

Fractions - Four Operations

Solutions

For Pearson Edexcel GCSE Mathematics (1MA1) • 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 (4 marks)

(a) Work out $2\frac{5}{8} + 1\frac{5}{6}$

Change to improper fractions:

$$2\frac{5}{8} = \frac{21}{8} \text{ and } 1\frac{5}{6} = \frac{11}{6}$$

The lowest common denominator of 8 and 6 is 24.

$$\frac{21}{8} = \frac{63}{24} \text{ and } \frac{11}{6} = \frac{44}{24}$$

$$\frac{63}{24} + \frac{44}{24} = \frac{107}{24}$$

As a mixed number: $\frac{107}{24} = 4\frac{11}{24}$

Answer: $4\frac{11}{24}$

Tip: The lowest common denominator of 8 and 6 is 24, not 48. Using 48 still works, but the numbers are bigger and errors are more likely.

Marks: 1 mark for using a correct common denominator (at most one error). 1 mark for $4\frac{11}{24}$ (or $\frac{107}{24}$).

(b) Work out $2\frac{1}{4} \div 1\frac{2}{7}$

Give your answer as a mixed number in its simplest form.

Change to improper fractions: $2\frac{1}{4} = \frac{9}{4}$ and $1\frac{2}{7} = \frac{9}{7}$

Flip the second fraction and multiply:

$$\frac{9}{4} \times \frac{7}{9} = \frac{63}{36}$$

Simplify (divide top and bottom by 9): $\frac{63}{36} = \frac{7}{4}$

As a mixed number: $\frac{7}{4} = 1\frac{3}{4}$

Answer: $1\frac{3}{4}$

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

2 (3 marks)

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

Give your answer as a mixed number in its simplest form.

Change to improper fractions:

$$3\frac{1}{3} = \frac{10}{3} \text{ and } 1\frac{3}{4} = \frac{7}{4}$$

Multiply the tops and multiply the bottoms:

$$\frac{10}{3} \times \frac{7}{4} = \frac{70}{12}$$

Simplify (divide top and bottom by 2): $\frac{70}{12} = \frac{35}{6}$

As a mixed number: $\frac{35}{6} = 5\frac{5}{6}$

Answer: $5\frac{5}{6}$

Tip: Do not multiply the whole numbers and the fractions separately. 3×1 and $\frac{1}{3} \times \frac{3}{4}$ gives the wrong answer.

Marks: 1 mark for improper fractions. 1 mark for $\frac{70}{12}$ (or equivalent). 1 mark for $5\frac{5}{6}$.

3 (3 marks)

Show that $1\frac{3}{5} \times 2\frac{3}{4} = 4\frac{2}{5}$

Change to improper fractions:

$$1\frac{3}{5} = \frac{8}{5} \text{ and } 2\frac{3}{4} = \frac{11}{4}$$

Multiply: $\frac{8}{5} \times \frac{11}{4} = \frac{88}{20}$

Simplify (divide top and bottom by 4): $\frac{88}{20} = \frac{22}{5}$

$22 \div 5 = 4$ remainder 2, so $\frac{22}{5} = 4\frac{2}{5}$ ✓

Answer: $\frac{8}{5} \times \frac{11}{4} = \frac{22}{5} = 4\frac{2}{5}$

Tip: In a “show that” question, write every step, including changing $\frac{22}{5}$ back to $4\frac{2}{5}$. Just writing “= $4\frac{2}{5}$ ” at the end is not enough.

Marks: 1 mark for improper fractions. 1 mark for $\frac{88}{20}$ (or cancelling first). 1 mark for showing that this equals $4\frac{2}{5}$.

