

Year 5

Small Steps Guidance and Examples

Block 1 – Decimals



Year 5 – 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 and Subtraction		Statistics		Number – Multiplication and Division		Perimeter and Area		Consolidation
Spring	Number – Multiplication and Division			Number – Fractions						Number – Decimals & Percentages		Consolidation
Summer	Number – Decimals				Geometry- Properties of Shapes			Geometry- Position and Direction	Measurement- Converting Units		Measures Volume	Consolidation

Overview

Small Steps

- Adding decimals within 1
- Subtracting decimals within 1
- Complements to 1
- Adding decimals – crossing the whole
- Adding decimals with the same number of decimal places
- Subtracting decimals with the same number of decimal places
- Adding decimals with a different number of decimal places
- Subtracting decimals with a different number of decimal places
- Adding and subtracting wholes and decimals
- Decimal sequences
- Multiplying decimals by 10, 100 and 1,000
- Dividing decimals by 10, 100 and 1,000

NC Objectives

Solve problems involving number up to three decimal places.

Multiply and divide whole numbers and those involving decimals by 10, 100 and 1000.

Use all four operations to solve problems involving measure [for example, length, mass, volume, money] using decimal notation, including scaling.

Adding Decimals within 1

Notes and Guidance

Children add decimals within one whole. They use place value counters and place value charts to support adding decimals and understand what happens when we exchange between columns.

Building on their understanding that 0.45 is 45 hundredths, children use a hundred square to add decimals.

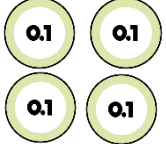

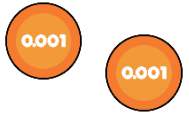
Mathematical Talk

What digit changes when I add a hundredth? How many hundredths can I add before the tenths place changes? Why is this?

Why does using column addition support adding decimals?

Varied Fluency

- 1 Use the place value chart to help answer the following:

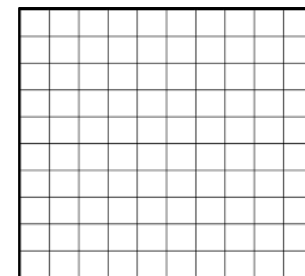
Ones	Tenths	Hundredths	Thousandths
			

- What is one hundredth more?
- Add 0.3, what number do you have now?
- How many thousandths can I add before the hundredths digit changes?

- 2 Using blank hundred squares, where each box represents one hundredth of the whole, shade and add:

$$0.07 + 0.78$$

$$0.87 + 0.07$$



- 3 Use the column method to complete the additions.

$$0.45 + 0.5$$

$$0.45 + 0.05$$

$$0.45 + 0.005$$

Adding Decimals within 1

Reasoning and Problem Solving

What mistake has Mary made?



$$0.41 + 0.3 = 0.413$$

Can you use at least 2 representations to show why she is incorrect?

Compare the numbers sentences using $<$, $>$ or $=$

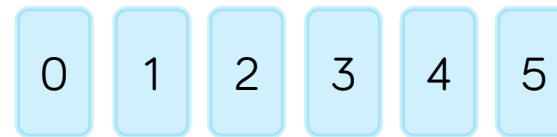
$$0.7 + 0.03 + 0.001 \quad \bigcirc \quad 0.07 + 0.3 + 0.1$$

$$0.4 + 0.1 + 0.05 \quad \bigcirc \quad 0.3 + 0.2 + 0.05$$

Mary has added the hundredths to the thousandths place.

$>$
 $=$

Annabelle has some digit cards.



She uses each card once to make a number sentence

$$\begin{array}{r} 0.\square\square\square \\ + 0.\square\square\square \\ \hline \end{array}$$

What is the largest number she can make? What is the smallest?

Largest: 0.951

Smallest: 0.159

Subtracting Decimals within 1

Notes and Guidance

Children subtract decimals using a variety of different methods. They look at taking away using place value counters on a place value grid. Children also explore subtraction as difference by using a number line to count on from the smaller decimal to the larger.

