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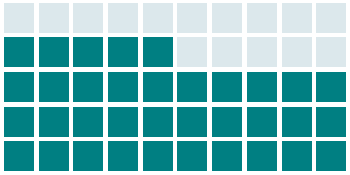
NUMBER / TOPIC GUIDE 04

04

Decimals and conversions

Shared GCSE foundations

Fractions, decimals and percentages are different ways of expressing the same quantities. Choosing a useful form can make a problem easier. This guide develops decimal calculations and conversions, including why the methods preserve value.



35 shaded out of 50

35/50 = 7/10 = 0.7 = 70%

UNDERSTAND THE IDEA. EXPLAIN THE METHOD.

Detailed teaching • Worked examples • Discussion • Original practice • Full solutions

Name: _____

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Your learning guide

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Independent educational resource

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Before you begin

Understand place value, equivalent fractions and the four operations.

Your route through this notebook

1. Decimal addition, subtraction and multiplication
2. Dividing by decimals
3. Converting fractions, decimals and percentages

How to use it

Read a lesson, cover the worked solutions and try the examples yourself. Complete its practice page before checking the answers at the back. Finish with the mixed review, then return to any method you could not explain.

YOUR PROGRESS

After each lesson, ask: Can I explain the idea? Can I choose a method? Can I check my result? Record any questions you want to revisit.

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LESSON 1 / UNDERSTAND

Decimal addition, subtraction and multiplication

A decimal is built from tenths, hundredths, thousandths and further powers of ten. Addition and subtraction work by combining equal place-value units, so decimal points must be aligned. Add trailing zeros where they help show columns. For multiplication, calculate with whole-number digits and then restore the scale, or use a partitioned calculation.

The number of decimal places in a product can be explained through fractions. Since $0.4 = 4/10$ and $0.03 = 3/100$, their product is $12/1{,}000 = 0.012$. This is why multiplying two positive decimals below 1 produces a result smaller than either factor. A product with a large multiplier need not be smaller.

A reliable method

1. Align place values for addition and subtraction.

2. For multiplication, temporarily remove decimal scaling, then divide the product by the combined power of ten.

3. Estimate to catch an answer with the wrong scale.

Worked example 1

Calculate $5.07 - 2.386$.

STEP-BY-STEP SOLUTION

Write $5.070 - 2.386$. Subtract matching columns to get 2.684. Check: $2.684 + 2.386 = 5.070$.

Worked example 2

Calculate 0.24×1.5.

STEP-BY-STEP SOLUTION

$24 \times 15 = 360$. The factors were scaled up by 100 and 10, so divide by 1,000: $0.360 = 0.36$.

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LESSON 1 / DISCUSS & PRACTISE

Explain it, then try it

DISCUSSION • TEST THE IDEA

“Multiplication makes bigger” applies only in suitable circumstances. For a positive starting quantity, multiplying by 0.5 halves it, by 1 leaves it unchanged and by 2 doubles it.

Say it in your own words

Explain the key idea to someone else. Use a small example to support your explanation. If you disagree with a claim, show why it fails.

1.1 Calculate 3.85 + 0.907.

1.2 Calculate 8 − 3.764.

1.3 Calculate 0.06 × 0.8.

1.4 A 1.25 m ribbon costs £2.40 per metre. Find its cost.

Check before turning to the answers: is the size sensible, is the notation clear, and have you included any required units?

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LESSON 2 / UNDERSTAND

Dividing by decimals

A quotient is unchanged if both the dividend and divisor are multiplied by the same non-zero number. For example, 6 ÷ 0.2 = 60 ÷ 2 because both describe the same ratio. This lets us replace a decimal divisor with a whole number while preserving the answer. Scaling only the divisor would produce a different question.

Once the divisor is whole, use a written division method and add zeros after the decimal point if needed. Some divisions terminate; others recur. Do not turn an unfinished calculation into a rounded answer unless a level of accuracy is requested. In measurement contexts, the quotient often counts how many equal lengths or amounts fit.

