Autumn Block 3

Multiplication and division A

Small steps

Step 1	Multiples
Step 2	Common multiples
Step 3	Factors
Step 4	Common factors
Step 5	Prime numbers
Step 6	Square numbers
Step 7	Cube numbers
Step 8	Multiply by 10, 100 and 1,000

Small steps

Step 9	Divide by 10, 100 and 1,000
Step 10	Multiples of 10, 100 and 1,000

Multiples

Notes and guidance

Children should already be familiar with the idea of multiples from their previous learning. They should understand that a multiple of a number is any number that is in its times-table. This can then be generalised to define a multiple more formally as the result of multiplying a number by a positive integer.

Building on this knowledge, children now find sets of multiples of given numbers and make generalisations about them. This allows children to begin to understand and use rules of divisibility, which will be built upon in later learning.

Children build multiples of numbers using concrete resources as well as pictorial representations. Arrays are particularly useful and will also help children when they study factors, prime numbers and square numbers later in the block. When listing multiples, children should work systematically to avoid omissions.

Things to look out for

- Children may confuse factors and multiples.
- Errors may be made with times-tables facts.
- Children may omit the number itself when listing multiples.
- Children may find it more difficult to identify and find multiples that go beyond the facts in the 12 times-table.

Key questions

- How do you find the multiples of a number?
- What do you notice about the multiples of _____?
  What is the same and what is different about them?
- Can a number be a multiple of more than one number?
- How can you tell if a number is a multiple of 2/5/10?
- What does the word “divisible” mean?
  How does it link to multiples?
- Are multiples of 8/4 also multiples of 4/8?

Possible sentence stems

- A multiple is the result of multiplying a number by _____
- The first multiple of a number is always _____
- _____ is a multiple of _____ because _____ × _____ = _____

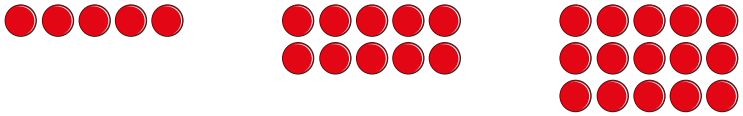
National Curriculum links

- Identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers
- Solve problems involving multiplication and division, including using their knowledge of factors and multiples, squares and cubes

Multiples

Key learning

- Here are the first three multiples of 5



Use counters to make these and the next three multiples of 5

List the first six multiples of 5

What is the same and what is different about the multiples of 5?

- How can you tell by looking at a number if it is a multiple of 5?

Which of these numbers are multiples of 5?

45	406	95	110	501	510	540	502

Which of the numbers are also multiples of 10?

- How can you tell by looking at a number if it is a multiple of 2?

Which of these numbers are multiples of 2?

62	48	104	401	86	68	612	620

Complete the sentence.

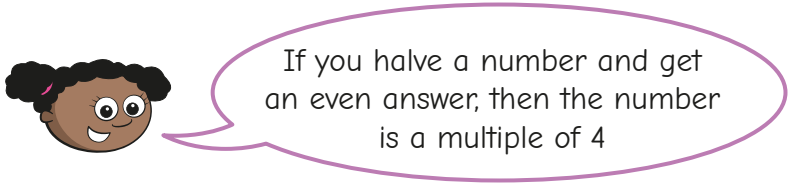
Multiples of 2 are called _____ numbers.

- List the first six multiples of 4

List the first six multiples of 8

What connection can you see between the multiples of 4 and the multiples of 8?

- Whitney has found a rule for identifying multiples of 4



Use Whitney's rule to find out which of the numbers are multiples of 4

64	46	104	82	90	96	120	248

Find a rule to test if a number is a multiple of 8

- On separate copies of a hundred square, shade all the multiples of each number.

2 3 4 5 6

What patterns do you notice?

Multiples

Reasoning and problem solving

If the sum of the digits of a number is a multiple of 3, then the number itself is a multiple of 3

Check Amir's rule using these multiples of 3

45	90	909	6,105

Use Amir's rule to find out whether these numbers are multiples of 3

81	103	267
1,524	5,810	

Amir's rule is correct.

81, 267 and 1,524 are multiples of 3

Find the sum of the digits of all the numbers in the 9 times-table up to 10 × 9

What do you notice?

Find the digit sums of these multiples of 9

648	8,388	9,378
82,602	99,999	

What do you notice?

What is the connection between numbers that are multiples of 9 and their digit sums?

The total is always 9

The total is a multiple of 9

Common multiples

Notes and guidance

Building on their knowledge from the previous step, children find common multiples of any pair of numbers. They do not need to be able to formally identify the lowest common multiple, but this idea can still be explored by considering the first common multiple of a pair of numbers.

Arrays and other representations may still be used for support, but children should start to become less reliant on these and more reliant on times-tables knowledge and simple rules of divisibility. These can be developed further as they notice, for example, that a multiple of 2 and 3 is also a multiple of 6 and can deduce that a number is divisible by 6 only if it is divisible by both 2 and 3

Encourage children to work systematically when listing multiples of given numbers. Tables and sorting diagrams are useful tools for children to show their results.

Things to look out for

- Children may confuse factors and multiples.
- Children may not be familiar with the use of the word "common" in this context.
- Children often think that the first common multiple of a pair of numbers is the product of the numbers.

