

Grade 9 ~ Unit 1 – Part 1: Square Roots

Name : _____

Curriculum Outcomes



STRAND	OUTCOME	PROCESS STANDARDS
Number	Determine the square root of positive rational numbers that are perfect squares. [9N5]	C, CN, PS, R, T
Number	Determine an approximate square root of positive rational numbers that are non-perfect squares. [9N6]	C, CN, PS, R, T
Shape and Space (3-D Objects and 2-D Shapes)	Determine the surface area of composite 3-D objects to solve problems. [9SS2]	C, CN, PS, R, V



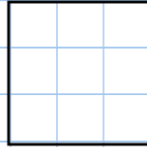
Sec 1.1: Square Roots of Perfect Squares.

Review from Grade 8

If we can represent an area using squares then it is a perfect square. For example, the numbers 1, 4 and 9 are all perfect squares.

To find the area, you must square the side length:

$$A = S^2 = S \times S$$

	Side Length	Area / Square Number / Perfect Square
	1	1
	2	4
	3	9

$A = S^2$

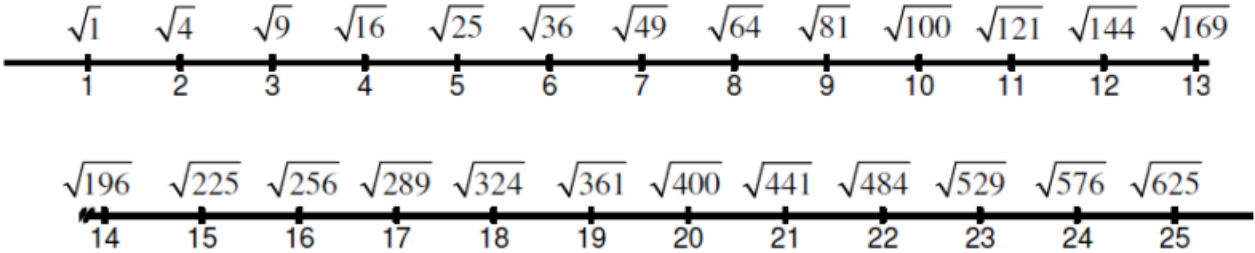
Remember the difference between Square & Square Root:

	Square	Square Root
Definition	Multiply number by itself.	What number, multiplied by itself, make the number under the symbol.
Symbol	$4^2 = 4 \times 4 = 16$	$\sqrt{64} = 8,$



		since $8 \times 8 = 64$
--	--	-------------------------

You will need to remember the following:



Complete the following questions:

1) Square the following:

- a) 9
- b) 3
- c) 1
- d) 23
- e) 16

2) Find each square root:

- a) $\sqrt{9}$
- b) $\sqrt{64}$
- c) $\sqrt{49}$
- d) $\sqrt{1}$
- e) $\sqrt{484}$

This year we will be considering Fractions and Decimals:

Fractions

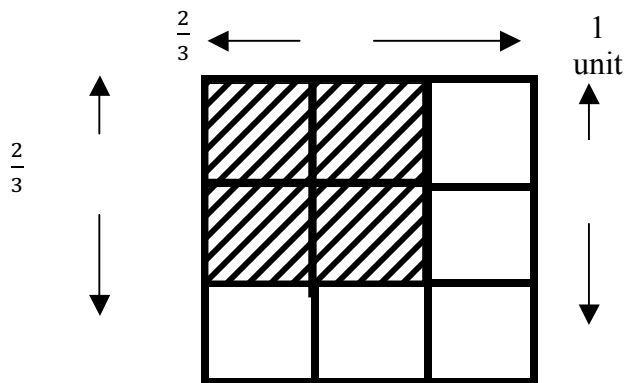
In order for a fraction to be a perfect square, BOTH the numerator (top number) and the denominator (bottom number) must be perfect squares.

Is $\frac{4}{9}$ a perfect square?

