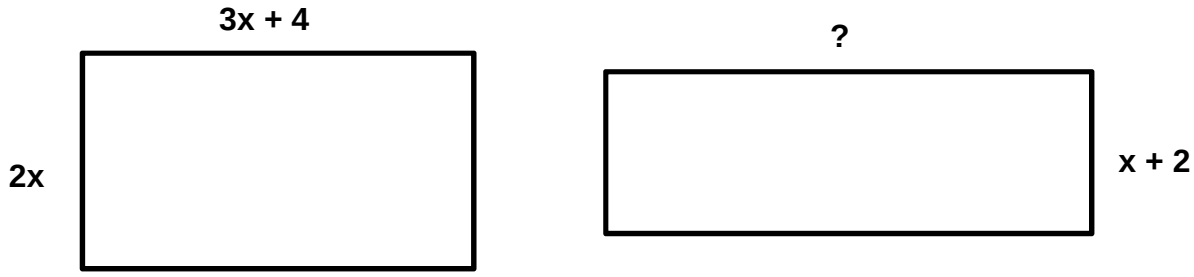
Julia is organizing a charity event in the town where she lives. She has a budget of $15 000 to put on the event.

Your task is to calculate if she will have enough money in her budget to run the event or if she will need to approach the town council to ask for additional funds, and if so, how much money would be needed to cover those additional costs.

Part 1 - The Location

There are two possible locations in town that can accommodate the event and their floor plans are shown below (the diagrams are not to scale). Julia knows that the perimeter of each location is the same at 118 meters. She wants to use the location with the greater area.



Location 1

Rental cost is $2000

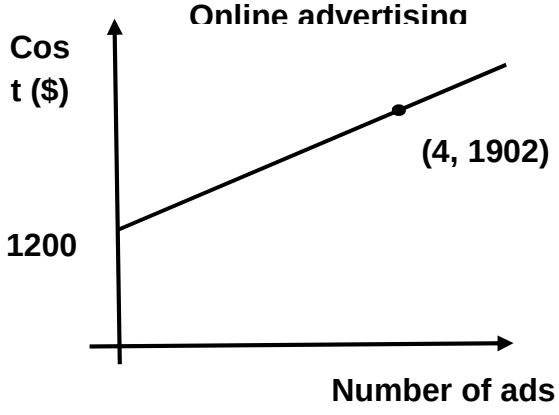
Location 2

Rental cost is $2500

Part 2 – Advertising the Event

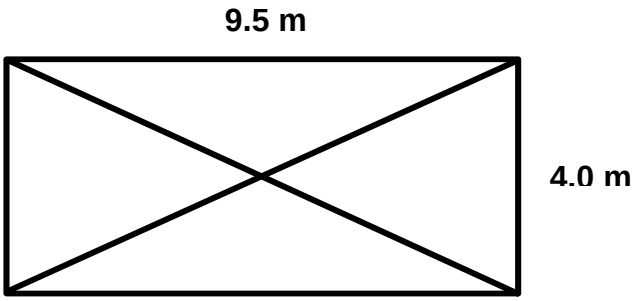
Julia wants to advertise the event by buying television spots and online newspaper ads. She has decided to place the same number of ads and spend the same amount of money on both the TV ads and the online ads. Both options are represented by linear relations and she is provided with the following information to make her decision:

TV advertising	
Number of ads	**Cost ($)**
1	235.50
2	471.00
3	706.50
4	942.00



Part 3 – Decorating the Stage

A rectangular stage is provided by the town but will need to be lighted. Suspended lights will be installed along its four sides and along the 2 diagonals as shown in the diagram below. Each of the lines in this diagram corresponds to a strip of lights.



The cost for the lights, which includes the installation by an electrician, is 18$ per meter.

Part 4 – The Caterer

The fire department provided Julia with a formula to figure out the maximum number of people (*x*) allowed in the room for safety reasons. She will be using that number to calculate how much the caterer will charge per person for the event by using the chart they provided.

$$2x + 237 \geq 6x - 583$$

Caterer Prices	
Number of people	**Cost per person ($)**
[0 - 100[	**35**
[100 - 200[	**30**
[200 - 300[	**25**
[300 - 400[	**20**

Your task is to calculate if she will have enough money in her budget to run the event or if she will need to approach the town council to ask for additional funds, and if so how much money would be needed to cover those additional costs.

