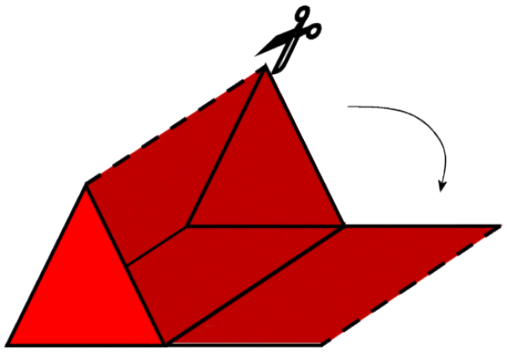
HAWKER COLLEGE
Engage | Inspire | Achieve

Week 3
Term 1
2022

Learning Brief

EM3

Goals



This week we are going to:

- Find the surface area of familiar solids, including cubes, rectangular and triangular prisms, spheres and cylinders (EMA06)
- Find the surface area of pyramids, such as rectangular- and triangular-based pyramids (EMA07)
- Use addition of the area of the faces of solids to find the surface area of irregular solids (EMA08)

Theoretical Components

Resources:
PDF file: Week 3 Notes and Exercises

Knowledge Checklist:

- Using nets to visualise surface area
- Surface area of prisms, spheres and cylinders
- Surface areas of irregular shapes

Order:

1. Work through the Week 3 notes and exercises
2. Complete the Portfolio task
3. Complete the reflection at the end of the booklet
4. Show your teacher your completed booklet.

Practical Components

Work through the exercises and show the complete tasks to your teacher.

Be sure to ask for help as you need for the successful completion of all tasks.

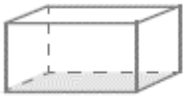
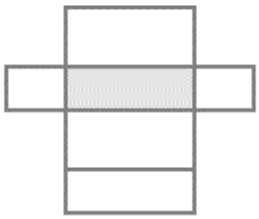
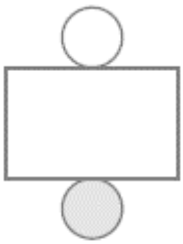
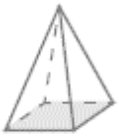
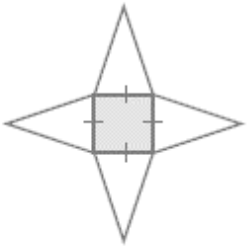
Portfolio Task

See the last page of the booklet

WEEK 3 – SURFACE AREA

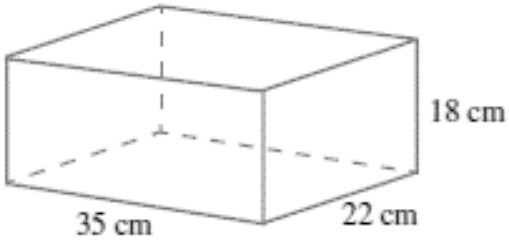
Nets of Solids

A net is the flat shape obtained when you "unwrap" a solid. Looking at the net of a solid helps find the surface area of a solid. Below are the nets of three solids.

Solid	Net
Rectangular prism 	6 faces (all rectangles) 
Cylinder 	3 faces (1 rectangle and 2 circles) 
Square pyramid 	5 faces (1 square and 4 triangles) 

Example 1

A box measures 35 cm by 22 cm by 18 cm. How much cardboard is needed to make the box (without overlapping flaps)?



Solution

The box has six rectangular faces, so we find the sum of the areas of the six rectangles.

$A = (35 \times 18) + (35 \times 18) + (22 \times 18) + (22 \times 18) + (22 \times 35) + (22 \times 35)$

