G1 *Coordinates* Activities

Activities

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Notes and Solutions (2 pages)

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ACTIVITY G1.1 *Conversion Graphs*

Many travel agents and banks will change money from one currency to another, They will also charge commission, either as a fee or as a percentage of the amount of money you are changing. Here are two examples for changing pounds (£) to dollars ($).

EasyChange

Rate: £1 buys $1.50

Commission: £4 per transaction

Better Exchange

Rate: £1 buys $1.60

Commission: 10%

1. If you have £100 to change, how much commission will you pay with *EasyChange*?

   How much money will you have left to change?

   How many dollars will you get?

2. If you have £100 to change, how much commission will you pay with *Better Exchange*?

   How much money will you have left to change?

   How many dollars will you get?

3. Repeat problems 1 and 2 for changing (a) £20 and (b) £200, to dollars.

   What conclusion can you reach to help you decide which of these two companies to use for changing your money?

You can easily see what is happening if you draw conversion graphs for each company on the same graph.

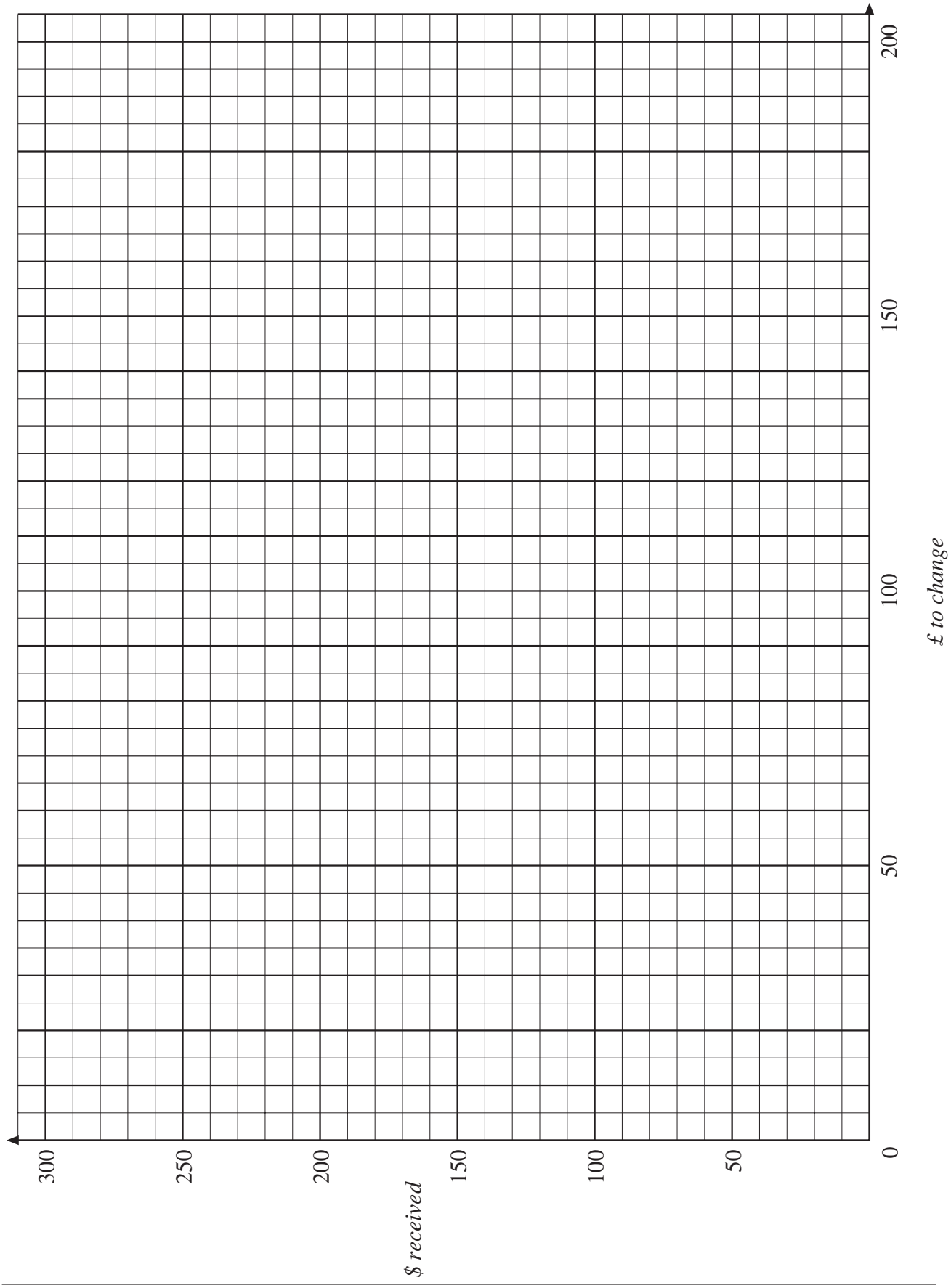
4. (a) Draw the conversion graph for *EasyChange*. First plot the three data points found in problems 1 and 3. Use a copy of the grid given. Draw a straight line through these points (it should also go through $x = 4$, $y = 0$).