Children use their knowledge of exchange within whole numbers to subtract decimals efficiently.

Mathematical Talk

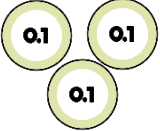
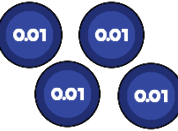
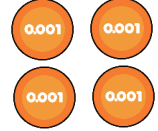
What is one tenth less than one? What about one hundredth less than one? Can you prove it?

If I'm taking away tenths, which digit will be affected? Is this always the case?

How many hundredths can I take away before the tenths place is affected?

Varied Fluency

- 1 Here is a number.

Ones	Tenths	Hundredths	Thousandths
			

- What is three tenths less than the number?
- Take away 0.02, what is your number now?
- Subtract 5 thousandths.. What number do you have left?

- 2 Find the difference between the two numbers using the number line.

0.424

0.618

- 3 Calculate.

$$0.584 - 0.154 =$$

$$0.684 - 0.254 =$$

$$0.685 - 0.255 =$$

$$0.44 - 0.1 =$$

$$0.44 - 0.09 =$$

$$0.44 - 0.11 =$$

Subtracting Decimals within 1

Reasoning and Problem Solving

Order the subtractions from easiest to solve to trickiest to solve.
Explain your choice of order.

$$0.45 - 0.3 =$$

$$0.45 - 0.15 =$$

$$0.45 - 0.23 =$$

$$0.45 - 0.18 =$$

Children justify the order they have given.

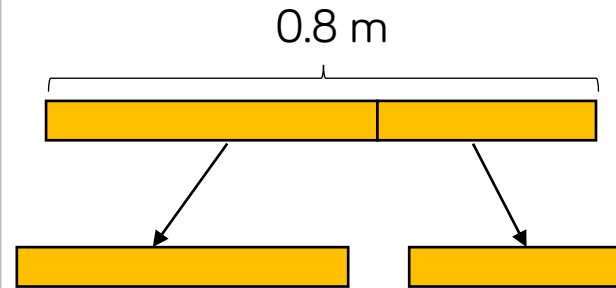
Possible order:

$0.45 - 0.23$ (no exchange)

$0.45 - 0.15$ (no exchange with 0)

$0.45 - 0.3$ (no exchange, different dp)

$0.45 - 0.18$ (exchange)



The strip of paper is 0.8 m long.

A strip is cut off.

The difference in lengths between the two strips of paper is 0.1 m

How long are the two strips of paper?

Strip 1: 0.45 m

Strip 2: 0.35 m

Complements to 1

Notes and Guidance

Children find the complements which sum to make 1. It is important for children to see the links with number bonds to 10, 100 and 1000. This will support them when finding complements to 1 up to three decimal places.

Children use a hundred square, part-whole models and number lines to support finding complements to one.

Mathematical Talk

What number bonds can you use to help you?

How many different ways can you make 1? How many ways do you think there are?

If I add _____, which place will change? How many can I add to change the tenths/hundredths place?

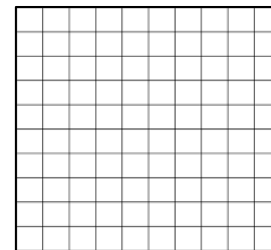
Varied Fluency

- Using a blank hundred square, where each square represents one hundredth. Find the complements to 1 for these numbers.