Key questions

- How do you find the multiples of a number?
- What multiples do _____ and _____ have in common?
- What is the first multiple that _____ and _____ have in common?
- How can you tell if a number is a multiple of _____?
- Given any two numbers, can you always find a common multiple? How?

Possible sentence stems

- _____ is a multiple of _____ because _____ × _____ = _____
- _____ is a common multiple of _____ and _____ because _____ × _____ = _____ and _____ × _____ = _____
- The first common multiple of _____ and _____ is _____

National Curriculum links

- Identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers
- Solve problems involving multiplication and division, including using their knowledge of factors and multiples, squares and cubes

Common multiples

Key learning

- Here is a hundred square.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

  Shade the first ten multiples of 5

  Circle the first ten multiples of 3

  List the first two common multiples of 5 and 3

  What is the next common multiple of 5 and 3?

  Find some more common multiples of 5 and 3

- On a hundred square, shade the first eight multiples of 6

  Circle the first eight multiples of 4

  List the first two common multiples of 6 and 4

  Find some more common multiples of 6 and 4

- Nijah rings a bell every 6 seconds.

  Dani blows a whistle every 8 seconds.

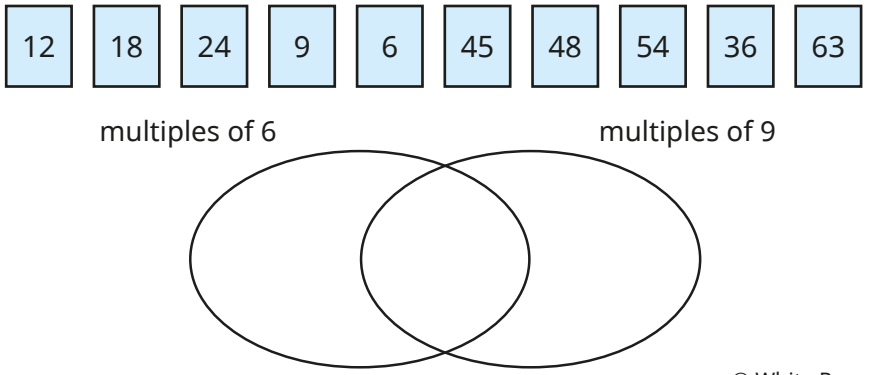
  They start by ringing the bell and blowing the whistle at the same time.

  How many times will they ring the bell and blow the whistle at the same time in the next minute?

- Sort the numbers from 1 to 30 into the table.

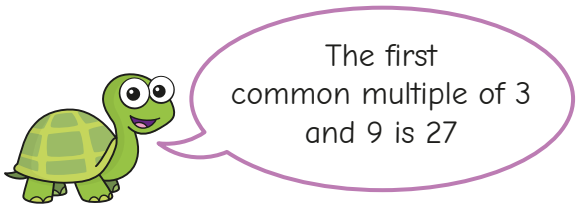
	Multiple of 7	Not a multiple of 7
Multiple of 4		
Not a multiple of 4		

- Write the numbers in the sorting diagram.



Common multiples

Reasoning and problem solving



Tiny is wrong.

Find two numbers less than 27 that are multiples of both 3 and 9

9 and 18

Are the statements always, sometimes or never true?

Common multiples of 2 and 3 are also multiples of 6

Common multiples of 5 and 10 are also multiples of 50

Explain your answers.

always true

sometimes true

Find different ways of completing the sentences.

All multiples of 10 are also multiples of _____ and _____

All multiples of 20 are also multiples of _____ and _____

All multiples of 30 are also multiples of _____ and _____

1, 2, 5

1, 2, 4, 5, 10

1, 2, 3, 5, 6, 10, 15

Are the statements always, sometimes or never true?

The product of two even numbers is a multiple of an odd number.

The product of two odd numbers is a multiple of an even number.

Explain your answers.

always true

never true

Factors

Notes and guidance

Children explored the idea of factor pairs being multiplied together to produce a given number in Year 4. In this small step, they explore further the relationship between multiplication and division and consolidate their understanding of the words "factor" and "multiple".

Children should know, for example, that as 5 is a factor of 20, 20 is a multiple of 5 and vice versa. They need to be aware of the special cases such as 1 being a factor of all numbers, and every number being both a multiple and a factor of itself. Children should also notice that although factors generally come in pairs, sometimes there is a repeated factor, for example $36 = 6 \times 6$, and this only needs to be listed once. This will be explored further later in the block.

Children begin to extend their knowledge by looking at products of three factors and products including simple multiples of powers of 10. Products using multiples of powers of 10 is looked at in depth in Step 10 of this block.

Things to look out for

- Children may confuse factors and multiples.
- Errors may be made with times-tables facts.
- Children may omit 1, the number itself or both when listing the factors of a number.

Key questions

- How do you find the factors of a number?
- How can you be sure you have found all the factors of a number?
- How can you work in a systematic way to find all the factors of a number?
- Do factors always come in pairs?
- Can a number be both a factor and a multiple of the same number?

Possible sentence stems

- _____ is a factor of _____ because _____ × _____ = _____
- _____ is a factor of _____ because _____ ÷ _____ = _____
- _____ is a factor of _____ because _____ is in the _____ times-table.

