Mathletics

Multiplication and Division

My name

Series F – Multiplication and Division

Contents

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Mental multiplication strategies – doubling strategy

Doubling is a useful strategy to use when multiplying.

To multiply a number by four, double it twice. | To multiply a number by eight, double it three times.

15 × 4 double once = 30
double twice = 60

13 × 8 double once = 26
double twice = 52
double three times = 104

1 **Warm up with some doubling practice:**

a

b

c

2 **Finish the doubling patterns:**

a 4   __8__   __16__   _____   __64__   _____

b 3   _____   _____   _____   _____   __96__

c 5   _____   _____   __40__   _____   _____

d 25   __50__   _____   _____   _____   _____

e 7   _____   __28__   _____   _____   __224__

f 75   _____   __300__   _____   _____   _____

3 **Choose a number and create your own doubling pattern. How high can you go? What patterns can you see within your pattern?**

4 **Two sets of twins turn 12. They decide to have a joint birthday party with 1 giant cake but they all want their own candles. How many candles will they need?**

Mental multiplication strategies – doubling strategy

5 **Use the doubling strategy to solve these:**

		× 2	× 4
a	13 × 4	26	52
b	16 × 4		
c	24 × 4		
d	25 × 4		
e	32 × 4		
f	21 × 4		
g	35 × 4		

> To multiply by 4, double twice. To multiply by 8, double three times.

REMEMBER

6 **Use the doubling strategy to solve these:**

		× 2	× 4	× 8
a	12 × 8	24		96
b	14 × 8			112
c	25 × 8			
d	21 × 8		84	
e	13 × 8			
f	16 × 8	32		

7 **Work out the answers in your head using the appropriate doubling strategy. Use a table like the one above if it helps.**

a 18 × 4 =

b 16 × 4 =

c 26 × 4 =

d 24 × 8 =

e 15 × 8 =

f 22 × 8 =

8 **Nick's dad offered him two methods of payment for helping with a 5 week landscaping project.**

Method 1: $24 a week for 5 weeks.

Method 2: $8 for the first week, then double the payment each week.

Which method would earn Nick the most money? Why?

F SERIES 1 TOPIC

Multiplication and Division
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Mental multiplication strategies – multiply by 10s, 100s and 1 000s

When we multiply by 10 we move the number one place value to the left.

When we multiply by 100 we move the number two place values to the left.

When we multiply by 1 000 we move the number three place values to the left.

Look at how this works with the number 45:

Ten Thousands	Thousands	Hundreds	Tens	Units	
			4	5	
		4	5	0	× 10
	4	5	0	0	× 100
4	5	0	0	0	× 1 000

1 **Multiply the following numbers by 10, 100 and 1 000:**

a

T Th	Th	H	T	U	
			1	7	
					× 10
					× 100
					× 1 000

b

T Th	Th	H	T	U	
			4	3	
					× 10
					× 100
					× 1 000

c

T Th	Th	H	T	U	
			8	5	
					× 10
					× 100
					× 1 000

d

T Th	Th	H	T	U	
			9	9	
					× 10
					× 100
					× 1 000

2 **Try these:**

a 14 × 10   =

b 14 × 100   =

c 14 × 1 000 =

d 92 × 10   =

e 92 × 1 000 =

f 92 × 100   =

g 11 × 1 000 =

h 11 × 100   =

i 11 × 10   =

3 **You'll need a partner and a calculator for this activity. Take turns giving each other problems such as "Show me 100 × 678". The person whose turn it is to solve the problem, writes down their prediction and you both check it on the calculator. 10 points for each correct answer, and the first person to 50 points wins.**

Mental multiplication strategies – multiply by 10s, 100s and 1 000s

It is also handy to know how to multiply multiples of 10 such as 20 or 200 in our heads.

4 × 2 helps us work out 4 × 20:   4 × 2 = 8   4 × 20 = 80

We can express this as 4 × 2 × 10 = 80   How would you work out 4 × 200?

4 **Use patterns to help you solve these:**

a 5 × 2 _____   5 × 20 _____   5 × 200 _____

b 2 × 9 _____   2 × 90 _____   2 × 900 _____

c 6 × $4 _____   6 × $40 _____   6 × $400 _____

d 8 × 3 _____   8 × 30 _____   8 × 300 _____

e 3 × $7 _____   3 × $70 _____   3 × $700 _____

f 2 × 8 _____   20 × 8 _____   200 × 8 _____

g 3 × 9 _____   30 × 9 _____   300 × 9 _____

5 **Answer these problems:**

a Jock runs 50 km per week. How far does he run over 10 weeks?

> **If you're struggling with your tables, get onto Live Mathletics and practise!**

b Huy earns $20 pocket money per week. If he saves half of this, how much will he have saved at the end of 8 weeks?

c The sum of two numbers is 28. When you multiply them together, the answer is 160. What are the numbers?

6 **Finish these counting patterns:**

a 10   20   _30_   _____   _____   _60_

b 20   40   _____   _80_   _____   _____

c 30   60   _____   _____   _150_   _____

d 40   80   _____   _____   _200_   _240_

e 50   100   _150_   _____   _____   _____

f 100   200   _____   _400_   _____   _____

g 200   400   _____   _____   _____   _1 200_

F **1**

SERIES   TOPIC

Multiplication and Division

Mental multiplication strategies – split strategy

Sometimes it's easier to split a number into parts and work with the parts separately.