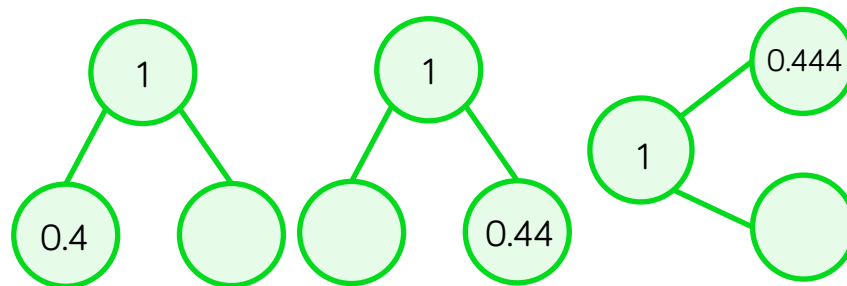
$$0.55 + \boxed{} = 1$$

$$1 = 0.32 + \boxed{}$$

$$0.11 + 0.5 + \boxed{} = 1$$



- Complete the part-whole models.



- Use the number line to find the complement to 1

$$0.324 \text{ ————— } 1$$

$$0.459 \text{ ————— } 1$$

Complements to 1

Reasoning and Problem Solving

$$0.333 + \boxed{} = 1$$

I think the answer is 0.777

because
 $0.3 + 0.7 = 1$
 $0.03 + 0.07 = 0.1$
 $0.003 + 0.007 = 0.01$



Do you agree with Abdul?
 Can you explain what his mistake was?

Abdul has forgotten that when you have ten in a place value column you exchange.

e.g. 10 tenths = 1

10 hundredths = 1
 tenth and 10
 thousandths = 1
 hundredth

How many different ways can you find a path through the maze, adding each number at a time, to make one?

Start →

0.02	0.01	0.05	0.08	0.3	0.04	0	0.001
0.2	0.06	0.07	0.09	0.001	0.004	0.02	0.04
0.005	0.04	0.2	0.02	0.05	0.06	0.07	0.6
0.5	0.005	0.05	0.02	0.03	0.017	0.006	0.06
0.009	0.8	0.001	0.05	0.015	0.01	0.008	0.007
0.09	0.2	0.08	0.03	0.199	0.01	0.04	0.05
0.01	0.008	0.1	0.09	0.005	0.08	0.02	0.02
0.05	0.03	0.01	0.22	0.07	0.003	0.04	0.09

→ 1

Once you have found a way, can you design your own maze for others to solve?

0.02	0.01	0.05	0.08	0.3	0.04	0	0.001
0.2	0.06	0.07	0.09	0.001	0.004	0.02	0.04
0.005	0.04	0.2	0.02	0.05	0.06	0.07	0.6
0.5	0.005	0.05	0.02	0.03	0.017	0.006	0.06
0.009	0.8	0.001	0.05	0.015	0.01	0.008	0.007
0.09	0.2	0.08	0.03	0.199	0.01	0.04	0.05
0.01	0.008	0.1	0.09	0.005	0.08	0.02	0.02
0.05	0.03	0.01	0.22	0.07	0.003	0.04	0.09

Adding – Crossing the Whole

Notes and Guidance

Children now use their skills at finding complements to cross over the whole. Children require flexibility at partitioning decimals, as bridging will be extremely important. Encourage children to make one first, then add the remaining decimal.

For example: $0.74 + 0.48 = 0.74 + 0.26 + 0.22 = 1.22$

$$\begin{array}{c} \swarrow \quad \searrow \\ 0.26 + 0.22 \end{array}$$

Mathematical Talk

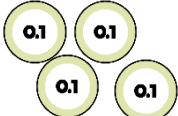
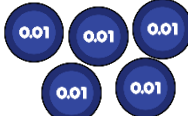
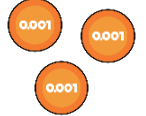
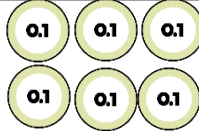
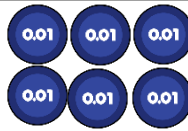
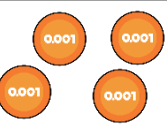
What happens when we have 10 in a place value column?

Which is the most efficient method to use?

What complement can I see to make 1?

