White Rose Maths

Summer - Block 4

Mass & Capacity

Year 3

Overview

Small Steps

- Measure mass (1)
- Measure mass (2)
- Compare mass
- Add and subtract mass
- Measure capacity (1)
- Measure capacity (2)
- Compare capacity
- Add and subtract capacity

NC Objectives

Measure, compare, add and subtract: lengths (m/cm/mm); mass (kg/g); volume/capacity (l/ml)

Measure Mass (1)

Notes and Guidance

Children learn how to read a range of scales to measure mass, including scales with missing intervals. In this step, children read scales in either kilograms or grams.

Use kilogram and gram weights to reinforce the difference in the units. Represent the intervals on the scale on a straight number line to highlight the link back to place value.

Mathematical Talk

How can we measure the mass of an object?

When would we use kilograms or grams to measure the mass of something?

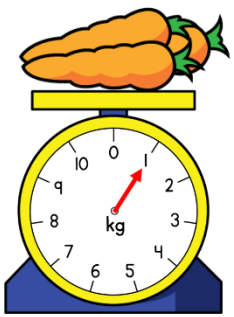
What's the same, what's different about the scales?

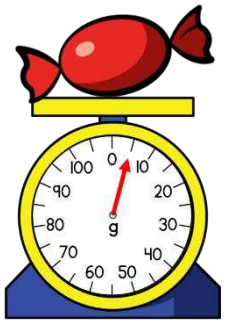
How do we know what each interval is worth?

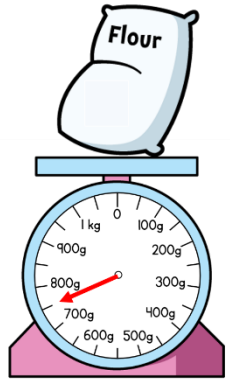
Varied Fluency

- Use balance scales to measure the mass of a range of objects. Decide whether to use gram or kilogram weights to balance the scales. Can you estimate the mass of each object before you weigh them?

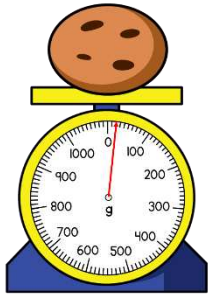
- Find the mass of each item.

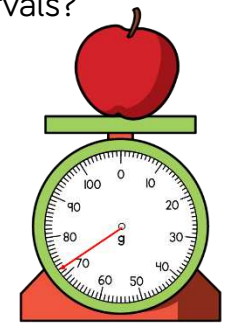






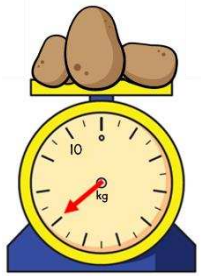
- Draw each scale as a straight number line. Can you identify the missing intervals?





Measure Mass (1)

Reasoning and Problem Solving



Who do you agree with?
Explain why.

The potatoes weigh 13 kg

Amir

We don't know how much the potatoes weigh because the number is hidden.

Jack

The potatoes weigh more than half of 10 kg

Rosie

Can you calculate the weight of the potatoes? Explain how you did it.

Amir is wrong – he has counted on 3 from 10 kg when he should have counted back 3 kg.

Jack is wrong because we can work out the scale by using the 10 kg and counting back. They weigh 7 kg.

Rosie is correct because half of 10 is 5 and the arrow is past where 5 kg would be.

The weight of the potatoes is 7 kg

The chocolate bar weighs 100 g.
How much does one muffin weigh?

How much does each side weigh?

Children could use a bar model to work this out. They would see the chocolate bar must weigh the same as two muffins so one muffin must weigh 50 g.
Each side weighs 150 g.

Using only 3 objects and a weighing scale, try to get as close to 2 kg as possible.
Explain why you chose those objects.
Work out how much more or how much less is needed to make it 2 kg.

Measure Mass (2)

Notes and Guidance

Children measure the mass of objects and record them as a mixed measurement in kilograms and grams. When given a mixed measurement, children can record the mass on scales by calculating the intervals and identifying where the arrow will go.

