

Fractions - Four Operations

Solutions

For AQA GCSE Mathematics (8300) • Foundation tier

Each question is shown in grey, followed by the working, one step per line. The final answer is in a box. *Marks* shows how the marks are usually given in the exam, and **Tip** points out a common mistake.

1 (3 marks)

Work out

(a) $\frac{3}{4} - \frac{2}{5}$

The lowest common denominator of 4 and 5 is 20.

$$\frac{3}{4} = \frac{15}{20} \text{ and } \frac{2}{5} = \frac{8}{20}$$

$$\frac{15}{20} - \frac{8}{20} = \frac{7}{20}$$

Answer: $\frac{7}{20}$

Tip: Never subtract the tops and the bottoms separately. Make the denominators the same first.

(b) $\frac{5}{6} \times \frac{9}{10}$

Multiply the tops and multiply the bottoms:

$$\frac{5 \times 9}{6 \times 10} = \frac{45}{60}$$

Simplify (divide top and bottom by 15): $\frac{45}{60} = \frac{3}{4}$

Answer: $\frac{3}{4}$

(c) $\frac{4}{9} \div \frac{2}{3}$

To divide, flip the second fraction and multiply:

$$\frac{4}{9} \times \frac{3}{2} = \frac{12}{18}$$

Simplify: $\frac{12}{18} = \frac{2}{3}$

Answer: $\frac{2}{3}$

2 (1 mark)

Circle the reciprocal of $2\frac{1}{2}$

Options: $-2\frac{1}{2}$, $\frac{2}{5}$, $\frac{5}{2}$, $\frac{1}{2}$

Write it as an improper fraction: $2\frac{1}{2} = \frac{5}{2}$

The reciprocal is the fraction turned upside down: $\frac{2}{5}$

Answer: $\frac{2}{5}$

3 (3 marks)

Work out $3\frac{2}{3} + 1\frac{3}{4}$

Give your answer as a mixed number.

Change to improper fractions:

$$3\frac{2}{3} = \frac{11}{3} \text{ and } 1\frac{3}{4} = \frac{7}{4}$$

The lowest common denominator of 3 and 4 is 12.

$$\frac{11}{3} = \frac{44}{12} \text{ and } \frac{7}{4} = \frac{21}{12}$$

$$\frac{44}{12} + \frac{21}{12} = \frac{65}{12}$$

$$65 \div 12 = 5 \text{ remainder } 5, \text{ so } \frac{65}{12} = 5\frac{5}{12}$$

Answer: $5\frac{5}{12}$

Tip: The question asks for a mixed number. Change $\frac{65}{12}$ back to $5\frac{5}{12}$ at the end, or you lose the last mark.

Marks: 1 mark for improper fractions (or adding the whole numbers separately). 1 mark for using a common denominator. 1 mark for $5\frac{5}{12}$.

4 (3 marks)

Work out $3\frac{1}{3} - 1\frac{4}{5}$

Change to improper fractions:

$$3\frac{1}{3} = \frac{10}{3} \text{ and } 1\frac{4}{5} = \frac{9}{5}$$

The lowest common denominator of 3 and 5 is 15.

$$\frac{10}{3} = \frac{50}{15} \text{ and } \frac{9}{5} = \frac{27}{15}$$

$$\frac{50}{15} - \frac{27}{15} = \frac{23}{15}$$

As a mixed number: $\frac{23}{15} = 1\frac{8}{15}$

Answer: $1\frac{8}{15}$

Marks: 1 mark for improper fractions. 1 mark for using a common denominator. 1 mark for $1\frac{8}{15}$.

5 (3 marks)

Work out $2\frac{2}{5} \times 1\frac{7}{8}$

Give your answer in its simplest form.

Change to improper fractions:

$$2\frac{2}{5} = \frac{12}{5} \text{ and } 1\frac{7}{8} = \frac{15}{8}$$

Multiply the tops and multiply the bottoms:

$$\frac{12}{5} \times \frac{15}{8} = \frac{180}{40}$$

$$\text{Simplify: } \frac{180}{40} = \frac{9}{2} = 4\frac{1}{2}$$

Answer: $4\frac{1}{2}$

Tip: Do not multiply the whole numbers and the fractions separately (2×1 and $\frac{2}{5} \times \frac{7}{8}$). Always change to improper fractions first.

Marks: 1 mark for improper fractions. 1 mark for multiplying them. 1 mark for $4\frac{1}{2}$.