Varied Fluency

- 1 Use the place value grid to solve $0.453 + 0.664$

Ones	Tenths	Hundredths	Thousandths
			
			

- 2 Sam is using complements to 1 to add decimals.

$$0.45 + 0.67 = 0.45 + 0.55 + 0.12 = 1.12$$

Use Sam's method to solve
a) $0.56 + 0.72$ b) $3.42 + 0.79$

- 3 Use column method to solve the additions.

$$0.47 + 0.6$$

$$0.982 + 0.18$$

$$0.92 + 0.8$$

Adding – Crossing the Whole

Reasoning and Problem Solving

A place value grid is used to solve
 $0.7 + 0.5$

Ones	Tenths
	<div>0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1</div>
	<div>0.1 0.1 0.1</div>

Jasmine thinks the answer is 0.12
What mistake has she made?

Ten lots of one tenth is one whole.

Therefore there should be an exchange.

The correct answer is 1.2

You will need a partner and a dice for this game.



Take it in turns rolling a die and place the digits in the blank spaces above. Record the number in a table.

Swap over with your partner.

Roll again and add your new number to the first number. The winner is the person who after 4 rolls is the closest to 1.5 **without** going over.

Example

Player 1	Player 2
0.14	0.64
0.38	1.23
0.69	1.49
1.24	1.60

Adding – Same Decimal Places

Notes and Guidance

Children add decimals greater than one with the same number of decimal places.

Place value grids and counters are extremely helpful in ensuring children are understanding the value of each digit and understanding when to exchange.

Mathematical Talk


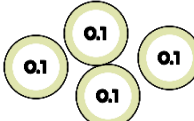
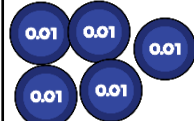



Why is it important to line up our columns?

What happens when there are ten in a place value column?

Why is the position of the decimal place important?

Varied Fluency

- 1 Use the place value chart to add 3.45 and 4.14

Ones	Tenths	Hundredths	
			3 . 4 5
			+ 4 . 1 4

- 2 Use the column method to solve these additions.

$$\begin{array}{r} 4.42 \\ + 7.63 \\ \hline \end{array}$$

$$\begin{array}{r} 4.55 \\ + 3.07 \\ \hline \end{array}$$

- 3 Beth goes to the shops. She buys 3 items. What is the most she could pay? What is the least?



£4.45



£5.59



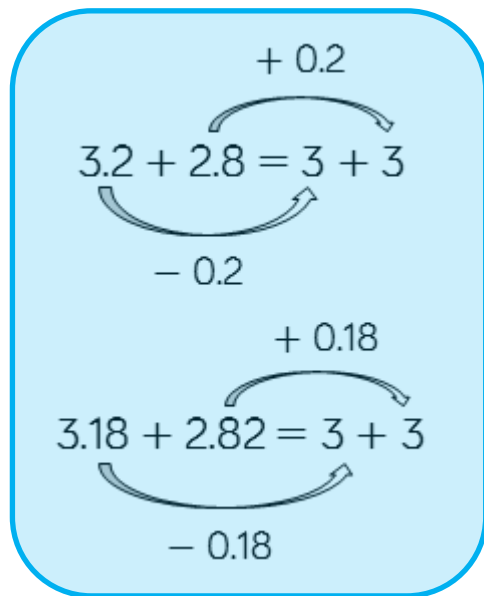
£3.99



£4.05

Adding – Same Decimal Places

Reasoning and Problem Solving



Using these strategies, can you find more number sentences which equal $3 + 3$?

Children may find a range of answers. The important teaching point is to highlight that you have added the same to one number as you have taken away from the other.

$$\begin{array}{r}
 \boxed{} \boxed{} \boxed{} \\
 + \boxed{} \boxed{} \boxed{} \\
 \hline
 \end{array}$$

Using the digits 0 – 9 only once in the spaces above, what is:

- The largest sum possible
- The smallest sum possible

Largest

$$9.75 + 8.64$$

$$9.65 + 8.74$$

$$9.64 + 8.75$$

$$9.74 + 8.65$$

Smallest

$$0.24 + 1.35$$

$$0.25 + 1.34$$

$$0.34 + 1.25$$

$$0.35 + 1.24$$

Subtract – Same Decimal Places

Notes and Guidance

Children subtract decimals with the same number of decimal places. They use place value counters and a place value grid to support them with exchanging.