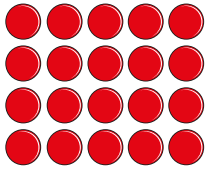
National Curriculum links

- Identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers
- Solve problems involving multiplication and division, including using their knowledge of factors and multiples, squares and cubes

Factors

Key learning

- The array shows that 4 and 5 are factors of 20



How many other arrays can you make using 20 counters?

Use your arrays to find all the factors of 20

- Which numbers are factors of 60?

9	6	8	4	12	5	60	15	45

Which factors of 60 are not shown?

- Whitney has found the factors of 24

1 × 24	4 × 6
2 × 12	5 × ✗
3 × 8	

Explain Whitney's method to a partner.

How did she know when to stop?

Use Whitney's method to find the factors of 42

40	75	57	35	505	705	507

Which of the numbers is 5 a factor of? How do you know?

Which of the numbers is 3 a factor of? How do you know?

40	80	82	66	56	106	160	144

Which of the numbers is 2 a factor of?

Which of the numbers is 4 a factor of?

What do you notice?

- Complete the calculations.
  - 2 × _____ = 14 so 6 × 14 = 6 × 2 × _____
  - 3 × _____ = 9 so 9 × 12 = 3 × _____ × 12

- Scott knows that as 4 × 7 = 28, 4 × 70 = 280

Complete the calculations.

- _____ × 7 = 280
- 4 × _____ = 2,800

Factors

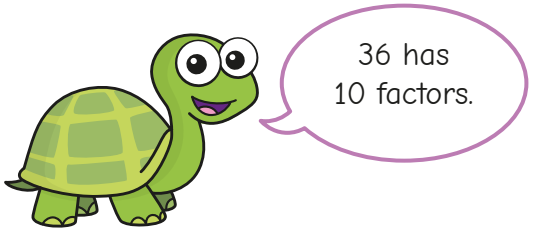
Reasoning and problem solving

Tiny has found the factors of 36

1	2	3	4	5	6
36	18	12	9	✗	6

Why does Tiny put a cross next to 5?

Why does Tiny stop after 6?



Do you agree with Tiny?

Explain your answer.

5 is not a factor of 36

Tiny would be repeating factors that have already been found.

No

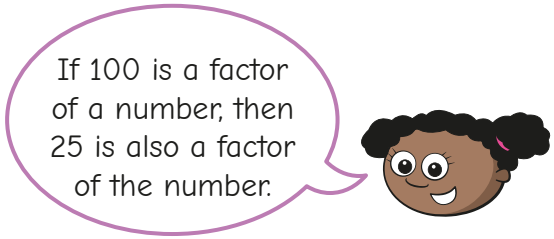
Are the statements always, sometimes or never true?

An even number has an even number of factors.

An odd number has an odd number of factors.

sometimes true

sometimes true



Is Whitney correct?

Can you replace 25 with another number?

Yes

You can replace 25 with any of 1, 2, 4, 5, 10, 20, 50

Common factors

Notes and guidance

In this small step, children learn that common factors are factors that are shared by two or more numbers.

Children work systematically to find lists of factors before comparing lists to find common factors. They should realise that 1 is a common factor of any set of numbers and that one of the numbers themselves could also sometimes be a common factor.

Arrays and other representations can be used as support when finding factors of numbers, including sorting diagrams for recording results. Children should use their times-tables knowledge as well as be able to recognise factors using the rules of divisibility.

Things to look out for

- Children may confuse factors and multiples.
- Children may not be familiar with the use of the word "common" in this context.
- Children may over-generalise the idea of pairs and think that a set of numbers can only have two common factors.
- It is common to omit 1 when listing factors, leading to an incorrect conclusion that a pair of numbers does not have a common factor.

Key questions

- Which numbers are factors of both the numbers?
- Which are the common factors of the numbers?
- On a sorting diagram, where can you see the common factors of the numbers?
- Why does any pair of numbers have at least one common factor?
- Can one of the numbers be a common factor? When does this happen?

Possible sentence stems

- _____ is a multiple of _____, so _____ is a factor of _____
- _____ is a factor of _____ and a factor of _____, so _____ is a common factor of _____ and _____
- The common factors of _____ and _____ are _____

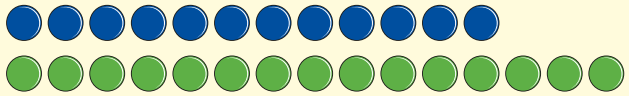
National Curriculum links

- Identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers
- Solve problems involving multiplication and division, including using their knowledge of factors and multiples, squares and cubes

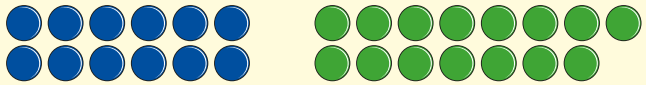
Common factors

Key learning

- Tiny is using arrays to find the common factors of 12 and 15



Both numbers can be arranged in one row, so 1 is a common factor.



12 can be arranged in two rows but 15 cannot, so 2 is not a common factor.

Working systematically, continue Tiny's method until you find all the common factors of 12 and 15

- List all the factors of 8

  List all the factors of 20

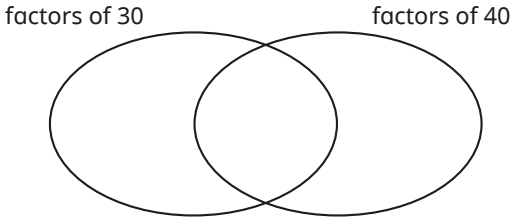
  What are the common factors of 8 and 20?