Look at 64 × 8

Split the number into 60 and 4

Work out (60 × 8) and then (4 × 8)

Add the answers together 480 + 32 = 512

1 **Use the split strategy to answer the questions:**

a 46 × 4

(40 × 4) + (6 × 4)

_____ + _____

= [ ]

b 74 × 5

(___ × ___) + (___ × ___)

_____ + _____

= [ ]

c 48 × 4

(___ × ___) + (___ × ___)

_____ + _____

= [ ]

d 37 × 7

(___ × ___) + (___ × ___)

_____ + _____

= [ ]

e 62 × 8

(___ × ___) + (___ × ___)

_____ + _____

= [ ]

f 91 × 5

(___ × ___) + (___ × ___)

_____ + _____

= [ ]

2 **Use the split strategy to answer the questions. This time see if you can do the brackets in your head:**

a 48 × 8 = _____ + _____ = [ ]

b 52 × 7 = _____ + _____ = [ ]

c 9 × 43 = _____ + _____ = [ ]

d 8 × 29 = _____ + _____ = [ ]

e 86 × 7 = _____ + _____ = [ ]

It's a good thing I know how to work with multiples of ten in my head!

THINK

3 **These problems have been worked out incorrectly. Circle where it all went wrong.**

a 37 × 6

(30 × 6) + (7 × 6)

180 + 13

= 193

b 17 × 5

(10 × 5) + (7 × 5)

70 + 35

= 105

c 32 × 9

(30 × 9) + (2 × 9)

27 + 18

= 45

Mental multiplication strategies – split strategy

4 Each trail contains 2 multiplication problems and steps to solve them. Only one trail has been solved correctly. There are errors in the other two. Find and colour the winning trail.

FINISH

78

291

114

(30 × 9) + (3 × 9)

(10 × 6) + (3 × 6)

(10 × 9) + (6 × 9)

13 × 6

33 × 9

16 × 9

464

294

51

(40 × 7) + (2 × 7)

400 + 64

30 + 21

42 × 7

58 × 8

17 × 3

START

F SERIES   1 TOPIC

Multiplication and Division

Mental multiplication strategies – compensation strategy

When multiplying we can round to an easier number and then adjust.

Look how we do this with 4×29

29 is close to 30. We can do 4×30 in our heads because we know $4 \times 3 = 12$

$4 \times 30 = 120$

We have to take off 4 because we used one group of 4 too many: $120 - (1 \times 4) = 116$

$4 \times 29 = 116$

1   **Use the compensation strategy to answer the questions. The first one has been done for you.**

a $19 \times 3 =$ __*20*__ $\times$ __*3*__ $-$ __*3*__ $=$ | *57* |

b $8 \times 29 =$ _____ $\times$ _____ $-$ _____ $=$

c $18 \times 6 =$ _____ $\times$ _____ $-$ _____ $=$

d $7 \times 39 =$ _____ $\times$ _____ $-$ _____ $=$

e $28 \times 5 =$ _____ $\times$ _____ $-$ _____ $=$

We can also adjust up. Look how we do this with 6×62:

62 is close to 60. We can do 6×60 in our heads because we know $6 \times 6 = 36$

$6 \times 60 = 360$

We have to then add 2 more lots of 6: $360 + 12 = 372$

$6 \times 62 = 372$

2   **Use the compensation strategy and adjust up for these. The first one has been done for you.**

a $41 \times 3 =$ __*40*__ $\times$ __*3*__ $+$ __*3*__ $=$ | *123* |

> Would I use the compensation strategy with numbers such as 56 or 84? Why or why not?

b $81 \times 4 =$ _____ $\times$ _____ $+$ _____ $=$

c $22 \times 9 =$ _____ $\times$ _____ $+$ _____ $=$

d $32 \times 9 =$ _____ $\times$ _____ $+$ _____ $=$

e $7 \times 62 =$ _____ $\times$ _____ $+$ _____ $=$

THINK

Mental multiplication strategies – compensation strategy

3   **In this activity you'll work alongside a partner. You'll each need two dice and your own copy of this page. For each line, roll the dice to find the tens digit and then roll it again to find the multiplier. Your partner will do the same. Use the compensation strategy to mentally work out the answers to the problems.**

Tens	Units		Multiplier		Answer
	1	×		=	
	9	×		=	
	2	×		=	
	1	×		=	
	8	×		=	
	1	×		=	
	9	×		=	
	8	×		=	
	2	×		=	
	1	×		=	

a   Check each other's calculations. You may want to use a calculator.

b   Now, use the calculator to add your answers. The person with the highest score wins.

F **1**

Multiplication and Division

Mental multiplication strategies – factors and multiples

Factors are the numbers we multiply together to get to another number:

(factor) × (factor) = (whole number)

How many factors does the number 12 have? 4 × 3 = 12, 6 × 2 = 12, 1 × 12 = 12

4, 3, 6, 2, 1 and 12 are all factors of 12.

1 List the factors of these numbers:

a 18

c 14

e 16

g 30

b 25

d 9

f 15

h 42

2 Fill the gaps in these sentences. The first one has been done for you.

a __1__ or __16__ or __2__ or __8__ or __4__ people can share 16 lollies evenly.

b _____ or _____ or _____ or _____ or _____ or _____ people can share 20 slices of pie evenly.

c _____ or _____ or _____ or _____ or _____ or _____ or _____ or _____ people can share 24 cherries.

d _____ or _____ or _____ or _____ or _____ or _____ or _____ or _____ people can share 30 pencils.

e _____ or _____ people can share 5 balls evenly.

3 Use a calculator to help you find as many factors of 384 as you can:

A factor divides into a number evenly with no remainder.

THINK

Multiplication and Division

Mental multiplication strategies – factors and multiples

Multiples are the answers we get when we multiply 2 factors.

Think about the 3 times tables where 3 is always a factor.

What are the multiples of 3?

3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 33 and 36 ...

(3) × (factor) = (multiple)

4   **Fill in the gaps on these multiple boards:**

a
4
8
16

b
5
10

c
9
63

d
7
35

Numbers can be either factors or multiples depending on where they sit in the number sentence.

