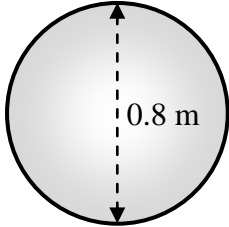


Surface Area and Volume

Level 1 – 2

1. Calculate the surface area and volume of each shape. Use metres for all lengths. Write your answers to 4 decimal places:

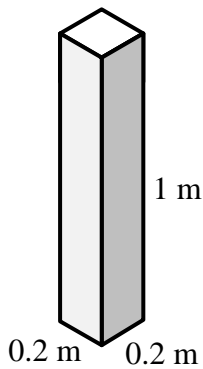
a)



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Surface Area: Volume:

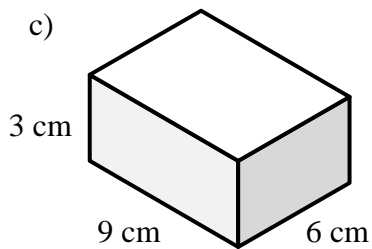
b)



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Surface Area: Volume:

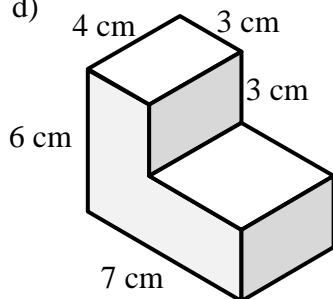
c)



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Surface Area: Volume:

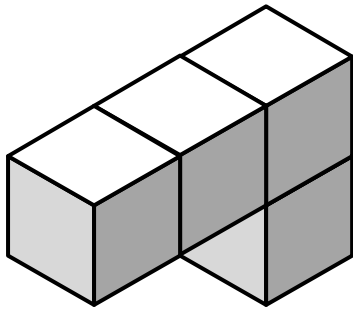
d)



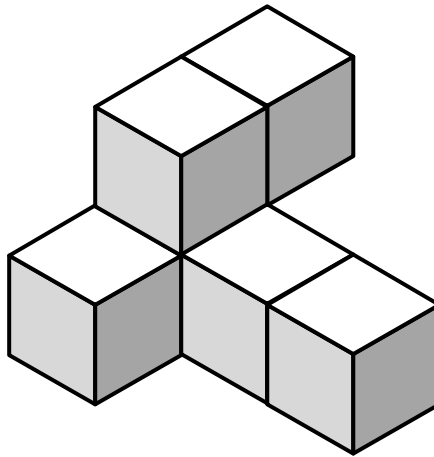
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Surface Area: Volume:

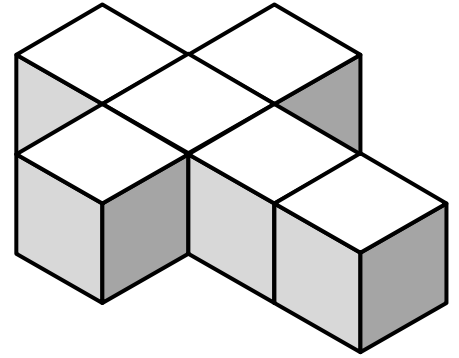
2. The following shapes are made using small blocks of dimensions 1cm x 1cm x 1cm. Calculate the surface area of each shape.



Surface Area:

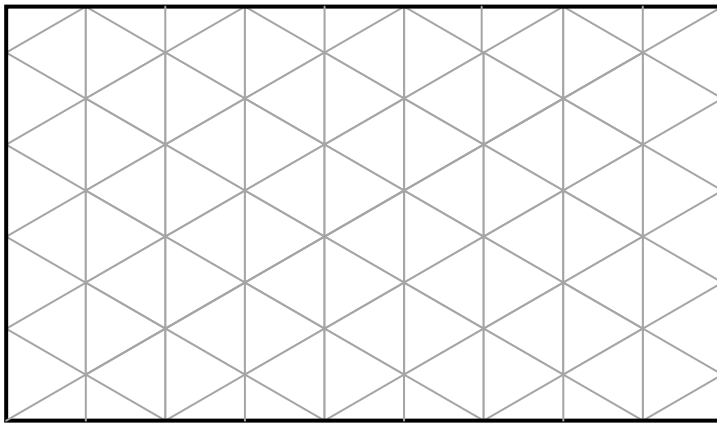


Surface Area:



Surface Area:

3. Six blocks (identical to those in question 5) are placed together to form a square prism. Draw the prism (using gridlines only), and calculate its surface area.



