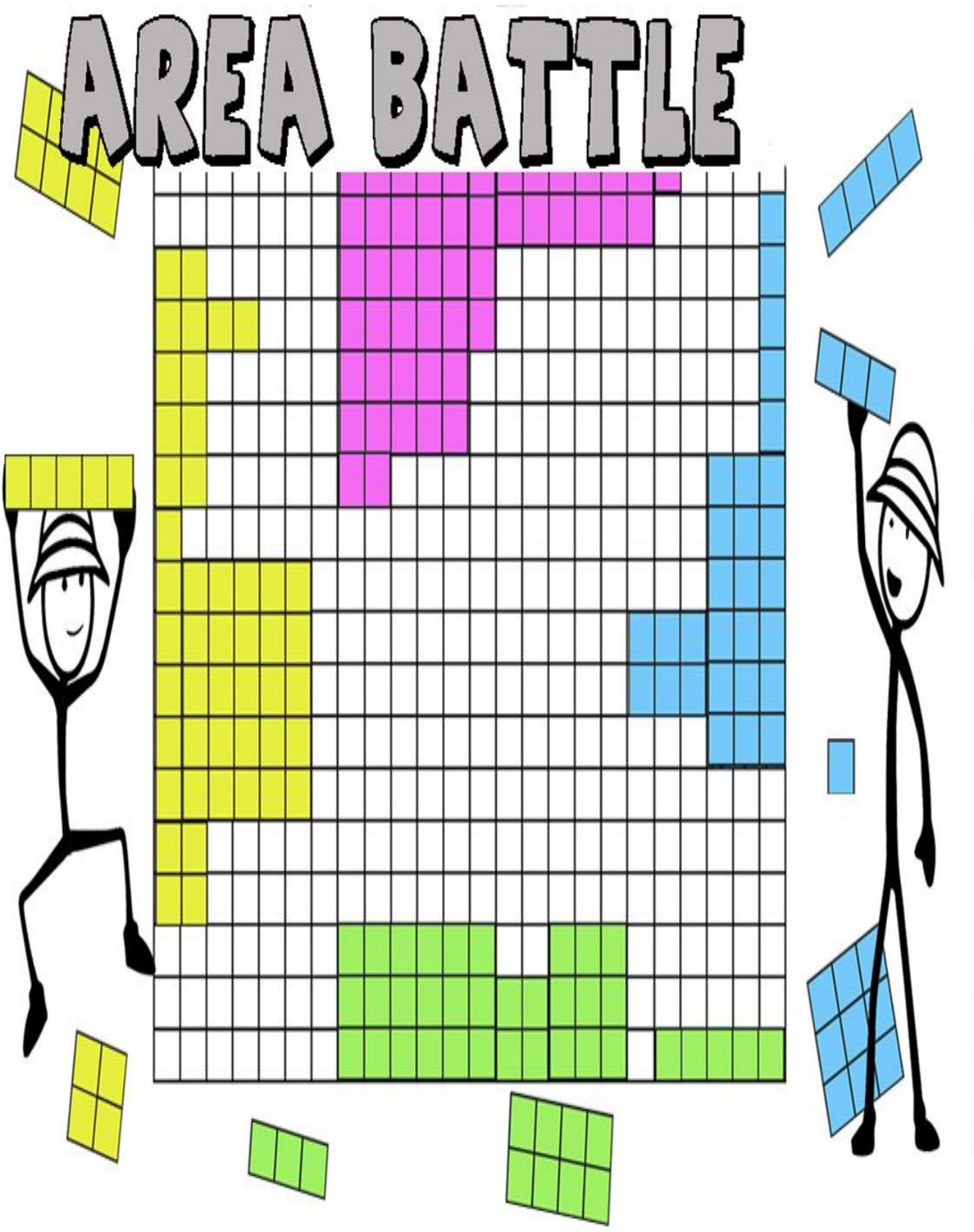
Grade 5 - Perimeter and Area

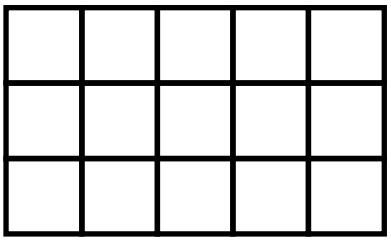


Name	Number	Class	Group

Perimeter

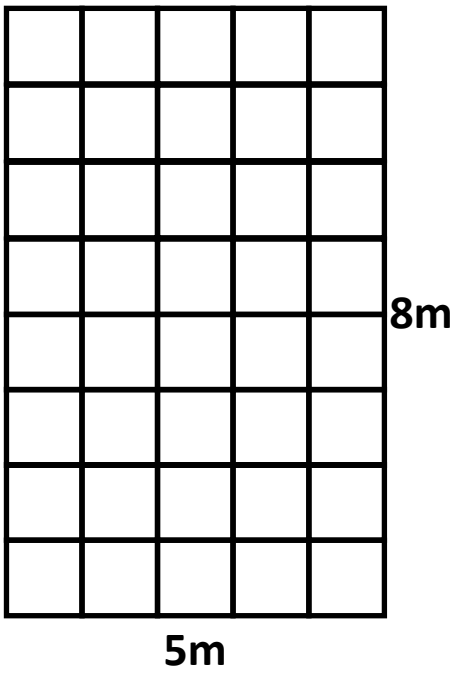
Perimeter is the distance around the outside of a **figure** (shape). It is the total length of all the sides of a **figure** added together. Let us see an example.

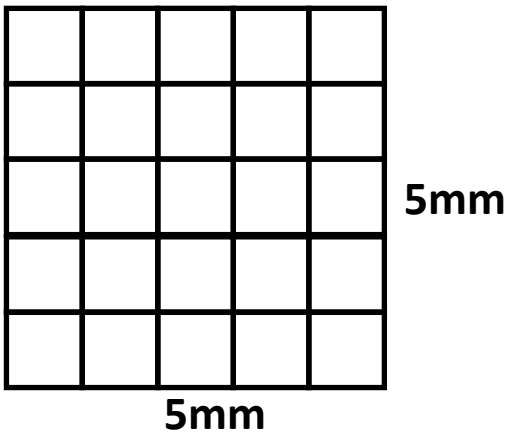
Step 1	**Step 2**
Each **square** is 1x1 centimeter. Try and measure it and see if you can find the **perimeter** of the **rectangle**.	Use the equation and calculate the **perimeter**. 5 + 3 + ⌐ ⌙ + ⌐ ⌙ =_____



You can also use a formula to find the **perimeter** of a **rectangle**.
P(perimeter)
l (length)
w (width)

Perimeter formula:
P = l + w + l + w
P = 2 * l + 2 * w
or
P = 2l + 2w





Find the **perimeter** of the **rectangle** and the **square**. Remember to use the units correctly (**m** and **mm**).

