

Golden Rectangles

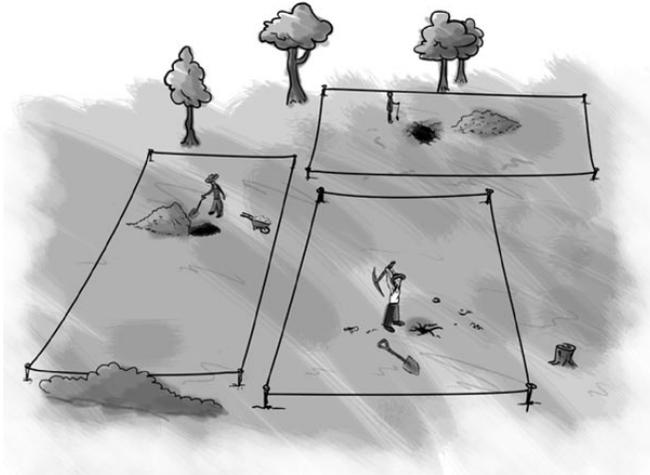
In the 19th century, many adventurers travelled to North America to search for gold.

Dan Jackson owned some land where gold had been found.

Instead of digging for the gold himself, he rented plots of land to the adventurers.



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Dan gave each adventurer four stakes and a rope 100 metres long.

Each adventurer had to use the stakes and the rope to mark off a rectangular plot of land.

1. How should an adventurer place his stakes to mark out the biggest plot of land? Explain your answer.
2. If two adventurers work together, do they get more land each – still using only four stakes?
3. What if more than two work together? Explain your answer.

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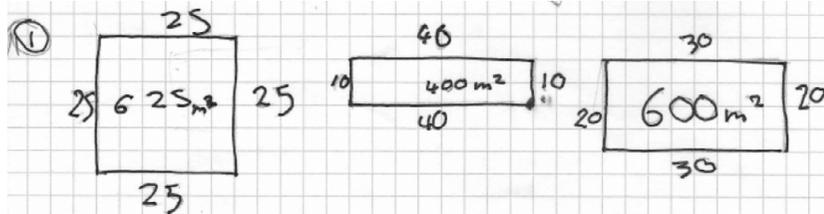
Follow-up task for students

Look carefully at the following extracts of work from other students. Imagine you are their teacher. Go through each piece of work and write comments on each one.

- Have they chosen a sensible method?
- Are the calculations correct?
- Are the conclusions sensible?
- Is the work easy to understand?

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Alvin's answer



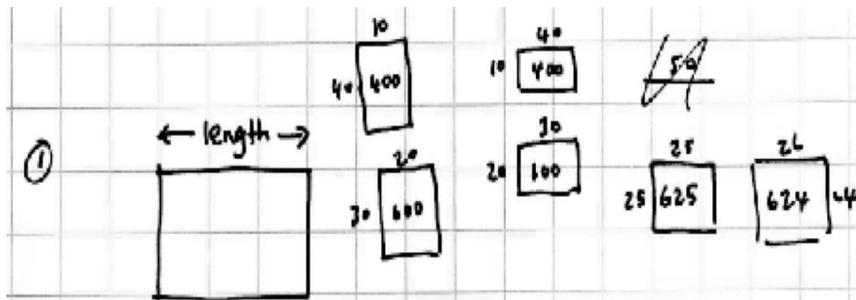
If you want the biggest plot, I think you need the biggest area, so what I did was draw the rectangles out and I found out that the more equal it is the bigger the area.

② It is better to work on your own because if you work together there will be a bigger area but you will have to half it with the other person, for example, if you combine the ropes you will have 200m, if you do 50 x 50 to find the area it will be 2500m² but you will need to half that with other person so that will give you 1250m², so you will have more to do. so it is easier to work on your own.

③ No it is not true for more than 2 people, they will have to work harder.

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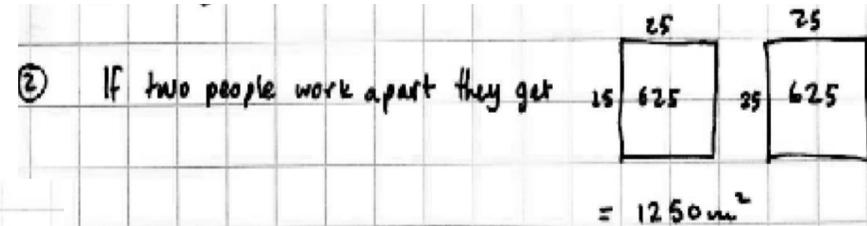
Bernie's answer



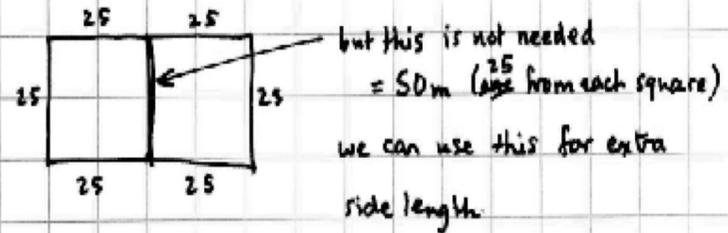
I will change the length and see how the Area changes.

length	10	20	30	40	50	25	26	
Area	400	600	600	400	X	625	624	

So a length of 25 is best.

