MBF 3C1 Name: ____________________________

UNIT 6
Geometry

MBF 3C1 Name: ____________________________

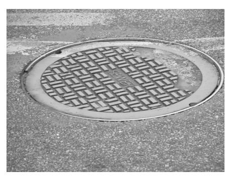
Geometric Shapes

Where can geometry be seen in everyday life?

- ____________________
- ____________________
- ____________________
- ____________________
- ____________________
- ____________________

What careers depend on geometry?

- ____________________
- ____________________
- ____________________
- ____________________
- ____________________
- ____________________
- ____________________



Why are certain geometric shapes important in the real world?

- ____________________
- ____________________
- ____________________

Example 1

a. Why are roofs triangular?

____

b. Why are manhole covers circular?

____

c. Why are tires round?

____

d. Why are cereal boxes rectangular?

____

____

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METRIC & IMPERIAL MEASUREMENT

	Metri
Length	millimetre (m
	centimetre (cn
	kilometre (km
Mass (Metric)/ Weight (Imperial)	gram (g)
	kilogram (kg)

between imperial + metric

Length	Ma
30.48 cm = 1 foot	28.35 g = 1
2.54 cm = 1 inch	0.454 kg =
1.6 km = 1 mile	0.907 t = 1
	454 g = 1 p

- Each statement above ie. $\boxed{100cm = 1m}$ can be written as ratios that are equivalent to ____________

$$\boxed{\frac{100cm}{1m}} \quad \text{OR} \quad \boxed{\frac{1m}{100cm}}$$

- **How do you decide which ratio to multiply by?**
  Look at placement of units, ensure that they would _______________ properly.

Example 1

Show the cancellations of the following speed conversion of cm/min into km/hr, find the final answer.

$$\frac{187500\ cm}{\min} \times \frac{1m}{100cm} \times \frac{1km}{1000m} \times \frac{60\min}{1hr}$$

Steps:

1. Record what's given with ______________
2. Decide on how to place a ratio so that units _____________
3. Multiply
   top with ________________ and
   bottom with _____________
4. Simplify final answer and record the result with units.

Example 2

a. If a wall is measured to have an area of 891 878 cm^2 long, what is the measurement in ft^2?

b. You have a $\frac{5}{16}$ inch drill bit, how large a hole will it make in mm?

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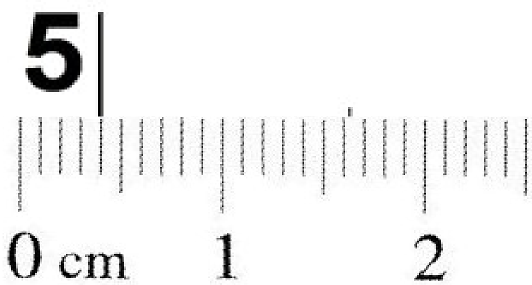
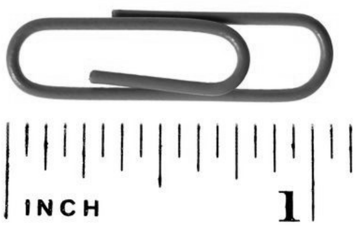
in



Example 3



How long is the paper clip?

Convert the measurement of the paper clip to centimetres.

Example 4

Ilya was watching an American news broadcast. It spoke of gas prices being $13.25/gal, what was the price per Litre?

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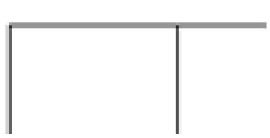
Nets & Patterns

Sketch a 3D drawing:

Compare your drawing with those of the people around you.

a. How are they similar?

b. How many different ways can the object be represented?

NET	**PATTERN**
A two-dimensional diagram that can be cut out and folded to form a three-dimensional object. For example, a net of a rectangular prism.	A two-dimensional diagram of a three-dimensional object which is split up into individual shapes. For example, a pattern for a basic skirt.
	