5   **Choose 2 numbers between 2 and 5 and put them in the first frame as factors. Your answer is the multiple. Now take that multiple and make it a factor in another number sentence. Write in the other factor and solve the problem. Then make the answer a factor again. Can you fill the grid? Use a calculator for the larger problems. The first one has been done for you.**

a   3 × 4 = 12   12 × 2 = 24   24 × 2 = 48

b   ☐ × ☐ = ☐   ☐ × ☐ = ☐   ☐ × ☐ = ☐

c   ☐ × ☐ = ☐   ☐ × ☐ = ☐   ☐ × ☐ = ☐

d   ☐ × ☐ = ☐   ☐ × ☐ = ☐   ☐ × ☐ = ☐

F **1**

SERIES   TOPIC

Multiplication and Division

Mental division strategies – use multiplication facts

Knowing our multiplication facts helps us with division as they do the reverse of each other.
They are inverse operations.

$$3 \times 5 = 15 \qquad 15 \div 5 = 3$$

1 **Use your knowledge of multiplication facts to help answer these division questions:**

a 56 ÷ 7 ⟶ ___8___ × 7 = 56 ⟶ 56 ÷ 7 = ☐

b 121 ÷ 11 ⟶ _____ × 11 = 121 ⟶ 121 ÷ 11 = ☐

c 72 ÷ 8 ⟶ _____ × 8 = 72 ⟶ 72 ÷ 8 = ☐

d 49 ÷ 7 ⟶ _____ × 7 = 49 ⟶ 49 ÷ 7 = ☐

e 36 ÷ 9 ⟶ _____ × 9 = 36 ⟶ 36 ÷ 9 = ☐

f 64 ÷ 8 ⟶ _____ × 8 = 64 ⟶ 64 ÷ 8 = ☐

g 108 ÷ 12 ⟶ _____ × 12 = 108 ⟶ 108 ÷ 12 = ☐

2 **Now try these:**

a 81 ÷ 9 = ☐   b 40 ÷ 5 = ☐

c 21 ÷ 3 = ☐   d 54 ÷ 6 = ☐

e 42 ÷ 7 = ☐   f 63 ÷ 9 = ☐

g 36 ÷ 4 = ☐   h 45 ÷ 9 = ☐
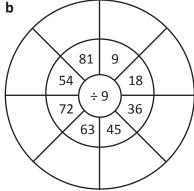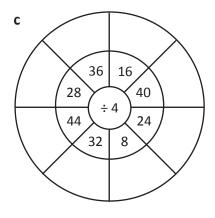
i 39 ÷ 3 = ☐   j 24 ÷ 6 = ☐

Doing maths without knowing your multiplication facts is hard. Learning them makes your life much easier. It's worth persevering to conquer them!

3 **Fill in the division wheels. Use multiplication facts to help you.**

a

÷ 6 : 36, 24, 6, 48, 18, 30, 42, 60

b

÷ 9 : 81, 9, 18, 36, 45, 63, 72, 54

c

÷ 4 : 36, 16, 40, 24, 8, 32, 44, 28

Mental division strategies – use multiplication facts

Knowing our families of facts is also helpful.

$$3 \times 5 = 15 \qquad 5 \times 3 = 15 \qquad 15 \div 5 = 3 \qquad 15 \div 3 = 5$$

4 Complete the following patterns. How many more multiplication and division facts can you find, given the first fact?

a $7 \times 8 = 56$

$8 \times 7 = \boxed{}$

$56 \div \boxed{} = 8$

$\boxed{} \div 8 = 7$

b $8 \times 9 = 72$

$9 \times 8 = \boxed{}$

$72 \div \boxed{} = 9$

$\boxed{} \div 9 = 8$

c $7 \times 9 = 63$

$9 \times 7 = \boxed{}$

$63 \div \boxed{} = 9$

$\boxed{} \div 9 = 7$

5 Write down another multiplication fact and two division facts for each question.

a $6 \times 7 = 42$

b $5 \times 9 = 45$

c $9 \times 6 = 54$

d $17 \times 8 = 136$

e $12 \times 8 = 96$

f $11 \times 21 = 231$

6 Look at these two division facts: $20 \div 5 = 4$ and $20 \div 4 = 5$

Imagine you're explaining to a younger child how they're related yet different. How would you do it? What would you say/write/draw?

Multiplication and Division

Mental division strategies – divide by 10s, 100s and 1 000s

When we divide by 10 we move the number one place value to the right.

When we divide by 100 we move the number two place values to the right.

When we divide by 1 000 we move the number three place values to the right.

Look what happens to 45 000 when we apply these rules:

Ten Thousands	Thousands	Hundreds	Tens	Units	
4	5	0	0	0	
	4	5	0	0	÷ 10
		4	5	0	÷ 100
			4	5	÷ 1 000

1 **Divide the following numbers by 10, 100 and 1 000:**

a

T Th	Th	H	T	U	
4	5	0	0	0	
					÷ 10
					÷ 100
					÷ 1 000

b

T Th	Th	H	T	U	
4	3	0	0	0	
					÷ 10
					÷ 100
					÷ 1 000

c

T Th	Th	H	T	U	
8	5	0	0	0	
					÷ 10
					÷ 100
					÷ 1 000

d

T Th	Th	H	T	U	
8	8	0	0	0	
					÷ 10
					÷ 100
					÷ 1 000

2 **Draw lines to match the answers with the questions:**

a What number is one thousand times smaller than 32 000?

b What number is one hundred times smaller than 32 000?

c What number is one hundred times smaller than 95 000?

d What number is ten times smaller than 95 000?

e What number is one hundred times smaller than 8 800?