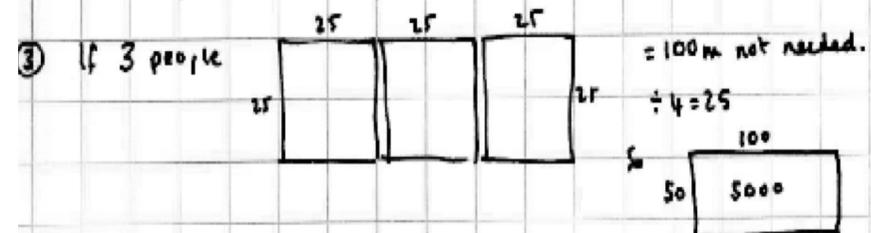
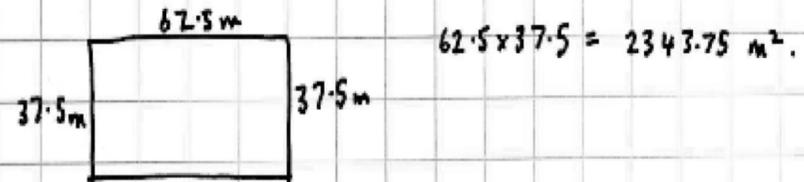


If they work together they get



$$50m \div 4 = 12.5m$$

Add 12.5m onto each side;



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Chris's answer

a $25 \times 25 = 625 \text{ m}^2$

~~$100 \times 100 = 10000 \text{ m}^2$~~

$30 \times 20 = 600 \text{ m}^2$

$40 \times 10 = 400 \text{ m}^2$

He should place the stakes in a ~~square~~ ^{rectangle}, because then he has the most land. But the rectangle need to be $30 \times 20 \text{ m}$.

b With two ropes of 100 m, you can get a bigger amount of land. If you take $55 \text{ m} \times 45 \text{ m}$, you get more than the double amount of land. $55 \times 45 = 2475$.
 $2475 \text{ m}^2 : 2 = 1237.5 \text{ m}^2$

c Yes, because you can make the plot of land bigger in that way everyone has more land.

If the plot of land is 80×70 , the land is 5600 m^2 .

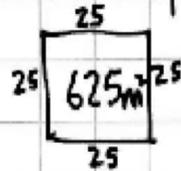
$5600 \text{ m}^2 : 3 = 1866.67 \rightarrow 1866.7 \text{ m}^2$ per person.

That is more land.

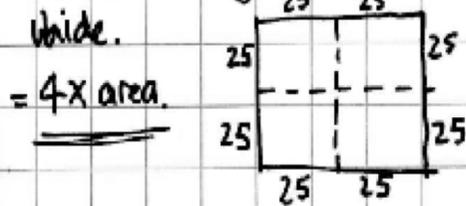
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Danny's answer

① He should place his stakes in a square to give the biggest area like this

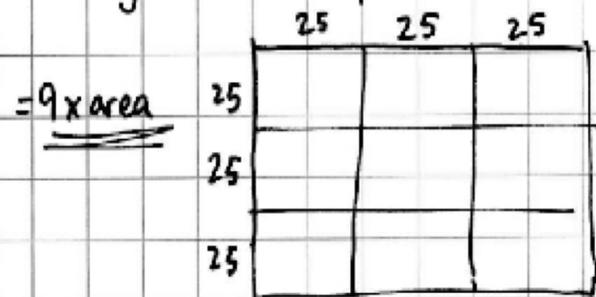


② If two adventurers work together they will have 200m² of rope so they can make a square twice as long and wide.



This is much better than 2x area.

③ If three work together they will have 300m² of rope so they can make a square three times as long and wide



This is much better than 3x area.

I think that the area goes up by square numbers each time.

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Elsie's answer

a: 4×25 metres \rightarrow area = $25 \times 25 = 625 \text{ m}^2$
 2×20 & $2 \times 30 \rightarrow$ area = $20 \times 30 = 600 \text{ m}^2$
 2×10 & $2 \times 40 \rightarrow$ area = $10 \times 40 = 400 \text{ m}^2$

So 4×25 metres would make the biggest area.

b: 2×100 metres of rope = 200 m.
 4×50 metres \rightarrow area = $50 \times 50 = 2500 \text{ m}^2$
 2×20 & $2 \times 80 \rightarrow$ area = $20 \times 80 = 1600 \text{ m}^2$
 2×30 & $2 \times 70 \rightarrow$ area = $30 \times 70 = 2100 \text{ m}^2$
 2×40 & $2 \times 60 \rightarrow$ area = $40 \times 60 = 2400 \text{ m}^2$
 2×10 & $2 \times 90 \rightarrow$ area = $10 \times 90 = 900 \text{ m}^2$

So the proposition is true, working together will deliver much more land to dig for gold.

c: for example: 300 metres of rope
 4×75 metres \rightarrow area = $75 \cdot 75 = 5625 \text{ m}^2$
So how longer the rope is, how bigger the land will be.
(400 metres of rope (4 people working together)
 4×100 metres \rightarrow area = $100 \cdot 100 = 10000 \text{ m}^2$