  How many common factors do 8 and 20 have?

- Write all the factors of 50 that are also factors of 25

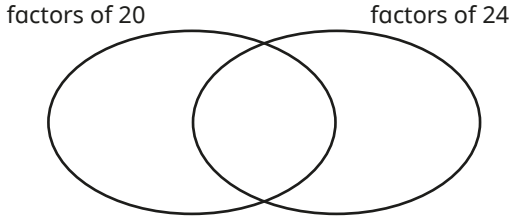
- Write the numbers in the sorting diagram.

1	5	8	10	15	20



What other numbers can you add to the diagram?

- Complete the sorting diagram to show the factors of 20 and 24



What are the common factors of 20 and 24?

Use a sorting diagram to find the common factors of 9 and 15

- Find the common factors of each pair of numbers.

10 and 15	15 and 20	10 and 20

Common factors

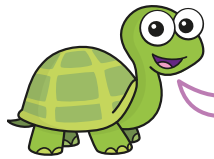
Reasoning and problem solving

Are the statements true or false?

1 is a multiple of every number.	False
0 is a factor of every number.	False
1 is a common factor of every pair of numbers.	True
2 is a common factor of every pair of even numbers.	True
5 is a common factor of every pair of multiples of 10	True
10 is a common factor of every pair of multiples of 5	False

Explain your answers.

Tiny is thinking of two numbers.



The common factors of my numbers are 1, 3, 7 and 21

What could Tiny's numbers be?

multiple possible answers, e.g.

21 and 42

21 and 63

42 and 63

Kim is thinking of two 2-digit numbers.

Both numbers have a digit sum of 6
Their common factors are 1, 2, 3, 4, 6 and 12

What are Kim's numbers?

24 and 60

Prime numbers

Notes and guidance

Building on their knowledge of factors, in this small step, children learn that numbers with exactly two factors are called prime numbers. They also learn that numbers with more than two factors are called composite numbers.

Through practice, children should recall the prime numbers up to 19. They should be able to determine whether numbers up to 100 are prime, using times-tables facts and the rules of divisibility they learned in earlier steps. Children use their knowledge of the concepts of both primes and factors to identify the prime factors of numbers. They learn that 1 is a special case as it is neither prime nor composite, as it has exactly one factor.

Things to look out for

- As most prime numbers are also odd numbers, children may mix up the two concepts and forget that 2 is a prime number.
- Children often mistake 1 for a prime number.
- Children may assume some numbers that do not appear in the times-tables up to 12 × 12 are prime, for example 51 = 3 × 17 is composite, not prime.
- Children may assume that all odd numbers are prime.

Key questions

- How many factors does the number have?
- How can you be sure you have found all the factors?
- What is the difference between a prime number and a composite number?
- How can you tell if a number is a multiple of 2/3/5?
- How can you check if a number is prime?
- How many factors does the number have?
  How many prime factors does the number have?

Possible sentence stems

- The only factors of _____ are _____ and _____, so _____ is prime.
- _____ is prime and a factor of _____, so _____ is a prime factor of _____

National Curriculum links

- Know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers
- Establish whether a number up to 100 is prime and recall prime numbers up to 19

Prime numbers

Key learning

- All of these numbers are prime numbers.

5	13	17	23

Use counters to find the factors of each number.

What do you notice?

- A prime number has exactly two factors: 1 and itself.

A composite number has more than two factors.

Which of the numbers are prime and which are composite?

7	8	11	20	21	25	29

- On a hundred square, shade the number 1

Shade the multiples of 2 apart from 2

Shade the multiples of 3 apart from 3

Continue this up to multiples of 7

What numbers are you left with?

What do you notice?

- Sort the numbers into the table.

12 2 7 20 9 15 3 17 21

	Prime	Composite
Even		
Odd		

- List the factors of 20

How many of the factors of 20 are prime?

- List the prime factors of 24

- Use your knowledge of multiples and factors to decide whether each number is prime.

70	92	51	61	81
29	57	43	63	77

Prime numbers

Reasoning and problem solving

Sort all the prime numbers between 10 and 100 into the table.

Number of ones			
1	3	7	9

1: 11, 31, 41, 61, 71

3: 13, 23, 43, 53, 73, 83

7: 17, 37, 47, 67, 97

9: 19, 29, 59, 79, 89

Why do no 2-digit prime numbers have 0, 2, 4, 6 or 8 ones?

They all have 2 as a factor.

Why do no 2-digit prime numbers have 5 ones?

They all have 5 as a factor.

Decide whether each statement is true or false.

All prime numbers are odd.

False

All odd numbers are prime.

False

The first prime number is 1

False

Talk about your answers with a partner.

Square numbers

Notes and guidance

In this small step, children use concrete manipulatives such as counters and cubes to build square numbers, and also to decide whether or not a given number is square. They learn that square numbers are the result of multiplying a number by itself. Through their knowledge of times-tables and practice over time, they should be able to recognise the square numbers up to 12 × 12. In this small step, children are introduced to notation for squared (^{2}).

