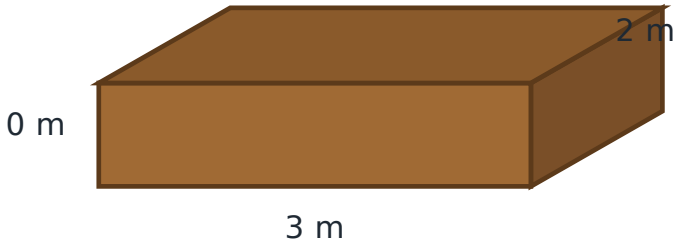
Extension & Challenge — Modelling with Measurement & Geometry

Part A — Volume, Capacity & Cost

Designing real objects links **volume** (space inside, in m³), **capacity** (how much it holds, in litres) and **cost**. A useful conversion: $1\ m^3 = 1000\ L$.

> **Worked example.** A box is $2 \times 1 \times 0.5\ m$, so volume $= 1\ m^3 = 1000\ L$. If a bag holds $25\ L$, you need $1000 \div 25 = 40$ bags.

Design Task: Filling a Garden Bed



Volume = 3 × 2 × 0 = 2 m³ = 1800 L

1800 ÷ 30 = 60 bags of soil

Design task: working out how much soil fills a garden bed.

1 A garden bed is $3\ m$ long, $2\ m$ wide and $0.3\ m$ deep. Find its volume in cubic metres.

Volume = _____ m^3

2 Convert that volume to litres. (Remember $1\ m^3 = 1000\ L$.)

Answer: _____ L

3 Soil is sold in $30\ L$ bags. How many bags are needed to fill the bed?

Answer: _____ bags

4 Each bag of soil costs $\$8$. What is the total cost to fill the bed?

Answer: _____

5 A second bed is the same width and depth but **twice** as long. Without redoing all the working, explain how the volume and the number of bags change.

6 **Design challenge.** Design a rectangular garden bed with a volume as close as possible to $1\ m^3$. Give its length, width and depth, and show the volume.

Part B — Measuring & Costing Real Spaces

Modelling a real job means choosing the right measure: **perimeter** for things that go around an edge (fencing, edging), and **area** for things that cover a surface (paving, paint). Watch your units and convert when needed.

Length conversions: $1\ m = 100\ cm$. Capacity: $1\ L = 1000\ mL$. Mass: $1\ kg = 1000\ g$.

Worked example. A $6\ m$ by $4\ m$ room has area $24\ m^2$ and perimeter $20\ m$. Carpet at $\$30/m^2$ costs $24 \times 30 = \$720$.

1 A rectangular yard is $8\ m$ by $5\ m$. Find the perimeter, then the cost of fencing it at $\$15$ per metre.

2 The same yard is to be paved. Find its area, then the cost at $\$40$ per square metre.

3 Complete these conversions.

(a) $2.5\ m =$ _____ cm

(b) $3500\ mL =$ _____ L

(c) $1.2\ kg =$ _____ g

4 **Estimate, then calculate.** A tin of paint covers $10\ m^2$. A wall is $4\ m$ wide and $2.5\ m$ high. Estimate, then work out how many tins are needed.

5 **Reasoning.** A square garden of side $6\ m$ has a $1\ m$-wide path running all the way around the outside. What is the area of the path only?

6 **Design and cost.** Plan a rectangular vegetable plot no larger than $12\ m^2$. State its dimensions, the length of edging it needs, and the cost of edging at $\$6$ per metre.