Perimiter of the rectangle	**Perimiter of the square**
_____	_____

Perimeter

Find the **perimeter** of each **figure**.

1) 

5cm

7cm

Length = 7cm Width = 5cm

Perimeter = _____

2) 

4cm

4cm

Length = ____ Width = ____

Perimeter = _____

3) 

8cm

3cm

Length = ____ Width = 8cm

Perimeter = _____

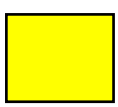
Find the missing measurement (**length** or **width**) of each **figure**.

4) 

? cm

7.5cm

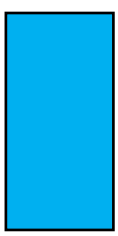
Perimeter = 22cm Width = _____

5) 

2.5 cm

? cm

Perimeter = 10cm Length = _____

6) 

8 cm

? cm

Perimeter = 24cm Width = _____

Perimeter

Complete the **perimeter** chart below. Each **figure** in the chart is a regular **figure** with sides of 5 centimeters.

	Regular Figure	Addition Expression	Multiplication Expression	Perimeter
7)	Triangle			
8)	Square	5cm+5cm+5cm+5cm	5cm x 4	20cm
9)	Pentagon			
10)	Hexagon			
11)	Octagon			

Complete the following word problem.

12) A **rectangular** room has sides of 6m and 4m. You want to use the formula ***P = 2l+2w***. What numbers would you put for ***l*** and ***w***? Does it matter if you switch the numbers? Finally, give the **perimeter** of the room.

l = _____

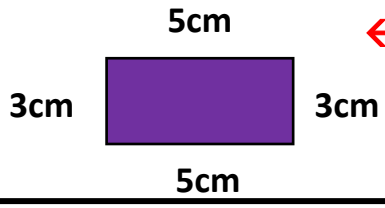
w = _____

Does it matter if you switch the numbers?_____

Perimeter = _____

Area of a Parallelogram

A **parallelogram** is a four-sided **figure** with two sets of equal sides. The most normal example of a **parallelogram** is a **rectangle**. Let us look at an example:



← As you can see, two sets of sides are equal. The **length** sides are both 5cm, and the **width** sides are both 3cm.

In this example, what is the **perimeter** of the **rectangle**? From our previous lesson on **perimeter**, we add up all the sides. In this case, we do the following: 5cm + 5cm + 3cm + 3cm. We could also follow the equation ***P = 2l + 2w***, and insert 5 for ***l*** and 3 for ***w***. This gives us a **perimeter** of **16cm**. But what if we want to find the **area** of the **rectangle**?

We measure the **area** of something by finding the number of **square units** it is. A **square unit** is a **square** with sides that are one **unit** (how something is measured or shown) long. In our example, the **unit** is **cm**. To measure the **area** of something, we use the following equation: ***A = l x w***. Like in the previous **perimeter** question, we insert 5 for ***l*** and 3 for ***w***. What does that look like for our example?

A = l x w → ***A*** = 5cm x 3cm → ***A*** = **15cm²**

The **area** of the **rectangle** from our example is **15cm²**. We use the "**²**" after "**cm**" to show the answer in **square units**.

A **rectangle** is not the only kind of **parallelogram**. To find the **area** of non-**rectangular parallelograms**, we use a similar method as before, but the equation is a bit different. The equation we use is ***A = bh***. "**Base**" is represented by ***b***, and "**height**" is represented by ***h***.

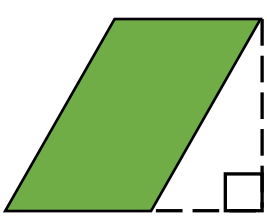
A = l * w

l = _____

w = _____

Area = _____

A = b * h



b = _____

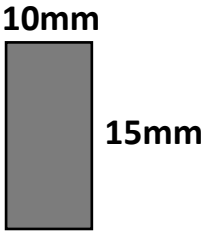
h = _____

Area = _____

Area of a Parallelogram

Find the **area** of each **figure**. Use the correct unit (**cm**, **km**, **mm**).

1)

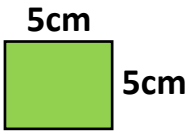


Length = _____

Width = _____

Area = _____

2)

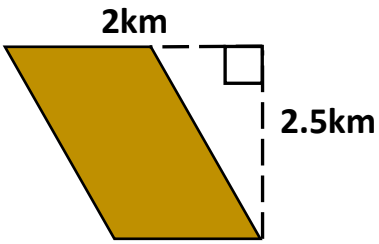


Length = _____

Width = _____

Area = _____

3)

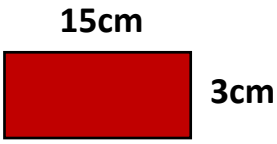


Base = _____

Height = _____

Area = _____

4)

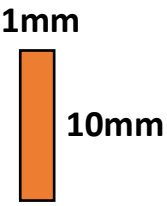


Length = _____

Width = _____

Area = _____

5)

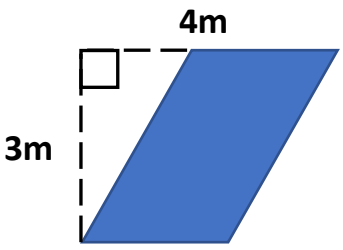


Length = _____

Width = _____

Area = _____

6)



Base = _____

Height = _____

Area = _____

Area of a Parallelogram

Complete the chart below. Find the **width, length** and **perimeter** of each **rectangle**.