4 (3 marks)

Show that $4\frac{1}{2} \div 1\frac{1}{8} = 4$

Change to improper fractions:

$$4\frac{1}{2} = \frac{9}{2} \text{ and } 1\frac{1}{8} = \frac{9}{8}$$

Flip the second fraction and multiply:

$$\frac{9}{2} \times \frac{8}{9} = \frac{72}{18}$$

$$72 \div 18 = 4, \text{ so } \frac{72}{18} = 4 \quad \checkmark$$

Answer: $\frac{9}{2} \times \frac{8}{9} = 4$

Tip: Only flip the fraction you are dividing **by**. Do not flip both fractions.

Marks: 1 mark for improper fractions. 1 mark for $\frac{9}{2} \times \frac{8}{9}$. 1 mark for showing that this equals 4.

5 (3 marks)

Work out $5\frac{1}{4} - 2\frac{2}{3}$

Give your answer as a mixed number.

Change to improper fractions:

$$5\frac{1}{4} = \frac{21}{4} \quad \text{and} \quad 2\frac{2}{3} = \frac{8}{3}$$

The lowest common denominator of 4 and 3 is 12.

$$\frac{21}{4} = \frac{63}{12} \quad \text{and} \quad \frac{8}{3} = \frac{32}{12}$$

$$\frac{63}{12} - \frac{32}{12} = \frac{31}{12}$$

As a mixed number: $\frac{31}{12} = 2\frac{7}{12}$

Answer: $2\frac{7}{12}$

Tip: If you subtract the whole numbers and fractions separately, take care: $\frac{1}{4} - \frac{2}{3}$ is negative. Improper fractions avoid this problem.

Marks: 1 mark for improper fractions (or a correct common denominator). 1 mark for $\frac{31}{12}$. 1 mark for $2\frac{7}{12}$.

6 (2 marks)

$$\frac{1}{a} = \frac{1}{2} - \frac{1}{5}$$

Find the value of a .

Work out the right-hand side:

$$\frac{1}{2} - \frac{1}{5} = \frac{5}{10} - \frac{2}{10} = \frac{3}{10}$$

$$\text{So } \frac{1}{a} = \frac{3}{10}$$

Take the reciprocal of both sides (turn them upside down):

$$a = \frac{10}{3}$$

Answer: $\frac{10}{3}$

Marks: 1 mark for $\frac{3}{10}$. 1 mark for $\frac{10}{3}$ (or $3\frac{1}{3}$).

7 (3 marks)

A tank holds $22\frac{1}{2}$ litres of water.

A jug holds $1\frac{7}{8}$ litres of water.

How many jugs of water are needed to fill the tank?

Divide the tank by the jug.

Change to improper fractions: $22\frac{1}{2} = \frac{45}{2}$ and $1\frac{7}{8} = \frac{15}{8}$

$$\frac{45}{2} \div \frac{15}{8} = \frac{45}{2} \times \frac{8}{15}$$

$$= \frac{360}{30} = 12$$

Answer: 12

Marks: 1 mark for dividing $22\frac{1}{2}$ by $1\frac{7}{8}$. 1 mark for $\frac{45}{2} \times \frac{8}{15}$. 1 mark for 12.

8 (3 marks)

Jo spends $\frac{2}{5}$ of her money on rent.

She spends $\frac{3}{8}$ of the rest on food.

What fraction of her money is left?

After rent, the rest is $1 - \frac{2}{5} = \frac{3}{5}$ of her money.

Food is $\frac{3}{8}$ of this $\frac{3}{5}$:

$$\frac{3}{8} \times \frac{3}{5} = \frac{9}{40}$$

Money left: $\frac{3}{5} - \frac{9}{40}$

$$= \frac{24}{40} - \frac{9}{40} = \frac{15}{40}$$

Simplify: $\frac{15}{40} = \frac{3}{8}$

Answer: $\frac{3}{8}$

Tip: “ $\frac{3}{8}$ of the rest” means $\frac{3}{8}$ of the $\frac{3}{5}$ that is left, not $\frac{3}{8}$ of all her money.

Marks: 1 mark for $\frac{3}{5}$. 1 mark for $\frac{9}{40}$. 1 mark for $\frac{3}{8}$.