- Since $\sqrt{4} = 2$ and $\sqrt{9} = 3$ then $\frac{4}{9}$ is a perfect square

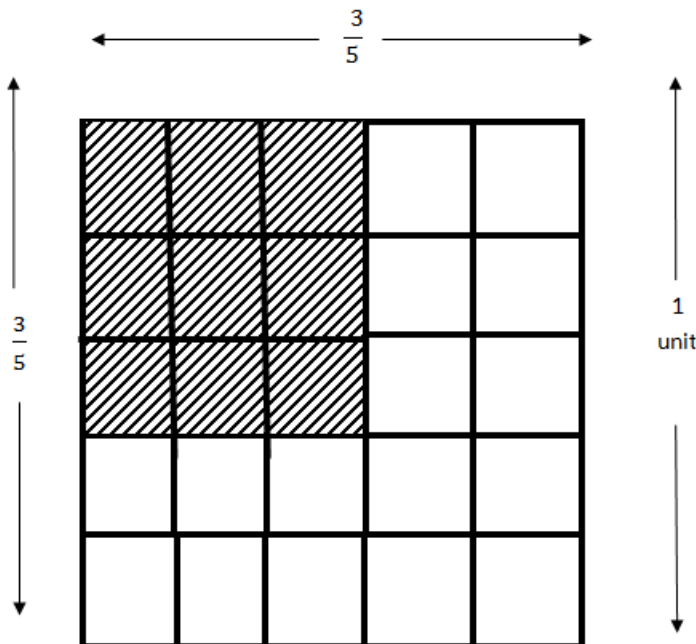
$$\sqrt{\frac{4}{9}} = \frac{\sqrt{4}}{\sqrt{9}} = \frac{2}{3} \quad \text{Check your answer} \quad \frac{2}{3} \times \frac{2}{3} = \frac{4}{9}$$

This can also be represented by drawing a diagram using squares:



There are 2 out of 3 squares shaded along the width and length of the square and there are 4 squares shaded out of a total of 9 squares. And it still created a square.

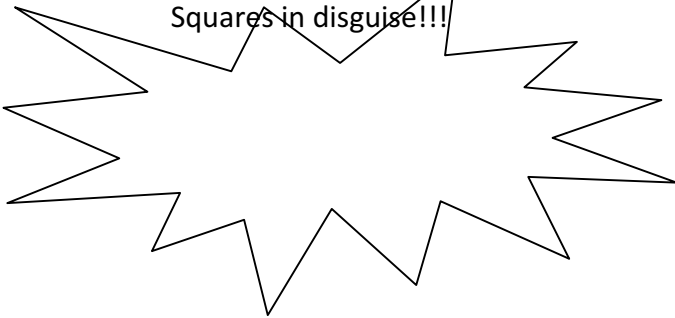
3) Use a diagram to determine the value of $\sqrt{\frac{9}{25}}$?



4) Which of the following are perfect squares?

$$\frac{1}{4}, \quad \frac{5}{16}, \quad \frac{81}{100}, \quad \frac{7}{36}, \quad \frac{324}{441}$$

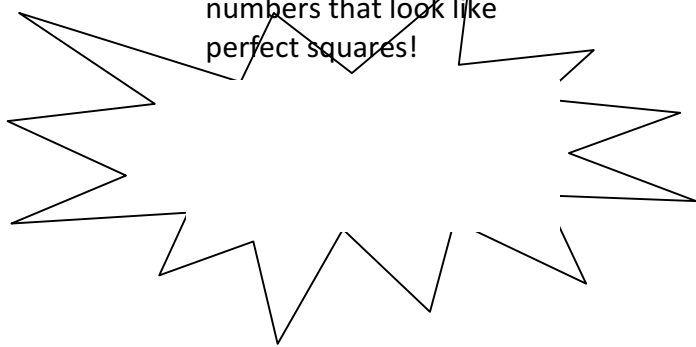
Watch out for Perfect
Squares in disguise!!!