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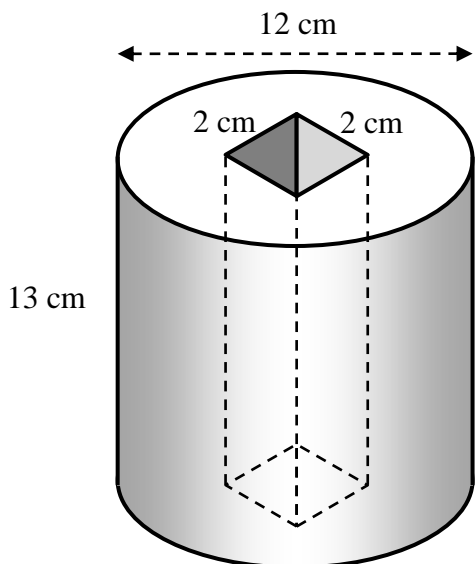
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Level 3 – 4

4. Calculate the surface area and volume

a)



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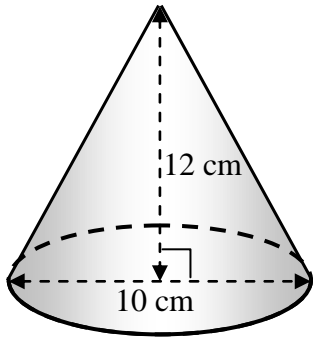
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Surface area: Volume:

b)



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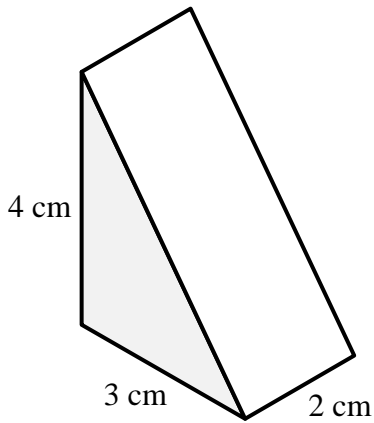
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Surface area: Volume:

c)



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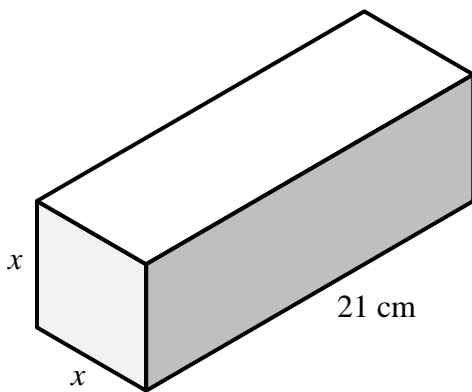
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Surface area: Volume:

5. A square prism has a length of 21 cm and a surface area of 800 cm^2 . Calculate the value of x .



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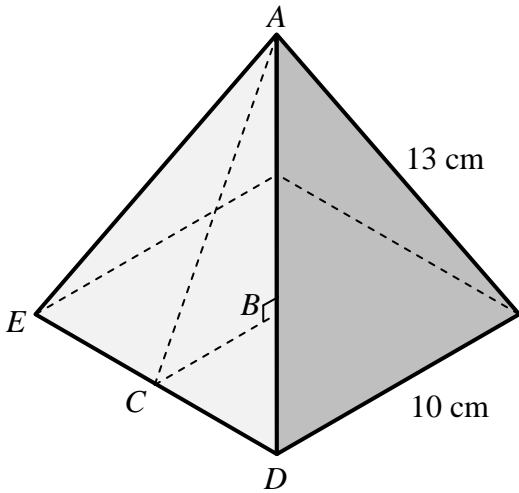
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6. The following solid is a square based pyramid. Point B represents the centre of the base. Point C is the midpoint of DE .



a) Write down length AD

b) Write down length CD

c) Hence, calculate length AC .

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d) Hence, calculate the surface area of the pyramid.

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e) Calculate the volume of the pyramid.

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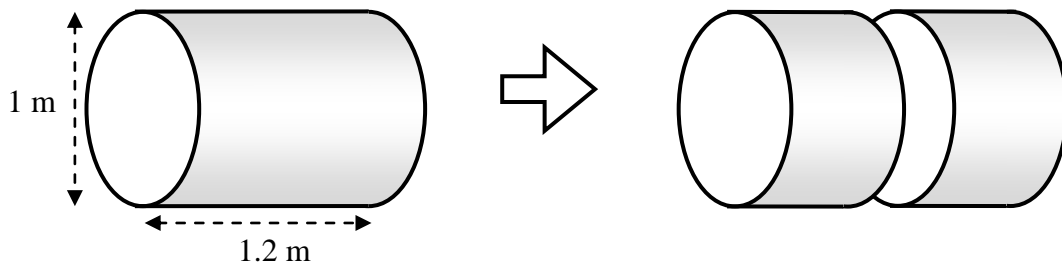
7. Balls of radius 5 cm are sold in boxes in the shape of the smallest possible cube in which a ball fits. Calculate the amount of empty space inside the box.