	Area of Rectangle	Length	Width	Perimeter
7)	**36cm²**	**1cm**	_____ **cm**	**74cm**
8)	**36cm²**	**2cm**	_____ **cm**	_____ **cm**
9)	**36cm²**	_____ **cm**	**12cm**	_____ **cm**
10)	**36cm²**	_____ **cm**	**6cm**	_____ **cm**

Complete the chart below. Find the **base** and **height** of each **parallelogram**.

	Area of Parallelogram	Base	Height
11)	**24cm²**	**3cm**	_____ **cm**
12)	**24cm²**	**6cm**	_____ **cm**
13)	**24cm²**	_____ **cm**	**12cm**
14)	**24cm²**	_____ **cm**	**24cm**

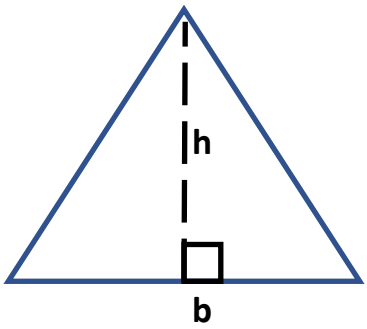
Complete the following word problem.

15) Mrs. Kim drew a **parallelogram** with a **base** of 4cm and an **area** of 16.4cm². Draw her **parallelogram**. What is the **height** of the **parallelogram**?

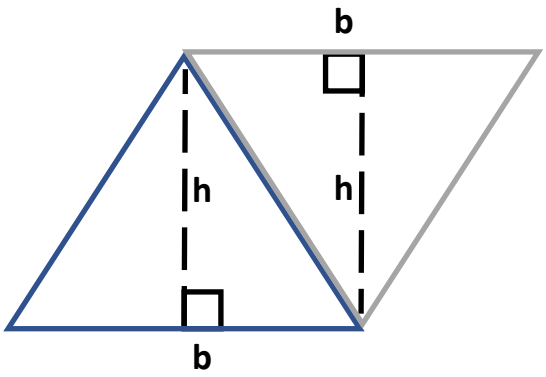
Height: _____

Area of a Triangle

A **triangle** is a three-sided shape. In order to find the **area** of a **triangle**, we use a similar equation to the one we use when finding the **area** of a **parallelogram**. Last week we learned the equation for finding the **area** of a **parallelogram**:
Area= base x height → *A = bh*
The equation for finding the area of a **triangle** is similar.
The area of a triangle is as follows: **Area =** $\frac{1}{2}$ **x base x height →** $A = \frac{1}{2}\ x\ b\ x\ h$.
As you can see, there is a $\frac{1}{2}$ here that is new.
Let us look at a **triangle** and compare it to a **parallelogram**:



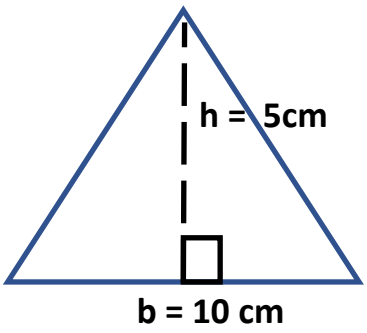
On the left, you can see a **triangle** with a **height** and a **base**. Below, we added another **triangle**. What shape do you see?



When we add two **triangles** together, they make a **parallelogram.** This is the reason for writing **A= ½ x b x h**.

If we took half the **area** of a **parallelogram**, it would have the **area** of one **triangle**.

1. Find the area of this triangle.



Height = _____

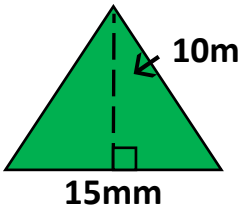
Base = _____

Area = ½ x _____

Area of a Triangle

Find the **area** of each **triangle**. Show your calculations and remember the unit (**mm, cm, km**).

2)

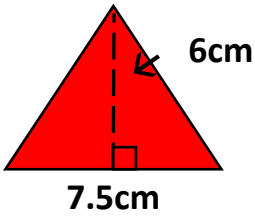


Height = _____

Base = _____

Area = _____

3)

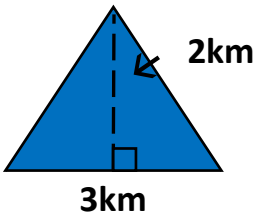


Height = _____

Base = _____

Area = _____

4)

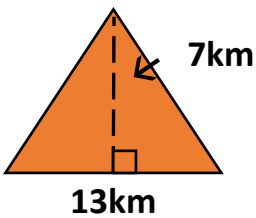


Height = _____

Base = _____

Area = _____

5)



Height = _____

Base = _____

Area = _____

Solve the following word problem. Show your calculations and the drawing.

6) A **triangle** has a **height** of 6cm and an **area** of 24cm^2. How long is the **base** of the **triangle**?

Height = _____

Base = _____

Area = _____

Area of a Triangle

6) A **triangle** has an **area** of 48cm^2. What are some possible sizes that the **triangle** could be? Draw three possible **triangles** and label the sizes of their **bases** and **heights**.

Triangle # 1 -

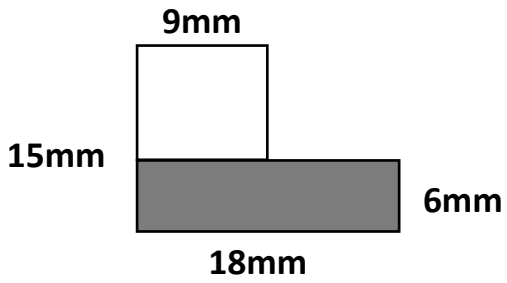
Triangle # 2 -

Triangle # 3 -

Perimeter and Area of Complex Figures

A **complex figure** is made of smaller **polygons**. As you can see below, the shape is made out of two **shapes**, a **square** and a **rectangle** (they are colored differently to help).

