Check-Up

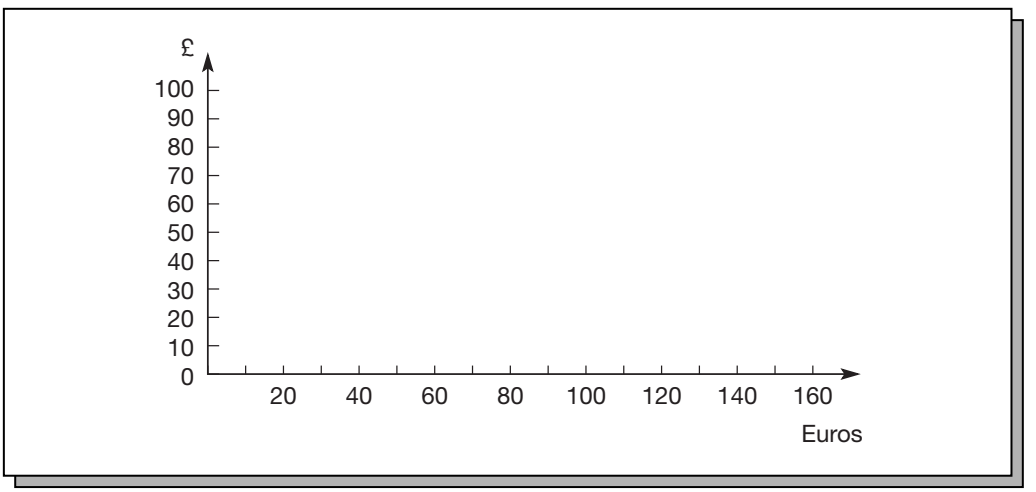
42

Conversion graphs

No calculator to be used.

Assume that you can exchange 1 pound sterling for 1.60 euros.

Mark one point on the diagram provided to represent the exchange of £100 into euros. Then draw a line that will enable you to make other conversions. Use the graph to find approximately (a) how many euros you would get for £85, and (b) the cost in pounds of 36 filled baguettes priced at 2.50 euros each.

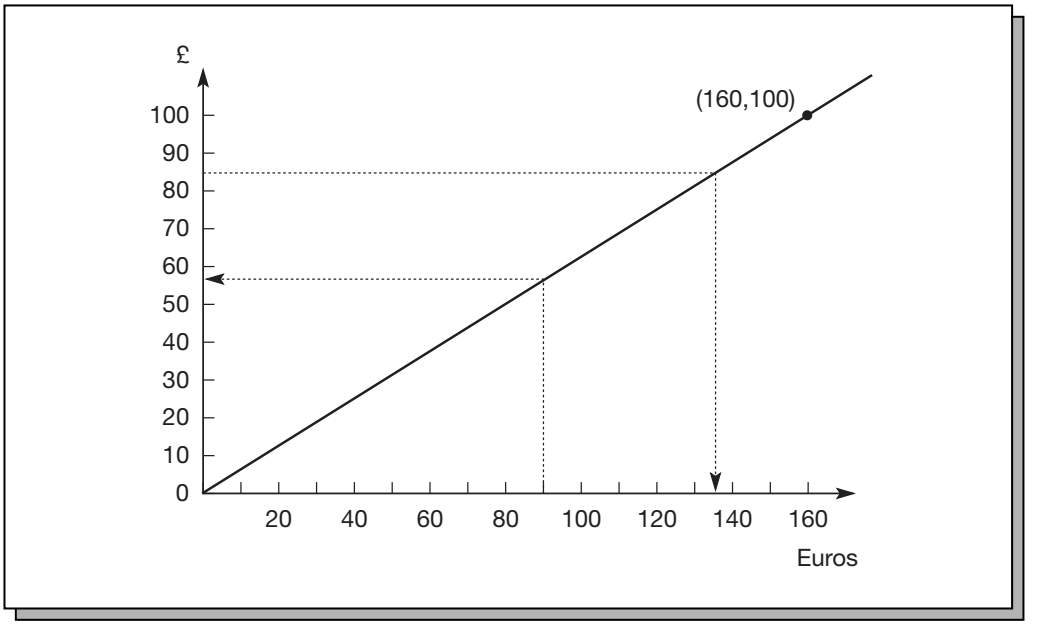


Answers to check-up 42

The point (160,100) shows the exchange of 160 euros for £100. Draw a line from (0,0) to (160,100).

a) The dotted line from £85 shows that this can be converted to about 136 euros.

b) The dotted line from 90 euros (36 2.50 = 90) shows that this is equivalent to about £56.



Discussion and explanation of check-up 42

A conversion graph is a pleasing, but fairly impractical alternative to using a calculator. When we convert a measurement or quantity in one unit to the equivalent in another unit, then the two amounts are in *direct proportion*. What this means is that the ratio of one amount to the other is the same. For example, you can convert 16 euros to £10, 32 euros to £20, 80 euros to £50, and so on. The ratios 16:10, 32:20 and 80:50 are all equivalent (see Check-up 31). Written in the form 'something to one', the ratio here is 1.60:1, which is, of course, the exchange rate for euros to pounds, namely 1.60 euros = £1. Written in the form 'one to something', the ratio would be 1:0.625, telling us that 1 euro = £0.625, which is the exchange rate going the other way. Whenever two variables are in direct proportion, the graph relating them will be a straight line passing through the *origin*. The origin is

where the axes meet, the point with coordinates (0,0). This point represents, in our case, the obvious fact that zero pounds can be exchanged for zero euros.

The slope (or gradient) of the line is the amount it goes up vertically for one unit horizonally. Since you get 0.625 pounds for every extra euro, then 0.625 is the gradient. In general, if the ratio between the variable on the horizontal axis and that on the vertical axis is 1:m, then m is the gradient. In the example above, the ratio was 1:0.625. If the exchange rate changes and the value of the pound increases against the euro, then the graph will have to be redrawn with a steeper gradient. If the value of the pound falls, then the gradient gets less steep. If Britain signs up to adopt the euro before you read this book, then much of this discussion will appear irrelevant!

Summary of key ideas

- Converting a quantity or measurement from one unit to an equivalent amount in another unit is a process of direct proportion.
- Two variables that are in direct proportion (such as an amount in pounds and the equivalent in some other currency) produce a straight-line graph passing through the origin.
- The slope or gradient of the graph is m, where 1:m is the ratio between the variable on the horizontal axis and that on the vertical axis.
- The gradient is the amount the line goes up for every one unit moved horizontally.

Further practice

42.1 Use the conversion graph provided in the answers to Check-up 42 to find the cost in pounds of hiring in France a coach for which the price is quoted as 140 euros.

42.2 Which of the following pairs of variables would be in direct proportion and would produce a straight-line graph passing through the origin:

a) the weight of a letter in grams and the corresponding cost of postage in pence

b) the length in m of the side of a square field and the area of the field in m^2

c) the weight of a person measured in pounds and their weight measured in kg

d) the National Curriculum level achieved by a specific pupil in mathematics assessments from Year 1 to Year 11, and the year group of the pupil.

42.3 A length of 100 inches is about 254 cm. Imagine drawing a conversion graph for inches to centimetres, with centimetres along the horizontal axis and inches along the vertical axis. Give the coordinates of two points through which the straight-line graph must pass. What would be the gradient of the line?