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8. A can of paint contains enough paint to cover 10 m^2 . How many cans of paint are needed to paint 40 spheres of radius 40 cm?

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9. A cylinder is cut into two equal pieces, as shown below. (Write all answers in terms of π)



a) Calculate the surface area of the original cylinder.

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b) Calculate the total surface area of the two pieces.

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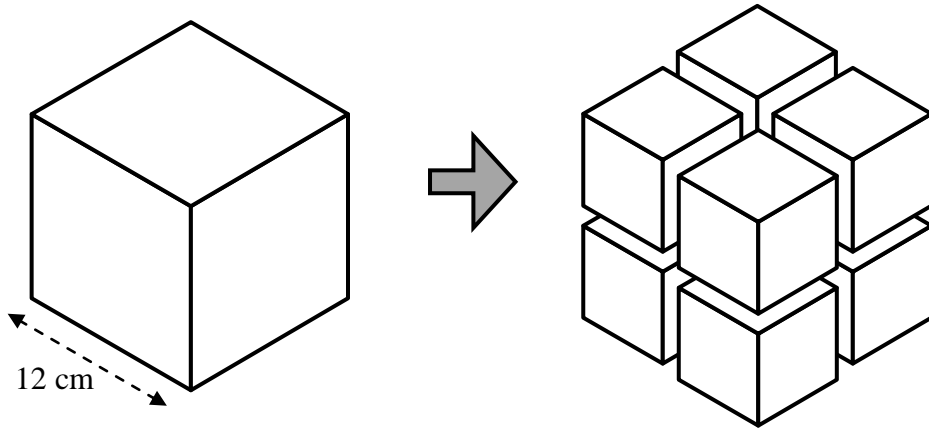
c) Complete the table:

Number of identical pieces	Total Surface Area	Number of identical pieces	Total Surface Area
1		4	
2		5	
3		6	

d) Complete the table:

Number of identical pieces	Total Volume	Number of identical pieces	Total Volume
1		4	
2		5	
3		6	

10. The following piece of wood in the shape of a cube is cut up into 8 identical pieces.



a) Calculate the surface area of the original piece of wood.

.....

b) Calculate the *total* surface area of the 8 identical pieces

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c) Complete the following table

Step	Number of identical pieces	Total Surface Area	Total Volume
1	1		
2	8		
3	27		
4			
5			
6			
7			
8			
<i>n</i>			

11. Which has the largest volume: a sphere with a surface area of 20 cm^2 or a cube with a surface area of 20 cm^2 ?

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12. A sphere is cut in half. The total surface area of the two halves is $50\pi \text{ cm}^2$ greater than the surface area of the original sphere. Calculate the surface area and volume of the original sphere.

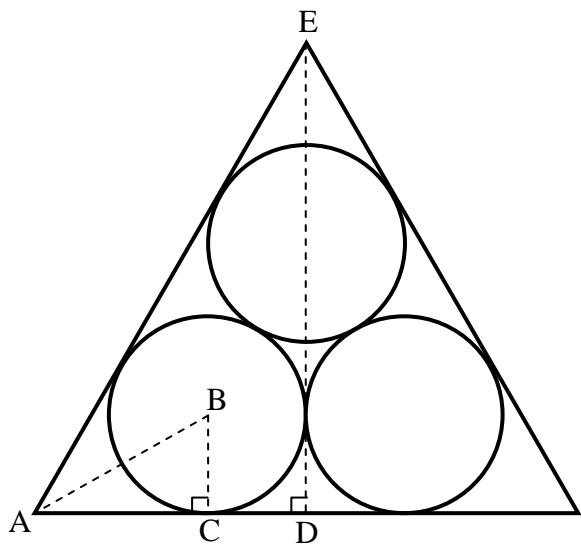
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13. Balls of radius 4 cm are sold in packs of three in a box in the shape of a triangular prism. Point B represents the centre of one of the balls.



a) Write down length BC.

b) Determine angle $\angle BAC$.

c) Determine length AC.

d) Determine length AD.

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e) Determine length ED.

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f) Hence determine the volume and surface area of the triangular prism.

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g) If the three balls were sold in packs which are cylindrical in shape, calculate the volume and surface area of the packaging.

