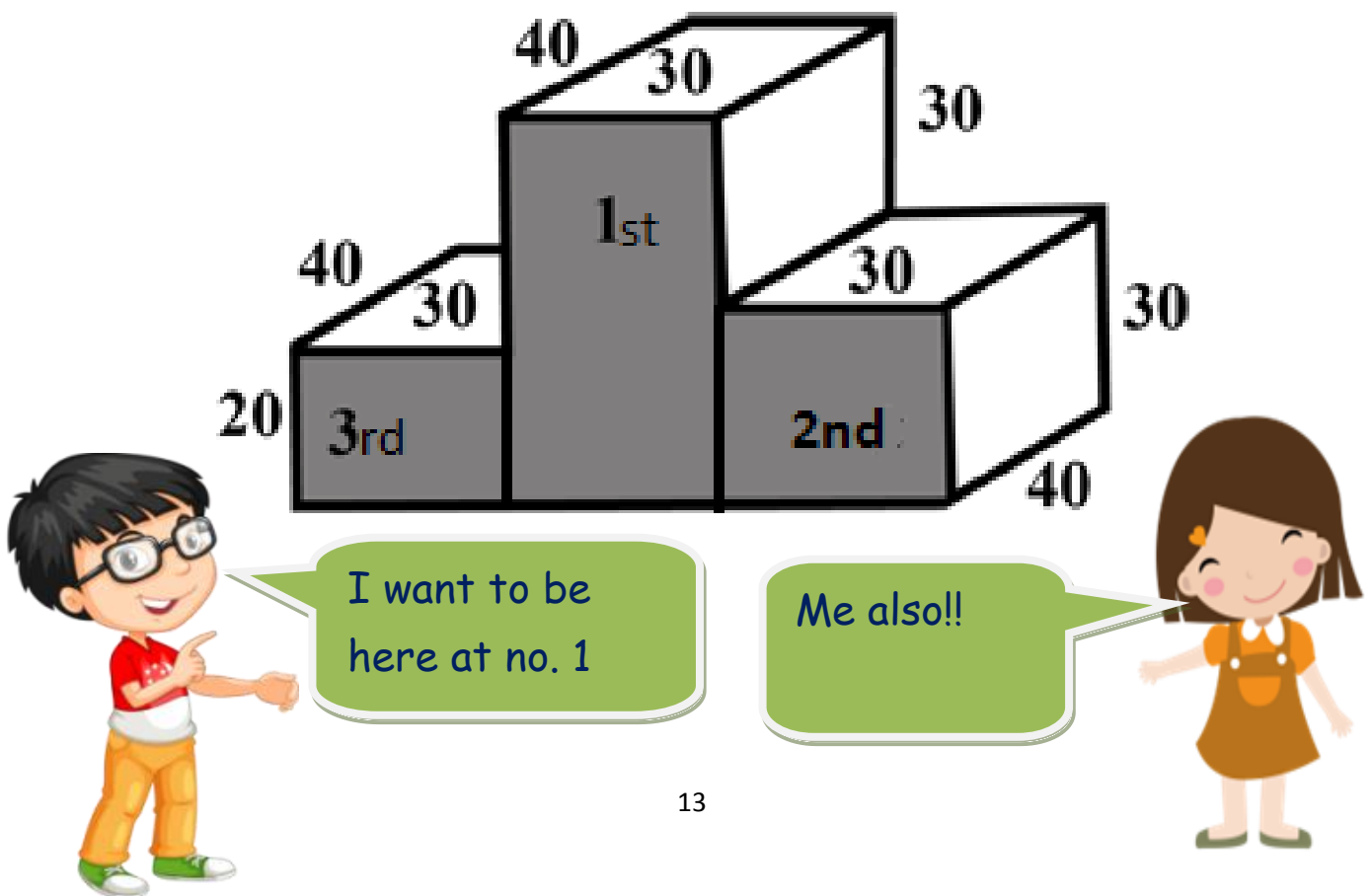
3. If cost of one paint container is Rs. 225/-. Find the total cost.



CHALLENGE 4

MATHS IS EVERYWHERE

Hey kids do you know this fact that victory-stand shape is based on math's. Here the figure shows a closed victory stand whose dimensions are given in centimeter and see the winner of 1st, 2nd and 3rd position always stand at different height. You have to find the volume and surface area of each victory-stand?

