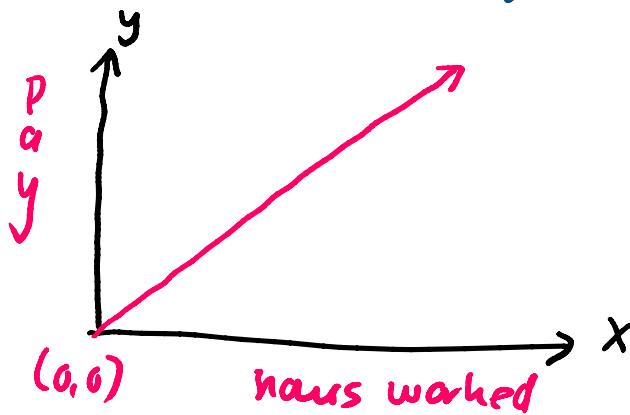when two quantities are in direct proportion
one increases so does the other
decreases

Directly proportional graphs will be a straight line
which passes through the origin. (0,0)

New   468 } Q1
OLD   403

T&T2h 20.2
Directly...

T&T2h 20.2
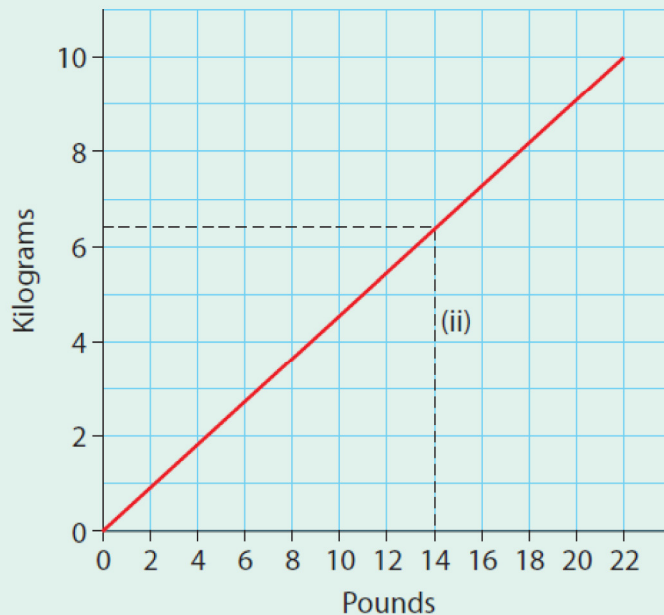Directly...

Drawing and interpreting real-life graphs

Section 20.2 Directly proportional graphs

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Example 1

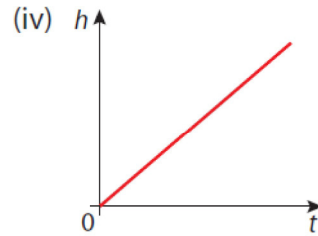The graph below shows the relationship between kilograms and pounds.
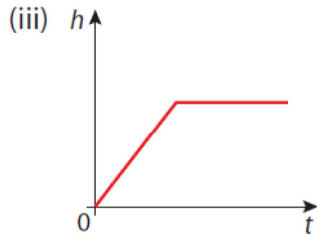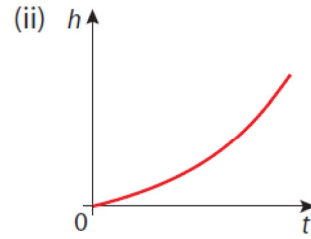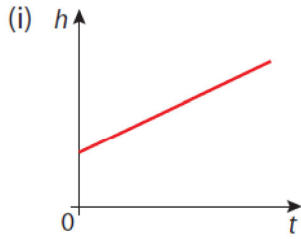
Use the graph to approximately convert
- (i)   20 pounds to kilograms (kg)
- (ii)   14 pounds to kilograms
- (iii)   4 kg to pounds
- (iv)   7.5 kg to pounds.

Exercise 20.2

1. In which of these graphs is h directly proportional to t?

(i)

(ii)

(iii)

(iv)

Explain your answer.