Recap counting in different multiples to support children's reading of scales with different intervals.

Mathematical Talk

Which is heavier, 7 kilograms or 8 grams?

How is a scale like a number line?

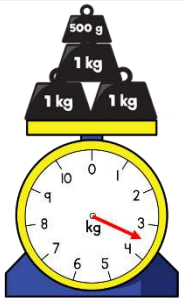
Does drawing a number line help you to find the intervals?

Where do we use measuring mass on a daily basis?

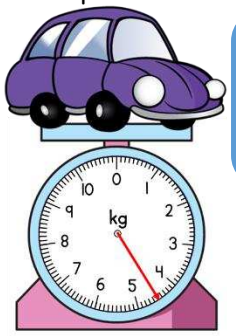
Varied Fluency

- What weight is on the scales?

  How do the scales show this?

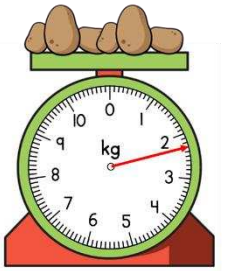


- Complete the missing information.



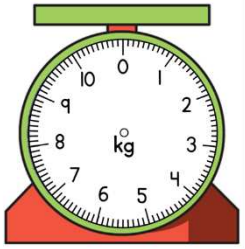
The toy car weighs 4 kg and _____ g

The potatoes weigh 2 kg and _____ g

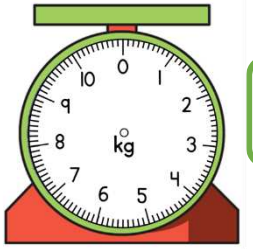


Use your own scales to measure how much objects weigh and record the mass in kg and g.

- Draw an arrow on the scales to show the mass of each object.



= 1 kg and 700 g



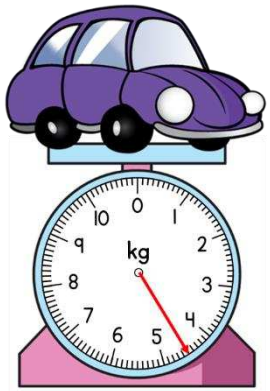
= 2 kg and 100 g

Measure Mass (2)

Reasoning and Problem Solving

Tommy is weighing a toy car.

Use this to work out what the other children's cars weigh.



Alex

My car weighs 1 kg more than Mo's.

Mo

My car weighs 200 g less than Tommy's.

Dexter

My car weighs 1 kg and 300 g less than Alex's.

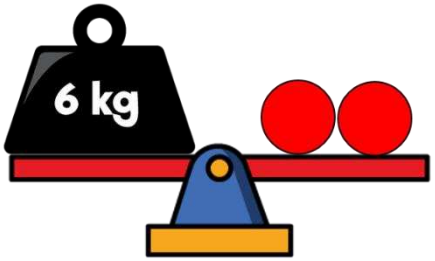
Tommy's car weighs 4 kg and 500 g.

Alex's car weighs 5 kg and 300 g.

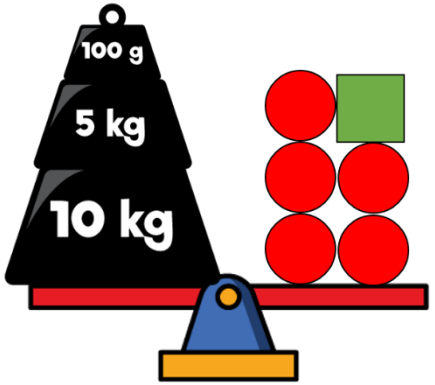
Mo's car weighs 4 kg and 300 g.

Dexter's car weighs 4 kg.

Here is a balance.



Here is another.



Work out the value of 

Can you create your own version for a partner?

One circle weighs 3 kg.
The square weighs 100 g.

Compare Mass

Notes and Guidance

Children build on Year 2 knowledge and use 'lighter' and 'heavier' to compare mass.
They use their understanding that kilograms are used for heavier objects and will use this to help them compare mass. For example 500 g is less than 500 kg.
Children compare mixed measurements using the inequality symbols. For example, 1 kg and 500 g $<$ 2 kg.