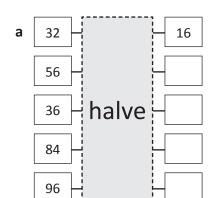f What number is ten times smaller than 8 800?
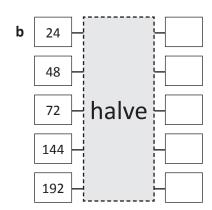
9 500

88

950

880

320

32

Mental division strategies – halving strategy

When the two numbers seem too large to work with in our heads, we can halve them till we get to a division fact we recognise. Both numbers must be even for this to work.

$$126 \div 14$$
$$(\text{half } 126) \div (\text{half } 14)$$
$$63 \div 7 = 9$$

1 Practise your halving. The first one has been done for you.

a

32	halve	16
56		
36		
84		
96		

b

24	halve	
48		
72		
144		
192		

c

50	halve	
500		
1 000		
250		
100		

2 Halve each number to get to a recognisable division fact. The first one has been done for you.

a 112 ÷ 14   __56__ ÷ __7__ = [8]

b 144 ÷ 16   _____ ÷ _____ = [ ]

c 96 ÷ 12   _____ ÷ _____ = [ ]

d 220 ÷ 4   _____ ÷ _____ = [ ]

e 162 ÷ 18   _____ ÷ _____ = [ ]

3 Match the problems with their halved equivalents. Then solve the problem. The first one has been done for you.

a 90 ÷ 18   60 ÷ 6   = [5]

b 64 ÷ 16   24 ÷ 8   = [ ]

c 120 ÷ 12   35 ÷ 7   = [ ]

d 70 ÷ 14   45 ÷ 9   = [ ]

e 144 ÷ 24   72 ÷ 12   = [ ]

f 48 ÷ 16   32 ÷ 8   = [ ]

F **2**

Multiplication and Division

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SERIES   TOPIC

Mental division strategies – halving strategy

Sometimes we need to keep halving until we reach an easy division fact.

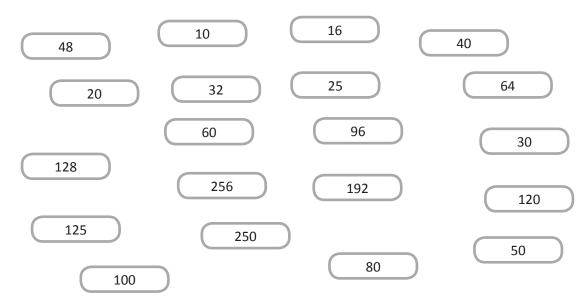$$144 \div 36 \longrightarrow 72 \div 18 \longrightarrow 36 \div 9 = 4$$

4 Keep halving until you get to a fact you can work with. If you can do it in your head, just fill in the last box. Otherwise, use the lines to help you.

a 216 ÷ 36 = _____ ÷ _____ = _____ ÷ _____ = ☐

b 196 ÷ 28 = _____ ÷ _____ = _____ ÷ _____ = ☐

c 224 ÷ 32 = _____ ÷ _____ = _____ ÷ _____ = ☐

d 168 ÷ 24 = _____ ÷ _____ = _____ ÷ _____ = ☐

e 144 ÷ 36 = _____ ÷ _____ = _____ ÷ _____ = ☐

f 288 ÷ 72 = _____ ÷ _____ = _____ ÷ _____ = ☐

5 Draw lines to connect numbers that could be doubled or halved to reach each other.

48   10   16   40

20   32   25   64

60   96   30

128   256   192   120

125   250   50

100   80

6 Work with a partner to solve this problem using halving:

You have an after school job at the local lolly shop, making up the mixed lolly bags. Today, you have to evenly share 288 freckles among 48 bags. How many freckles will you put in each bag? Show each halved sum.

Mental division strategies – split strategy

Division problems also become easier if you split the number to be divided into recognisable facts.

Look at the problem 144 ÷ 9

Can we divide 144 into 2 multiples of 9?

We can divide it into 54 and 90. These are both easily divided by 9. Then we add the two answers together.

$$144 \div 9$$

90	54
÷ 9	÷ 9
10	+ 6	= 16

1 **Use the split strategy to divide these numbers. Use the clues to guide you:**

a 112 ÷ 8

80	32
÷ 8	÷ 8

_____ + _____ = [ ]

b 85 ÷ 5

50	_____
÷ 5	÷ 5

_____ + 7 = [ ]

c 78 ÷ 6

_____	18
÷ 6	÷ 6

10 + _____ = [ ]

d 64 ÷ 4

24	_____
÷ 4	÷ 4

_____ + _____ = [ ]

e 91 ÷ 7

21	_____
÷ 7	÷ 7

_____ + _____ = [ ]

f 144 ÷ 8

80	64
÷ 8	÷ 8

_____ + _____ = [ ]

2 **Now try these:**

a 90 ÷ 6

60 ÷ 6
30 ÷ 6
= [ ]

b 105 ÷ 7

70 ÷ _____
_____ ÷ _____
= [ ]

c 72 ÷ 4

_____ ÷ _____
24 ÷ _____
= [ ]

d 144 ÷ 8

_____ ÷ _____
96 ÷ _____
= [ ]

> Hmmm … 91 ÷ 7. The unit digit helps me here. What multiple of 7 ends in 1? I know, 21. So that makes the other number 70!

DISCOVER

F
SERIES

2
TOPIC

Multiplication and Division

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Mental division strategies – split strategy

3 Play this game with a partner. Use one copy of this page between you. Cut out the problems on the left and stack them face up. Cut out and spread the other cards face up. Work together (or race) to find two numbers you could divide to solve the problem on the top card of the pile. One card in the pair will be grey, the other white. For example, if the problem was 76 ÷ 4, you could locate 36 and 40.

