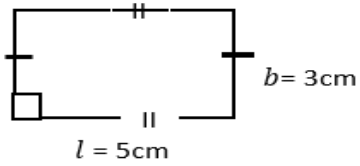
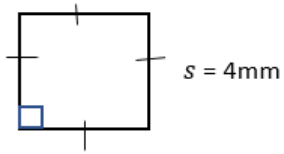
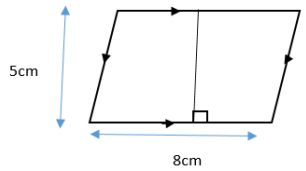
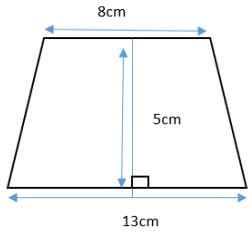
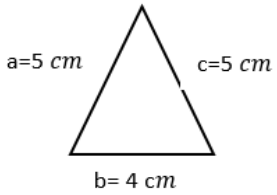
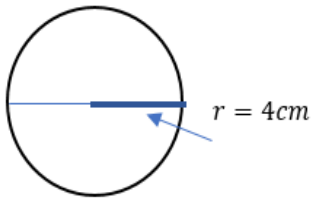
SUBJECT and GRADE	MATHEMATICS GRADE 10	
TERM 4	*Week 1*	
TOPIC	MEASUREMENT	
AIMS OF LESSON	Calculating Area, Surface Area and Volume of Prisms and Cylinders with different dimensions	
RESOURCES	***Paper based resources***	***Digital resources***
	Go to the Measurement section in your textbook	https://www.youtube.com/watch?v=JnLDmw3bbuw Area of a Rectangle, Triangle, Circle & Sector, Trapezoid, Square, Parallelogram, Rhombus, Geometry
INTRODUCTION	• *Learners should be familiar with the concepts of length, perimeter, area and volume.* • *We will recap the basic formula of figures required in measurement.*	
	• *Perimeter/Circumference this is the length of the border of a given shape. The perimeter is measured in either milimeter(mm), centimetre(cm), meter(m) or kilometer(kl).* • *Area is the the two dimensional space inside the boundary of a flat object. It is measured in square units. That is mm^2 cm^2, m^2 or km^2. Please study the formaula for the areas of the shapes in the table below, this will be required to determine the Total Surface area and volume of any right prism and cylinder.*	

Name	*Shape*	*Formula*	*Example*
Rectangle		*Perimeter:* $P = 2l + 2b$ *or* . $P = 2(l + b)$	$P = 2l + 2b$ $P = 2(5) + 2(3)$ $P = 10 + 6$
		Area: $A = l \times b$ $l = \frac{A}{b}$ *Or.* $b = \frac{A}{l}$	$A = l \times b$ $A = (5) \times (3)$ $A = 15\ cm^2$
Square		*Perimeter:* $P = 4s$	$P = 4s$ $P = 4(4)$ $P = 16\ mm$
		Area: $A = s^2$ $s = \sqrt{A}$	$A = s^2$ $A = (4)^2$ $A = 16\ mm^2$

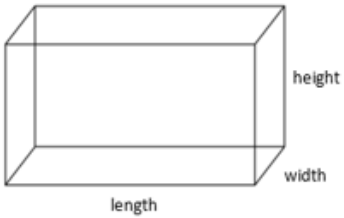
Name	Shape	Formula	Example
Parallelogram/ Rhombus		*Area:* $A = base \times \perp height$ $A = b \times \perp h$	$A = base \times \perp height$ $A = (8) \times (5)$ $A = 40\ cm^2$
Trapezium		*Area:* $A = \frac{1}{2}\left(\begin{matrix}sum\ of\ the\\ parallel\\ sides\end{matrix}\right) \times (distance\ between\ the\ sides)$ $A = \frac{1}{2}(a+b) \times (\perp h)$	$A = \frac{1}{2}(a+b) \times (\perp height)$ $A = \frac{1}{2}(8+13) \times (5)$ $A = 52{,}5\ cm^2$
Triangle		$P = a + b + c$	$P = a + b + c$ $P = 5 + 4 + 5$ $P = 14\ cm$
		Area: $A = \frac{1}{2} base \times \perp height$ $= \frac{1}{2} b \times \perp h$	$A = \frac{1}{2} base \times \perp height$ $A = \frac{1}{2}(7) \times (6)$ $A = 21\ cm^2$
Circle		*Circumference or perimeter of Circle* $C = 2\pi r$ Or $C = \pi d$ *Since.* $d = 2r$ *i.e. diameter = 2 × the radius*	$C = 2\pi r$ $C = 2\pi(5)$ $C = 10\pi\ cm$ *or* $C = 2(3.14)(5)$ $C = 31.4\ cm$
		Area: $A = \pi r^2$	$A = \pi r^2$ $A = (3.14)(4)^2$