2. The graph below shows the relationship between kilometres and miles.
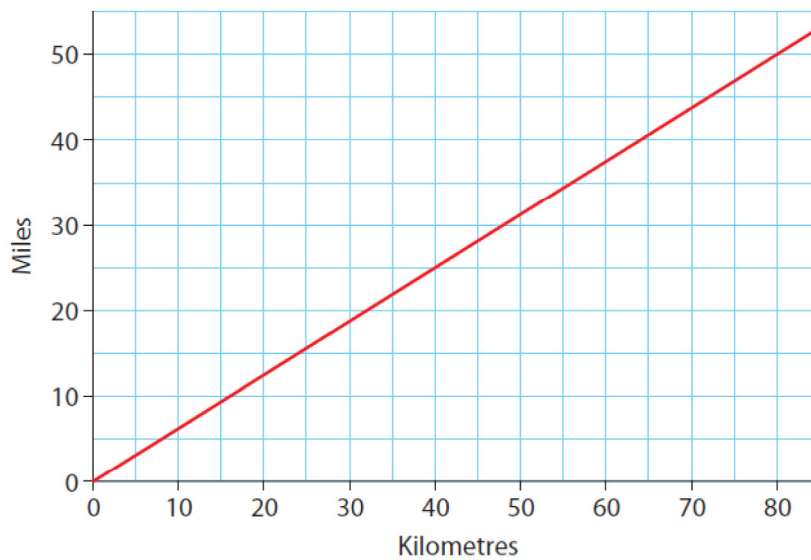
Use the graph to convert approximately

(i) 60 km to miles

(ii) 80 km to miles

(iii) 30 miles to km

(iv) 15 miles to km.

Is the given graph a directly proportional one?

3. The graph below shows the relationship between degrees Celsius (°C) and degrees Fahrenheit (°F).
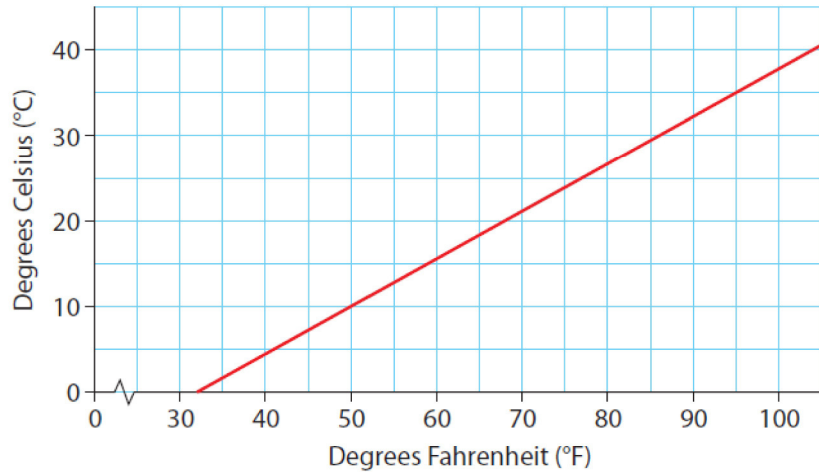

Is this a directly proportional graph? Explain your answer.

Use the graph to convert approximately

  (i) 35°C to Fahrenheit   (ii) 15°C to Fahrenheit

(iii) 50°F to Celsius   (iv) 100°F to Celsius.

If the temperature in a city on a particular day ranges between 55°F and 90°F, express this range in °C.

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4. Television repair charges depend on the length of time taken for the repair, as shown on the graph.
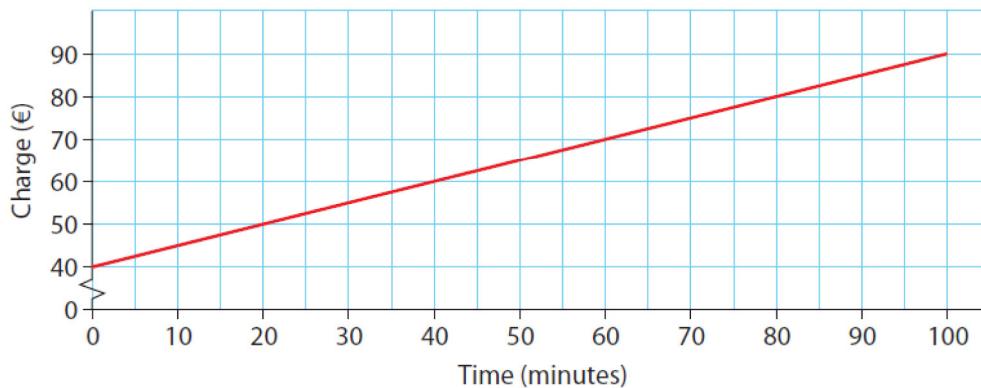