Mathematical Talk

Which item is heavier or lighter? How do you know?

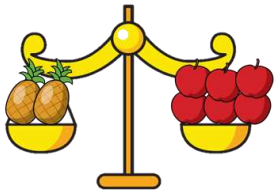
Using the symbols $<$, $>$ or $=$, what can you tell me about each of the scales?

If I added an extra item, what would happen?

Can I work out how much one item weighs? Would this be more or less than the other item?

Varied Fluency

Complete the sentences.

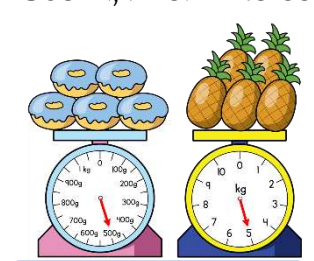


☐ pineapples are equal to ☐ apples.

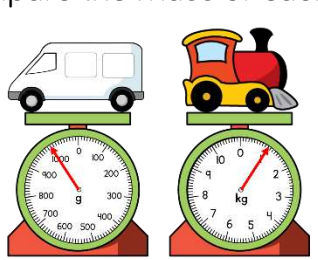
1 pineapple is equal to ☐ apples.

Can you write sentences using 'heavier' or 'lighter' about the image?

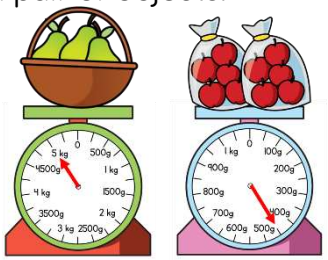
Use $<$, $>$ or $=$ to compare the mass of each pair of objects.



500 g ◯ 5 kg

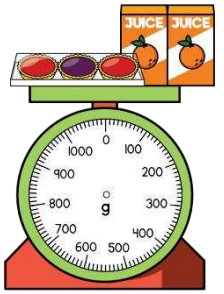


1,000 g ◯ 1 kg



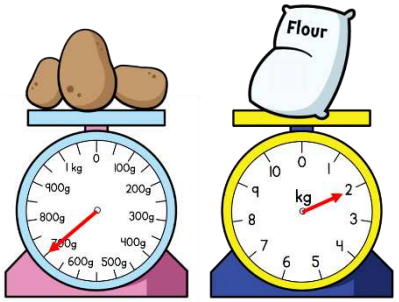
☐ ◯ ☐

A pack of tarts weighs 220 g.
Two cartons of orange juice weigh 140 g.
Draw an arrow to show the weight of the 3 items.



Compare Mass

Reasoning and Problem Solving



Three children are weighing potatoes and flour.

Whitney

The potatoes weigh more because the arrow is further than the arrow on the flour scale.

The flour weighs less because 2 is less than 700

Amir

Alex

The flour weighs more because 2 kg is more than 700 g.

Who do you agree with?
Explain your answer.

Whitney is wrong because the scales are different.
Mo is wrong because he hasn't noticed the flour is weighed in kg and the potatoes are weighed in g.
Alex is correct because 2 kg is the same as 2,000 g which is more than 700 g.

Here are three masses.

20 kg and 600 g

20 kg

18 kg and 500 g

Match each mass to the correct child.

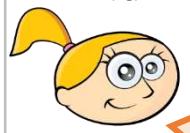
Dora

My mass weighs more than $\frac{1}{2}$ of 40 kg.

My mass is more than Eva's mass.

Mo

Eva



My mass weighs more than 18 kg but less than 20 kg.

Eva: 18 kg and 500 g

Mo: 20 kg

Dora: 20 kg and 600 g

Add & Subtract Mass

Notes and Guidance

Children add and subtract mass. They use a range of mental and written methods, choosing the most efficient one for each question.

Children may use concrete resources to represent kilograms and grams. Children could also use bar models to support them to represent calculations.

Mathematical Talk

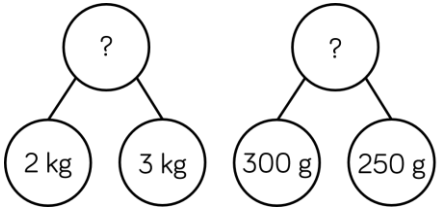
How many grams are in a kilogram? How could I represent this using concrete resources?

