Unit 9
Multiplication and division 1

Five daily lessons

National **Numeracy** *Strategy*

Year 4
Summer term

Unit Objectives

Year 4

• Understand the principle (not the name) of the distributive law as it applies to multiplication.	Pages 52, 54
• Round up or down after division, depending on the context.	Page 56
• Use known number facts and place value to multiply and divide integers including by 10 and then by 100.	Page 64
• Use doubling or halving starting from known facts.	Page 60
• Use the relationship between multiplication and division.	Page 62
• **Derive quickly: division facts corresponding to 2, 3, 4, 5 and 10 times tables.**	**Page 58**
• Use all four operations to solve word problems involving numbers in 'real life', money and measures, using one or more steps.	Pages 82–89

Link Objectives

Year 3

- Understand multiplication as repeated addition.
- Round up or down after division, depending on the context.
- **Recognise division is the inverse of multiplication.**
- Solve word problems involving numbers in 'real life', money and measures, using one or more steps.

Year 5

- Understand the effect of and relationships between the four operations and the principles of the arithmetic laws as they apply to multiplication.
- **Extend written methods to HTU x U or U.t x U.**
- **Use all four operations to solve simple word problems involving numbers and quantities.**

(Key objectives in bold)

This Unit Plan is designed to guide your teaching.

You will need to adapt it to meet the needs of your class.

Resources needed to teach this unit:

- Resource sheet 9.1
- Resource sheet 9.2
- Resource sheet 9.3
- Activity sheet 9.1
- Activity sheet 9.2
- Activity sheet 9.3
- OHT 9.1
- OHT 9.2
- Self-assessment sheet 9.1
- OHP calculator
- 0–9 cards
- Counters
- Dice marked $\times 2$, $\times 20$, $\times 5$, $\times 10$, $\times 100$, $\div 10$
- Triangle flashcards
- Individual whiteboards

department for education and skills

Planning sheet	Day One	Unit 9 *Multiplication and division 1*	Term: *Summer*	Year Group: *4*

Oral and Mental

Objectives and Vocabulary

Use known number facts and place value to multiply and divide integers including by 10 and then by 100.

VOCABULARY
double

RESOURCES
OHP calculator
Whiteboards and pens

Teaching Activities

- Ask the children to respond to some quick fire multiplication and division questions relating to the 2, 3, 4, 5 and 10 times tables. The children show answers on whiteboards.

  For some questions ask the children to explain their strategy. Highlight efficient strategies, e.g. × by 4 by doubling and doubling again.

- Display 78 on the OHP calculator. Ask the children what the calculator display will show if you multiply 78 by 10.

  Enter [×] [10] [=]

  Q What happened to the digits when the number was multiplied by 10?

  Discuss the children's observations.

  Q What would the calculator show if I pressed [×] [10] [=] again?

  The children write their answer on whiteboards.

  Choose one child to come out and demonstrate the effect of multiplying by 10. The same child presses the [CA] button to clear the display and enters a new two-digit number.

  Q What will the calculator show if I multiply this number by 100?

  Ask the children to write their answer on whiteboards. One of the children to demonstrate × 100 on the calculator.

  Q What happens to the digits when the number is multiplied by 100?

  Repeat as necessary using a variety of two-digit/three-digit numbers to multiply or divide by 10 or multiply by 100.

Main Teaching

Objectives and Vocabulary

Use known facts to multiply and divide, including by 10 and then by 100.

Use doubling and halving, starting from known facts.

VOCABULARY
multiplication
division
double
halve

RESOURCES
Copies of Resource sheet 9.1
Counters
0–9 cards
Blank dice marked × 2, × 20, × 5, × 10, ÷ 10, × 100

Teaching Activities

- Ask the children to calculate 37 × 20.

  Q How did you work out the answer?

  Discuss the children's strategies.

  Q How does the work we did in the oral and mental starter on multiplying by 10 help?

  Repeat with a few more examples of Tu × 20.

  Ensure that the children understand that to multiply by 20 you can multiply by 10, then double.

- Ask the children to calculate 44 × 5.

  Q How did you work out the answer?

  Discuss strategies. Repeat with a few more examples of Tu × 5.

  Ensure the children understand that an efficient strategy for multiplying by 5 is to multiply by 10, then halve.