CONCEPTS AND SKILLS

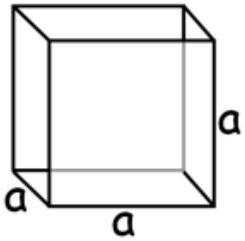
SURFACE AREA OF RIGHT PRISMS AND CYLINDERS

Examples of right prisms are as given below. A right prism is a 3 D figure where the base and the top are identical shapes. The Surface area is the total area of the exposed or outer surface of a right prism. To calculate the total surface area of a right prism you have to determine thae area of the base and then you have the area of the top. What is then left is to determine the outside area of the shape on top of the base. Consider a closed box which represent a rectangular prism. Suppose that you cut the base and the top of the closed box out. What is now left is the surrounding part of the box. The challenge is now to find this area. Cut along one of the edges of the open box so that it is able to open and be placed on a flat surface. This should have the shape of a rectangle. The one side of this rectangle is the perimeter onf the base of the base of the rectangular prism and the other side of the rectangle is the height of the rectangular prism.

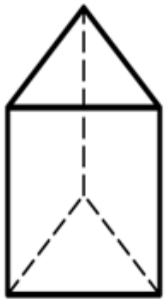
Thus the ***Total Surface area of this Rectangular*** *Prism is:* **Area of the base X 2 + Perimeter of the base X Height**
Apply the same thinking to the other Right Prisms below. You should notice that the exact same formula will apply to all of them.



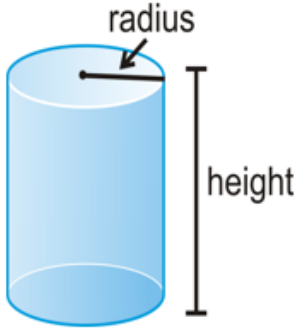
Rectangular prism



Cube



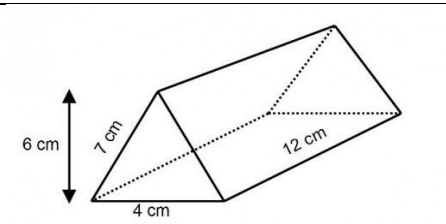
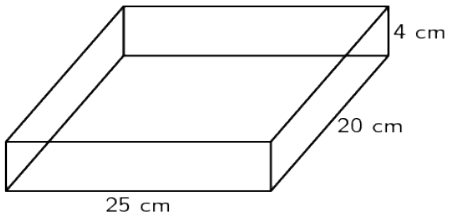
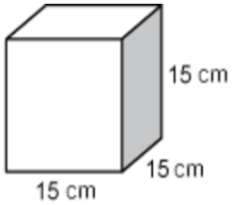
Triangular prism

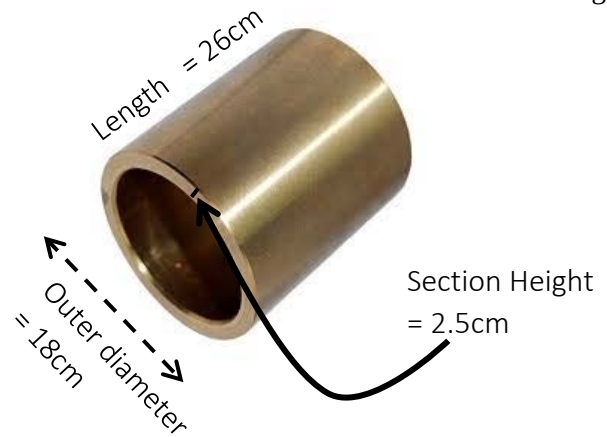


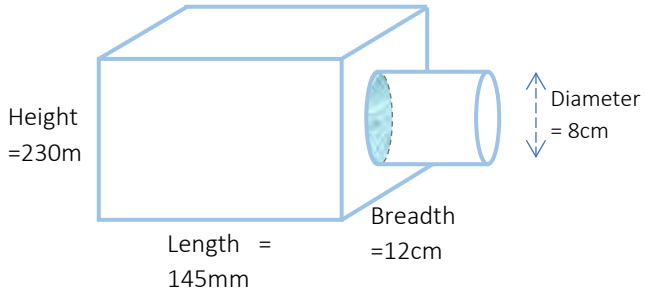
Cylinder

The Total Surface Area (of all prisms and cylinders) = 2 (area of the base) + (perimeter / circumference of the base) × height

NB! The base for a rectangular prism is a rectangle, a square is the base for a cube, a triangle is the base for a triangular prism and a circle is the base for a cylinder.

