Solving problems with multiplication and division

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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.

Mili: 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

5 x 2 or 2 x 5

Factors of 10
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

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

LCM of 9 and 12

The first time their multiples match

LCM = 36

9   18   27   36   45
12   24   36   48

Multiply/ Divide by powers of 10

| 100s | 10s | 1s | ×100 | 100s | 10s | 1s |

3 x 100 = 300

| 1s | 1/10 | 1/100 | ×100 | 1s | 1/10 | 1/100 |

0·03 x 100 = 3

Repeated multiplication and division by powers of 10 is commutative

÷ 10 then ÷ 10 ⟶ ÷ 100

Metric conversions
Useful Conversions

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

mm $\xleftarrow{× 10}$ cm $\xleftarrow{× 100}$ m $\xleftarrow{× 1000}$ km

g $\xrightarrow{÷ 1000}$ kg

g $\xleftarrow{× 1000}$ kg

ml $\xrightarrow{÷ 1000}$ L

ml $\xleftarrow{× 1000}$ L

Multiplication methods

H	T	O
1	8	7
		9

Long multiplication (column)

×	100	80	7
9			

Grid method

Less effective method especially for bigger multiplication

Repeated addition

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

$7 \overline{) 3\ ^35\ ^58\ ^14}$ = 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

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Order of operations

Brackets
Indices or roots
Multiplication or division
Addition or subtraction

( )
² & √
× & ÷
+ & −

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