

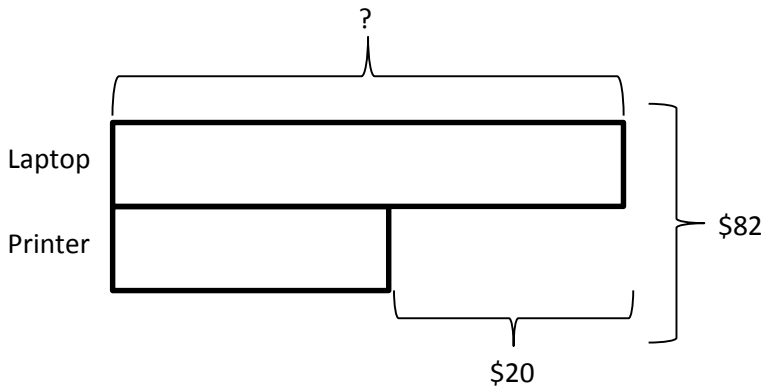
Heuristic Concept 1: Make a whole unit

Using 2 identities/ objects...

Question:

James paid \$82 for a laptop and a printer. The printer cost \$20 **less than** the laptop. How much did the laptop cost?

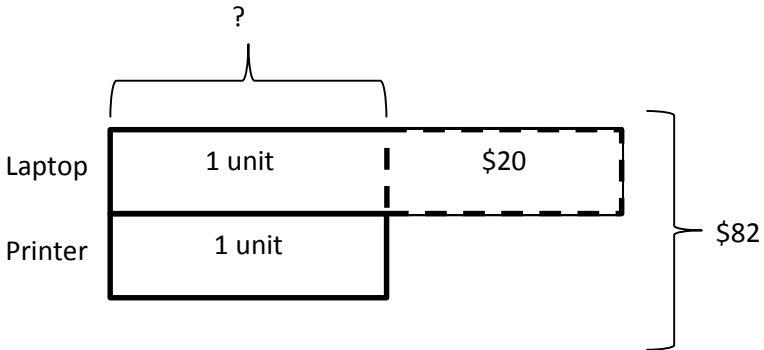
To start solving, you should draw a complete model. A complete model tells you the whole story without the need to refer to the question again.



One of the quickest ways to solve such question is to extend the bar of the printer to one whole unit. The reason is we do not know the value of the printer. So the only way to do it is to extend the bar of the printer and make it the same length as the bar of the laptop.

The normal way most students do is to try to cut the laptop bar into two bars as shown below.

Method 1 (what most students will do)



Step 1:

$$2 \text{ units} = \$82 - \$20$$

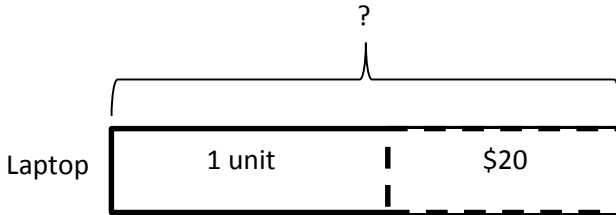
$$= \$62$$

Step 2:

$$1 \text{ unit} = \$62 \div 2$$

$$= \$31$$

Step 3:



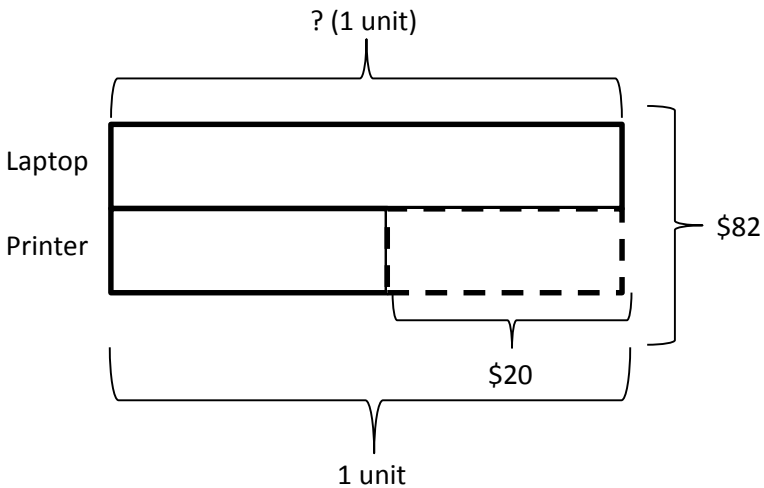
$$\begin{aligned} \text{Laptop} &= 1 \text{ unit} + \$20 \\ &= \$31 + \$20 \\ &= \$51 \text{ (Ans)} \end{aligned}$$

Take note that we've used 3 steps to reach the answer.

Now, let's try another method.

What if we extend the printer bar to be the same length as the bar of the laptop?

Method 2 (Make a whole):



Step 1:

$$2 \text{ units} = \$82 + \$20$$

$$= \$102$$

Step 2:

$$1 \text{ unit} = \$102 \div 2$$

$$= \$51 \text{ (Ans)}$$

Laptop is also 1 unit. So finding the value of 1 unit also means that you have found the cost of the laptop.

The advantage of making part to the whole is reducing the steps from 3 to 2. Cutting the workings by one step also means “one” less room for mistake.