A reliable method

1. Scale both numbers by 10, 100 or another power of ten until the divisor is whole.
2. Divide, retaining the decimal place value in the dividend.
3. Check by multiplying the quotient by the original divisor.

Worked example 1

Calculate 7.56 ÷ 0.12.

STEP-BY-STEP SOLUTION

Multiply both by 100: 756 ÷ 12 = 63. Check: 63 × 0.12 = 7.56.

Worked example 2

How many 0.75 litre servings fit into 6 litres?

STEP-BY-STEP SOLUTION

6 ÷ 0.75 = 600 ÷ 75 = 8. Eight servings use exactly 8 × 0.75 = 6 litres.

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LESSON 2 / DISCUSS & PRACTISE

Explain it, then try it

DISCUSSION • TEST THE IDEA

Dividing by 0.1 gives ten times as many groups as dividing by 1. Thus 4 ÷ 0.1 = 40, not 0.4. Distinguish division by a tenth from multiplication by a tenth.

Say it in your own words

Explain the key idea to someone else. Use a small example to support your explanation. If you disagree with a claim, show why it fails.

2.1 Calculate 4.2 ÷ 0.6.

2.2 Calculate 0.936 ÷ 0.24.

2.3 Calculate 5 ÷ 0.04.

2.4 A 4.5 m board is cut into 0.35 m pieces with no cutting loss. How many complete pieces and what length remains?

Check before turning to the answers: is the size sensible, is the notation clear, and have you included any required units?

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LESSON 3 / UNDERSTAND

Converting fractions, decimals and percentages

Percent means per hundred. Therefore 35% = 35/100 = 0.35. To change a decimal to a percentage, express the same amount in hundredths: multiply its numerical value by 100 and attach %. To reverse the change, divide by 100. The amount itself is unchanged; only its representation changes.

A fraction becomes a decimal by dividing numerator by denominator. For friendly denominators, equivalent fractions may be quicker: 3/8 = 375/1,000 = 0.375. A terminating decimal becomes a fraction by using its place-value denominator and simplifying. Percentages can exceed 100%, just as decimals can exceed 1 and fractions can exceed one whole.

A reliable method

1. Fraction to decimal: divide the numerator by the denominator.

2. Decimal to fraction: use 10, 100, 1,000 and so on, then simplify.

3. Decimal to percentage: multiply by 100; percentage to decimal: divide by 100.

Worked example 1

Write 7/20 as a decimal and a percentage.

STEP-BY-STEP SOLUTION

7/20 = 35/100 = 0.35 = 35%.

Worked example 2

Write 0.045 as a simplified fraction and a percentage.

STEP-BY-STEP SOLUTION

0.045 = 45/1,000 = 9/200. As a percentage it is 0.045 × 100 = 4.5%.

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LESSON 3 / DISCUSS & PRACTISE

Explain it, then try it

DISCUSSION • TEST THE IDEA

A common error is writing 0.6% = 0.6. In fact, 0.6% = 0.006, whereas 0.6 = 60%. Always check what one whole would look like in the chosen representation: 1 = 100%.

Say it in your own words

Explain the key idea to someone else. Use a small example to support your explanation. If you disagree with a claim, show why it fails.

3.1 Convert 3/8 to a decimal and percentage.

3.2 Convert 0.72 to a fraction in simplest form.

3.3 Convert 125% to a decimal and mixed number.

3.4 Order 0.58, 3/5 and 59%, smallest first.

Check before turning to the answers: is the size sensible, is the notation clear, and have you included any required units?

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MIXED REVIEW / ORIGINAL EXAM-STYLE PRACTICE

Apply your learning • 1

These questions are independently authored, not taken or adapted from past papers. Marks are suggested for self-assessment. Show your method and explain decisions. Use a calculator only where the arithmetic requires it.

R1. Calculate 6.03 − 0.875. [2 marks]

R2. Calculate 0.35 × 0.24. [2 marks]

R3. Calculate 8.64 ÷ 0.32. [2 marks]

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MIXED REVIEW / ORIGINAL EXAM-STYLE PRACTICE

Apply your learning • 2

These questions are independently authored, not taken or adapted from past papers. Marks are suggested for self-assessment. Show your method and explain decisions. Use a calculator only where the arithmetic requires it.

