# Decimals, rounding and accuracy

Leaving Certificate · Ordinary Level

## Understand the idea

### How to start

In $3.47$, the $4$ means four tenths and the $7$ means seven hundredths.

1. Read whether the question asks for decimal places or significant figures.
2. Mark the last digit you will keep, then look at the digit immediately after it.
3. Round only at the end of a calculation.

### Key terms & definitions

**Estimate**
An approximate value used to judge whether an answer is sensible.

**Significant figures**
Digits starting at the first non-zero digit that show the stated precision.

**Recurring decimal**
A decimal with a repeating digit or block.

### Key ideas

• To convert a fraction to a decimal, divide the numerator by the denominator.

• A terminating decimal ends. A recurring decimal repeats a digit or block; both are rational.

• Decimal places count positions after the decimal point. Significant figures begin at the first non-zero digit.

• For rounding, look at the next digit : $5$ or more rounds up; $4$ or less leaves the retained digit unchanged.

• Keep extra digits during a calculation. Round the final answer to the accuracy requested.

# Quick reminder

• Decimal places start after the decimal point.

• Significant figures start at the first non-zero digit.

• Keep extra digits and round the final result.

# Worked examples

### Example 01 · Fractions and decimals

Write $\frac{3}{4}$ as a decimal.

### Why this method?

Identify the place value or conversion being asked for before moving or rounding any digits.

| | |
|---|---|
| $\frac{3}{4} = 3 \div 4$ | **Step 1**<br>The fraction bar means divide |
| $3.00 \div 4 = 0.75$ | **Step 2**<br>Think of $3$ as $3.00$ and divide by $4$ |
| $\frac{3}{4} = 0.75$ | **Step 3**<br>So the two forms name the same number |

Think about it: Why is $0.75a$ sensible answer for $\frac{3}{4}$?

### Example 02 · Decimal and percentage

Write $\frac{7}{20}$ as a decimal and percentage.

### Why this method?

Identify the place value or conversion being asked for before moving or rounding any digits.

| | |
|---|---|
| $7 \div 20 = 0.35$ | **Step 1**<br>The fraction bar means division. Divide the numerator by the denominator to find the decimal value. |
| $0.35 \times 100\% = 35\%$ | **Step 2**<br>Convert to hundredths |

### Example 03 · Rounding to a stated accuracy

Round $9.995$ to $2$ decimal places. For halfway values, round away from zero; show the stated precision.

#### Why this method?

Identify the place value or conversion being asked for before moving or rounding any digits.

| | |
|---|---|
| Rounding unit : $0.01$. | **Step 1**<br>Identify the rounding unit |
| $10.00$ | **Step 2**<br>Round the magnitude, then restore the sign and show the precision |

Think about it: Why does $0.00450$ have three significant figures?

### Example 04 · Percentage error

A length of $80$ cm is measured as $78$ cm. Find the percentage error.

| | |
|---|---|
| $\lvert 78 - 80 \rvert = 2$ cm | **Step 1**<br>Find the size of the error. |
| $\frac{2}{80} \times 100 = 2.5\%$ | **Final step**<br>Divide by the actual value, not the measured value. |

### Example 05 · Add measurement tolerances

Two lengths are stated as $12.0 \pm 0.1$ cm and $7.0 \pm 0.2$ cm. Bound their difference.

| | |
|---|---|
| $11.9 - 7.2 = 4.7$ cm | **Step 1**<br>Smallest difference: smallest first value minus largest second value. |
| $12.1 - 6.8 = 5.3$ cm | **Final step**<br>Largest difference: largest first value minus smallest second value. |

## Common mistake

Counting the zeros before the first non-zero digit as significant figures. In $0.00470$, the significant digits are $4$, $7$ and the final $0$ : three significant figures. That final zero records precision.

# Exam technique

Write the requested accuracy beside your answer.

# Try it yourself

Work on paper before checking the answers at the end. These questions are for self-checking, not submitted homework.

**Question** 1

Round $0.62721$ to $3$ significant figures. For halfway values, round away from zero; show the stated precision.

A. $0.630$

B. $0.627$

C. $0.6272$

D. $0.628$

**Question** 2

Write $\frac{7}{10}$ as a decimal.

# Watch an explanation

Cognito — Converting Fractions to Decimals

Cognito — Rounding Decimals

Open the website chapter to load the embedded players. Use the rates and rules in your question for financial examples.

# Self-check answers

### Question 1

0.627

Correct.

### Question 2

0.7

Compare your method with the worked examples.

Open the full chapter online