



Four operations

Theme 4 – Multiplication

Multiply 4-digits by 1-digit

Reasoning and Problem Solving

Alex calculated $1,432 \times 4$

Here is her answer.

	Th	H	T	O
	1	4	3	2
\times				4
	4	16	12	8

$$1,432 \times 4 = 416,128$$

Can you explain what Alex has done wrong?

Alex has not exchanged when she has got 10 or more in the tens and hundreds columns.

Can you work out the missing numbers using the clues?

$$\begin{array}{r}
 \boxed{} \boxed{} \boxed{} \boxed{} \\
 \times \boxed{5} \\
 \hline
 \boxed{} \boxed{} \boxed{} \boxed{} \boxed{}
 \end{array}$$

- The 4 digits being multiplied by 5 are consecutive numbers.
- The first 2 digits of the product are the same.
- The fourth and fifth digits of the answer add to make the third.

$$2,345 \times 5 = 11,725$$

Multiply 2-digits (Area Model)

Reasoning and Problem Solving

Eva says,



To multiply 23 by 57 I just need to calculate 20×50 and 3×7 and then add the totals.

What mistake has Eva made?
Explain your answer.

Amir hasn't finished his calculation.
Complete the missing information and record the calculation with an answer.

×	40	2
40	<div><div>100</div><div>100</div><div>100</div><div>100</div><div>100</div><div>100</div><div>100</div><div>100</div></div>	<div><div>10</div><div>10</div><div>10</div><div>10</div><div>10</div><div>10</div><div>10</div><div>10</div></div>
6	<div><div>10</div><div>10</div><div>10</div><div>10</div><div>10</div><div>10</div><div>10</div><div>10</div><div>10</div><div>10</div><div>10</div><div>10</div><div>10</div><div>10</div><div>10</div><div>10</div><div>10</div><div>10</div></div>	<div><div>1</div><div>1</div><div>1</div><div>1</div><div>1</div><div>1</div><div>1</div><div>1</div><div>1</div><div>1</div><div>1</div><div>1</div><div>1</div><div>1</div><div>1</div><div>1</div><div>1</div><div>1</div></div>

Eva's calculation does not include 20×7 and 50×3
Children can show this with concrete or pictorial representations.

Amir needs 8 more hundreds, $40 \times 40 = 1,600$ and he only has 800

His calculation is $42 \times 46 = 1,932$

Farmer Ron has a field that measures 53 m long and 25 m wide.

Farmer Annie has a field that measures 52 m long and 26 m wide.

Dora thinks that they will have the same area because the numbers have only changed by one digit each.

Do you agree? Prove it.

Dora is wrong. Children may prove this with concrete or pictorial representations.

Multiply 2-digits by 2-digits

Reasoning and Problem Solving

Tommy says,



It is not possible to make 999 by multiplying two 2-digit numbers.

Do you agree?
Explain your answer.

Children may use a trial and error approach during which they'll further develop their multiplication skills. They will find that Tommy is wrong because 27×37 is equal to 999

Amir has multiplied 47 by 36



		4	7
×		3	6
	2	8	2
	1	4	1
	3	2	3

Alex says,



Amir is wrong because the answer should be 1,692 not 323

Who is correct?
What mistake has been made?

Alex is correct. Amir has forgotten to use zero as a place holder when multiplying by 3 tens.

Multiply 3-digits by 2-digits

Reasoning and Problem Solving

22 × 111 = 2442

23 × 111 = 2553

24 × 111 = 2664

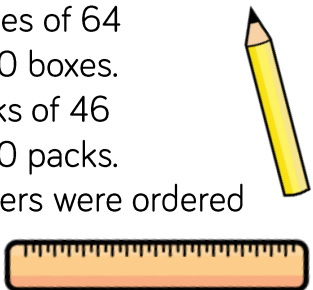
The pattern stops at up to 28 × 111 because exchanges need to take place in the addition step.

What do you think the answer to 25 × 111 will be?

What do you notice?

Does this always work?

Pencils come in boxes of 64
A school bought 270 boxes.
Rulers come in packs of 46
A school bought 720 packs.
How many more rulers were ordered than pencils?



15,840

Here are examples of Dexter's maths work.

			9	8	7		
×				7	6		
		5	5 ⁹	4 ²	2		
		6	6 ⁹	4 ⁰	9		
	1	2	8	3	1		

			3	2	4		
×				7	8		
				5	9	2	
		2	1	3			
	2	1	2	6	8	0	
		3	2	7	2		

He has made a mistake in each question.

Can you spot it and explain why it's wrong?

Correct each calculation.

