

Year 6

Small Steps Guidance and Examples

Block 1 – Decimals



Year 6 – Yearly Overview

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Autumn	Number- Place Value		Number- Addition, Subtraction, Multiplication and Division				Fractions				Geometry- Position and Direction	Consolidation
Spring	Number- Decimals		Number- Percentages		Number- Algebra		Measurement Converting units	Measurement Perimeter, Area and Volume		Number- Ratio		Consolidation
Summer	Geometry- Properties of Shapes		Problem solving			Statistics		Investigations				Consolidation

Overview

Small Steps

- Three decimal places
- Multiply by 10, 100 and 1,000
- Divide by 10, 100 and 1,000
- Multiply decimals by integers
- Divide decimals by integers
- Division to solve problems
- Decimals as fractions
- Fractions to decimals (1)
- Fractions to decimals (2)

NC Objectives

Identify the value of each digit in numbers given to 3 decimal places and multiply numbers by 10, 100 and 1,000 giving answers up to 3 decimal places.

Multiply one-digit numbers with up to 2 decimal places by whole numbers.

Use written division methods in cases where the answer has up to 2 decimal places.

Solve problems which require answers to be rounded to specified degrees of accuracy.

Three Decimal Places

Notes and Guidance

Children recap their understanding of numbers with up to 3 decimal places. They look at the value of each place value column and describe the columns in words and digits.

Children use concrete resources to investigate exchanging between columns e.g. 3 tenths is the same as 30 hundredths.

Mathematical Talk

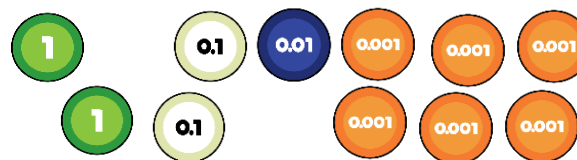
How many tenths are in the number? How many hundredths?

Can you make the number on the place value chart?

How many hundredths are the same as 5 tenths?

Varied Fluency

- Complete the sentences.



There are ____ ones, ____ tenths, ____ hundredths and ____ thousandths.

The number in digits is _____

- Use counters and a place value chart to make these numbers.

3.456

72.204

831.07

Hundreds	Tens	Ones	Tenths	Hundredths	Thousandths

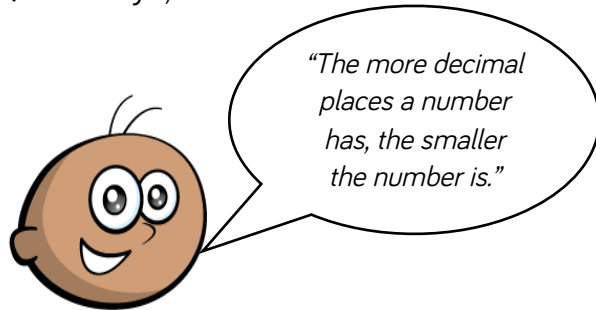
- Write down the value of the 3 in the following numbers.

0.53 362.44 739.8 0.013 3,420.98

Three Decimal Places

Reasoning and Problem Solving

Qasim says;



Do you agree?
Explain why.

Tina says that 3.24 can be written as 2 ones, 13 tenths and 4 hundredths.

Do you agree?

How else can you partition 3.24?
Think about exchanging between columns.

Possible answer:

I do not agree with this as the number 4.39 is smaller than the number 4.465, which has more decimal numbers.

Possible answer:

I disagree; Tina's numbers would make 3.34 rather than 3.24.
I can make 3.24 by having 1 one, 22 tenths and 4 hundredths.

Four children are thinking of four different numbers.

3.454

4.445

4.345

3.54

Yvonne: "My number has four hundredths."

Alex: "My number has the same amount of ones, tenths and hundredths."

Louise: "My number has more tenths and hundredths than ones."

Emily: "My number has 2 decimal places."

Match each number to the correct child.

Yvonne: 4.345

Alex: 4.445

Louise: 3.454

Emily: 3.54

Multiply by 10, 100 and 1,000

Notes and Guidance

Children multiply numbers with up to three decimal places by 10, 100 and 1,000

They discover that digits move to the left when they are multiplying and look at when to use zero as a place value holder.

Once children are confident in multiplying by 10, 100 and 1,000, they use these skills to investigate multiplying by multiples of these numbers. E.g. 2.4×20

Mathematical Talk

What number is represented on the place value chart?

