Ratio, Proportion and Rates of change – 2021/20 GCSE Mathematics Higher
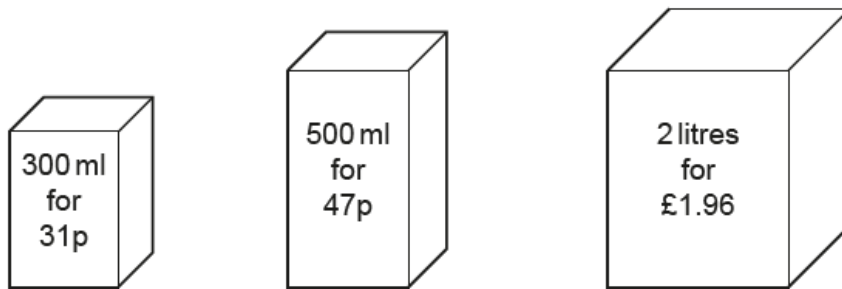
1. Nov/2021/Paper_J560/04/No.6

A shop sells the same milk in three different sized cartons.
The diagram shows the price of each carton.

300 ml for 31p

500 ml for 47p

2 litres for £1.96

(a) Which carton is the best value for money?
Show how you decide.

....

....

.... **[3]**

(b) A student only buys milk on a Saturday morning.
They use 120 ml of milk each day.
Any unused milk has to be thrown away at the end of the following Friday.

Show that it is cheaper for the student to buy the milk they need in 300 ml cartons than in 500 ml cartons. **[3]**

2. Nov/2021/Paper_J560/04/No.8

Jamie invests £6000 at a simple interest rate of $r\%$ each year.
After 6 years the value of their investment is £7170.

Find the value of r.

$r =$ .... **[4]**

2. Nov/2021/Paper_J560/04/No.8

3. Nov/2021/Paper_J560/04/No.16

The formula

$$P = 6800 \times 1.045^n$$

is used to predict the population, P, of an island n years after 2018.

(a) Write down the population of the island in 2018.

(a) .... [1]

(b) Write down the percentage growth rate used in the formula.

(b) .... % [1]

(c) (i) Work out the population predicted by the formula for the year 2030.

(c)(i) .... [2]

(ii) Give **one** reason why the answer to **(c)(i)** may **not** be reliable.

....

.... [1]

4. Nov/2021/Paper_J560/06/No.2

Azmi, Beth and Callum share a flat.

(a) The monthly rent is £760.
They share the rent in the ratio 2 : 3 : 3.

How much does Beth pay for rent each month?

(a) £ .... **[2]**

(b) Azmi, Beth and Callum also share the fuel bill in the ratio 2 : 3 : 3.
Callum pays £36 for fuel each month.

How much does Azmi pay for fuel each month?

(b) £ .... **[2]**

4. Nov/2021/Paper_J560/06/No.2

5. Nov/2021/Paper_J560/06/No.6

A bag of sweets contains jellies, mints and toffees.

The ratio of jellies to mints is $n : 2$.
The ratio of mints to toffees is $5 : 3n$.

Work out the ratio of jellies to toffees.
Give your answer in its simplest form.

.... : .... **[4]**

6. Nov/2021/Paper_J560/06/No.8

(a) Train A travels 120 km at a constant speed of 80 km/h.
Train B travels 120 km at a constant speed of 50 km/h.

How many more minutes does train B take to travel 120 km than train A?

(a) .... minutes **[4]**

(b) Train C has a speed of x km/h.

Write an algebraic expression for train C's speed in metres per second.

(b) .... m/s **[2]**

7. Nov/2021/Paper_J560/06/No.14

y is inversely proportional to the square root of x.
$y = 5$ when $x = 36$.

(a) Find a formula linking x and y.

(a) .... **[3]**

(b) Find the value of x when $y = 20$.

(b) $x =$ .... **[3]**

7. Nov/2021/Paper_J560/06/No.14

8. Nov/2020/Paper_J560/04/No.3

Three people take $2\frac{1}{2}$ hours to deliver leaflets to 270 houses.

Assuming all people deliver leaflets at the same rate, how long will it take five people to deliver leaflets to 405 houses?
Give your answer in hours and minutes.

.... hours .... minutes **[4]**

9. Nov/2020/Paper_J560/04/No.8

Lily buys and sells microwaves.

She buys each one for £32 and sells it for £60.
She also pays £7 for the delivery of each microwave she sells.

If she sells a microwave that is faulty then Lily must pay for its repair and redelivery.
This costs her another £25 for each faulty microwave.

Last month, 6 out of the 80 microwaves Lily sold were faulty.

This month she has orders for 133 microwaves.

Calculate her expected percentage profit on this month's order.
Showing your working in the boxes below may help you present your work.

Expected number of faulty microwaves:	Expected costs:
Income from sales:	Expected percentage profit:

10. Nov/2020/Paper_J560/04/No.16

y is inversely proportional to the square of x.
$y = 2$ when $x = 5$.

Find a formula linking x and y.

.... **[3]**

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11. Nov/2020/Paper_J560/05/No.3

(a) The ratio 45 minutes to 3 hours 45 minutes can be written in the form 1 : n.

Find the value of n.

(a) n = ... **[2]**

(b) Reece and Sarah share some money in the ratio 9 : 16.

Reece says that Sarah gets more than 60% of this money.

Show that Reece is correct.

.... **[3]**

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12. Nov/2020/Paper_J560/06/No.9

x is directly proportional to y.
y is directly proportional to z.

When $x = 10$, $y = 60$.
When $y = 8$, $z = 1.6$.

Find a formula for z in terms of x.

.... **[4]**

13. Nov/2020/Paper_J560/06/No.10

Paintings are sold in an art gallery.
The cost of a painting has k% commission added to it.
Tax of 15% is then added to the total cost to give the price to pay.

Layla correctly calculates the price to pay by multiplying the cost of the painting by 1.403.

Work out the value of k.

$k =$ .... **[3]**