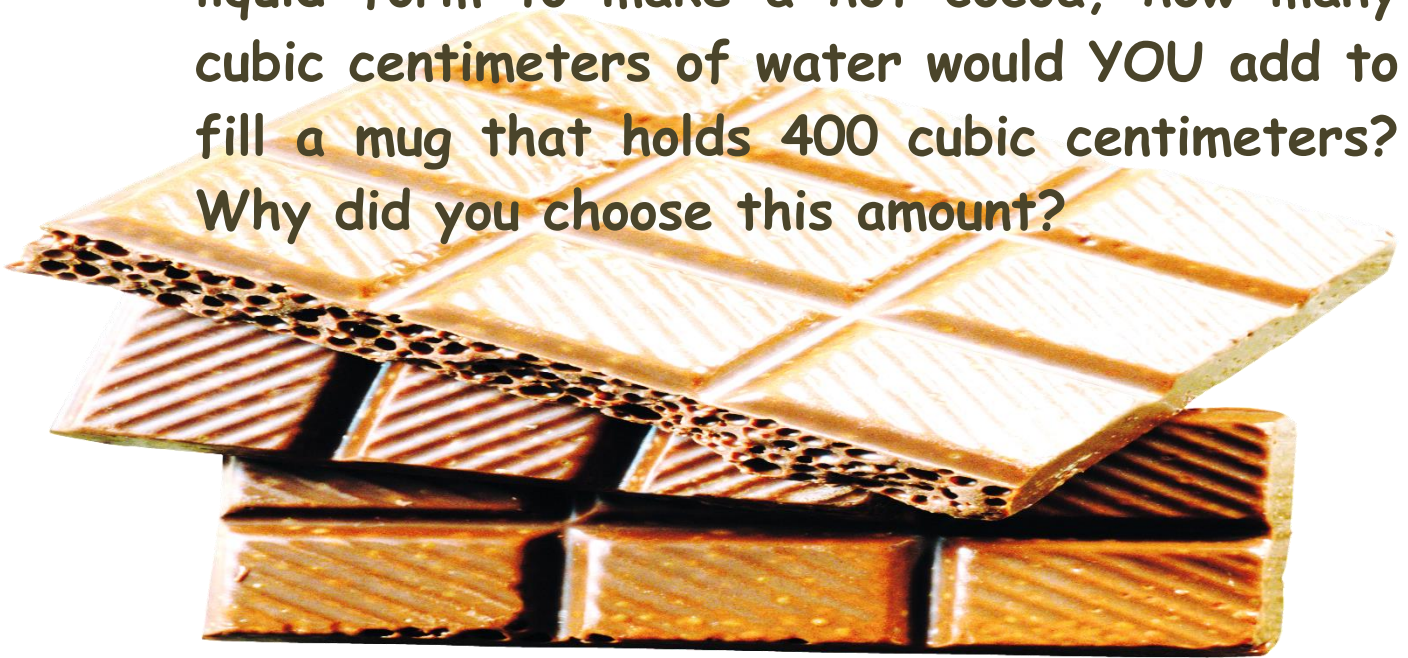


CHALLENGE 5

CHOCOLATE वात MATHS

A Chocolate bar made of fifteen equal-sized rectangular pieces has an area of 225 square centimeters.

1. What are the dimensions of each rectangular piece?
2. What is the perimeter of the whole chocolate bar?
3. If the surface area of the packaging that holds the chocolate bar is 510 square centimeters, what is the height of the chocolate bar?
4. If you wanted to melt the chocolate bar into liquid form to make a hot cocoa, how many cubic centimeters of water would YOU add to fill a mug that holds 400 cubic centimeters? Why did you choose this amount?



CHALLENGE 6



Hey Kids, do you know that in our times we use these fountain pens to write. They are reusable and environment friendly as we can fill the ink again and again.

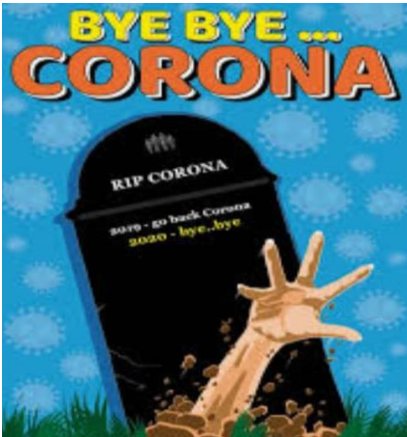
The barrel of a fountain pen, cylindrical in shape, is 7cm long and 5mm in diameter. A full barrel of ink in the pen will be used up on writing 330 words on an average. How many words would use up a bottle of ink containing one-fifth of a litre?



CHALLENGE 7



Hey Siya, your parents got Corona Vaccination or not?



Yes, My parents got vaccinated but my grandparents are not convinced to get vaccinated



My all family members got vaccinated. You should convince your grandparents as it is not harmful. Government is spending lot of money to protect its citizen from this deadly virus. Although it is free for all of us.



