Worksheet - Fractions, decimals and percentages

Year: Year 10 · 20

Show your working.

Question 1

Question 1 – The four operations with fractions *(Section A · Skills practice)*

Non-calculator. Work out each answer. Give fractions in their simplest form and write improper fractions as mixed numbers.

a. $\frac{2}{3} + \frac{3}{4}$

b. $5\frac{1}{2} - 2\frac{3}{4}$

c. $\frac{3}{5} \times \frac{10}{21}$

d. $2\frac{1}{4} \div 1\frac{1}{2}$

Question 2

Question 2 – Equivalent fractions, decimals and percentages *(Section A · Skills practice)*

Copy and complete the table. Show how you converted each one.

Fraction	Decimal	Percentage
$\frac{7}{40}$	?	?
?	0.36	?
?	?	62.5%
$\frac{3}{11}$	?	?

a. Complete row 1.
b. Complete row 2.
c. Complete row 3.
d. Complete row 4 and write the decimal using dot notation.

Question 3

Question 3 – Percentages of amounts *(Section A · Skills practice)*

Non-calculator. Work out each percentage using 10% and 1% as stepping stones.

a. 15% of £84
b. 12.5% of 640
c. 7% of 350
d. 35% of 2.4 kg

Question 4

Question 4 – Multipliers *(Section A · Skills practice)*

Write the multiplier for each change, then use it to find the new value.

a. Increase £60 by 8%.
b. Decrease 250 kg by 15%.
c. Increase 840 m by 2.5%.
d. Decrease £12 500 by 0.4%.

Question 5

Question 5 – Percentage change *(Section A · Skills practice)*

Find the percentage change in each case. Say whether it is an increase or a decrease.

a. from 80 to 100
b. from 250 to 190
c. from 36 to 45
d. from 2.5 to 2

Question 6

Question 6 – Reverse percentages *(Section A · Skills practice)*

Each value is the result of a percentage change. Find the original value.

a. After a 20% increase the price is £54.
b. After a 15% decrease the price is £68.
c. After an 8% increase the value is £175.50.
d. After a 35% decrease the mass is 91 g.

Question 7

Question 7 – Prices with VAT *(Section B · Real-life practice)*

In the UK, most goods have VAT at 20% added to the price. A shop sells the items below. The prices shown include VAT.

Item	Price including VAT
Laptop	£480
Headphones	£36
Desk lamp	£27

a. Work out the price of the laptop without VAT.
b. Work out the amount of VAT in the price of the headphones.
c. The lamp is reduced by 15% in a sale. Find the new price including VAT.
d. A customer says, “VAT on the laptop is 20% of £480, which is £96.” Explain her mistake.

Question 8

Question 8 – The January sale *(Section B · Real-life practice)*

A sports shop has a coat for £120. In the sale, it is reduced by 25%. A customer also has a voucher that gives a further 10% off the sale price.

a. Work out the sale price.
b. Work out the price after the voucher.
c. Find the single multiplier for both reductions and the overall percentage saved.
d. A second customer buys the coat when it is reduced by 35% with no voucher. Who pays less, and by how much?

Question 9

Question 9 – Take-home pay *(Section B · Real-life practice)*

Priya earns £28 000 a year. She pays no tax on the first £12 570 (her personal allowance) and 20% tax on the rest. Calculator allowed.

a. Work out how much tax she pays in a year.
b. Work out her income after tax in a year and in a month (to the nearest penny).
c. She gets a 3.5% pay rise. Work out her new salary.
d. By how much does her yearly tax increase after the rise?

Question 10

Question 10 – A car losing value *(Section B · Real-life practice)*

A new car costs £18 000. Its value falls by 15% each year. Calculator allowed.

a. Work out the value after 1 year.
b. Work out the value after 3 years to the nearest £.
c. After how many whole years is the value first less than £8000?
d. Find the total percentage the car has lost after 3 years, to 1 decimal place.

Question 11

Question 11 – A growing town *(Section B · Real-life practice)*

The population of a town is 42 000 and it is growing at 2.4% per year.

a. Work out the population after 5 years to the nearest hundred.
b. After how many years will the population first exceed 50 000?
c. Show that the population increases by about 1000 in the first year.
d. A neighbouring town has 38 000 people and is growing at 3.1% per year. After how many years will it have more people than the first town (start now)?

