Name	Date started	Target end date

REVISE
.wales

2.04 — Fraction arithmetic & equivalence

Spec 1.4.1, 1.4.2, 1.4.3 — Unit 2 (no calculator)

Adding, subtracting, multiplying and dividing fractions; converting between mixed numbers and improper fractions; equivalence and simplification. Sourced from legacy WJEC GCSE Mathematics and Mathematics-Numeracy Higher (with Intermediate top-up) non-calculator papers, organised for revision under the 2025 spec.

2025 SPECIFICATION

Estimated time for entire question pack: ~28 minutes

*Derived from the GCSE Higher pace of **~1.5 min/mark** (19 marks across 8 questions).*

*You are advised to **not** attempt to complete all of this in one sitting.*

ABOUT THIS QUESTION PACK

This is a **focused single-topic practice pack**, not a single mock paper. Questions are organised against the 2025 specification. Questions are ordered chronologically by sitting, with custom-written and SAM questions at the end.

INSTRUCTIONS

Use black ink or black ball-point pen. Show all working — method marks are awarded for clear setup.

*A calculator is **not** permitted on any question in this pack (Unit 2 is the non-calculator paper).*

Fraction arithmetic & equivalence — what the new spec asks

WJEC GCSE Mathematics (first teaching 2025) · Unit 2: non-calculator.

Equivalence & simplification 1.4.1

- Multiply or divide numerator and denominator by the same value.
- Simplest form: divide both by their HCF.
- Compare fractions by converting to a common denominator.

Mixed numbers & improper fractions 1.4.1

- $a\frac{b}{c} = \frac{ac+b}{c}$.
- Always convert before multiplying or dividing.
- Convert back to mixed form for a tidy final answer if appropriate.

Add & subtract 1.4.2

- Use the lowest common denominator (LCD).
- Add/subtract numerators only; the denominator stays the same.
- Simplify at the end.

Multiply & divide 1.4.3

- Multiply: numerator × numerator, denominator × denominator.
- Divide: multiply by the reciprocal.
- Cancel common factors early to keep arithmetic simple.

Crib sheet »

Fraction arithmetic & equivalence in one page

Quick-reference notes — revisit before each question. Don't use during the questions.

Add & subtract — common denominator

$$\frac{a}{b} \pm \frac{c}{d} = \frac{ad \pm bc}{bd}$$

Find the LCD, rewrite each fraction over it, then add/subtract numerators.

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

Multiply — straight across

$$\frac{a}{b} \times \frac{c}{d} = \frac{ac}{bd}$$

$\frac{2}{5} \times \frac{1}{4} = \frac{2}{20} = \frac{1}{10}$.

Cancel common factors *before* multiplying to keep numbers small.

Divide — multiply by the reciprocal

$$\frac{a}{b} \div \frac{c}{d} = \frac{a}{b} \times \frac{d}{c}$$

$\frac{3}{4} \div \frac{2}{5} = \frac{3}{4} \times \frac{5}{2} = \frac{15}{8} = 1\frac{7}{8}$.

Mixed ↔ improper

Mixed → improper: multiply whole × denominator, add numerator.

$2\frac{3}{5} = \frac{2 \times 5 + 3}{5} = \frac{13}{5}$.

Improper → mixed: divide; quotient is the whole, remainder over original denominator.

Simplify by HCF

Divide numerator and denominator by their HCF.

$\frac{18}{24} = \frac{18 \div 6}{24 \div 6} = \frac{3}{4}$.

State fractions in simplest form unless told otherwise.

Decimal ↔ fraction

Terminating decimal: write over a power of 10, then simplify.

$0 \cdot 83 = \frac{83}{100}$ (already simplest).

$0 \cdot 13 = \frac{13}{100}$.

Fraction of a quantity

"$\frac{3}{8}$ of 120" = 120 ÷ 8 × 3 = 45.

For multi-step problems, work out the fraction left first, then take the next share of that.

Common traps

- Adding numerators *and* denominators — wrong: $\frac{1}{2} + \frac{1}{3} \neq \frac{2}{5}$.
- Forgetting to convert mixed numbers before multiplying/dividing.
- Leaving answers un-simplified.

Examiner only

6. Daniel has made a pizza to share with some friends.

After he has taken his share, he calculates that he has $0{\cdot}8\dot{3}$ of the pizza left.
Daniel shares what he has left equally between 3 of his friends.
Calculate the fraction of the whole pizza that each of these 3 friends will have.
Give your answer as a fraction in its lowest terms. [4]

Examiner only

2. Circle the correct answer to complete each of the following statements.

(a) $\frac{1}{3}$ of $\frac{1}{3}$ is equal to [1]

$\frac{2}{3}$ $\frac{2}{6}$ $\frac{1}{6}$ $\frac{1}{9}$ $\frac{2}{9}$

(b) $0{\cdot}02 \times 0{\cdot}8$ is equal to [1]

0·016 0·16 1·6 0·4 4

(c) 1·5% can be written as [1]

$1{\cdot}5^{100}$ 0·15 0·015 0·105 $1{\cdot}5^{10}$

3. *(a)* Calculate the value of $\frac{\square}{\square} \times \frac{\square}{\square}$.

Give your answer in its simplest form. [1]

(b) Calculate the value of $3^3 \div 2^2$.
Give your answer as a decimal. [2]

Examiner only

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Examiner only

7. Trains using electrified railway tracks produce fewer emissions than other trains.

In 2020, the USA had the longest total length of railway track of any country in the world.

	Approximate length of **electrified** railway track (km)	Approximate **total** length of railway track (km)
USA	2×10^3	2×10^5
Rest of the world	$3{\cdot}98 \times 10^5$	$1{\cdot}2 \times 10^6$

Answer the following questions using information from the table.

