

Exercise walk-through

E1.6

The four operations

IGCSE Mathematics

You must be able to

- apply the order of operations, including brackets, powers and roots
- add, subtract, multiply and divide fractions and mixed numbers
- calculate with negative numbers, including subtracting a negative

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The method

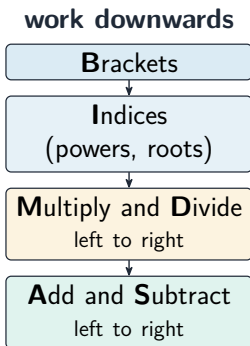
Method — Brackets first, then powers, then $\times$, $\div$, then $+$, $-$

- **Order:** $3 + 4 \times 2^2 = 3 + 4 \times 4 = 19$, but $(3 + 4) \times 2^2 = 7 \times 4 = 28$.
- **Mixed numbers:** turn them into improper fractions first. $2\frac{1}{4} \times 1\frac{1}{3} = \frac{9}{4} \times \frac{4}{3} = 3$.
- **Dividing fractions:** multiply by the reciprocal — $\div \frac{a}{b}$ becomes $\times \frac{b}{a}$.
- **Two minus signs:** $-6 - (-4) = -6 + 4 = -2$. Subtracting a negative adds.

Answer shapes (marked by **method marks** — M1 for a correct method, A1 for the correct answer): the line showing the improper fractions, or the bracket evaluated first, is the method mark.

Method — Brackets first, then powers, then $\times$, $\div$, then $+$, $-$

Answer shapes (marked by method marks — M1 for a correct method, A1 for the correct answer): the line showing...

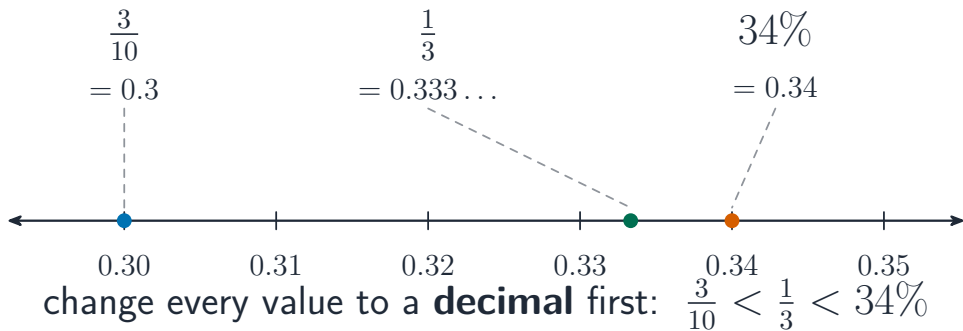


$$\begin{array}{l} -6 \times -3 + 7 \times 2 \\ \downarrow \text{multiply first: } -6 \times -3 = 18, 7 \times 2 = 14 \\ 18 + 14 \\ \downarrow \text{then add} \\ 32 \end{array}$$

The order of operations, from brackets down to addition

Method — Brackets first, then powers, then $\times$, $\div$, then $+$, $-$

Answer shapes (marked by method marks — M1 for a correct method, A1 for the correct answer): the line showing...



Numbers placed on a number line, negatives to the left of zero

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Practice

Practice 2.1 ■ 1 mark

Work out $20 - 3 \times 4$.

Solution 2.1

Method: Brackets first, then powers, then $\times$, $\div$, then $+$, $-$ — p.4

Worked steps

- multiplication before subtraction: $3 \times 4 = 12$

$$20 - 12 = 8$$

B1

Practice 2.2 ■ 2 marks

Work out $2\frac{2}{3} + 1\frac{1}{2}$, giving your answer as a mixed number.

Solution 2.2

Method: Brackets first, then powers, then $\times$, $\div$, then $+$, $-$ — p.4

Worked steps

■ improper fractions with a common denominator: $\frac{8}{3} + \frac{3}{2} = \frac{16}{6} + \frac{9}{6}$ **M1**

$$= \frac{25}{6} = 4\frac{1}{6} \quad \textbf{A1}$$

Practice 2.3 ■ 2 marks

Work out $-5 \times (-3) + 2$.

Solution 2.3

Method: Brackets first, then powers, then $\times$, $\div$, then $+$, $-$ — p.4

Worked steps

- a negative times a negative is positive: $-5 \times (-3) = 15$ **M1**

$$15 + 2 = 17$$

A1

Practice 2.4 ■ 1 mark

Work out $1.2 \div 0.4$.

Solution 2.4

Worked steps

- multiply both by 10 to clear the decimals: $12 \div 4$

$$= \mathbf{3}$$

B1

3

Exam-style

Exam-style 3.1 (a) ■ 2 marks

Work out $(7 - 2)^2 \div 5$.

Solution 3.1 (a)

Method: Brackets first, then powers, then $\times$, $\div$, then $+$, $-$ — p.4

Worked steps

■ bracket first, then the power: $(7 - 2)^2 = 5^2 = 25$ **M1**

$$25 \div 5 = 5$$

A1

Exam-style 3.1 (b) ■ 3 marks

Work out $3\frac{1}{5} \div 1\frac{3}{5}$.

Solution 3.1 (b)

Worked steps

- improper fractions: $\frac{16}{5} \div \frac{8}{5}$ **M1**
- multiply by the reciprocal: $\frac{16}{5} \times \frac{5}{8}$ **M1**

$$= \frac{80}{40} = 2$$

A1

Exam-style 3.2 ■ 1 mark

At midnight the temperature was -4°C . By 3 a.m. it had fallen by a further 7°C . Find the temperature at 3 a.m.

Solution 3.2

Worked steps

■ a fall of 7 means subtract: $-4 - 7$

$$= -11^{\circ}\text{C}$$

B1