Concept: Ratios for Area and Volume

Name:

COMPUTER COMPONENT

<u>Instructions</u>: In UMATH X follow the **Content Menu** path:

Measurement and Geometry > Ratios for Area and Volume

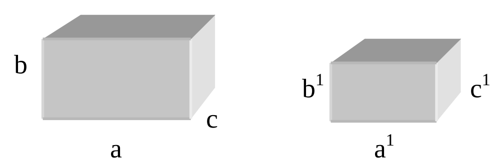
Work through all Sub Lessons of the following Lessons **in order**:

- *In This Topic*
- *Ratios*

As you work through the computer exercises, you will be prompted to make notes in your notebook/math journal.

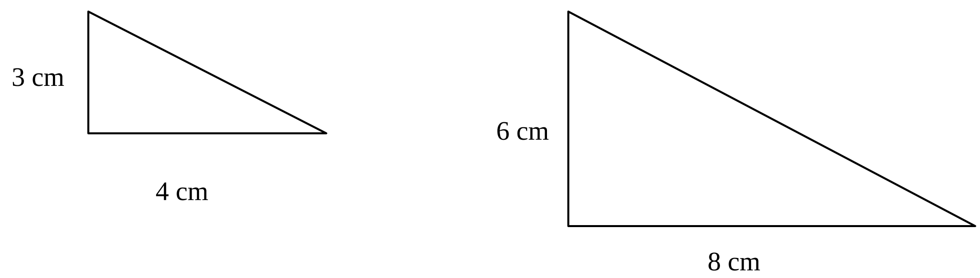
SUMMARY

1. The Patterns / the Rules: Record your observations for the on-computer exercises that you have just completed, in the spaces below.

AREA	VOLUME
	
Notes: ***'Similar' polygons create a pattern of 'squares'. As sides change, the area squares according to the factor of this change.***	Notes: ***'Similar' polyhedrons create a pattern of 'cubes'. As sides change, the volume changes to the power of 3 according to the factor of this change of side length.***

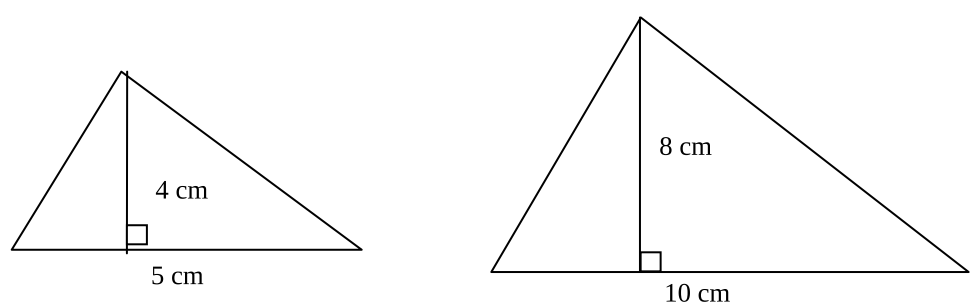
OFF COMPUTER EXERCISES:

1. Find the ratios of base: base, height : height, area : area for this pair of similar triangles:



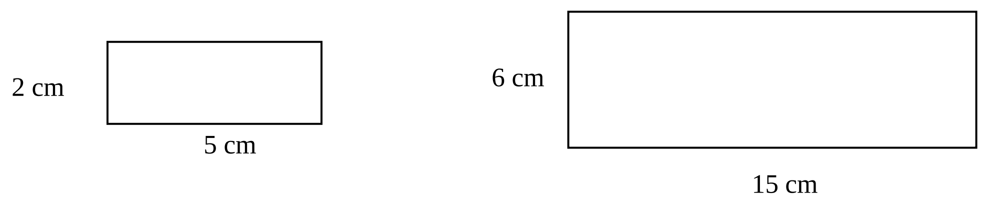
Shape	Base	Height	Area
Pair of similar triangles	**Base > 4:8 = 1:2**	**Height > 3:6 = 1:2**	**Area > Left** = 1/2 x b x h = 1/2 x 4 x 3 = 2 x 3 = 6 m2
			Area > Right = 1/2 x b x h = 1/2 x 8 x 6 = 4 x 6 = 24 m2 Ratio l:r = 6:24 = 1 : 4 (2 x the size: 4 x the area)

