ArithmeKit

Secondary Sample

The essential maths toolkit

A collection of rich problem solving and reasoning activities designed to deepen children's understanding of the Number strands (place value and calculation) of the National Curriculum for Mathematics and improve their arithmetical proficiency.

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www.CanDoMaths.org

Go to www.buzzardpublishing.com to find out more or purchase your PDF versions of the Secondary ArithmeKits

www.candomaths.org

Teacher notes

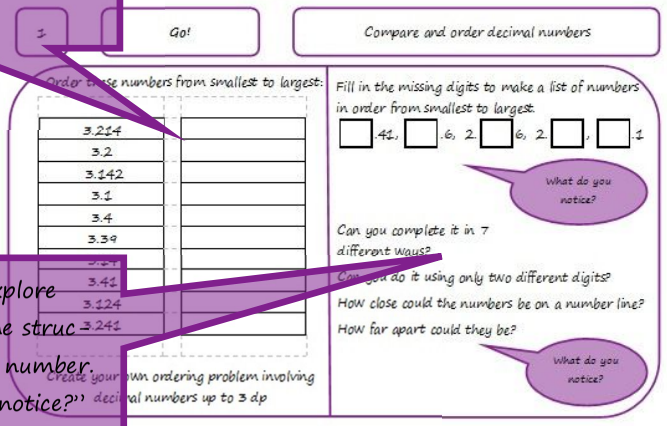
Secondary Go ArithmeKit offers a range of 120 problem solving and reasoning activities to strengthen and deepen understanding of key number and calculation skills and strategies.

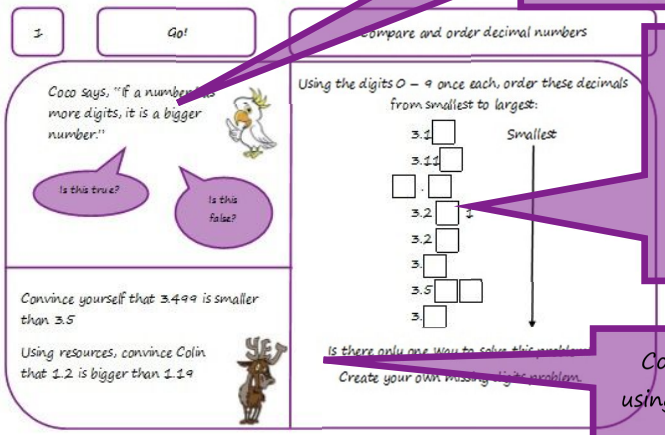
The 24 skills and strategies, essential elements of any successful mathematician's toolkit, have been carefully selected to develop pupils' conceptual understanding. By exploring the structure of mathematics and noticing relationships, the activities aim to improve fluency in calculation, develop a secure and deep understanding and help pupils make connections.

Each section has 2 pages containing 5 activities:

An activity to develop fluency – just do it! Then use higher order thinking skills to create your own challenge.

A 'true or false' statement to investigate further. Do you agree with Colin or Coco? Explore a conjecture by asking "When is it true?"





A missing number activity to develop fluency – just do it! Then use higher order thinking skills to create your own challenge.

An activity to explore relationships and the structure of an aspect of number. Ask "What do you notice?" to dig deeper.

Convince Coco or Colin using resources or jottings.

With thanks to Deborah M°Carthy, Chris Tomkins, Suzanne Matthews and Duncan Russell.

5

On Your Marks

Round and adjust to subtract numbers including decimal numbers

Find the matching pairs:

19.3 - 4.9	14.3
19.5 - 4.9	16.6
	14.5
16.2 - 1.9	14.4
20.7 - 5.9	
20.4 - 5.9	16.5
19.7 - 2.9	16.7
19.5 - 2.9	14.8
20.2 - 4.9	16.8
19.6 - 2.9	14.6

What's missing?

Create your own matching pairs problem.

Calculate these by rounding the second number to 2000:

5736 - 1999 =

4826 - 1999 =

5746 - 1998 =

4856 - 1998 =

5756 - 1997 =

4886 - 1997 =

What do you notice?

When is rounding to 2000

What do you

Try some more.

What is the smallest number that round to 2000 works efficiently for?

5

On Your Marks

Round and adjust to subtract numbers including decimal numbers

Colin says, "The best way to subtract ★.9 is to round to the nearest whole number and then adjust."

Do you agree with Colin? Give some examples

Do you disagree with Colin? Give some examples

Use practical resources and jottings to convince Coco that

5672 - 2999 = 5672 - 3000 + 1

and that

4.7 - 1.9 = 4.8 - 2

Put a digit in each box to make the statements true:

□□.□ - 1 . 9 = 6 . 3

6 4 2 - 2 9 9 = 3 4 □

□□.□ - □.□ = 8 . 7

8 6 2 - 3 9 □ = 4 □ 2

Is there only one way to solve this problem?