5) Is $\frac{18}{98}$ a perfect square?

6) Is $16\frac{4}{9}$ a perfect square?

Watch out for mixed
numbers that look like
perfect squares!



7) Find each Square Root:

a) $\sqrt{\frac{4}{81}}$

b) $\sqrt{\frac{1}{25}}$

c) $\sqrt{\frac{49}{121}}$

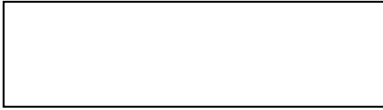
d) $\sqrt{\frac{50}{200}}$

e) $\sqrt{\frac{12}{48}}$

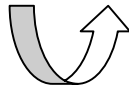
To complete on loose leaf: p.11 # 3 (b &c), 4, 5 (e, f, g, h), 7 (a, b, c, d), 8 (e, f, g, h)

Decimals – hundredths
place means over 100!

Don't forget that decimals can be changed into fractions:



$$1.21 = \frac{121}{100}, \text{ Is } \frac{121}{100} \text{ a perfect square?}$$



8) Change each of the following to decimals to determine if they are perfect squares.

a) 0.09

b) 0.4

c) 2.25

d) 1.6

e) 0.1

What did you notice about the answers above? There is a little trick you can use when trying to decide whether or not a number is a perfect square:

In order for a decimal to be a perfect square it must have an even number of decimal places AND "look" like a perfect square!

9) Which of the following are perfect squares?

a) 0.049

b) 0.000016

c) 1.96

d) 0.9

e) 0.036

When Finding the square root of decimals you halve the number of decimal places!!!

10) Find each square root:

a) $\sqrt{0.09}$

b) $\sqrt{0.0064}$

c) $\sqrt{0.49}$

d) $\sqrt{1.69}$

11) Calculate the number whose square root is...

a) 0.3

b) 0.4

c) 1.6

d) 0.05

e) 0.9

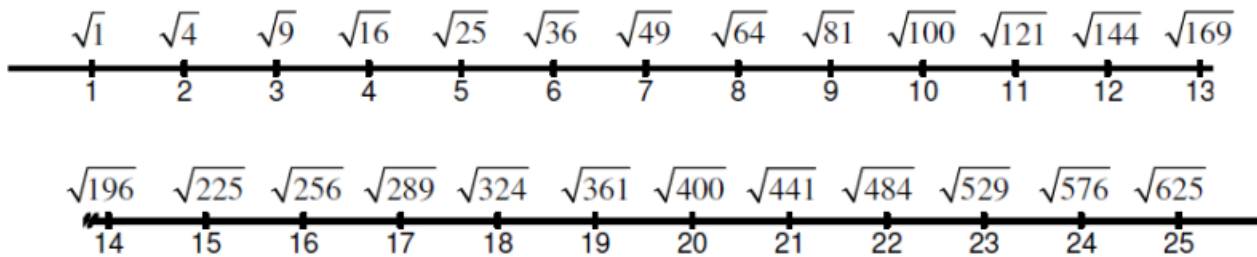
**One final note is that if you use a calculator, a number is a perfect square as long as the square root answers is a terminating decimal! **

To complete on loose leaf: p.11 # 3a, 5 (a, b, c, d), 7 (e, f, g, h, i, j), 8 (a, b, c, d, i, k), 9 (b, d, f, h)

--

Sec 1.2: Square Roots of Non-Perfect Squares.

If you have not memorized this, now is the time!!!

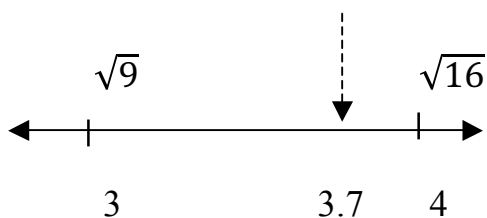


Recall Grade 8:

What is $\sqrt{14}$?

Since 14 is not a perfect square we must estimate. Between what two perfect squares does 14 fall between?

