Year 7 – Maths Knowledge Organiser – Spring 2023

Application of number
Solving problems with multiplication and division

What do I need to be able to do?

By the end of this unit you should be able to:
- Understand and use factors
- Understand and use multiples
- Multiply/ Divide integers and decimals by powers of 10
- Use formal methods to multiply
- Use formal methods to divide
- Understand and use order of operations
- Solve area problems
- Solve problems using the mean

Keywords

Array: an arrangement of items to represent concepts in rows or columns
Multiples: found by multiplying any number by positive integers
Factor: integers that multiply together to get another number.
Mil: prefix meaning one thousandth
Centi: prefix meaning one hundredth.
Kilo: prefix meaning multiply by 1000
Quotient: the result of a division
Dividend: the number being divided
Divisor: the number we divide by

Factors

Arrays can help represent factors

Factors of 10
5 x 2 or 2 x 5
1, 2, 5, 10

10 x 1 or 1 x 10

The number itself is always a factor
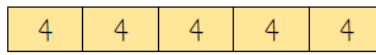
Square numbers have an ODD number of factors

Factors of 4
1, 2, 4

Factors of 36
1, 2, 3, 4, 6, 9, 12, 18, 36

Be strategic – Lay factors out in pairs can help you not to miss any

Multiples

| 4 | 4 | 4 | 4 | 4 |

Bar models can represent by something is a multiple. Eg. 20 is a multiple of 4

Lowest Common Multiples

LCM of 9 and 12

The first time their multiples match

| 9 | 9, 18, 27, (36) 45, 54 |
| 12 | 12, 24, (36) 48, 60 |

LCM = 36

Multiply/ Divide by powers of 10

3 x 100 = 300

0.03 x 100 = 3
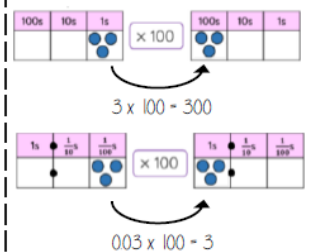
Repeated multiplication and division by powers of 10 is commutative

÷ 10 then ÷ 10 ⟶ ÷ 100

Metric conversions

Useful Conversions

mm $\xrightarrow{\div 10}$ cm $\xrightarrow{\div 100}$ m $\xrightarrow{\div 1000}$ km

$\xleftarrow{\times 10}$ $\xleftarrow{\times 100}$ $\xleftarrow{\times 1000}$

g $\xleftarrow{\div 1000}$ kg

$\xrightarrow{\times 1000}$

ml $\xleftarrow{\div 1000}$ L

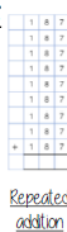$\xrightarrow{\times 1000}$
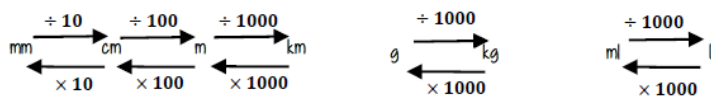
Multiplication methods

Long multiplication (column)

Grid method

Repeated addition

Less effective method especially for bigger multiplication

Multiplication with decimals
Perform multiplications as integers
eg. 0.2 x 0.3 ⟶ 2 x 3
Make adjustments to your answer to match the question: 0.2 x 10 = 2
0.3 x 10 = 3
Therefore 6 ÷ 100 = 0.6

Estimations: Using estimations allows a 'check' if your answer is reasonable

Division methods

Short division

3584 ÷ 7 = 512

$7 \overline{)3\,^3 5\, 8\,^1 4}$ = 5 1 2

Complex division
÷ 24 = ÷ 6 ÷ 4
Break up the divisor using factors

**Division with decimals**
The placeholder in division methods is essential – the decimal lines up on the dividend and the quotient

24 ÷ 0.02 ⟶ 24 ÷ 0.2 ⟶ 240 ÷ 2

All give the same solution as represent the same proportion. Multiply the values in proportion until the divisor becomes an integer
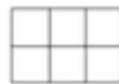

Order of operations

Brackets
Indices or roots
Multiplication or division
Addition or subtraction
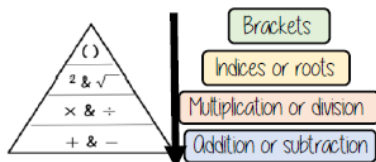
If you have multiple operations from the same tier work from left to right

eg. 10 – 3 + 5 ⟶ 10 – 3 ⟶ 7 + 5

6 x 4 + 8 x 2
24 + 16 = 40

Area problems

Rectangle
Base x Perpendicular height

Parallelogram/ Rhombus
Base x Perpendicular height

Triangle
½ x Base x Perpendicular height
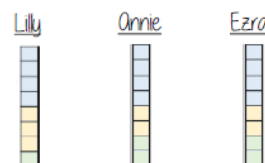A triangle is half the size of the rectangle it would fit in