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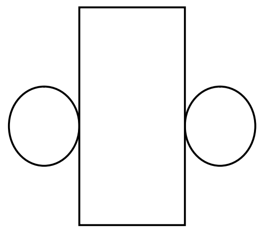
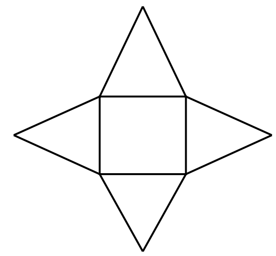
Example 1

For each of the following nets, what 3-D object would it create? Sketch the figure in 3D.

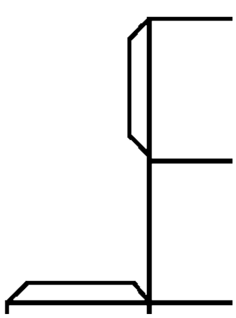
	

Example 2

There are 11 possible nets for a 3D cube. In the space below, try to draw as many of the 11 nets as possible.

Patterns often have to account for seams, or flaps, that allow for the separate pieces to be attached together.

Example 3



Is the diagram a net or pattern? Explain your answer.

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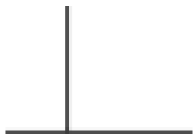
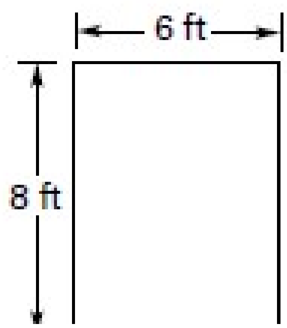
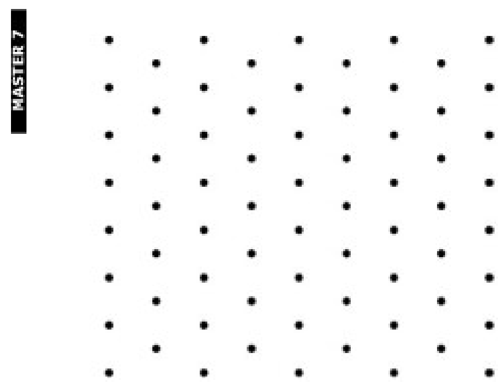
Isometric and Orthographic Drawings

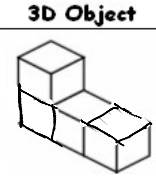
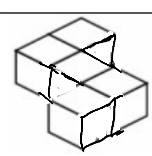
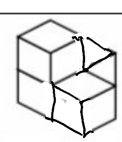
ISOMETRIC PERSPECTIVE DRAWING	ORTHOGRAPHIC PROJECTION
	
A visual representation of a three-dimensional object in two dimensions.	A set of drawings that show up to six views of an object. Usually front, side and top views are given.
Common in manuals, patent applications and other technical documents.	

Example 1
The orthographic projections of a rectangular prism are shown. Use isometric dot paper to make an isometric drawing of the prism. Let one unit between each pair of dots equal one foot.





Example 2

3D Object	Front Elevation	Side Elevation	[illegible]Elevation
			
			
			

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Plans and Scale Models

Scale is the fraction that shows the relationship between the measurement of matching parts of a real object and a drawing of it. A scale can be written without units when the units are the same; this is called a **scale factor**.

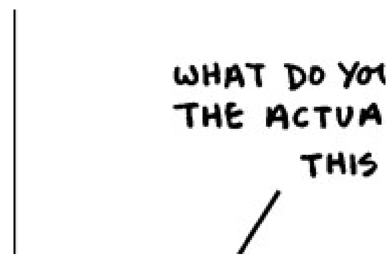
A **scale drawing** is a drawing which uses a specific ratio to represent an object that is too large or too small to be drawn in its actual dimensions.

A **plan** is a set of orthographic drawings used to describe a place or object. Plans are often used for technical purposes.

A **scale model** is a three-dimensional physical replica of an object which is very large or small.

What are some common examples of scale drawings?

