

Flik
1 Anthill Mound
Sandpile, AZ 11122

Christ's Greenfield Lutheran School
5th & 6th Math masterminds
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Dear Flick,

My math mastermind team and I analyzed your moving problem and we are sure that we can help you. According to your professors at ASU (Ant State University) your colony needs 2,000 square feet to live in. The length of the sides have been measured and double-checked in ant paces. The professors also told us that 800 ant paces = 1 foot.

The first step in the determination if the Cox family yard is large enough to suit the needs of the colony is to find the area in square ant paces. The shape of the back yard is an unusual one, and we do not know any math formulas that will solve for the total area all at one time. Instead, we will divide the area of the back yard into shapes that we do know how to find the area of like: squares, rectangles, and triangles. Then we will find the area of those shapes and add the area of the smaller shapes to find the total area of the yard in square ant paces. Next we will convert square ant paces into square feet. That way we will know if the back yard is large enough for your large colony to live in.

After dividing the back yard into simpler shapes, we came out with five different rectangles, and one triangle. We know the formulas to solve for these areas and they are:

$$\begin{aligned} &\underline{\text{Area of a Rectangle:}} \\ &\text{Base x Height} \end{aligned}$$

$$\begin{aligned} &\underline{\text{Area of a Triangle:}} \\ &1/2 \text{ x Base x Height} \end{aligned}$$

We decided to find the area of the triangle first. The Height is 6,800 ant paces. The base was found by adding the lengths of the bases given:

$$(11600+15600+4000+20800+4000) = 56,000 \text{ ant paces}$$

It is possible to find the total length of any of the sides in the chart using this technique.

Now we use the triangle formula:

$$1/2 (6,800) \times (56,000) = 190,400,000 \text{ square ant paces}$$

Now we will solve the area of the five rectangles starting with the large one first, then moving from left to right on the bottom row in the diagram. We will apply the rectangle area formula each time:

1. $(12000 \times 56000) = 672,000,000$ square ant paces
2. $(11600 \times (17200 + 800 + 5600)) = 273,760,000$ square ant paces
3. $(15600 \times (800 + 5600)) = 99,840,000$ square ant paces
4. $(4000 \times 5600) = 22,400,000$ square ant paces
5. $(6400 \times 4000) = 25,600,000$ square ant paces

To find the total area we simply add the areas of these shapes together.

$$(190,400,000 + 672,000,000 + 273,760,000 + 99,840,000 + 22,400,000 + 25,600,000) = 1,284,000,000 \text{ square ant paces}$$

One billion, two hundred eighty-four million square ant paces

We must convert square ant paces into square feet. We have been told that 800 ant paces = 1 foot. We will divide our answer that was in square ant paces by 800 twice so the answer is in square feet instead of square ant paces.

$$\frac{1,284,000,000 \text{ square ant paces}}{1} \cdot \frac{1 \text{ ft}}{800 \text{ ant paces}} \cdot \frac{1 \text{ ft}}{800 \text{ ant paces}} = 2006.25 \text{ ft}^2$$

This result of 2006.25 square feet means that the Cox family back yard is just barely big enough for your colony. Keep in mind that if your colony grows much more then you will need to look for a bigger yard soon. We are sure that you can move to our principal's yard if you need to move again! We are sure he would appreciate having a few more "nagging pests" around!! Now you and your colony can move away from the terror of the Grasshoppers and their new allies, the Scorpions. If you have any further questions, feel free to contact my Math Masterminds team or me. While I am very glad to help you at this time, you should be advised that my fee is \$85 an hour.

Glad to be of service!

Get some rest and don't let the Bedbugs bite!,

The Math Mastermind Team