Children apply subtraction to real life contexts involving measures.

Mathematical Talk


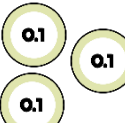
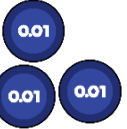
Where should I begin when I subtract?

Which of these numbers will need exchanging? Can you predict what the answer might be?

How could you check your answer?

Varied Fluency

- 1 Use the place value chart to solve: $4.34 - 2.14$

Ones	Tenths	Hundredths
		

$$\begin{array}{r} 4.34 \\ - 2.14 \\ \hline \\ \hline \end{array}$$

- 2 Use the column method to solve these subtractions

$$\begin{array}{r} 6.4 \\ - 3.8 \\ \hline \\ \hline \end{array} \qquad \begin{array}{r} 5.05 \\ - 2.15 \\ \hline \\ \hline \end{array}$$

- 3 Billy has £12.54 in his wallet.
He buys a football which costs £5.82

How much money does he have left?



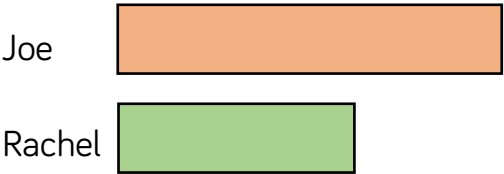
Subtract – Same Decimal Places

Reasoning and Problem Solving

Joe and Rachel have some money.
Joe has £3.45 more than Rachel.

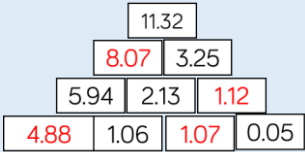
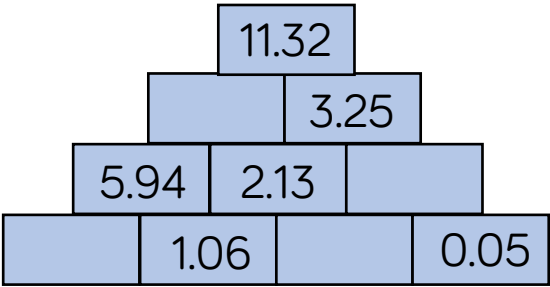
They have £12.45 altogether.

How much money does Rachel have?



Rachel has £4

In this number pyramid, the numbers on the top sum to the two numbers underneath.



Adding – Different D.P.

Notes and Guidance

Children add decimals with different numbers of decimal places. They focus on the importance to line up the decimal point in order to line up the columns correctly.

Children should be encouraged to think about whether their answers are sensible. For example, when adding 1.3 to 1.32 and getting an answer 1.45, how do we know it is not a sensible answer?

Mathematical Talk


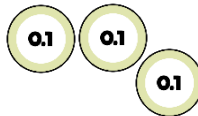



Why is the decimal point important when we are reading a number?

What would a sensible estimate be?

Is this a sensible answer? Why/why not?

Varied Fluency

- 1 Use the place value grid to add 1.3 and 3.52

Ones	Tenths	Hundredths
		
		

$$\begin{array}{r} 1.3 \\ + 3.52 \\ \hline \end{array}$$

- 2 Use the column method solve these additions.

$$\begin{array}{r} 4.4 \\ + 7.044 \\ \hline \end{array} \qquad \begin{array}{r} 4.42 \\ + 1.6 \\ \hline \end{array}$$

- 3 Sally is cycling in a race. She has cycled 3.145 km so far and has 4.1 km left to go. What is the total distance of the race?

Adding – Different D.P.

Reasoning and Problem Solving

Pavel is trying to find the answer to



$4.144 + 1.4$

Here is his working out.