In his first calculation, Dexter has forgotten to use a zero when multiplying by 7 tens. It should have been
987×76 = 75,012

In the second calculation, Dexter has not included his final exchanges.
324 × 8 = 2,592
324 × 70 = 22,680
The final answer should have been 25,272

Multiply 4-digits by 2-digits

Reasoning and Problem Solving

Spot the Mistakes

Can you spot and correct the errors in the calculation?

		2	5	3	4
×				2	3
		17	5	19	2
		15	0	6	8
	1	2	16	16	0

There are 2 errors. In the first line of working, the exchanged ten has not been added. In the second line of working, the place holder is missing. The correct answer should be 58,282

Teddy has spilt some paint on his calculation.

		2		6	9
×				2	
	2	2	9	5	2
	5	7	3		0
	0	3	3		2

The missing digits are all 8

What are the missing digits?

What do you notice?

Multiply 4-digits by 2-digits

Reasoning and Problem Solving

True or False?

- $5,463 \times 18 = 18 \times 5,463$
- I can find the answer to $1,100 \times 28$ by calculating $1,100 \times 30$ and subtracting 2 lots of 1,100
- $702 \times 9 = 701 \times 10$

True

True

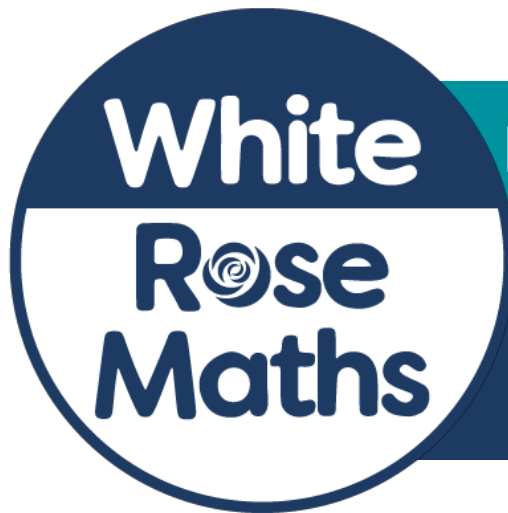
False

2 3 4 5 7 8

Place the digits in the boxes to make the largest product.

×				

$$\begin{array}{r} 8432 \\ \times 75 \\ \hline 632000 \end{array}$$



Four operations

Theme 6 – Division

Divide 4-digits by 1-digit

Reasoning and Problem Solving

Jack is calculating $2,240 \div 7$

He says you can't do it because 7 is larger than all of the digits in the number.

Do you agree with Jack?
Explain your answer.

Jack is incorrect. You can exchange between columns. You can't make a group of 7 thousands out of 2 thousand, but you can make groups of 7 hundreds out of 22 hundreds.

The answer is 320

Spot the Mistake

Explain and correct the working.

Thousands	Hundreds	Tens	Ones
<div>100010001000</div>	<div>100100100</div>	<div>10</div>	<div>111</div>
<div>100010001000</div>	<div>100</div>		<div>1</div>
<div>100010001000</div>			

	3	1	0	1
3	9	4	1	4

There is no exchanging between columns within the calculation. The final answer should have been 3,138

Divide with Remainders

Reasoning and Problem Solving

I am thinking of a 3-digit number.

When it is divided by 9, the remainder is 3

When it is divided by 2, the remainder is 1

When it is divided by 5, the remainder is 4

What is my number?

Possible answers:

129	219
309	399
489	579
669	759
849	939

Encourage children to think about the properties of numbers that work for each individual statement. This will help decide the best starting point.

Always, Sometimes,

A three-digit number made of consecutive descending digits divided by the next descending digit always has a remainder of 1

$$765 \div 4 = 191 \text{ remainder } 1$$

How many possible examples can you find?

Sometimes

Possible answers:

$$\begin{aligned} 432 \div 1 &= 432 \text{ r } 0 \\ 543 \div 2 &= 271 \text{ r } 1 \\ 654 \div 3 &= 218 \text{ r } 0 \\ 765 \div 4 &= 191 \text{ r } 1 \\ 876 \div 5 &= 175 \text{ r } 1 \\ 987 \div 6 &= 164 \text{ r } 3 \end{aligned}$$

Short Division

Reasoning and Problem Solving

Find the missing digits.

$$\begin{array}{r} 041\boxed{4}r3 \\ 4\overline{)1\boxed{6}59} \end{array}$$

$$\begin{array}{r} 041\boxed{4}r3 \\ 4\overline{)1\boxed{6}59} \end{array}$$

Here are two calculations.