Use the digits 0, 1, 2, 3, 4, 5, 6, 7, 8 and 9 once each, to make all the statements true.

Create your own missing digit problem.

11

On Your Marks

Recall and use multiplication and division facts for the 3 times table

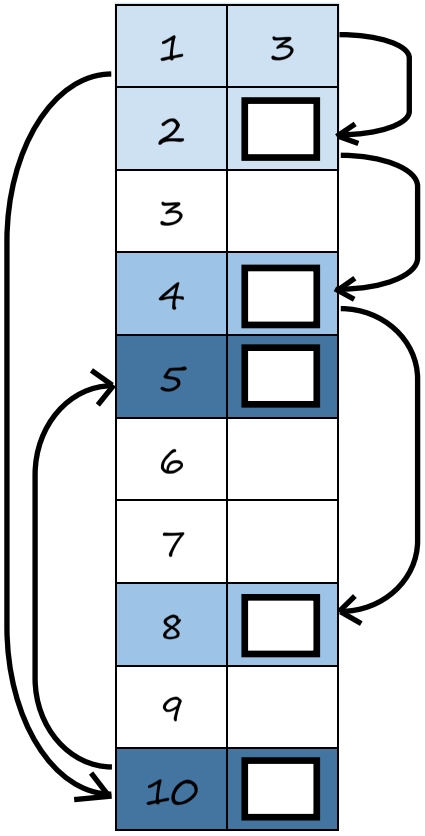
Find the matching pairs:

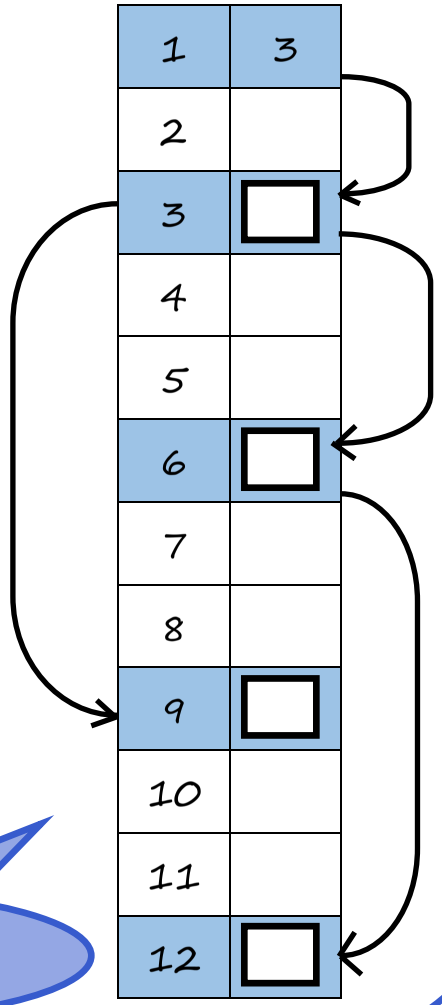
3 × 3	12
	1
9 × 3	0
15	2 × 3
18 ÷ 3	12
3 × 7	3 × 5
3 ÷ 3	21
3 × 4	
36 ÷ 3	11 × 3
0 × 3	9

What's missing?

Create your own matching pairs problem involving multiplication and division facts for the 3 times table.

Fill in the gaps:





What do you notice?

11

On Your Marks

Recall and use multiplication and division facts for the 3 times table

Colin says, "An even number multiplied by 3 is an even number."

Always true?

Never true?

Sometimes true?

Using practical resources convince Coco that an odd multiple of 3 is odd.

Put a digit in each box to make the statements true.

$3 \times \square = 1\square$

$2\square \div \square = 3$

$\square = 0 \times 3$

$15 \div 3 = \square$

$\square \times \square = \square\square$

Is there only one way to solve this problem?

Use the digits 0, 1, 2, 3, 4, 5, 6, 7, 8 and 9 once each, to make all the statements true.

Create your own missing digit problem.

12

Get Ready

Divide numbers mentally using known facts and place value

(Mental methods include 'in your head' or 'with jottings.')

Find the matching pairs:

560 000 ÷ 80	8
420 ÷ 60	70
630 ÷ 0.9	80
35 ÷ 0.5	80 000
	700
2400 ÷ 3	
4800 ÷ 60	8000
640 000 ÷ 0.8	7
320 ÷ 0.8	800
4 ÷ 0.5	7000

What's missing?

Create your own matching pairs problem involving known facts and place value.

Calculate:

560 000 ÷ 80 =

56 000 ÷ 8 =

5600 ÷ 0.8 =

560 ÷ 0.08 =

What do you notice?

5600 ÷ 8 =

5600 ÷ 80 =

5600 ÷ 800 =

5600 ÷ 8000 =

Use place value and the fact 6 x 7 = 42 to make 0.6 in seven different ways.