What do you know about kilograms or grams that can help you solve this question?

How can you represent this problem with a bar model?

Varied Fluency

Amir uses a part-whole model to add 2 kg and 300 g to 3 kg and 250 g. He partitions each mass into kilograms and grams and calculates them separately.



Use Amir's method to calculate:

3 kg and 450 g + 4 kg and 200 g
4 kg and 105 g + 2 kg and 300 g
4 kg and 400 g − 2 kg and 100 g
8 kg and 600 g − 1 kg and 550 g

The jar of cookies has a mass of 800 g.
The empty jar has a mass of 350 g.
How much do the cookies weigh?

Choose an appropriate approach to solve:

- $7\text{ kg} - \square = 5\frac{1}{2}\text{ kg}$
- $3\text{ kg and }200\text{ g} + \square = 4\frac{1}{2}\text{ kg}$
- $4\text{ kg} + \square - 1\frac{1}{2}\text{ kg} = 3\text{ kg}$

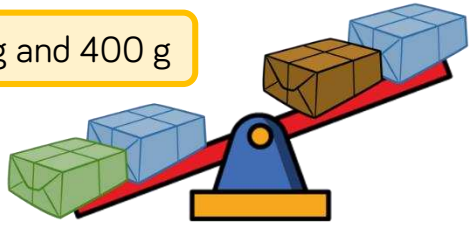
Add & Subtract Mass

Reasoning and Problem Solving

The green parcel weighs 5 kg.
Can you work out what the blue and brown parcel weigh?

7 kg and 250 g

9 kg and 400 g



How much would the green and brown parcel weigh altogether?

Blue parcel = 4 kg and 400 g

Brown parcel = 2 kg and 850 g

Green and brown parcel = 7 kg and 850 g

Dora buys two peaches and three pears.

One peach weighs 75 g.

Three pears weigh the same as two peaches.

How much does one pear weigh?

50 g

Measure Capacity (1)

Notes and Guidance

Children use litres, millilitres and standard scales to explore capacity. In this step, children focus on the capacity in either litres or millilitres and not as a mixed measurement, for example 5 l and 500 ml.
Children continue to use place value skills to explore scales.
Children build on their knowledge from KS1, recognising the capacity is the amount of liquid a container can hold and the volume is how much liquid is in the container.

Mathematical Talk

What's the same and what's different about capacity and volume?

What does capacity mean? What does volume mean?

What do we measure capacity and volume in?

What unit of measure (ml or l) would we use to measure ____ ?

How much liquid is in the container?

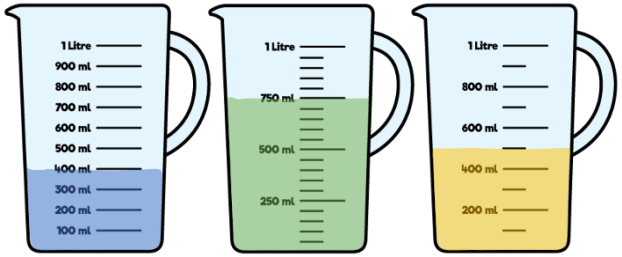
What is the scale going up in?

Varied Fluency

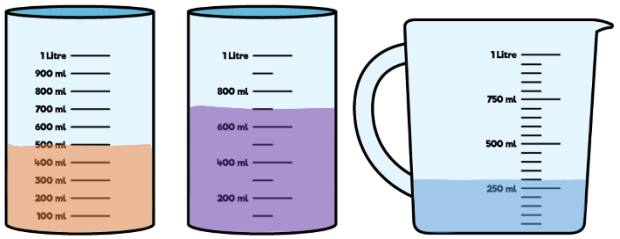
- Use a variety of scales, discuss what's the same, what's different about the scales. Using different containers explore which measurement (litres or millilitres) would be used to measure the liquid inside. Discuss what things would be measured in litres and in millilitres.

- Use the sentence stem to describe the capacity and volume of each container.

