Unit 14
Capacity

Mastery Expert tip! "I found it valuable to make the links between this unit and the work children have done in number and calculating. Thinking of the scale as a number line helped the children to apply their understanding of number to the context of capacity."

Don't forget to watch the Unit 14 video!

WHY THIS UNIT IS IMPORTANT

This unit explores capacity and comes after other units about measure. It asks children to interpret a range of scales and apply their knowledge of place value and the number system. Children will learn to compare and order measurements, and convert between millilitres and mixed units of litres and millilitres. They will then use knowledge of all four operations to solve problems involving capacity.

WHERE THIS UNIT FITS

→ Unit 13: Mass

→ **Unit 14: Capacity**

This unit builds on from children's previous work in measures involving length and mass. Children should already have experience in reading and interpreting a range of scales and converting between units of measure, which will help them in this unit. Children will learn to compare, calculate and solve problems in the context of capacity. Children will need to apply their knowledge of the number system and calculating, in order to solve capacity word problems.

Before they start this unit, it is expected that children:
- understand place value in 3-digit numbers
- know how to add and subtract 3-digit numbers
- know multiplication facts for the 2, 5 and 10 times-tables.

ASSESSING MASTERY

Children will be able to use and interpret a variety of scales in order to measure amounts. They will be able to work with mixed units and convert between litres and millilitres. Children will be able to add and subtract capacities that cross the litre boundary; and they will be able to solve problems using addition, subtraction, multiplication and division. Children will understand that the capacity of a container is how much it holds when full.

COMMON MISCONCEPTIONS	STRENGTHENING UNDERSTANDING	GOING DEEPER
Children may struggle to interpret scales where not all divisions are labelled. They may make errors in place value, particularly when measuring and calculating in mixed units and converting between litres and millilitres.	Make the links to the work on calculations and the number system clear to children. Encourage children to think of the scales as number lines, and to represent them horizontally as well as vertically. Allow children to explore with capacity equipment by measuring, comparing and calculating capacities practically.	Encourage children to write their own capacity word problems that they can try on a partner. You could challenge them by specifying what operations their problem should include. Ask: *Can you write a problem with three or four steps?*

Unit 14: Capacity

WAYS OF WORKING

Use these pages to introduce what children will be covering in this unit. Ask children if they have done anything similar in other units. Children may be able to make links between this unit and their work on length and mass.

Talk through the bar model to ensure children understand what it represents. You could start with easier examples, using number bonds to 100, such as: *How does 35 + ? = 100 relate to 350 + ? = 1,000?* Discuss how a subtraction such as 100 ? = 45 would be represented and how that relates to 1,000 – ? = 450.

Talk through the part-whole model, using it to practise the same number bonds to 100 used in the bar model, such as: *35 + ? = 100; 100 - ? = 45.* Ask: *How many multiples of 5 pairs can you write in 3 minutes? Can you then relate this to multiples of 10 bonds to 1,000?*

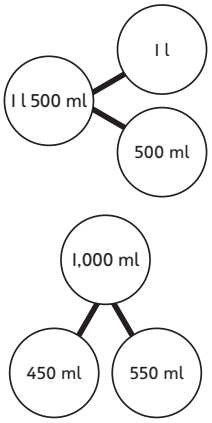
Finally go through the key vocabulary with children. Ask: *Do you recognise any words? Can you explain what they mean? Which words are new?* Practise counting up and back in steps of 100 and 1,000.

STRUCTURES AND REPRESENTATIONS

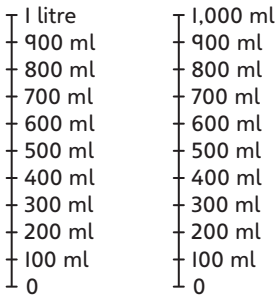
Bar model:

350	?
1,000	

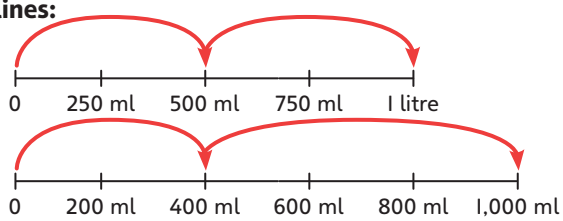
Part-whole model:



Scales:



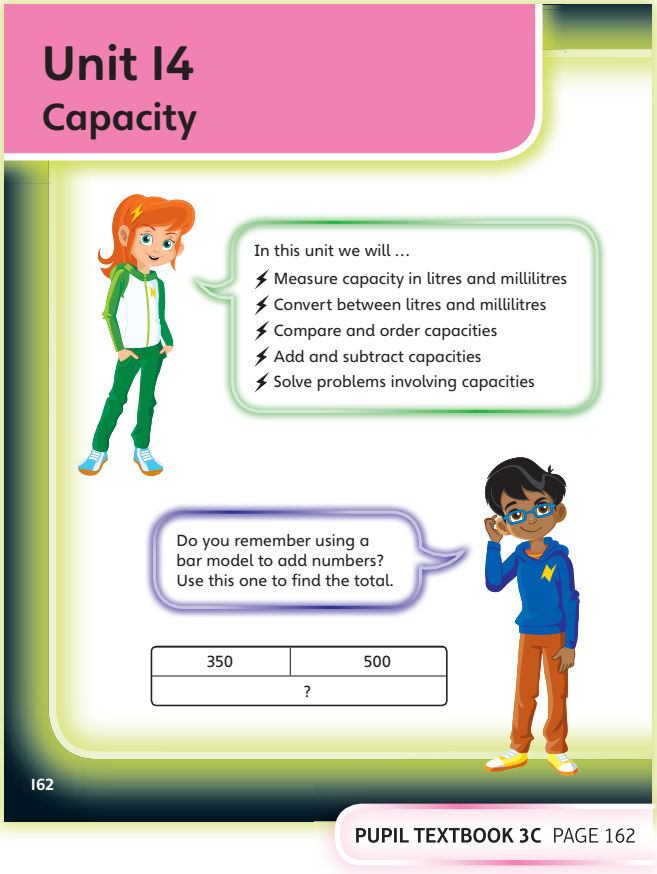
Number lines:



KEY LANGUAGE

There is some key language that children will need to know as part of the learning in this unit:

- capacity, amount, measurement
- litres (l), millilitres (ml)
- scale, number line, interval
- compare, convert, order



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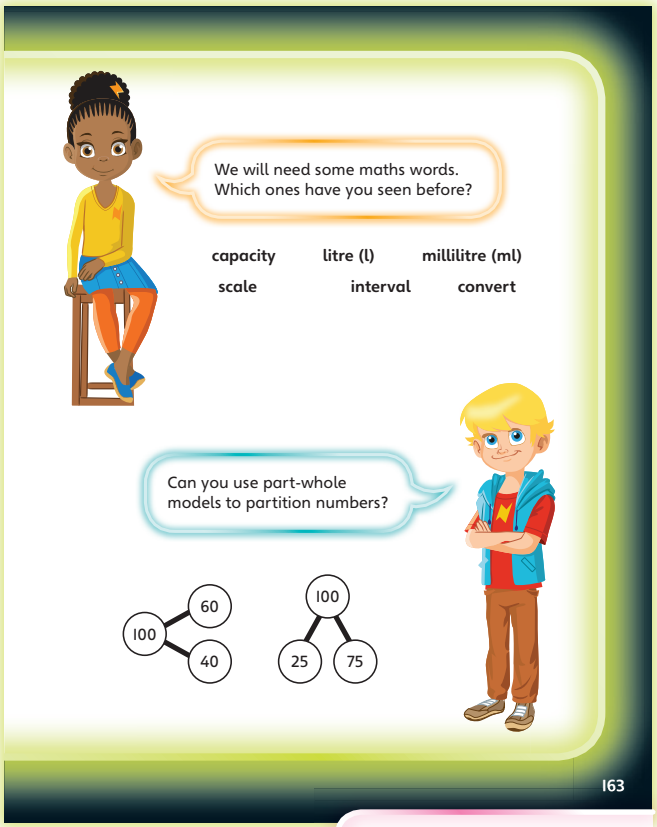

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Measuring capacity (1)

Learning focus

In this lesson, children will learn to measure volume in litres and in millilitres. They will learn how to read a variety of scales where only some of the divisions are labelled; drawing on their understanding of number, division and multiplication.

Small steps

- Previous step: Problem solving – mass
- **This step: Measuring capacity (1)**
- Next step: Measuring capacity (2)

NATIONAL CURRICULUM LINKS

Year 3 Measurement

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

ASSESSING MASTERY

Children can read a scale in either litres or millilitres in order to determine volume. They will be able to work out the value of intervals not labelled, by applying known multiplication and division facts.

COMMON MISCONCEPTIONS

Children may struggle to determine how the scale is divided up. This could be due to not applying division facts or miscounting the intervals between two labelled measures. Encourage the children to look at the scale as a number line. Draw the scale horizontally, as this may be a more familiar orientation for them. Ask:

- *What is the total amount between these two labelled markers? How many jumps are there between these two labelled markers? How can you work out how much each jump is worth?*

Children may not understand that capacity is the amount a container holds when full, whereas the amount actually in the container is often not its full capacity. Ask:

- *What is the capacity of this jug when it is full? What is the amount of liquid in the jug? How much more will fill it to its capacity?*

STRENGTHENING UNDERSTANDING

Encourage children to use a range of different containers and a variety of scales. Ask children to fill the containers to a given level, discussing how they would find this on the scale and encouraging them to identify the container's capacity.

GOING DEEPER

Children could create their own capacity problems by coming up with their own scales. They could think of different ways to divide multiples of 100 ml or 1,000 ml on their scales.

KEY LANGUAGE

In lesson: capacity, litres (l), millilitres (ml), scale, interval, amount, number line, divided by, half-way between, least, most, approximate, measure, gauge

Other language used by the teacher: volume, add, subtract, divide, multiply, unit of measure

STRUCTURES AND REPRESENTATIONS

number line, bar model

RESOURCES

Optional: number lines, capacity measuring equipment (selection of 100 ml, 500 ml and litre containers)

In the eTextbook of this lesson, you will find interactive links to a selection of teaching tools.

Before you teach

- Use practical activities to improve understanding.
- Link this to other curriculum areas (i.e. science).
- Can children count in 10s, 2s, 5s?

Discover

WAYS OF WORKING Pair work

ASK

- Question 1 a): *How many intervals are there between 0 litres and 100 litres?*
- Question 1 a): *Is the interval the number of markers, or the number of jumps between the markers?*
- Question 1 a): *How could you work out how much each interval is worth?*
- Question 1 a): *If the tank was full at the start, how many litres has the elephant drank?*

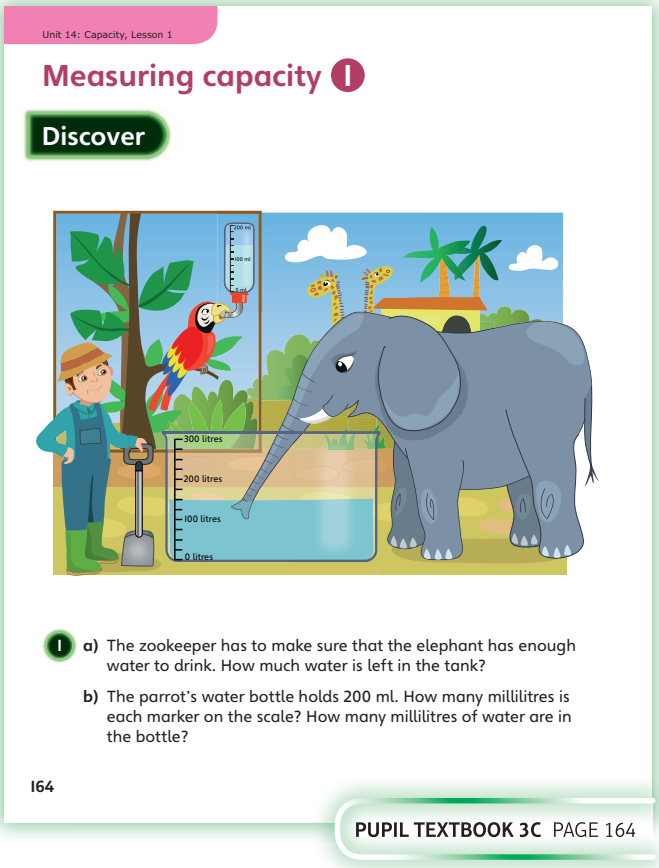
IN FOCUS The focus is on identifying the intervals between unlabelled markers on two different scales. Modelling the scale as a number line (with arrowed jumps between markers) will help children to see how to work out what each interval (amount between each marker) is worth. Remind children that when counting on, you do not count the start number, so the number of intervals is the same as the number of jumps between marked points. Some children will count just the unlabelled markers and others may include the ones given as well.

PRACTICAL TIPS Give children number lines modelled on the scales to practise counting the number of intervals between marked points. Practise counting in 25s to 200, and in 20s to 200, then count in 10s, 20s, 25s and 50s on each scale to see which works. Discuss how you know you have the right interval.

ANSWERS

Question 1 a): There are 150 litres of water left in the tank.

Question 1 b): Each marker is 20 ml. There are 140 ml in the bottle.



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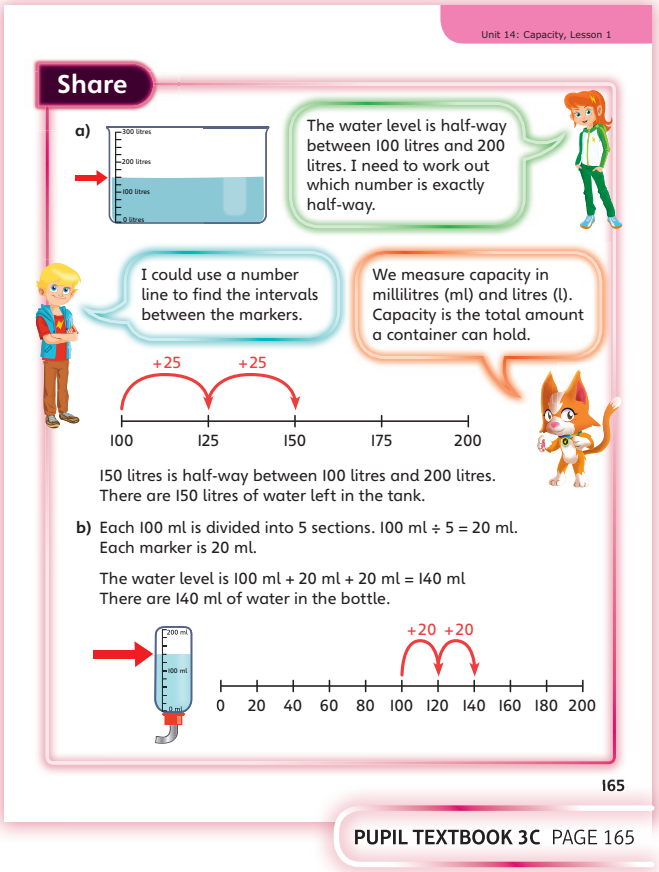
Share

WAYS OF WORKING Whole class teacher led

ASK

- Question 1 a): *How many jumps are there from 0 to 100 litres?*
- Question 1 a): *How does Astrid's comment help you to work out how much is left in the tank?*
- Question 1 b): *How else could you divide 100 ml equally?*
- Question 1 b): *How does Dexter's comment help you to work out the scale on the bottle?*

IN FOCUS The questions show that scales can be divided in different ways. In question 1 a), the scale is divided into four equal sections, each worth 25 litres; but in question 1 b), the scale is divided into five, so children need to work out 100 ml divided by 5. Some children may struggle with this. Can they use 10 ÷ 5 to work out 100 ÷ 5? It is important for children to see that they can use their knowledge of counting and calculations within this context.



