

E1.6 The four operations

Name: _____ Class: _____ Date: _____

Total: 12 marks

KEY WORDS order of operations • brackets • mixed number
 • improper fraction • reciprocal

Objective

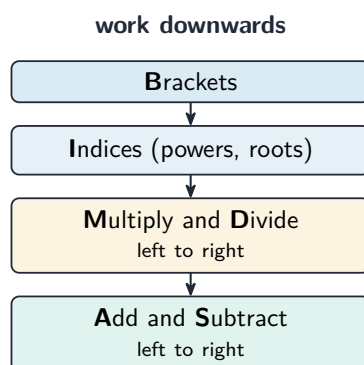
Build the skills to answer Extended exam questions on **the four operations** – working with **integers**, **fractions** and **decimals** in the correct **order of operations**, including **brackets** and **negative numbers**.

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

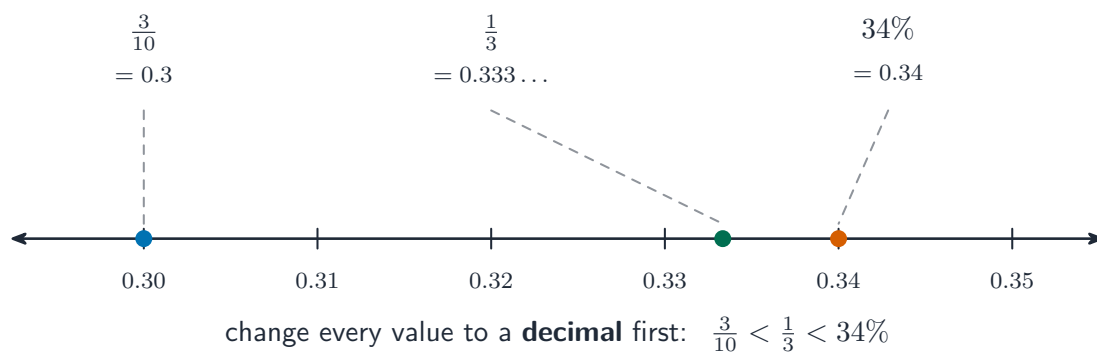
1 Key knowledge and worked examples

■ Brackets first, then powers, then $\times \div$, then $+$ $-$



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

Work down the ladder – never simply left to right



Subtracting a negative moves you to the right

- **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.

2 Practice

2.1 Work out $20 - 3 \times 4$. [1]

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

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

2.4 Work out $1.2 \div 0.4$. [1]

3 Exam-style questions

3.1 (a) Work out $(7 - 2)^2 \div 5$. [2]

(b) Work out $3\frac{1}{5} \div 1\frac{3}{5}$. [3]

3.2 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. [1]

Solutions

Marking: **M1** a correct method, **A1** the correct answer.

Each answer shows the steps, then the **result**.

2.1

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

$$20 - 12 = \mathbf{8}$$

2.2

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

$$= \frac{25}{6} = \mathbf{4\frac{1}{6}}$$

2.3

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

$$15 + 2 = \mathbf{17}$$

2.4

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

$$= \mathbf{3}$$

3.1

(a)

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

$$25 \div 5 = \mathbf{5}$$

(b)

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

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

3.2

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

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