

Name _____

Date _____

Unit 10 · Percentages — teaching slides

18 slides, formatted for printing.

10.1 Fractions, decimals and percentages

What per cent means

- “Cent” means a hundred — as in century, or centimetre.
- **Per cent** means *out of a hundred*.
- 45% is 45 out of every 100.
- That is why the denominator 100 is always hiding behind a percentage.

$$45\% = 45 \text{ out of } 100 = 45/100 = 0.45$$

The two conversions

- Percentage to decimal: divide by 100.
- Decimal to percentage: multiply by 100.
- The point moves two places — left one way, right the other.
- Ask yourself which way makes the number bigger, and check.

$$35\% \div 100 \rightarrow 0.35$$

$$0.35 \times 100 \rightarrow 35\%$$

$$7\% \rightarrow 0.07 \text{ not } 0.7$$

Percentage to fraction

- Write it over 100 — that is what per cent means.
- Then simplify by dividing top and bottom by the HCF.
- One step, done properly, beats several rough ones.
- The answer should be in its simplest form unless told otherwise.

$$45\% = 45/100$$

$$\text{HCF is } 5$$

$$= 9/20$$

Fraction to percentage

- A fraction is a division: $3/8$ means $3 \div 8$.
- Do the division to get a decimal.
- Then multiply by 100.
- If the denominator already divides into 100, go straight there.

$$3/8 \rightarrow 3 \div 8 = 0.375 \rightarrow 37.5\%$$
$$7/20 \rightarrow 35/100 \rightarrow 35\%$$

The ones to know by heart

- A short list that saves time in every later unit.
- Recognise them instantly, in all three forms.
- Then build others from them: $3/8$ is three times $1/8$.
- Ten minutes learning these pays back all year.

$$1/2 = 0.5 = 50\% \quad 1/5 = 0.2 = 20\%$$
$$1/4 = 0.25 = 25\% \quad 1/10 = 0.1 = 10\%$$
$$3/4 = 0.75 = 75\% \quad 1/8 = 0.125 = 12.5\%$$

Comparing across forms

- You cannot compare 0.45, 42% and $9/20$ as they stand.
- Convert them all to the same form first.
- Percentages are usually easiest — one fixed denominator.
- Then the comparison is just comparing whole numbers.

$$0.45 \rightarrow 45\%$$
$$42\% \rightarrow 42\%$$
$$9/20 \rightarrow 45\%$$

so 42% is the odd one out, and smallest

10.2 Percentages of a quantity

Start from 10%

- 10% is one tenth — just divide by 10.
- It is the easiest percentage to find, in your head, every time.
- Almost every other percentage can be built from it.
- So make finding 10% the automatic first move.

$$10\% \text{ of } 240 = 24$$
$$20\% = 24 + 24 = 48$$
$$30\% = 24 \times 3 = 72$$
$$5\% = 24 \div 2 = 12$$

And from 1%

- 1% is one hundredth — divide by 100.
- From 1% you can reach absolutely any percentage.
- It is slower than the 10% route, but it always works.
- Use it when the percentage is awkward.

1% of 250 = 2.5
8% = $2.5 \times 8 = 20$
37% = $2.5 \times 37 = 92.5$

The fraction shortcuts

- 50% is a half — halve it.
- 25% is a quarter — divide by 4.
- 75% is three quarters — divide by 4, then treble.
- Recognising these saves a lot of arithmetic.

50% of 86 = 43
25% of 48 = 12
75% of 48 = 36
12.5% of 96 = 12 (one eighth)

Building awkward percentages

- Break the percentage into pieces you can find easily.
- 10%, 5% and 1% are the usual pieces.
- Find each piece, then add.
- Show the pieces in your working — the marks are there.

35% of 80
10% = 8 → 30% = 24
5% = 4
35% = $24 + 4 = 28$

Swapping the numbers round

- p% of n is always equal to n% of p.
- Both work out as $p \times n \div 100$.
- So choose whichever way round is easier.
- This turns some hard questions into easy ones instantly.

4% of 75 is awkward
75% of 4 = 3 much easier
both equal 3

Working backwards

- Sometimes you are told the part and asked for the whole.
- Find 1% first, by dividing.
- Then multiply by 100.
- Check by taking the percentage of your answer.

30% of a number is 24
10% = 8
100% = 80
check: 30% of 80 = 24 ✓

10.3 Percentage increase and decrease

Increasing and decreasing

- Find the percentage of the amount.
- Then add it on, or take it away.
- Two steps, both of which you already know how to do.
- Write both steps down — the method carries marks.

increase 200 by 15%
15% of 200 = 30
200 + 30 = 230

The one-step way

- Increasing by 20% leaves you with 120% of the amount.
- 120% is 1.2, so multiply by 1.2.
- Decreasing by 20% leaves 80%, so multiply by 0.8.
- Faster once you trust it — but only if you can explain it.

increase by 20% → $\times 1.2$
decrease by 20% → $\times 0.8$
increase by 5% → $\times 1.05$

Percentage change

- Work out the actual change first.
- Divide it by the **original** amount.
- Multiply by 100 to make it a percentage.
- State whether it is an increase or a decrease.

40 → 50
change = 10
10 ÷ 40 = 0.25
= 25% increase

Divide by the original

- This is where nearly every mark is lost.
- The comparison is always with where you started.
- Dividing by the new amount answers a different question.
- Write “÷ original” at the top of your working if it helps.

40 → 50 is $10 \div 40 = 25\%$ up
50 → 40 is $10 \div 50 = 20\%$ down
same change of 10, different percentages

Up then down is not back where you started

- Take 100 and add 10%: you get 110.
- Now take 10% off 110: that is 99, not 100.
- You end at 99, not 100.
- The two percentages were taken of different amounts.

100 +10% → 110
110 -10% → 99
a net 1% decrease

The extremes

- Increasing by 100% doubles an amount.
- Increasing by 200% trebles it.
- Decreasing by 100% leaves nothing at all.
- You cannot decrease by more than 100% of something real.

+100% of 30 → 60
+200% of 30 → 90
-100% of 30 → 0