14 falls between 9 and 16, so $\sqrt{14}$ falls between $\sqrt{9}$ and $\sqrt{16}$ or 3 and 4. So $\sqrt{14} \sim 3.7$



1) Estimate each square root. SHOW WORKINGS!!

a) $\sqrt{55}$

b) $\sqrt{100}$

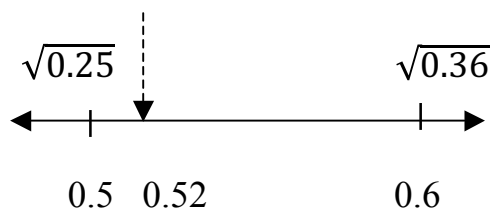
We will now study how to estimate the square root of non-perfect fractions and decimals.

Decimals:

What is $\sqrt{0.27}$?

Find the 2 closest decimal perfect squares!

0.27 falls between 0.25 and 0.36, so $\sqrt{0.27}$ falls between $\sqrt{0.25}$ and $\sqrt{0.36}$ or 0.5 and 0.6. So $\sqrt{0.27} \sim 0.52$



2) Estimate each square root. SHOW WORKINGS!!

a) $\sqrt{0.79}$

b) $\sqrt{0.3}$

c) $\sqrt{3.8}$

b) $\sqrt{19.2}$

Fractions:

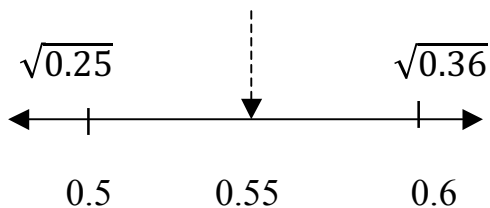
There are 3 ways to estimate the square root of a fraction:

#1 Estimate by changing to a decimal:

What is $\sqrt{\frac{3}{10}}$? Change to a decimal $\rightarrow 0.3$ or 0.30

Find the 2 closest decimal perfect squares!

0.30 falls between 0.25 and 0.36 , so $\sqrt{0.30}$ falls between $\sqrt{0.25}$ and $\sqrt{0.36}$ or 0.5 and 0.6 . So $\sqrt{0.30} \sim 0.55$



What is $\sqrt{1\frac{1}{4}}$?

#2 Estimate by finding the closest perfect squares:

What is $\sqrt{\frac{8}{5}}$? Change to closest perfect squares $\Rightarrow \sqrt{\frac{9}{4}} = \frac{3}{2} = 1.5$

What is $\sqrt{\frac{15}{24}}$?

#3 Choose an easier number then estimate:

What is $\sqrt{\frac{3}{7}}$? $\frac{3}{7}$ is a little less than $\frac{1}{2}$, so we can use 0.49. $\sqrt{0.49} = 0.7$

What is $\sqrt{\frac{1}{3}}$?

3) Use any method to estimate each of the following:

Find each Square Root:

a) $\sqrt{\frac{8}{79}}$

b) $\sqrt{\frac{5}{12}}$

c) $\sqrt{\frac{13}{4}}$

To complete on loose leaf: p. 18 & 19, #4 (b, d, f), 6, 7(a,c,e), 11(e, f, g, h),

Pythagorean Theorem

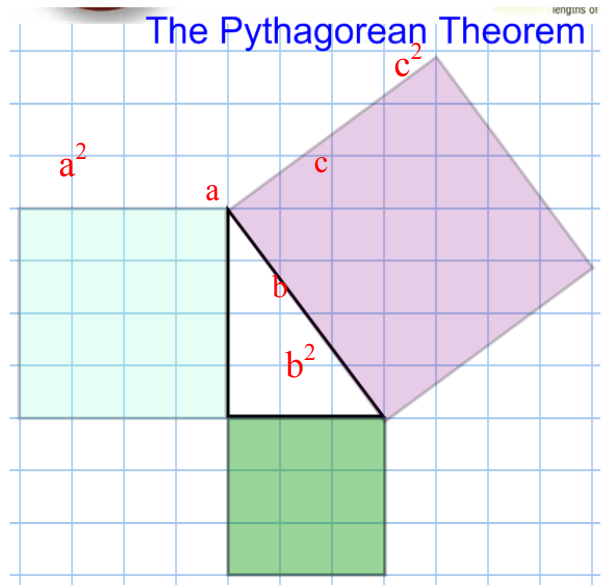
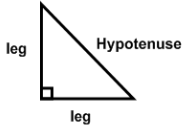
Recall the Pythagorean Theorem:

The Pythagorean Theorem

In any right triangle:

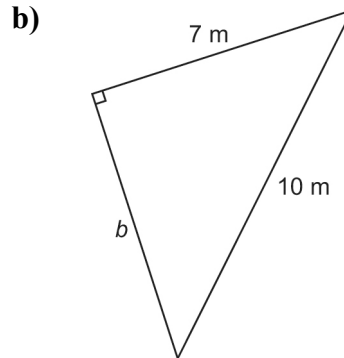
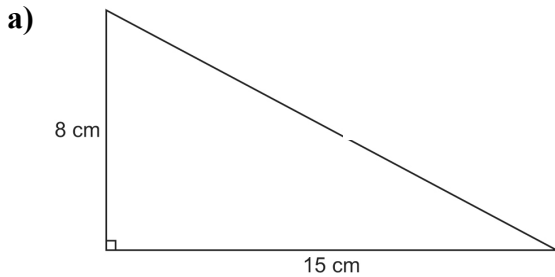
Legs are the shorter sides

Hypotenuse is the longest side and is located across from the right angle



$$a^2 + b^2 = c^2$$

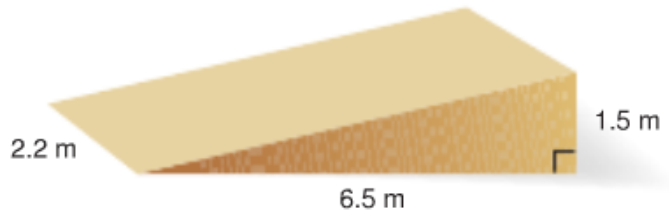
1) Use the Pythagorean theorem to solve for the missing value:



2) Solve:

The sloping face of this ramp is to be covered in carpet.

- Estimate the length of the ramp to the nearest tenth of a metre.
- Use a calculator to check the answer.
- Calculate the area of carpet needed.



To complete on loose leaf: p. 19, #13



Unit 1 – Part 2: Surface Area

Name : _____

Curriculum Outcomes



STRAND	OUTCOME	PROCESS STANDARDS
Number	Determine the square root of positive rational numbers that are perfect squares. [9N5]	C, CN, PS, R, T
Number	Determine an approximate square root of positive rational numbers that are non-perfect squares. [9N6]	C, CN, PS, R, T
Shape and Space (3-D Objects and 2-D Shapes)	Determine the surface area of composite 3-D objects to solve problems. [9SS2]	C, CN, PS, R, V

Grade 9 - Section 1.3: Investigation p. 25

1. Assume each face of a linking cube is 1 cm^2 .

- What is the surface area of 1 cube? _____

2. Continue to add cubes and determine the surface area. Complete the table below.

Number of Cubes	Surface Area (square units)
1	
2	
3	
4	
5	

- What patterns do you see in the table?

- What happens to the surface area each time you place another cube on the train?

- Explain why the surface area changes this way.

3. With 5 cubes, build an object that is different from the train. Determine its surface area.

Surface area of new object: _____

Sec 1.3: Surface Area of Objects Made from Right Rectangular Prisms

Determining the Surface Area of a Composite Object Made from Cubes

An object is called composite when it is made up of or composed of different objects.