Now, you have learnt how to solve. Try to solve by yourself. =)

Question:

James paid \$82 for a laptop and a printer. The printer cost \$20 less than the laptop. How much did the laptop cost?

Your Solution:

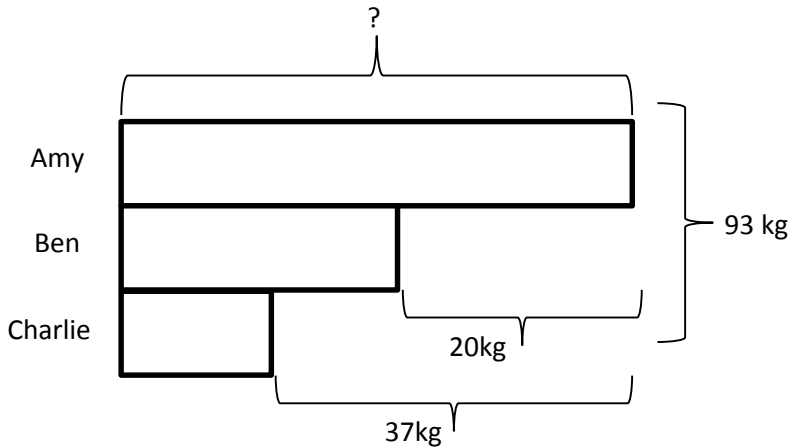
Your checklist (please tick):

	K	C	N	S	U
What was done well					
What's missing					

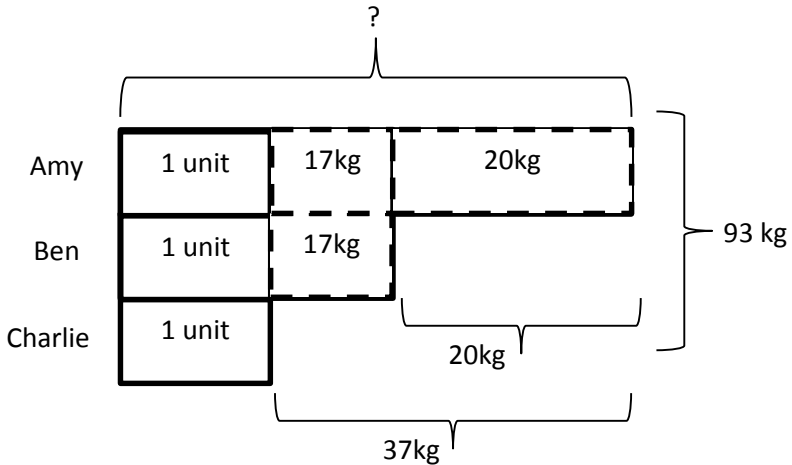
Using 3 identities/ objects...

Question:

The total mass of Amy, Ben and Charlie is 93 kg. Ben is 20 kg **lighter than** Amy. Amy is 37kg **heavier than** Charlie. What is Amy's mass?



Method 1 (what most students will do):



Step 1: Most students will try to cut the model into tiny boxes. *The result?* Many more values to find and many calculations to do.

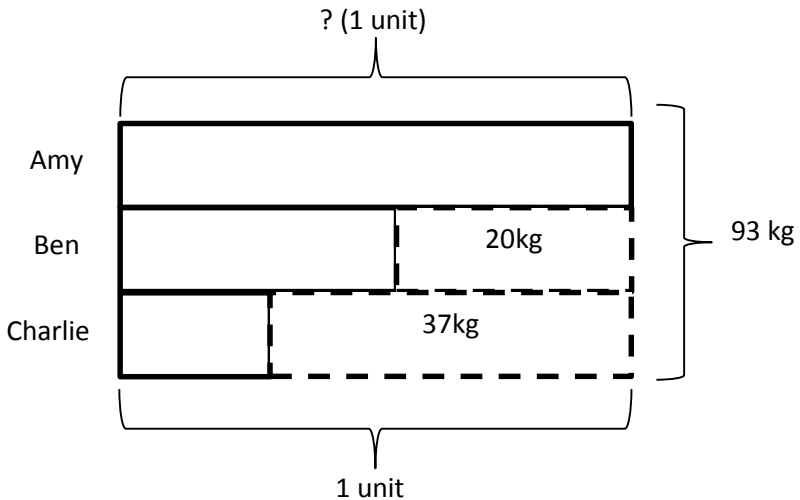
$$\begin{aligned}
 3 \text{ units} &= 93 - 20 - (37 - 20) - (37 - 20) \\
 &= 93 - 20 - 17 - 17 \\
 &= 39 \text{ kg}
 \end{aligned}$$

Step 2: **1 unit** = $39 \div 3 = 13 \text{ kg}$

Step 3: Amy = $1 \text{ unit} + 17 + 20$

$$\begin{aligned}
 &= 13 + 17 + 20 \\
 &= 50 \text{ kg (Ans)}
 \end{aligned}$$

Method 2 (Make into a whole unit)



We extend Ben's bar and Charlie's bar by making them the same length as the bar (1 unit) representing Amy's mass.

Step 1:

$$\begin{aligned}
 3 \text{ units} &= 93 + 20 + 37 \\
 &= 150 \text{ kg}
 \end{aligned}$$

Step 2:

$$\begin{aligned}
 1 \text{ unit} &= 150 \div 3 \\
 &= 50\text{kg} \text{ (Ans)}
 \end{aligned}$$