

## Extension & Challenge — Modelling with Number

### Part A — Bar Models for Problem Solving

A **bar model** turns a word problem into a picture. Splitting a bar into equal parts, or drawing two bars side by side, makes it clear whether to multiply, divide, add or subtract.

**Worked example.** A bar of 240 is split into 4 equal parts. One part is  $240 \div 4 = 60$ . So three parts would be  $3 \times 60 = 180$ .

#### Bar model: 4 equal parts make 240



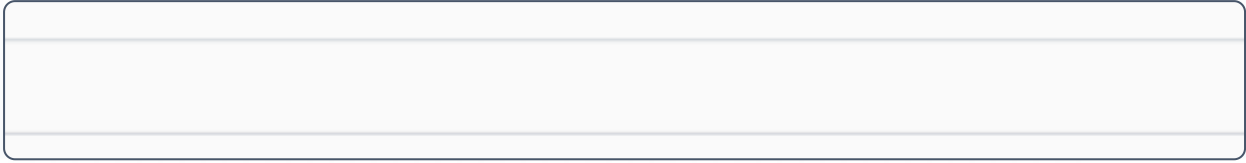
*A bar model: four equal parts make a total of 240.*

1 The bar above shows 4 equal parts making 240. What is the value of **one** part?

Answer: \_\_\_\_\_

2 Draw your own bar for this: 3 equal parts make 180. What is one part worth? What are two parts worth?

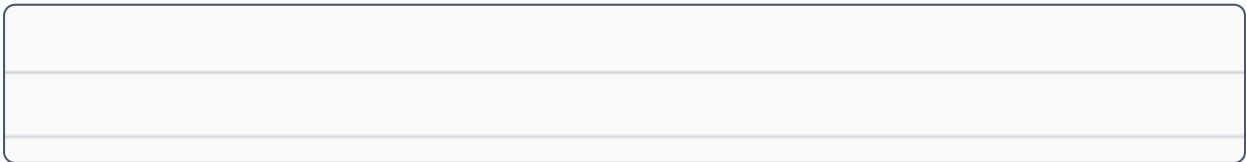
3  $\frac{2}{5}$  of a number is 30. Draw a bar split into fifths to find the **whole** number.



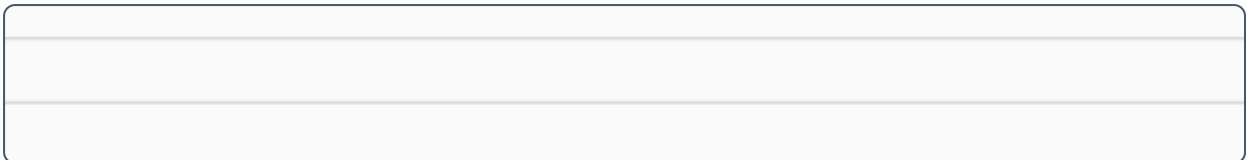
4 **Comparison bars.** Anna has \$40 more than Ben. Together they have \$150. Draw two bars and find how much each has.



5 A ribbon 240 cm long is cut into two pieces so that one piece is **three times** as long as the other. Use a bar model to find both lengths.



6 **Open challenge.** Invent a word problem that can be solved with a bar model and whose answer is exactly 60. Draw the bar and write the problem.



## Part B — Working Through the Modelling Cycle

Real problems are messy. Mathematicians use a [modelling cycle](#): pose the problem, make sensible assumptions, do the mathematics, check whether the answer makes sense, then communicate it — looping back if it does not.



A circular diagram of the modelling cycle: pose the problem, make assumptions, do the maths, interpret and check, then communicate, looping back to the start.

*The modelling cycle. Real modelling often loops back when the check fails.*

Watch for answers that must be whole numbers. You cannot order 5.2 buses — you round *up* to 6 so everyone has a seat.

1 A school needs buses for 250 students. Each bus holds 48 students. Work through the cycle:

(a) **Assumptions:** what are you assuming? \_\_\_\_\_

(b) **Calculate:** how many buses? \_\_\_\_\_

(c) **Check:** would 5 buses be enough? Explain.

2 **Estimation model.** About how many students could stand in your classroom if there were no furniture? State your assumptions (e.g. floor area, space per student) and show your calculation.

3 A model says "a 12-year-old grows about 6 cm per year." List **two** assumptions this model makes, and one reason it might not be accurate for a real person.

4 **Your own model.** Choose one question below, then outline how you would model it: the steps, the assumptions, and the calculation you would do.

A. How much water does our class drink in a week?

B. How many pizzas to feed the whole year group?

C. How long would it take to count to a million?