2. Find the ratios of base : base, height : height, area : area for this pair of similar triangles:



Shape	Base	Height	Area
Pair of similar triangles	Base > 5 : 10 = 1:2	Height > 4 : 8 = 1:2	**Area > Left** = 1/2 x b x h = 1/2 x 5 x 4 = 2.5 x 4 = 10 cm2 **Area > Right** = 1/2 x b x h = 1/2 x 10 x 8 = 5 x 8 = 40 cm2 Ratio l:r = 10:40 = 1 : 4 (2 x the size: 4 x the area)

3. Find the ratios of length : length, width : width, area : area for this pair of similar rectangles:

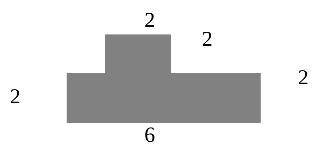
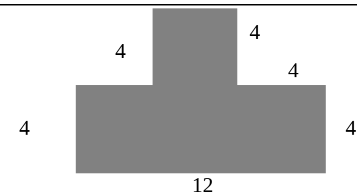
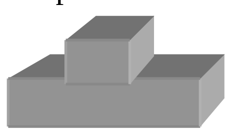
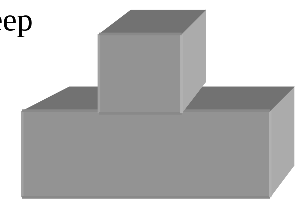


Shape	Length	Width	Area
Pair of similar rectangles	**Length > 5 : 15 = 1:3**	**Width > 2 : 6 = 1:3**	**Area > Left** = l x w = 5 x 2 = 10 cm2 **Area > Right** = l x w = 15 x 6 = 90 cm2 Ratio l:r = 10 : 90 = 1 : 9 (3 x the size: x the area)

4. *For this next problem, you'll really have to use your mathematical wizardry!*

In this case we'll take a basic shape (inverted 'T') and examine it in 2D space and then in 3D space. Next we'll double the dimension of the polygon and then the polyhedron. Our investigation should include the following 3 parts and should provide proofs for our conclusions:

- the total area of shape A to A^1
- the total surface area of B to B^1
- the total volume of B to B^1

A 	**A1** 
B Same face dimensions as above + 2 units deep 	**B^1** Same face dimensions as above + 4 units deep 

For this investigation, 'chunk' the problem; break the shapes into manageable parts.

Shape	Area (Complete your work here)
The total area of shape A to A1	**Area of A** = (l x w) + (l x w) = (6 x 2) + (2 x 2) = 12 + 4 = 16 **Area of A1** = (l x w) + (l x w) = (12 x 4) + (4 x 4) = 48 + 16 = 64 **Ratio of Area of A to A1** = 16:64 = 1:4 The shape was twice as big; yet the area continued to be a square of the change factor.

Shape	Surface Area	Volume
Comparing B to B1	(calculations shown are for front and back faces. Other surfaces have been added using the same process) **Area of A front & back** = 2x((l x w) + (l x w)) = 2 x ((6 x 2) + (2 x 2)) = 2 x (12 + 4) = 2 x 16 = 32 Total of Areas = 32 + (7 x 4) + (6 x 2) = 32 + 28 + 12 = 72 **Area of A1 front & back** = 2x((l x w) + (l x w)) = 2 x ((12 x 4) + (4 x 4)) = 2 x (48 + 16) = 2 x 64 = 128 Total of Areas = 128 + (7 x 16) + (12 x 4) = 128 + 112 + 48 =288 **Ratio of Total Area of A to A1** = 72:288 = 1:4 The shape was twice as big; yet the area continued to be a square of the change factor.	(calculations shown are for front and back faces. Other surfaces have been added using the same process) **Volume of B front & back** = (l x w x d) + (l x w x d) = (6 x 2 x 2) + (2 x 2 x 2) = 24 + 8 = 32 **Volume of B1 front & back** = (l x w x d) + (l x w x d) =(12 x 4 x 4) + (4 x 4 x 4) = 192 + 64 = 256 **Ratio of Total Volume of B to B1** = 32:256 = 1:8 The shape was twice as big; yet the volume continued to be a cube of the change factor.

Conclusion:

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