A vaccination camp was organized in GMSSS-35, Chandigarh in which 500 people can be vaccinated. One carton of covishield vaccine contains 50 bottles. Volume of each bottle is 5ml.

1. What will be the volume of one dose given to one person if all 500 people were vaccinated?
2. But only 348 people turned up on that day. So how many bottles are left unused.
3. If a bottle is not consumed completely can it be used on next day?

CHALLENGE 8

At Elante Mall, in a Grocery store, tasting cups are used to let customer try new brand of shakes. 500 ml bottle of shake can fill four testing cups. Each carton of shake has 10 bottles. If 5600 persons try the shakes.

1. Find how much shakes were consumed?
2. How many cartons were used?



CHALLENGE 9

An adventure camp was arranged by Siya and Sameer's school as these camps are the perfect place for children to practice decision making. Sameer and siya along with their friends reached at adventure camp in kansal forest.

They received welcome drink on their arrival. Welcome drink were served in cylindrical and hemispherical mugs after that they went for tracking which was very enjoyable but tiring too. All the students were divided into different groups with each group has 4 students. Each group has to make a conical tent with canvass of area 550 m^2 to stay at night. Assuming that stitching and wasting margins are negligible. The teacher told them that the radius of each tent should not be more or less than 7 meters.



NOW SOME BRAIN TEASERS.

1. Sameer had welcome drink in cylindrical mug and siya in hemispherical mug. Which mug contain more drink and by how much?

$D = 11\text{cm}$



$D = 7\text{cm},$
 $h = 10 \text{ cm}$

2. Find the height of conical tent prepared to accommodate four students with the given canvass.



3. How much space on ground will be occupied by each student in the conical tent?

Challenge 10

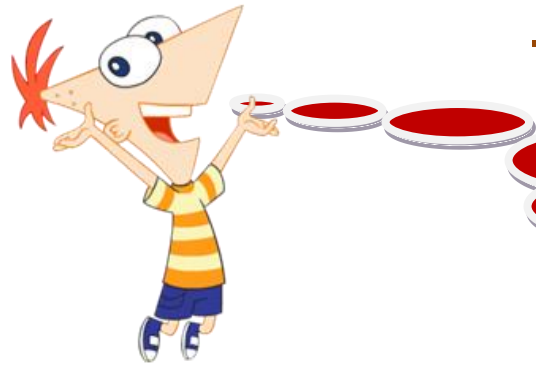
MATHS IS EVERY WHERE

प्रपापूरण

भरती बेलनाकार जलकुण्ड है राधा ।
7 मी० ऊँचा, चार मी. है जिसका अर्धव्यास ।
उड़ाता पनघट पै मोहन उपहास ।
11 मी³० घन की राधा तेरी गागर ।
कैसे भरोगी गागर से सगरा ।
भर कर लाती एक गागर एक बेर ।
बीस लगा चुकी पनघट के फेर ।
ठोकर मारी गगरी फूटी ।
कितने चक्करोँ से राधा छूटी ।



FUN RIDDLE



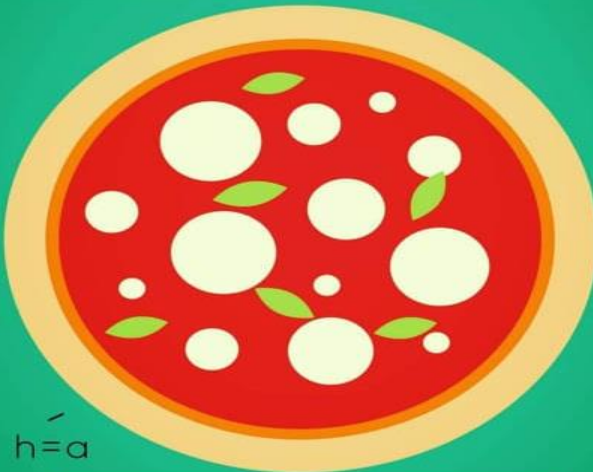
Let's have some fun

1. Two Fathers and Two Sons Riddle

Two fathers and two sons sat down to eat eggs for breakfast. They ate exactly three eggs, each person had an egg. The riddle is for you to explain how.

2.

Why pizza is called pizza ?



let $r = z$

let $h = a$

Volume of cylinder = $\pi r^2 h$

= $\pi (z.z) a$ = pizza

Instagram: Science.curiocity



THINKING ABOUT
THE ANSWERS,
TRYING TO SOLVE
IT



KYA TUMHE
QUESTIONS
SAMJH
AAYE?