The volume of liquid is ____.
The capacity of the container is _____.



- Identify what the scale is going up in to find out the volume in each container. Use the stem sentence.



The increments are in ____.
The volume is _____.

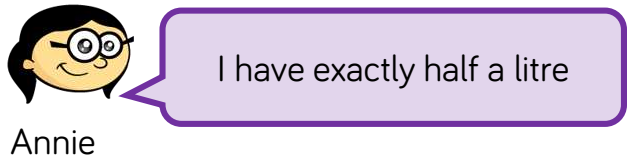
Measure Capacity (1)

Reasoning and Problem Solving

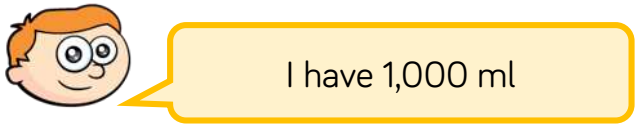
Use a variety of containers.
Can you estimate how much liquid they hold?
Check your estimates using measuring jugs and cylinders to see how accurate you were.

Children will use a variety of containers and gather a range of measurements. Encourage children to record their results in a table.

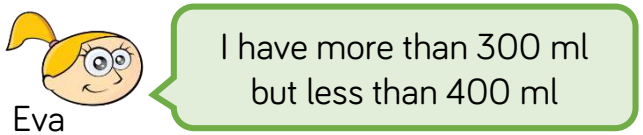
Use the clues to work out who has which container.



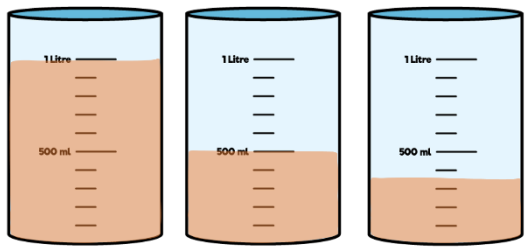
Annie



Amir



Eva



Annie has container B

Ron has container A

Eva has container C

Measure Capacity (2)

Notes and Guidance

Children use litres and millilitres and standard scales to explore capacity.
Children measure capacity with litres and millilitres together and record measurements as __ l and __ ml, for example 5 l and 500 ml.
Children continue to use place value skills to read and interpret scales.

Mathematical Talk

How many millilitres are in 1 litre? If we know this, what else do we know?

Look at the scale, show me where ____ would be.

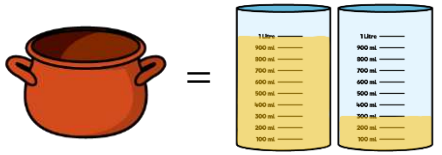
What is the capacity of the _____? How can we record this as l and ml?

How would I show how much water is left on the scale?

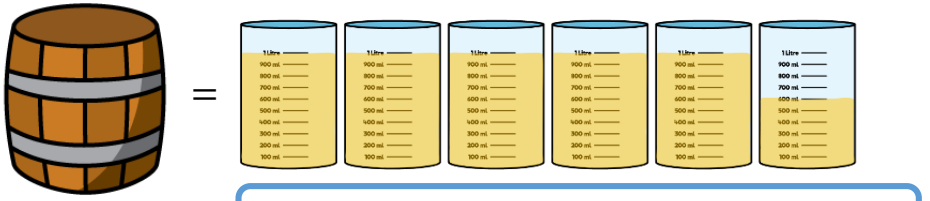
Varied Fluency

- Use equipment and liquid to count in increments of 100 ml. Discuss what happens when you reach 1,000 ml. Explore other connections linked to this. For example, 2 l = 2,000 ml.

- Complete the missing information.