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Think together

WAYS OF WORKING Whole class teacher led (I do, We do, You do)

ASK

- Questions 1, 2 and 3: *How can you calculate what each interval is worth?*
- Questions 1, 2 and 3: *What number facts can you draw on to help you work out what each interval is worth?*
- Question 3: *What number is half-way between 150 and 200?*
- Question 4: *What does capacity mean? What knowledge can you use to match the amounts?*

IN FOCUS Question 3: This question involves three different scales and an amount that is half-way between two intervals. Once children have worked out each interval, encourage discussion about what the values half-way between markers would be, and how to work this out.

Question 4: Children will not know the actual capacities of these items, but encourage logical reasoning to work out the matches, even though the items are not shown to scale.

STRENGTHEN Allow children to experiment with 500 ml and 1 l containers with scales in 100s, 50s and 25s; first working out the in between values to identify the intervals, then partially filling them to read the amounts. Colouring water with a little bit of poster paint can help children to read the quantities. Let children look at a variety of milk and drink bottles to see what each capacity is.

DEEPEN Ask children to create different scales for 1 litre and to identify one(s) that make it easy to measure 250 ml / 200 ml.

ASSESSMENT CHECKPOINT Can children use division or counting strategies to work out the intervals on a millilitre or litre scale?

Children should know that amounts of liquids are measured in millilitres or litres, and be able to give examples of capacities measured in litres and capacities measured in millilitres. Children are beginning to understand that capacity is the amount a container can hold when filled up.

ANSWERS

Question 1: The scale is marked in intervals of 5 l.

7 × 5 = 35 l

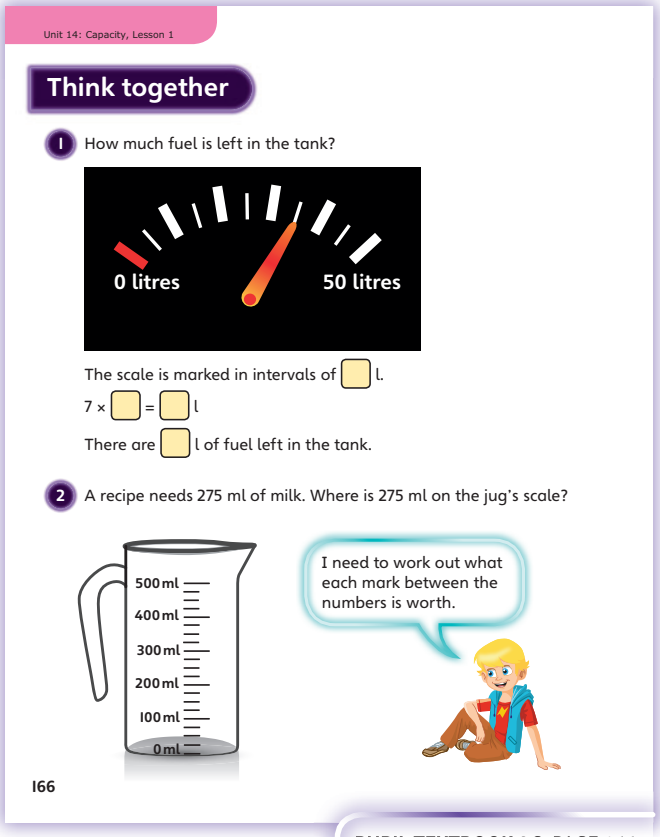
There are 35 l of fuel left in the tank.

Question 2: Children should indicate 275 ml on the scale (marker just under 300 ml).

Question 3 a): A 80 ml; B 175 ml C 125 ml

Question 3 b): A, C, B

Question 4: A 5 litres, B 5 ml, C 50 litres, D 500 ml



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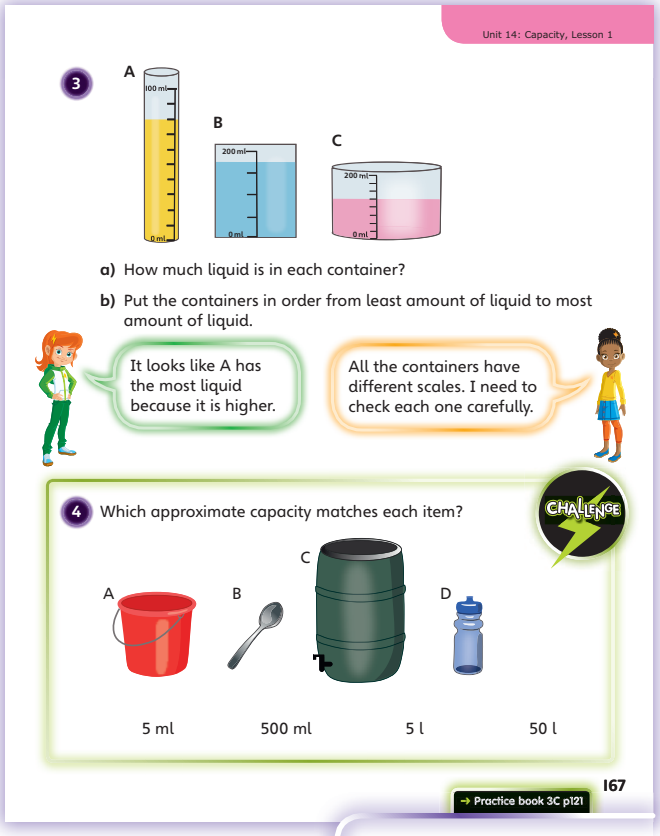

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Practice

WAYS OF WORKING Independent thinking

IN FOCUS The focus in questions 1, 3, and 4 is on reading scales and working out what each interval is worth. A variety of different types of measuring scales are used, including gauges. There is plenty of opportunity to work out the value of each interval, which is a key skill in this unit.

STRENGTHEN Look at scales that children may be more familiar with, such as scales on a ruler. Talk about how the scales have been divided up. Children could use a ruler to draw a line of 10 cm to create a scale that goes up to 100 millilitres in 10s, or up to 1,000 ml in 100s. Ask them to number each marker. Discuss different ways that a 10 cm scale could be divided. Give children the opportunity to explore what 5 ml, 50 ml, 500 ml and 1 litre look like on a 10 cm scale.

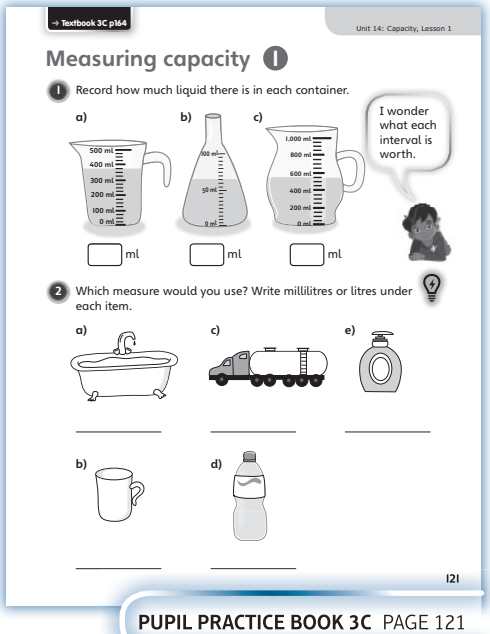
DEEPEN Children draw three vertical lines. One is 20 cm, the second is 50 cm and the third is 80 cm. They label the top of each line 100 ml. Can children divide these scales so that each has 10 ml divisions? What strategies did they use to work it out? Can children draw an accurate scale to show 0 – 100 ml with 20 ml or 25 ml intervals?

THINK DIFFERENTLY Question 2 involves children using their general knowledge of the world to decide whether something will be measured in litres or millilitres. An understanding that a litre is quite a lot and 1 millilitre is a very small drop will help.

ASSESSMENT CHECKPOINT Questions 1, 3 and 4 will determine whether the children are able to read a variety of scales.

Question 2 will determine whether children understand the relative sizes of litres and millilitres.

ANSWERS Answers to the **Practice** part of the lesson appear in a separate **Practice and Reflect answer guide**



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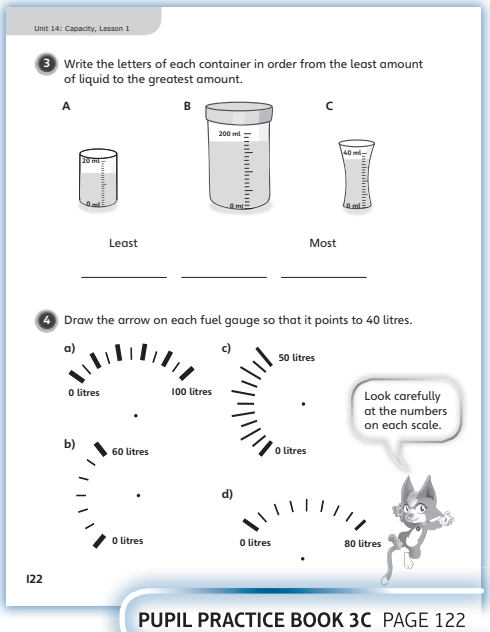

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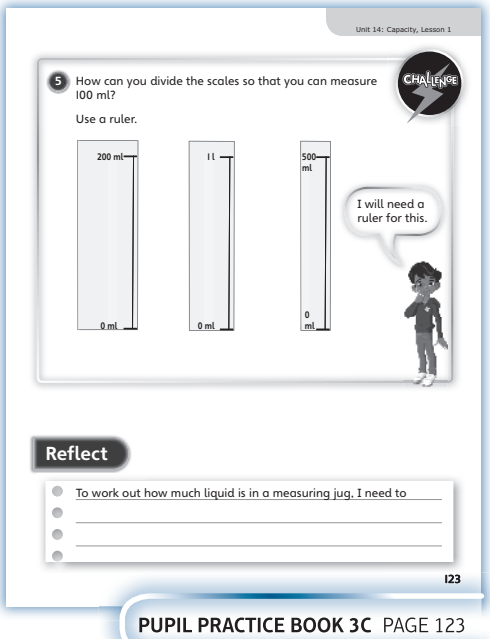
Reflect

WAYS OF WORKING Independent thinking

IN FOCUS This section encourages children to think about what information is important when reading scales. They have to consider the value of the labelled divisions, and the number of divisions between each labelled division. Children should reflect on the types of operations they need to carry out, in order to determine how much each division is worth.

ASSESSMENT CHECKPOINT Do children mention the importance of the scale on measuring equipment? Can children explain how to work out the unlabelled parts of the scale?

ANSWERS Answers to the **Reflect** part of the lesson appear in a separate **Practice and Reflect answer guide**



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After the lesson

- Can you provide opportunities for children to practise these skills in other curriculum areas?
- Are children secure on how to read a scale where not every interval is labelled?
- Did you draw links with other areas of maths such as number, calculations and other measures?

Measuring capacity 2

Learning focus

In this lesson, children will learn to read mixed units of capacity given in litres and millilitres and as $\frac{1}{2}$ litres, and convert them to millilitres. They will also read scales showing amounts over 1 litre.

Small steps

- Previous step: Measuring capacity (1)
- **This step: Measuring capacity (2)**
- Next step: Measuring capacity (3)

NATIONAL CURRICULUM LINKS

Year 3 Measurement

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

ASSESSING MASTERY

Children can measure amounts greater than 1 litre. They will understand that capacity between whole litres is measured in a mixture of litres and millilitres. Children understand that $\frac{1}{2}$ litre is the same as 500 ml. Children will begin to convert between mixed units and millilitres.

COMMON MISCONCEPTIONS

Children may read only the millilitres and overlook any litres when measuring with mixed units. Ask:

- *Is this amount more than 1 litre? How many whole litres are there?*

STRENGTHENING UNDERSTANDING

Encourage children to create their own amounts with mixed units. First measure 1 litre of water and pour it into a larger container then add 500 millilitres of water. Ask:

- *How much water is in the container altogether?*

Add different amounts to the litre and record as, for example, 1 l 500 ml.

Make links with the previous lesson clear. Encourage children to think of the scale as a number line. Draw the scale horizontally if that helps children to understand it.

GOING DEEPER

Give children a measurement with mixed units. Get children to create their own scale to record the measurement.

KEY LANGUAGE

In lesson: Capacity, litre (l), millilitre (ml), scale, intervals, half ($\frac{1}{2}$), partition, amount, whole, half-way, number line, partition

Other language used by the teacher: mixed unit, greater than (>), less than (<)

STRUCTURES AND REPRESENTATIONS

number line, bar model, column addition

RESOURCES

Optional: capacity measuring equipment

In the eTextbook of this lesson, you will find interactive links to a selection of teaching tools.

Before you teach

- Are there any children who may need support reading scales?
- Can you provide practical activities to support children's understanding of measuring capacity?
- How will you make the links between measuring capacity and their understanding of number patterns clear to children?

Discover

WAYS OF WORKING Pair work

ASK

- Question 1 a): *What is the same and what is different about the way the capacities have been measured?*

IN FOCUS This lesson introduces the children to capacities over 1 litre given as mixed units of litres and millilitres, including $\frac{1}{2}$ litre and converting these to millilitres. As half of 10 is 5, half of 1,000 is 500 so $\frac{1}{2}$ litre = 500 ml.

PRACTICAL TIPS Allow children to measure out 1 litre 500 millilitres into a 2 litre jug and to record the measurement in litres and millilitres, in millilitres and as $1\frac{1}{2}$ litres. Repeat if appropriate with 2 litres 500 millilitres. Can children record other whole and half litres in these three ways?

ANSWERS

Question 1 a): Watering can A holds 500 ml, B 1,500 ml and C 2,500 ml.

Question 1 b): Watering can B holds $1\frac{1}{2}$ litres.