Mean problems

Mean – a measure of average It gives an idea of the central value

Lilly, Annie and Ezra have the following cubes

Lilly
Annie
Ezra
24 in total

Finding the mean amount is the average amount each person would have if shared out equally
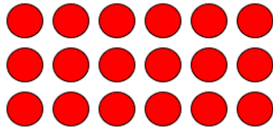
Lilly   Annie   Ezra

The mean number of blocks would be 8 each
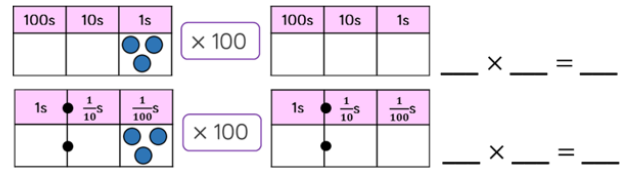
Questions for practice

What two multiplications does the array show?

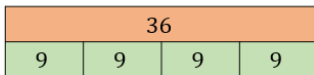What two divisions does the array show?

Explain how the array shows that multiplication is commutative. Is division commutative? Why or why not?

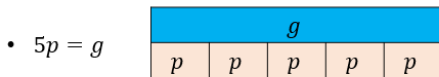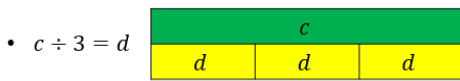Draw counters on each place value grid to show the new number and complete the calculations.

___ × ___ = ___

___ × ___ = ___

What's the same, what's different?

Write the fact family for this bar model

36			
9	9	9	9

Draw a bar models to illustrate these:

- $c \div 3 = d$

c		
d	d	d

- $5p = g$

g				
p	p	p	p	p

What other facts do your models show?

Put the results of these calculations in order, starting with the smallest.

82×0.1 $802 \div 10$ $80.2 \div 100$

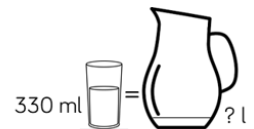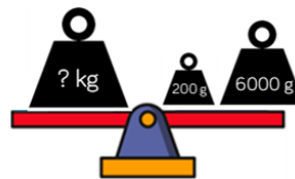8.2×10 $82 \div 100$ 80.2×0.01

Work out the factors of 30
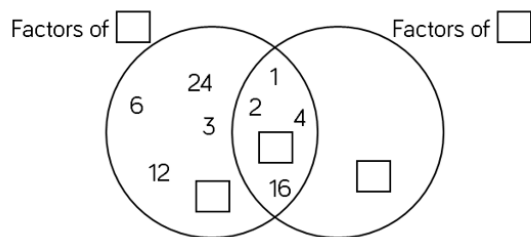
Explain your method.

What are the factors of 45?

What are the common factors of 30 and 45?

Find the missing equivalent measures:

Here is a part completed Venn diagram containing the factors of two numbers. Work out the missing information.

Factors of ☐   Factors of ☐

Complete these calculations.

	H	T	O
	1	8	7
×			9

×	100	80	7
9			

	1	8	7
	1	8	7
	1	8	7
	1	8	7
	1	8	7
	1	8	7
	1	8	7
	1	8	7
	1	8	7
+	1	8	7

Which is the most efficient method?

Which method is not appropriate for 187 × 56?

Find the missing numbers in these calculations.

$$5\square 2$$
$$7 \overline{)3\,{}^{3}5\,8\,\square}$$

$$8\square 3$$
$$\square\square\,{}^{7}8\,{}^{6}5\,\square$$

ANSWERS

What two multiplications does the array show?
$6 \times 3 = 18$
$3 \times 6 = 18$

What two divisions does the array show?
$18 \div 6 = 3$
$18 \div 3 = 6$
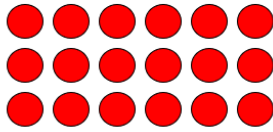
Explain how the array shows that multiplication is commutative. Is division commutative? Why or why not?

The array shows that six lots of three and three lots of six are both equal to 18 showing multiplication is commutative. However 18 divided into six groups is not equal to 18 divided into three groups.

Draw counters on each place value grid to show the new number and complete the calculations.

$3 \times 100 = 300$

$0.03 \times 100 = 3$
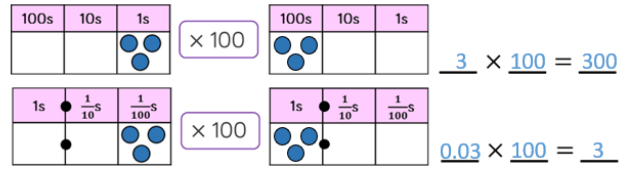
What's the same, what's different?