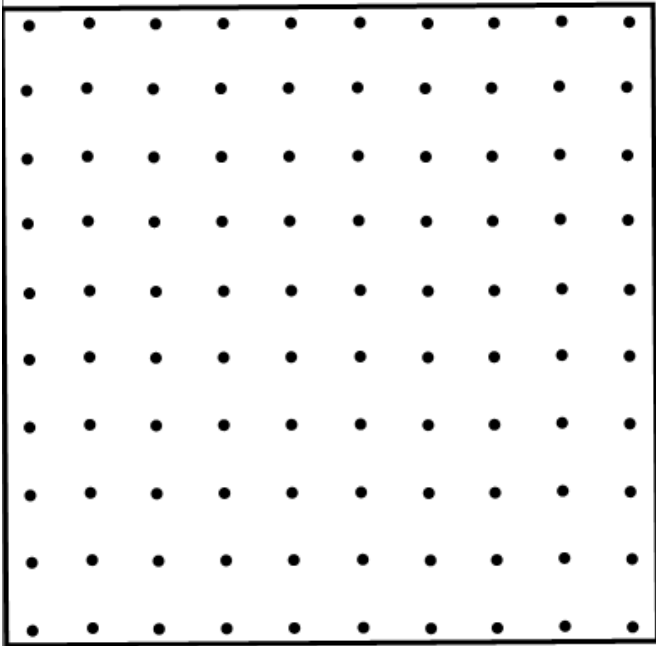
Example 1: Find the Surface area of the following:

Here is an object made from 4 unit cubes.
Each face of a cube is a square with area 1 unit².



Solutions

Method 1	Method 2
----------	----------



Example 2: Find the Surface area of the following:

Determine the surface area of this composite object.

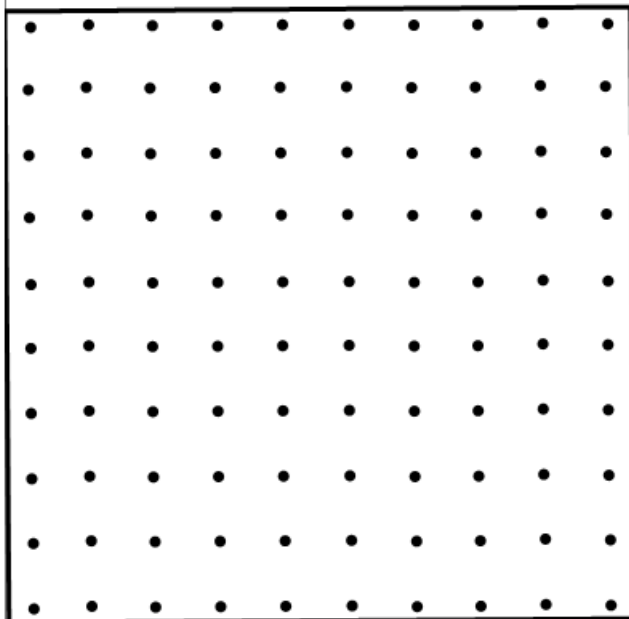
Each cube has edge length 2 cm.



► Solutions

Method 1

Method 2

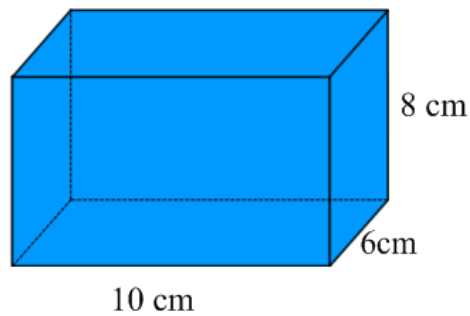


To complete on loose leaf: p. 30, #4

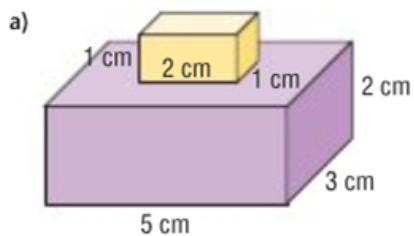
--

Review: How to find the surface area of a rectangular prism

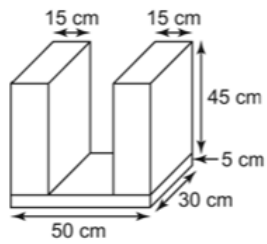
- ▶ A right rectangular prism has 3 pairs of congruent faces:
 - the top and bottom faces
 - the front and back faces
 - the left side and right side faces