- Model the following activity that the children will go on to play in pairs. Each child in the pair has a set of 0–9 digit cards. All 20 cards are laid out where the children can see them. The first child to play rolls the dice, getting, e.g. × 10. Then they take a look at the game board (Resource sheet 9.1) in order to find a number they can make using any combination of 0–9 cards multiplied by 10. They show the 0–9 cards arranged in the correct way with the dice to their partner to confirm that the operation is correct. The player then places a counter of their colour on the relevant number on the board. The second player then has a turn. Play continues in this way. The winner is the first player to get four counters of their colour in a line.

  The game can be made more challenging by removing the cards as they are used.

Plenary

Teaching Activities/Focus Questions

- Discuss with the children how the game went.

  Q Which calculations were easier/harder?

  Discuss the calculations the children found harder.

  Q What strategies did you use to help you with the harder calculations?

  Q What strategies did you use to help you win the game?

By the end of the lesson the children should be able to:

- **Use known facts to multiply and divide including by 10 and 100.**

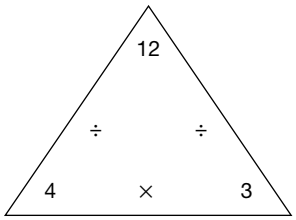
(Refer to supplement of examples, section 6, page 64.)

Planning sheet	Day Two	Unit 9 *Multiplication and division 1*	Term: *Summer*	Year Group: *4*

Oral and Mental

Objectives and Vocabulary	Teaching Activities
Derive quickly division facts corresponding to the 2, 3, 4, 5 and 10 times tables. Begin to know multiplication facts for 6, 7, 8 and 9 times table. RESOURCES Individual whiteboards Computer Large screen	• Function Machine program on 'Using ICT to Support Mathematics in Primary Schools.' • Select either: Multiplying by a single-digit number OR Dividing by a single-digit number before the children see it. • Tell the children that they will have three chances to work out the function. Ask for numbers to input, show the output and after three goes ask the children to record individually on their whiteboards what they think the function is. Repeat with a new input and change the function.

Main Teaching

Objectives and Vocabulary	Teaching Activities
Use the relationship between multiplication and division. VOCABULARY inverse RESOURCES Triangle flashcards Activity sheet 9.1	• Ask the children how they could check an addition calculation. Focus on using the inverse, i.e. subtraction. Ask the children then how they could check a multiplication calculation. Establish that multiplication and division are inverses. • Establish that knowing one fact means that you also know another three which are directly related to it, i.e. knowing $7 \times 8 = 56$ means you also know $8 \times 7 = 56$, $56 \div 7 = 8$ and $56 \div 8 = 7$ • Demonstrate how we can find the four facts using triangle flashcards:  Hold the triangle by one of its corners, concealing a number, e.g. 12. • Ask the children what 3×4 equals, so 4×3 equals. Reveal the answer 12. On the same card, conceal 3 and ask what $12 \div 4$ is, repeat with the 4 concealed. • Explain how this reinforces the fact that from knowing one fact we know another three. • Model the activity for the children. Pairs of children will have a sheet of triangles between them and work collaboratively. • Using Activity sheet 9.1, the children write two multiplication and two division sentences for each triangle in the first six examples. In the second set of six, only two of the numbers are given. In the last examples, only one number is given. For each of these sets the children need to write in appropriate numbers and multiplication and division signs before they give the two multiplication and two division sentences. • An extension would be to have a blank sheet of triangles per pair and have the children generate their own flashcards for each other.

Plenary

Teaching Activities/Focus Questions

- Discuss the main activity. Focus on a number on Activity sheet 9.1 where more than one answer is possible.

> **Q** Can you find any other examples like this on the sheet?

> **Q** Which numbers at the top of the triangle will only give two facts?

Allow some discussion.

Establish that some square numbers would only give two facts, e.g.

$9 \div 3 = 3$ $\quad$ $25 \div 5 = 5$
$3 \times 3 = 9$ $\quad$ $5 \times 5 = 25$

By the end of the lesson the children should be able to:

- **From a known multiplication or division fact, derive three other facts;**
- **Understand the relationship between multiplication and division.**

(Refer to supplement of examples, section 6, page 62.)

Planning sheet	Day Three	Unit 9 *Multiplication and division 1*	Term: *Summer*	Year Group: *4*

Oral and Mental

Objectives and Vocabulary

Describe and visualise 2-D shapes.

Recognise equilateral and isosceles triangles.