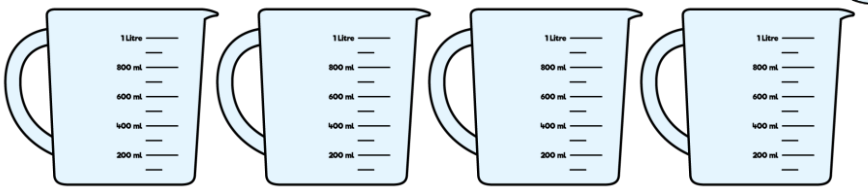


The pot's capacity is _____ l and _____ ml



The barrel's capacity is _____ l and _____ ml

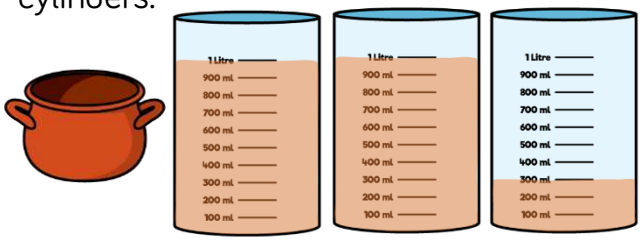
- The capacity of the full fish bowl is 8 l and 750 ml.
Hannah pours 5 l of water out of the bowl.
Show how much water is left in the measuring jugs.



Measure Capacity (2)

Reasoning and Problem Solving

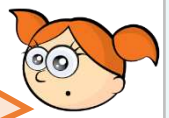
Amir and Alex work out the capacity of the pot by filling it with water, then pouring the water into the measuring cylinders.



Amir

The capacity of the pot is 302 ml

The capacity of the pot is 2 l and 300 ml.



Alex

Who do you agree with?
Explain why.

Alex is correct because there are 2 full litres and 300 millilitres in the third cylinder.

True or False?

The tallest container has the largest capacity.

Use containers to decide whether the statement is true or false.

Record the capacity of the different containers in a table.

Children will collect different measurements of capacities from different containers. Children will hopefully find that as well as height, the capacity of the container also depends on its width.

Compare Capacities

Notes and Guidance

Children continue to build on Year 2 and use 'full' and 'empty' to compare capacity.
They use their understanding that litres are used for larger containers and will use this to help them compare capacity.
For example 500 ml is less than 5 l.
Children also compare actual numerical measures, including mixed measurements using the inequality symbols. For example, 1 l and 500 ml < 2 l.

Mathematical Talk

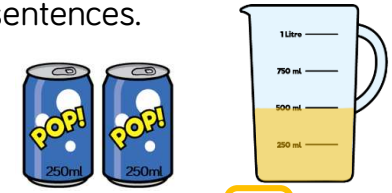
Which container is the most full?
Which container is the least full?

Which has the most liquid in it?
What does the liquid measure?

Which has the least liquid in it?
What does the liquid measure?

Varied Fluency

Complete the sentences.



☐ cans of pop are equal to ☐ jug of orange juice.

1 can of pop is equal to ☐ jug of orange juice.

Use $<$, $>$ or $=$ to compare the volume of liquid in each pair of containers.

800 ml ◯ 1 l

_ l and __ ml ◯ 750 ml

☐ ◯ ☐

Whitney has 3 bottles of water with 500 ml in each.
Sophie has one bottle of water with 1 and a half litres in it.
Who has the most water?
Can you prove it?

Compare Capacities

Reasoning and Problem Solving

Rosie has a litre bottle of water.

She pours a drink for herself and two friends. Their glasses can hold up to 250 ml.

Teddy has more than Amir.
Rosie has the most.

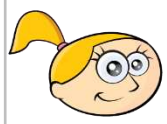
How much could each child have in their glass?

How much would be left in the bottle?

There are a range of possible answers the children could find. Rosie should have the most and Amir should have the least. The total should not exceed 750 ml

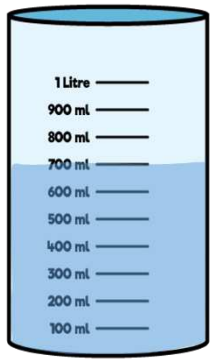
Possible answer:

Rosie: 250 ml
Teddy: 200 ml
Amir: 150 ml
There is 400 ml left in the bottle.

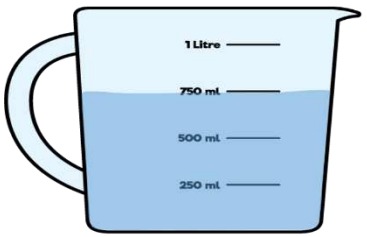


Eva

I know container 1 has more than container 2 in it because the water goes further up the side.