- ______________________________________
- ______________________________________
- ______________________________________
- ______________________________________
- ______________________________________



Who uses scale drawings and models?

- ____
- ____
- ____
- ____
- ____

Why are scale drawings and models necessary?

- ____
- ____

Need to understand scales?
Watch http://www.youtube.com/watch?v=XtkU4VkWh8I.

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Example 1

A scale drawing of a spider is 5 centimeters long. The actual spider is 10 millimeters long.

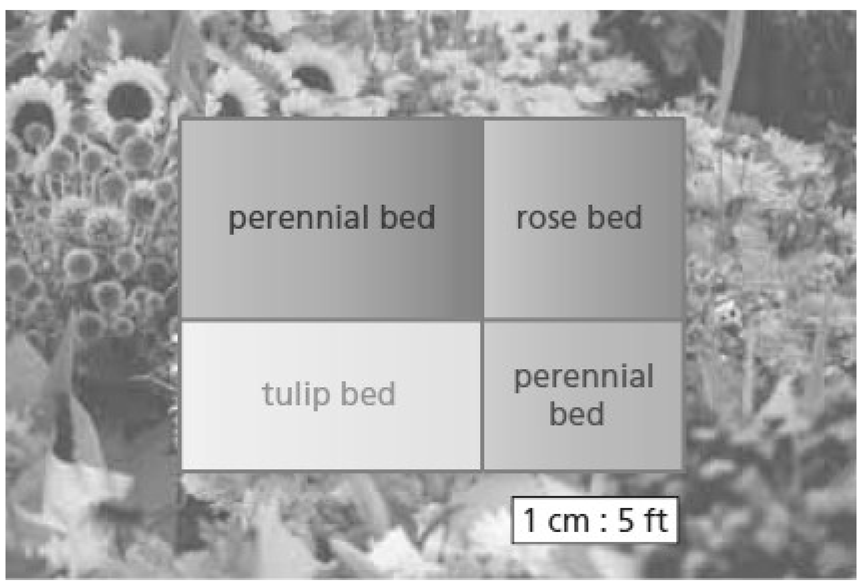
a. What is the scale of the drawing?

b. What is the scale factor of the drawing?

c. The spiders mate is 8mm, what size should the drawing for it be in cm? Explain how to decide whether to use the scale or scale factor?

Example 2

Use the diagram to answer the following questions. (Use rulers to measure)



a. What is the actual length of the flower garden?

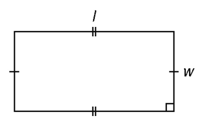
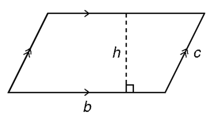
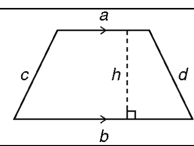
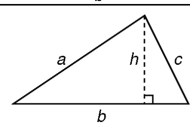
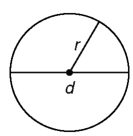
b. What are the actual dimensions of the rose bed?

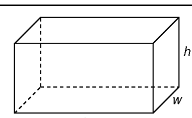
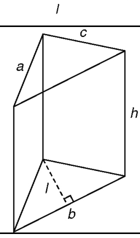
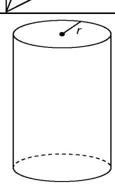
c. What are the actual perimeters of the perennial beds?

Solving Problems with Geometry

When using geometry to solve problems it is important to consider constraints. **Constraints** are conditions that limit or restrict options. Examples of constraints include ___________________, ___________________, ___________________, ___________________, or ___________________. Architects, engineers, fashion designers and other professionals deal with these types of constraints every day.