1)



Width W = _____ **Width G = _____**

Length W = _____ **Length G = _____**

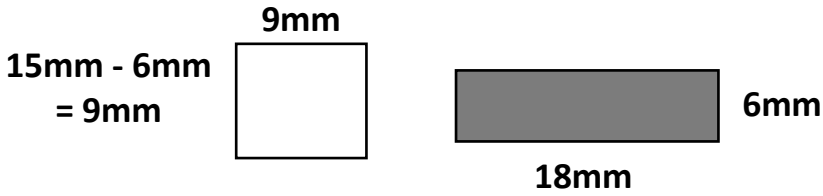
Perimeter W = _____ **Perimeter G = _____**

Area W = _____ **Area G = _____**

The easiest way to solve a **complex figure** is to separate them into **simple figures**. In this example, we made a **rectangle** and a **square**.
Now we need to figure out the **height**, **length**, **perimeter**, and **area** of both **shapes**.

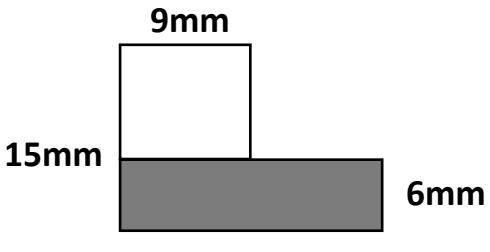
We know that the **length** of the white square is 9mm, we know that the grey **rectangle's width** is 6mm, and we know the grey **rectangle's length** is 18mm. What are the missing measurements? Write them above.

Now that we have found the missing measurements, we can start cutting the **complex shape** up. We can find the last measurement by removing the grey **rectangle** and subtracting its **width** from our **length**.



This assignment would be too easy if this was all you needed to do. Now we need to calculate the **complex shape's perimeter** and its **area** (remember the units).

2)



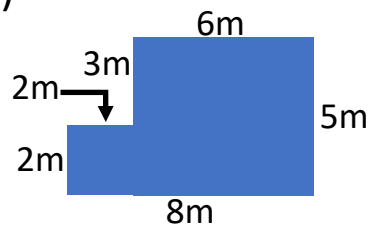
Perimeter = _____

Area = _____

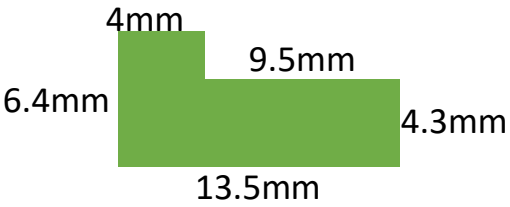
Perimeter and Area of Complex Figures

Find the **perimeter** and **area** of the following **complex figures**.

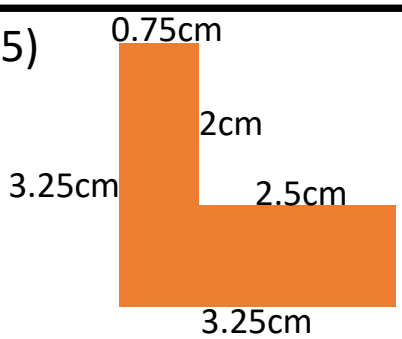
3)



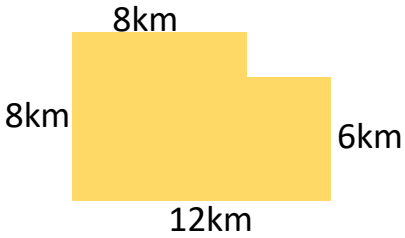
4)



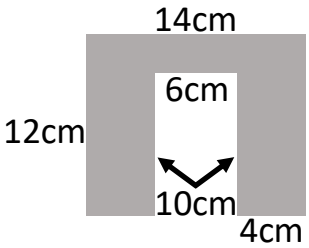
5)



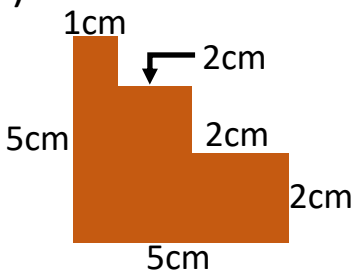
6)



7)



8)



3) Perimeter – _____ Area – _____

4) Perimeter – _____ Area – _____

5) Perimeter – _____ Area – _____

6) Perimeter – _____ Area – _____

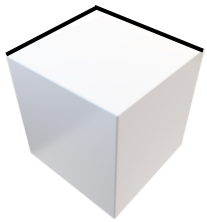
7) Perimeter – _____ Area – _____

8) Perimeter – _____ Area – _____

Solid Figures

We have learned about two dimensional figures, and now it is time we learn about three dimensional figures(3D). A **solid figure** is a shape with not only **length** (*l*) and **width** (*w*), but also with a **height** (*h*).

There are many kinds of examples of **solid figures**. The most common one is the **cube**.

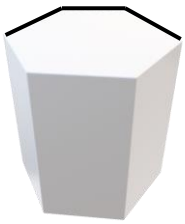


Cube

Today we are going to learn about the names and what different **solid figures** look like.