Children explore the factors of square numbers and notice that they have an odd number of factors, because the number that multiplies by itself to make the square does not need a different factor to form a factor pair.

Things to look out for

- The notation for squared (^{2}) may confuse children, as they may think that $6^2 = 6 \times 2$ rather than 6×6
- Children may not realise that 1 is a square number, as its array may not appear to be a square.
- When listing factors, children may include the repeated factor twice, meaning they will not recognise that square numbers have an odd number of factors.

Key questions

- Why are square numbers called "square" numbers?
- How do you work out _____ squared?
- How do you write _____ squared?
- Is 1 a square number? Why or why not?
- Are the squares of odd numbers even or odd?
- Are the squares of even numbers even or odd?

Possible sentence stems

- A square number is the result of multiplying a number by _____
- _____ is a square number because _____ × _____ = _____
- _____ squared means _____ × _____ and is the square number _____

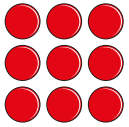
National Curriculum links

- Recognise and use square numbers and cube numbers, and the notation for squared (^{2}) and cubed (^{3})
- Solve problems involving multiplication and division, including using their knowledge of factors and multiples, squares and cubes

Square numbers

Key learning

- 9 is a square number as 9 counters can be arranged to form a square array.

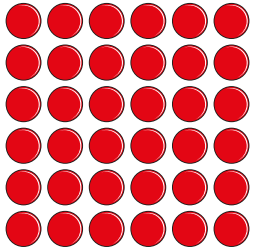


$3 \times 3 = 9$

Use counters to decide whether each number is square.

12	16	4	10	20	25	24

- 36 counters can be arranged into a square array with 6 rows and 6 columns.



$6 \times 6 = 36$

How many counters will there be in a square array with 7 rows and 7 columns?

How many counters will there be in a square array with 8 rows and 8 columns?

How many counters will there be in a square array with 10 rows and 10 columns?

- A square number is found by multiplying a number by itself.

$5^2 = 5 \times 5$ and is said as "5 squared".

What is the value of 5^2?

Work out the values of the square numbers.

4^2	9^2	10^2	8^2	7^2

- Esther thinks $6^2 = 12$

Do you agree?

Explain your answer.

- Here are five digit cards.

1	2	5	6	7

Choose two cards each time to make:

- an even number
- a square number
- a prime number
- a multiple of 9
- a factor of 48
- an even square number

Square numbers

Reasoning and problem solving

List the first six square numbers and find their factors.

How many factors does each square number have?

What do you notice about the number of factors that square numbers have?

Explain why this happens.

Each square number has an odd number of factors.

Some square numbers can be written as the sum of two prime numbers.

Here is an example. $2 + 2 = 4$

Find some other square numbers that can be written as the sum of two prime numbers.

multiple possible answers, e.g.

$2 + 7 = 9$

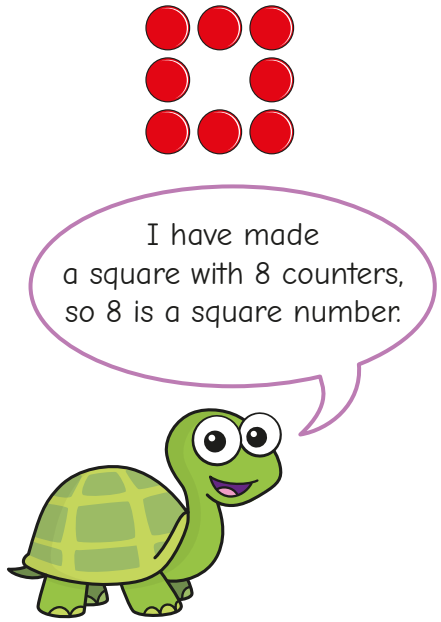
$5 + 11 = 16$

$23 + 2 = 25$

$29 + 7 = 36$

$47 + 2 = 49$

Tiny is using counters to make square numbers.



Do you agree with Tiny?

Explain your answer.

No

Cube numbers

Notes and guidance

In this small step, children learn that a cube number is the result of multiplying a whole number by itself and then by itself again, for example 6 × 6 × 6. Linking this to previous learning on square numbers, children should recognise that when they multiply a number by itself once, the result is a square number, and so to find the cube of a given number, they can multiply its square by the number itself, for example 6 × 6 = 36, so 6 cubed = 36 × 6. Children are introduced to the notation for cubed (^{3}) for the first time and should ensure that this is not confused with the notation for squared (^{2}) from the previous step.

Cube numbers could be introduced through using interlocking cubes to make larger cubes. This can be related to finding the volume of cubes and cuboids, which is introduced in the Summer term and studied more formally in Year 6

Things to look out for

- The notation for cubed (^{3}) may confuse children, as they may think that $6^3 = 6 \times 3$ rather than $6 \times 6 \times 6$
- Children may not realise that 1 is a cube number.
- Children may think that to find the cube of a number they can square it and then square the result.

Key questions

- Why are cube numbers called “cube” numbers?
- How do you work out _____ cubed?
- How do you write _____ cubed?
- Is 1 a cube number? Explain your answer.
- Are the cubes of odd numbers even or odd?
- Are the cubes of even numbers even or odd?