Container 1



Container 2

Is Eva correct? Explain your answer.

Eva is not correct. The measurements show that container 1 has 700 ml in it whereas container 2 has 750 ml in. Container 2 is wider than container 1 which is why it looks like it has less in it.

Add & Subtract Capacity

Notes and Guidance

Children add and subtract volumes and capacities. They can apply their understanding of different methods such as column addition/subtraction, finding the difference etc. Children should choose the correct method depending on the context of the problem. They continue to use mixed measures.
Children may use concrete resources to represent litres and millilitres. Children could also use bar models to represent calculations.

Mathematical Talk

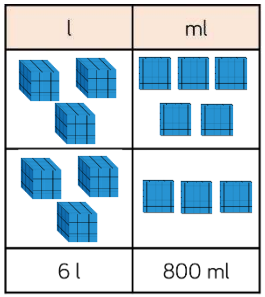
How many millitres are in one litre? How could I show this using concrete resources?

How many litres are there in total?
How many millilitres are there in total?

What methods can we use to add volumes or capacities?
What methods can we use to subtract volumes or capacities?

Varied Fluency

Teddy uses Base Ten and a place value chart to add 3 l and 500 ml and 3 l and 300 ml



Use the same approach to calculate:

- 4 l and 600 ml + 2 l and 100 ml
- 7 l and 320 ml + 1 l and 125 ml
- 3 l and 950 ml − 3 l and 50 ml
- 800 ml − 375 ml

To make Summer Punch for 2 people:

- 300 ml of pineapple juice
- 250 ml of orange juice
- 500 ml of lemonade

- How much liquid is used in total to make Summer Punch for 2 people?
- How much orange juice would be need to make enough for 4 people?
- Would a 1 l bottle of lemonade be enough to make drinks for 6 people?

Rosie keeps a record of how much milk she has in her café.
Work out how much milk is used for each order.

Amount of milk to start	Amount of milk used	Amount of milk left
1 l and 430 ml		1 l and 100 ml
1 l and 100 ml		890 ml
890 ml		545 ml

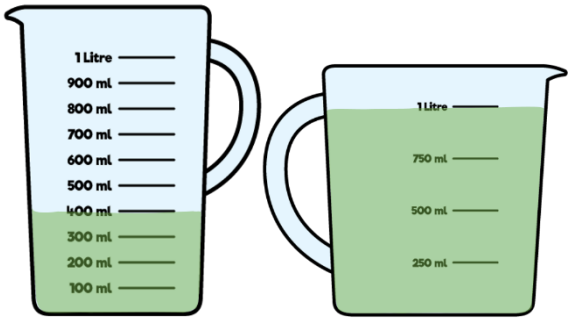
Add & Subtract Capacity

Reasoning and Problem Solving

Tommy is pouring drinks using these jugs.
A drink is 125 ml.

Tommy

If I pour three more drinks using jug 2, both jugs will have the same amount of juice in.



Jug 1 Jug 2

Is Tommy correct?
If not, how much juice will be left in jug 2?

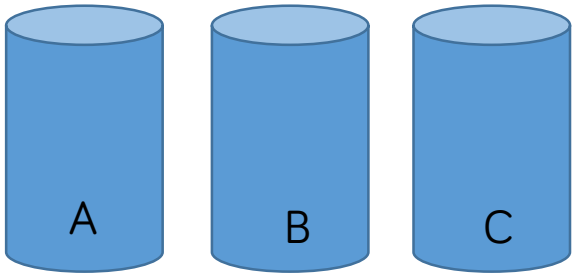
Tommy is not correct.
If Tommy makes three more drinks he will use a further 375 ml of juice.
1 l – 375 ml = 625 ml

Here are some measuring cylinders.
The total liquid in all three cylinders is 400 ml.

Cylinder A has half of the total amount in it.

Cylinder B has 67 ml less than Cylinder A.

How much liquid does each cylinder contain?



A: 200 ml

B: 133 ml

C: 67 ml