96 ÷ 4	45	90
75 ÷ 5	25	21
87 ÷ 3	60	50
98 ÷ 7	80	70
135 ÷ 9	55	36
78 ÷ 6	30	60
112 ÷ 8	60	60
51 ÷ 3	27	32
95 ÷ 5	24	40
84 ÷ 6	28	18

Mental division strategies – tests of divisibility

Divisibility tests tell us if a number can be divided evenly by another (that is with no remainders).

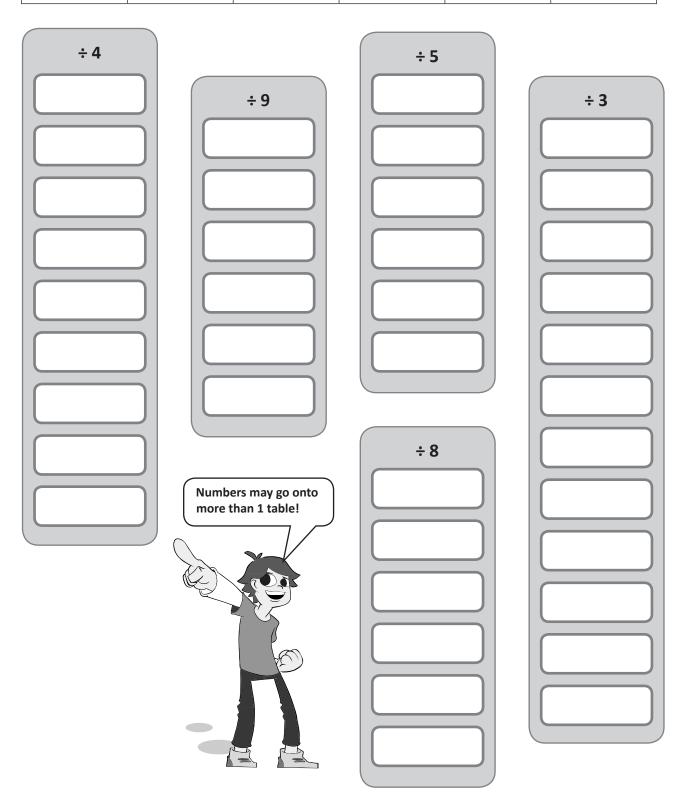**1**   **Use the rules to test out the numbers in the last column. The first two have been done for you:**

Divisible by	Rule	Test
2	A number is divisible by 2 if it's even (ends in 0, 2, 4, 6 or 8).	Is 458 divisible by 2? *Yes, because it ends in an even number.*
3	A number is divisible by 3 if the sum of its digits is divisible by 3.	Is 7 281 divisible by 3? 7 + 2 + 8 + 1 = 18 *Yes, because 18 is divisible by 3.*
4	A number is divisible by 4 if the number made by the last 2 digits is divisible by 4.	Is 3 912 divisible by 4?
5	A number is divisible by 5 if there's a 0 or 5 in the units place.	Is 455 divisible by 5?
8	A number is divisible by 8 if the last 3 digits are divisible by 8.	Is 74 160 divisible by 8?
9	A number is divisible by 9 if the sum of its digits is divisible by 9.	Is 6 345 divisible by 9?
10	A number is divisible by 10 if there is a zero in the units place.	Is 5 680 divisible by 10?

Multiplication and Division

Mental division strategies – tests of divisibility

2 These numbers can all be divided with no remainders. Work with a partner to find the rule/s that can be used to divide them. Fill in the tables.

36	90	84	99	50	72
456	330	888	120	981	548
1 025	3 486	6 993	1 256	9 050	10 072

÷ 4

÷ 9

÷ 5

÷ 3

÷ 8

Numbers may go onto more than 1 table!

Written methods – contracted multiplication

Contracted multiplication is one way to solve a multiplication problem.

First we use our mental strategies to estimate an easier problem:
3 × 150 = 450. The answer will be around 450.

	H	T	U
	¹1	¹5	6
×			3
	4	6	8

We start with the units. 3 × 6 is 18 units. We rename this as 1 ten and 8 units.

We put 8 in the units column and carry the 1 to the tens column.

3 × 5 plus the carried 1 is 16 tens. We rename this as 1 hundred and 6 tens.

We put 6 in the tens column and carry the 1 to the hundreds column.

3 × 1 plus the carried 1 is 4 hundreds. We put 4 in the hundreds column.

1 Solve these problems using contracted multiplication. Estimate first:

a e:

	H	T	U
	3	2	7
×			3

b e:

	H	T	U
	2	4	7
×			4

c e:

	H	T	U
	1	5	4
×			5

d e:

	H	T	U
	3	1	5
×			3

e e:

	H	T	U
	2	8	6
×			2

f e:

	H	T	U
	1	9	4
×			5

2 Solve these word problems. Show how you worked them out:

a Dan's dad has resorted to bribery to counteract Dan's PlayStation addiction. For every evening, Dan spends away from the PlayStation, his dad pays him $3. So far, Dan has racked up an impressive 27 nights (though he looks like breaking any day now). How much money does this equate to?

b Dan's mum thinks she might get in on the action too and pays Dan $4 for every week that he puts his dishes in the dishwasher and his dirty clothes in the basket. Dan is less keen on this plan but does manage 33 weeks in 1 year. How much has he made out of this scheme?

Multiplication and Division

Written methods – contracted multiplication

3 Below are Jess and Harry's tests. Check them and give them a mark out of 5. If they made mistakes, give them some feedback as to where they went wrong.