Possible sentence stems

- The cube of a number is the result of multiplying the number by _____ and then by _____ again.
- _____ is a cube number because _____ × _____ × _____ = _____
- _____ cubed means _____ × _____ × _____ and is the cube number _____

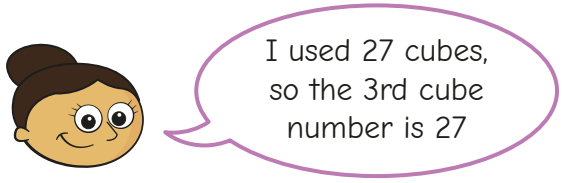
National Curriculum links

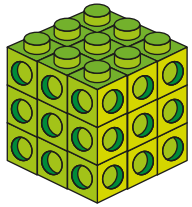
- Recognise and use square numbers and cube numbers, and the notation for squared (^{2}) and cubed (^{3})
- Solve problems involving multiplication and division, including using their knowledge of factors and multiples, squares and cubes

Cube numbers

Key learning

- Dora has used small cubes to make a cube with a side length of 3





Use cubes to work out the 2nd cube number.

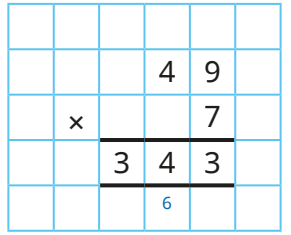
- Complete the table.

Size of cube	Calculation	Number of cubes
1^3		1
2^3		8
3^3	$3 \times 3 \times 3$	
4^3		
5^3		
6^3	$6 \times 6 \times 6$	

- Filip is using square numbers to help work out cube numbers.

Here are his workings.

$$\begin{aligned} 7^3 &= 7 \times 7 \times 7 \\ &= 49 \times 7 \\ &= 343 \end{aligned}$$



Use Filip's method to work out 8^3 and 9^3

- Write <, > or = to compare the calculations.

5 squared ◯ 4 cubed

5^3 ◯ 8^2

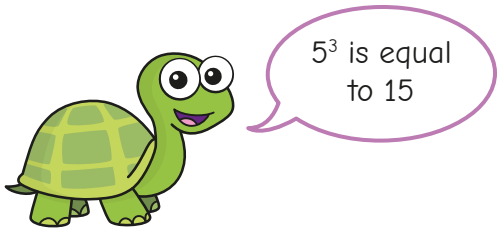
1^2 ◯ 1^3

45 squared ◯ 45 cubed

- Show that the sum of 3^3 and 7^3 is **not** equal to 10^3

Cube numbers

Reasoning and problem solving



Do you agree with Tiny?

Explain your answer.

No

Here are three cards.

A	B	C

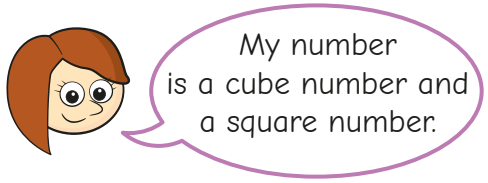
Each card represents a cube number.

Use the clues to work out the numbers.

- A × A = B
- B + B – 3 = C
- digit sum of C = A

A = 8, B = 64, C = 125

Rosie is thinking of a number less than 100

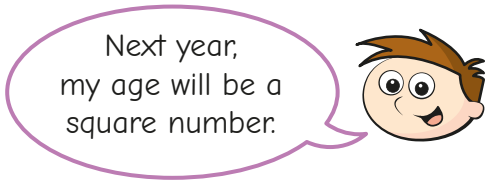


What number could Rosie be thinking of?

Is there more than one possible answer?

1 or 64

Teddy's age is a cube number.



How old is Teddy now?

8 years old

Multiply by 10, 100 and 1,000

Notes and guidance

In this small step, children revisit multiplying whole numbers by 10 and 100 (introduced in Year 4), and move on to multiplying whole numbers by 1,000

Concrete manipulatives such as place value charts and counters and Gattegno charts can be used to support understanding, using children's knowledge of the relationship between digits in given rows/columns.

Children need to be aware that the effect of multiplying by 10 twice is the same as multiplying by 100 and that multiplying by 10 three times is the same as multiplying by 1,000. Children should be comfortable with the language of "10 times the size of", "100 times the size of" and "1,000 times the size of".

In the next steps, children look at dividing whole numbers by 10, 100 and 1,000 and then multiplying and dividing by multiples of 10, 100 and 1,000

Things to look out for

- Children may move digits in the wrong direction in the place value chart, or by the wrong number of columns.
- Some children may over-generalise that multiplying by a power of 10 always results in adding zeros, which will cause issues in the Spring term when multiplying decimals.

Key questions

- In what direction do the digits move when you multiply by 10/100/1,000?
- How many places to the left do the digits move when you multiply by 10/100/1,000?
- When you have an empty place value column, what digit do you use as a placeholder?
- How can you use the result of multiplying by 100 to help you multiply a number by 1,000?

Possible sentence stems

- _____ multiplied by 10/100/1,000 is equal to _____
- _____ is 10/100/1,000 times the size of _____
- There were _____ ones/tens. Now there are _____ tens/hundreds.
- Multiplying by 100 is the same as multiplying by _____ twice.

National Curriculum links

- Multiply and divide whole numbers and those involving decimals by 10, 100 and 1,000

Multiply by 10, 100 and 1,000

Key learning

- Use counters to make 234 on a place value chart.