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Share

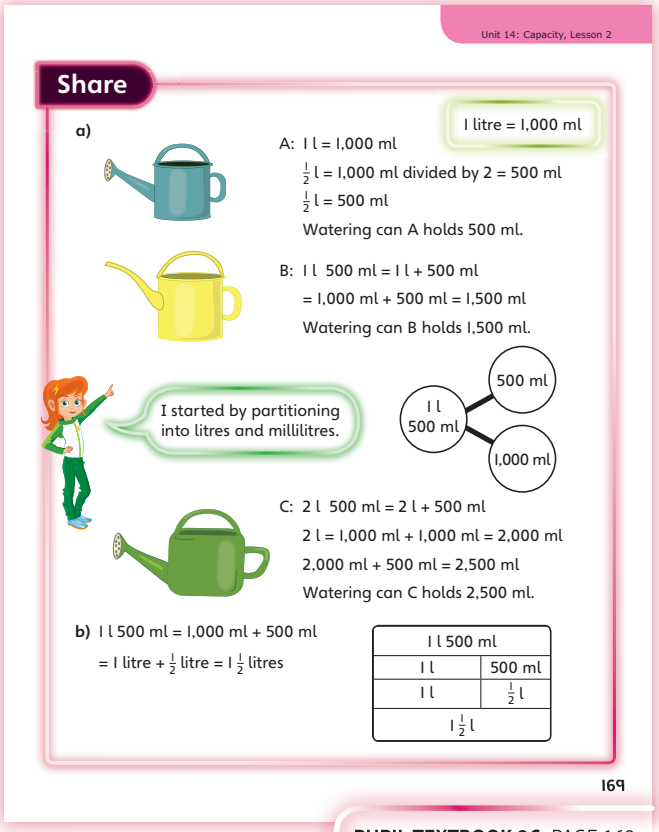
WAYS OF WORKING Whole class teacher led

ASK

- Question 1 a): *How can you use the fact box to help you work out how many millilitres is in watering can A?*
- Question 1 a): *Look at the part-whole model: how has the capacity in watering can B has been partitioned?*
- Question 1 a): *1,000 ml = 1 litre so how many litres is 2,000 ml? 3,000 ml?*
- Question 1 a): *Can you use a part-whole model to partition the amount in watering can C?*
- Question 1 b): *How can you use $\frac{1}{2}$ litre = 500 ml from the first question to help you with this question?*

IN FOCUS

The focus here is on the different ways capacities can be recorded. How that is translated to a scale will be tackled in **Think Together** using the learning from lesson 1.



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Think together

WAYS OF WORKING Whole class teacher led (I do, We do, You do)

ASK

- Question 1 : *What do you need to know in order to work out the value of the intervals?*
- Question 2 : *How do you work out amounts when the liquid is between intervals?*
- Question 3 : *How are the scales the same? How are they different?*

IN FOCUS In question 2 c), help children to think about place value when writing 1 l 50 ml as 1,**0**50 ml.

The focus in question 3 is on estimation, as children are given only 0 and various maximum values. Encourage children to start by working out where the whole litre intervals should be on each scale. Children should then be able to see that the arrows on the second and third scales point to less than 1 litre, and the arrow on the fourth scale points to more than 2 l.

STRENGTHEN Ask children to identify how many whole litres the liquid has gone over, and then how many extra millilitres are above that. Practise counting in 1,000s to convert the litres to millilitres. Write this as an addition and finally as an amount in millilitres. Children could make the amounts using a range of measuring jugs and cylinders.

DEEPEN Look at question 3. Can children draw other scales that will show 1 l 400 ml? Ask: *Draw three scales to show other amounts (such as 1 l 250 ml).*

ASSESSMENT CHECKPOINT Question 1 : Can children accurately read a scale using mixed litres and millilitres?

Question 2 : Can children read scales where the liquid is between intervals?

Question 3 : Are children able to interpret a range of scales and reason about them in order to estimate a capacity?

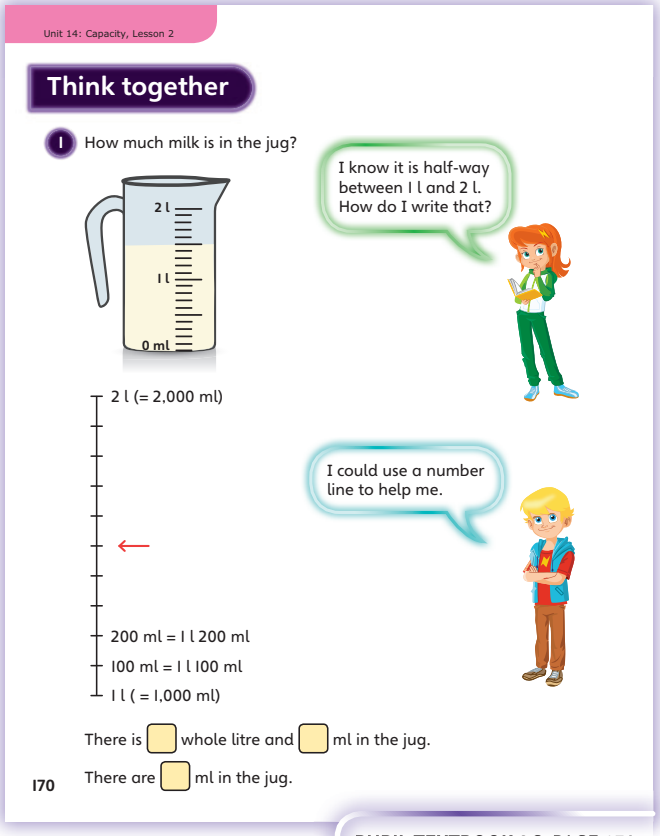
ANSWERS

Question 1 : There is 1 whole litre and 500 ml in the jug.
There are 1,500 ml in the jug.

Question 2 a): A 1 l 200 ml; B 3 l 500 ml; C 1 l 50 ml

Question 2 b): A 1,200 ml; B 3,500 ml; C 1,050 ml

Question 3 : A shows 1 l 400 ml because the scale goes up in intervals of 200 ml.



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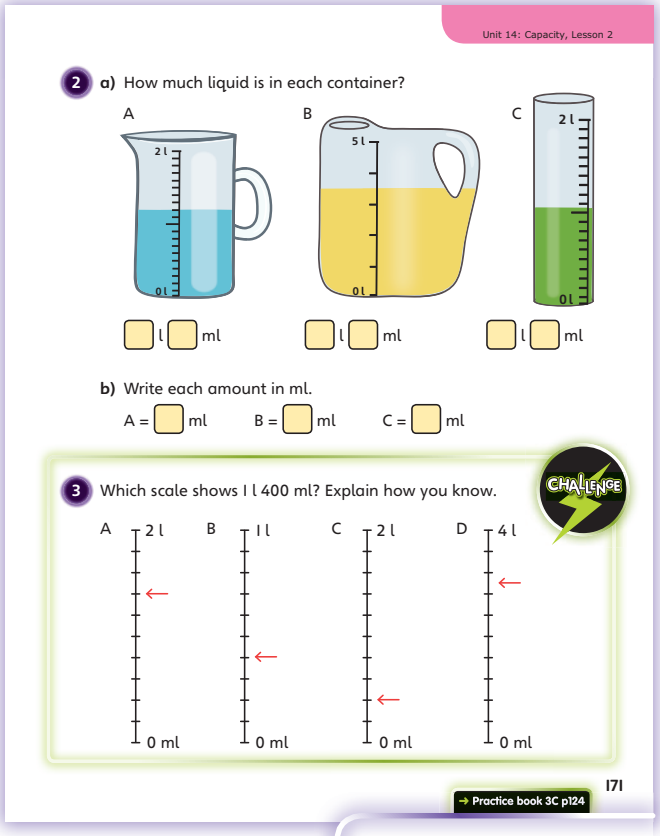

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Practice

WAYS OF WORKING Independent thinking

IN FOCUS The focus in questions 1, 2 and 3 is on determining the intervals on a variety of scales and writing the amounts shown in mixed units and also in millilitres. Encourage children to realise that the intervals are likely to be 100 ml, 200 ml, 250 ml or 500 ml and that the number of unlabelled intervals (jumps between markers rather than the number of markers) will determine which it is (10 for 100 ml, 5 for 200 ml, 4 for 250 ml and 2 for 500 ml as 10 × 100 ml, 5 × 200 ml, 4 × 250 ml and 2 × 500 ml all equal 1,000 ml = 1 litre).

In question 1, one amount is 500 ml. Encourage children to write this as 0 l 500 ml.

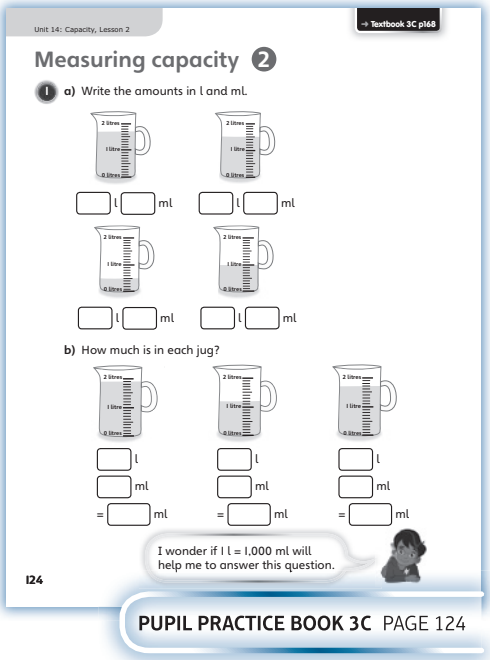
STRENGTHEN Allow children to label some of the unlabelled intervals in between the whole litre intervals, to make the scale easier to read. Practise counting in 100s, 200s, 250s and 500s to see which work for each scale (does the count result in the next recorded value?).

DEEPEN Ask children to create their own versions of question 5 to try out on their partner, and to discuss how accurate they can be when there is no scale shown.

THINK DIFFERENTLY The focus in question 4 is on measuring an amount in a slightly different context. Encourage children to think about what they need to do to answer the question (Flo's comment: measure the amount in the large jug), then what they need to do first to be able to measure the amount (work out where the whole litre intervals are). Have children fully answered the question by deciding which jug it is?

ASSESSMENT CHECKPOINT Questions 1, 2 and 3 will determine whether the children are able to read a variety of scales to measure capacity in mixed units. Question 4 will determine whether children can solve a word problem involving scales and mixed units. Question 5 will determine whether children can apply their knowledge of number to read a scale and make an estimation.

ANSWERS Answers to the **Practice** part of the lesson appear in a separate **Practice and Reflect answer guide**.



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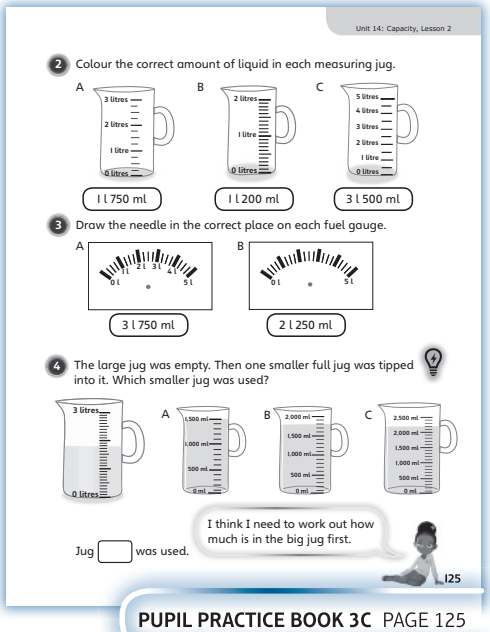

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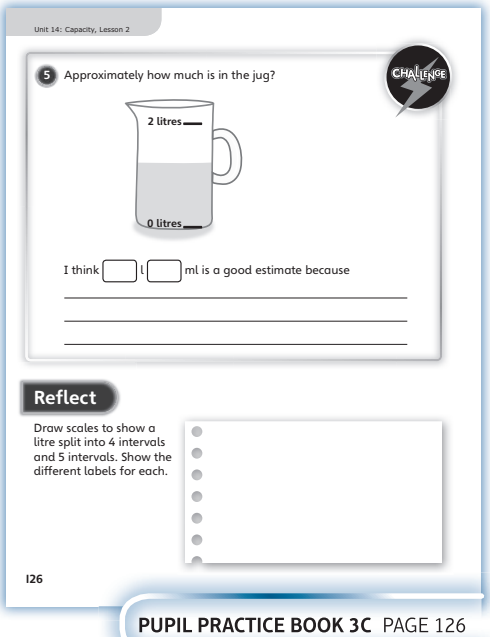
Reflect

WAYS OF WORKING Independent thinking

IN FOCUS Children should be aware that as the number of intervals changes, the amount that they represent also changes. Responses should also include the unit of measurement.

ASSESSMENT CHECKPOINT Is it clear from children's responses that they understand the use of intervals on a scale? Have they also included 0 l and 1 l at either ends of the scale?

ANSWERS Answers for the **Reflect** part of the lesson appear in the separate **Practice and Reflect answer guide**.



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After the lesson

- Are children confident in reading a range of scales?
- How could you further support those children who are not secure in measuring amounts using mixed units?
- Can you provide practical opportunities to reinforce children's learning in other curriculum areas?

Measuring capacity 3

Learning focus

In this lesson, children will continue to learn how to convert between litres and millilitres, including mixed units, in the context of real-life scenarios.

Small steps

- Previous step: Measuring capacity (2)
- **This step: Measuring capacity (3)**
- Next step: Comparing capacities

NATIONAL CURRICULUM LINKS

Year 3 Measurement

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

ASSESSING MASTERY

Children will know that 1 litre is the same as 1,000 millilitres and that $\frac{1}{2}$ litre equals 500 millilitres. Children will be able to convert measurements between litres and millilitres, and millilitres in the context of real-life word problems.

COMMON MISCONCEPTIONS

If children are not fully secure in their place value of 4-digit numbers, they may make errors when converting, particularly when the number of millilitres in a mixed unit measure is less than 100. Ask:

- *How do you write the number one thousand and twenty? Three thousand and five?*

STRENGTHENING UNDERSTANDING

Support children by using equipment (such as base 10 equipment, place value cards) or by labelling the place value columns (so they are able to partition and identify the number of thousands and remaining millilitres). Children can represent the partition in a part-whole model: 1 l 250 ml = 1 l and 250 ml = 1,000 ml and 250 ml = 1250 ml.

GOING DEEPER

Provide children with a blank scale, with the bottom labelled 0 litres and the top labelled 10 litres. Children roll dice to generate a 4-digit number. This represents a measurement in millilitres. Children then have to plot that measurement on their scale.

KEY LANGUAGE

In lesson: capacity, litres (l), millilitres (ml), scale, bar model, number line, place value, convert, approximately, thousand

Other language used by the teacher: mixed unit, measure, measurement, compare, interval, partition

STRUCTURES AND REPRESENTATIONS

bar model, number line, part-whole model, column addition

RESOURCES

Optional: base 10 equipment, capacity measuring equipment, place value columns, place value cards, number lines, milk containers with a capacity greater than 1 litre

In the eTextbook of this lesson, you will find interactive links to a selection of teaching tools.

Before you teach

- Can you make links to previous learning on converting measurements?
- Are there any children who may need support in applying their knowledge of place value?
- Do children know that 1,000 ml = 1 litre?

Discover

WAYS OF WORKING Pair work

ASK

- Question 1 a): *What do you notice about the scale on the jug? Where would 1,000 ml be on the scale?*
- Question 1 b): *Can you use the scale to work out how many millilitres 3 litres is?*

IN FOCUS Question 1 a) involves converting millilitres to mixed units, the inverse of the learning in the previous lesson. Although this is new for this unit, children may be able to draw on their knowledge of converting measurements in mass. Encourage children to look carefully at the scale on the jug to remind themselves that 1 l is equivalent to 1,000 ml. In question 1 b), encourage children to use the jug scale to help them: although the scale does not go up to 3 litres, they could deduce that 2 l = 2,000 ml so 3 l = 3,000 ml.

PRACTICAL TIPS Use large measuring containers to partially fill and read off the levels, giving the measurements in mixed units and in millilitres. Show some larger milk containers and practise converting the capacities to litres.