What do you notice?

12

Get Ready

Divide numbers mentally using known facts and place value

(Mental methods include 'in your head' or 'with jottings.')

Colin thinks 420 ÷ 6 = 700

Coco thinks 420 ÷ 6 = 70

Who do you agree with?

Explain your answer.

Using practical resources convince yourself 450 ÷ 5 = 90

Using practical resources convince Coco 2.4 ÷ 4 = 0.6

Using the digits 0–9 once each, complete these statements:

2□□ ÷ 5 = 50

□400 ÷ 0.7 = □□00

2□00 ÷ □ = □00

□□0 ÷ 8 = 80

Is there only one way to solve this problem?

Create your own missing digits problem.

18

Get Ready

Solve problems using percentage and decimal equivalents

Match the decimals to their equivalent percentages:

0.2	75%
0.5	2.5%
0.75	
0.02	22%
	25%
0.1	5%
0.22	1%
0.4	10%
0.05	2%
0.01	20%
0.025	50%

What is missing?

Create your own matching pairs problem involving decimals and percentages.

Write the equivalent fractions:

30% 70% 10%

40% 80% 20%

What do you notice?

Write the equivalent fractions as hundredths and then in their lowest form:

0.5 0.75 0.25

What do you notice?

18

Get Ready

Solve problems using percentage and decimal equivalents

Colin thinks these are all correct.

$\frac{4}{5} = 45\%$ $\frac{1}{5} = 5\%$ $\frac{3}{5} = 60\%$

$\frac{1}{2} = 50\%$ $\frac{1}{4} = 14\%$

Who do you agree with?

Coco thinks that more are correct than incorrect.

Convince Coco in at least two different ways that,

$\frac{2}{5} = 40\%$

Using the digits 0–9 once, complete these statements:

$\frac{\square}{6} = 100\%$

$\frac{\square}{12} = \square 5\%$

$\frac{6}{\square\square} = \square 0\%$

$\frac{\square}{5} = \square\square\ \%$

$\frac{1}{\square} = 33.3\%$ (to 1 dp)

Is there only one way to solve this problem?

Create your own missing digits problem.

6

Go!

Use place value or adjusting to add numbers mentally

(Mental methods include 'in your head' or 'with jottings.')

Find the matching pairs:

434 500 + 19 500	629 000
256 000 + 199 000	780 500
	512 300
434 000 + 195 000	275 900
48 250 + 29 800	643 300
436 000 + 198 000	455 000
256 000 + 19 900	912 400
482 500 + 298 000	634 000
436 000 + 19 800	
613 400 + 29 900	453 500

What's missing?

Create your own matching pairs problem involving adjusting.

Calculate 345 000 + 198 000 by adding 200 000 then adjusting.

276 000 + 199 000 =

536 900 + 197 000 =

634 000 + 195 000 =

783 400 + 189 000 =

When is rounding to 200 000 the most efficient method?

What do you notice?

Try some more.

What is the smallest number that rounding to 200 000 still works for?

What do you notice?

6

Go!

Use place value or adjusting to add numbers mentally

(Mental methods include 'in your head' or 'with jottings.')

Colin says, "The best way to add 28 000 is to round it to 30 000 and adjust."

Do you agree?

Do you disagree?

Using jottings convince Coco that you can calculate

36874 + 29 800

by adjusting.

Using the digits 0 – 9 once each, complete these statements:

322 000 + 16 ☐ 000 = 485 000

12 300 + 45 600 = ☐☐ 900

42 ☐ 000 + 115 000 = 54 ☐ 000

36 000 + 6 ☐ 000 = ☐ 6 000

78 ☐ 00 + 43 ☐ 00 = 1☐ 2 200

Create your own missing digits problems.

9

Go!

Double decimal and whole numbers

Find the matching pairs:

Fill in the middle column to help.

Start	Double	Double again
8.5		56
		21
13.75		42
9.5		47
11.75		22
5.5		34
5.25		
14		38
10.5		54
35		45

What's missing?

Create your own matching pairs problem involving doubling.

Double these numbers:

3.2 5.4 4.2 7.4 8.2

3.7 5.6 4.7 7.6 8.7

What do you notice?

Now double these:

3.08 2.09 4.08 5.09 6.08

3.8 2.9 4.8 5.9 6.8

What do you notice?

9

Go!

Double decimal and whole numbers

Coco thinks to double a number, you double each digit.

Sometimes true?

Always true?

Never true?

Using concrete apparatus, convince Colin that double 5.6 is 11.2

Using the digits 0-9 once, complete these statements:

4. ☐☐ doubled = 8.☐6

2☐ doubled = 50

6.☐2 doubled = 1☐.☐4

☐.3 doubled = 4.☐

24.5 doubled = ☐

Is there only one way to solve this problem?

Create your own missing digits problem.