Cylinder

Cone

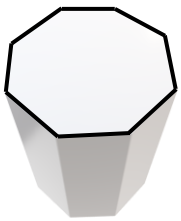


Hexagonal Prism

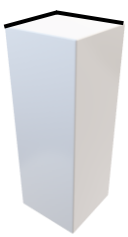
Square Pyramid

Triangular Prism

Sphere



Octagonal Prism

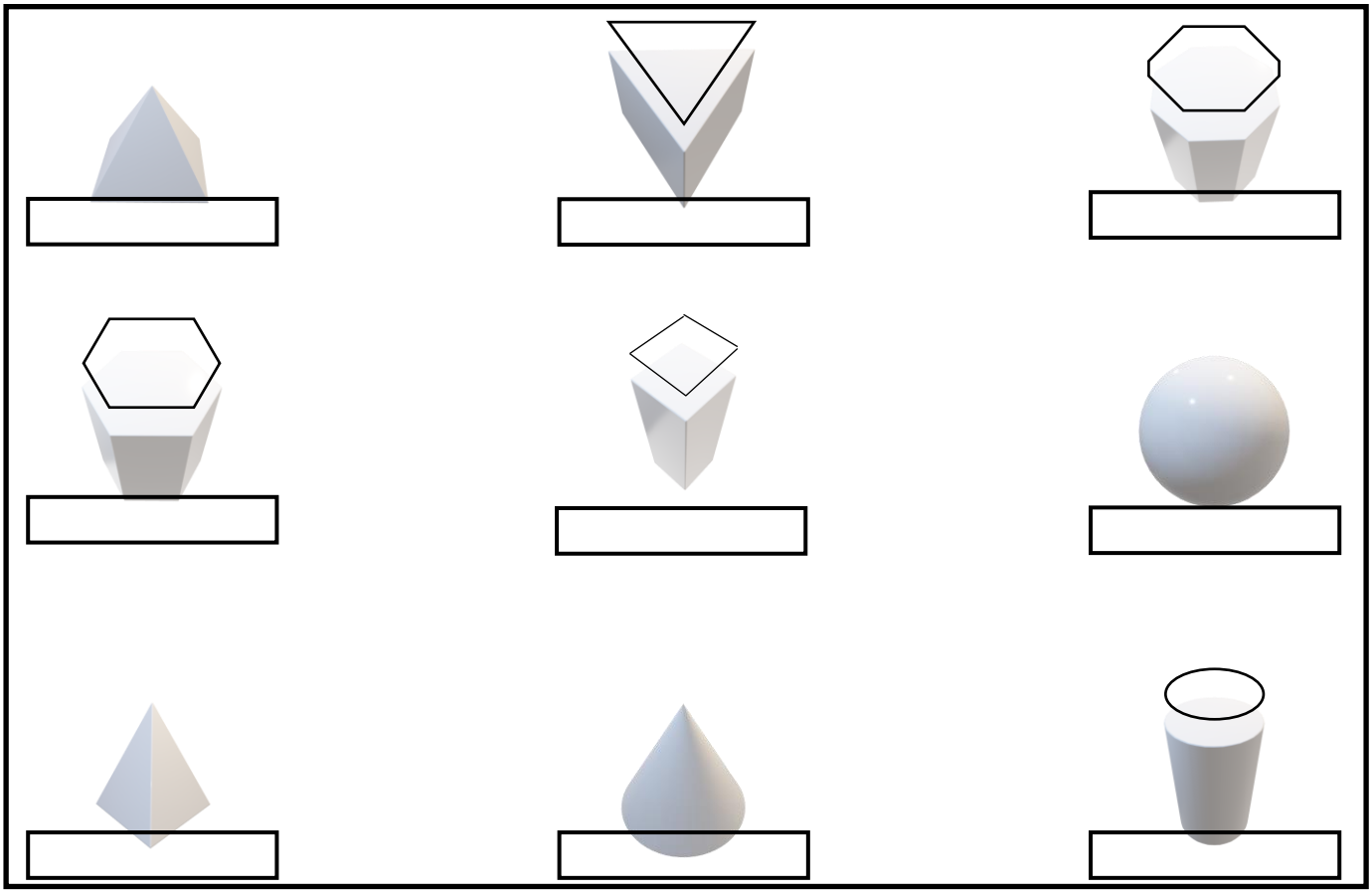


Cuboid

Tetrahedron

Solid Figures

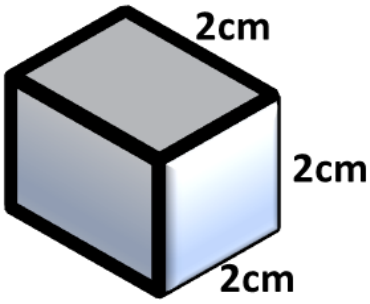
Write the names of the **solid figures**.



Draw 3 **solid figures**.

Surface Area

To determine the **surface area** of a **cube**, you must first remember that all the sides are equal. This means that each **face** will be the same size. A **cube** has six **faces**, which means that once you find the size of the **face**, you can multiply the answer by 6 to find the **surface area**. Let us see an example.



Face # 1 Area: 2 x 2 = 4

Surface Area of Cube: 4 x 6 = 24

The **surface area** is 24cm^2.

With this example in mind, complete the following chart.

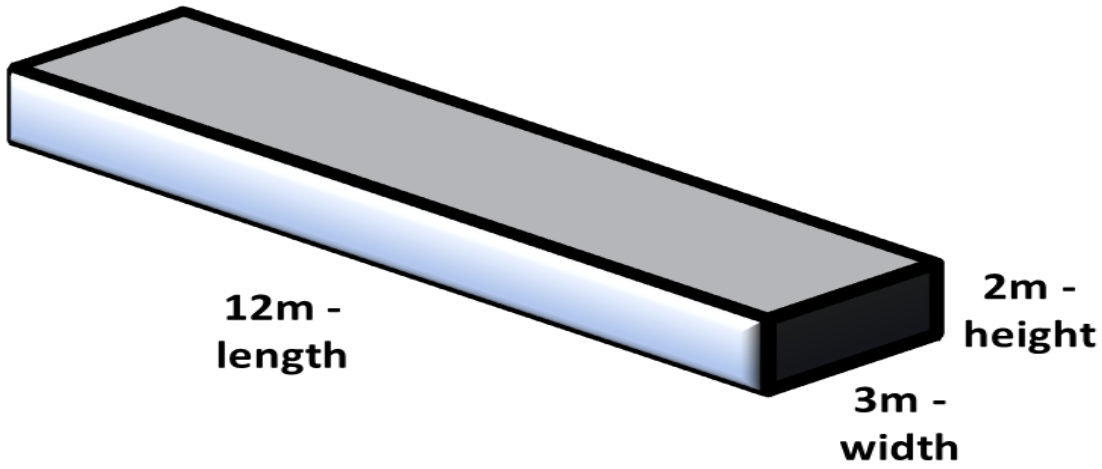
	Length of One Side of Cube (*s*)	Area of One Face (*f*)	Surface Area of Cube (*SA*)
EX.	2cm	4cm^2	24cm^2
4.	3cm		
5.	4cm		
6.	5cm		
7.	6cm		
8.	7cm		
9.	8cm		

10. Look at the answers you have for questions 4-9. Can you write an equation that uses the length of one side (*s*) to find the cube's surface area (*SA*)?

The equation is: _____

Solid Figures

The **surface area** of a **solid figure** is the total of all the areas of all its **faces** (each flat surface) and is measured in **square units**. Let us look at an example.
Determine the **surface area** of the following **solid figure**. Since this **figure** is a **rectangular prism**, this means its opposite **faces** are the same **length**. This means that we can multiply each calculation by 2.