ANSWERS

Question 1 a): The water will be at 1 l and 200 ml on the scale.

Question 1 b): 3 l 250 ml is 3,250 ml of cream.

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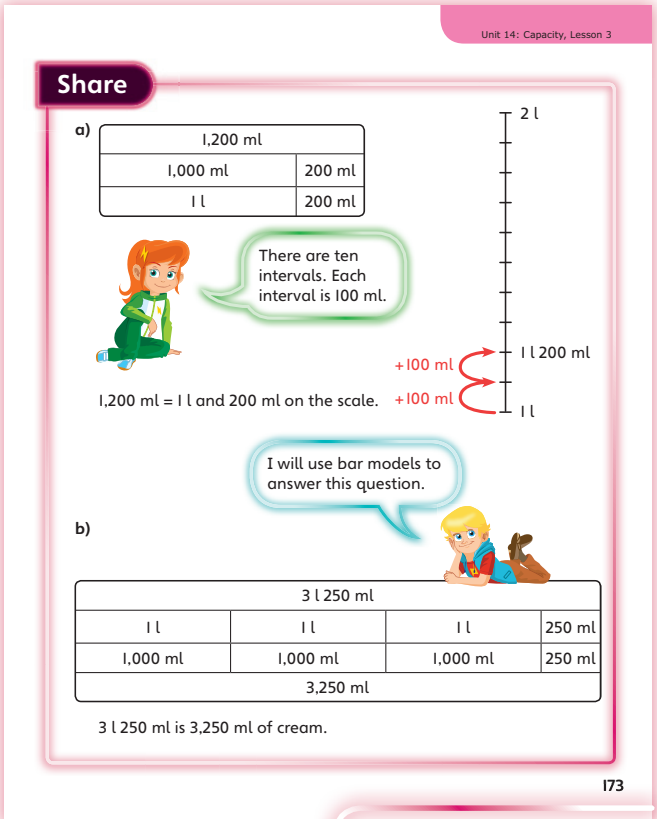
Share

WAYS OF WORKING Whole class teacher led

ASK

- Question 1 a): *Look at the bar model. What have the millilitres been partitioned into?*
- Question 1 a): *Does this remind you of converting between other units of measure?*
- Question 1 a): *What do you think the prefix 'milli-' in millimetres means?*
- Question 1 b): *How has 3 l 250 ml been partitioned?*

IN FOCUS The focus in both parts of the question is on partitioning the measurement using bar models. Question 1 b) shows the 3 litres partitioned into 1 l + 1 l + 1 l first, then into 1,000 ml + 1,000 ml + 1,000 ml. Encourage children to use the number link between 1 + 1 + 1 = 3 and 1,000 + 1,000 + 1,000 = 3,000. Ask: *How many millilitres is 5 l? 8 l?*



PUPIL TEXTBOOK 3C PAGE 173

Think together

WAYS OF WORKING Whole class teacher led (I do, We do, You do)

ASK

- Question 1: *What do you have to partition the millilitres into when converting to litres?*
- Question 1: *Can you see the relationship between a measurement in millilitres and a measurement in mixed litres and millilitres?*
- Question 2: *Is there more than one possibility? Which one would you choose and why?*

IN FOCUS Question 3 has a measurement of 1 l and 50 ml. Some children may get confused with how to represent this in millilitres, as it requires a place holder. Children could write the 1,000 ml and the 50 ml as a column addition, making sure to align the digits in the correct columns. This may help them to identify the need for the zero place holder in the hundreds column.

STRENGTHEN Use base 10 equipment to model the conversion between millilitres and mixed units. Using place value columns will help support children in identifying how to partition, in order to convert between units. Practise particularly amounts with less than 100 ml, such as 3 l 60 ml and 2,075 ml.

DEEPEN Children roll dice to create a 4-digit number. Explain that this number represents a measurement in millilitres. Ask: *Can you convert it to mixed units without the support of a bar model? How did you work it out?*

ASSESSMENT CHECKPOINT Question 1 shows whether children are able to convert between mixed units and millilitres. Question 2 shows whether children are able to apply their knowledge of conversion in order to solve a problem. Question 3 shows whether children can securely use their knowledge of place value when converting capacity.

ANSWERS

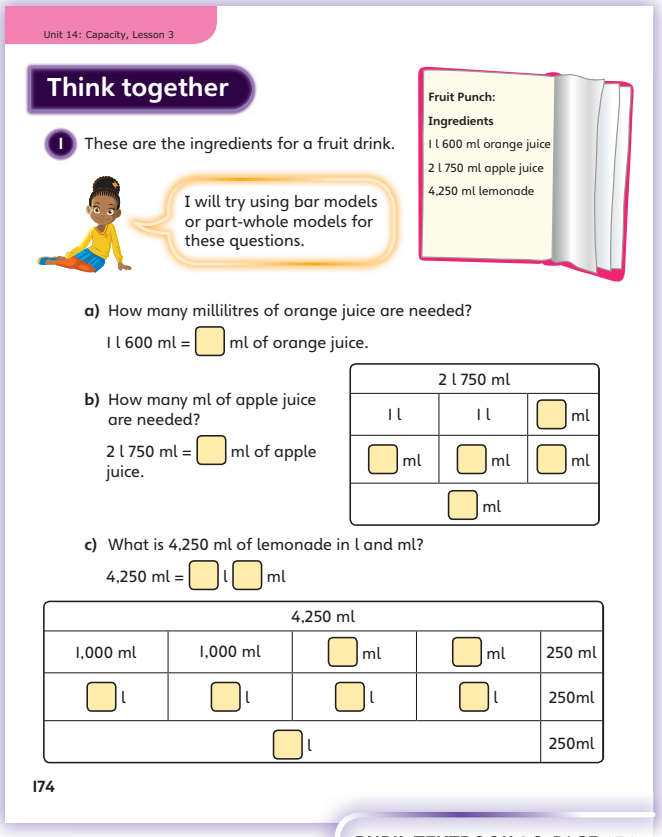
Question 1 a): 1 l 600 ml = 1,600 ml of orange juice.

Question 1 b): 2 l 750 ml = 2,750 ml of apple juice.

Question 1 c): 4,250 ml = 4 l 250 ml.

Question 2: The $2\frac{1}{2}$ l bowl and the 4,000 ml bowl are both big enough to hold 2 l 350 ml of water.

Question 3: He will have 1,050 ml of liquid altogether.



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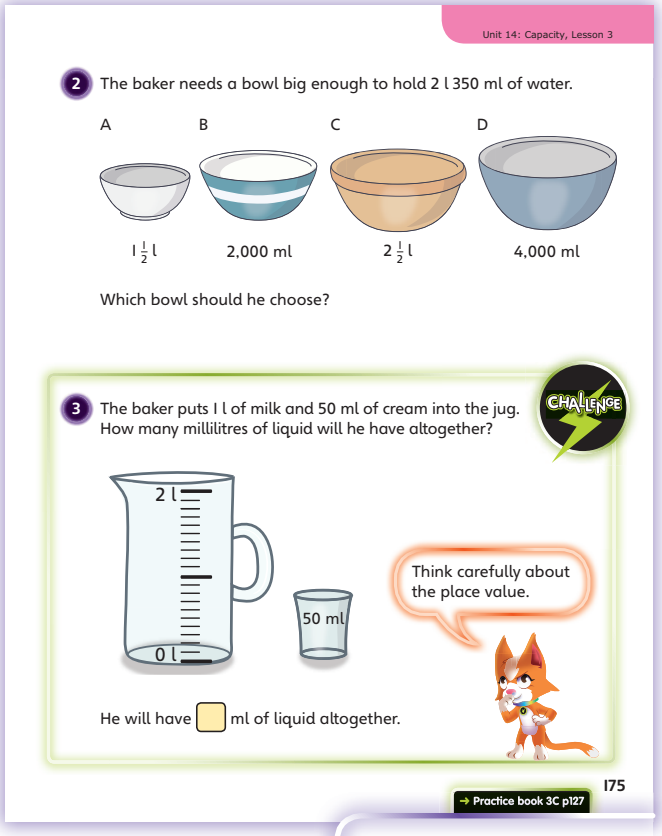

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Practice

WAYS OF WORKING Independent thinking

IN FOCUS These questions focus on converting between units of measure. Question 1 a) is supported with artwork, question 1 b) with a bar model and a part-whole model. Question 2 asks children to draw their own model to support the conversion. Question 4 provides the challenge of working out amounts between markers.

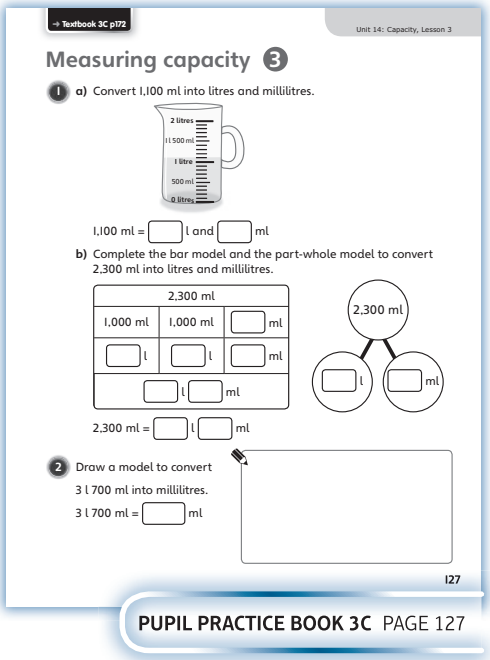
STRENGTHEN Use of base 10 equipment and place value columns can support children with converting between millilitres and mixed units. Get children to spot that numbers are the same and in the same order in the conversion (**3** l **450** ml = **3,450** ml). The exception is when there are no hundreds 3 l 50 ml = 3,**0**50 ml. Practise finding half-way between pairs of numbers (such as 100 and 200, 50 and 100, 1,000 and 2,000).

DEEPEN Can children create their own conversion problems set in a real-life context? Children could also draw and label their own containers, coloured to show a level, and swap with a partner for them to write the amount in two ways.

THINK DIFFERENTLY Question 5 requires children to record a number on a scale. It combines the skill of reading a scale and of converting between millilitres and mixed measures.

ASSESSMENT CHECKPOINT Can children confidently convert millilitres to mixed litres and millilitres? Can children confidently convert litres and ml to millilitres? Children should now be able to read scales for amounts over 1 litre, given in either millilitres or mixed units.

ANSWERS Answers to the **Practice** part of the lesson appear in a separate **Practice and Reflect answer guide**.



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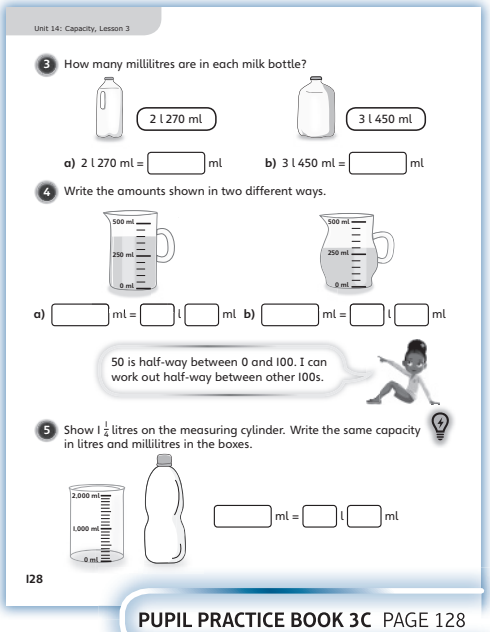

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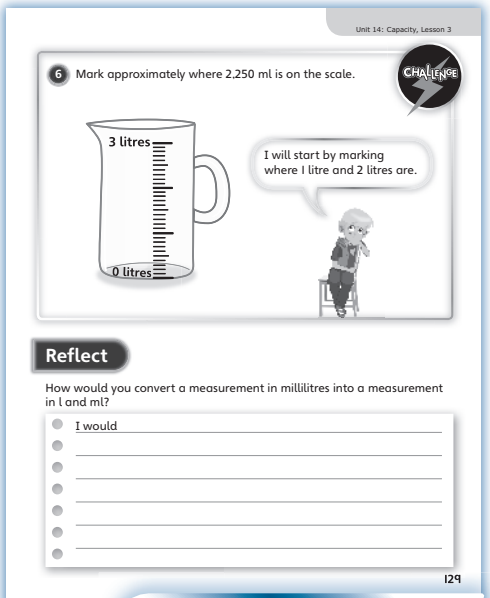
Reflect

WAYS OF WORKING Independent thinking

IN FOCUS This section requires children to identify what they need to consider when converting between units. Answering this question will help children secure their understanding of the process.

ASSESSMENT CHECKPOINT Are children able to describe what they need to do in order to convert between millilitres and mixed units?

ANSWERS Answers to the **Reflect** part of the lesson appear in a separate **Practice and Reflect answer guide**.



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After the lesson

- Did the lesson identify any gaps in the way children applied their place value knowledge?
- Were children able to apply their learning from other areas of measurement?
- Have children become fluent in converting between millilitres and mixed units?

Comparing capacities

Learning focus

In this lesson, children will learn to compare capacities by first comparing the number of litres then the number of millilitres. Children will also apply their knowledge of converting when comparing capacities given in different units.

Small steps

- Previous step: Measuring capacity (3)
- **This step: Comparing capacities**
- Next step: Adding and subtracting capacities

NATIONAL CURRICULUM LINKS

Year 3 Measurement

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

ASSESSING MASTERY

Children can compare and order a range of capacities. Children will be able to convert measures into the same units before making comparisons.

COMMON MISCONCEPTIONS

Children may not consider the number of litres before looking at the number of millilitres. Be sure to emphasise that they must first look at how many litres there are in each measure. Make links to comparing numbers, where you look at the largest place value first. Ask:

- *How many litres is in this measure? And in this one?*

STRENGTHENING UNDERSTANDING

Start by comparing measures that are just in litres, to ensure that the children focus on litres first. Then move to comparing two capacities, where one is in whole litres and the other is in mixed litres and millilitres. This will help children see the importance of looking at the litres first.

GOING DEEPER

Children play a game in pairs or small groups. Each child rolls four dice to generate the largest 4-digit number. This gives them a capacity in millilitres. They each convert their capacity to mixed units and order them largest to smallest. The child who generates the largest capacity in each round wins a point. Children could have other rules: generate a capacity between 2 l and 4 l, or generate capacities as close to 3 litres as possible.

KEY LANGUAGE

In lesson: order, compare, litres (l), millilitres (ml), capacity, more, less, most, least, greater, greatest, greater than (>), less than (<), half ($\frac{1}{2}$)

Other language used by the teacher: place value

STRUCTURES AND REPRESENTATIONS

bar model, number line

RESOURCES

Optional: dice, capacity measuring equipment

In the eTextbook of this lesson, you will find interactive links to a selection of teaching tools.

Before you teach

- Are children secure at reading capacities of mixed units on a range of scales?
- What practical opportunities can you incorporate in the lesson?
- Are there any children who may need support in place value in order to make comparisons?