4

.

1

4

4

+

1

.

4

4

.

2

4

8

Can you spot and explain his error?

The digits are lined up incorrectly.

Pavel needs to line up the decimal point.

Place the calculations in the correct column in the table.

9.99 + 0.1

9.99 + 1

9.99 + 0.001

9.99 + 0.01

Some calculations might need to go in more than one place.

No exchange	Exchange in the ones column	Exchange in the tenths column	Exchange in the hundredths column	Exchange in the thousandths column

Add 2 more calculations to each column

No exchange:

$9.99 + 0.001$

Exchange in the ones column:

$9.99 + 1$

$9.99 + 0.1$

$9.99 + 0.01$

Exchange in the tenths column:

$9.99 + 0.1$

$9.99 + 0.01$

Exchange in the hundredths column:

$9.99 + 0.01$

Subtracting – Different D.P.

Notes and Guidance

Children subtract decimals with different numbers of decimal places. They focus on the importance to line up the decimal point in order to line up the columns correctly.

Children identify the importance of zero as a place holder.

Mathematical Talk

What does it mean if there is nothing in a place value column?

Do we always do column subtraction to subtract decimals?

Are there more efficient methods for this question?

Varied Fluency

- 1 Use the place value grid to subtract 4.54 and 1.4

Ones	Tenths	Hundredths	
<div>1</div> <div>1</div> <div>1</div> <div>1</div>	<div>0.1</div> <div>0.1</div> <div>0.1</div> <div>0.1</div>	<div>0.01</div> <div>0.01</div> <div>0.01</div> <div>0.01</div>	$\begin{array}{r} 4.54 \\ - 1.4 \\ \hline \\ \hline \end{array}$

- 2 Use the column method to subtract the following.

$$\begin{array}{r} 6.06 \\ - 3.7 \\ \hline \\ \hline \end{array} \quad \begin{array}{r} 4.7 \\ - 3.825 \\ \hline \\ \hline \end{array}$$

$$\begin{array}{l} 3.3 - 1.34 = \\ 14.41 - 1.43 = \\ 3 - 1.87 = \end{array}$$

- 3 How much change would I get from £10 if I bought a bag of apples costing £4.27?



Subtracting – Different D.P.

Reasoning and Problem Solving

When you subtract from a place which has nothing in it, you can write the number underneath

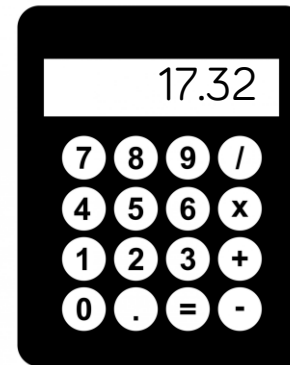


Rita

$$\begin{array}{r} 4 . 9 \\ - 3 . 8 5 \\ \hline 1 . 1 5 \end{array}$$

Do you agree with Rita?
Explain your answer.

Rita is not correct, as you need to exchange. She needs to use zero as a place value holder.



Bob used a calculator to solve:
 $31.4 - 1.408$

When he looked at his answer of 17.32 he realised he'd made a mistake.

He had typed all the correct digits in.

Can you spot his mistake?

Bob placed the decimal point after the 4 making 14.08

Wholes and Decimals

Notes and Guidance

Children add and subtract numbers with decimals from whole numbers. Attention should be drawn to whole numbers and the fact they are written without a decimal point.

This may bring about a misconception about their placement, so repetition of the decimal point being to the right of the ones place should be explored.

Mathematical Talk

What is a whole number?

Where could we place a decimal point in 143 so its value stays the same? Where would it go?

What's the same and what's different about 10 and 10.0 ?

Can you use different methods? (Number line, column subtraction, mentally) Which is most efficient for this calculation? Explain why.