Review: How to find the surface area of a composite rectangular prisms

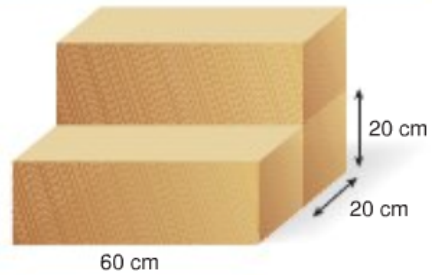


b)



c)

Renee uses 3 pieces of foam to make this chair.
Each piece of foam is a right rectangular prism with dimensions 60 cm by 20 cm by 20 cm.
Can Renee cover the chair with 2 m^2 of fabric?
Explain.



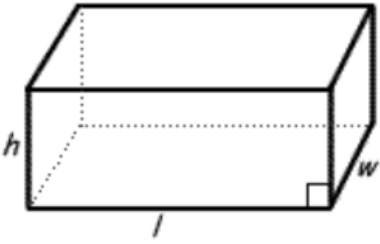
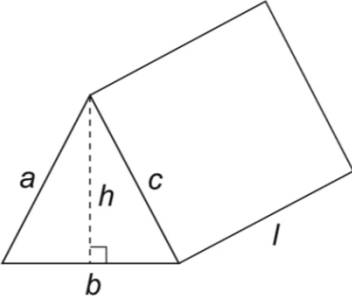
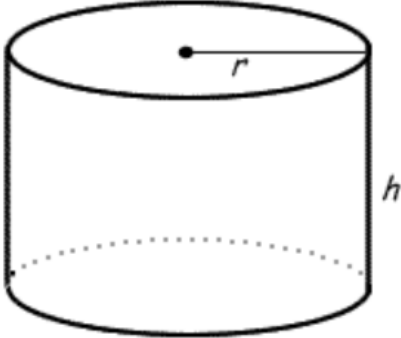
To complete on loose leaf: p. 31, #8 (b, c) , 11

--

Sec 1.4: Surface Area of Other Composite Objects

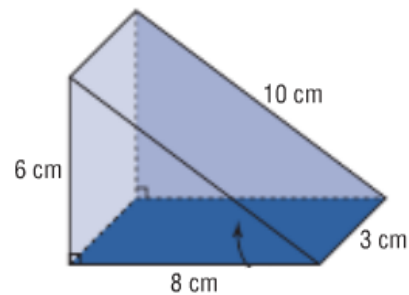
Before we study other composite figures, we must review how to calculate the surface area of other solids...

Surface Area Formulae

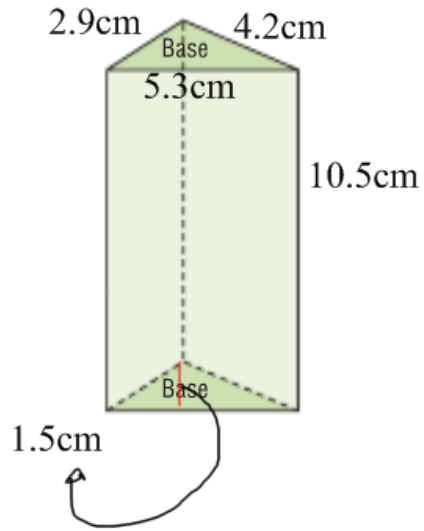
Rectangular Prism	Triangular Prism	Cylinder
$SA = 2lw + 2lh + 2wh$	$SA = bh + al + bl + cl$	$SA = 2\pi r^2 + 2\pi rh$
		