   (b) On the same graph, draw the conversion graph for *Better Exchange*. First plot the three data points found in problems 2 and 3. Draw a straight line through these points (it should also go through the origin, $x = y = 0$).

   (c) Where do the lines intersect? From your graph, estimate the best outcome when changing (i) £50, (ii) £150.

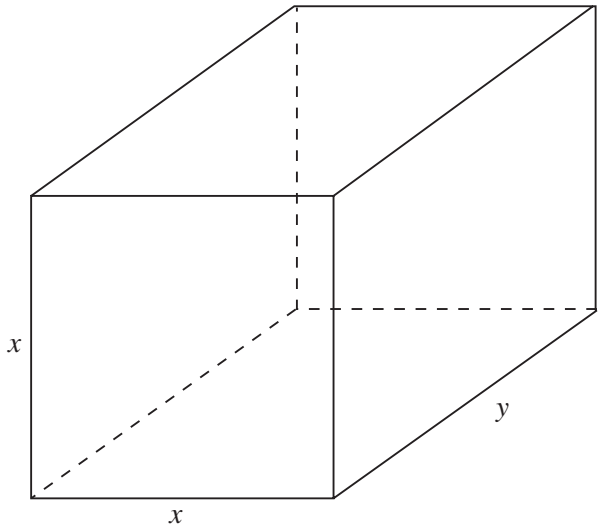
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ACTIVITY G1.1 *Conversion Graph*



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ACTIVITY G1.2 *Maximum Volume of Cuboid*



This cuboid has a square end and a volume of $100\ \text{cm}^3$.

1. Show that the surface area of the cuboid is given by

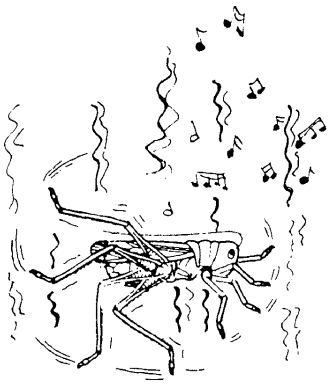
$$A = 2x^2 + \frac{400}{x}$$

2. Use a graph to determine the values of x and y for which the surface area is a minimum.

3. What shape would this give?

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ACTIVITY G1.3 *Chirping Crickets*



In forests in many warm and humid parts of the world, crickets can be heard making chirping sounds. The rate at which they chirp varies according to the temperature; the warmer it is, the more quickly they chirp (maybe because they are happy!).

A suggested formula that connects the temperature in degrees Fahrenheit, y, and the number of chirps made in one minute, x, is

$$y = \frac{1}{4}x + 40$$

1. What is the temperature when the number of chirps per minute is

   (a) 60 (b) 80 (c) 100 ?

