Percentages as multipliers, including over 100%

Teacher		**Class**	Year 7
Subject	Maths	**Topic**	Converting fractions, decimals and percentages
Date		**Room**	
Lesson length	60 minutes	**Country**	United Kingdom

Pupils learn to read any percentage as a fraction, a decimal and a multiplier. They use this to compare scores and work out price increases.

Curriculum links

- define percentage as ‘number of parts per hundred’
- interpret percentages and percentage changes as a fraction or a decimal, and interpret these multiplicatively
- express 1 quantity as a percentage of another, compare 2 quantities using percentages, and work with percentages greater than 100%

Learning objectives

- Students will define per cent as parts per hundred and convert between FDP forms.
- Students will express one quantity as a percentage of another to compare two quantities.
- Students will interpret percentage changes as multipliers, including values over 100%.

Success criteria

- I can write a percentage as a fraction over 100 and as a decimal.
- I can write one amount as a percentage of another to decide which is larger.
- I can use a multiplier such as 1.25 for a 25% increase, even over 100%.

What students already know

Show 50% on a 100-square. Ask: what fraction and decimal is shaded? Listen for 50/100, 1/2 and 0.5.

Key words

per cent	a number of parts out of every hundred [10]
fraction	a part of a whole written with a top number over a bottom number [6]
decimal	a number that uses tenths and hundredths after a point [4]
percentage	an amount written as a number of parts per hundred [10]
multiplier	a number you times an amount by to find a new amount

Materials

- Slides 4–5, 7–9, 11–12 and Video clip 6 (0:00–2:29) ready to play
- Worksheet Task B and Worksheet Task C printed, one per pupil
- Till receipt copies with prices in £, one per group, plus calculators

Before the lesson

- Print Worksheet Tasks B and C and till receipt copies with prices in £
- Test Slide 8 Video clip 6 (0:00–2:29) for sound and picture
- Draw two large 10 by 10 grids on the board and stick masking tape line on floor

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- Mini-whiteboards, pens and long masking tape line for ordering
- Set out calculators, mini-whiteboards and rulers for each pair

Lesson outline

0–8 min **Starter** 8 min · Whole class

Recall what per cent means and raise the question of increases over 100%.

YOU DO

1. Greet the class and show Slides 4–5 with the 100-square and mystery stock question.
2. Say the hook question about the £40 toy and take quick predictions on adding or timesing.
3. Ask pupils to show 50% as a fraction and decimal on mini-whiteboards.
4. Confirm per cent means per hundred and that over 100% means more than one whole.

STUDENTS DO

1. Hold up mini-whiteboards showing 50% as 50/100 and 0.5.
2. Discuss in pairs whether 135% stock is possible and why.
3. Chant the two-place shift for ÷100 and ×100.

Say: Per cent means per hundred, so 50% means 50 out of 100 [10]. A shopkeeper puts a £40 toy up by 25%. Is she adding 25 or timesing something? Today we find the multiplier that answers this.

Worked example: 50% = 50/100 = 1/2 = 0.5, because percentage to decimal is divide by 100 [7]. 135% = 135/100 = 1.35 wholes, because decimals greater than 1 are greater than 100% [4].

Ask: What does 50% mean as parts per hundred? (50 out of 100, which is 50/100 [10].) · A shopkeeper orders 135% of usual stock. Is that possible? (Yes, 135/100 = 1.35 wholes, so more than one whole [3].)

Check understanding: All boards up for 50% = 0.5. If mixed, re-show the 100-square and move the point two places together.

Support: Point to a half-shaded 100-square and count 50 shaded out of 100 to link to 1/2. **Stretch:** Ask what 135% would look like with two grids: one full grid plus 35 squares.

Use: Slides 4–5

8–20 min **Teaching** 12 min · Whole class

Model how to turn a fraction into a decimal and percentage and read it as a multiplier.

YOU DO

1. Show Slide 7 chain for 3/8 and think aloud through divide then times 100.
2. Write 3 ÷ 8 = 0.375 on the board, because fraction to decimal is numerator divided by denominator [6].
3. Write 0.375 × 100 = 37.5%, because decimal to percentage is multiply by 100 [6], then add that 37.5% of an amount means times 0.375.
4. Play Video clip 6 (0:00–2:29) on Slide 8 and pause to spot 1.45 = 145% as more than one whole [3].

STUDENTS DO

1. Watch the clip and call out when the point jumps two places to make a percentage.
2. Copy the 3/8 chain with arrows for ÷8 and ×100.
3. Repeat the multiplier sentence: 62% ÷ 100 = 0.62 [6], so 62% means times 0.62.