Right Triangular Prisms

- A right triangular prism has 5 faces:
 - 2 congruent triangular bases
 - 3 rectangular faces



Triangular Prisms



Cylinders

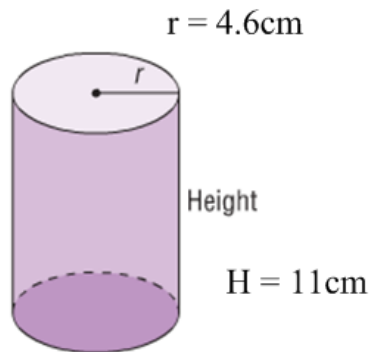
A cylinder has 2 congruent bases and a curved surface.

Each base is a circle, with radius r and area πr^2 .

The curved surface is formed from a rectangle with:

- one side equal to the circumference of the circular base, and
- one side equal to the height of the cylinder

The circumference of the circular base is $2\pi r$.

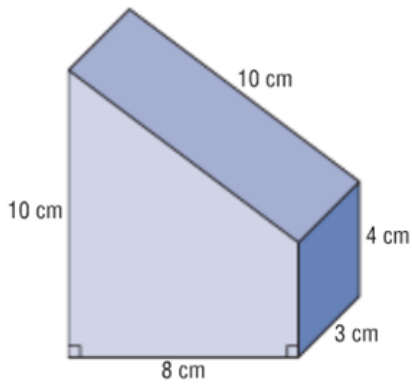


Composite Figures

Calculate the surface area of the following composite figures:

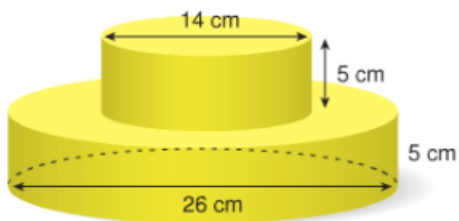
Example 1 Determining the Surface Area of a Composite Object Made from Two Prisms

Determine the surface area of this object.



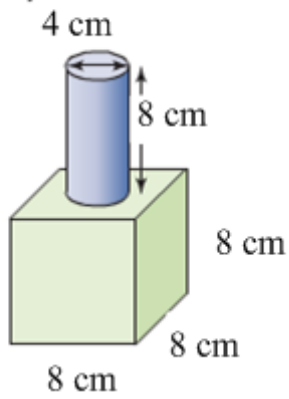
Example 2 Determining the Surface Area of a Composite Object Made from Two Cylinders

Two round cakes have diameters of 14 cm and 26 cm, and are 5 cm tall. They are arranged as shown. The cakes are covered in frosting. What is the area of frosting?

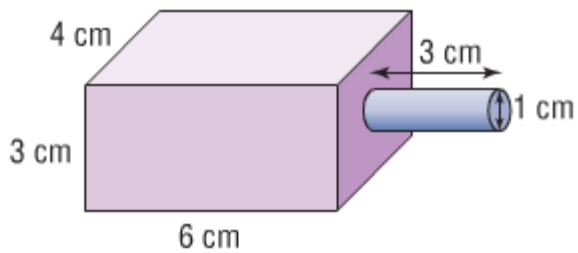


More Practice:

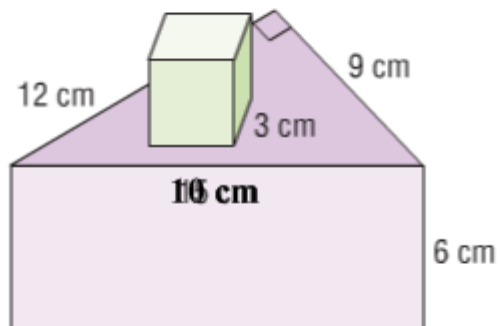
a) cylinder on a cube



b) cylinder on a rectangular prism



c) cube on a triangular prism



To complete on loose leaf: p. 40& 41, #3,4,5