MEASUREMENT FORMULAS:

2-DIMENSIONAL SHAPE	DIAGRAM	PERIMETER FORMULA	AREA FORMULA
rectangle		$P = 2l + 2w$ (for a square $P = 4s$)	$A = lw$ (for a square $A = s^2$)
parallelogram		$P = 2b + 2c$	$A = bh$
trapezoid		$P = a + b + c + d$	$A = \dfrac{(a+b)h}{2}$
triangle		$P = a + b + c$	$A = \dfrac{bh}{2}$
circle		$C = \pi d$ or $C = 2\pi r$	$A = \pi r^2$

3-DIMENSIONAL OBJECT	DIAGRAM	SURFACE AREA FORMULA	VOLUME FORMULA
rectangular prism		SA = 2lw + 2wh + 2lh	$V = lwh$
triangular prism		$SA = bl + ah + bh + ch$	$V = \dfrac{bh}{2}L$
cylinder		$SA = 2\pi r^2 + 2\pi rh$	$V = \pi r^2 h$

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Example 1

Sometimes, basic safety considerations depend on understanding nets and volumes. Consider an engineer who needs to design a square-based berm (a shallow container to prevent the spread of oil from a leaking oil tank). The cylindrical oil tank is 20 m in diameter, and has a height of 20 m. The berm must have a height of 5 m.

a. Make the appropriate calculations to find the minimum dimensions of the berm.

b. Select a suitable scale. Draw a net for the berm and a net for the oil tank.

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EXTRA: Measuring Distances & Nets

1. Convert the following length measurements.

	Length	Mass	Volume
between imperial + metric	30.48 cm = 1 foot 2.54 cm = 1 inch 1.6 km = 1 mile	28.35 g = 1 ounce 0.454 kg = 1 pound 0.907 t = 1 ton (US) 454 g = 1 pound	15 mL = 1 tbsp 29.574 mL = 1 fluid ounce 0.473 L = 1 pint 3.785 L = 1 gallon 1L = 4 cups
within metric	10 mm = 1 cm 100 cm = 1 m 1000 m = 1 km	1000 g = 1 kg 1000 kg = 1 t	1000 mL = 1 L
within imperial	12 in = 1 ft 3 ft = 1 yard 1760 yd = 1 mile	16oz = 1lb 2000 lb = 1ton	16 tbsp = 1cup 16 fl oz = 1 pint 2 pints = 1 quart 8 pints = 1 gallon

   a. 2 m = ____________________ cm = ____________________ in

   b. 120 m = ____________________cm = ____________________ ft

   c. 10 320 m = ____________________ km = ____________________ mi

   d. 5 km = ____________________ mi = ____________________ yd

   e. 4600 km = ____________________ m = ____________________ mi

   f. 35 cm = ____________________ mm = ____________________ in

2. What unit would you use to measure each of the following distances? Give a reason for your answer.

   a. The length of your school.

   b. The distance from Notre Dame to Vancouver.

3. A person is 180 centimetres tall.

   a. How tall is the person in metres?

   b. How tall is the person in inches?

   c. How tall is the person in feet?

4. A killer whale is 950 centimetres long.

   a. How long is the killer whale in metres?

   b. How long is the killer whale in inches?

   c. How long is the killer whale in feet?

5. A dolphin is 3000 millimetres long.

   a. How long is the dolphin in metres?

   b. How long is the dolphin in inches?

   c. How long is the dolphin in feet?

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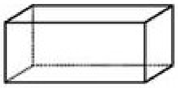
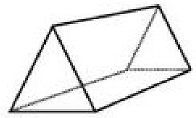
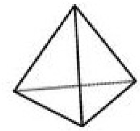
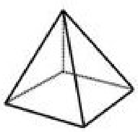
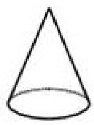
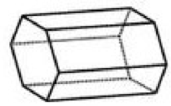
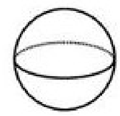
6. Draw a net for each object.

a. 	b. 	c. 	d. 
e. 	f. 	g. 	h. 

7. How would the net of a box with a closed top differ from the net of the same box with an open top? Sketch the net for each case to demonstrate the difference.