Jess	Harry
^{13} ^{18} 7 × 2 7 7 4	^{13} ^{18} 7 × 2 7 7 4
1 1 9 × 7 7 7 3	^{11} ^{61} 9 × 7 8 3 3
2 0 3 × 3 6 0 9	2 0 3 × 3 6 9
4 ^{13} 6 × 3 1 2 0 8	^{14} ^{13} 6 × 3 1 3 0 8
4 0 1 × 7 2 8 0 7	4 0 1 × 7 2 8 7

Written methods – extended multiplication

	H	T	U	
	2	3	4	
×			3	
		1	2	← (3 × 4)
		9	0	← (3 × 30)
	6	0	0	← (3 × 200)
	7	0	2	

Extended multiplication is another way of solving problems. In extended multiplication we multiply the units, tens and hundreds separately then add the answers together.

1 Use a calculator to help you work out the values you could expect when multiplying the following. Tick the columns:
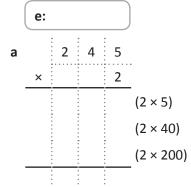
		T TH	TH	H	T	U
a	a unit by a unit ⟶ 9 × 7					
b	a ten by a unit ⟶ 43 × 5					
c	a hundred by a unit ⟶ 126 × 7					
d	a ten by a ten ⟶ 13 × 72					
e	a ten by a hundred ⟶ 55 × 120					

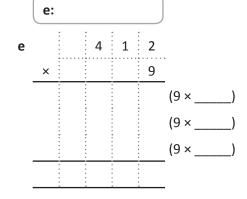2 × 2 would give me a unit only. But 8 × 6 would give me tens and units. I'll tick both columns.

2 Complete using extended multiplication. Estimate first:

e: ____

a
```
    2   4   5
×           2
            (2 × 5)
            (2 × 40)
            (2 × 200)
```

e: ____

b
```
    4   5   2
×           7
            (7 × 2)
            (7 × 50)
            (7 × 400)
```

e: ____

c
```
    3   2   7
×           8
            (8 × 7)
            (8 × 20)
            (8 × 300)
```

e: ____

d
```
    2   7   9
×           2
            (2 × _____)
            (2 × _____)
            (2 × _____)
```

e: ____

e
```
    4   1   2
×           9
            (9 × _____)
            (9 × _____)
            (9 × _____)
```

F SERIES 3 TOPIC

Multiplication and Division

Written methods – extended multiplication

3 **Use extended multiplication to solve these problems:**

a Jack and his 2 friends bought tickets to the World Cup. Each ticket costs $124. How much did they spend altogether?

e:

b Jack has a paper round and earns $7 per day. He works for 18 days and saves it all. Has he earned enough to pay for his World Cup ticket?

e:

c Yusuf's highest Level 1 Live Mathletics score is 112. Yep, he's fast. If he scores this 7 times in a row, how many correct answers has he achieved?

e:

d Kyra's class of 24 all had to stay in for 11 minutes of their recess. Something to do with too much talking. How many minutes is this in total?

e:

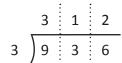**4** **Once you have the hang of extended multiplication, you can apply it to larger numbers. Try these:**

a
```
      2 4 5
  ×     3 2
             (2 × 5)
             (2 × 40)
             (2 × 200)
             (30 × 5)
             (30 × 40)
             (30 × 200)
```

b
```
      3 2 9
  ×     4 3
             (3 × 9)
             (3 × 20)
             (3 × 300)
             (40 × 9)
             (40 × 20)
             (40 × 300)
```

c
```
      2 3 8
  ×     5 2
             (2 × 8)
             (2 × 30)
             (2 × 200)
             (50 × 8)
             (50 × 30)
             (50 × 200)
```

Written methods – short division

In short division, we use our knowledge of multiplication to help us. We can split 936 into 900 + 30 + 6.

```
      3 ┊ 1 ┊ 2
   ┌─────────────
 3 │ 9 ┊ 3 ┊ 6
```
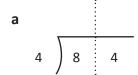
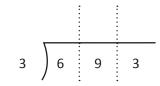900 divided by 3 is 300, so we put a 3 in the hundreds place.

30 divided by 3 is 10, so we put a 1 in the tens place.

6 divided by 3 is 2, so we put a 2 in the units place.   **936 ÷ 3 = 312**
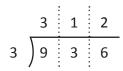
1 **Divide these numbers:**

a
```
   ┌──────
 4 │ 8 ┊ 4
```

b
```
   ┌──────
 5 │ 5 ┊ 5
```

c
```
   ┌──────
 3 │ 9 ┊ 3
```

d
```
   ┌──────────
 9 │ 9 ┊ 9 ┊ 0
```

e
```
   ┌──────────
 4 │ 4 ┊ 8 ┊ 4
```

f
```
   ┌──────────
 6 │ 6 ┊ 6 ┊ 6
```

g
```
   ┌──────────
 3 │ 9 ┊ 9 ┊ 9
```

h
```
   ┌──────────
 2 │ 4 ┊ 6 ┊ 2
```

i
```
   ┌──────────
 3 │ 6 ┊ 9 ┊ 3
```

Sometimes it's easier to split the numbers differently. We can also split 936 into 900 + 36.

```
      3 ┊ 1 ┊ 2
   ┌─────────────
 3 │ 9 ┊ 3 ┊ 6
```

900 divided by 3 is 300 so we put a 3 in the hundreds place

36 divided by 3 is 12. We put the 1 in the tens place and the 2 in the units place.

936 ÷ 3 = 312

In these problems, if there are no tens in a number we put a 0 in to show this and also to hold the place of the other numbers!