Question 12

Question 12 – Exam marks *(Section B · Real-life practice)*

Three pupils sat two maths papers. Paper 1 is out of 72 marks and Paper 2 is out of 90 marks.

Pupil	Paper 1	Paper 2
Ayo	54	63
Bella	45	72
Carlos	63	54

a. Write each pupil's Paper 1 score as a percentage.
b. Write each pupil's Paper 2 score as a percentage.
c. The final grade uses 60% of the Paper 1 percentage and 40% of the Paper 2 percentage. Find each pupil's final percentage.
d. Who has the highest final percentage?

Question 13

Question 13 – School travel survey *(Section B · Real-life practice)*

In a survey of 360 pupils, $\frac{2}{5}$ walk to school, $\frac{1}{4}$ take the bus, and the rest travel by car or bike.

a. How many pupils walk and how many take the bus?
b. What fraction of the pupils travel by car or bike? Write it as a percentage as well.
c. Of the pupils who travel by car or bike, 40% cycle. How many cycle?
d. Draw (describe) the pie chart angles for walk, bus and car or bike.

Question 14

Question 14 – Simple and compound interest *(Section B · Real-life practice)*

Sam invests £2000 for 4 years at 3% per year. His brother Jay invests £2000 for 4

years at 3% per year compound interest.

a. Work out the simple interest for Sam and his total after 4 years.
b. Work out Jay's total after 4 years, to the nearest penny.
c. How much more does Jay have than Sam?
d. Explain why compound interest gives more.

Question 15

Question 15 – Two successive discounts *(Section C · Problem solving)*

Dev buys a bike. The shop takes 10% off the marked price, and then a further 25% off the reduced price for a damaged item. Dev pays £87.75.

a. Write down the single multiplier for the two discounts.
b. Work out the original marked price.
c. Work out the overall percentage reduction.
d. Zoe says it is the same as 35% off. Show that she is wrong.

Question 16

Question 16 – Higher: recurring decimals *(Section C · Problem solving)*

Higher tier. Convert recurring decimals to fractions using the method: let x be the number, multiply by a power of 10 to line up the repeats, then subtract.

a. Show that $0.\dot{7} = \frac{7}{9}$.
b. Show that $0.\dot{4}\dot{5} = \frac{5}{11}$.
c. Write $0.2\dot{1}$ as a fraction in its simplest form.
d. Show that $0.\dot{9} = 1$.

Question 17

Question 17 – Doubling time *(Section C · Problem solving)*

A savings account pays 7% compound interest per year. Calculator allowed.

a. Find the value of £1000 after 10 years.
b. After how many whole years does the account first have more than double the original amount?
c. Use the "rule of 72" (years to double $\approx 72 \div$ rate) to estimate the doubling time and compare it with your answer.
d. A different account pays 4%. Use trial and improvement to find how many years it takes to double.

Question 18

Question 18 – Fraction of the remainder *(Section C · Problem solving)*

Lena has some money. She spends $\frac{1}{3}$ of it on a book. She then spends $\frac{2}{5}$ of the money she has left on lunch. She has £12 left at the end.

a. What fraction of her original money is left after buying the book?
b. What fraction of her original money does she spend on lunch?
c. What fraction of her original money is left at the end?
d. How much money did Lena start with, and how much did the book cost?

Question 19

Question 19 – Profit and loss *(Section C · Problem solving)*

A shopkeeper buys a games console for £240 and sells it for £330.

a. Work out the percentage profit based on the cost price.
b. She wants a 40% profit on the cost price on another console that cost her £275. Find the selling price.
c. A third console is sold for £399 which gives a 33% profit. What was the cost price?
d. A fourth console is sold at a 20% loss for £192. What was the cost price?

Question 20

Question 20 – Challenge: up then down by the same percentage *(Section D · Challenge)*

A price is increased by $x\%$ and then the new price is decreased by $x\%$. The final price is 9% lower than the original price.

a. Show that the overall multiplier is $1 - \frac{x^2}{10\,000}$.
b. Find x.
c. Check your value with an original price of £200.
d. Why can the final price never be higher than the original price if the same percentage is used?