Discover

WAYS OF WORKING Pair work

ASK

- Question 1 a): *What should you look at first when comparing these measurements?*
- Question 1 b): *What do you need to do before you can compare all these measurements?*
- Question 1 b): *Which holds the most/least of all four jugs?*

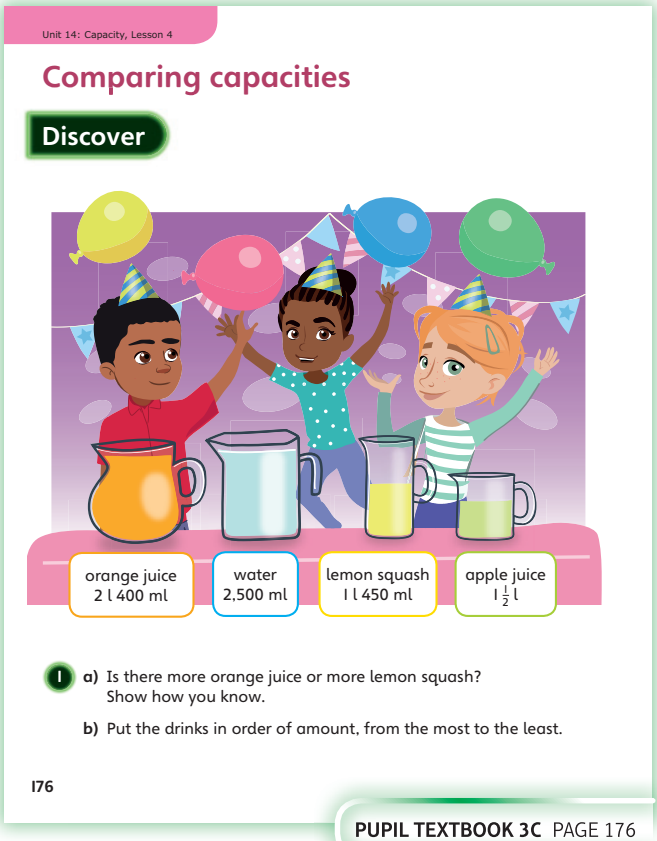
IN FOCUS These questions cover the key aspects of comparing two or more capacities. As with place value, the litres have the highest value, so this is the first number to consider. If the litres are the same, then the number of millilitres becomes important. When capacities are in different forms, then one (or more) of the measures will have to be converted so that they are all same. Encourage children to verbalise their reasoning when tackling these questions to ensure that they go through the correct process.

PRACTICAL TIPS Practical experience of using pairs of similar sized containers (where one has measurements in mixed measures and the other just millilitres) would be a helpful way for children to see that, for example: 1 l 500 ml is the same as 1,500 ml. Counting up in steps of 100 ml, 200 ml, 250 ml and 500 ml to 5,000 ml would be useful (800, 1,000, 1,200, 1,400 and so on). This can be repeated immediately with the related mixed measure: … 800 ml, 1 litre, 1 l 200 ml, 1 l 400 ml and so on.

ANSWERS

Question 1 a): The orange juice has 2 litres, the lemon squash has only 1 litre. There is more orange juice.

Question 1 b): The drinks in order of amount from most to least are: water, orange juice, apple juice, lemon squash.



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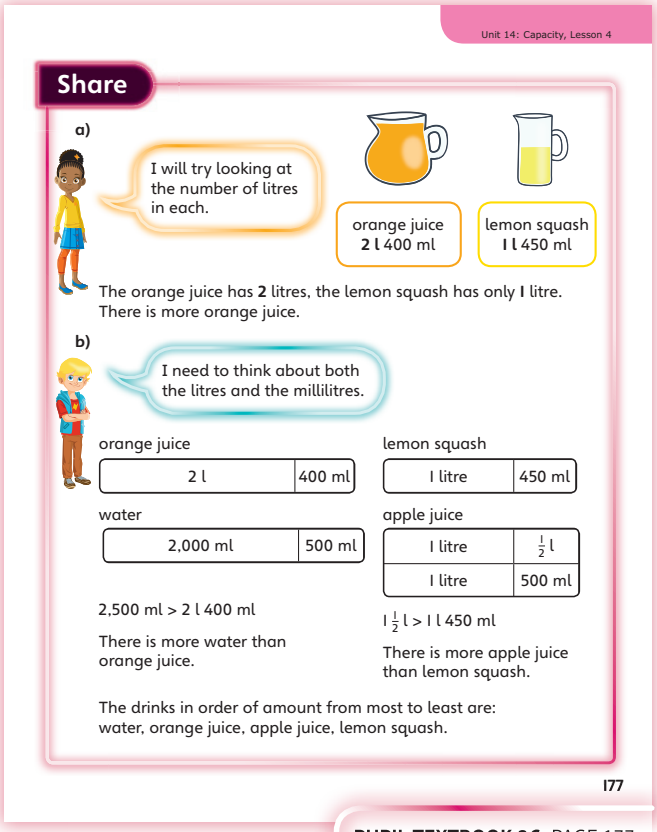
Share

WAYS OF WORKING Whole class teacher led

ASK

- Question 1 a): *Why do you compare the litres first?*
- Question 1 b): *What do you do if the number of litres are the same?*
- Question 1 b): *Which is easier, to convert millilitres into mixed litres and millilitres or to convert mixed litres and millilitres into millilitres?*

IN FOCUS These questions highlight the importance of comparing the number of litres first, because they are the larger unit. Only when the litres are different do you need to look at the smaller unit, the millilitres. Question 1 b) encourages children to convert one or more of the measurements so that all the measurements are in the same unit, making a direct comparison easier.



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Think together

WAYS OF WORKING Whole class teacher led (I do, We do, You do)

ASK

- Question 1 : *What do you have to do before you can compare these capacities?*
- Question 2 : *Is it easy to see which one will hold the least? Why?*
- Question 3 : *Can you draw a picture to help you solve this?*

IN FOCUS Question 3 requires children to carry out a multiplication to solve the problem. They could use repeated addition in order to do this. They will then need to carry out a conversion to compare the capacities. Encourage children to draw or make notes to keep track of their thinking. The fact that the capacities are the same may make some children question whether they calculated correctly.

STRENGTHEN Use capacity equipment so children can physically measure and compare the capacities in the questions.

DEEPEN For question 3 , ask: *What other ways can Reena and Max still have the same capacities?*

ASSESSMENT CHECKPOINT Question 1 will determine whether children can convert and compare capacities that have the same number of litres. Question 2 will determine whether children can convert, compare and order capacities that have different numbers of litres. Question 3 will determine whether children can apply their knowledge of multiplication in order to solve a multi-step problem comparing capacities.

ANSWERS

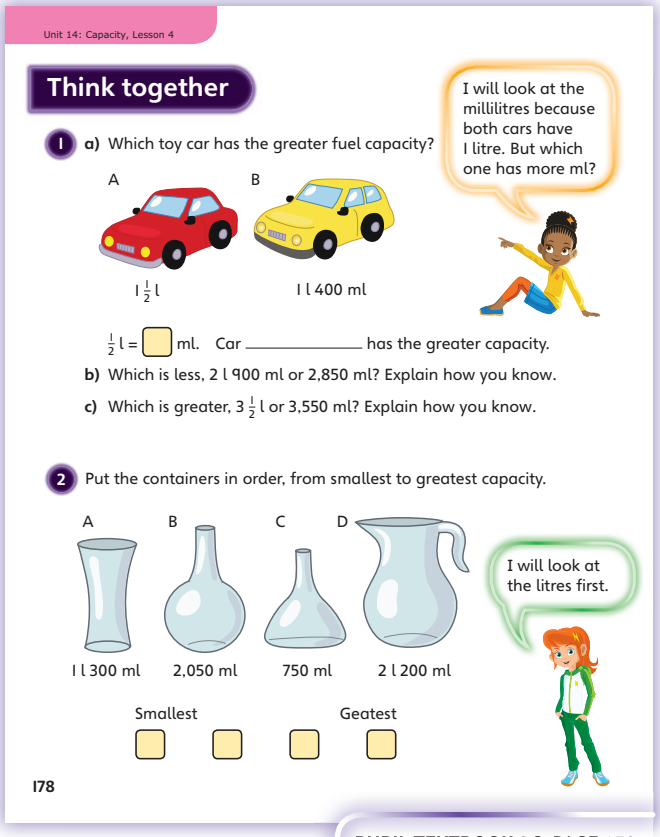
Question 1 a): $\frac{1}{2}$ l = 500 ml. Car A has the greater capacity.

Question 1 b): 2,850 ml is less than 2 l 900 ml.
2,850 ml = 2 l 850 ml, 850 < 900

Question 1 c): 3,550 ml is more than 3 $\frac{1}{2}$ litres.
3 $\frac{1}{2}$ litres = 3,500 ml, 3,550 ml > 3,500 ml

Question 2 : C: 750 ml, A: 1 l 300 ml, B: 2,050 ml, D: 2 l 200 ml

Question 3 : Reena and Max have the same amount of fizzy drink as they each have 4 litres.
8 × 500 = 4,000 ml = 4 l
($\frac{1}{2}+\frac{1}{2}+\frac{1}{2}+\frac{1}{2}+\frac{1}{2}+\frac{1}{2}+\frac{1}{2}+\frac{1}{2}=4$)
2 × 2 l = 4 l.



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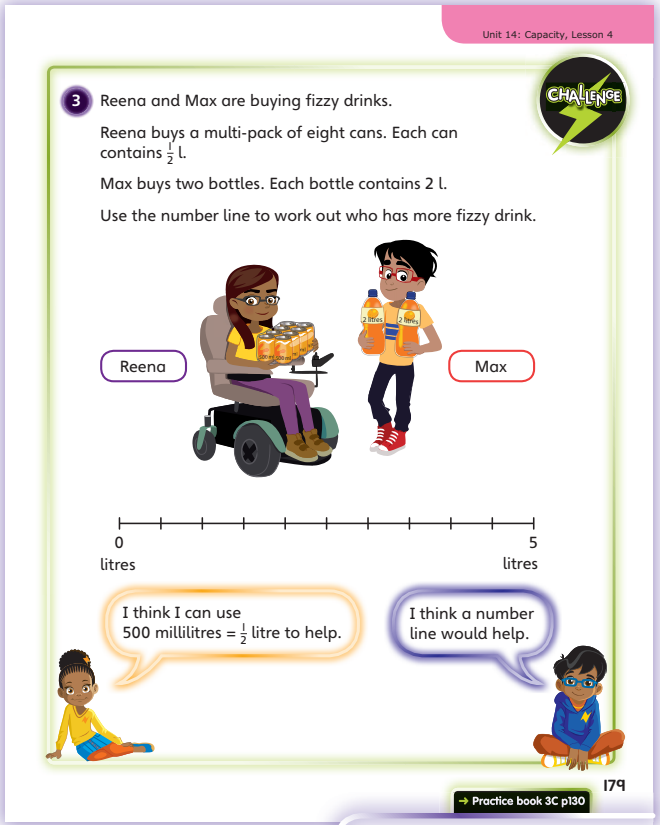

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Practice

WAYS OF WORKING Independent thinking

IN FOCUS In question **7**, some children may just guess, thinking that the tall, thin container is fuller than the short wide container. But the total capacity of the wide one holds 2 litres and it is at least $\frac{3}{4}$ full which is 1 l 500 ml (1,500 ml); whereas the total capacity of the taller container is only 1,500 ml (1 l 500 ml) and it is not full.

STRENGTHEN Children can make comparisons by using capacity equipment. Firstly give each pair two different containers. Ask them to pour 1 or 2 litres of water into them. Ask: *Which looks as if it has more liquid?* Provide two 2 litre jugs, one in litres and one in millilitres. Ask children to pour the same amount in each jug. Then read and record the amounts. Children should then pour more water into one container and record each amount as a comparison: a > b.

DEEPEN Children work in pairs. Give each pair a scale from 0 l to 7 l, marked in 100 millititre intervals, whole litres labelled. Children take it in turns to roll two dice to generate two numbers. They choose one for the litres and the other for the hundreds of millilitres (for example, 3 and 4 could give 3 l 400 ml or 4 l 300 ml). Children plot their capacity on the scale. The first child to get three in a row wins. To simplify, the first number rolled is litres and the second the hundreds (so that the winning depends more on the roll of the dice than on choosing strategically).

THINK DIFFERENTLY Question **5** combines learning from this and previous lessons. Children need to read the amounts from a variety of vertical line scales and order the amounts. Some may need support reading the intervals on each scale.

ASSESSMENT CHECKPOINT Children should compare by first looking at the number of litres in mixed units, or by using place value to 4 digits for millilitres. Children should realise that they may need to convert units, so that all the measurements are in the same unit of measure. Children can read off a scale where not all intervals are labelled.

ANSWERS Answers to the **Practice** part of the lesson appear in a separate **Practice and Reflect answer guide**.

Reflect

WAYS OF WORKING Independent thinking

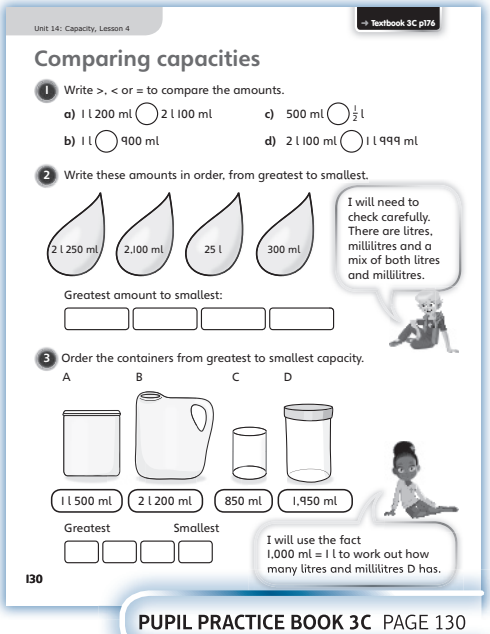
IN FOCUS Children list the steps needed to order a set of capacities. Steps should include: converting to same unit of measure, comparing the litres or thousands of millilitres, converting $\frac{1}{2}$ l to 500 ml, comparing the number of millilitres.

ASSESSMENT CHECKPOINT Do children understand that the number of litres is compared first, as that is the largest unit? Do children mention converting units when the units of measure are different? You only need to compare the millilitres when the units of measure are different.

ANSWERS Answers to the **Reflect** part of the lesson appear in a separate **Practice and Reflect answer guide**.

After the lesson

- Were there any gaps in understanding that hindered children's ability to compare capacities?
- Were children able to convert to the same units in order to compare capacities?
- Were children able to draw on their knowledge from other units on measures to help them in this lesson?