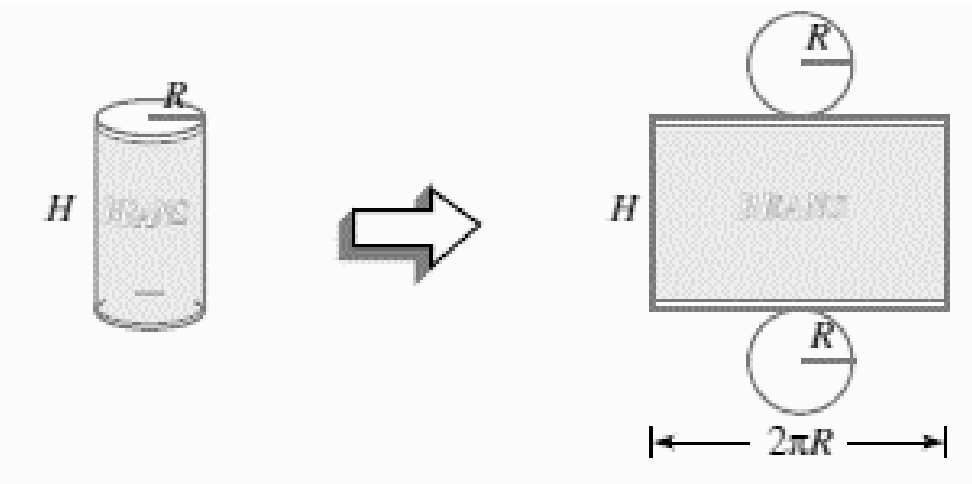
$A = 2(35 \times 18) + 2(22 \times 18) + 2(22 \times 35)$
$A = 3592$ cm^2

The amount of cardboard needed to make the box is 3592 cm^2.

Note: there are actually three pairs of rectangles.

Cylinders

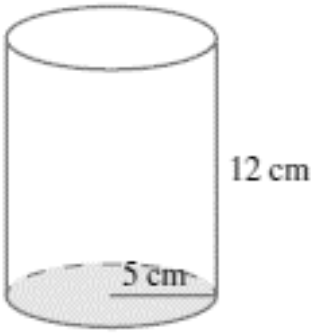
An unopened can of beans has three faces. The top and bottom of the can are circles with radius r. The curved surface is a rectangle with length equal to the circumference ($2\pi r$) of the circle and width equal to the height of H of the can.



Each circle has an area of πr^2 and the curved surface of the cylinder has an area of $2\pi rh$.

Example 2

Find the surface area (to 2 decimal places) of a closed cylinder with base radius 5 cm and height 12 cm.



Solution

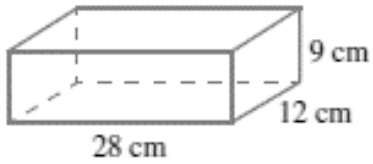
The cylinder has three faces (two circles and a rectangle).

$A = \pi r^2 + \pi r^2 + 2\pi rh$
$A = 2\pi r^2 + 2\pi rh$
$A = (2 \times \pi \times 5^2) + (2 \times \pi \times 5 \times 12)$
$A \approx 534.07$ cm^2

The surface area is about 534 cm^2.

Exercise 1

1. Find the surface area of the closed solid



   a. How many faces are there?

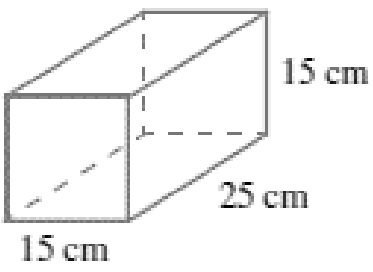
   b. Area of rectangle ‘1’:

      Area of rectangle ‘2’:

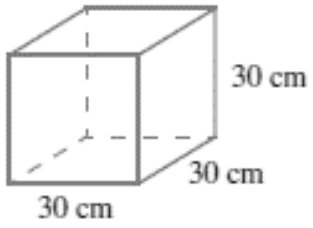
      Area of rectangle ‘3’:

   c. The total surface area:

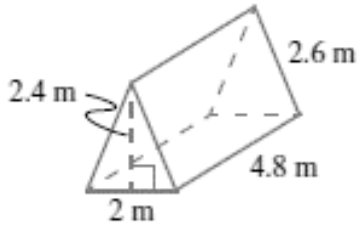
2. Using the steps from Question 2, find the surface area of this rectangular prism:



3. Calculate the surface area of the cube below:



4. For the solid below:



a. How many triangular faces are there?