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h) If you were the manufacturer and reducing transportation costs was your priority, which design would you choose? Explain your answer.

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i) If you were the manufacturer and reducing packaging costs was your priority, which design would you choose? Explain your answer.

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14. A cylindrical hole of radius 4 cm is drilled 5 cm deep into the centre of a cube with sides of length 20 cm. Find the surface area of the resulting solid.

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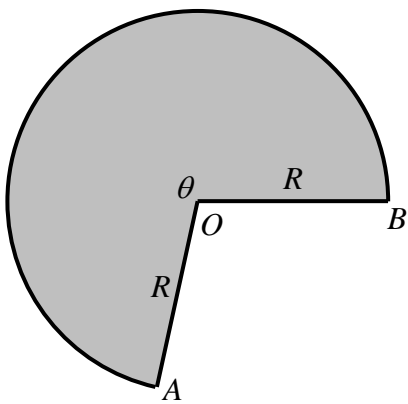
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Level 7 – 8

15. A segment is cut from a circle leaving the following shape. Point O represents the centre of the original circle. Angle θ represents the obtuse angle AOB .



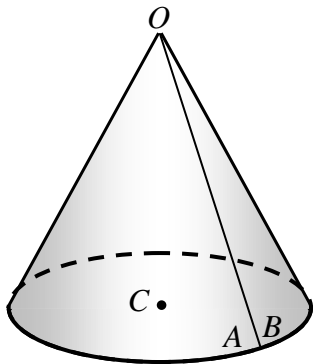
a) Write down an expression for the area of the shape in terms of R and θ .

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b) Write down an expression for the length of arc AB in terms of R and θ .

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Point A is pulled towards point B to form a cone. Point C represents the centre of the base:



c) Let distance AC be equal to r . Write down an expression for the circumference of the base in terms of r .

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d) Hence, write down an expression for r in terms of R and θ .

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e) Write down an expression for the slant height, s , which is equal to distance OA , in terms of R .

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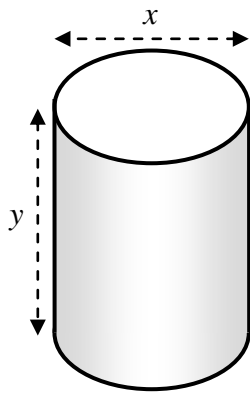
f) Hence show that the area of the curved surface of the cone is equal to πrs .

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16. The volume of the following cylinder is 1.5 m^3 .



a) Determine an expression for y in terms of x .

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b) Hence show that the surface area is equal to $\frac{\pi x^2}{2} + \frac{6}{x}$.

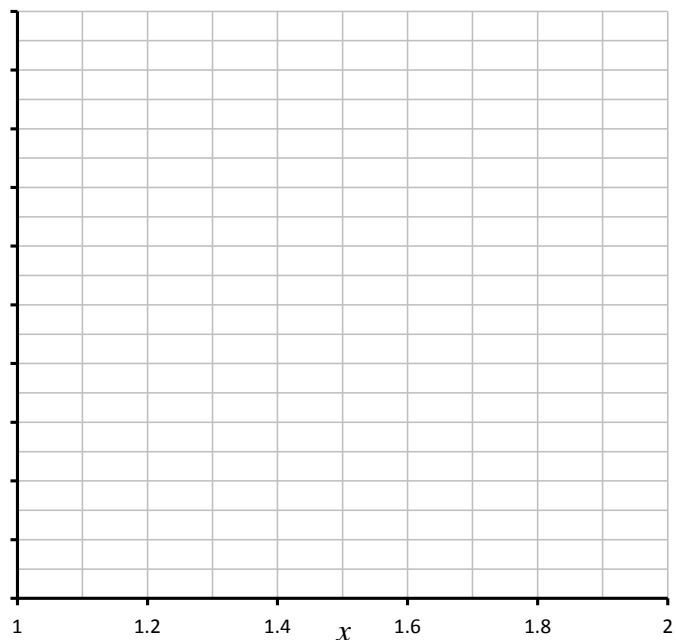
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c) Use your GDC to complete the table and plot the graph of this function. Write the surface area to 2 decimal places. Choose an appropriate scale on your y-axis so that you get a clear view of the graph. Your y-axis does not have to start from 0.

x	Surface Area
1	
1.2	
1.4	
1.6	
1.8	
2.0	



d) Use your GDC to determine the minimum surface area and the value of x which gives this area.

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19. Approximately 71% of the earth is covered by water. The average depth of all of the water is approximately 3,700 m. The radius of the earth is approximately 6,400 km. Determine the approximate percentage of the volume of the earth that is water.

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