VOCABULARY
isosceles triangle
oblong
semi-circle
curved
right angle
underneath
apart

RESOURCES
Resource sheet 9.2

Teaching Activities

- Encourage use of correct vocabulary for shape and position.
- The children are to work in pairs. Give one child from each pair one of the two illustrations in Resource sheet 9.2. The partner must not see it. The child has to describe the picture for the partner to draw.
- Stop the activity and let the pair compare their drawings.

> **Q** Which shapes were the most difficult to describe and draw? Why?

> **Q** How did you know what kind of triangle the sail of the boat made?

Main Teaching

Objectives and Vocabulary

Round up and down after division depending on context.

VOCABULARY
divide
round up
round down

RESOURCES
OHT 9.1
OHT 9.2
Activity sheet 9.2

Teaching Activities

- Write on the board: 38 ÷ 6 = ? Ask the children to each write an estimate on a whiteboard and hold it up.

> **Q** How did you make your estimate?

Invite someone to work out the answer on the board (any reasonable method is acceptable).

Establish that 38 ÷ 6 = 6 R 2 and write on the board.

Now display OHT 9.1 which shows five problems, all centred round 38 ÷ 6. Establish that the calculation needed for each problem is the same.

- Discuss rounding up or down for a sensible answer.

> **Q** Why do you need to round up for some questions and down for others?

Draw out how rounding down is appropriate when you need to know the number of full groups; and rounding up is appropriate when finding the number of groups including the last, incomplete group.

- Tell the children they are going to work in pairs to find sensible answers to problems. Tell the children that the calculations needed to solve the problems are 51 ÷ 2 = ? and 22 ÷ 9 = ? Ask the children to estimate and then calculate the answer. Hand out Activity sheet 9.2 and ask them to cut the questions into strips. Working in pairs the children sort the questions by the two calculations and by whether they would need to round up or down.

The children write the answer on each strip. Ask questions such as:

> **Q** Can you think of another problem using 51 ÷ 2 = 25 R 1. Where would you need to round up?

Plenary

Teaching Activities/Focus Questions

- For 22 ÷ 9 = 2 R 4

> **Q** Which questions did you need to round up?

> **Q** Which questions did you need to round down?

> **Q** How did you decide?

Ask the children to explain their reasoning.

- Look at the layout of a Testbase question (OHT 9.2). Help the children recognise that rounding is needed to answer the second question.

Discuss the calculations, estimates and solutions needed.

By the end of the lesson the children should be able to:

- **Consider whether to round up or down following division depending on context.**

(Refer to supplement of examples, section 6, page 56.)

Planning sheet	Day Four	Unit 9 *Multiplication and division 1*	Term: *Summer*	Year Group: *4*

Oral and Mental

Objectives and Vocabulary

Recognise and explain patterns and relationships, generalise and predict.

VOCABULARY
coins
total
pattern

RESOURCES
1p, 2p, 5p, 10p, 50p
£1, and £2 coins

Teaching Activities

- Invite nine children to stand at the front of the class. Give each child a 1p coin.

Q What is the total amount of money the group have?

Write on the board

Coin	Total
1p	9p

Swap the 1p coin for a 2p coin; repeat the question and work towards building up the table below.

Coin	Total
1p	9p
2p	18p
5p	45p
10p	90p
20p	£1.80
50p	£4.50
£1	£9.00
£2	£18.00

Q What patterns can you see in the totals?

Discuss patterns made in totals, e.g. 2p, 20p, £2.00, doubles and the first digit of each total. Ask the children to explain patterns.

Q What amount of money could we give to each child in order to have a total starting with the digit 4?

Allow the children to discuss with a partner. Take responses and encourage the children to justify their answer by referring to the pattern.

Q If the total amount is £1800 how much money would you give to each child?

Main Teaching

Objectives and Vocabulary

Use all four operations to solve word problems involving numbers in 'real life' money and measures using one or more steps.

VOCABULARY
what could we try next?
how much is?
multiply
divide

RESOURCES
Resource sheet 9.3

Teaching Activities

Display the menu on Resource sheet 9.3. Invite the children to choose one item from each section of the menu and work out the total cost using informal jottings if necessary.

Q How did you work out your total?

Highlight strategies such as rounding 99p to £1, using amounts that total £1, etc.

Q If my meal cost £3.34 what four things did I choose?