HTh	TTh	Th	H	T	O
			●●	●● ●	●● ●●

If you multiply 234 by 10, where do the counters move to?

What is the result of multiplying 234 by 10?

If you multiply 234 by 100, where do the counters move to?

What is the result of multiplying 234 by 100?

- Complete the calculations.

You can use a place value chart to help you.

- 156 × 100 = _____
- _____ = 324 × 100
- 100 × 36 = _____
- 1,000 × 207 = _____
- 45,020 × 10 = _____
- _____ = 3,406 × 100

- Work out the calculations.

37 × 10	37 × 100	37 × 1,000

What is the same and what is different?

- Complete the multiplications.

- 4 × 10 = _____
  - 4 × 100 = _____
  - 4 × 1,000 = _____
- 24 × 10 = _____
  - 24 × 100 = _____
  - 24 × 1,000 = _____
- 204 × 10 = _____
  - 204 × 100 = _____
  - 204 × 1,000 = _____
- 240 × 10 = _____
  - 240 × 100 = _____
  - 240 × 1,000 = _____

What do you notice?

- Write <, > or = to complete the statements.

71 × 1,000 ◯ 71 × 100

100 × 32 ◯ 16 × 1,000

6×10^3 ◯ 45×10^2

- What number is 100 times the size of 4,000?

4,000 is 100 times the size of what number?

Multiply by 10, 100 and 1,000

Reasoning and problem solving

100,000	200,000	300,000	400,000	500,000	600,000	700,000	800,000	900,000
10,000	20,000	30,000	40,000	50,000	60,000	70,000	80,000	90,000
1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000	9,000
100	200	300	400	500	600	700	800	900
10	20	30	40	50	60	70	80	90
1	2	3	4	5	6	7	8	9

What number is 1,000 times the size of the number shown?

Show 602,000 on a Gattegno chart.

Use the chart to work out the missing numbers.

602,000 = _____ × 10

602,000 = _____ × 100

602,000 = _____ × 1,000

463,000

60,200, 6,020, 602

Aisha has won 300 points in a computer game.

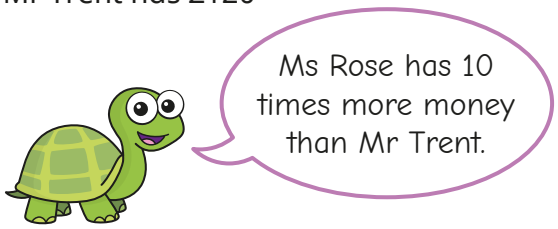
Brett has 100 times the number of points Aisha has.

How many more points does Brett have than Aisha?

29,700

Ms Rose has £1,020

Mr Trent has £120



Is Tiny correct?

Explain your reasoning.

No

Divide by 10, 100 and 1,000

Notes and guidance

In this small step, children revisit dividing numbers by 10 and 100, and move on to dividing whole numbers by 1,000

As with multiplying, place value charts, counters and Gattegno charts can be used to support understanding, using children's knowledge of relationships between rows and columns. They need to be aware that the effect of dividing by 10 twice is the same as dividing by 100 and that dividing by 10 three times is the same as dividing by 1,000. Children should be comfortable with the language of "one-tenth the size of", "one-hundredth the size of" and "one-thousandth the size of".

Children should be aware that multiplication and division are inverse operations and make links between this step and previous learning.

Division with decimal answers is covered in the Spring term.

Things to look out for

- Children may move digits in the wrong direction in the place value chart, or by the wrong number of columns.
- Children may make errors with the number of zeros at the end of a number and/or zeros used as placeholders.

Key questions

- What direction do the digits move when you divide by 10/100/1,000?
- How many places to the right do digits move when you divide by 10/100/1,000?
- How is dividing by 10, 100 or 1,000 linked to multiplying by 10, 100 or 1,000?
- How can you use the result of dividing by 100 to help you divide a number by 1,000?
- What does "inverse" mean?

Possible sentence stems

- _____ divided by 10/100/1,000 is equal to _____
- _____ is one-tenth/one-hundredth/one-thousandth the size of _____
- There were _____ tens/hundreds. Now there are _____ ones/tens.

National Curriculum links

- Multiply and divide whole numbers and those involving decimals by 10, 100 and 1,000

Divide by 10, 100 and 1,000

Key learning

- What number is represented in the place value chart?

HTh	TTh	Th	H	T	O
	●	● ●	● ● ●		

If you divide the number by 10, where do the counters move to?

What is the result of dividing the number by 10?

If you divide the number by 100, where do the counters move to?

What is the result of dividing the number by 100?

- Use a place value chart or a Gattegno chart to work out the calculations.

460 ÷ 10	5,300 ÷ 100	62,000 ÷ 1,000

- Divide each number by 10, 100 and 1,000

80,000	300,000	547,000

- Work out 45,000 ÷ 10 ÷ 10

How else could you write this calculation?

How else could you write 45,000 ÷ 10 ÷ 10 ÷ 10?