Mujhe sab samajh
aa gya. These
questions were very
easy. Anyone can
solve them if their
basics are clear

Siya, hopefully
you can solve all
these questions
now



Keep on doing Bacho.
I will share the answers next
time.





LEARNING OUTCOMES ACHIEVED



CLASS 6

- Identifies various (3-d) objects like sphere, cube, cuboid, cylinder, cone from the surrounding.
- Describe and provides examples of edges, vertices and faces of 3-d objects.
- Find out the perimeter and area of the rectangular objects in the surrounding like floor of the classroom, surfaces of chalk book etc.

CLASS 7

- Calculate areas of the region enclosed in a rectangle and a square.



CLASS 8

- Find the areas of the polygon.
- Find surface area and volume of cuboidal and cylindrical objects.

CLASS 9

- Derives formula for surface area and volumes of different solid objects like cubes, cuboids, right circular cylinder, cones, sphere and hemisphere and applies them to objects found in the surrounding.

CLASS 10

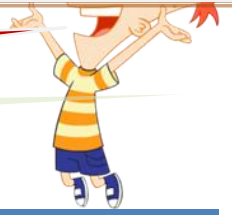
- Find surface areas and volumes of objects in the surrounding by visualizing them as a combination of different solids like cylinder and a cone, cylinder and a hemisphere, combination of different cubes etc.




STEP 4

(ANSWER KEY)

Match your IQ with my answers of our previous book.



<div>CHALLENGE 1</div> <div>18in 8 mm 50 cm 20 m 23 yards</div>	<div>CHALLENGE 2</div> <div>P=76 unit A(R) = 30 unit² A(B) = 10 A (BLACK) = 4 A (PEACH) = 20 A (BROWN) = 18 TOTAL AREA = 82</div>	<div>CHALLENGE 3</div> <div>A = l x b = 20 Sq. Inch.</div> <table><tr><th colspan="5">Possible length & width of rectangles</th></tr><tr><th>Case</th><th>L</th><th>B</th><th>A</th><th>P</th></tr><tr><td>1st</td><td>1</td><td>20</td><td>20</td><td>42</td></tr><tr><td>2nd</td><td>2</td><td>10</td><td>20</td><td>24</td></tr><tr><td>3rd</td><td>4</td><td>5</td><td>20</td><td>18</td></tr><tr><td>4th</td><td>20</td><td>1</td><td>20</td><td>42</td></tr><tr><td>5th</td><td>10</td><td>2</td><td>20</td><td>24</td></tr><tr><td>6th</td><td>5</td><td>4</td><td>20</td><td>18</td></tr></table>	Possible length & width of rectangles					Case	L	B	A	P	1 st	1	20	20	42	2 nd	2	10	20	24	3 rd	4	5	20	18	4 th	20	1	20	42	5 th	10	2	20	24	6 th	5	4	20	18
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6 th	5	4	20	18																																						
<div>CHALLENGE 4</div> <div>a. Perimeter b. Area</div>	<div>CHALLENGE 5</div> <div>Estimate area that was flooded with should be in the range 71-76 m². 73m² is a good estimate.</div>	<div>CHALLENGE 6</div> <div>Here we calculate the perimeter to find the greatest of crispy edge. P1 = 2(8 +6) = 28 P2 = 2(12 + 4) = 32 P3 = 2(9 + 3) = 24 She chooses P2.</div>																																								
<div>CHALLENGE 7</div> <div>1. Possible rectangular shape :- 1X30, 2X15, 3X10, 5X6 2. No 3. perimeter of possible rectangular shape in answer 1:- 62,34,26,22 4. Same = 30 unit²</div>	<div>Challenge 8</div> <div>1.<table><tr><td>Big wheel</td><td>1061</td><td>796</td><td>637</td><td>531</td></tr><tr><td>Small wheel</td><td>3182</td><td>2652</td><td>1591</td><td>1273</td></tr></table> 2. W1=900π cm², W2=1600π cm², W3=2500π cm², W4=3600π cm²</div>	Big wheel	1061	796	637	531	Small wheel	3182	2652	1591	1273	<div>CHALLENGE 9</div> <div>Estimated area of Jammu and Kashmir including Ladakh = 342200 km² Estimated area of Rajasthan = 342239 km² Estimated distance from Chandigarh to Bangalore = 2424 km.</div>																														
Big wheel	1061	796	637	531																																						
Small wheel	3182	2652	1591	1273																																						
<div>CHALLENGE 10</div> <div>Area of path = Area of outer rectangle – Inner rectangle = 35-15 =20 sq. ft.</div>																																										

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