Give the children a few minutes to discuss the problem in pairs.

Take some responses about strategies the children are using to solve the problem.

Ensure the children understand that the 4p from the £3.34 must be made by adding a 9p and 5p from various items in the menu.

Q What combinations of items could/couldn't I choose?

Give the children a short time to find the solution.

Reveal the challenge at the bottom of Resource sheet 9.3. Ensure the children understand the challenge. The children work on the challenge in pairs.

Plenary

Teaching Activities/Focus Questions

Q What strategies did you use to help you find a solution?

- Pick up on and discuss different strategies.

1. Choose, say, a burger and work out what six would cost. Then choose, say, fries and work out what six would cost, etc. Finally total and adjust if necessary.
2. Work out the cost of one meal and multiply by 6. Adjust if necessary.
3. Start with a division to see how much each meal can cost.

Q Which method do you think is most efficient?

- Assess the children on their approach to the problem and on their understanding of and response to the discussion of other strategies.

By the end of the lesson the children should be able to:

- **Apply multiplication and division to solving 'real life' problems and appreciate that there may be different strategies for solving a problem.**

(Refer to supplement of examples, section 6, page 82.)

Planning sheet	Day Five	Unit 9 *Multiplication and division 1*	Term: *Summer*	Year Group: *4*

Oral and Mental

Objectives and Vocabulary	Teaching Activities
Use known number facts and place value to multiply and divide integers, including by 10 and then 100 (whole-number answers). VOCABULARY multiplied by divided by product factor RESOURCES Whiteboards	• On the board write ten two- and three-digit numbers all of which are divisible by 10 or 100, e.g. 20, 30, 50, 400, 170, 280. Ask the children to choose a number and divide it by 10. Ask the children to give their answers in a sentence as a number statement, e.g. 90 divided by 10 equals 9, 170 divided by 10 equals 17. Practise with other numbers written on the board. Repeat for division by 100.

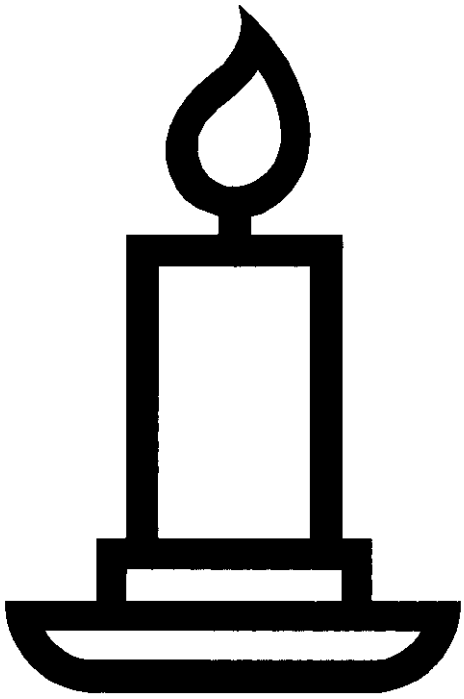
Main Teaching

Objectives and Vocabulary	Teaching Activities
Understand distributive law. VOCABULARY sum total RESOURCES Activity sheet 9.3 Self-assessment sheet 9.1	• Write 7×8 on the board. **Q** How can you work out the answer to 7×8? Collect answers. Re-write the question as $7 \times 8 = (5 \times 8) + (2 \times 8)$ and work through with the children. Practise with 7×9 and 7×7 until you have established that the children can write 7×7 as $(7 \times 5) + (7 \times 2)$. • Now write 11×8 on the board. **Q** How can you work out the answer to 11×8? Collect answers. Explain that this can be written as $(10 \times 8) + (1 \times 8)$. Practise with 9×8 and 7×8. Establish that the children can see the pattern. Now explain that they have been partitioning the first number, i.e. $7 = 5 + 2$ and $8 = 5 + 3$. Explain that the method they have been taught can help them to work out answers to multiplication questions that they cannot work out in their heads. • Write 21×7 on the board. **Q** How can you multiply 21×7? Establish that children are aware of the pattern: $(10 \times 7) + (10 \times 7) + (1 \times 7)$ Give children other examples to work out using the partitioning method you have taught them e.g. $31 \times 7 = (10 \times 7) + (10 \times 7) + (10 \times 7) + (1 \times 7) = 70 + 70 + 70 + 1 = 217$ • Encourage the children to use the method to work out answers to multiplication questions they cannot work out in their heads.