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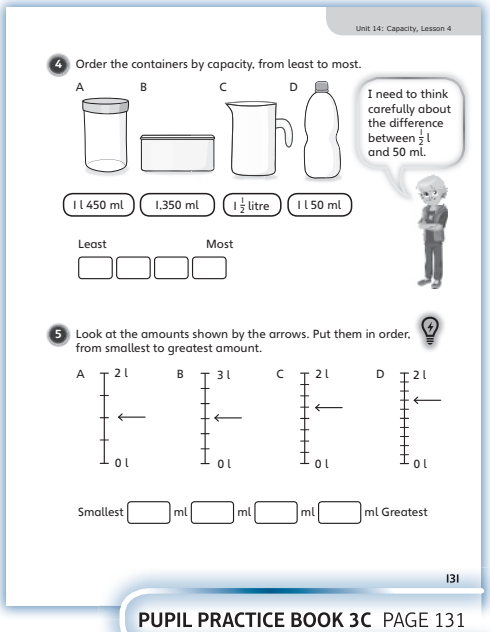

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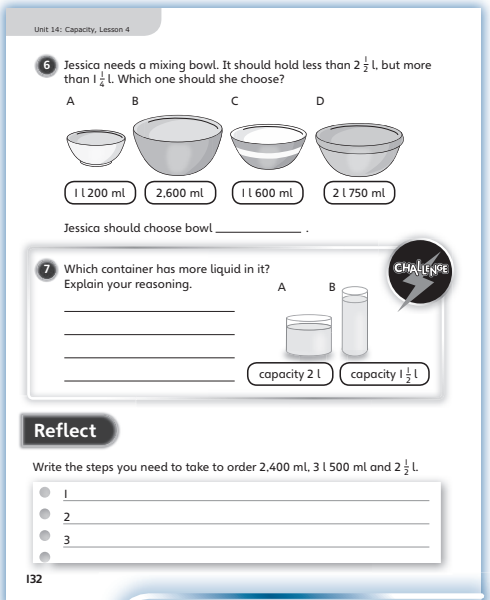

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Adding and subtracting capacities

Learning focus

In this lesson, children will apply what they have learnt about converting between litres and millilitres to add and subtract capacities. They will have to draw on their knowledge of number bonds to 1,000 and their knowledge of partitioning.

Small steps

- Previous step: Comparing capacities
- **This step: Adding and subtracting capacities**
- Next step: Problem solving – capacity

NATIONAL CURRICULUM LINKS

Year 3 Measurement

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

ASSESSING MASTERY

Children can add and subtract capacities across a litre boundary. Children will be able to use what they know about converting between litres and millilitres, as well as number bonds to 1,000, to solve addition and subtraction problems in the context of capacity.

COMMON MISCONCEPTIONS

Children may not be able to make the link between bonds to 10 and bonds to 100 and 1,000. Start by asking the children to record their bonds to 10. Then look at bonds to 100 with multiples of 10, and discuss the similarities. Finally, look at bonds to 1,000 with multiples of 100, and discuss the patterns between the three sets of number bonds. Ask:

- *What do you add to 6 to make 10? What do you add to 60 (600) to make 100 (1,000)?*

STRENGTHENING UNDERSTANDING

Where possible, use bar models to illustrate the addition or subtraction. Children could use the scales as number lines to help calculate the addition or subtraction. Ensure children have practise in crossing the litre boundaries, and in partitioning the mixed measure, in order to add or subtract them where appropriate.

GOING DEEPER

Children by posing problems where they have to add or subtract three or more quantities. Include amounts in different units, so that children need to convert as well as cross a litre boundary. Children could make up their own capacity problems to solve.

KEY LANGUAGE

In lesson: add, subtract, total, difference, capacity, millilitres (ml), litres (l), scale, column addition, counting on, subtraction, greater than (>), less than (<), total, number bonds to 1,000

Other language used by the teacher: number bonds to 10/100, mixed measure, pattern

STRUCTURES AND REPRESENTATIONS

bar model, column addition, column subtraction, number line

RESOURCES

Optional: capacity measuring equipment

In the eTextbook of this lesson, you will find interactive links to a selection of teaching tools.

Before you teach

- Can you provide practical opportunities for children to add and subtract quantities?
- How secure are children in addition and subtraction with up to three digits?
- How will you link this lesson to previous units on addition and subtraction?

Discover

WAYS OF WORKING Pair work

ASK

- Question 1 a): *Which containers have less than 1 litre? Less than 500 ml?*
- Question 1 a): *Is it possible to answer the question without adding the amounts?*
- Question 1 b): *What do you need to do first to answer this question?*

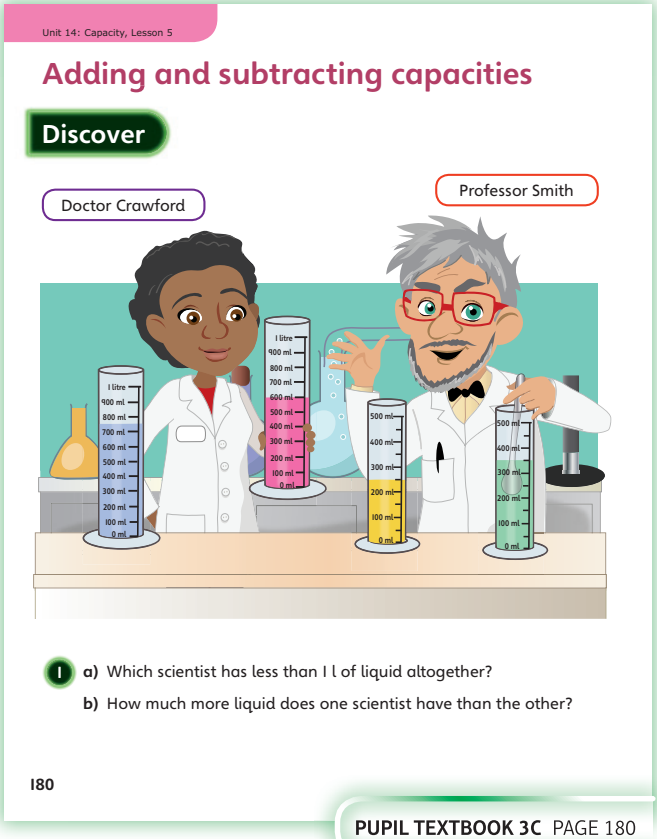
IN FOCUS In question 1 a), bar models should help children to answer the question, rather than adding the amounts. As both of Professor Smith's amounts are less than 500 ml, their total must be less than 1,000 ml, which is 1 litre. Similarly, Doctor Crawford's amounts are both more than 500 ml, so their total must be over 1 litre. Question 1 b) requires column addition, but children can use a counting on method (using a number line) for subtraction.

PRACTICAL TIPS Allow children to act out the scene. They can physically measure out the amounts and pour them in together in a clearly labelled container, to find the totals. Children could also use the scale as a counting-up number line for the subtraction.

ANSWERS

Question 1 a): Professor Smith has less than 1 litre of liquid altogether.

Question 1 b): The doctor has 750 ml more liquid than the professor.


Unit 14: Capacity, Lesson 5

Adding and subtracting capacities

Discover

Doctor Crawford

Professor Smith

1 a) Which scientist has less than 1 l of liquid altogether?

b) How much more liquid does one scientist have than the other?

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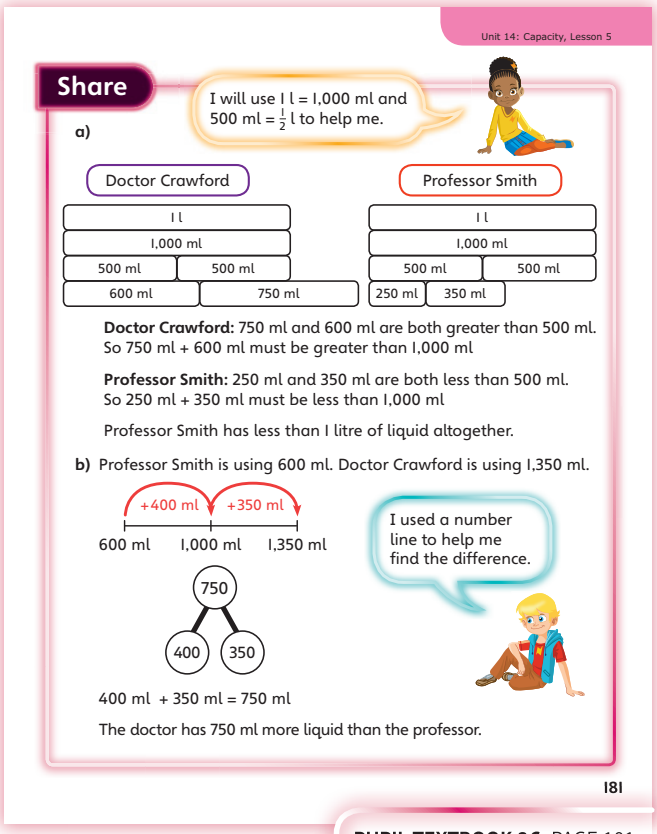
Share

WAYS OF WORKING Whole class teacher led

ASK

- Question 1 a): *How do the bar models show that Professor Smith has less than 1 litre in total?*
- Question 1 b): *What do you need to remember when doing column addition?*
- Question 1 b): *Can you answer this question without adding or subtracting?*
- Question 1 b): *Do you need to do addition or subtraction first?*
- Question 1 b): *Which method is being shown for the subtraction?*

IN FOCUS Although question 1 a) could be answered using addition, the bar models show that it is not necessary. However, it is necessary to add and subtract to answer question 1 b). Children may suggest other known methods for addition and subtraction to the ones modelled, which could be used to check the answers given.


Unit 14: Capacity, Lesson 5

Share

I will use 1 l = 1,000 ml and 500 ml = $\frac{1}{2}$ l to help me.

a)

Doctor Crawford: 1 l; 1,000 ml; 500 ml | 500 ml; 600 ml | 750 ml

Professor Smith: 1 l; 1,000 ml; 500 ml | 500 ml; 250 ml | 350 ml

Doctor Crawford: 750 ml and 600 ml are both greater than 500 ml. So 750 ml + 600 ml must be greater than 1,000 ml

Professor Smith: 250 ml and 350 ml are both less than 500 ml. So 250 ml + 350 ml must be less than 1,000 ml

Professor Smith has less than 1 litre of liquid altogether.

b) Professor Smith is using 600 ml. Doctor Crawford is using 1,350 ml.

+400 ml +350 ml

600 ml 1,000 ml 1,350 ml

I used a number line to help me find the difference.

750

400 350

400 ml + 350 ml = 750 ml

The doctor has 750 ml more liquid than the professor.

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Think together

WAYS OF WORKING Whole class teacher led (I do, We do, You do)

ASK

- Questions 1 and 2 : *Which addition facts could help you?*
- Question 3 : *Do you need to convert between units? Why not?*

IN FOCUS Question 4 involves crossing the litre boundary when adding and also when subtracting. Discuss some strategies for adding the amounts, including using bonds to 1,000 then adding on, or adding the litres and millilitres separately and converting the units. Ask: *Which do you find easier?* Steps for this question are modelled using bar models, but number lines marked as scales could also be used.

STRENGTHEN Model the additions and subtractions using the part-whole model and the bar model. It may support some children's understanding of adding and subtracting capacities to explore the questions practically.

DEEPEN Set children word problems to deepen learning. Ask: *What three quantities could you add together to make a total of 2 l 200 ml? Each quantity must be a multiple of 100 ml. How many different combinations can you find?*

ASSESSMENT CHECKPOINT Questions 1 and 2 show whether the children are able to use number bonds to 1,000. Question 3 shows whether children can add mixed units by partitioning the litres and millilitres. Question 4 shows whether children can add and subtract capacities involving crossing litre boundaries.

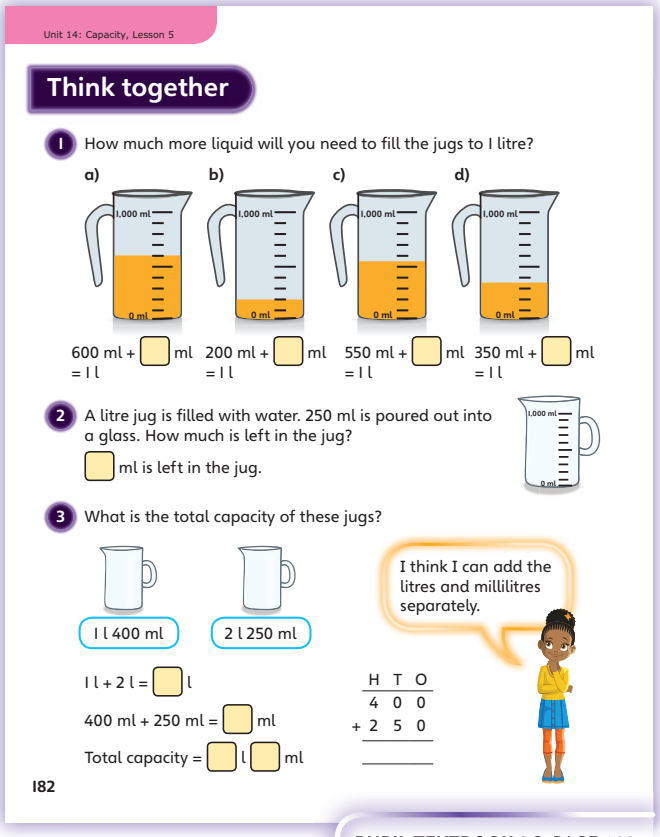
ANSWERS

Question 1 : A 600 ml + 400 ml = 1 l, B 200 ml + 800 ml = 1 l, C 550 ml + 450 ml = 1 l, D 350 ml + 650 ml = 1 l

Question 2 : 750 ml is left in the jug.

Question 3 : Total capacity = 3 l 650 ml

Question 4 : The total is 2 l 200 ml. 800 ml more liquid is needed to fill the 3 l jug.



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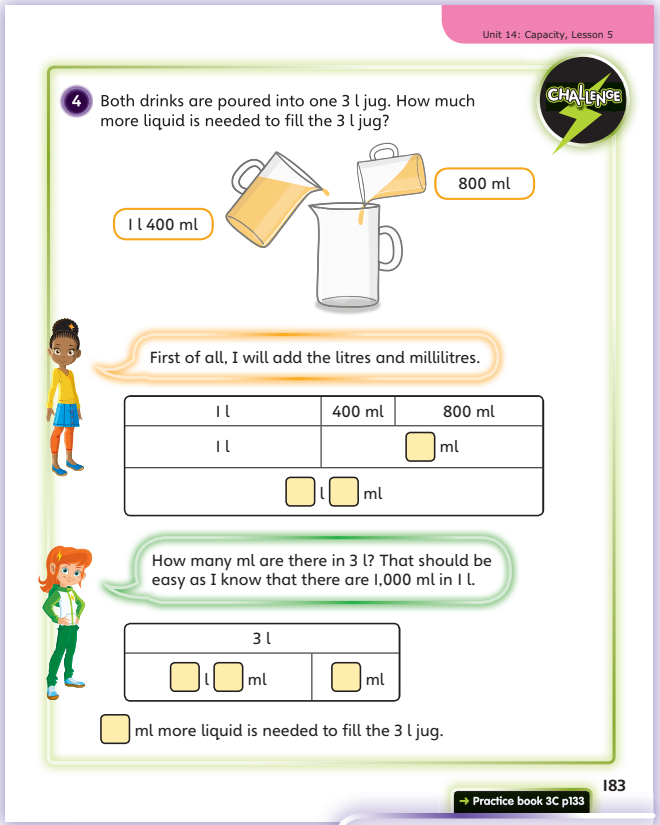

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Practice

WAYS OF WORKING Independent thinking

IN FOCUS Question 4 is a two-step problem requiring addition then subtraction, and a knowledge of how to convert between litres and millilitres. Some children may need extra guidance to identify the calculations that need to be done. Encourage children to draw a bar model of the problem to help them identify the steps.