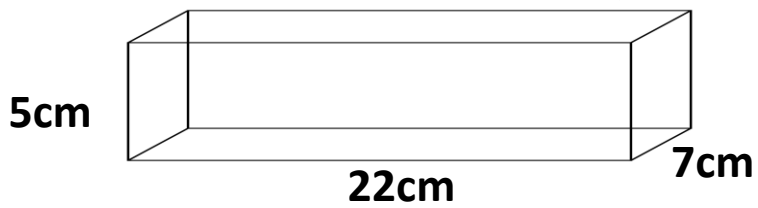
Method 1 – Find the Areas of the Faces

Top and bottom: 2 x (12 x 3) = 2 x 36 = 72
Front and back: 2 x (3 x 2) = 2 x 6 = 12
Right and left sides: 2 x (12 x 2) = 2 x 24 = 48
The total of the areas: 72 + 12 + 48 = 132
The **surface area** is 132m^2.

Method 2 – Use an Equation

Surface Area = 2 x (length x width + width x height + height x length)
Surface Area = 2 x (12 x 3 + 3 x 2 + 2 x 12)
Surface Area = 2 x (36 + 6 + 24)
Surface Area = 2 x (66)
Surface Area = 132
The **surface area** is 132m^2.

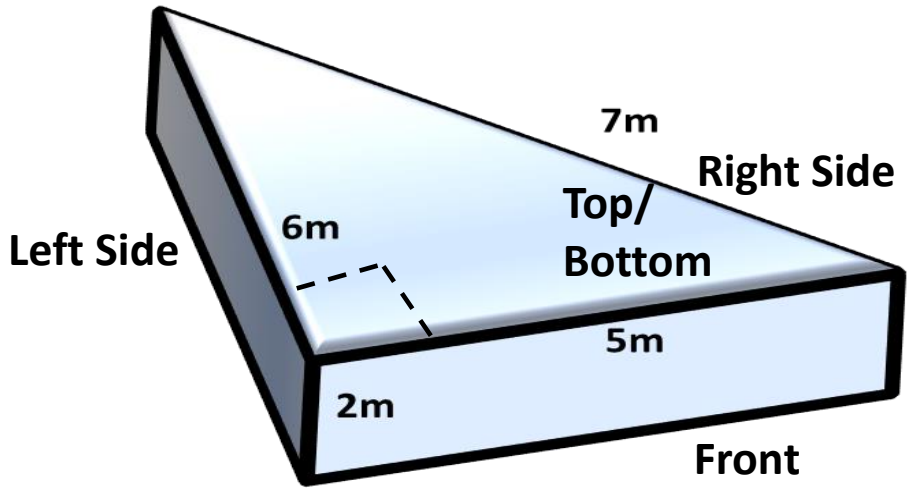
11. Calculate the surface area of this solid figure.



The surface area is _____

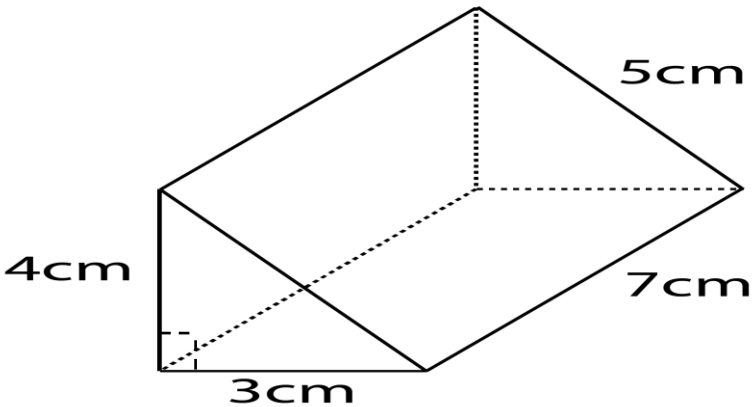
Solid Figures

Let us look at another example. This time, we will try to find the **surface area** of a **triangular prism**.
Remember, the top and the bottom are **triangles** that are the same in this **triangular prism**. The front, left side, and right side are **rectangles** that are ***NOT*** the same.
We need to find the areas of the **faces**.



The top and bottom are triangles, so we need to use the formular for the area of a triangle: A $= \boldsymbol{h} * \boldsymbol{b} * \frac{\mathbf{1}}{\mathbf{2}}$. Because this is a right-angled triangle, we know the height is 6m. Our formula should then look like this. A $= \mathbf{6} * \mathbf{5} * \frac{\mathbf{1}}{\mathbf{2}} = \mathbf{15}$, which means our triangles' surface area is 15x2=30.
The front, left and right sides are rectangles, so we use the formula for a rectangle's area.
Front: 2 x 5 = 10
Left side: 2 x 6 = 12
Right side: 2 x 7 = 14
Then we add all the areas together and get: 30 + 10 + 12 +14 = 66
The **surface area** is 66m^2.

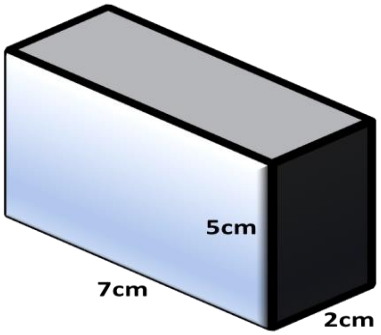
12. Calculate the surface area of this triangular prism.



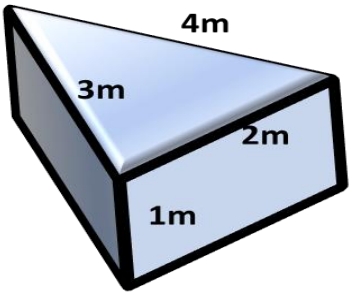
The surface area is _____

Surface Area

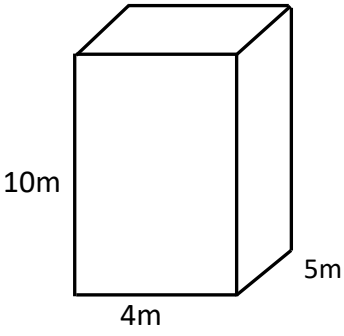
Determine the **surface area** of each **solid figure**.