Why is 0 important when multiplying by 10, 100 and 1,000?

What patterns do you notice?

What is the same and what is different when multiplying by 10, 100, 1,000 on the place value chart compared with the Gattegno chart?

Varied Fluency

- 1 Identify the number represented on the place value chart.

Thousands	Hundreds	Tens	Ones	Tenths	Hundredths
			● ●	●	

Multiply it by 10, 100 and 1,000 and complete the sentences.

Which direction do the counters move?

When multiplied by ____ the counters move ____ places to the ____.

- 2 Use a place value chart to multiply the following decimals by 10, 100 and 1,000

6.4

6.04

6.004

- 3 Fill in the missing numbers in these calculations

$$32.4 \times \boxed{} = 324$$

$$1.562 \times 1,000 = \boxed{}$$

$$\boxed{} \times 100 = 208$$

$$4.3 \times \boxed{} = 86$$

Multiply by 10, 100 and 1,000

Reasoning and Problem Solving

Using the digit cards 0-9 create a number with up to 3 decimal places, for example, 3.451.
Cover the number using counters on your Gattegno chart.

10,000	20,000	30,000	40,000	50,000	60,000	70,000	80,000	90,000
1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000	9,000
100	200	300	400	500	600	700	800	900
10	20	30	40	50	60	70	80	90
1	2	3	4	5	6	7	8	9
0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.001	0.002	0.003	0.004	0.005	0.006	0.007	0.008	0.009

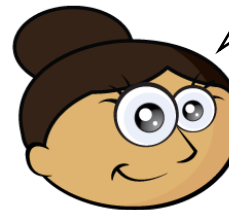
Explore what happens when you multiply your number by 10, then 100, then 1,000

What patterns do you notice?

Children will be able to see how the counter will move up a row for multiplying by 10, two rows for 100 and three rows for 1,000. They can see that this happens to each digit regardless of the value.

For example,
 3.451×10
 becomes 34.51
 Each counter moves up a row but stays in the same column.

Gemma says,



When you multiply by 100, you should add two zeros

Do you agree?
Explain your thinking.

Children should explain that when you multiply by 10 the digits move one place to the left, two places to the left when you multiply by 100 and three places to the left when you multiply by 1,000

For example:

$0.34 \times 100 =$
 0.3400 is incorrect
 as 0.34 is the same as 0.3400

Divide by 10, 100 and 1,000

Notes and Guidance

Once children understand how to multiply decimals by 10, 100 and 1,000, they can apply this knowledge to division, then later apply these skills to converting between units of measure.

It is important that children continue to understand the importance of 0 as a place holder. Children also need to be aware that 2.4 and 2.40 are the same, but the zero is not needed in this case.

Mathematical Talk

What happens to the counters/digits when you divide by 10, 100 or 1000?

Why is the zero important?

What is happening to the value of the digit each time it moves one column to the right?

What is the relationship between tenths, hundredths and thousandths?

Varied Fluency

- 1 Use the place value chart to divide the following numbers by 10, 100 and 1,000

Hundreds	Tens	Ones	Tenths	Hundredths	Thousandths

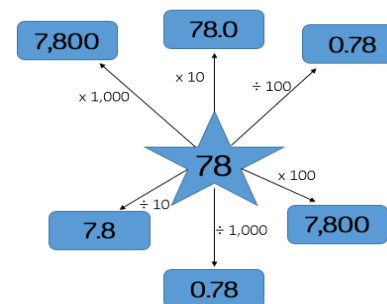
44

1.36

107

5

- 2 Tick the correct answers. Can you explain the mistakes with the incorrect answers?



- 3 Complete the table.

	$\div 10$	$\div 100$	$\div 1000$
789			
14			
60			
101			
		2.09	
3Kg			
	345.1		

Divide by 10, 100 and 1,000

Reasoning and Problem Solving

Using the following rules, how many ways can you make 70?

- Use a number from column A,
- Use an operation from column B.
- Use number from column C.

A	B		C
0.7	x	÷	0.1
7			1
70			10
700			100
7000			1000

Can you find a path from 6 to 0.6?
You cannot make diagonal moves.

6	x 10	x 10	÷ 100
÷ 10	x 100	x 100	÷ 10
x 10	÷ 10	÷ 1000	÷ 100
÷ 1000	x 1000	x 100	0.06

Is there more than one way?