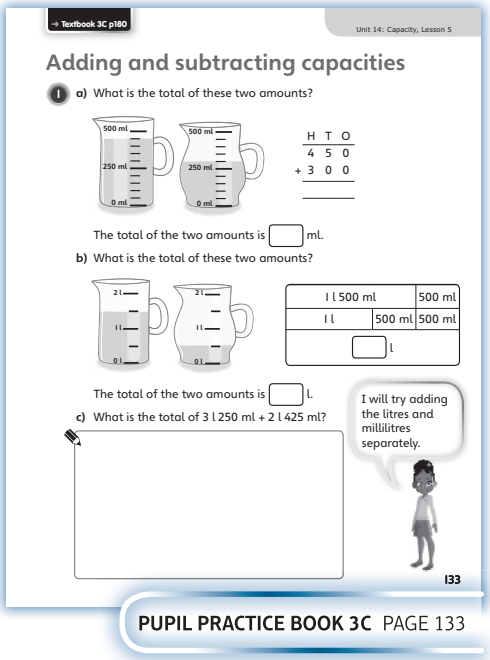
Question 5, the challenge question, is a multi-step problem. Some children may need to physically act it out, then draw bar models or number lines to realise they need to add the first two amounts and subtract that from 2 l (2,000 ml) to then work out what must be in cylinder C.

STRENGTHEN Children should use bar models or number lines to represent each problem. They can use base 10 equipment to help calculate with the 1,000 cubes representing litres. Practise multiple of 10 and multiple of 100 bonds to 1,000.

DEEPEN Ask children to develop their own addition and subtraction 2-step problems. Their problems need to require the crossing of a litre boundary.

ASSESSMENT CHECKPOINT Questions 1, 2 and 3 assess whether children can add or subtract amounts without crossing a litre boundary. Questions 4 and 5 assess whether children can solve multi-step word problems involving crossing litre boundaries and converting between units.

ANSWERS Answers to the **Practice** part of the lesson appear in a separate **Practice and Reflect answer guide**.



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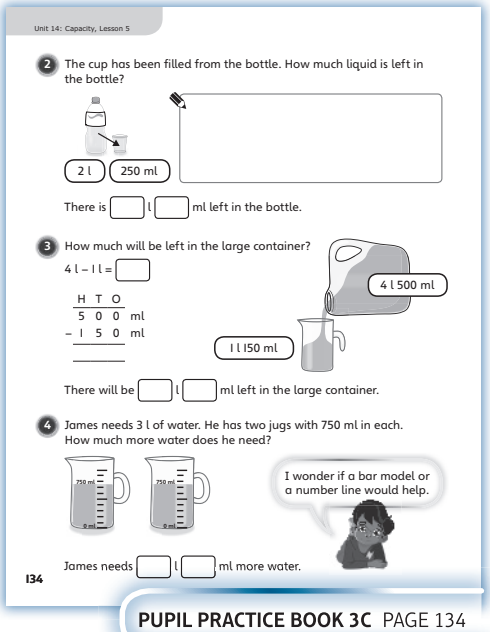

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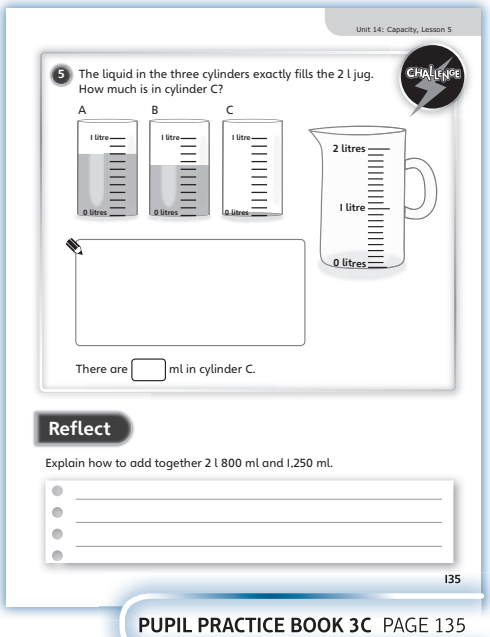
Reflect

WAYS OF WORKING Independent thinking

IN FOCUS Children are asked to explain how they would add together two amounts, given in different units of measure.

ASSESSMENT CHECKPOINT Can children identify strategies such as converting between units, adding the litres and millilitres separately, or using knowledge of number bonds to 1,000?

ANSWERS Answers to the **Reflect** part of the lesson appear in a separate **Practice and Reflect answer guide**.



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After the lesson

- Were there any gaps in children's knowledge and application of place value, number bonds or partitioning that acted as barriers to their learning?
- Were you able to make the links between this lesson and previous lessons in this unit?

Problem solving – capacity

Learning focus

In this lesson, children will apply their learning from this unit to solve problems involving all four operations.

Small steps

- Previous step: Adding and subtracting capacities
- **This step: Problem solving – capacity**

NATIONAL CURRICULUM LINKS

Year 3 Measurement

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

ASSESSING MASTERY

Children can carry out multi-step capacity problems involving all four operations. Children will be able to apply their knowledge of multiplication, division, subtraction and addition, as well as converting between litres and millilitres.

COMMON MISCONCEPTIONS

Children may need support to identify what calculations they need to do, particularly if it is a multi-step problem. Encourage children to draw a picture of the problem and use bar models in order to identify what operations are required. Ask:

- *What is the question asking you to do? What do you need to do first? What could you draw to show what the problem is asking?*

STRENGTHENING UNDERSTANDING

Where possible, represent the problem using concrete apparatus. Encourage children to talk the problem through with a partner or an adult and to say the problem in their own words. It can help model children's thinking process by thinking out loud whilst solving the problem with them.

GOING DEEPER

Ask children to adapt some of the problems in order to change the type of operations required. For example, they could adapt a problem that requires addition, so that it requires subtraction instead.

KEY LANGUAGE

In lesson: capacity, millilitres (ml), litres (l), add (+), subtract (–), multiply (×), divide (÷), difference, total, convert, equivalent

Other language to be used by the teacher: calculation, scale, division

STRUCTURES AND REPRESENTATIONS

bar model, number line, part-whole model

RESOURCES

Optional: capacity measuring equipment, base 10 equipment

In the eTextbook of this lesson, you will find interactive links to a selection of teaching tools.

Before you teach

- Are there any children who may need support with calculating?
- How can you model the problems for children to help them identify the calculations required?

Discover

WAYS OF WORKING Pair work

ASK

- Question 1 a): *What do you need to do to solve this?*
- Question 1 b): *What could you draw to show a picture of the problem?*
- Question 1 b): *What calculation do you need to do to solve the problem?*

IN FOCUS Both questions involve division, but question 1 a) is modelled as a repeated addition, whereas question 1 b) shows the problem as a division. Both parts are shown using bar models. Children need to draw on their knowledge of converting 1 litre to millilitres.

PRACTICAL TIPS You can support children by drawing a scale for 1 litre with five divisions. This will help children apply their learning from reading scales to solve the problem. Children could physically enact the questions by using a 200 ml measure and a litre jug.

ANSWERS

Question 1 a): Holly uses three 200 ml cartons of milk for the pancake recipe.

Question 1 b): There will be 200 ml of juice in each cup.

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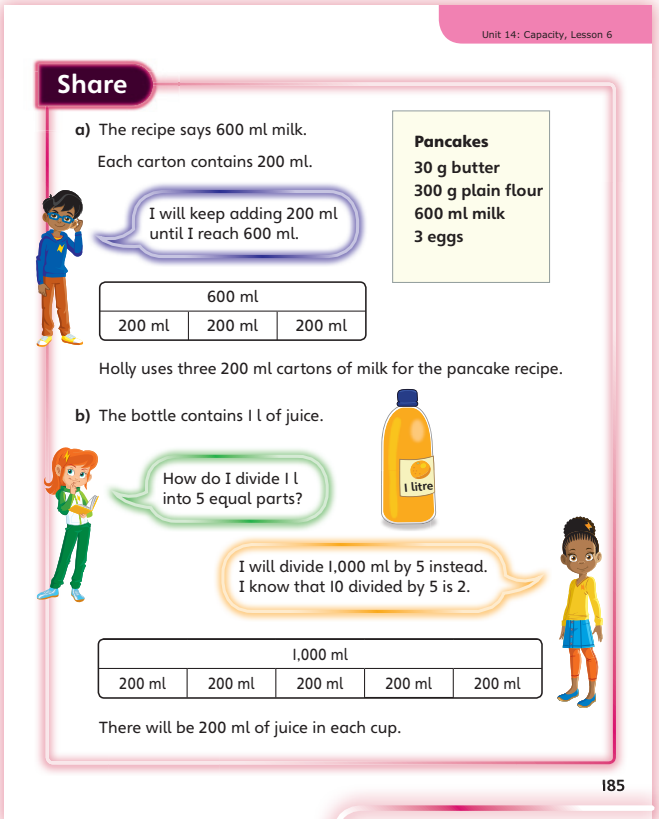
Share

WAYS OF WORKING Whole class teacher led

ASK

- Question 1 a): *What addition facts did you use to find the solution?*
- Question 1 b): *What multiplication facts did you use to find the solution? Is there another way of finding the solution? How else could you share 1,000 ml equally between cups?*

IN FOCUS Known multiplication facts can be used to work out related division facts. These can be used to solve problems with much larger numbers. Draw attention to the relationship between 10 ÷ 5 = 2, and 100 ÷ 5 = 20 and therefore 1,000 ÷ 5 = 200. Discuss how to divide 100 between 2, 4 and 10, relating that to dividing 1,000 between 2, 4 and 10.



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Think together

WAYS OF WORKING Whole class teacher led (I do, We do, You do)

ASK

- Question 1 : *What addition or multiplication facts are going to help you?*
- Question 3 : *Have you solved it the same way as your partner? If not, which way do you think is easier?*
- Question 3 : *Can you draw a picture of the problem?*

IN FOCUS Question 3 requires children to first convert from litres to millilitres and then carry out a division. Children may overlook that it is 2 l and only divide 1 l. They should remember that 250 ml is a quarter of 1,000 ml (from previous lessons), so they will get four cups from each litre. You could encourage them to draw a scale on a white board for 2 l and to put in 250 ml divisions, so children can link the calculation to the learning they did on reading scales in previous lessons.

STRENGTHEN Ask children to draw a picture of the problem to help understand what is required. If possible, use equipment to replicate the problem, so children can see the calculations needed.

DEEPEN Can children adapt question 3 so that the answer will be: 4 cups? 10 cups? 16 cups? 20 cups?

ASSESSMENT CHECKPOINT Can children solve word problems involving millilitres and litres, choosing the correct operation(s), and using their knowledge of the relationship between litres and millilitres?

ANSWERS

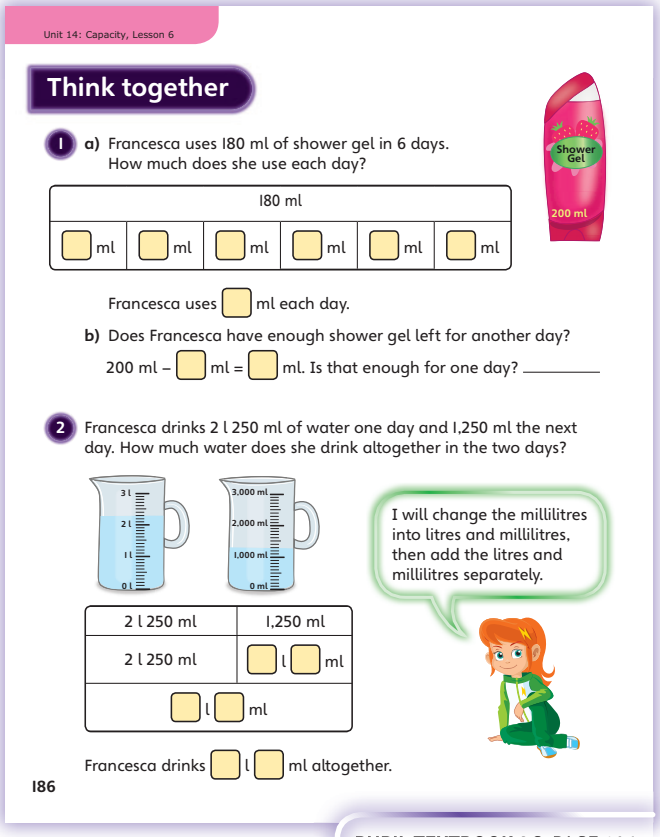
Question 1 a): Francesca uses 30 ml each day.

Question 1 b): 200 –180 = 20 ml. No, it is not enough for one day.

Question 2 : Francesca drinks 3 l 500 ml altogether.

Question 3 a): Leon can fill 8 cups.

Question 3 b): 6 cups = 1 l 500 ml. There are 500 ml left.



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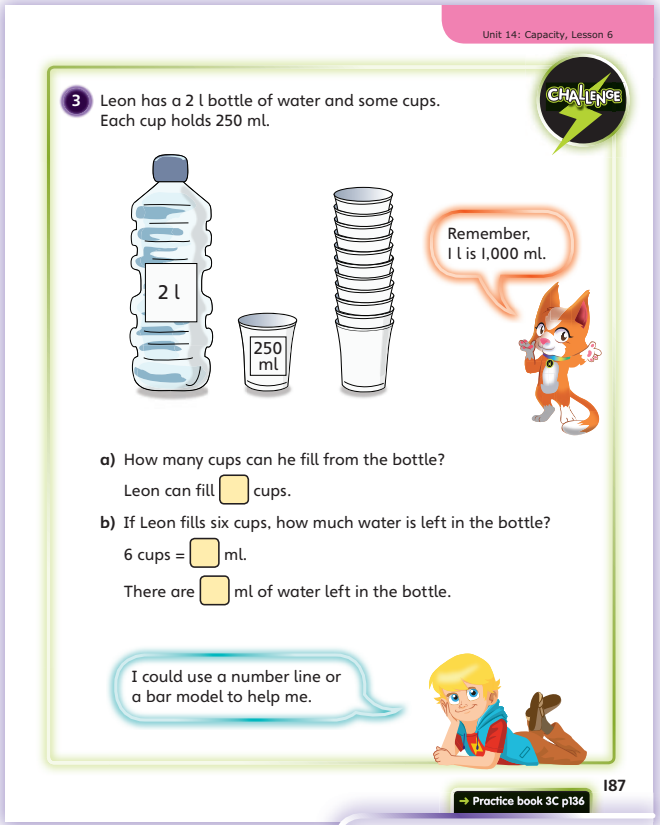

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Practice

WAYS OF WORKING Independent thinking

IN FOCUS Questions from 3 onwards are 2- or multi-step problems with the challenge question 7 requiring a number of steps. Children may need support through diagrams to start. A common error is not working all the way through a question. Children may only do the first calculation or miss one of the calculations out. Encourage children to go back and read the problem after they have their answer, in order to check that they have answered it.