  (i)   What is the charge for a repair that took 60 minutes?

 (ii)   What is the charge for a repair that took 30 minutes?

(iii)   If the charge was €80, how long did the repair take?

(iv)   If the charge was €60, how long did the repair take?

The standing charge is the basic charge before the time charge is added.

 (v)   What is this standing charge?

5. In which of these graphs is Q directly proportional to P? Give reasons.

A

B

C

D
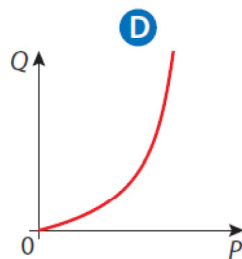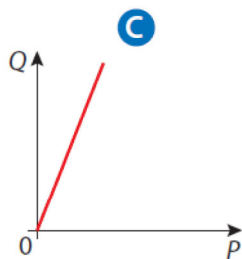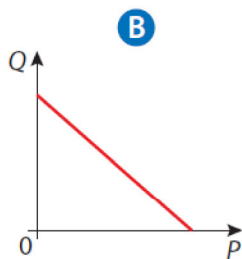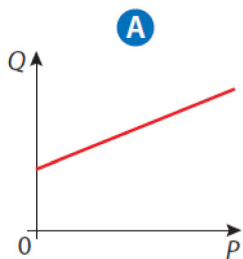
6. The given diagram shows that the length of the shadow cast by a tree at midday is directly proportional to the height of the tree.

(i) What is the length of the shadow when the tree is 8 m in height?

(ii) By using two points on the line, find the equation of the line in terms of s and h.

(iii) Use the equation you have found to write down the length of the shadow when the tree is 15 metres in height.
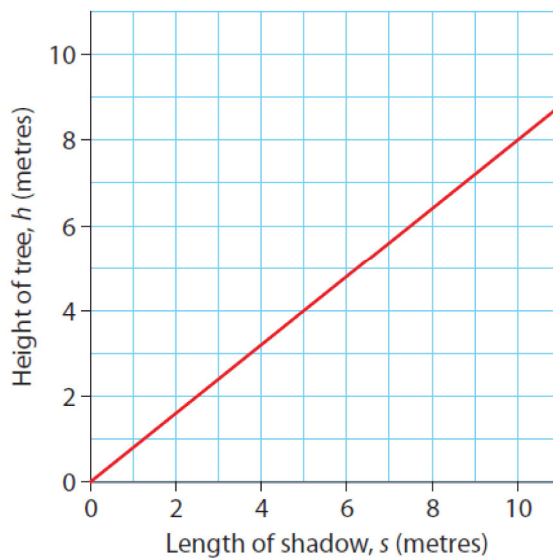
7. Is each of these statements true or false?

    (i)   The cost of petrol is directly proportional to the quantity purchased.

    (ii) The height of a person is directly proportional to their age.

    (iii) The area of a square is directly proportional to the length of the side.

    (iv) The distance travelled in a certain time by a car travelling at constant speed is directly proportional to the speed of the car.

    (v) The time taken for a journey is directly proportional to the speed of travel.