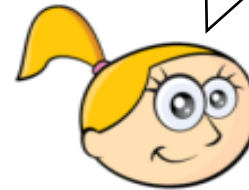
Possible answers:

0.7×100
 7×10
 70×1
 $700 \div 10$
 $7000 \div 100$
 $70 \div 1$

6	x 10	x 10	÷ 100
÷ 10	x 100	x 100	÷ 10
x 10	÷ 10	÷ 1000	÷ 100
÷ 1000	x 1000	x 100	0.6

Kate says,

When you divide by 10, 100 and 1,000 you just knock off the zeros or move the decimal point.



Do you agree?
Explain why

Kate is wrong, the decimal point never moves. When dividing, the digits move to the right and each time they move one column to the right they get 10 times smaller.

You cannot just get rid of zeros as sometimes a number being divided by 10, 100 or 1,000 does not have any zeros to begin with e.g. 24

Multiply Decimals by Integers

Notes and Guidance

Children use concrete resources to multiply decimals and explore what happens when you exchange with decimals.

Children use their skills in context and make links to money and measures.

Mathematical Talk

Which is bigger, 0.1, 0.01 or 0.001. Why?

How many 0.1s do you need to exchange for a whole one?

Can you draw a bar model to represent the problem?

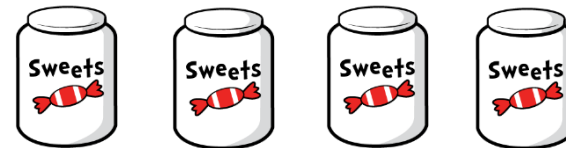
Can you think of another way to multiply by 5? (multiply by 10 and divide by 2).

Varied Fluency

- 1 Use the place value counters to multiply 1.212 by 3
Complete the calculation alongside the concrete

Tens	Ones	Tenths	Hundredths	Thousandths
	1	0.1 0.1	0.01	0.001 0.001
	1	0.1 0.1	0.01	0.001 0.001
	1	0.1 0.1	0.01	0.001 0.001

- 2 A jar of sweets weighs 1.23 kg.
How much would 4 jars weigh?



- 3 Jess is saving her pocket money. Her mum says,

“Whatever you save, I will give you five times the amount.”

If Jess saves £2.23, how much will her mum give her?

If Jess saves £7.76, how much will her mum give her?

Multiply Decimals by Integers

Reasoning and Problem Solving

Amy says,



When you multiply a number with 2 decimal places by an integer, the answer will always have more than 2 decimal places.

Do you agree?
Explain why.

Possible answer:

I do not agree because there are examples such as 2.23×2 that gives an answer with only two decimal places.

Fill in the blanks

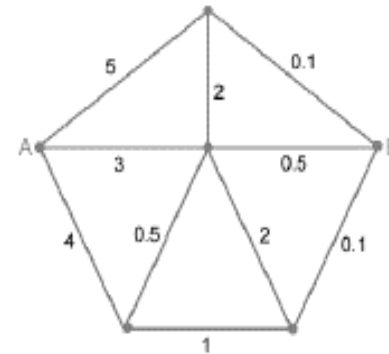
3	•	4	5
x			

0	•	3	0
	•	4	0
1	•	0	0
	•		

3	•	4	5
x			

0	•	3	0
2	•	4	0
1	•	8	0
2	•	0	7

You need to travel from point A to point B. You can only travel through each point once.



Largest product:

$$5 \times 2 \times 2 \times 0.1 = 2$$

Smallest product:

$$3 \times 0.5 \times 1 \times 0.1 = 0.15$$

What's the largest product you can make from A to B?

What's the smallest product you can make from A to B?

Divide Decimals by Integers

Notes and Guidance

Children continue to use concrete resources to divide decimals and explore what happens when exchanging with decimals.

Children build on their prior knowledge of sharing and grouping when dividing and apply this skill in context.

Mathematical Talk

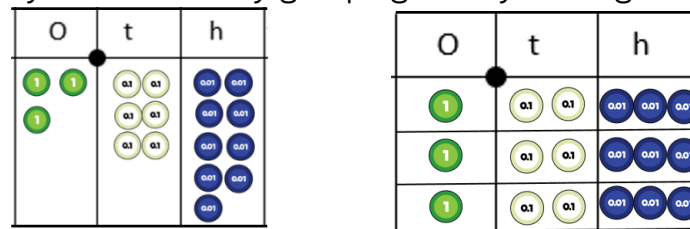
Are we grouping or sharing? Explain why. How are these different? How are they the same?