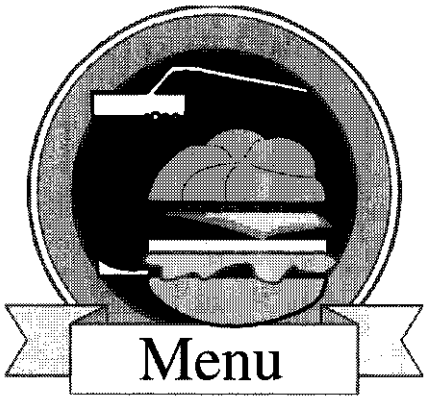
Plenary

Teaching Activities/Focus Questions
• Explain that next week the children are going to revisit the grid method of multiplication and that today's learning will help with this. ASSESSMENT – Ask the children to get out My Mathematics Self-assessment sheet 9.1 and allow them time to complete it. Then review and complete the target. HOMEWORK – Hand out Activity sheet 9.3. Explain the task and point out how there can be lots of different ways to reach the answer.

13	38	54	71	74
136	154	155	188	215
220	230	250	610	640
730	870	920	930	960
1400	2600	4600	6800	8100



Joe's American Diner



Hamburger	£1.20
Cheeseburger	£1.50
Veggieburger	£1.10
Fries	65p
Baked Potato	85p
Cookies	15p
Ice Cream	50p
Apple Pie	99p
Large Soda Pop	99p
Small Soda Pop	49p
Milkshake	£1.20

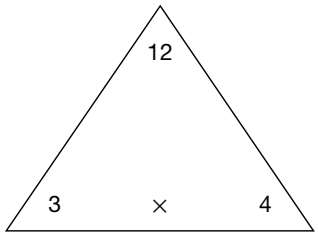
The Challenge

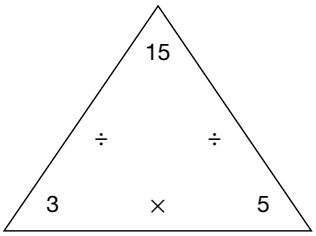
Tom and his five friends are going for a meal. Tom is paying! He's got £25. These are the rules:

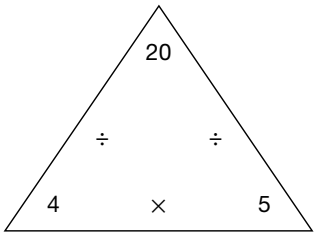
- All children must have the same to eat.
- Each child must have at least one item from each of the four menu sections.
- The total must not be greater than £25.

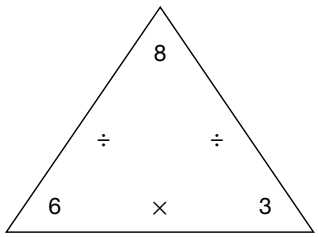
What are you going to choose?

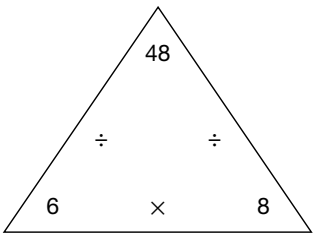
A

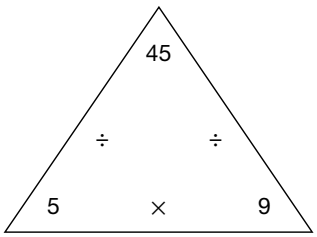












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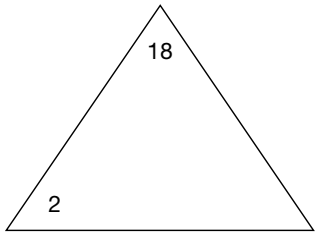