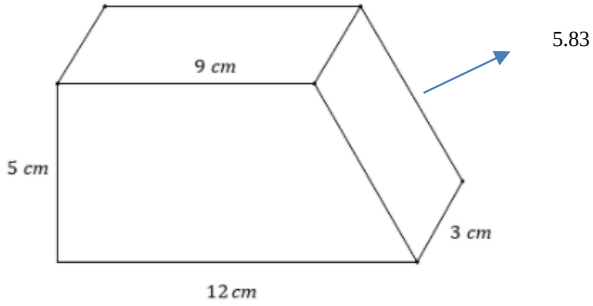
b. What is the area of each triangle?

c. How many rectangular faces are there?

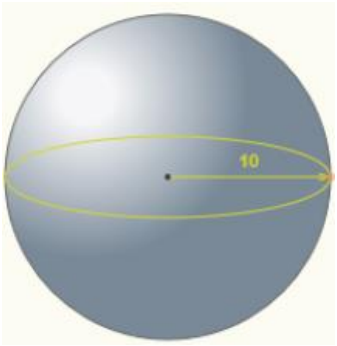
d. What is the area of the rectangles? Not all the rectangles have the same size.

e. What is the total surface area of the triangular prism?

5. What is the surface area of the solid below?



Surface areas of Spheres



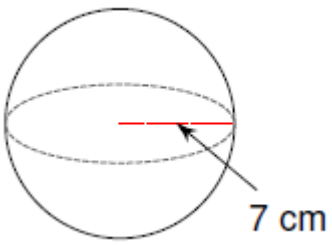
A sphere is a circular solid. For a given volume, the sphere is the shape that has the smallest surface area. The sphere appears in naturel such as water drops, bubbles, and planets.

The surface area of a sphere is exactly four times the area of a circle with the same radius. Since the area of a circle is πr^2, the surface area of a sphere is $4\pi r^2$.

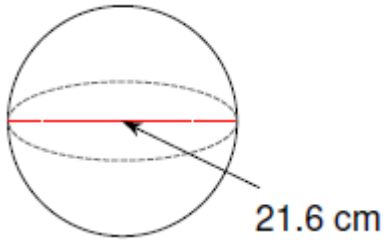
The surface area of the above sphere is $4 \times \pi \times r^2 = 4 \times \pi \times 10^2 = 1256.6$ u^2

Exercise 2

1. Find the surface area of the following spheres
   a.

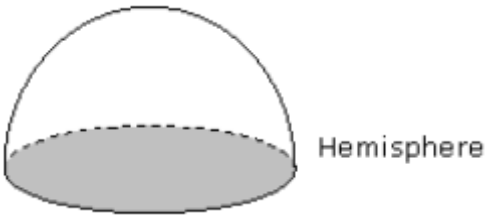


b.

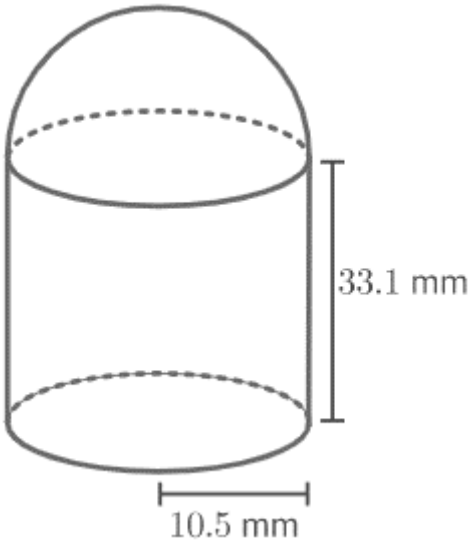


2. The surface area formula for the 'closed' hemisphere is $3\pi r^2$ and the surface area formula for an 'open' hemisphere is ___πr^2.

   Find the surface area for the following closed hemisphere, where the radius of the circle is 5 cm.