6 (3 marks)

$$\text{Work out } 3\frac{3}{4} \div 1\frac{1}{2}$$

Change to improper fractions:

$$3\frac{3}{4} = \frac{15}{4} \text{ and } 1\frac{1}{2} = \frac{3}{2}$$

Flip the second fraction and multiply:

$$\frac{15}{4} \times \frac{2}{3} = \frac{30}{12}$$

$$\text{Simplify: } \frac{30}{12} = \frac{5}{2} = 2\frac{1}{2}$$

Answer: $2\frac{1}{2}$

Tip: Only flip the fraction you are dividing **by** (the second one). You do not need a common denominator to divide.

Marks: 1 mark for improper fractions. 1 mark for flipping the second fraction and multiplying. 1 mark for $2\frac{1}{2}$.

7 (2 marks)

Show that $\left(1\frac{1}{2}\right)^2 - \frac{3}{4} = 1\frac{1}{2}$

Change to an improper fraction: $1\frac{1}{2} = \frac{3}{2}$

Square it: $\left(\frac{3}{2}\right)^2 = \frac{3 \times 3}{2 \times 2} = \frac{9}{4}$

Subtract: $\frac{9}{4} - \frac{3}{4} = \frac{6}{4}$

Simplify: $\frac{6}{4} = \frac{3}{2} = 1\frac{1}{2}$ ✓

Answer: $\frac{9}{4} - \frac{3}{4} = \frac{3}{2}$

Marks: 1 mark for $\frac{9}{4}$. 1 mark for showing the rest of the working to reach $1\frac{1}{2}$.

8 (5 marks)

A rectangle has sides of length $2\frac{1}{4}$ m and $3\frac{1}{3}$ m.

(a) Work out the area of the rectangle.

Area = length $\times$ width

$$2\frac{1}{4} = \frac{9}{4} \text{ and } 3\frac{1}{3} = \frac{10}{3}$$

$$\frac{9}{4} \times \frac{10}{3} = \frac{90}{12}$$

$$\frac{90}{12} = \frac{15}{2} = 7\frac{1}{2}$$

Answer: $7\frac{1}{2} \text{ m}^2$

Marks: 1 mark for $\frac{9}{4} \times \frac{10}{3}$. 1 mark for $7\frac{1}{2}$.

(b) Work out the perimeter of the rectangle.

Perimeter = $2 \times (\text{length} + \text{width})$

$$\text{Length + width: } \frac{9}{4} + \frac{10}{3} = \frac{27}{12} + \frac{40}{12} = \frac{67}{12}$$

$$\text{Double it: } 2 \times \frac{67}{12} = \frac{134}{12}$$

$$\frac{134}{12} = 11\frac{2}{12} = 11\frac{1}{6}$$

Answer: $11\frac{1}{6}$ m

Marks: 1 mark for adding the two lengths with a common denominator. 1 mark for doubling. 1 mark for $11\frac{1}{6}$.

9 (2 marks)

Work out $\frac{1}{\frac{1}{3} + \frac{1}{4}}$

Work out the bottom first.

$$\frac{1}{3} + \frac{1}{4} = \frac{4}{12} + \frac{3}{12} = \frac{7}{12}$$

$$\text{Now } 1 \div \frac{7}{12} = 1 \times \frac{12}{7} = \frac{12}{7}$$

$$\text{As a mixed number: } \frac{12}{7} = 1\frac{5}{7}$$

Answer: $\frac{12}{7} = 1\frac{5}{7}$

Marks: 1 mark for $\frac{7}{12}$. 1 mark for $\frac{12}{7}$.

10 (3 marks)

A water tank is $\frac{2}{5}$ full.

42 litres of water are added.

The tank is now $\frac{3}{4}$ full.

Work out the capacity of the tank.

The 42 litres take the tank from $\frac{2}{5}$ full to $\frac{3}{4}$ full.

Fraction added: $\frac{3}{4} - \frac{2}{5} = \frac{15}{20} - \frac{8}{20} = \frac{7}{20}$

So $\frac{7}{20}$ of the tank is 42 litres.

$\frac{1}{20}$ of the tank: $42 \div 7 = 6$ litres

The whole tank: $6 \times 20 = 120$ litres

Answer: 120 litres

Tip: The 42 litres is only the part that was added, $\frac{7}{20}$ of the tank. It is not $\frac{3}{4}$ of the tank.

Marks: 1 mark for $\frac{3}{4} - \frac{2}{5}$ or $\frac{7}{20}$. 1 mark for $42 \div \frac{7}{20}$ (or $42 \div 7 \times 20$). 1 mark for 120.