2. Using axes $0 \le x \le 120$, $0 \le y \le 100$, plot the graph of the function

$$y = \frac{1}{4}x + 40$$

3. Use your graph to predict

   (a) the temperature when there are 71 chirps per minute,

   (b) the number of chirps per minute when the temperature is $67\,°\text{F}$.

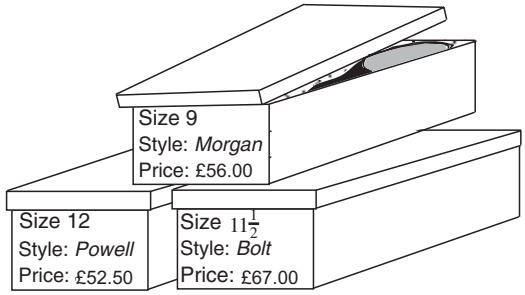
Extension

What is the relationship between the temperature in degrees Celsius and the number of chirps per minute?

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ACTIVITY G1.4 *Shoe Size*

Correct shoe size is important; your feet need room for growth until they are full-size, but not so much room that the shoes will become sloppy and provide inadequate support.



For adults, there is a simple relationship between the length of the foot, x cm, and the adult US men's shoe size, y. This is given by

$$y = 1.2x - 25$$

(Note that if y is not a whole number, then you must take the next whole number *larger* than the value.)

1. Use the formula to determine the suitable shoe size when
   (a) $x = 22$ cm (b) $x = 28$ cm (c) $x = 30$ cm.

2. With axes $20 \le x \le 30$ and $0 \le y \le 12$, draw the graph of $y = 1.2x - 25$.

3. Use the graph to estimate the required shoe size when
   (a) $x = 24$ cm (b) $x = 26$ cm (c) $x = 30$ cm.

Extension

(A) Repeat questions 1 and 3, using half-sizes as well as whole number sizes.

(B) Find the relationship between US men's shoe sizes and UK men's shoe sizes.
(You might find the website www.dancesport.uk.com/shoes/conchart.htm useful.)

(C) Find out about the relationship between men's European and US shoe sizes.

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ACTIVITY G1.1 *Notes and Solutions*

Notes and solutions are only given where appropriate.