3. Find the surface area of this compound shape (to 2 decimal places).



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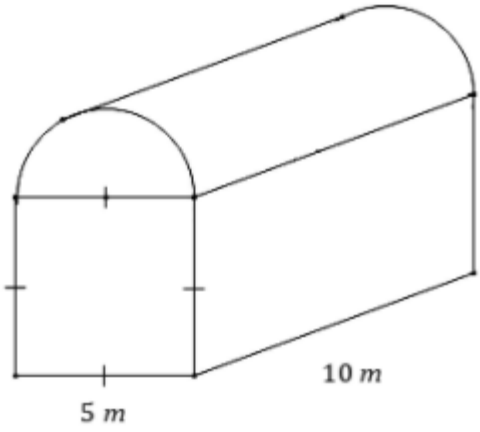
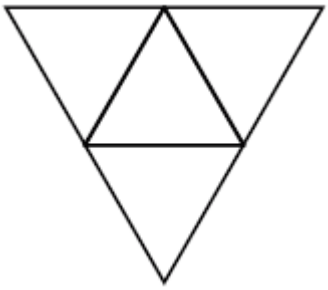
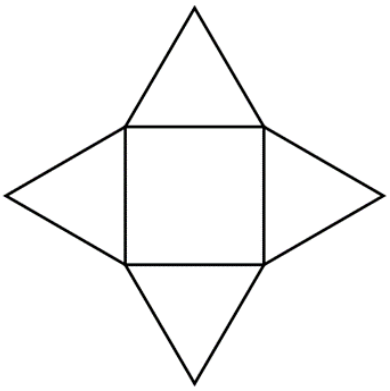


5. Consider the net below. Name the solid it forms. Draw a sketch of this solid and explain how you would find its surface area. What dimensions are needed to find the surface area?



6. Consider the net below. Name the solid it forms. Draw a sketch of this solid and explain how you would find its surface area. What dimensions are needed to find the surface area?

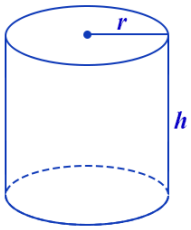


Portfolio Task Week 3

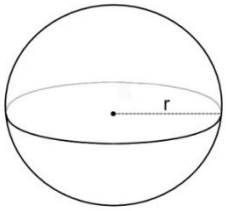
One a separate piece of paper, choose <u>ONE</u> of the follow tasks to complete

1. Find an example of a common everyday item that is a rectangular prism.
    - Name your chosen item (e.g. tissue box, mattress, etc) and draw a neat diagram or provide a photo image (this will need to be submitted with in your booklet)
    - Find the length, width, and height of your item to the nearest centimetre – state these dimensions clearly
    - Draw the net of this rectangular prism; include the dimensions on your diagram
    - Find the surface area of your chosen prism; show working

2. Find an example of a common everyday item that is cylindrical in shape.
    - Name your chosen item (e.g. can of drink, tin of food, etc) and draw a neat diagram or provide a photo image (this will need to be submitted with in your booklet)
    - Find the radius and height of your item to the nearest centimetre – state these dimensions clearly
    - Draw the net of this cylinder; include the dimensions on your diagram
    - Find the surface area of your chosen prism; show working



3. Find an example of a common everyday item that is spherical in shape
    - Name your chosen item (e.g. tow bar ball, netball, etc) and draw a neat diagram or provide a photo image (this will need to be submitted in your booklet)
    - Find the radius of your item to the nearest centimetre – state these dimensions clearly
    - Find the surface area of your chosen prism; show working



4. Choose your own solid and discuss this choice with your teacher.

MARKING RUBRIC

CRITERIA	EXPECTATIONS	POSS	MULT	GIVEN	TOTAL
Practical	Student completes practical work, including exercises and Mathspace task, of the brief to an acceptable standard set by the teacher.	**2**	**3**		**/6**
Portfolio Task	Student completes the investigation task of the week to an acceptable standard set by the teacher.	**2**	**2**		**/4**
Reasoning and Communications	Student responses are accurate and appropriate in presentation of mathematical ideas, with clear and logical working out shown.	**4**	**-**		**/4**
Concepts and Techniques	Student submitted work selects and applies appropriate mathematical techniques to solve practical problems and demonstrates proficiency in the use of mathematical facts, techniques and formulae.	**4**	**-**		**/4**
	Submission Guidelines				
Timeliness	Student submits the exercises, Mathspace task and investigation by the set deadline. See scoring guidelines for specific details.	**2**	**-**		**/2**
				FINAL	**/20**

Student Reflection:
How did you go with this week's work? What was interesting? What did you find easy? What do you need to work on?