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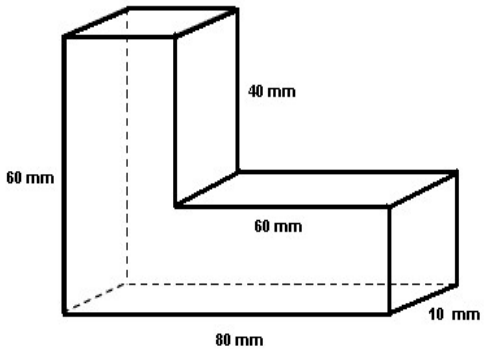
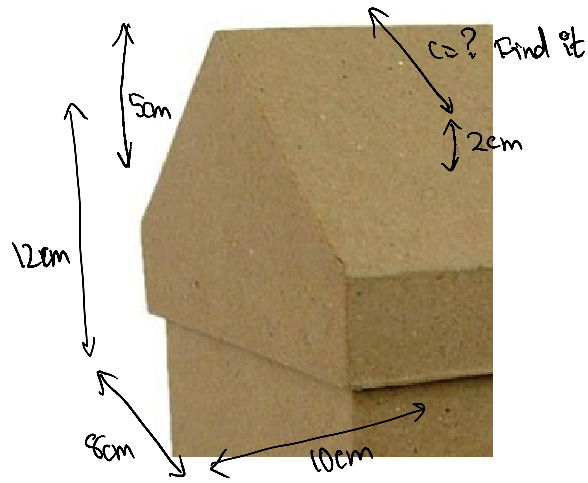
8. Draw a net for each 3-D object below. Include dimensions.





9. Draw or describe the basic structure of a net for a soccer ball.

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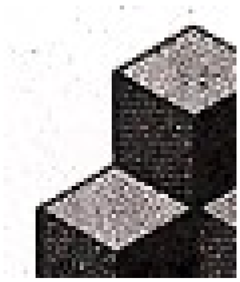
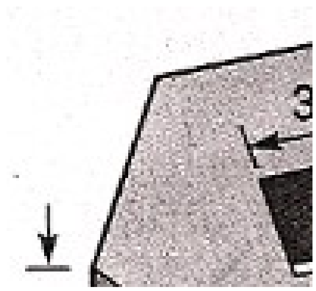
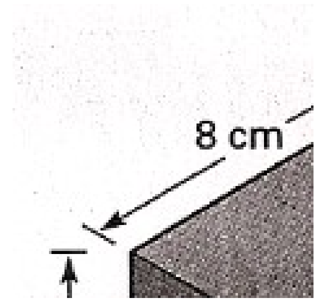
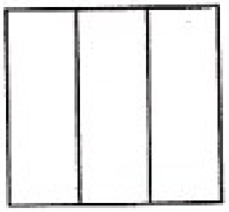
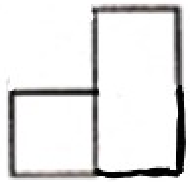
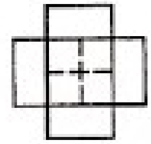
EXTRA: Isometric & Orthographic Drawings

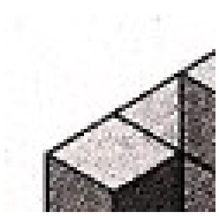
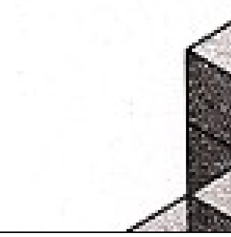
1. Create orthographic projections for each of the following.

			
TOP			
FRONT			
SIDE			

2. Create an isometric drawing for each of the following.

 Top	 Top	 Top
		

3. Complete the chart.

		
How many cubes are in the drawing?		
Draw the front orthographic projection.		
Draw the side orthographic projection.		

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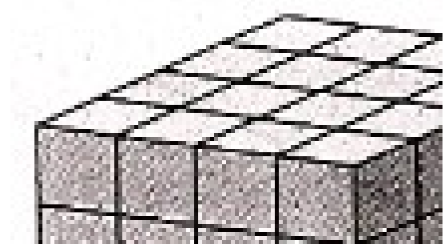
4. Use the blocks in the illustration to answer the following.



   a. Create top, front and side orthographic projections of the blocks.

   b. Create an isometric drawing of the blocks.

   c. Suppose you are given 48 boxes and are asked to pack them for shipping in the arrangement shown above. Which drawing (drawings from part a or b) would you prefer to use to stack the boxes? Explain why.