How else could we partition the number 3.69? (For example, 2 ones, 16 tenths and 9 hundredths.)

How could we check that our answer is correct using the inverse? Which method, sharing or grouping, shows the inverse more clearly?

Varied Fluency

- 1 Divide 3.69 by 3
Can you show this by grouping and by sharing?



Use these methods to complete the sentences.

3 ones divided by 3 is _____ ones.

6 tenths divided by 3 is _____ tenths.

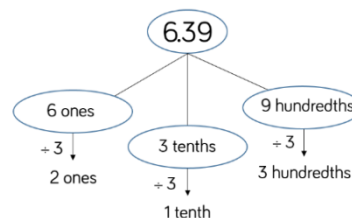
9 hundredths divided by 3 is _____ hundredths.

3.69 divided by 3 is _____.

- 2 Decide whether you will use grouping or sharing and use the place value chart and counters to solve:

$$7.55 \div 5 = \quad 8.16 \div 3 = \quad 3.3 \div 6 =$$

- 3 Danny solves $6.39 \div 3$ using a part whole method.



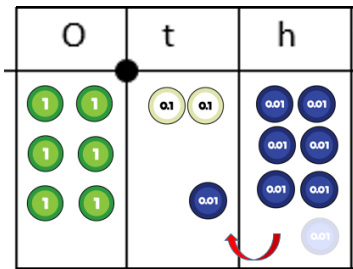
Use this method to solve:

- $8.48 \div 2 =$
- $6.9 \div 3 =$
- $6.12 \div 3 =$

Divide Decimals by Integers

Reasoning and Problem Solving

When using the counters to answer 6.27 divided by 3, this is what Bob did:



Bob says,



I only had 2 in the tenths column, so I moved one of the hundredths.

Do you agree with what Bob has done? Explain why.

Possible answer:
Bob is incorrect because he should have exchanged both of the tenths for 20 hundredths to get an answer of 2.09

Children may explain that you cannot just move one hundredth into the tenths column as in order to exchange hundredths for tenths you need to have ten hundredths.

$$C \text{ is } \frac{1}{4} \text{ of } A$$

$$B = C + 2$$

Use the clues to complete the division:

0	.	B	B
A	C	.	B
		C	C
		2	

Children may try A as 8 and C as 2 but will realise that this cannot complete the whole division.

Therefore A is 4, B is 3 and C is 1

0	.	3	3
4	1	.	3
		1	1
		2	

Division to Solve Problems

Notes and Guidance

Children will apply their understanding to use division to solve problems in cases where the answer has up to 2 decimal places.

Children will continue to show division using place value counters and exchanging where needed.

Mathematical Talk

How can we represent this problem using a bar model?

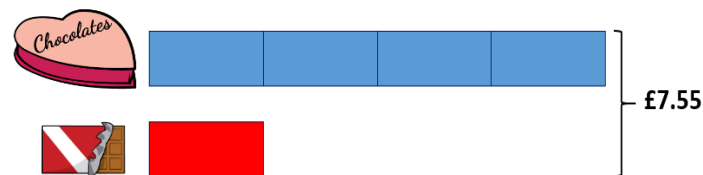
How will we calculate what this item costs?

How will we use division to solve this?

How will we label our bar model to represent this?

Varied Fluency

- 1 Mrs Forbes has saved £4,960
She shares the money between her 15 grandchildren.
How much do they each receive?
- 2 Playdoh is sold in two different shops.
Shop A sells four pots of Playdoh for £7.68
Shop B sells three pots of Playdoh for £5.79
Which shop has the better deal?
Explain your answer.
- 3 A box of chocolates costs 4 times as much as a chocolate bar.
Together they cost £7.55



How much does each item cost?
How much more does the box of chocolates cost?

Division to Solve Problems

Reasoning and Problem Solving

Each division sentence can be completed using the digits below. If there is more than one digit missing from the division, it must be filled with the same digit. For example, $44 \div 5 = 8.8$



$$\square 3 \div \square = 10.33$$

$$12 \square \div \square = 18.14$$

$$\square 34 \div \square = 104.25$$

$$\begin{aligned} 93 \div 9 &= 10.33 \\ 127 \div 7 &= 18.14 \\ 834 \div 8 &= 104.25 \end{aligned}$$

Stefan and Tilly are both calculating the answer to $147 \div 4$

Stefan says,



"The answer is 36 remainder 3"

Tilly says,



"The answer is 36.75"

Who do you agree with?