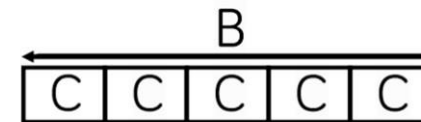
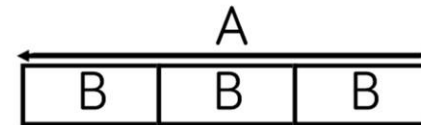
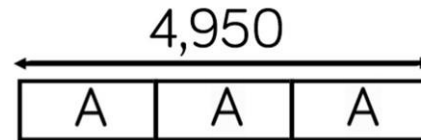
$$A = 396 \div 11$$

$$B = 832 \div 13$$

Find the difference between A and B.

$$\begin{aligned} 396 \div 11 &= 36 \\ 832 \div 13 &= 64 \\ 64 - 36 &= 28 \end{aligned}$$

Work out the value of C.
(The bar models are not drawn to scale)



$$4,950 \div 3 = 1,650$$

$$1,650 \div 3 = 550$$

$$550 \div 5 = 110$$

Division using Factors

Reasoning and Problem Solving

Calculate:

- $1,248 \div 48$
- $1,248 \div 24$
- $1,248 \div 12$

What did you do each time? What was your strategy?

What do you notice? Why?

Tommy says,



To calculate $4,320 \div 15$ I will first divide 4,320 by 5 then divide the answer by 10

Do you agree?
Explain why.

26

52

104

Children should recognise that when the dividend is halved, the answer (quotient) is doubled.

Tommy is wrong: he has partitioned 15 when he should have used factor pairs. He could have used factor pairs 5 and 3 and divided by 5 then 3 (or 3 then 5).

Class 6 are calculating $7,848 \div 24$

The children decide which factor pairs to use. Here are some of their suggestions:

- 2 and 12
- 1 and 24
- 4 and 6
- 10 and 14

Which will not give them the correct answer? Why?

Use the correct factor pairs to calculate the answer.

Is the answer the same each time?

Which factor pair would be the least efficient to use? Why?

10 and 14 is incorrect because they are not factors of 24 (to get 10 and 14, 24 has been partitioned).

The correct answer is 327

Children should get the same answer using all 3 factor pairs methods.

Using the factor pair of 1 and 24 is the least efficient.

Long Division (1)

Reasoning and Problem Solving

Odd One Out

Which is the odd one out?
Explain your answer.

$$512 \div 16$$

$$672 \div 21$$

$$792 \div 24$$

$792 \div 24 = 33$ so
this is the odd one
out as the other
two give an
answer of 32

Spot the Mistake

$$855 \div 15 =$$

		0	5	1	0	
1	5	8	5	5		
	–	7	5		(× 4)	
		1	0	5		
	–	1	0	5	(× 10)	
				0		

The mistake is that
 $105 \div 15$ is not
equal to 10

$105 \div 15 = 7$ so
the answer to the
calculation is 57

Long Division (2)

Reasoning and Problem Solving

Which calculation is harder?

$$1,950 \div 13$$

$$1,950 \div 15$$

Explain why.

Dividing by 13 is harder because 13 is prime so we cannot use factor knowledge to factorise it into smaller parts. The 13 times table is harder than the 15 times table because the 15 times table is related to the 5 times table whereas the 13 times table is not related to a more common times table (because 13 is prime).

$$6,120 \div 17 = 360$$

Explain how to use this fact to find



$$6,480 \div \text{★} = 360$$

6,480 is 360 more than 6,120, so there is 1 group of 360 more.

Therefore, there are 18 groups of 360, so the answer is 18

Long Division (3)

Reasoning and Problem Solving

Here are two calculation cards.

$$A = 396 \div 11$$

$$B = 832 \div 11$$

Whitney thinks there won't be a remainder for either calculation because 396 and 832 are both multiples of 11

Rosie disagrees, she has done the written calculations and says **one** of them has a remainder.

Who is correct? Explain your answer.

Rosie is correct because 832 is not a multiple of 11

$$396 \div 11 = 36$$

$$832 \div 11 = 75 \text{ r } 7$$

576 children and 32 adults need transport for a school trip.
A coach holds 55 people.



Dora

We need 10 coaches.



Eva

We need 11 coaches.



Alex

We need 12 coaches.

Who is correct? Explain how you know.

How many spare seats will there be?

Alex is correct.

There are 608 people altogether,
 $608 \div 55 = 11 \text{ r } 3$,
so 12 coaches are needed.

On 12 coaches there will be 660 seats, because $55 \times 12 = 660$
 $660 - 608 = 52$ spare seats.

Long Division (4)

Reasoning and Problem Solving

Class 6 are calculating three thousand, six hundred and thirty-three divided by twelve.

Rosie says that she knows there will be a remainder without calculating.

Is she correct?
Explain your answer.

What is the remainder?

Rosie is correct because 3,633 is odd and 12 is even, and all multiples of 12 are even because 12 is even.

$3,633 \div 12 = 302$
r 9, so the remainder is 9

Which numbers up to 20 can 4,236 be divided by without having a remainder?

What do you notice about all the numbers?

1, 2, 3, 4, 6, 12

They are all factors of 12