



Fraction arithmetic and percentage change

Grades 4–9 About 80 minutes No calculator

87 marks

Name _____

Class _____

Date _____

A Before you start

Grades 4–5

You will need these in every question below.

A1 Work out $\frac{2}{3} + \frac{1}{6}$.

[1 mark]

Answer

A2 Write $\frac{18}{24}$ in its simplest form.

[1 mark]

Answer

A3 Write $2\frac{3}{5}$ as an improper fraction.

[1 mark]

Answer

A4 Work out 15% of 80.

[1 mark]

Answer

A5 Write $\frac{7}{20}$ as a percentage.

[1 mark]

Answer

Your teacher works through each example with you. Then try the one beside it on your own.

EXAMPLE 1

Work out $2\frac{1}{4} + 1\frac{5}{6}$.

Hint Write each mixed number as an improper fraction. Then use a common denominator: 12 is the smallest one that 4 and 6 both go into.

B1 Work out $3\frac{2}{5} - 1\frac{3}{4}$.

[3 marks]

Answer

EXAMPLE 2

Work out $1\frac{3}{5} \div 2\frac{2}{3}$.

Hint Write both as improper fractions. Dividing by a fraction is the same as multiplying by its reciprocal.

B2 Work out $2\frac{1}{4} \div 1\frac{2}{7}$.

[3 marks]

Answer

EXAMPLE 3

Increase £320 by 15%.

Hint The new amount is 115% of the old one, so multiply by 1.15. Or find 15% and add it on.

B3 Decrease £360 by 35%.

[2 marks]

Answer

EXAMPLE 4

The price of a ticket rose from £40 to £46.
Work out the percentage increase.

Hint Find the change first. Then write the change as a percentage of the ORIGINAL price.

B4 The number of members of a club fell from 250 to 215. Work out the percentage decrease. [3 marks]

Answer

c Practice

Grades 5–7

Each question asks for something different. Show your working.

C1 Write 45 minutes as a fraction of 2 hours. Give your answer in its simplest form. [2 marks]

Answer

C2 Write these numbers in order of size. Start with the smallest. [2 marks]

$\frac{5}{8}$ 0.61 63% $\frac{3}{5}$

Answer

C3 Work out $\frac{4}{9} \times \frac{15}{16}$. Give your answer in its simplest form. [2 marks]

Answer

C4 There are 32 students in a class. $\frac{3}{8}$ of them walk to school, 25% come by bus and the rest come by car.

(a) How many of the students come by car? [2 marks]

Answer

(b) What percentage of the class come by car? [2 marks]

Answer

Total for C4: 4 marks

C5 Write down the reciprocal of $2\frac{1}{3}$. [1 mark]

Answer

C6 Asha scored 42 out of 56 in her first test and 54 out of 75 in her second test. In which test did she get the higher percentage? You must show your working. [3 marks]

Answer

C7 Work out $\frac{3}{4} - \frac{2}{3} \times \frac{3}{8}$. [2 marks]

Answer

- C8** A water tank is $\frac{2}{5}$ full. After 36 litres are added, it is $\frac{7}{10}$ full. How many litres does the tank hold when it is full? [3 marks]

Answer

- C9** Find the number that is exactly halfway between $\frac{2}{3}$ and $\frac{4}{5}$. [2 marks]

Answer

D Exam-style questions

Grades 6–9

Answer every question in the space given. Show your working: most of the marks are for method.

- D1** Show that $1\frac{5}{6} \div 2\frac{4}{9} = \frac{3}{4}$. [3 marks]

- D2** A shop buys a jacket for £80 and sells it for £120.

- (a) Work out the profit as a percentage of the price the shop paid. [2 marks]

Answer

- (b) In a sale, the shop reduces its selling price of the jacket by 15%. Work out the profit in the sale as a percentage of the price the shop paid. [3 marks]

Answer

Total for D2: 5 marks

- D3** Sam says, " $\frac{2}{5} + \frac{3}{4} = \frac{5}{9}$." [3 marks]

Explain why Sam is wrong, and work out the correct answer.

Answer

- D4** Kerry has £2400. She gives $\frac{1}{3}$ of it to her brother. She gives 25% of what is left to her sister. Then she spends $\frac{3}{8}$ of what she has left. [4 marks]

How much money does Kerry have now?

Answer

- D5** Jo's salary rises from £24 000 to £25 080. Show that this is an increase of 4.5%. [2 marks]

D6 A rectangular garden is $12\frac{1}{2}$ m long and $8\frac{2}{5}$ m wide.

(a) Show that the area of the garden is 105 m^2 .

