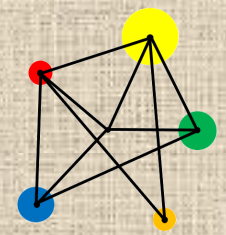
Percentages



Calculate a percentage of an amount.

Vocabulary

Percent
A fraction out of 100.

Review of Multiplying and Dividing by 100

Work out:

1. 2 x 10
2. 23 x 100
3. 9.6 x 100
4. 600 ÷ 100
5. 4800 ÷ 100
6. 12 ÷ 100

Work out:

1. 8.3 x 100
2. 20 ÷ 100
3. 0.1 x 100
4. 0.0023 x 100
5. 1.2 ÷ 100
6. 0.02 ÷ 100

Work out:

1. £8.36 x 100
2. 12kg ÷ 100
3. 1.2 seconds x 100
4. 5 minutes ÷ 100

Solutions

Work out:

1. 2 x 10 = **20**
2. 23 x 100 = **2300**
3. 9.6 x 100 = **960**
4. 600 ÷ 100 = **6**
5. 4800 ÷ 100 = **48**
6. 12 ÷ 100 = **0.12**

Work out:

1. 8.3 x 100 = **830**
2. 20 ÷ 100 = **0.2**
3. 0.1 x 100 = **10**
4. 0.0023 x 100 = **0.23**
5. 1.2 ÷ 100 = **0.012**
6. 0.02 ÷ 100 = **0.0002**

Work out:

1. £8.36 x 100
   = **£836**
2. 12kg ÷ 100
   = **120g**
3. 1.2 seconds x 100
   = **2 minutes**
4. 5 minutes ÷ 100
   = **3 seconds**

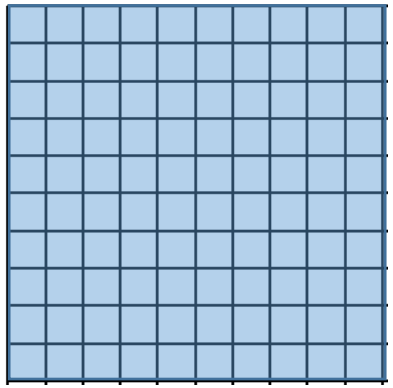
Key Facts

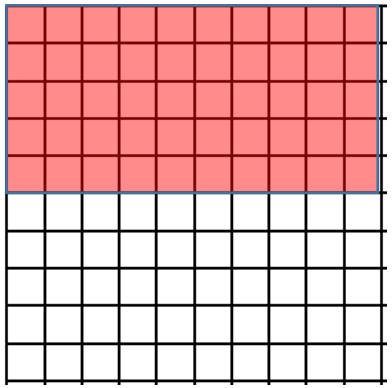
‘Per cent’ literally means ‘by the hundred’.

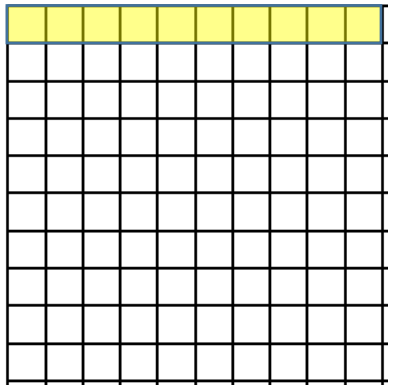
100% means $\frac{100}{100}$

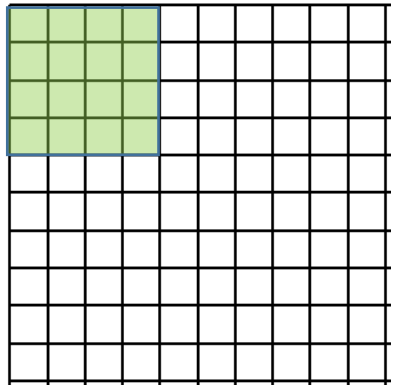
Question

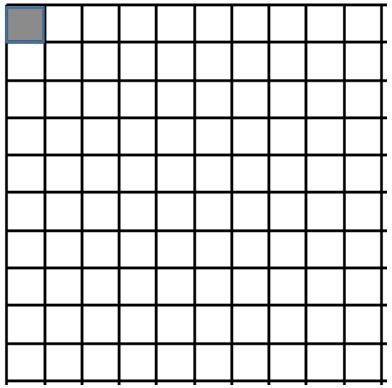
What percentage of each 100 square is shaded?