STRENGTHEN Encourage children to talk through the problem with a partner or adult. As they are talking it through, the adult or partner can draw a picture of the problem. It may also help to read the problem to the child and get them to repeat it back in their own words. The use of bar models can aid children in identifying the calculations that are needed. You can adapt question 7 with fewer plants and/or less days.

DEEPEN Ask children to develop their own multi-step problems. You could challenge them further by specifying what operations children have to include in the problem. A good starting point is to write similar problems to those on these pages, with different contexts, values or operations.

THINK DIFFERENTLY Question 5 is a multi-step problem. Encourage children to look back at other questions to help them work out how many glasses each child needs. Ensure they actually answer the question: *How many more?*

ASSESSMENT CHECKPOINT Can children solve a single-step capacity problem without crossing a litre boundary? Can children solve a single-step capacity problem crossing a litre boundary? Can children solve a 2- or multi-step capacity problem? Are children completing a multi-step problem or only partially completing it?

ANSWERS Answers to the **Practice** part of the lesson appear in a separate **Practice and Reflect answer guide**.

Reflect

WAYS OF WORKING Independent thinking

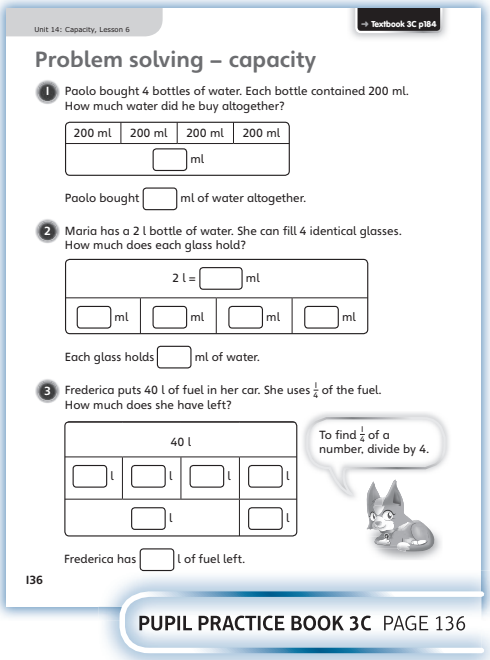
IN FOCUS This section encourages children to verbalise how they solved one of the problems on these pages. You may wish to specify the question they are to explain. Children should mention the steps they took in the correct order and which calculations they had to work out to answer the question fully.

ASSESSMENT CHECKPOINT Are children able to explain clearly how they solved a capacity problem with more than one step? Did children show the calculations needed in the correct order?

ANSWERS Answers to the **Reflect** part of the lesson appear in a separate **Practice and Reflect answer guide**.

After the lesson

- How confident were children in identifying the calculations within the problems?
- Did children apply any strategies that could be helpful to others?
- How successful were you and children in making the links between this lesson and previous lessons in this unit?


Unit 14: Capacity, Lesson 6

→ Textbook 3C p184

Problem solving – capacity

1 Paolo bought 4 bottles of water. Each bottle contained 200 ml. How much water did he buy altogether?

200 ml | 200 ml | 200 ml | 200 ml

[ ] ml

Paolo bought [ ] ml of water altogether.

2 Maria has a 2 l bottle of water. She can fill 4 identical glasses. How much does each glass hold?

2 l = [ ] ml

[ ] ml | [ ] ml | [ ] ml | [ ] ml

Each glass holds [ ] ml of water.

3 Frederica puts 40 l of fuel in her car. She uses $\frac{1}{4}$ of the fuel. How much does she have left?

40 l

[ ] l | [ ] l | [ ] l | [ ] l

[ ] l | [ ] l

To find $\frac{1}{4}$ of a number, divide by 4.

Frederica has [ ] l of fuel left.

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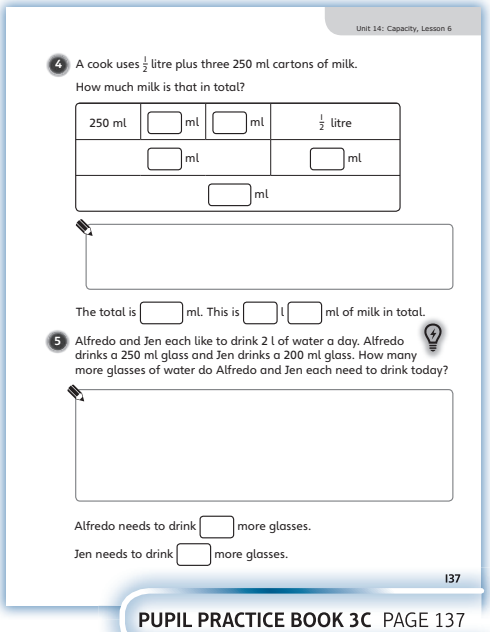
Unit 14: Capacity, Lesson 6

4 A cook uses $\frac{1}{2}$ litre plus three 250 ml cartons of milk. How much milk is that in total?

250 ml | [ ] ml | [ ] ml | $\frac{1}{2}$ litre

[ ] ml | [ ] ml

[ ] ml

The total is [ ] ml. This is [ ] l [ ] ml of milk in total.

5 Alfredo and Jen each like to drink 2 l of water a day. Alfredo drinks a 250 ml glass and Jen drinks a 200 ml glass. How many more glasses of water do Alfredo and Jen each need to drink today?

Alfredo needs to drink [ ] more glasses.

Jen needs to drink [ ] more glasses.

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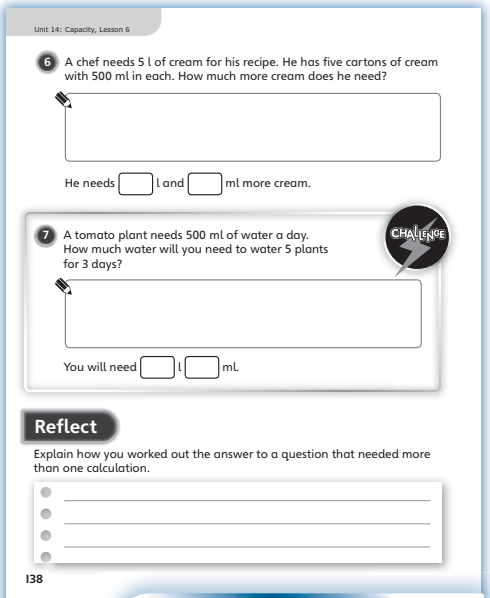
Unit 14: Capacity, Lesson 6

6 A chef needs 5 l of cream for his recipe. He has five cartons of cream with 500 ml in each. How much more cream does he need?

He needs [ ] l and [ ] ml more cream.

7 A tomato plant needs 500 ml of water a day. How much water will you need to water 5 plants for 3 days?

CHALLENGE

You will need [ ] l [ ] ml.

Reflect

Explain how you worked out the answer to a question that needed more than one calculation.

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End of unit check

Don't forget the *Power Maths* unit assessment grid on p26.

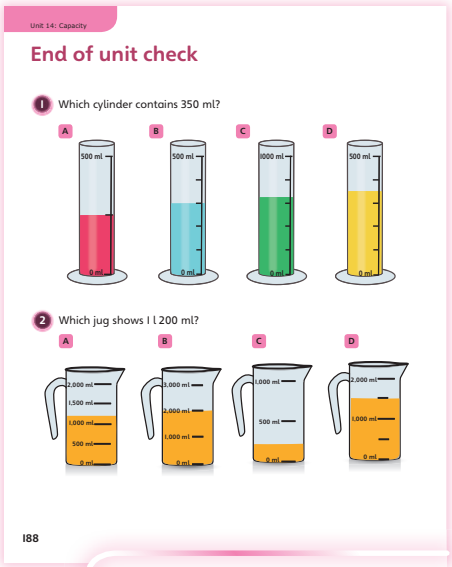
WAYS OF WORKING Group work adult led

IN FOCUS

- Question 1 assesses children's ability to read a range of scales involving millilitres.
- Question 2 assesses children's ability to read scales and convert from millilitres to mixed units.
- Question 3 assesses children's ability to convert from mixed units to millilitres.
- Question 4 assesses children's ability to compare capacities involving mixed units.
- Question 5 assesses children's ability to add capacities of mixed units crossing the litre boundary.
- Question 6 assesses children's ability to subtract capacities of mixed units crossing the litre boundary.
- Question 7 assesses children's ability to solve multi-step capacity problems.

ANSWERS AND COMMENTARY

Children who have mastered the concepts in this unit will be able to read and measure amounts in litres and millilitres. They will be able to add, subtract and convert between the units and use this knowledge with the four operations in problem solving.


Unit 14: Capacity

End of unit check

1 Which cylinder contains 350 ml?

A B C D

2 Which jug shows 1 l 200 ml?

A B C D

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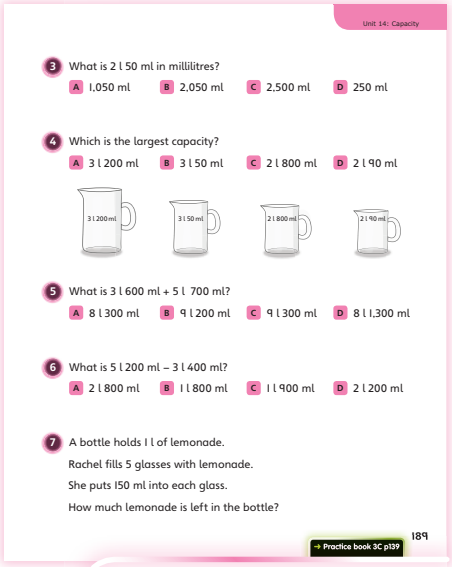
Unit 14: Capacity

3 What is 2 l 50 ml in millilitres?
A 1,050 ml B 2,050 ml C 2,500 ml D 250 ml

4 Which is the largest capacity?
A 3 l 200 ml B 3 l 50 ml C 2 l 800 ml D 2 l 90 ml

5 What is 3 l 600 ml + 5 l 700 ml?
A 8 l 300 ml B 9 l 200 ml C 9 l 300 ml D 8 l 1,300 ml

6 What is 5 l 200 ml – 3 l 400 ml?
A 2 l 800 ml B 1 l 800 ml C 1 l 900 ml D 2 l 200 ml

7 A bottle holds 1 l of lemonade.
Rachel fills 5 glasses with lemonade.
She puts 150 ml into each glass.
How much lemonade is left in the bottle?

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→ Practice book 3C p139

PUPIL TEXTBOOK 3C PAGE 189

Q	A	WRONG ANSWERS AND MISCONCEPTIONS	STRENGTHENING UNDERSTANDING
1	D	A suggests an error in halving 500 ml; B suggests misreading the target capacity as 300ml; C suggests that the total capacity has been ignored when interpreting the scale.	Do not forget to make the links to understanding of number and calculating clear to children. The scale should be seen as a number line and children can use this to support their calculations. Providing opportunities for children to engage in practical exploration of capacity can help them in their understanding of the context. Practice writing numbers (such as one thousand and fifty, two thousand and seventy, three thousand and fifteen), stressing the importance of the 0 as a place holder in the 100s.
2	A	C suggests children have looked at ml only.	
3	B	A suggests incorrect conversion of the whole litres; C and D suggest an error in place value.	
4	A	B suggests an error in place value; C suggests ignoring the whole litres; D suggests ignoring the whole litres and an error in place value.	
5	C	A suggests forgetting the extra litre gained from adding the millilitres; B suggests an addition error when crossing the litre boundary. D suggests forgetting to convert 1,000 ml to 1 litre.	
6	B	A or C suggest an error when crossing the litre boundary; D suggests incorrect subtraction of 400 –200.	
7	250 ml	An answer of 750 ml suggests forgetting to subtract.	

My journal

WAYS OF WORKING Independent thinking

ANSWERS AND COMMENTARY

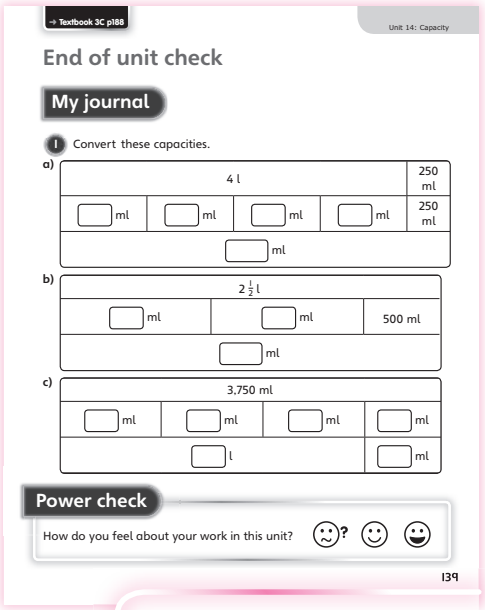
Children should be able to use the bar models provided to support their understanding of converting between mixed units and millilitres. Remind children that each litre is the same as 1,000 ml. The use of base 10 equipment can support children's understanding.

Question 1 a): 4,250 ml

Question 1 b): 2,500 ml

Question 1 c): 3 l 750 ml

Children should be confident in their understanding that there are 1,000 ml in 1 l.



PUPIL PRACTICE BOOK 3C PAGE 139

Power check

WAYS OF WORKING Independent thinking

ASK

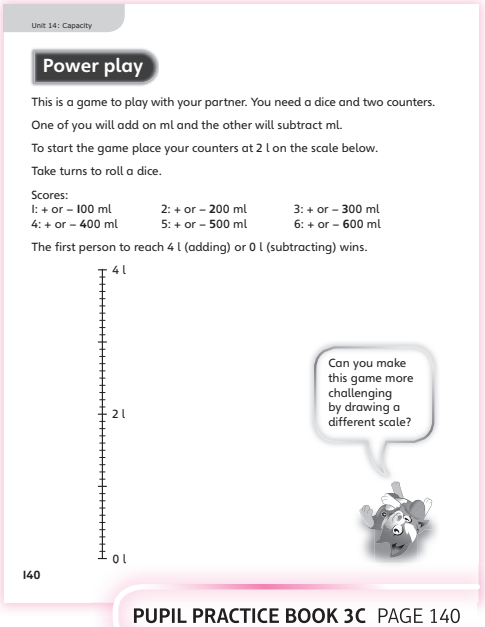
- *How confident are you in converting between mixed litres and millilitres to millilitres?*
- *Do you think you can understand a range of scales to work out capacity?*
- *How happy are you in adding and subtracting capacities?*

Power play

WAYS OF WORKING Pair work

IN FOCUS Use this **Power play** to determine how confident children are in reading scales as they add and subtract millilitres across the litre boundaries.

ANSWERS AND COMMENTARY The less confident of the pair could start by being the player who adds. They could use the scale as a number line to count on. Encourage the children to try solving the calculation and finding the answer on the scale before moving their counter, recording their addition or subtraction in both ml and in mixed units. For example,
2 litres: (score of 4) 2 l + 400 ml = 2 l 400 ml = 2,400 ml, or
2 l – 400 ml = 1 l 600 ml = 1,600 ml.



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After the unit

- The most obvious practical application for capacity is cooking. Could you provide an opportunity for the children to apply their skills by following up with a cooking activity?
- The skills in this unit are transferable to other units of measure. Ask the children what is the same or different about their learning in this unit and their learning in the length and mass units.

Strengthen and **Deepen** activities for this unit can be found in the *Power Maths* online subscription.