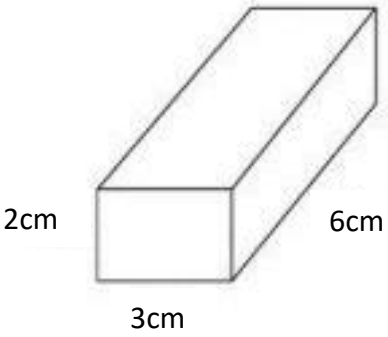
13. Surface Area – _____



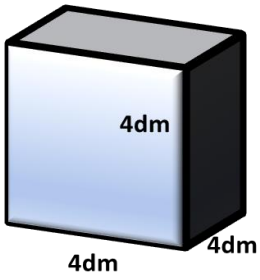
14. Surface Area – _____



15. Surface Area – _____



16. Surface Area – _____

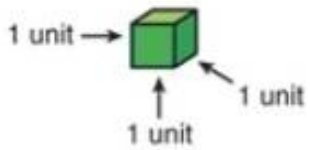


17. Surface Area – _____

Volume

The **volume** of a **solid figure** is the amount of space the figure occupies. **Volume** is measured using **cubic units**. A cube measuring 1 unit on each edge has a **volume** of 1 **cubic unit**.

One cubic unit



One cubic unit has a height, width, and length of 1.

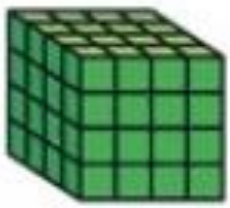
The **volume** of a **cube** is the **height** times the **width** times the **length** of the **figure**.

Height x width x length = V

So, the **volume** of a **cube** that has edges of 4 units would have a volume of 64 **cubic units** written as 64 unit^3.

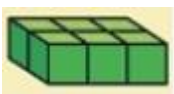
Volume of a Cube

Volume = Side^3
= 4 X 4 X 4
=64

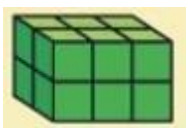


The volume of this cube is 64 cubic units

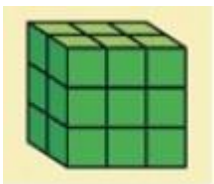
Find the volume of the solid figures.



1) Volume = _____

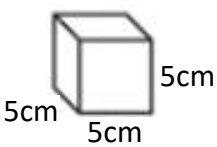


2) Volume = _____

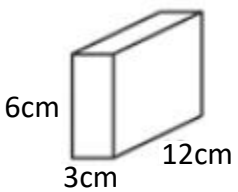


3) Volume = _____

4) Volume = _____



5) Volume = _____

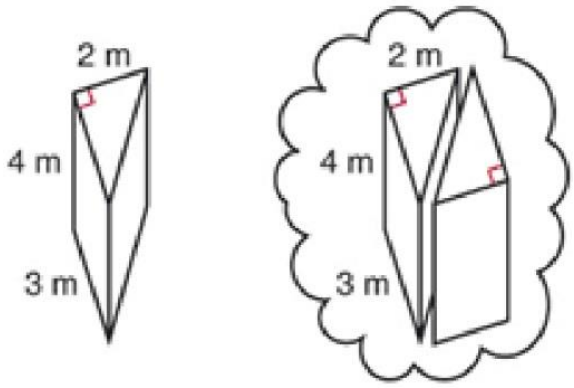


6) Volume = _____

Volume

Volume of Triangular Prism

The volume of the triangle prism at the left is one half of the volume of a rectangular prism with the same length, width and height.



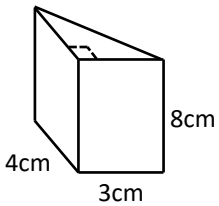
length = 3 m
width = 2 m
height = 4 m
X $\frac{1}{2}$

Total volume 12 m^3

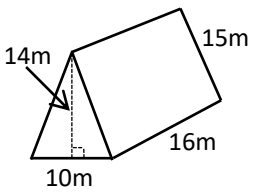
$\frac{1}{2}$ X 3 X 2 X 4 = 12 m^3

HINT* You can divide the total of a rectangular prism with the same length, width, and height as your triangular prism by 2

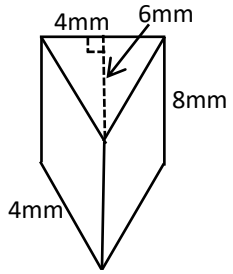
Find the volume of the solid figures.



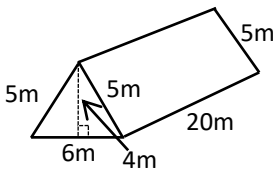
1) Volume = _____



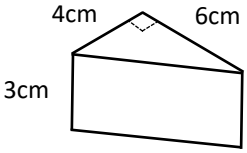
2) Volume = _____



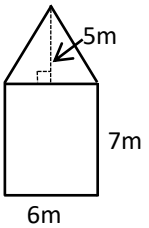
3) Volume = _____



4) Volume = _____



5) Volume = _____



6) Volume = _____

Volume

Volume of Complex Figures

Separate the complex figure into simpler solid figures.
Find the volume of each figure. Add the volumes together.

Figure A
length = 1 m
width = 3 m
height = 2 m

Total volume= 6 m^3

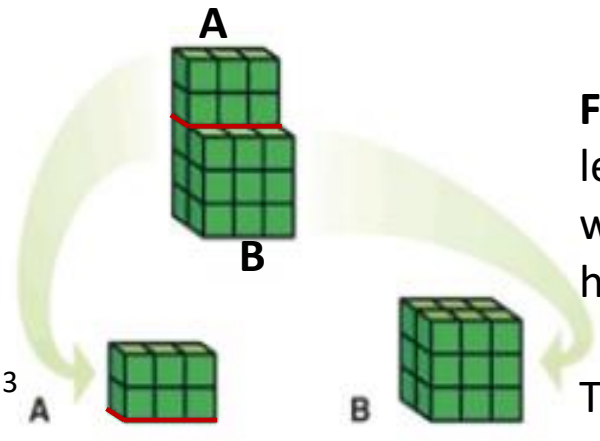


Figure B
length = 2 m
width = 3 m
height = 3 m

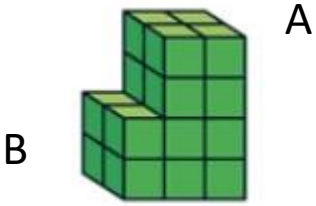
Total volume= 18 m^3

Figure A + B

$V = 6\ m^3 + 18\ m^3$

Total volume= 24 m^3

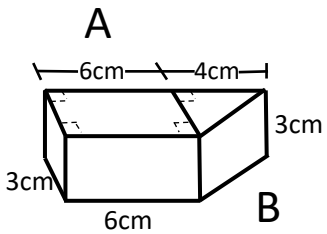
Find the volume of the figures.