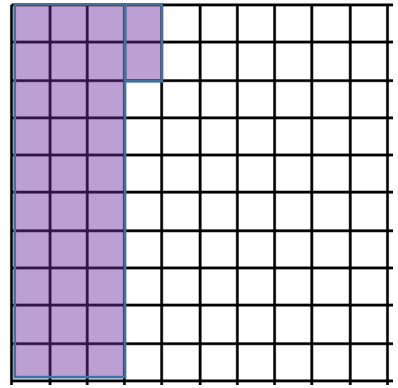




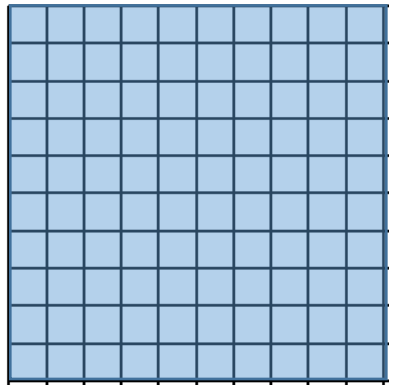




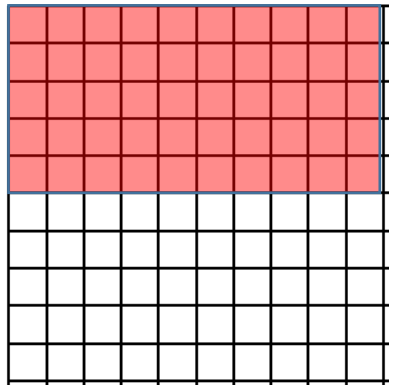




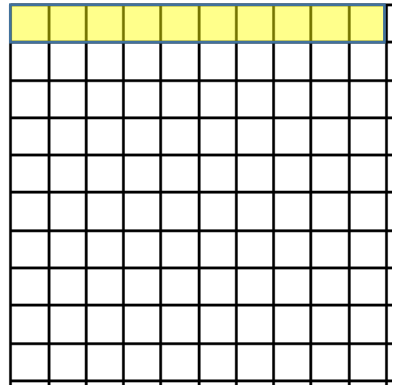
Solutions



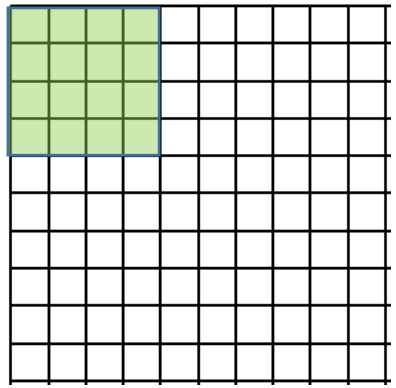
$100\% = \frac{100}{100}$



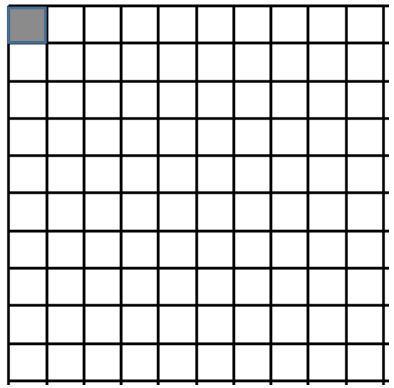
$50\% = \frac{1}{2}$



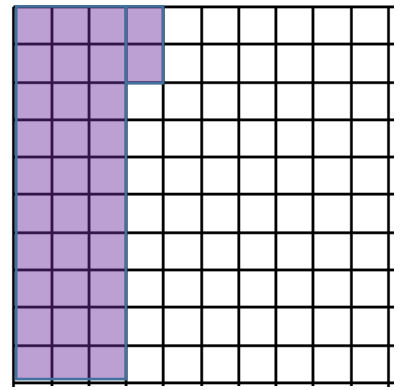
$10\% = \frac{1}{10}$



$25\% = \frac{1}{4}$



$1\% = \frac{1}{100}$



$32\% = \frac{8}{25}$

Key Facts

100% of a quantity means all the quantity:

100% of 50 = ?