8. The graph below shows the cost of using broadband internet for one month on three different tariffs.

The three tariffs are:

Tariff 1:   Rental €30 + 10c/GB
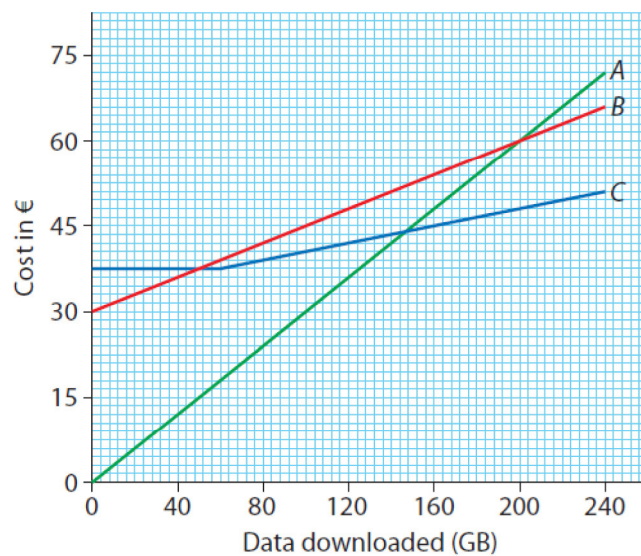
Tariff 2:   No rental but 30c/GB

Tariff 3:   Rental €37.50 + 5c/GB with the first 60GB free

    (i)   Match each tariff with the letter of its graph.

Carol downloads more than 140 Gigabytes of data each month.

   (ii) Explain which tariff would be the cheapest for her to use.

9. This graph shows how much petrol two cars use.

——————— David's car

- - - - - - - Stephen's car

(i) David's car travelled 80 km. How much petrol did it use?

(ii) Stephen's car used 9 litres of petrol one day. How far did it go?

(iii) How much more petrol does Stephen's car use than David's car when each car travels 60 km?

(iv) Is each line graph directly proportional? Explain your answer.

(v) Find the equation of the broken red line in the form $y = mx$.

Now use this equation to find the number of litres used when the car travels 300 km.

Petrol used by cars
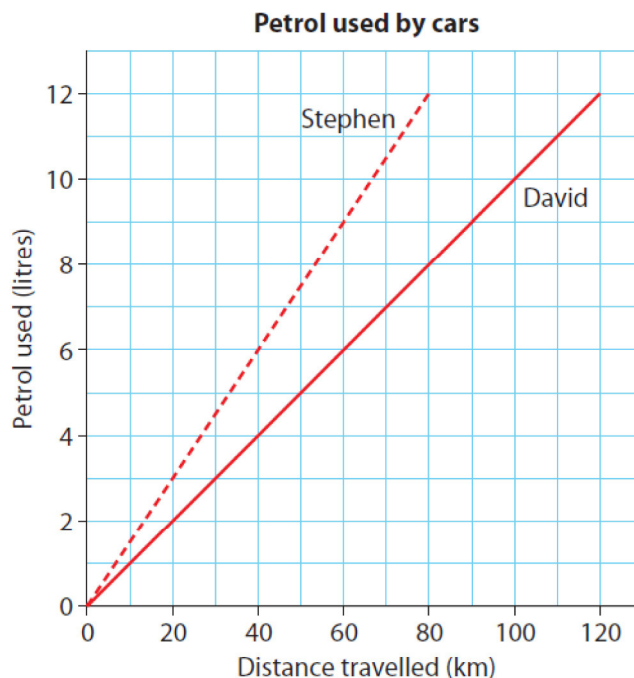
Answers

Exercise 20.2

1. (iv); straight line graph through the origin
2. (i) $37\frac{1}{2}$ miles   (ii) 50 miles
   (iii) 48 km   (iv) 24 km; Yes
3. No; it doesn't go through the origin;
   (i) 95°F   (ii) 59°F   (iii) 10°C
   (iv) 38°C; 13°C to 32°C
4. (i) €70   (ii) €55   (iii) 80 min
   (iv) 40 min   (v) €40
5. Graph C; only graph where the line is both straight and through the origin.
6. (i) 10 m   (ii) $4s - 5h = 0$
   (iii) 18.75 m
7. (i) T   (ii) F   (iii) F   (iv) T   (v) F
8. (i) T1 and B, T2 and A, T3 and C
   (ii) Tariff A
9. (i) 8ℓ (ii) 60 km   (iii) 3ℓ
   (iv) Yes   (v) $\ell = \frac{3}{20}k$; 45ℓ