Say: A fraction bar means divide. We divide the top number by the bottom number to get the decimal [6]. Then we times by 100 to get the percentage, which also tells us the multiplier.

Worked example: 3/8 means 3 divided by 8 = 0.375 [6]. 0.375 × 100 = 37.5% [6]. So 37.5% = 37.5/100 = 0.375, and 37.5% of an amount means multiply by 0.375. For over 100%, 135 ÷ 100 = 1.35 [3], so a 35% increase means times 1.35.

Ask: How do we turn 3/8 into a decimal? (Divide numerator by denominator, 3 ÷ 8 = 0.375 [6].) · What multiplier matches a 35% increase? (100% + 35% = 135% = 1.35, so times 1.35 [3].)

Check understanding: Hinge on whiteboards: write 56% as a decimal. Expect 0.56 [3]. Reteach ÷100 if many write 5.6.

Support: Use a double bar to show 1/4 = 25% [5] and that 100% means multiply by 1. **Stretch:** Ask pupils to predict the multiplier for a 125% increase before you write 125/100 = 5/4 [3].

Use: Slides 7–8, Video clip 6 (0:00–2:29)

20–32 min **Paired practice** 12 min · Pairs

Practise writing quantities as percentages and ordering mixed FDP values.

YOU DO

1. Show Slide 9 and set the pair task: turn 17/25, 3/5 and 27/20 into decimals and percentages.
2. Remind pairs to divide top by bottom to get the decimal, then times by 100 to get the percentage.
3. Hand out Worksheet Task B for extra conversion practice and circulate to mark.
4. Stop the class to agree the order smallest to largest and the over-100% value.

STUDENTS DO

1. In pairs, divide and multiply to find 68%, 60% and 135% and write each as fraction, decimal and percentage.
2. Complete Worksheet Task B conversions on mini-whiteboards then on paper.
3. Line up the three values smallest to largest and explain which is over 100%.

Say: Divide the top number by the bottom number, then multiply the decimal by 100. Convert everything to the same form, decimals are usually easiest [7]. Then you can see which is larger and which is over one whole.

Worked example: 17/25: 17 ÷ 25 = 0.68, then 0.68 × 100 = 68% [8]. 3/5: 3 ÷ 5 = 0.6 = 60%. 27/20: 27 ÷ 20 = 1.35 = 135% [3]. Order is 0.6, 0.68, 1.35, so 27/20 is largest and over 100%.

Ask: How do you write 7 out of 20 as a percentage? (7 ÷ 20 = 0.35 and 0.35 × 100 = 35% [8].) · Which is larger, 3/5 or 63%, and how do you know? (3 ÷ 5 = 0.6 and 63 ÷ 100 = 0.63 [8], so 63% is larger.)

Check understanding: Pairs hold up ordered cards for 3/5, 17/25, 27/20. If order is wrong, convert all to decimals together on the board.

Support: Give a reference strip with halves, quarters and tenths, for example 1/4 is equivalent to 25/100, so 1/4 = 25% [5]. **Stretch:** Add near-miss cards 0.58, 58% and 7/12 and ask pairs to slot them into the order.

Use: Slide 9, Worksheet Task B

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32–50 min **Main activity** 18 min · Groups

Apply percentage multipliers to till receipts to find new prices after increases.

YOU DO

1. Give each group a till receipt copy, a calculator and Worksheet Task C.
2. Model with the Toy £40.00: 25% increase means 100% + 25% = 125% = 1.25, then £40.00 × 1.25.
3. Set groups to find multipliers and new prices for 25% and 35% increases on their receipts.
4. Ask each group to write its multiplier sentence, for example 35% means times 0.35 [6], increase means times 1.35.

STUDENTS DO

1. Read receipt prices in £ and write each rise as 100% plus the rise, over 100.
2. Divide by 100 to get the decimal multiplier and multiply by the old price on the calculator.
3. Complete Worksheet Task C and write the multiplier sentence for each receipt to show.

Say: A percentage over 100 tells us the multiplier. Since 25% means 25 out of 100 [10], a 25% rise means 125 out of 100. Divide by 100 to get the decimal multiplier, then times the old price by it.

Worked example: Receipt: Toy £40.00, Book £12.00. Toy up 25%: 125 ÷ 100 = 1.25, £40.00 × 1.25 = £50.00. Book up 35%: 100% + 35% = 135%, 135 ÷ 100 = 1.35 [3], £12.00 × 1.35 = £16.20. 35% of an amount alone means multiply by 0.35.

