Surface Area - Prisms and Cylinders

Tuesday, 13 March 2018 8:39 pm

By the end of the lesson I am asking for the following work to be completed:

	Lesson, starter, examples, exercise		Proficiency/Enrichment	Standard	Advanced
Lesson 1	**6D Surface area – prisms and cylinders** Let's start: *Drawing nets* Key ideas Example 10, 11	Exercise 6D Page 412	Understanding 1-2	2	—
			Fluency 3-6	3-4(½), 5	3-4(½), 5, 6
			Problem-solving 7-10	7-8(½)	8(½) 9, 10
			Reasoning 11-14	11, 12	12-14
			Enrichment 15	—	15

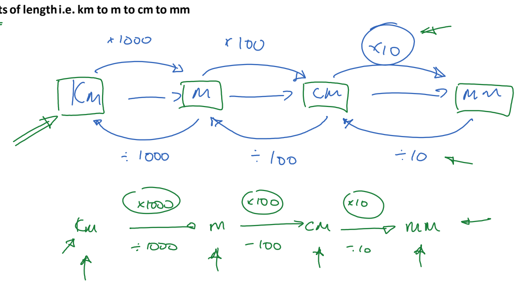
RECAP:

Measurement is a really important topic.
We have missed three important sections of this chapter which I will show a quick recap below.

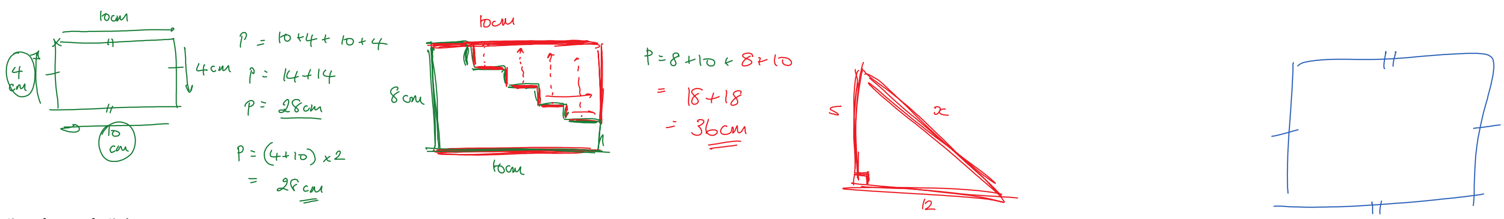
1. Review of Length
2. Pythagoras' Theorem
3. Area (Consolidating)

Review of Length

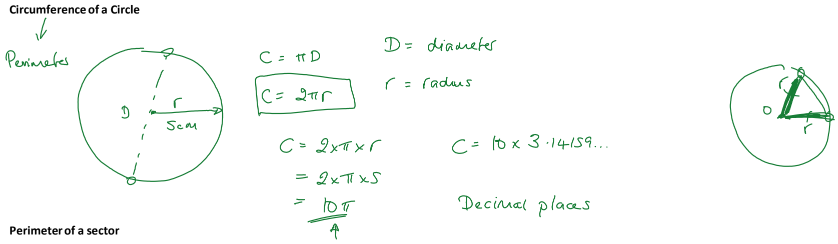
Converting between metric units of length i.e. km to m to cm to mm