- Complete the divisions.
  - 64,000 ÷ 10 = _____

    64,000 ÷ 100 = _____

    64,000 ÷ 1,000 = _____

HTh	TTh	Th	H	T	O
	6	4	0	0	0

  - 604,000 ÷ 10 = _____

    604,000 ÷ 100 = _____

    604,000 ÷ 1,000 = _____

HTh	TTh	Th	H	T	O
6	0	4	0	0	0

- Complete the calculations.
  - 180,000 ÷ _____ = 180
  - _____ ÷ 1,000 = 22
  - _____ × 1,000 = 66,000
  - _____ × 100 = 4,000
  - 180,000 ÷ _____ = 18,000
  - _____ ÷ 100 = 402
  - _____ × 100 = 9,700
  - _____ ÷ 100 = 4,000

Divide by 10, 100 and 1,000

Reasoning and problem solving

Mr Xu has £357,000 of savings in his bank account.

He takes one-thousandth of his savings out of his bank account.

Using this money, he buys a suit costing £269

How much of the money that he took out of the bank does Mr Xu have left?

£88

Complete the calculations.

_____ × 100 = 600

_____ + 100 = 600

_____ ÷ 1,000 = 600

_____ – 1,000 = 600

6

500

600,000

1,600

Is the statement always, sometimes or never true?

> Dividing by 100 is the same as dividing by 10 twice.

Explain your answer.

always true

Ron has 400 marbles.

Jack has ten times as many marbles as Ron.

Eva has one-tenth of the number of marbles that Ron has.

How many marbles do Ron, Jack and Eva have altogether?

4,440

Multiples of 10, 100 and 1,000

Notes and guidance

In this small step, children build on previous learning and begin to multiply and divide by multiples of 10, 100 and 1,000.

Children use knowledge of factors to break a calculation down into a series of easier calculations. For example, to multiply by 200, they write 200 as 2 × 100 and then multiply by 2 and by 100. Children use the commutative law to know that they can find the product by multiplying by the factors in either order.

Children use their knowledge of multiples and factors of numbers in common times-tables and link this to powers of 10 to find multiples of related numbers. They also work out related multiplications and divisions from a given fact that uses multiples of powers of 10

Things to look out for

- Children may mix up the operations they need to use, for example mistakenly thinking that because 400 = 100 × 4, dividing by 400 is the same as dividing by 100 and then multiplying by 4
- At first, children may need support to recognise the relationships between calculations such as 36 × 5 and 36 × 50

Key questions

- Will multiplying/dividing by 20 give an answer that is less than or greater than multiplying/dividing by 10? Why?
- How can you break down multiplying/dividing by _____ into steps using powers of 10?
- What is the same and what is different about the two calculations?
- How can you use inverse operations to find related calculations?
- When do numbers have common multiples that are lower than their product?

Possible sentence stems

- _____ = _____ × _____, so to multiply by _____ you can first multiply by _____ and then by _____
- _____ = _____ × _____, so to divide by _____ you can first divide by _____ and then by _____

National Curriculum links

- Multiply and divide whole numbers and those involving decimals by 10, 100 and 1,000
- Multiply and divide numbers mentally, drawing upon known facts

Multiples of 10, 100 and 1,000

Key learning

- Here are two methods to work out 24 × 20

Method 1

24 × 10 × 2
= 240 × 2
= 480

Method 2

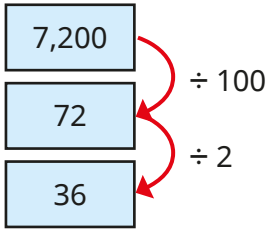
24 × 2 × 10
= 48 × 10
= 480

What is the same and what is different about the two methods?

Work out the multiplications.

21 × 30	43 × 20	12 × 400	2,000 × 13

- The diagram shows that 7,200 ÷ 200 = 36



Use a similar strategy to work out the divisions.

18,000 ÷ 200	3,600 ÷ 300	3,600 ÷ 30	8,800 ÷ 400

- Work out the multiplications.

Show all the steps in your thinking.

6 × 400	60 × 400	30 × 8,000	400 × 500

- Find a number for each clue.
  - a multiple of 30 that is between 100 and 200
  - a multiple of 40 that is between 300 and 400
  - a multiple of 500 that is between 4,000 and 5,000

- Use the fact that 36 × 5 = 180 to find the answers to the calculations.

36 × 50	5 × 360	180 ÷ 5
500 × 36	360 × 500	1,800 ÷ 5

- Teddy has 8 boxes of 50 apples.

Rosie has 5 boxes of 80 apples.

How many apples do they each have?

What do you notice? Why does this happen?

Multiples of 10, 100 and 1,000

Reasoning and problem solving

Tiny is working out 600 ÷ 25

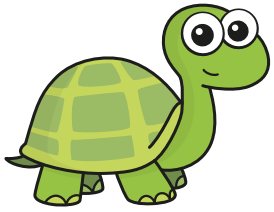
Here are Tiny's workings.

600 ÷ 25

600 ÷ 2 = 300

300 ÷ 5 = 60

600 ÷ 25 = 60



Explain why Tiny is incorrect.

Find the correct answer.

24

Whitney is using the fact that 6 × 7 = 42 to work out 420 ÷ 70

The answer is 60, because all the numbers are 10 times greater.

Do you agree with Whitney?

Explain your answer.

No

Which is the correct way to work out 800 ÷ 25?

A

800 ÷ 100 = 8

8 ÷ 4 = 2

B

800 ÷ 100 = 8

8 × 4 = 32

Explain your answer.

B