They are both correct.

Tilly has continued to divide into the decimal place value columns whereas Stefan has recorded his as a remainder.

Decimals as Fractions

Notes and Guidance

Children explore the relationship between decimals and fractions. They start with a decimal and use their place value knowledge to help them convert it into a fraction. Children will use their previous knowledge of exchanging between columns, for example, 3 tenths is the same as 30 hundredths. Once children convert from a decimal to a fraction, they simplify the fraction to help to show patterns.

Mathematical Talk

How would you record your answer as a decimal and a fraction? Can you simplify your answer?

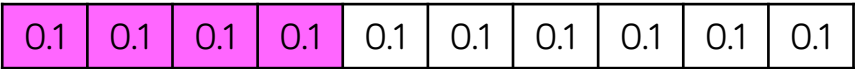
How would you convert the tenths to hundredths?

What do you notice about the numbers that can be simplified in the table?


Can you have a unit fraction that is larger than 0.5? Why?

Varied Fluency

- 1 What decimal is shaded?
Can you write this as a fraction?



- 2 Complete the table.

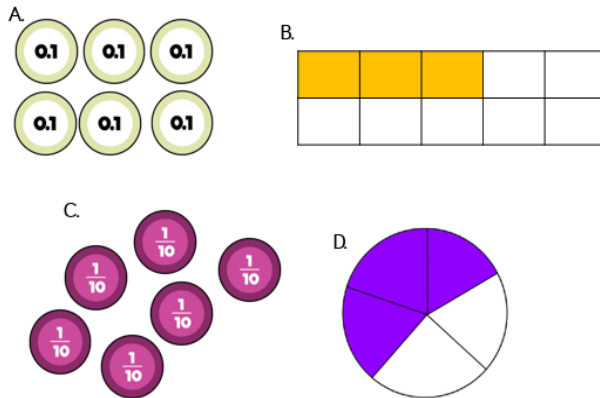
Decimal	Fraction in Tenths or hundredths	Simplified fraction
0.6	$\frac{6}{10}$	$\frac{3}{5}$
0.92		
		-
0.25		
0.5		

- 3 Three friends share a pizza. Sam ate 0.25 of the pizza, Mark ate 0.3 of the pizza and Jill ate 0.35 of the pizza.
- Can you write the amount each child ate as a fraction?
 - What fraction of the pizza is left?

Decimals as Fractions

Reasoning and Problem Solving

Odd one out.



Which is the odd one out and why?

Possible response:

B is the odd one out because it represents $\frac{3}{10}$

A represents 0.6 which is the same as 6 tenths or $\frac{6}{10}$

C also shows this.

D represents $\frac{3}{5}$ which is equivalent to $\frac{6}{10}$

Alex says,



0.84 is equivalent to $\frac{84}{10}$

Do you agree?
Explain why.

Possible response:

I disagree because there are 8 tenths and 4 hundredths. Also 0.84 is smaller than one whole but $\frac{84}{10}$ is larger than one because the numerator is larger than the denominator.

As a mixed number $\frac{84}{10}$ would be 8.4 not 0.84.

Fractions to Decimals (1)

Notes and Guidance

At this point children should know common fractions as decimals, including thirds, quarters, fifths and eighths. Children learn that finding an equivalent fraction where the denominator is 10, 100 or 1,000 makes it easier to convert from a fraction to a decimal.

They investigate the most efficient method to convert fractions to decimals, for example, converting twentieths to hundredths or tenths depending on the numerator.

Mathematical Talk

How many tenths are equivalent to one hundredth?

How would you convert a fraction to a decimal?

Which is the most efficient method? Why?

Varied Fluency

- 1 Match the fractions to the equivalent decimals.

$$\frac{4}{10}$$

0.09

$$\frac{37}{100}$$

0.4

$$\frac{9}{100}$$

0.37

- 2 Use your knowledge of known fractions to convert the fractions to decimals. Show your method for each one.

$$\frac{7}{20}$$

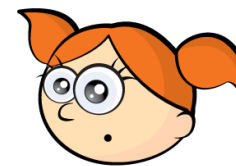
$$\frac{3}{4}$$

$$\frac{2}{5}$$

$$\frac{6}{200}$$

- 3 Eva says that $\frac{63}{100}$ is less than 0.65

Do you agree with Eva?
Explain your answer.