							Total
Criteria 1 (Method and Steps Taken):	0	8	16	24	32	40	
Criteria 2 (Calculations):	0	8	16	24	32	40	
Criteria 3 & 4 (Validation, Clarity and Completeness):	0	4	8	12	16	20	

FEB. 2017 The Charity Event - Solution

Part 1 – The Location

Perimeter of location 1 $= 2(2x) + 2(3x + 4) = \mathbf{10x + 8}$

Finding *x*

$10x + 8 = 118$
$\quad -8 \qquad -8$
$10x = 110$
$\frac{10x}{10} = \frac{110}{10}$
$\boldsymbol{x = 11}$

Area of location 1	**Area of location 2**
Length $= 3x + 4 = 3(11) + 4 = 37\ meters$ Width $= 2x = 2(11) = 22\ meters$ Area $= l \text{ x } w = 37 \text{ x } 22 = \mathbf{814\ m^2}$	Width $= x + 2 = 11 + 2 = 13\ meters$ Length $= (Perimeter - 2 \text{ x } Width) \div 2 =$ $(118 - 2(13)) \div 2 = 46\ meters$ Area $= l \text{ x } w = 46 \text{ x } 13 = \mathbf{598\ m^2}$

Answer: Location 1 has a greater area and will be chosen at a cost of $2000.

Part 2 – Advertising the Event

Finding the rule for TV ads	**Finding the rule for online ads**
$a = \frac{471 - 235.5}{2 - 1} = \frac{235.5}{1} = 235.5\$/Ad$ $b = y - ax = 235.5 - (235.5)(1) = 0$ Rule: $\boldsymbol{y = 235.5x}$	$a = \frac{1902 - 1200}{4 - 0} = \frac{702}{4} = 175.5\$/Ad$ $b = y - ax = 1200 - (175.5)(0) = 1200$ (or read directly from the graph) Rule: $\boldsymbol{y = 175.5x + 1200}$

Solving the system of equations by comparison

$235.5x = 175.5x + 1200$
$-175.5x \qquad -175.5x$
$60x = 1200$
$\frac{60x}{60} = \frac{1200}{60}$
$\boldsymbol{x = 20}$

Solving for *y*

$y = 235.5x = 235.5(20) = \mathbf{4710}$ and $y = 175.5x + 1200 = 175.5(20) + 1200 = \mathbf{4710}$

Answer: She will buy 20 ads each on TV and online for a total of 4710+4710 = $9420

Part 3 – Decorating the Stage

Length of the diagonal
$= \sqrt{a^2 + b^2}$
$= \sqrt{9.5^2 + 4.0^2}$
$= \sqrt{90.25 + 16}$
$= \sqrt{106.25}$
$\approx \boldsymbol{10.31\ meters}$

Perimeter of the stage $= 2l + 2w = 2(9.5) + 2(4.0) = 19 + 8 = \mathbf{27}\ \boldsymbol{meters}$
Total length of the strips $\approx 2(10.31) + 27 \approx \mathbf{47.62}\ \boldsymbol{meters}$

Total cost $\approx 47.62\ m$ x $18\frac{\$}{m} \approx \$\mathbf{857.08}$

Accept also answer the answer below if students rounded to 48 meters:

Total cost $\approx 48\ m$ x $18\frac{\$}{m} \approx \$\mathbf{864}$

Part 4 – The Caterer

$2x + 237 \geq 6x - 583$

$2x + 237 - 237 \geq 6x - 583 - 237$

$2x \geq 6x - 820$

$2x - 6x \geq 6x - 6x - 820$

$-4x \geq -820$

$\frac{-4x}{-4} \leq \frac{-820}{-4}$

$\boldsymbol{x \leq 205}$

She will be charged $25 per person, as per the table provided (interval [200-300[).

Total cost for catering = 205 persons x 25$/person = **$5125.00**

Cost of the event

Part	Cost ($)	Cost ($)
1	2000.00	2000.00
2	9420.00	9420.00
3	857.08	864.00
4	5125.00	5125.00
Total	17402.08	17409.00

The event will cost **$17 402.08**.

Are additional funds needed: ■ YES in the amount of **$2402.08** (**$2409.00**).

☐ NO.