2 **Decide how you'll split these numbers and then divide. Remember to put in zeros as needed.**

a
```
   ┌──────────
 5 │ 5 ┊ 1 ┊ 5
```

b
```
   ┌──────────
 3 │ 6 ┊ 6 ┊ 9
```

c
```
   ┌──────────
 9 │ 9 ┊ 2 ┊ 7
```

d
```
   ┌──────────
 4 │ 8 ┊ 0 ┊ 4
```

e
```
   ┌──────────
 4 │ 8 ┊ 1 ┊ 2
```

F **3**

SERIES   TOPIC

Multiplication and Division

Written methods – short division with remainders

Sometimes numbers don't divide evenly. The amount left over is called the **remainder**.

```
      1   0   5  r 2
   _____
5 ) 5   2   7
```

Look at 527 divided by 5.

500 divided by 5 is 100.

27 divided by 5 is 5 with 2 left over (this is the remainder).

This can be written as r 2.

527 ÷ 5 = 105 r 2.

1 **Divide these 2 digit numbers. Each problem will have a remainder.**

a
```
         r
   _____
9 ) 7   5
```

b
```
         r
   _____
4 ) 4   7
```

c
```
         r
   _____
6 ) 3   8
```

d
```
         r
   _____
5 ) 6   3
```

e
```
         r
   _____
4 ) 4   9
```

f
```
         r
   _____
6 ) 6   2
```

2 **Divide these 3 digit numbers. Each problem will have a remainder.**

a
```
             r
   _____
5 ) 5   5   7
```

b
```
             r
   _____
3 ) 6   6   1
```

c
```
             r
   _____
4 ) 4   8   1
```

d
```
             r
   _____
9 ) 9   9   4
```

e
```
             r
   _____
4 ) 8   4   5
```

f
```
             r
   _____
6 ) 6   3   8
```

3 **Solve these problems:**

a Giovanni's Nonna has given him a bag of gold coins to share among him and his two sisters. There are 47 gold coins altogether. How many does each child get if they're shared evenly? How would you suggest they deal with the remainder?
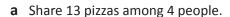
_____

b You have 59 jubes to add to party bags. Each bag gets 5 jubes. How many full party bags can you make?

Written methods – short division with remainders

There are 3 ways of expressing remainders. How we do it depends on how we'd deal with the problem in the real world. Look at:

$$\begin{array}{r} 1 \quad 0 \quad 5 \text{ r 2} \\ 5 \overline{\smash{\big)}\ 5 \quad 2 \quad 7} \end{array}$$

4 One way is to write *r 2* as in the example above. We use this when we don't care about being absolutely precise and when the remainder can't be easily broken up. An example would be sharing 527 jelly beans among 5 people. Solve these problems expressing the remainders as *r*.

a Share 126 blue pencils among 4 people.

b Share 215 paper clips among 7 people.

5 We can also express a remainder as a fraction. We do this when we can easily share the remainder. For example, 19 cakes shared among 3 people is 6 and one third each. Solve these problems expressing the remainder as a fraction:

$$\begin{array}{r} 6 \frac{1}{3} \\ 3 \overline{\smash{\big)}\ 1 \quad 9} \end{array}$$

a Share 13 pizzas among 4 people.

b Share 50 sandwiches among 3 people.

REMEMBER

6 We express remainders as decimals when we must be absolutely precise. Sharing dollar amounts is a good example of this. We add the cents after the decimal point to help us. Try these:

27 divided by 2 is 13. Now we have one dollar left. How how many cents is half of one dollar?

a Share 12 dollars among 4 people.

b Share 27 dollars between 2 people.

$$4 \overline{\smash{\big)}\ 1 \quad 2 \cdot 0 \quad 0}$$

$$2 \overline{\smash{\big)}\ 2 \quad 7 \cdot 0 \quad 0}$$

THINK

Multiplication and Division

F SERIES   3 TOPIC

Written methods – solving problems

We regularly come across multiplication and division problems in our everyday life. It doesn't matter which strategy we use to solve them, we can choose the one that suits us or the problem best.

1 One real-life problem is comparing prices to find the best deal. It's easy if the prices and amounts are the same but what if the amounts are different? Use a strategy to help you find the best deal on these:

a

CHIPS 100 g $1.95

CHIPS 300 g $5.43

Best deal is _____

b

CEREAL 500 g $3.95

CEREAL 1 kg $8.50

Best deal is _____

c

10 pack CD $22.90

Single CD $2.75

Best deal is _____

d

500 ml $1.40

2 litres $2.80

Best deal is _____

2 You go to the service station with your weekly pocket money of $5. When you take a $1.75 chocolate bar to the counter, they offer you the special of 3 bars for $4.50. Which is a better deal? Show why.

Written methods – solving problems

3 **You're planning a trip to the Wet and Wild theme park and there are many ticket options. Use a strategy of your choice and the price list below to answer the following questions:**

Entry	
1-day pass **$32**	
2-day pass **$48**	
Annual pass **$99**	
Individual rides **$12**	
10-ride pass **$95**	
Order online **$5 discount**	

Extras	
5-minute helicopter ride **$42**	
10-minute helicopter ride **$74**	
30-minute helicopter ride **$209**	
Sunset cruise **$12**	
Lunch cruise **$22**	
Swim with the dolphins **$75**	

a If you buy a 2-day pass, what is the cost per day?

b How much cheaper is this option than buying two 1-day passes?

c If you bought an annual pass, how many times would you need to visit to make it a better option than buying either a 1-day or 2-day pass?

d What if you choose just the rides? How much would you save if you bought the 10-ride pass instead of the individual rides?

e If you took a 5-minute helicopter ride, what would be the cost per minute?

f What about if you chose the 10-minute flight option? What would be the cost per minute?

g Plan a day's itinerary for you and a partner. How much will this cost?

F SERIES   3 TOPIC

Multiplication and Division

What to do → Use the code below to work out the hidden message.