Ask: 25% of the toy means times what? And a 25% increase means times what? (25% means times 0.25, increase means 125% so times 1.25.) · How do you know 145% is more than one whole? (1.45 × 100 = 145% [3], and 1.45 is bigger than 1.)

Check understanding: Each group reads its multiplier sentence aloud. If multipliers are 0.25 for an increase, re-model 100% + rise on the double bar.

Support: Use a double bar to show 1/4 = 25% [5] and that 100% means multiply by 1, then add the extra part.
Stretch: Ask groups to work backwards from a new price and multiplier to find the starting price.

Use: Worksheet Task C

50–60 min **Plenary** 10 min · Whole class

Return to the objectives by comparing test scores and fixing key misconceptions.

YOU DO

1. Show Slide 11 and ask pairs to prove which test result is better.
2. Take answers and model 14/20 as 14 ÷ 20 = 0.7 = 70%, so 70% beats 68%.
3. Show Slide 12 true or false cards and vote for 8% = 0.8, 135% = 1.35 and 3/5 = 60%.
4. Link back to per cent as per hundred and multipliers, and set homework.

STUDENTS DO

1. In pairs, convert 14/20 to 70% and decide which score is better with a reason.
2. Vote true or false on mini-whiteboards and correct 8% to 0.08.
3. Repeat success criteria: I can write % as fraction and decimal, compare, and use multipliers.

Say: To compare, write both as percentages. Divide the top by the bottom, then times by 100. Then the larger percentage tells you the better score, and the multiplier tells you how to change an amount.

Worked example: 14 out of 20 = 14/20. 14 ÷ 20 = 0.7. 0.7 × 100 = 70%. 70% is larger than 68%, so the first test is better. Check: 6/10 is equivalent to 60/100, so 6/10 = 60% [5].

Ask: A student scores 14 out of 20, then 68% next time. Which is better? (14 ÷ 20 = 0.7 = 70%, so 14 out of 20 is better than 68%.) · Is 8% = 0.8 true or false, and why? (False, 8 ÷ 100 = 0.08, you must fill the empty place with a zero [10].) · Is 135% = 1.35 true, and what does it mean? (True, over 100% means over 1 whole [4].)

Check understanding: Whiteboard vote on the three true-or-false statements. Re-teach ÷100 and 3 ÷ 5 = 0.6 = 60% where needed.

Support: Let pupils first change everything to decimals on a place-value grid, since ordering is easier in the same form [7]. **Stretch:** Ask pupils to add a value slightly larger than 70% and prove which is larger by converting both to decimals.

Use: Slides 11–12

Common mistakes

Mistake	How to spot it	How to fix it
Writing 8% as 0.8 instead of 0.08	Seeing 0.8 or 0.80 for single-digit percentages	Divide by 100 so the point moves two places left; 8 ÷ 100 = 0.08, fill the empty place with zero [10].
Dividing the wrong way to turn a fraction into a decimal	Working 20 ÷ 7 for 7/20 or getting an answer larger than expected	Remind that fraction to decimal is numerator divided by denominator [6]; 7 ÷ 20 = 0.35, then 0.35 × 100 = 35% [8].
Thinking 100% is the largest possible percentage	Saying 135% is impossible or writing it as 0.135	Show two grids: 135/100 = 1.35 [3]; decimals greater than 1 are greater than 100% [4].

Support

- Provide 100-squares, a halves-quarters-tenths strip and place-value grids for ÷100 and ×100 moves.
- Use writing frames with a worked layout such as 40/100 simplifies to 2/5 [10] to copy.

Stretch

- Order tricky near values such as 0.62, 3/5 and 63% by converting all to decimals [8].
- Work backwards from a new price and multiplier to find the starting price.

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For the LSE or teaching assistant

Sit with the target pair in paired practice and main activity; prompt divide top by bottom first, then times by 100, and check calculator entry for ×1.25 and ×1.35.

Check for understanding

Question	Answer
Write 56% as a fraction in its simplest form and as a decimal.	56/100 = 14/25 = 0.56 [3].
A student scores 17 out of 25. What percentage is this?	17 ÷ 25 = 0.68, 0.68 × 100 = 68% [8].
A £20 game rises by 35%. What is the multiplier and new price?	135% = 1.35 [3], £20 × 1.35 = £27.00.

Homework

Complete Worksheet Task F by filling the missing fractions, decimals and percentages.

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