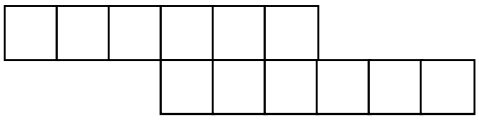
Activity 11-12: **The Royal Rule** Name:

In the Kingdom of Squareless, everyone was required to give a parcel of land to the Queen. This land had to be no smaller that that which could be enclosed by 28 meters of fence, and no side could be less than 1 meter long. Most people simply gave the Queen a square plot of land that was seven meters on each side.

Peasant Mangham, being the clever one that he was, wanted to give the Queen as little land as possible and he was about to comply with the rule by only giving her 13 square meters of land. He was sentenced to life in prison for trying to outsmart the Queen.

Peasant Mangham then asked the Queen if his sentence could be suspended if he could truly amaze the Queen. The Queen agreed.

Peasant Mangham showed the Queen the following land (each square is one meter on each side). He asked the Queen how much fence it would take to fence the area.



Peasant Mangham then told the Queen he could increase the area by 50% and still use the same amount of fence. The Queen was puzzled and said Peasant Mangham could have his freedom is he could explain how this worked.

Use graph paper and notebook paper to answer the following.

1.	Draw a model of the plot of land most people gave the Queen.
2.	Draw a model of the plot of land that Peasant Mangham gave the Queen.
3.	Draw the shape made by Peasant Mangham on this page. How many more squares can you enclose and not change the perimeter? Will Peasant Mangham be released from prison?
4.	Draw a similar shape to the one above that has a perimeter of 18. How can you increase the area by 75% without changing the perimeter?
5.	Draw a shape that has a perimeter of 14. Double the area without changing the perimeter.
6.	Draw a shape that has a perimeter of 20. Show how the area can more than double without changing the perimeter.
7.	Suppose the Queen wanted you to fence in a rectangular space that had a perimeter of 28 meters. What are the possible dimensions? Give at least 5 examples.
8.	What has to be true of each of the pairs of dimensions that you find?
9.	Suppose the Queen wants you to fence in a rectangular space that had an area of 28 square meters. What are the possible rectangular dimensions? Give at least 5 examples.
10.	What has to be true about each of the pairs of dimensions that you find?

Using your results of the possible areas that can be enclosed by 28 meters of fence, answer the following questions.

11.	What is the smallest land area that can be submitted?	
12.	What seems to be true of the shape of the land with smaller areas?	
13.	Is there an even smaller land area that fits the Queen's request?	
14.	What is the largest land that can be submitted?	
15.	What seems to be true about the shape of the land with larger areas?	
16.	Is there an even larger area that fits the Queen's request?	
17.	What conclusions can be drawn from the above answers?	

After Peasant Mangham managed to successfully escape being imprisoned by the Queen, he decided to issue his own challenge:

"Your majesty, if this is really the kingdom of Squareless, who do you insist that all of the parcels of land be squares or rectangles? If I simply give you 28 meters of fencing and no restrictions, what would be the greatest land area you could enclose? I challenge you to break out of your mold!"

18.	If the Queen hires you to tackle this challenge, what will you answer be? Prove it!