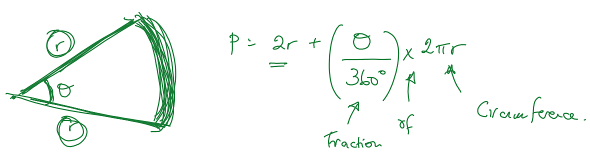
Perimeter



Circumference of a Circle

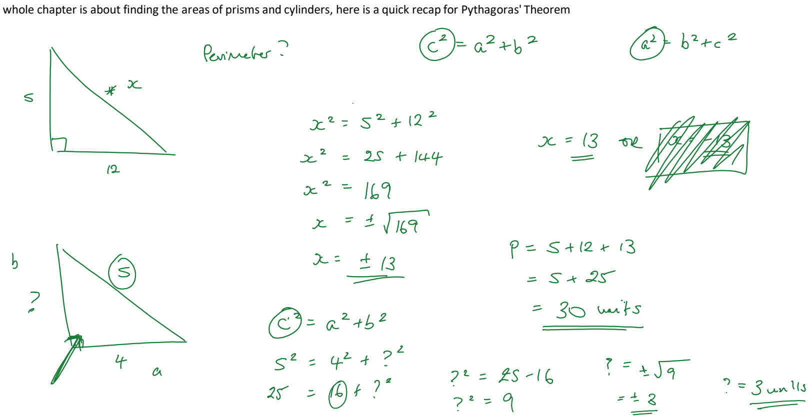


Perimeter of a sector



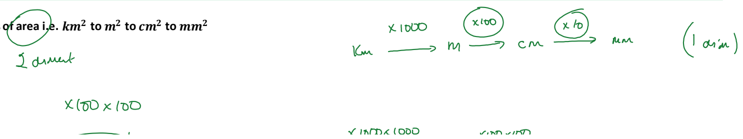
Review of Pythagoras' Theorem

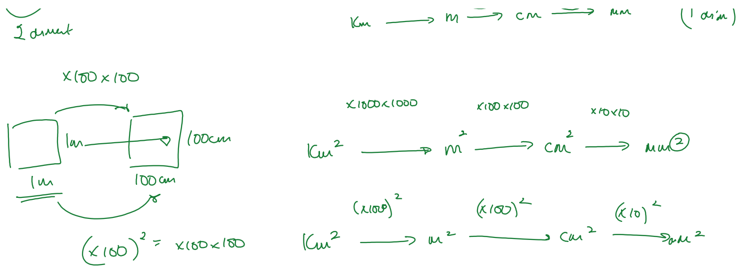
I feel like we have done this to death!
However, we need to know that we can use Pythagoras' Theorem to find the Areas of Triangles!
As this whole chapter is about finding the areas of prisms and cylinders, here is a quick recap for Pythagoras' Theorem



Area: Consolidating

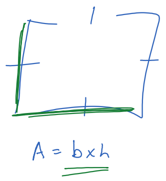
Conversion of units of area i.e. km^2 to m^2 to cm^2 to mm^2



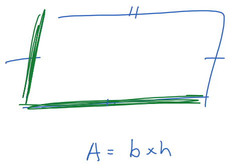


Areas of standard shapes

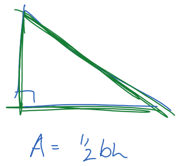
1. Square



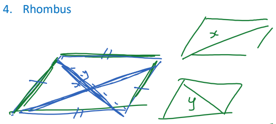
2. Rectangle



2. Triangle

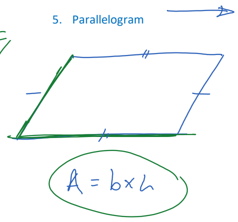


4. Rhombus

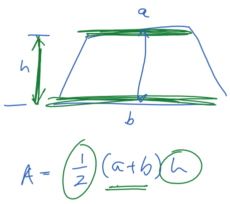


$$Area = \frac{1}{2}xy$$

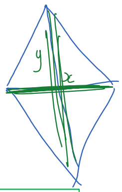
5. Parallelogram



6. Trapezium

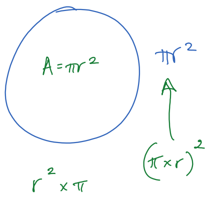


7. Kite

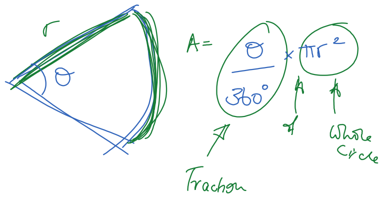


$$Area = \frac{1}{2}xy$$

8. Circle



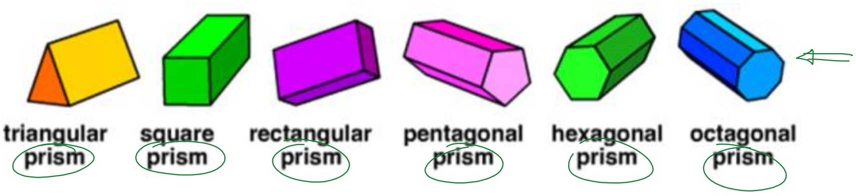
9. Area of a sector of a circle

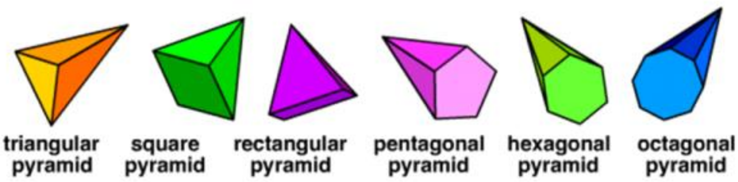


Surface Area of Prisms and Cylinders….

Firstly … what is a prism?

