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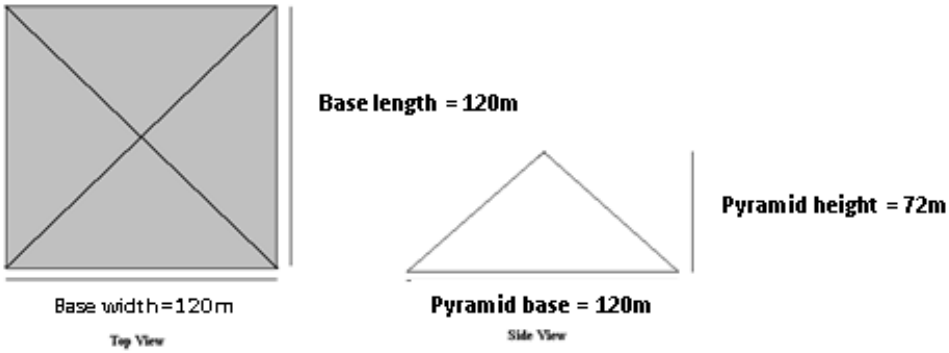
Stack It Up! Math Worksheet Answers

Engineers always think about customer wishes when designing new things. We call these "customer requirements."

Your leader has asked you to design a pyramid with a base (or bottom) level that measures 120 meters on each side. Your leader is picky — she also wants the pyramid you design to be 72 meters high.

1. The area of the base (or bottom layer) of your pyramid is calculated by multiplying the length of the pyramid base by the width of the pyramid base, measured in square meters.

   Calculate the area of the base of your pyramid, using the base length and base width measurements in the drawing below. Please show your work.



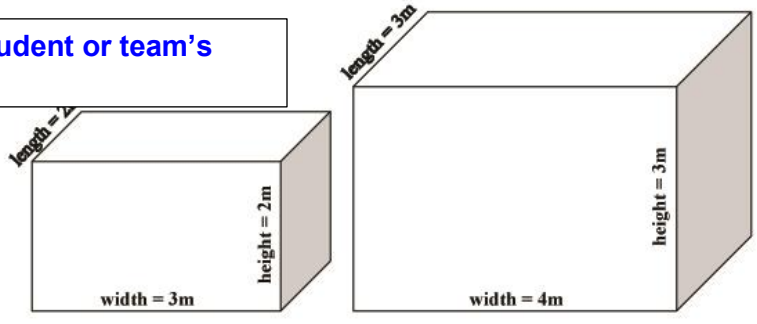
   Area = Base length x Base width

   My pyramid base area =

   Answer = 120m x 120m = 14,400m^2

2. Pyramids are created in many different styles, using different shapes and sizes of stones. Circle which stone block size you will use to create the bottom level, or base, of your pyramid:

   Answer: Student or team's choice



Block size A Block size B

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3. Calculate the area of the block of stone you have chosen, showing your work.

   Block Area = Block length x Block width

   My block area =

Answers: **Block A: 2m x 3m = $6m^2$**
Block B: 3m x 4m = $12m^2$

4. To figure out how many blocks the stone cutters must remove from the quarry and transport to build the base of your pyramid, divide the area of the whole base level of your pyramid (your answer to question #1) by the area of one block of stone (your answer to question #3).

   Number of blocks on base level = Base Area ÷ Block Area

   My number of blocks on base level =

Answers: **Block A 14,400 m^2/$6m^2$ = 2,400 blocks of stone**
Block B 14,400 m^2/$12m^2$ = 1,200 blocks of stone

5. The volume of an object is the amount of space it takes up. Find the volume of the stone block you have chosen (either Block size A or Block size B) to make the base of your pyramid. Please show your work.

   Volume = Height x Width x Length

   My stone block volume =

Answers: **Block A: 3m x 2m x 2m = $12m^3$**
Block B: 4m x 3m x 3m = $36m^3$

6. Next, find the volume of the whole base layer of your pyramid by multiplying the area of your base level (your answer to question #1) by the height of the block size you have chosen. Show your work.

   Volume of base layer = base area x block height

   My pyramid's base volume =

Answers: **Block A: 14,400 m^2 x 2m = $28,800m^3$**
Block B: 14,400 m^2 x 3m = $43,200m^3$

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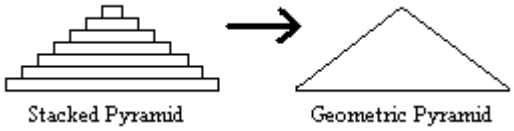
7. A stacked pyramid is a lot like a geometric pyramid, but with smooth sides. You can use the *approximate* shape of a geometric pyramid to *estimate* the entire volume (including all layers) of your pyramid.



The volume of a geometric pyramid is found by this equation:

$$\frac{Total Volume}{Block Volume} = \#\ Blocks$$

Example: Suppose you designed a pyramid to these requirements: pyramid base length = 100 meters, pyramid base width = 100 meters, pyramid height = 75 meters. You could calculate the approximate volume of the example pyramid to be:

$$\frac{100 \times 100 \times 75}{3} = 250{,}000 \text{ meters}^3$$

Now calculate the volume of your pyramid, which has a base = 120 meters on each side, and height = 72 meters. Set up your equation and show your work.

Answer: My pyramid's total volume = $\frac{120 \times 120 \times 72}{3} = 345{,}600$ **m³**

8. Let's also calculate the *total number of blocks* stone workers must cut and transport to build all levels of your pyramid. To do this, divide the total estimated volume of your pyramid (answer to question #7) by the volume of one block of stone (answer to question #5).

$$\frac{Base Length \times Base Width \times height}{3} = volume$$

My pyramid's total volume =

Answer: Block A = $\frac{345{,}600}{12} = 28{,}800 blocks$

Answer: Block B = $\frac{345{,}600}{36} = 9{,}600 blocks$

Bonus Question: For even more challenge, compare this to the number of blocks stone cutters must cut for your pyramid if you chose the other block size in Question #2.

Answer: See answers to Question #8, above.