1)
Volume of A = _____

Volume of B = _____

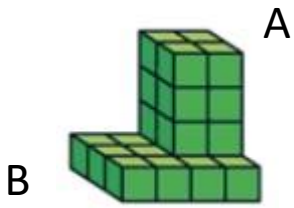
Volume of A+ B = _____



2)
Volume of A = _____

Volume of B = _____

Volume of A+ B = _____



3)
Volume of A = _____

Volume of B = _____

Volume of A+ B = _____

Perimeter and Area - Test

Signature	_____	___/13

Find the **perimeter** and **area** of the following **figures**. Show your calculations.

1)

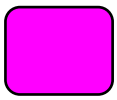
5cm

7cm

Perimeter – _____

Area – _____

2)



4cm

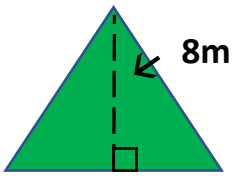
4cm

Perimeter – _____

Area – _____

Find the **area** of each **triangle**. Show your calculations.

3)

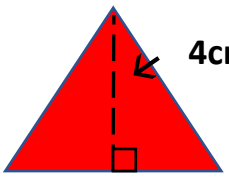


8mm

12mm

Area – _____

4)

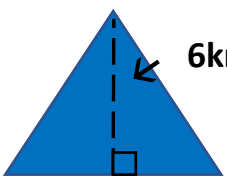


4cm

6.5cm

Area – _____

5)



6km

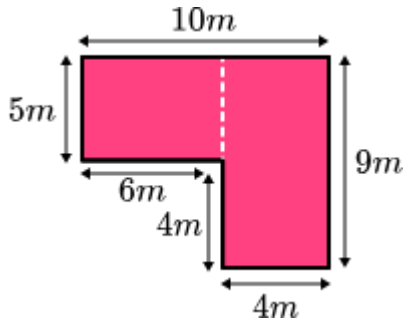
8.5km

Area – _____

Perimeter and Area - Test

Find the **perimeter** and **area** of the following **complex figures**. Show your calculations.

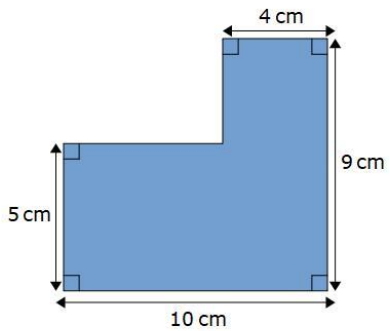
6)



Perimeter – _____

Area – _____

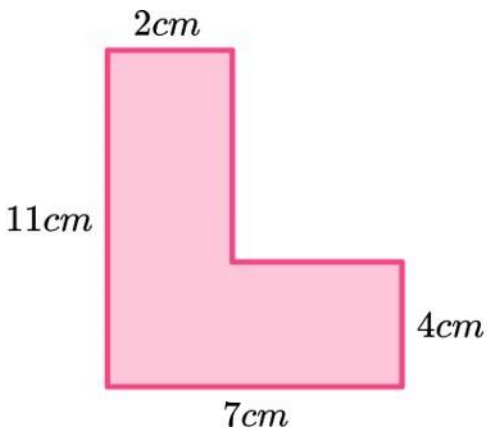
7)



Perimeter – _____

Area – _____

8)

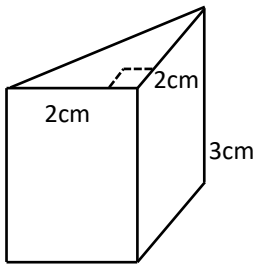


Perimeter – _____

Area – _____

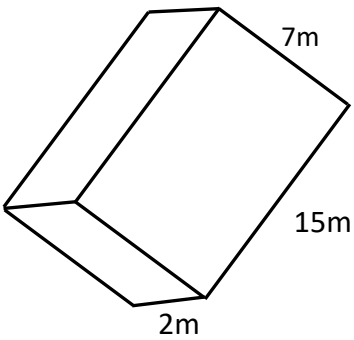
Perimeter and Area - Test

Name the solid figure and calculate the surface area.



9. **Name of the Prism:** _____

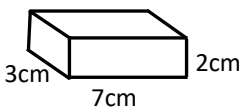
Surface Area: _____



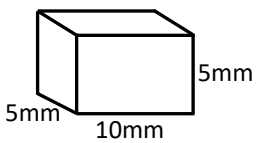
10. **Name of the Prism:** _____

Surface Area: _____

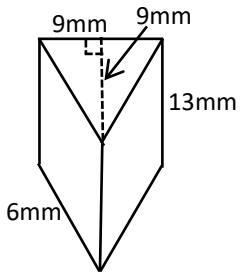
Calculate the volume of the prisms below.



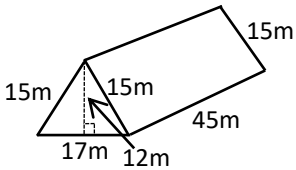
11) Volume = _____



12) Volume = _____

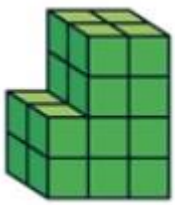


13) Volume = _____



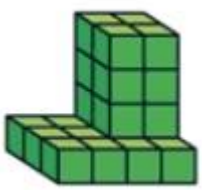
14) Volume = _____

1 cube = 1cm^3



15) Volume = _____

1 cube = 1m^3



16) Volume = _____