100% of 200 = ?

100% of 1.6kg = ?

Solutions

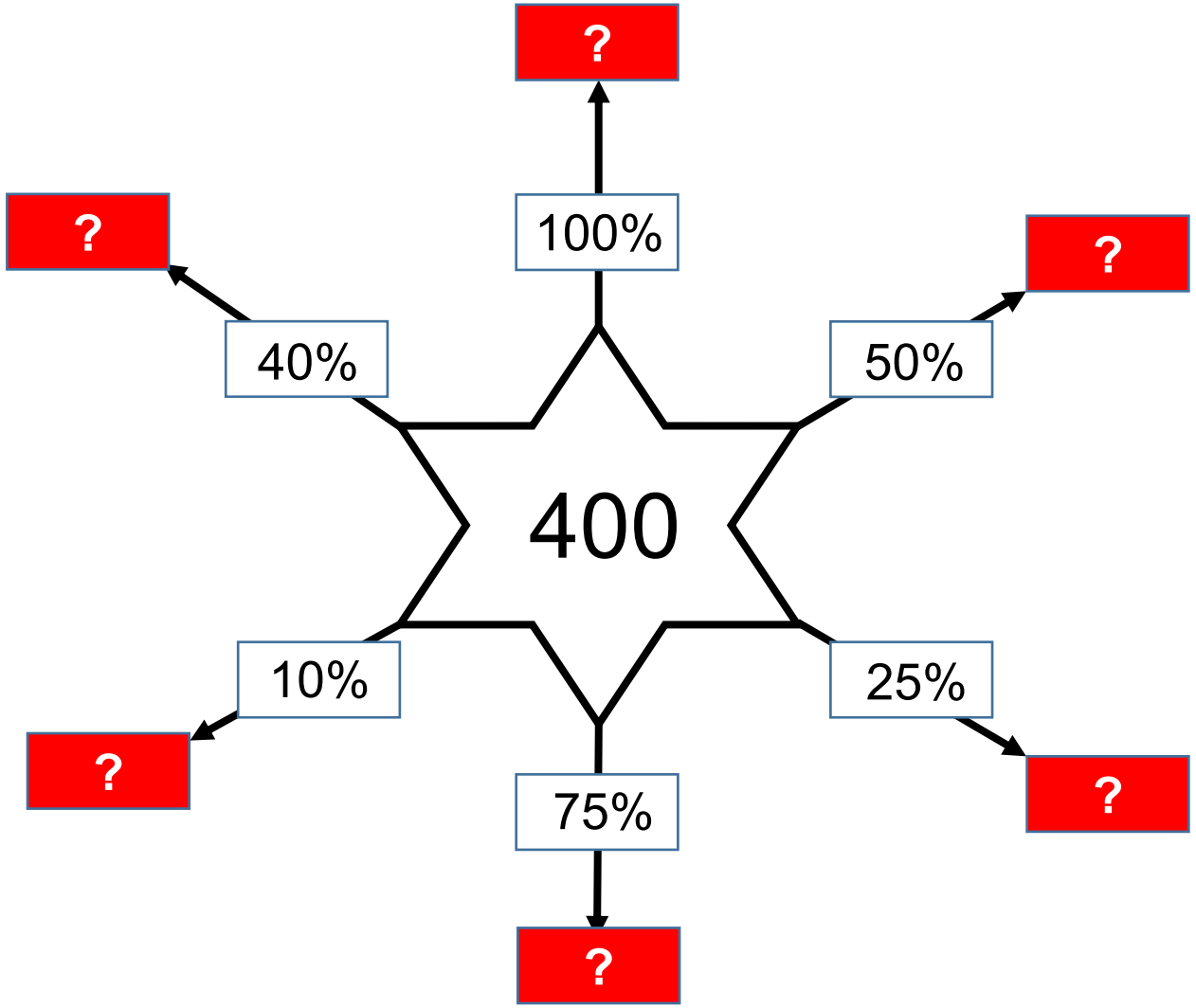
100% of a quantity means all of the quantity:

100% of 50 = 50

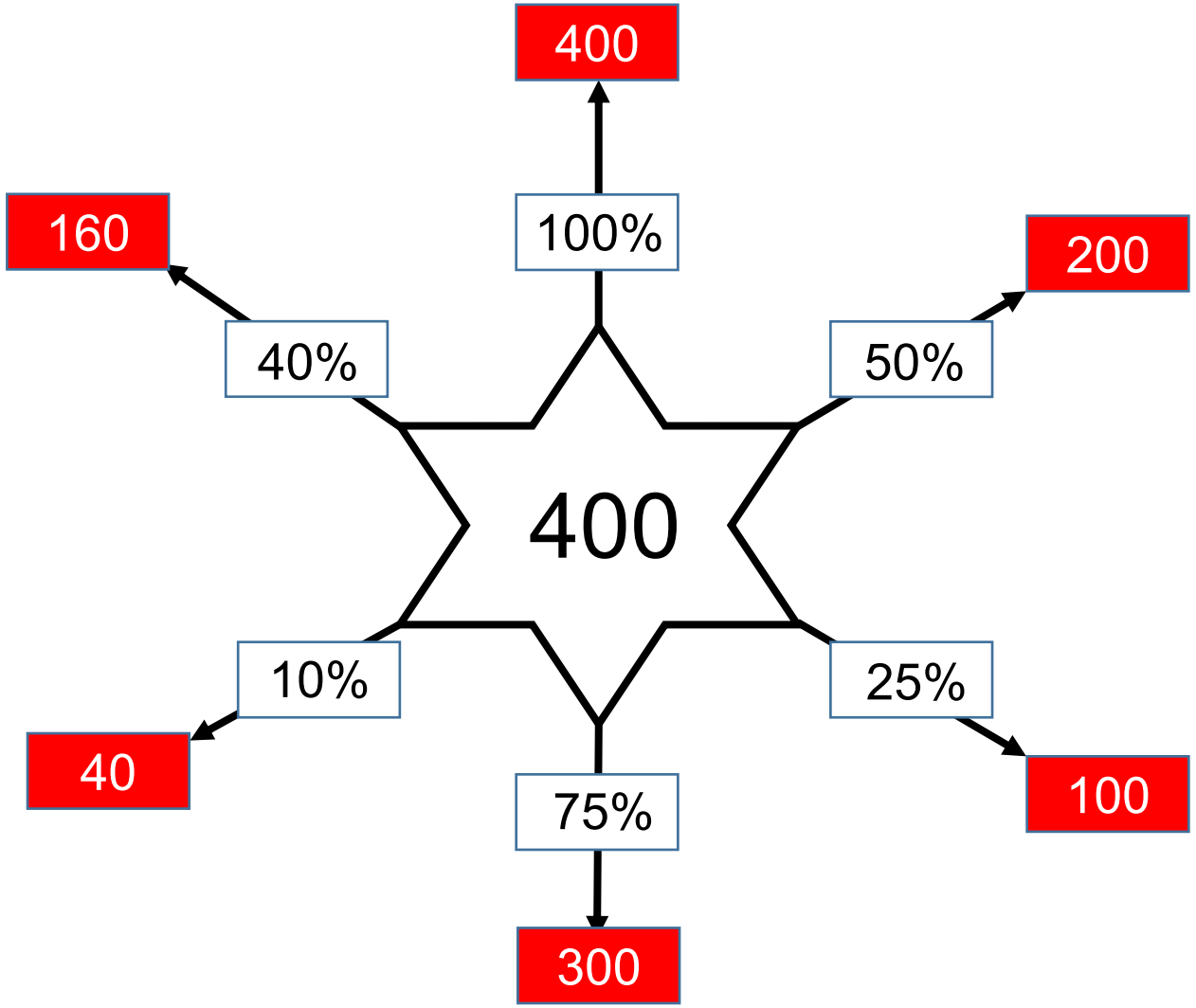
100% of 200 = 200

100% of 1.6kg = 1.6kg

Calculate Simple Percentages: Example



Solutions



Examples

Find:

a) 10% of 160.

b) 45% of 220.