Varied Fluency

- 1 Use the place value grid to add 143 and 1.45

H	T	O	tths	hths
100	10 10 10 10	1 1 1		
		1	0.1 0.1 0.1 0.1	0.01 0.01 0.01 0.01 0.01

$$\begin{array}{r} 143. \\ + \quad 1.45 \\ \hline \\ \hline \end{array}$$

- 2 Use the place value grid to answer $12 - 1.2$

Tens	Ones	Tenths
10	1 1	

$$\begin{array}{r} 12. \\ - \quad 1.2 \\ \hline \\ \hline \end{array}$$

- 3 Choose the most efficient method to solve this calculations.

$$43 - 2.14 + 0.86 =$$

$$19 - 0.25 =$$

$$23 + 4.105 =$$

$$19 - 17.37 =$$

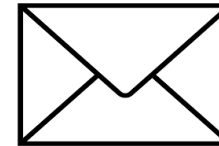
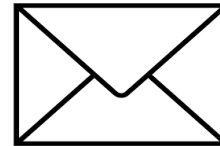
Wholes and Decimals

Reasoning and Problem Solving

Can you find the missing numbers in the calculation?

$$\begin{array}{r}
 31.\text{[redacted]}0 \\
 - \text{[redacted]}.37 \\
 \hline
 29.63
 \end{array}$$

$$\begin{array}{r}
 31.00 \\
 - 1.37 \\
 \hline
 29.63
 \end{array}$$



Two envelopes contain two different numbers.

- The sum of the numbers is 9.92
- The difference between the numbers is 2.32

What numbers are inside the envelopes?

3.8 and 6.12

Decimal Sequences

Notes and Guidance

Children look at decimal sequences and create simple rules
For example: adding 0.5

It is important to note that they are not expected to generate algebraic expressions for the sequences, but the use of the word 'term' could be used to predict the next number in the sequence – for example: what would be the value of the 10th term in the sequence?

Mathematical Talk

What does increasing and decreasing mean?

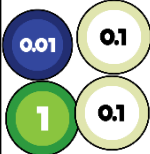
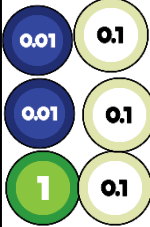
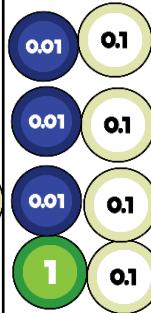
Is the sequence increasing? By how much?

What is the same about each term? What is changing in each term?

What will the next term in the sequence be?

Varied Fluency

- 1 Complete the sequence.

				
1st	2nd	3rd	4th	5th
1.21	1.32	1.43		

- 2 Write the rules for each sequence.

• 0.45, 0.6, 0.75, 0.9 The rule is

• 1.25, 2.5, 3.75, 5, 6.25 The rule is

- 3 Generate the first 5 terms of this sequence.

The 1st term is 1.74
The sequence decreases by 0.24 each time.

Decimal Sequences

Reasoning and Problem Solving

9.48 9.52 9.56 9.6 ...

The number 9.7
will be in this
sequence.

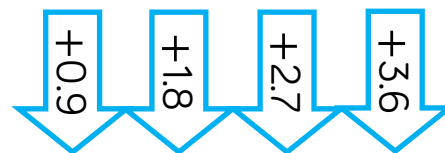


Ryan

Do you agree with Ryan?
Explain your answer.

Ryan is incorrect,
9.68 and 9.72 will
be in the sequence
but not 9.7

0.1 0.2 0.3 0.4 ...



1 2 3 4 ...

Emily compared the two sequences
above.

She noticed the difference between the
terms was increasing by 0.9 each time.

**Investigate Emily's sequence and explain
your thinking.**

I wonder what
would happen in a
+ 0.01 and +1
sequence...



The difference
would increase by
0.99 each time.

Multiply by 10, 100 and 1,000

Notes and Guidance

Children learn how to multiply numbers with decimals by 10, 100 and 1,000. They look at moving the counters to the left in order to multiply by multiples of 10.