[2 marks]

(b) $\frac{3}{7}$ of the garden is to be sown with grass seed. A bag of seed covers 9 m^2 and costs £4.80. The shop takes 10% off the price when you buy 5 or more bags. [4 marks]

Work out the cost of the seed for the garden.

Answer

Total for D6: 6 marks

D7 400 people were asked which hot drink they like best. $\frac{3}{8}$ of them said tea. 36% of the rest said coffee. Everyone else said neither. [4 marks]

What percentage of the 400 people said neither?

Answer

D8 Work out $(2\frac{1}{3})^2 - 1\frac{1}{2} \div \frac{3}{4}$. Give your answer as a mixed number. [3 marks]

Answer

- D9** Last year a café sold 1250 cups of coffee a week at £2.40 a cup. This year it sells 1400 cups a week at £2.70 a cup. [4 marks]

Work out the percentage increase in the money the café takes for coffee each week.

Answer

- D10** A ribbon is 2.4 m long. Hasan cuts 45 cm off it. Then he cuts off $\frac{2}{5}$ of the ribbon that is left. [3 marks]

What fraction of the original ribbon is left now? Give your answer in its simplest form.

Answer

E Extension

Grade 9 and beyond

No route is given. Spend five minutes on a problem before you look at a hint. The hints are on the last page of the worksheet, and you can use one at a time.

- E1** A unit fraction has 1 as its numerator, such as $\frac{1}{7}$. [4 marks]

Find every way of writing $\frac{5}{12}$ as the sum of two different unit fractions.

Answer

- E2** A fraction and its reciprocal add up to $\frac{13}{6}$. Find the fraction. Give every possible answer. [3 marks]

Answer

- E3** In a school, 45% of the students are boys. 20% of the boys and $x\%$ of the girls play in the orchestra. Altogether, 25.5% of the students play in the orchestra. Find the value of x . [3 marks]

Answer

- E4** Work out the exact value of [3 marks]

$$\left(1 - \frac{1}{2}\right) \left(1 - \frac{1}{3}\right) \left(1 - \frac{1}{4}\right) \cdots \left(1 - \frac{1}{50}\right)$$

Answer

F How did it go?

Colour one circle on each line.

	Not yet	Nearly	Yes
I can add, subtract, multiply and divide fractions and mixed numbers.	☐	☐	☐
I can write one quantity as a fraction of another.	☐	☐	☐
I can increase or decrease an amount by a percentage.	☐	☐	☐
I can work out a percentage change and write one quantity as a percentage of another.	☐	☐	☐

Extension hints

Use one hint at a time. Cover the ones below it with a sheet of paper.

E1	Hint 1	Call the larger fraction $\frac{1}{a}$. It must be more than half of $\frac{5}{12}$, but less than $\frac{5}{12}$.
	Hint 2	Half of $\frac{5}{12}$ is $\frac{5}{24}$, so $\frac{1}{a}$ is between $\frac{5}{24}$ and $\frac{5}{12}$. That leaves $a = 3$ or $a = 4$.
	Hint 3	$\frac{5}{12} - \frac{1}{3} = \frac{1}{12}$ and $\frac{5}{12} - \frac{1}{4} = \frac{2}{12} = \frac{1}{6}$. So $\frac{1}{3} + \frac{1}{12}$ and $\frac{1}{4} + \frac{1}{6}$ are the only two ways.

E2	Hint 1	Write the fraction as $\frac{a}{b}$, so its reciprocal is $\frac{b}{a}$. Add them.
	Hint 2	$\frac{a}{b} + \frac{b}{a} = \frac{a^2+b^2}{ab}$
	Hint 3	So $a^2 + b^2 = 13$ and $ab = 6$ will do: $a = 2$ and $b = 3$. The fraction is $\frac{2}{3}$, or its reciprocal $\frac{3}{2}$, which works just as well.

E3	Hint 1	Suppose the school has 100 students. Work out how many are boys and how many are girls.
	Hint 2	20% of 45 boys is 9, and 25.5 of the 100 students play, so 16.5 girls play.
	Hint 3	16.5 out of 55 girls is $\frac{16.5}{55} \times 100 = 30\%$, so $x = 30$.

E4	Hint 1	Work out each bracket as a single fraction.
	Hint 2	$\frac{1}{2} \times \frac{2}{3} \times \frac{3}{4} \times \cdots \times \frac{49}{50}$
	Hint 3	Each numerator cancels with the denominator before it. Only the first numerator, 1, and the last denominator, 50, are left. The answer is $\frac{1}{50}$.