G1.1 1. £4 ; £96 ; $144

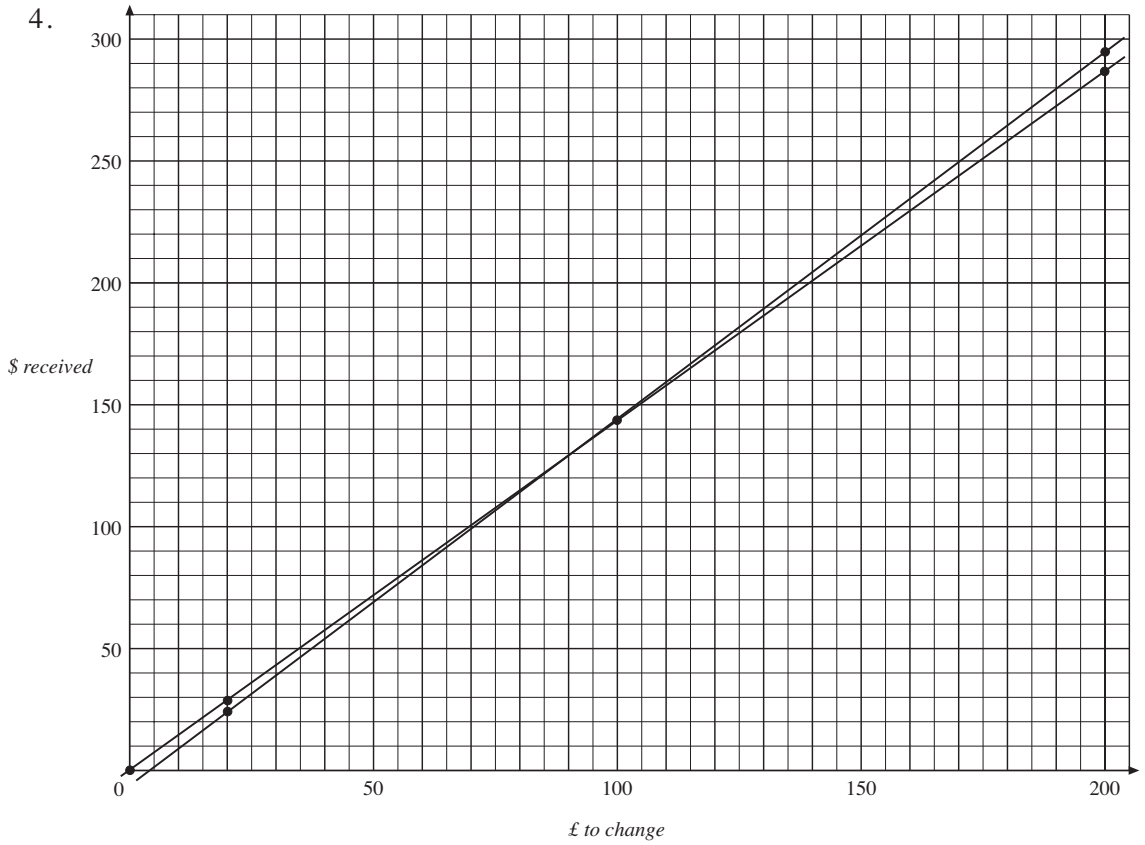
2. £10 ; £90 ; $144

3. (a) £4 ; £16 ; $24 and £2 ; £18 ; $28.8

(b) £4 ; £196 : $294 and £20 ; £180 ; $288

For amounts of less than £100 to change, use *Better Exchange*; for amounts more than £100, use *EasyChange*.

4.



(c) (i) $72 (ii) $219

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ACTIVITY G1.2 - G1.4 *Notes and Solutions*

G1.2 1. $100 = x^2 y$

$$xy = \frac{100}{x}$$

$$A = 2x^2 + 4xy$$

$$= 2x^2 + 4 \times \frac{100}{x}$$

$$= 2x^2 + \frac{400}{x}$$

2. $x = 4.64$ cm $y = 4.64$ cm

3. Cube

G1.3 1. (a) 55 °F (b) 60 °F (c) 65 °F

2. Graph

3. (a) About 58 °F (b) About 108 per minute

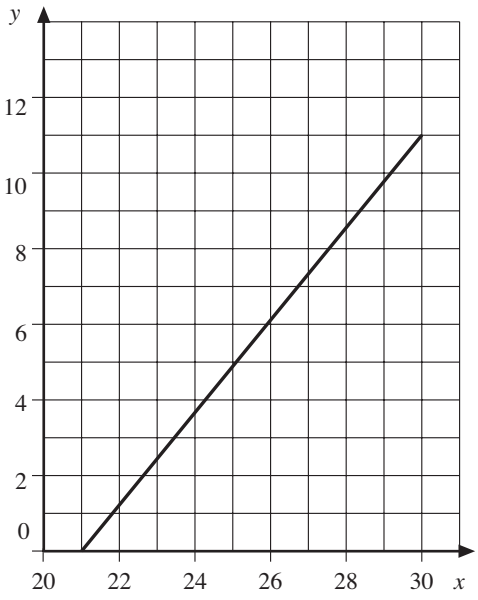
Extension

$$°C = \frac{5}{36}x + \frac{40}{9}$$

G1.4 1. (a) 2 (b) 9 (c) 11

2. Graph

3. (a) 4 (b) 6 (c) 11



Graph of $y = 1.2x - 25$

Extension

(A) 1. (a) $1\frac{1}{2}$ (b) $8\frac{1}{2}$ (c) 11

3. (a) 4 (b) 6 (c) 11

(B) (UK men's shoe size) = (US men's shoe size) + $\frac{1}{2}$ (this is an <u>exact</u> relationship)

(C) (European men's shoe size) $\approx \frac{9}{7} \times$ (US men's shoe size) + 31 (this is an <u>approximate</u> relationship)

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