Moving on from this, children can move digits to the left in a place value grid to support understanding further.

Mathematical Talk

What is the value of each digit? Where would this digit move to if I multiplied it by 10?

Why is the zero important in this number? Could we just take it out to make it easier for ourselves? Why/why not?

Varied Fluency

- 1 Use the place value grid to multiply 3.24 by 10, 100 and 1,000

Th	H	T	O	Tths	Hths
			● ● ●	● ●	● ● ● ●

When you multiply by ____, you move the counters ____ places to the left.

- 2 Use a place value grid to multiply these decimals by 10, 100 and 1,000

4.24

2.401

42.1

- 3 Complete the table below.

	$\times 10$	$\times 100$	$\times 1,000$
3.14			
0.233			
		404	

Multiply by 10, 100 and 1,000

Reasoning and Problem Solving



Stefan

Multiplying by 1,000 is just the same as doing $10 \times 10 \times 10$

Stefan is correct, as you move the digits 3 places to the left in both cases.

Do you agree with Stefan?
Explain your answer

Using the digits 0-9 create a number with up to 3 decimal places, for example, 3.451

Cover the number using counters on your Gattegno chart.

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.

Divide by 10, 100 and 1,000

Notes and Guidance

Children learn how to divide numbers with decimals by 10, 100 and 1,000. Children use the place value chart to support the understanding of moving digits to the right.

Building on the previous step, the importance of the place holder is a key teaching point.

Mathematical Talk

What is the value of each digit? Where would this digit move to if I divided it by 10?

Which direction do I move the digits when dividing by 10, 100 and 1,000?

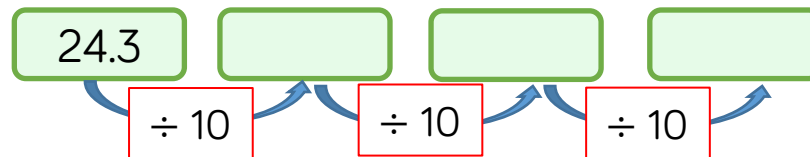
Varied Fluency

- 1 Use the place value grid to divide 14.4 by 10, 100 and 1,000

T	O	Tths	Hths	Thths	TThths
●	●●●●●	●●●●●			

When you divide by ____, you move the counters ____ places to the right.

- 2 Fill in the missing spaces in the diagram.



- 3 Fill in the missing numbers in these calculations.

$$34.2 \div \boxed{} = 0.342 \quad \boxed{} \div 10 = 54.1$$

$$\boxed{} \div 10 = 1.93 \div 100$$

Divide by 10, 100 and 1,000

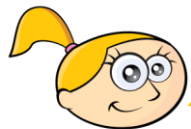
Reasoning and Problem Solving

If you multiply a number by 1,000, you can just divide the answer by 1,000 to get back to your original number.



Suzie

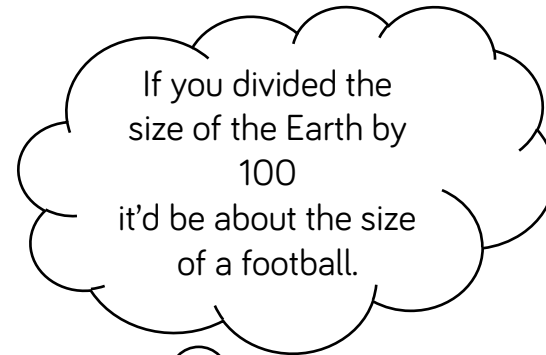
Both girls are correct, as dividing by 1,000 is the same as dividing by 10 three times



Katy

That's not true, you would need to divide the answer by ten three times.

Who do you agree with?
Explain your thinking.



Isaac



If you divided the size of the Earth by 100 it'd be about the size of a football.

Do you agree with Isaac's thinking?

Isaac is quite far off. Children might need to think about how large 100 footballs would be – they might give estimates of its size in footballs