Similarity – Multiplying by 100 moves digits two place value columns to the left.
Difference – The starting columns of the place value counters.

Write the fact family for this bar model

36			
9	9	9	9
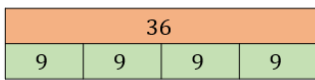
$9 \times 4 = 36$
$4 \times 9 = 36$
$36 \div 4 = 9$
$36 \div 9 = 4$

Draw a bar models to illustrate these:

- $c \div 3 = d$

c		
d	d	d

$d \times 3 = c$
$3 \times d = c$
$c \div 3 = d$
$c \div d = 3$

- $5p = g$

g				
p	p	p	p	p

$p \times 5 = g$
$5 \times p = g$
$g \div 5 = p$
$g \div p = 5$

What other facts do your models show?

Put the results of these calculations in order, starting with the smallest.

Smallest
80.2×0.01 = 0.802
$80.2 \div 100$ = 0.802
$82 \div 100$ = 8.2
82×0.1 = 8.2
$802 \div 10$ = 80.2
Largest
8.2×10 = 82

Work out the factors of 30

Factors of 30 = 1, 2, 3, 5, 6, 10, 15 and 30

Explain your method.
Use division of 30 by 1, 2, 3, 4, 5etc to ascertain if the division produces an integer answer. If so the divisor and the integer answer create a factor pair.

What are the factors of 45?

Factors of 45 = 1, 3, 5, 9, 15 and 45

What are the common factors of 30 and 45?

Common factors of 30 and 45 = 1, 3, 5 and 15

What is their highest common factor?

Highest common factor (HCF) = 15

Find the missing equivalent measures:
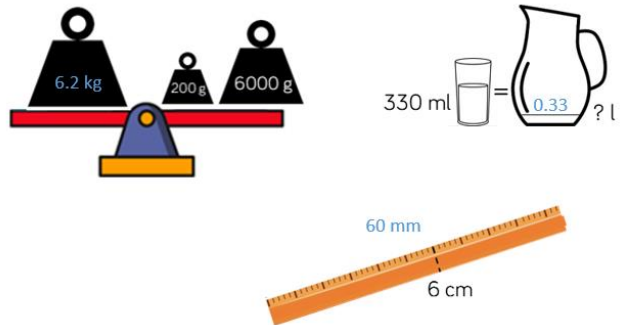
6.2 kg   200 g 6000 g

330 ml = 0.33 ? l

60 mm
6 cm

Here is a part completed Venn diagram containing the factors of two numbers. Work out the missing information.

Factors of 48   Factors of 32

24 1
6   2   4
3   8
12 48 16 32
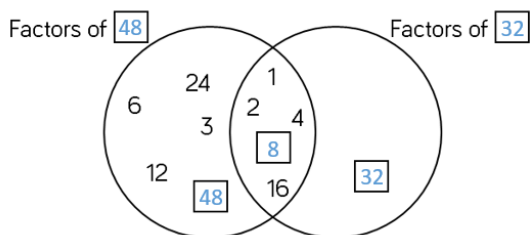
Complete these calculations.

	H	T	O
	1	8	7
×		7	9
1	7	8	3

×	100	80	7
9	900	720	63

		1	8	7
		1	8	7
		1	8	7
		1	8	7
		1	8	7
		1	8	7
		1	8	7
		1	8	7
		1	8	7
+	1	1 7	8 6	7
1	7	8	3

Which is the most efficient method?
Column method
Which method is not appropriate for 187 × 56?
Repeated addition method

Find the missing numbers in these calculations.

$$7 \overline{)\, 3 \,^3 5 \; 8 \,^1 4 \,} = 5\,1\,2$$

$$97 \overline{)\, ^7 8 \,^6 5 \,^2 7 \,} = 8\,7\,3$$
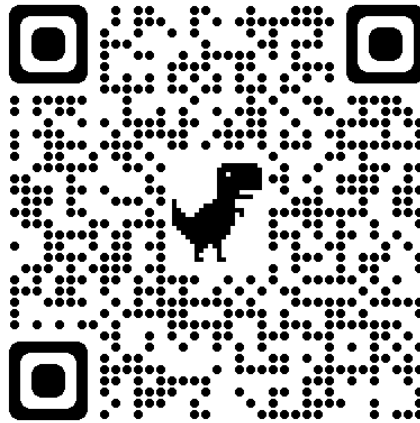
BBC Bitesize

Multiplication and Division