__ __ __ __ __ __ __ __ __ __   __ __   __ __ __
2   1   3   6   4   5   3   8   7   9   8   9   10 12 11

A × A = A   **A is** _____   F = H + L   **F =** _____

M × M = M + M   **M is** _____   E = F ÷ 2   **E =** _____

T − M = A   **T is** _____   2 × L = I   **I =** _____

T + T = H   **H is** _____   (2 × L) − A = C   **C =** _____

H − M = L   **L is** _____   F + A = N   **N =** _____

3 × L = U   **U is** _____   3 × T = S   **S =** _____

> Once I work out the first couple, the rest come easily!

DISCOVER

What to do → Try this one:

__ __ __ __ __ __ __ __ __ __   __ __ __
2   9   4   12 13 8   2   7   4   9   2   12 3

__ __ __ __ __ __   __ __   __ __ __ __ __
4   2   6   6   3   12   0   8   9   1   2   5   3

> If two letters are together, we read them as a tens digit and a units digit.

A × A = A + A   **A is** _____   L + E = S   **S is** _____

A + A = T   **T is** _____   N − N = I   **I is** _____

T × 2 = N   **N is** _____   U − A = C   **C is** _____

AT ÷ N = E   **E is** _____   S − (2 × T) = P   **P is** _____

2 × E = L   **L is** _____   2 × U − P = O   **O is** _____

E + T = U   **U is** _____   S + E = R   **R is** _____

Smart buttons   apply

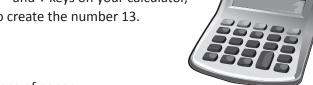**Getting ready** → In this activity, you'll use your knowledge of multiplication, division, subtraction and addition to find as many number statements you can to create one number.

What to do → Using ONLY the number 2, +, ×, − and ÷ keys on your calculator, find as many ways as you can to create the number 13.
For example, you could make:

22 + 2 + 2 = 26 ÷ 2 = 13

Record your statements on a piece of paper.

Now, compare your answers with a partner's. How many did they find?
Can you supplement each other's lists?

What's the longest statement? What's the shortest?

What to do → Choose another number to make and see how many statements you can find *or* challenge a partner to a competition. Set a time limit and see who can find the most ways to make 15 within the time span.

Bugs   investigate

Getting ready → Use your knowledge of multiples to help you work out how many boy bugs and girl bugs there are in the problem below. Listing all the multiples is a strategy that would help.

What to do → Girl bugs have 4 splodges on their backs, boy bugs have 9.

Altogether there are 48 splodges. Work out how many girl bugs and how many boy bugs there are.

What to do next → What if girl bugs have 8 splodges and boy bugs have 6 and there are 120 splodges altogether? How many different answers can you find?

F **4**

Multiplication and Division

What to do → Use your knowledge of multiplication to work out the missing values:

a
```
    2  8
 ×     3
 ──────────
    8  □
```

b
```
    7  □
 ×     4
 ──────────
 2  8  8
```

c
```
    □  7
 ×     5
 ──────────
 2  3  5
```

d
```
    8  □
 ×     9
 ──────────
 7  2  9
```

e
```
    6  8
 ×     □
 ──────────
 2  0  4
```

f
```
    □  2  3
 ×        □
 ──────────────
 6  5  8  4
```

g
```
    2  6  1
 ×        □
 ──────────────
    □  □  4  4
```

h
```
       4  2
 ×     □  3
 ─────────────
    1  2  6
 □  6  8  0
 ─────────────
    □  □  □  □
```

i
```
       5  6
 ×     2  7
 ─────────────
    3  9  2
 □  □  □  □
 ─────────────
 □  □  □  □
```
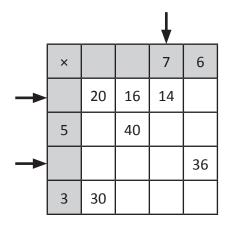
What to do → Fill in the multiplication and division tables by working out the missing digits. The arrows show you some good starting places.

Table 1 (arrows above the columns headed 7 and 6):

×			7 ↓	6
→		20	16	14	
5		40		
→				36
3	30			

Table 2 (arrows above the columns headed 8, 9 and the last column):

×		8 ↓	9 ↓	↓
12	24			
3				12
		14		
			54	

Table 3:

×			3	
4				32
		14		
	45		27	
12		24		

Table 4:

×			9	
	6			
11	33	44		
			63	
8				64

What to do → Complete this crossnumber puzzle:

¹		■	²		
	■	³		■	■
	■	⁴		■	⁵
■	⁶		■	⁷	
■		■	⁸	■	■
⁹		■	¹⁰		

Across		Down	
1	60 ÷ 5	**1**	11 × 11
2	25 × 5	**2**	12 × 10
3	7 × 6	**3**	7 × 7
4	15 × 6	**5**	66 ÷ 6
7	7 × 3	**6**	12 × 12
9	9 × 6	**8**	39 ÷ 3
10	6 × 50		

What to do → Test your speed and accuracy. Race against a partner or the clock to complete each table:

÷ 8	
56	
16	
64	
80	
32	
72	
24	
8	

Time:

÷ 3	
9	
6	
18	
12	
24	
30	
27	
33	

Time:

÷ 7	
21	
7	
14	
70	
49	
28	
42	
35	

Time:

What to do → Use the "guess, check and improve" strategy to solve this problem. You could use a calculator to help if you wish.

Tracey paid $3.10 for 7 lolly snakes and 4 sherbets. Madison paid $2.95 for 4 lolly snakes and 7 sherbets. How much does one lolly snake cost? How much does one sherbet cost?

> If the decimals are confusing me, I can change the amounts to 310 cents and 295 cents.

THINK