R4. Express 0.375 as a simplified fraction and percentage. [3 marks]

R5. Which is greatest: 5/8, 0.62 or 63%? Show a comparison. [2 marks]

R6. A 7.2 kg bag is divided into 0.45 kg portions. Each sells for £1.35. Find total sales if all portions sell. [4 marks]

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SOLUTIONS / LESSON PRACTICE

Check the reasoning

Your layout may differ. Compare the mathematical reasoning as well as the final answer. Correct any error, then reattempt the question without looking.

Lesson 1 • Decimal addition, subtraction and multiplication

1.1 Calculate 3.85 + 0.907.

3.850 + 0.907 = 4.757.

1.2 Calculate 8 − 3.764.

8.000 − 3.764 = 4.236.

1.3 Calculate 0.06 × 0.8.

6 × 8 = 48, then divide by 1,000: 0.048.

1.4 A 1.25 m ribbon costs £2.40 per metre. Find its cost.

1.25 × 2.40 = £3.00. One metre costs £2.40 and a quarter metre costs £0.60.

Lesson 2 • Dividing by decimals

2.1 Calculate 4.2 ÷ 0.6.

42 ÷ 6 = 7.

2.2 Calculate 0.936 ÷ 0.24.

93.6 ÷ 24 = 3.9. Check: 3.9 × 0.24 = 0.936.

2.3 Calculate 5 ÷ 0.04.

500 ÷ 4 = 125.

2.4 A 4.5 m board is cut into 0.35 m pieces with no cutting loss. How many complete pieces and what length remains?

4.5 ÷ 0.35 = 12.857… . Twelve full pieces use 4.2 m, leaving 0.3 m.

Lesson 3 • Converting fractions, decimals and percentages

3.1 Convert 3/8 to a decimal and percentage.

3 ÷ 8 = 0.375, so 37.5%.

3.2 Convert 0.72 to a fraction in simplest form.

72/100 = 18/25.

3.3 Convert 125% to a decimal and mixed number.

125 ÷ 100 = 1.25 = 1 1/4.

3.4 Order 0.58, 3/5 and 59%, smallest first.

Convert to decimals: 0.58, 0.60 and 0.59. Order: 0.58 < 59% < 3/5.

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SOLUTIONS / MIXED REVIEW

Answers and marking guidance

Award the suggested method marks for valid working, even where a later arithmetic slip occurs. Do not count the same step twice. These are independent teaching allocations, not official exam-board mark schemes.

R1. Calculate 6.03 − 0.875. [2 marks]

6.030 − 0.875 = 5.155. [1 for place-value alignment/method; 1 for result.]

R2. Calculate 0.35 × 0.24. [2 marks]

35 × 24 = 840; divide by 10,000 to get 0.084. [1 for whole-number product; 1 for scale.]

R3. Calculate 8.64 ÷ 0.32. [2 marks]

864 ÷ 32 = 27. [1 for scaling both numbers; 1 for result.]

R4. Express 0.375 as a simplified fraction and percentage. [3 marks]

375/1,000 = 3/8, and 37.5%. [1 for place-value fraction; 1 for simplification; 1 for percentage.]

R5. Which is greatest: 5/8, 0.62 or 63%? Show a comparison. [2 marks]

5/8 = 0.625 and 63% = 0.63. Therefore 63% is greatest. [1 for common representation; 1 for conclusion.]

R6. A 7.2 kg bag is divided into 0.45 kg portions. Each sells for £1.35. Find total sales if all portions sell. [4 marks]

7.2 ÷ 0.45 = 16 portions; 16 × £1.35 = £21.60. [1 for division model; 1 for 16; 1 for sales multiplication; 1 for money answer.]

Reflect, repair and revisit

Record one secure method, one mistake you corrected and one question to retry. Reattempt the questions you missed in a few days. Explain why your new method works before you compare your answer.

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