	Example:	**Solutions**
	 *1.* *Determine the Surface Area of the triangular box which will be a new packaging for chocolate. NB! Two sides are 7cm.*	*Remember the base is the side that is the same, the triangle.* *So it is a triangular prism.* **The Total Surface Area of a Triangular Prism** **= 2 (area of the triangle) + (perimeter of the triangle) × height** **= 2 (**$\frac{1}{2}b \times\perp h$**) + (**$a+b+c$**) × h** **= 2 (**$\frac{1}{2}(4) \times (6)$**) + (**$7+4+7$**) × 12** **= 2 (12) + (**18**) × 12** **The Total Surface Area of a Triangular Prism = 240** cm^2
	2.  Determine the Surface Area of the rectangular tray which will be polished . Please note it has no top.	*In the case of the tray there is no top.* **The Total Surface Area of a Rectangular Prism** **= 1 (area of the rectangle)+ (perimeter of the rectangle) × height** **= 1 (**$l \times b$**)+ (**$2l+2b$**) ×** h **= 1 (**25×20**)+ (**$2(25)+2(20)$**) ×** (4) **= 1 (**500**)+ (**$50+40$**) ×** (4) **= 1 (**500**)+ (**90**) ×** (4) **= (**500**+ (**360**)** **The Total Surface Area of a Rectangular Prism = 860** cm^2
	Can You?	
	 *Determine the Surface Area of the figure above.*	Recognize that all the sides have the same measurement And the base is a square hence we have a cube **The Total Surface Area of a Cube** **= 2 (area of the square) + (perimeter of the square) × height** **= 2 (**$s)^2$ **+ (**$4s$**) ×** h **= 2 (**$15)^2$**) + (**4×15**) ×** 15 **= 2 (225) + (60) ×** 15 **The Total Surface Area of a Cube = 1 350** cm^2

	Example 2	**Solutions**
	Below is a picture of a cylindrical "bush" that an Eskom engineer requires for maintenance. The outer diameter is 18 cm. The section height is 2.5cm. The length of the bush is 26 cm. The bush must be coated with a protective layer of chrome. The chrome is priced at R2450 per square metre. Determine the total surface area that would be coated. Then calculate the cost of coating the bush  	The area of the flat ring-shaped annulus **A = π R² – π r²** outer radius R=18÷2=9cm; inner radius = (18-2x2.5)÷2 =6.5cm A = **π** (9)² - **π** (6.5)² = 15,5 **π** cm² Outer curved area = **(2 π R) x (h)** = 2(**π**)(9) x (26) = 468 **π** cm² Inner curved area = **(2 π r) x (h)** = 2(**π**)(6.5) x (26) = 338 **π** cm² Total surface area = 2(15,5 **π**)+468 **π** + **338 π** =837 **π** = 2629.51 cm² Convert cm² area to m² area by ÷ 100² TSA = 0.262951m² (correct to 4 decimal places) Cost = area multiply the rate = 0.262951x 2450 = R644.23
	Can You?	
	The picture on next page shows a cylindrical pipe entering a rectangular holding tank. The tank has one flap to prevent insects flying in indicated by the blue circle in the sketch. The length of the pipe is 15 cm. The dimensions of the tank are indicated on the sketch. Determine the Total surface area of the tank.	Solution: The grain pipe does not have two areas of the base to consider only the flap. SA of the Cylinder = Area of the circle + Circumference of Circle (Height) SA of the Pipe = $(\pi r^2) + (2\pi r) \times h$ SA of the Pipe = $(\pi (4)^2) + 2(\pi \times 4) \times 15$ SA of the Pipe = $136\ \pi\ cm^2$ SA of the Rectangular Prism = 2 (area of the rectangle) + (perimeter of the rectangle) ×height

		SA of the Rectangular Prism = 2 ($l \times b$) + ($2l + 2b$) ×h SA of the Rectangular Prism = 2 (14,5 × 12) + (2(14,5) + 2(12)) ×(23) SA of the Rectangular Prism =1567cm^2 Just don't forget to subtract the area of the pipe opening = πr^2 = π × 4^2= 16π cm^2 Thus Surface Area of the entire figure =136 π +1 567 - 16 π = 2044.52 cm^2
CONSOLIDATION	• *Make sure you know the formula for calculating the perimeter and area of a square, rectangle, parallelogram, rhombus, trapezium, triangle and circle* • *Make sure you understand the formulae for calculating the Surface Area for any right prism.*	
TEXTBOOK REFERENCES	*Classroom Mathematics pg's . 335- 375; Mind Action Series pg's 244- 256; Via Afrika pg's 110 – 116; Platinum Mathematics pg's 268-280; Siyavula pg's 394 - 430*	
VALUES	*Real life scenarios*  You could use surface area of a cylinder to find out how much paint you would need to paint a fuel tank.  You could use surface area of a cylinder to figure out how big a label for a container must be, for example a tin can.	