Solutions

Find:

a) 10% of 160

$10\% = \frac{1}{10}$

160 ÷ 10 = **16**

b) 45% of 220

10% of 220 = 22

5% of 220 = 11

40% of 220 = 88

45% of 220 = 88 + 11 = **99**

Exercise

Work out:

a) 100% of 800

b) 50% of 800

c) 25% of 800

d) 75% of 800

e) 10% of 800

f) 5% of 800

Work out:

a) 25% of 60

b) 10% of 60

c) 15% of 60

d) 35% of 60

e) 1% of 60

f) 110% of 60

Work out:

a) 80% of 20

b) 125% of 1000

c) 2.5% of 200

d) 99% of 900

Solutions

Work out:

a) 100% of 800 **= 800**

b) 50% of 800 **= 400**

c) 25% of 800 **= 200**

d) 75% of 800 **= 600**

e) 10% of 800 **= 80**

f) 5% of 800 **= 40**

Work out:

a) 25% of 60 **= 15**

b) 10% of 60 **= 6**

c) 15% of 60 **= 9**

d) 35% of 60 **= 21**

e) 1% of 60 **= 0.6**

f) 110% of 60 **= 66**

Work out:

a) 80% of 20 **= 16**

b) 125% of 1000 **= 1250**

c) 2.5% of 200 **= 5**

d) 99% of 900 **= 891**

Key Fact

All percentages are equivalent to a decimal.

$$23\% = 0.23$$

We can use a decimal to find more complex percentages

Example

Find 23% of 400

Solution

Find 23% of 400

23% = 0.23

400 x 0.23 = 92

23% of 400 = **92**

You try...

Find 36% of 80

Find 2.7% of 8.6

Solutions

Find 36% of 80

$0.36 \times 80 = 28.8$

Find 2.7% of 8.6

$0.027 \times 8.6 = 0.2322$

Exercise

Use a calculator to work out:

1. 23% of 800
2. 17% of 40
3. 68% of 120
4. 40% of 90
5. 4% of 90
6. 100% of 8321

Use a calculator to work out:

1. 50% of 60
2. 5% of 60
3. 1.5% of 8000
4. 99.9% of 99
5. 120% of 70
6. 250% of 10

Use a calculator to work out:

1. 0.1% of 50
2. 300% of 1000
3. $10\frac{1}{2}$% of 200
4. $33\frac{1}{3}$% of 900

Solutions

1. 23% of 800 = **184**
2. 17% of 40 = **6.8**
3. 68% of 120 = **81.6**
4. 40% of 90 = **36**
5. 4% of 90 = **3.6**
6. 100% of 8321 = **8321**

1. 50% of 60 = **30**
2. 5% of 60 = **3**
3. 1.5% of 8000 = **120**
4. 99.9% of 99 = **98.901**
5. 120% of 70 = **84**
6. 250% of 10 = **25**

1. 0.1% of 50 = **0.05**
2. 300% of 1000 = **3000**
3. $10\frac{1}{2}$% of 200 = **21**
4. $33\frac{1}{3}$% of 900 = **300**

Examples

a) Increase £400 by 25%

b) Decrease £20 by 10%

Solutions

a) Increase £400 by 25%

Step 1 25% of £400 = £100

Step 2 £400 + £100 = **£500**

b) Decrease £20 by 10%

Step 1 10% of £20 = £2

Step 2 £20 - £2 = **£18**

Exercise

1. Increase £1000 by 50%
2. Decrease £600 by 25%
3. Increase £40 by 10%
4. Increase £20 by 5%
5. Decrease £1400 by 32%
6. Increase 200 by 17.5%

<u>Challenge</u>

A television costs £800.
In a sale, the price decreases by 20%.

This new price is later decreased by 30%.

Is this the same as decreasing the original price by 50% ?

Solutions

1. Increase £1000 by 50% **£1500**
2. Decrease £600 by 25% **£450**
3. Increase £40 by 10% **£44**
4. Increase £20 by 5% **£21**
5. Decrease £1400 by 32% **£952**
6. Increase 200 by 17.5% **£235**

<u>Challenge</u>

A television costs £800.
In a sale, this price decreases by 20%.