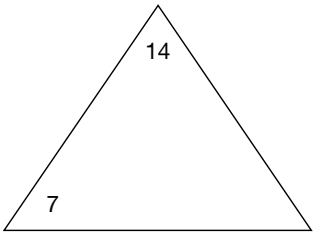

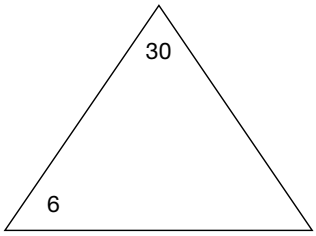

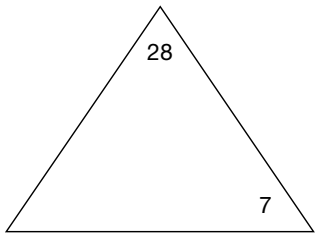

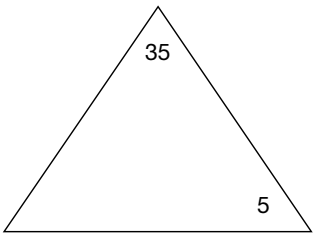

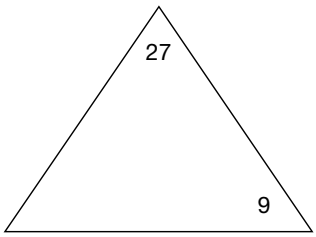

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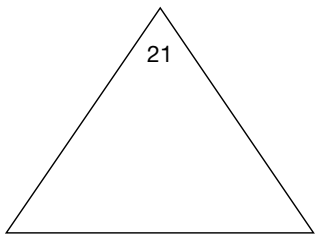

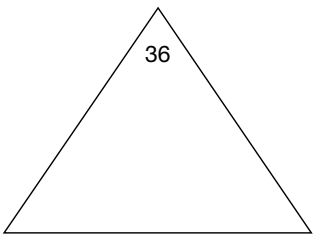

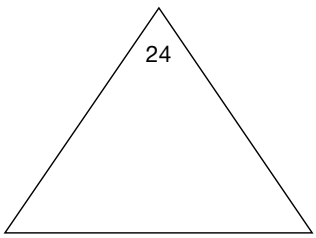

1. I have a strip of sticking plaster 51 cm long. I want to cut it into 2 cm pieces for my first aid kit. How many 2 cm pieces can I cut?

2. There are 51 white socks. How many pairs are there?

3. At the disco, children get a glass of pop with two ice cubes in it. There are 51 ice cubes. How many children can have a glass of pop?

4. A pet shop has 51 hamsters. Two hamsters can fit in a cage. How many cages are needed?

5. A factory makes fireworks. There are 51 Coloured Fountains. Two go in every box. How many boxes can be filled?

6. There are 22 people waiting to go up in the lift. The lift can hold nine people. How many times must the lift go up?

7. There are 22 people going to the cinema. There are nine seats in a row. How many rows will be needed to seat everyone?

8. Nine choc-bars fill a Selection Box. There are 22 bars. How many boxes can be filled?

9. I have 22 metres of rope. I need 9-metre lengths. How many can I make?

10. Jan has £22. T-shirts cost £9 each. How many can she buy?

For each multiplication, break down the first number in two different ways. Do you get the same answer both times?

Example:

$9 \times 7 = (5 + 4) \times 7 = (5 \times 7) + (4 \times 7) = 35 + 28 = 63$

$= (3 + 6) \times 7 = (3 \times 7) + (6 \times 7) = 21 + 42 = 63$

15×8

13×7

14×9

18×4

Challenge

Explore breaking down **both** numbers. What happens? If you can't make it work, experiment with very small numbers where you know the amount before you start, to see if you can work out what you need to do.

1. I have £38. Toys cost £6 each. How many can I buy?

2. At the fair, 38 people want to ride on the Little Dipper. A car can carry six people. How many cars will they need?

3. There are 38 children at the pantomime. There are six seats in a row. How many rows are needed to seat everyone?

4. The farmer has 38 eggs. Six fit in a box. How many boxes can he fill?

5. It was Tom's birthday. Some DVDs cost £38. We paid with pound coins at the checkout. Six of us shared the cost equally. How many pound coins did we each have to give?

Some children go camping.

It costs **£2.20** for each child to camp each night. They go for 6 nights.

How much will **each child** have to pay for the 6 nights?

Show your **working.** You may get a mark.

There are **70** children.
Each tent takes up to **6** children.

What is the **least number of tents** they will need?

Show your **working.** You may get a mark.

My Mathematics by .....

Give three other multiplication and division facts you can work out from $4 \times 8 = 32$

My facts

I have £62.
Tickets cost £8 each.
I know $62 \div 8 = 7$ remainder 6.
How many tickets can I buy?

_____ **tickets**

Why I think this:

_____

_____

_____

_____

_____

I can do this on my own ☐

My next target:

_____

_____

_____