It's a shape which, when oriented in a particular way, can be cut such that each slice would be identical in size.
Examples include, cubes, cuboids, triangular prisms, cylinders etc.
A pretty good selection is shown below.



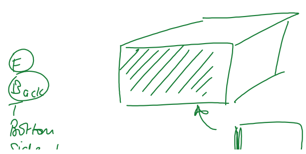


Secondly … what is the surface area?

Is the sum of all the areas of all of the surfaces (faces) of a shape.
This can apply to it being a prism or not!

To do this we need to view the shape as lots of surfaces (or faces).
We find the area of each surface (or face) and then add them all together at the end.

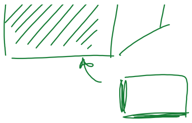
There are lots of ways of doing this.
Some more visual than others.
Some more helpful than others.
Which ever way you do it … have a system!



We find the area of each surface (or face) and then add them all together at the end.

There are lots of ways of doing this.
Some more visual than others.
Some more helpful than others.
Which ever way you do it … have a system!

F
Back
T
Bottom
Side 1
Side 2



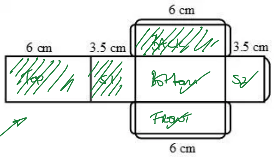
Lions and tigers and bears … oh my!

Not really …
But we can think of the surface area of shapes as using the same building blocks of shapes:

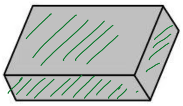
Squares and triangles and circles … oh my!

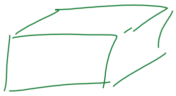
Finding Surface Areas of Cubes/Cuboids

This is considered the easiest of all shapes!
But it's the one which causes the most mistakes :(



Net of a Cuboid


Cuboid



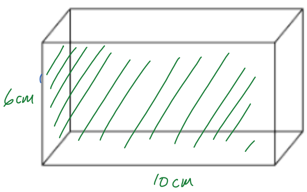
Front
Back
Side 1
Side 2
Top
Bottom

I like to save myself some time and work!

A cuboid is effectively 6 faces:

- Top and bottom which are the same
- Front and back which are the same
- Left side and right side (which are the same!)

Total Surface Area



Front = 6 x 10 = 60cm² +
Back = 60cm²
Top = +
Bottom = +
Side 1 = +
Side 2 = +

T.S.A

This means I can find the area of:

1. The front
2. The top
3. One side
4. Add them together
5. Double it …

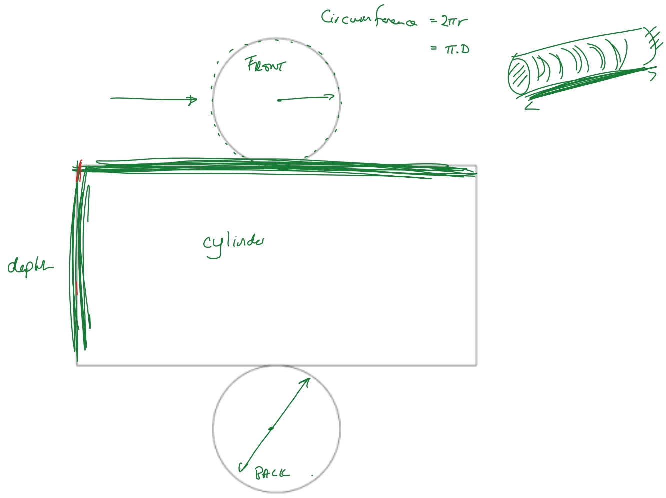
Finding Surface Areas of Cylinders

This shape is awesome! Some of the greatest chocolates and lollies come in these shapes!!!

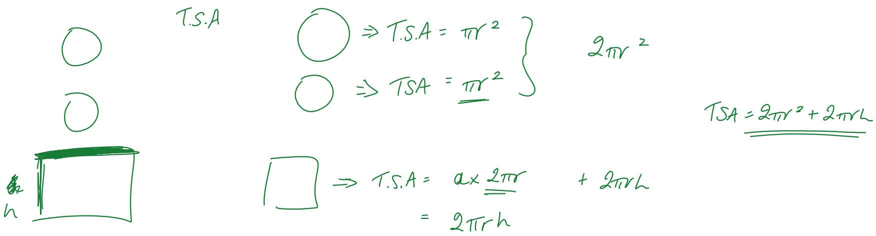
A cylinder is basically:

- Two circles (one at each end)
- A rectangle folded around it's shortest edge to meet itself.