Fractions to Decimals (1)

Reasoning and Problem Solving

Josh says,



The decimal 0.42 can be read as 'four tenths and two hundredths'.

Bix says,



The decimal 0.42 can be read as 'forty-two hundredths'.

Who do you agree with?
Explain your answer.

Both are correct.
Four tenths are equivalent to forty hundredths, plus the two hundredths equals forty-two hundredths.

True or False?

0.3 is bigger than $\frac{1}{4}$

Explain your reasoning.

0.3 is bigger than one quarter because one quarter is equivalent to 0.25

Hannah and Alex are converting $\frac{30}{500}$ into a decimal.

- Hannah doubles the numerator and denominator, then divides by 10
- Alex divides both the numerator and the denominator by 5
- Both get the answer $\frac{6}{100} = 0.06$

Which method would you use to work out each of the following?

$$\frac{25}{500} \quad \frac{125}{500} \quad \frac{40}{500} \quad \frac{350}{500}$$

Explain why you have used a certain method.

$\frac{25}{500}$ - divide by 5, known division fact.

$\frac{125}{500}$ - double, easier than dividing 125 by 5

$\frac{40}{500}$ - divide by 5, known division fact.

$\frac{350}{500}$ - double, easier than dividing 350 by 5

Fractions to Decimals (2)

Notes and Guidance

It is important that children recognise that $\frac{3}{4}$ is the same as $3 \div 4$. They can use this understanding to find fractions as decimals by then dividing the numerator by the denominator.

In the example provided, we cannot make any equal groups of 5 in the ones column so we have exchanged the 2 ones for 20 tenths. Then we can divide 20 into groups of 5

Mathematical Talk

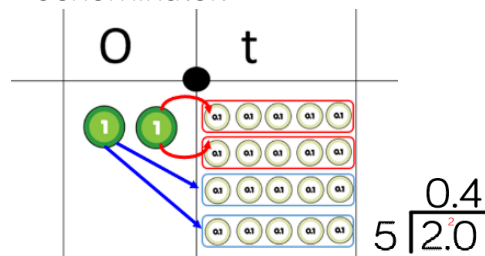
Do we divide the numerator by the denominator or divide the denominator by the numerator? Explain why.

When do we need to exchange?

Are we grouping or are we sharing? Explain why.

Varied Fluency

- 1 Deena has used place value counters to write $\frac{2}{5}$ as a decimal. She has divided the numerator by the denominator.



Use this method to convert the fractions to decimals. Give your answers to 2 decimal places.

$$\frac{1}{4}$$

$$\frac{2}{9}$$

- 2 Use the short division method to convert the fractions to decimals.

Write the decimals to three decimal places.

$$\frac{4}{7} \quad \frac{5}{9} \quad \frac{5}{6}$$

- 3 8 friends share 7 pizzas. How much pizza does each person get? Give your answer as a decimal fraction.

Fractions to Decimals (2)

Reasoning and Problem Solving

Charlotte and Stephen have both attempted to convert $\frac{2}{8}$ into a decimal.



I converted $\frac{2}{8}$ into 0.25

I converted $\frac{2}{8}$ into 4

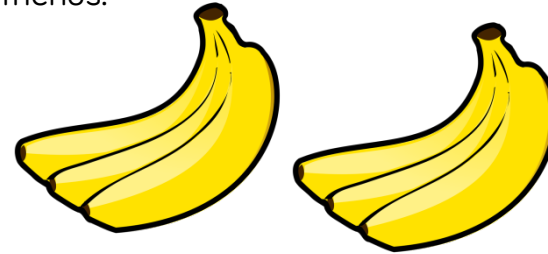


Who is correct?
Prove it.

Charlotte is correct
and Stephen is
incorrect.

Stephen has
divided 8 by 2
rather than 2
divided by 8 to find
the answer.

Pete shares 6 bananas between some friends.



Each friend gets 0.75 of a banana.

How many friends does he share the
bananas with?
Show your method.

Pete shares his 6
bananas between
8 friends because
6 divided by 8
equals 0.75

Children may show
their methods in
different ways.
Method 1: Children
add 0.75 until they
reach 6. This may
involve spotting that 4
lots of 0.75 equals 3
and then they
doubling this to find 8
lots of 0.75 equals 6.
Method 2: Children
use their knowledge
that 0.75 is equivalent
to $\frac{3}{4}$ to find the
equivalent fraction of
 $\frac{6}{8}$