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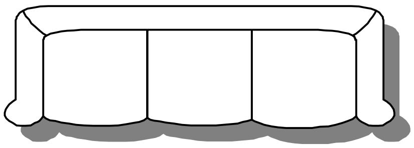
5. The figure shown is the top view of a couch. Sketch the front and side view of the couch.



6. Complete the following drawings for an object in the classroom of your choice (ie, a table, a chair, etc.).
   1. isometric

   2. orthographic

   3. a net

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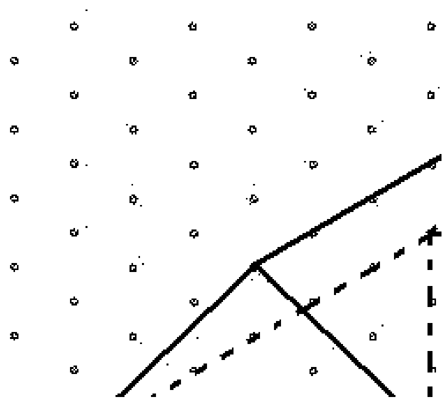
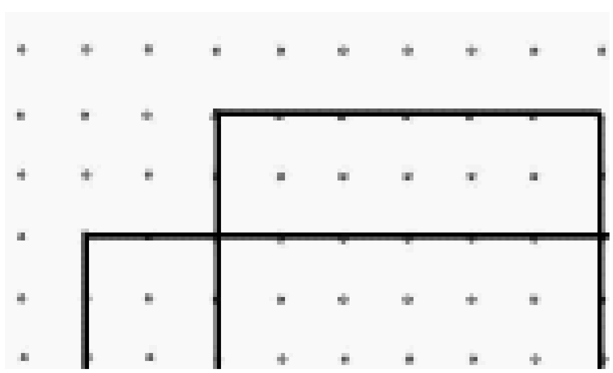
EXTRA: Scale Drawings

1. You want to build a dog house using existing plans. This isometric drawing of a dog house has a scale of 1 space between pairs of dots representing 20 cm. Based on the drawing, what are the actual dimensions of each of the lengths labelled (A, B, and C)?

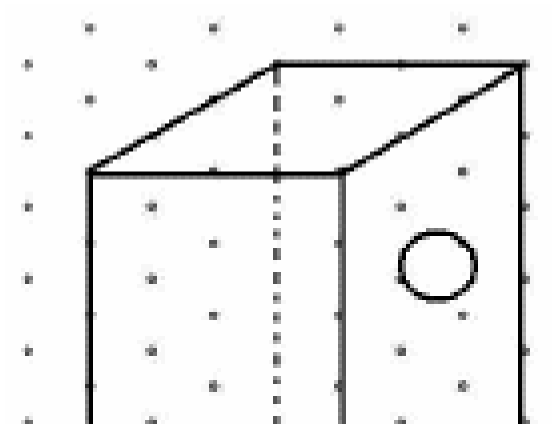


2. The distance between pairs of dots in this diagram is 1.5 cm.
   a. What would be the minimum size of a piece of paper needed to cut out the net in order to make a three-dimensional object?
   b. Draw the net in real dimensions on a separate piece of paper
   c. Cut it out and fold it to create the 3-D object



MBF 3C1 Name: ___________________________

3. The distance between pairs of dots on this scale drawing is 1 cm and the scale is $\frac{1}{4}$. What are the dimensions of the real object? Label the real dimensions onto diagram. Explain your decision.



4. In the below diagram, the roof is to be shingled. Each package of shingles covers an area of 5.6 m^2, what would be the minimum number of packages needed to do the job?