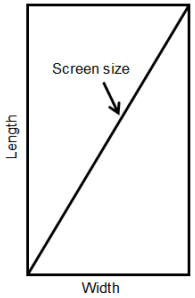
Feb 2015 **Kiwi's Newest Smartphone**

You are the developer for an electronics company called Kiwi. You have been asked to evaluate some of the costs associated with the production of Kiwi's newest smartphone, and to ensure the company will make a profit. You do not need to calculate any taxes.

You must calculate the selling price of one phone.

The Screen

The screen of the phone will be rectangular as shown in the diagram below.



The length of the phone will be 1 cm more than twice its width.

The perimeter of the phone will be 32 cm.

The screen size of a phone is the diagonal measure. The screen size must be rounded to 2 decimal places.

The cost of a screen is determined by the screen size according to the following formula:

$C(x) = 2.50x$ where C(x) is the cost in dollars and x is the screen size in cm

The Number of Phones Produced

Many factors affect the number of phones that can be produced each day. The maximum number of phones produced in a day is represented by the inequality below:

$$(x - 2)(2x - 1) - 2\,500 \leq 2x^2 - 10x + 10\,002$$

where x is the number of phones produced in a day

The factory is open for 360 days in a year, but only some of those days are used to build the phone. The ratio of the number of days to build the phone compared to the number of days not building the phone is $0.6\overline{1} : 0.3\overline{8}$.

The Glass Covering

The screen of the phone will be made out of *G Glass*.

The data to calculate the cost to purchase *G Glass*, which is a linear relation, is given in the table below (shipping costs are already included in these figures).

G Glass cost	
Area (m^2)	G(x)
100	10 000 900
1 000	10 009 000
10 000	10 090 000

The glass will be ordered to cover all of the phones produced in a year.
8.5×10^{-3} m^2 of glass is required for 1 phone.

The Remaining Components

To help determine the cost of the remaining components, Kiwi uses information from last year's model.

The system of equations below shows the cost of the remaining components per phone determined by the weight of the components:

This year's model: $R(x) = 380x + 71$ where R(x) is the cost in dollars and x is the weight per phone in kilograms

Last year's model: $R(x) = 260x + 89$

The cost and the weight of the remaining components for this year's model and for last year's model must be the same.

The total cost of a phone consists of the costs for the touch screen, the glass covering, and the remaining components.

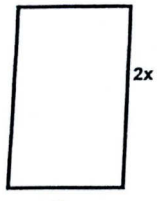
The company would like to make a profit of $50 on the sale of each phone.

You must calculate the selling price of one phone.

							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**	

Your Solution:

The Screen



Perimeter = 2(x) + 2(2x + 1)
32 = 2x + 4x + 2
32 = 6x + 2
-2 -2
30 = 6x
6 6
5 = x

width = 5 cm
length = 2(5) + 1
length = 11 cm

$c = \sqrt{a^2 + b^2}$
$c = \sqrt{5^2 + 11^2}$
$c = \sqrt{25 + 121}$
$c = \sqrt{146}$
c = 12.08 cm

Cost of the screen:
C(x) = 2.50x
C(12.08) = 2.50 (12.08) = 30.20

The cost of the screen is $30.20

The Number of Phones Produced

$(x - 2)(2x - 1) - 2\,500 \leq 2x^2 - 10x + 10\,002$

$2x^2 - x - 4x + 2 - 2\,500 \leq 2x^2 - 10x + 10\,002$

$2x^2 - 5x - 2\,498 \leq 2x^2 - 10x + 10\,002$

$-5x - 2\,498 \leq -10x + 10\,002$

$-5x \leq -10x + 12\,500$

$5x \leq 12\,500$

$5 \quad 5$

x ≤ 2 500 (maximum number of phones in a day)

Ratio: n = 0.61111111...

$0.6\overline{1} \rightarrow 6.\overline{1} = 6\frac{1}{9} = \frac{55}{9} \rightarrow \frac{55}{90} = \frac{11}{18}$
(×10, ÷10)

100n = 61.1111...
-10 n = 6.1111...

$\frac{90n}{90} = \frac{55}{90}$

$n = \frac{55}{90} = \frac{11}{18}$

Number of days making phones = (360)(11/18) = **220 days**

Maximum number of phones in a year = (2500)(220) = **550 000**

Your Solution:

The Glass Covering

Linear function y = ax + b

(1) $a = \frac{y^2 - y^1}{x^2 - x^1} = \frac{10\,009\,000 - 10\,000\,900}{1\,000 - 100}$

$a = \frac{8\,100}{900}$

a = 9 $/m²

(2) b = y – ax = 10 000 900 – (9)(100)

b = 10 000 000

y = 9x + 10 000 000

Area of glass needed in a year = $(8.5 \times 10^{-3})(550\,000)$ = **4 675 m²**

Cost of glass for all the phones y = 9(4 675) + 10 000 000

y = $10 042 075

Cost of glass for one phone = $\frac{10\,042\,075}{550\,000}$ = **$18.26**

The Remaining Components

380x + 71 = 260x + 89
-260x -260x
120x + 71 = 89
-71 -71
$\frac{120x}{120} = \frac{18}{120}$
x = 0.15

R(x) = 380x + 71 = 380(0.15) + 71 = **$128**
R(x) = 260x + 89 = 260(0.15) + 89 = **$128**

Total cost of a phone:

Touch screen	**= $30.20**
Glass	**= $18.26**
Remaining components	**= $128.00**
Profit	**= $50.00**
Total	**= $226.46**