(a) Calculate the percentage of track in the USA that was electrified in 2020. [2]

(b) Calculate the fraction of the **whole world's** railway track that was electrified in 2020. Give your answer in its simplest form. [5]

Examiner only

1. (a) Evaluate each of the following.

(i) $9^2 \times 10^3$ [2]

(ii) $0{\cdot}8 \times 0{\cdot}25$ [1]

(iii) $13{\cdot}4 - 2{\cdot}96$ [1]

(b) Evaluate $\frac{2}{7} \times \frac{1}{4}$.

Give your answer as a fraction in its simplest form. [2]

Examiner only

6. Most aircraft are held together with metal rivets.

(a) The rivet used on one type of aircraft is shown below. It can be thought of as a cylinder connected to a hemisphere.

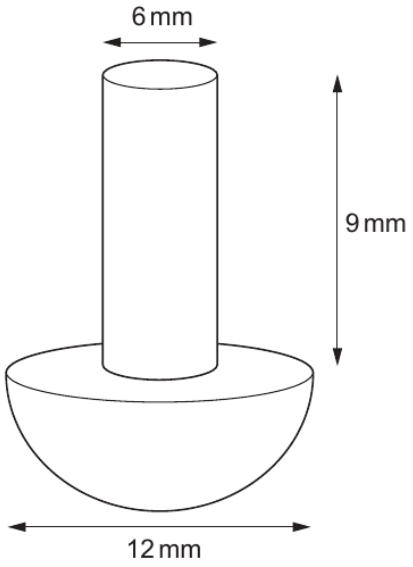


Diagram not drawn to scale

The cylinder has a diameter of 6 mm and a length of 9 mm.
The hemisphere has a diameter of 12 mm.

(i) Calculate the volume of the rivet.
Give your answer in terms of π in its simplest form. [4]

Examiner only

(ii) The manufacturer plans to reduce the length of the cylindrical part of the rivet from 9 mm to 8 mm.
Calculate the fractional reduction in the volume of a rivet this would produce. [2]

Fractional reduction in the volume of a rivet = ...

(b) For another type of rivet, the manufacturer plans to reduce the volume by $0{\cdot}16\dot{1}$ of its original volume.
Write $0{\cdot}16\dot{1}$ as a fraction.
Give your answer in its simplest form. [3]

Examiner only

10. (a) Write the reciprocal of 4 as a decimal. [1]

(b) Estimate the value of $\frac{79{\cdot}34}{40{\cdot}1 \times 0{\cdot}48}$.

You must show all your approximations in your working. [2]

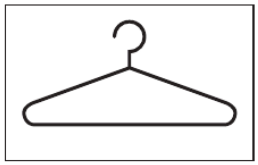
(c) Evaluate

$$1\frac{5}{7} + 2\frac{11}{14}.$$

Give your answer in its simplest form. [3]

Examiner only

9. Hang-Up is a company that makes clothes hangers.
One type of hanger is made from a single length of metal wire that is bent to form the hanger.



(a) (i) The design for the main part of the hanger is shown below.
This part of the hanger is symmetrical.
It has straight sections of length 24 cm and 38 cm.
It also has curved sections that are arcs of a circle of radius 3 cm.

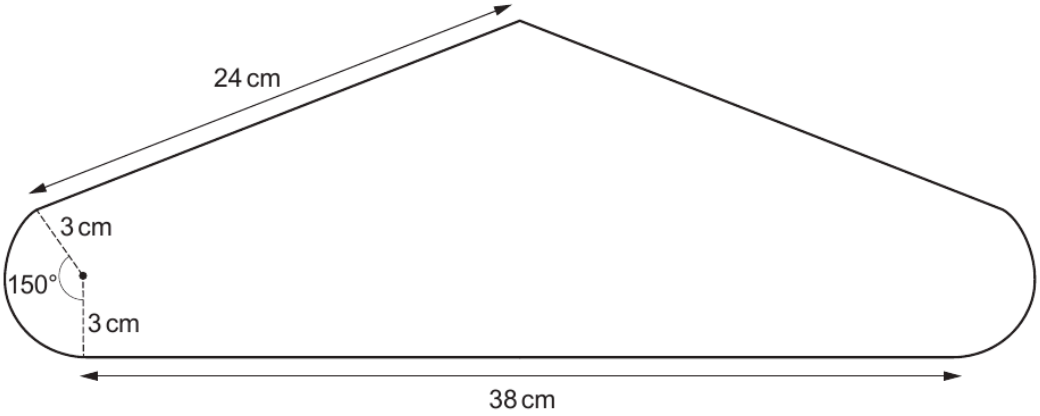


Diagram not drawn to scale

Calculate the length of metal wire needed for the main part of the hanger.
Give your answer in terms of π in its simplest form. [4]

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Examiner only

(ii) The length of wire needed for the hooked part of this hanger is $0\dot{1}\dot{3}$ of the total length of wire needed for a hanger.

Write $0\dot{1}\dot{3}$ as a fraction in its simplest form. [3]

(b) Hang-Up makes metal hangers in batches of 80.
Every 3 hours, it randomly samples 8 hangers from one batch of 80 for quality assurance.

The following numbers are taken from a table of random digits.

299986 890791 810130 955579 268884 301244

Use these numbers to choose 8 hangers from a batch of 80 hangers.
You must start with the first number in the list.
Describe clearly how you use the numbers to select the sample. [3]

Hangers chosen:

....

Examiner only

(c) Hang-Up also makes plastic hangers of various sizes.
Two of its plastic hangers have main parts that are mathematically similar.
These are shown below.

Diagram not drawn to scale

The total surface area of the larger hanger is 1·44 times the total surface area of the smaller hanger.

The height of the smaller hanger is 9 cm.
Calculate the height of the larger hanger. [3]