This price is later decreased by 30%.

Is this the same as decreasing the original price by 50% ?

No. It is decreased by 44%

Using a multiplier : Example

Increase £400 by 25%

£400 x 1.25 = **£500**

£400 x 1 = £400 | 100%

+

£400 x 0.25 = £100 | 25%

£400 x 1.25 = £500 | 125%

Using a multiplier : Example

Decrease £20 by 10%

£20 x 0.9 = **£18**

£20 x 1 = £20 — 100%

\-

£20 x 0.1 = £2 — 10%

£20 x 0.9 = £18 — 18%

You try:

a) Increase 150 by 24%

b) Decrease 360 by 35%

Solutions

a) Increase 150 by 24%

150 x 1.24 = **186**

b) Decrease 360 by 35%

360 x 0.65 = **234**

Exercise

1. Increase 50 by 30%
2. Decrease 90 by 15%
3. Decrease 200 by 9%
4. Increase 66 by 1%
5. Decrease 1 by 98%
6. Increase 0 by 77%

1. Decrease 100 by 12%
2. Increase 48 by 11.2%
3. Decrease 0.1 by 0.1%
4. Increase 640 by 200%
5. Decrease 100 by 20%
6. Increase 80 by 20%

The population of a town is 60 000.

The population of the town increases by 5% each year.

What will the population of the town be after:

a) 1 year b) 10 years

c) 100 years

Discuss the long term future of the town.

Solutions

1. Increase 50 by 30%
   65
2. Decrease 90 by 15%
   76.5
3. Decrease 200 by 9%
   182
4. Increase 66 by 1%
   66.66
5. Decrease 1 by 98%
   0.02
6. Increase 0 by 77%
   0

1. Decrease 100 by 12%
   88
2. Increase 48 by 11.2%
   53.376
3. Decrease 0.1 by 0.1%
   0.0999
4. Increase 640 by 200%
   1920
5. Decrease 100 by 20%
   80
6. Increase 80 by 20%
   96

The population of a town is 60 000.

The population of the town increases by 5% each year.

What will the population of the town be after:

a) 1 year
63 000

b) 10 years
97 734

c) 100 years
7 890 075

Discuss the long term future of the town.

Extension

In a sale, the price of a jumper is reduced by 20%.

The sale price of the jumper is £40.

What was the price of the jumper before the sale?

Exam Style Question

Steven wants to buy a computer for £1400.

He has already saved £344.

Each week:

His pay is £320

He saves 30% of this pay.

How many **more** weeks must he save?

Solution

Steven wants to buy a computer for £1400.

He has already saved £344.

£1400 - £344 = £1056

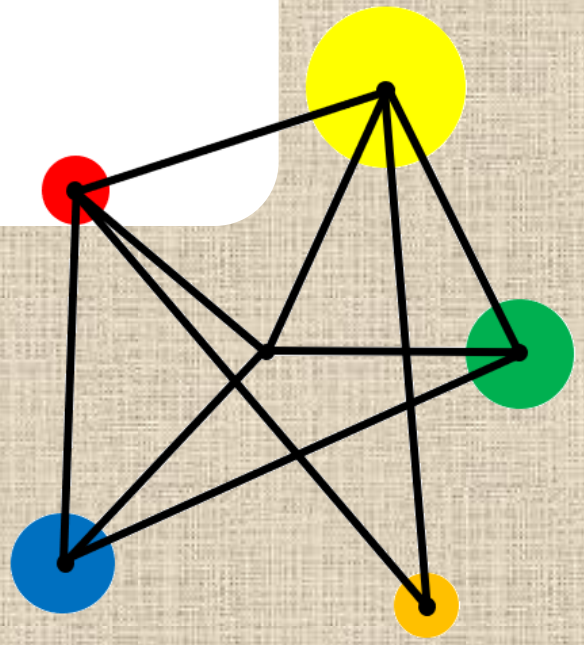
Each week:

His pay is £320

He saves 30% of this pay.

30% of £320 = £96

How many **more** weeks must he save?

£1056 ÷ £96 = 11 more weeks.

www.plexmaths.com