In this case … it's easier to see the net to see how we can find the surface area:

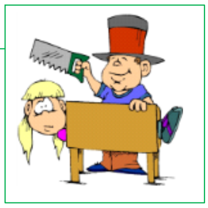


We use the idea that the circumference of a circle is πD to help us find the dimensions of one side of the rectangle. The other is given as the length of the cylinder.



Formula for the Surface Area of Cylinder (Closed) is $2\pi r^2 + 2\pi rh$
This can also be factorised to become: $2\pi r(r + h)$

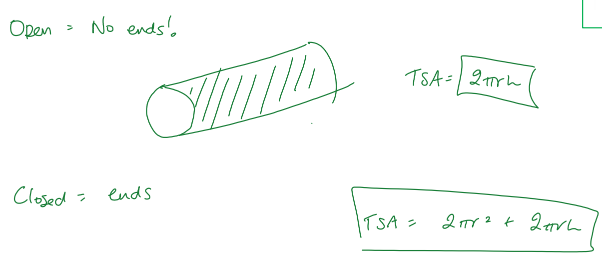
Maths is a BFT!



Remember, Maths is going to try and trick you!
All prisms can be described as:

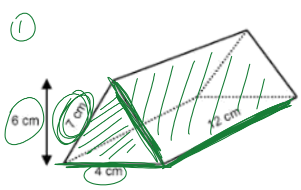
- Open ended
- Closed ended

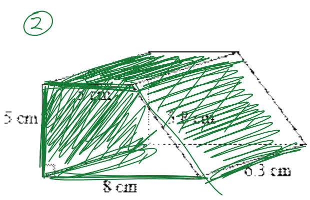
This makes a HUGE difference when working out the surface area.



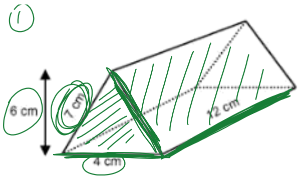
Finding Surface Areas of Prisms (General)

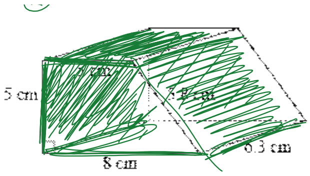
The basics are always the same.
Split the shapes up into faces.
Find the areas of each of the faces and then add them together.





①



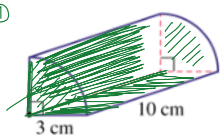


FRONT $= \frac{1}{2} \cdot b \cdot h = \frac{1}{2} \cdot 4 \times 6 = 12 cm^2$
BACK $= 12 cm^2$
BOTTOM $= 12 \times 4 = 48 cm^2$
FACE 1 $= 12 \times 7 = 84 cm^2$
FACE 2 $= 12 \times 7 = 84 cm^2$

TSA $= 12 + 12 + 48 + 84 + 84$
$= 24 + 48 + 168$
$= 72 + 168$
$= \underline{240 cm^2}$

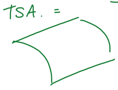
FRONT $= \frac{1}{2}(5+8) \cdot 5$
$= 32.5 cm^2$
BACK $= 32.5 cm^2$
BASE $= 8 \times 6.3 =$
TOP $= 5 \times 6.3 =$
SIDE $= 5 \times 6.3 =$
SIDE $= 5.8 \times 6.3 =$

①



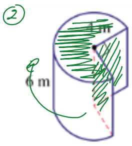
$\frac{\pi r^2}{4}$

TSA. =



$\frac{2\pi rh}{4}$

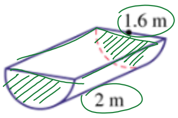
②



$A = \pi r^2 \times \frac{3}{4}$

$2\pi rh \times \frac{3}{4}$

③

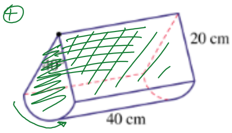


$\frac{2\pi rh}{2}$

$\frac{\pi r^2}{2}$

2×1.6

④

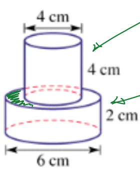


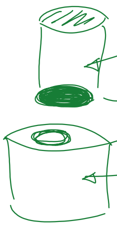
Area $= \frac{40°}{360°} \times \pi r^2 \times 2$

Fraction

$2\pi rh \times \frac{40°}{360°}$

What about when we have shapes sitting on shapes.
Easy! Find the surface area of each shape separately, then take away the areas where they overlap!





$2\pi r^2 + 2\pi rh$

$\pi r^2 \times 2$ −

$2\pi r^2 + 2\pi rh$ +