| Name | Date started | Target end date |
| --- | --- | --- |
| | | |

**WJEC GCSE Mathematics and Numeracy (Double Award) — Question Pack**

Direct and inverse proportion. Sourced from legacy WJEC GCSE Mathematics Higher papers, organised for revision under the 2025 spec.

REVISE
.wales

# 1.12 — Direct & inverse proportion

## *Spec 1.10.3 — Unit 1 (calculator allowed)*

*Direct and inverse proportion. Sourced from legacy WJEC GCSE Mathematics Higher papers, organised for revision under the 2025 spec.*

2025 SPECIFICATION

### Estimated time for entire question pack: ~10 minutes

*Derived from the GCSE Higher pace of **~1.5 min/mark** (7 marks across 2 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 allowed on every question in this pack (Unit 1 is the calculator-allowed paper).*

# Direct & inverse proportion — what the new spec asks

WJEC GCSE Mathematics (first teaching 2025) · Unit 1: calculator-allowed.

## Direct proportion 1.10.3

- $y \propto x$ means $y = kx$ for some constant $k$.
- Doubling $x$ doubles $y$; halving $x$ halves $y$.
- Find $k$ from any known pair, then use it for the missing value.

## Inverse proportion 1.10.3

- $y \propto 1/x$ means $y = k/x$.
- Doubling $x$ halves $y$; the product $xy = k$ is constant.
- Common in physics-style contexts: time vs speed, force vs distance.

## Finding the constant 1.10.3

- Substitute one known pair into the relationship.
- Solve for $k$, then state the explicit formula $y = \ldots$
- Use the formula to predict missing values in a table.

## Powers & roots 1.10.3

- $y \propto x^n$ covers $x^2$, $\sqrt{x}$, $1/x^2$, etc.
- Same method: find $k$ from one pair.
- Watch the wording — “square”, “cube”, “root” flag the power.



Crib sheet »

# Direct & inverse proportion in one page

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

## Direct proportion

$$y = kx$$

$y$ is *directly* proportional to $x$ means doubling $x$ doubles $y$.

$k$ is the *constant of proportionality*.

## Inverse proportion

$$y = \frac{k}{x}$$

$y$ is *inversely* proportional to $x$ means doubling $x$ halves $y$.

Same $k$ for every $(x, y)$ pair.

## Find $k$ from one pair

Given $y = 12$ when $x = 4$ and $y \propto x$:

$12 = k \times 4 \Rightarrow k = 3$, so $y = 3x$.

For inverse: $12 = k/4 \Rightarrow k = 48$, so $y = 48/x$.

## Cross-multiply

Direct: $\frac{y_1}{x_1} = \frac{y_2}{x_2}$.

Inverse: $y_1 x_1 = y_2 x_2$.

Always identify *which* type before using.

## Higher powers

$y \propto x^2$: $y = kx^2$.

$y \propto \sqrt{x}$: $y = k\sqrt{x}$.

$y \propto 1/x^2$: $y = k/x^2$.

## Common traps

- Confusing direct and inverse from the wording.
- Forgetting $k$ stays the same across all pairs.
- Mixing units (cm vs m) before forming the relationship.

Examiner only

**8.** On a new housing estate, teams of painters paint the walls and ceilings of houses once they are built.

*(a)* It takes a team of 5 painters 10 hours to paint a house that has a total wall and ceiling area of 500 $m^2$.

A new house on the estate has a total wall and ceiling area of 600 $m^2$.
This house has to be painted in 8 hours.

Calculate the least number of painters needed.
You must show all your working. [4]

*(b)* What assumption have you made in answering part *(a)*? [1]

Examiner only

**10.** Gardeners can apply weedkiller to large areas of land by using a spray gun. Weedkiller is stored in a large bottle that gardeners carry on their backs, and this feeds the spray gun.

A gardening company has designed the bottle shown below.
It consists of a hollow cylinder and cone that are joined.

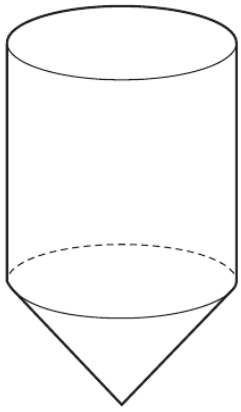


*Diagram not drawn to scale*

The base radius of the cone and the radius of the cylinder are both 9 cm.
The height of the cylinder is four times the vertical height of the cone.

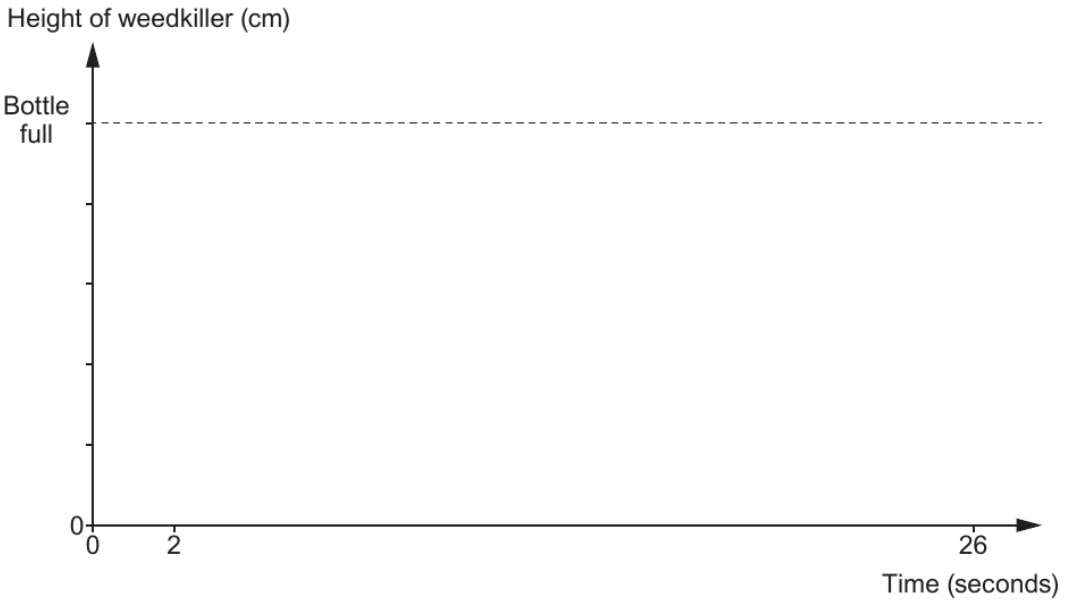
The bottle has been designed so that it has a capacity of 10 litres.

*(a)* Calculate the total height of the bottle. [7]

Total height of the bottle = ..... cm

Examiner only

*(b)* Weedkiller is poured into the bottle at a constant rate.
The cone is full of weedkiller after 2 seconds.
The bottle as a whole is full after 26 seconds.
Using the axes below, sketch a graph of the height of weedkiller in the bottle during the 26 seconds it takes to fill. [2]




**END OF PAPER**