

JAMAICA

SAMPLE

NSC Edition

Primary Mathematics

Second Edition

Grade

5



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Josh Lury**

hachette
LEARNING

Contents

Term 1

Unit 1: Number

Chapter 1 Sets7

What is a set?	8
Finite and infinite sets	10
Subsets	11
Venn diagrams	13
Intersection of sets	14

Chapter 2 Number value 19

Our number system	20
Number value	22
Expanding numbers	25
Representing numbers in different ways	27
Comparing numbers	29
Ordering numbers	31
Decimal fractions	32
Decimal number values	35
Decimal numbers	36

Chapter 3 Types of numbers 43

Fractional numbers	44
Odd and even numbers	45
Factors	46
Multiples	48
Prime and composite numbers	50

Unit 2: Measurement

Chapter 4 Time and temperature 55

The 24-hour clock	56
Schedules and timetables	58
Working with calendars	60
Years, decades and centuries	62
Years, events and time intervals	64
Temperature	65

Chapter 5 Length, mass and capacity 71

Revising what you know about measurement	72
Units of measurement	73
Working with length and height	75
More about perimeter	77
Working with distance	79
Working with mass	80
Working with capacity	82
Problem solving	84

Unit 3: Geometry

Chapter 6 Lines and line segments 89

Lines and line segments	90
Horizontal and vertical lines	91
Perpendicular and parallel lines	92

Chapter 7 Types of angles 96

Angles	97
Identifying and measuring angles	98

Unit 4: Statistics and probability

Chapter 8 Collecting information 106

Populations and samples	107
Fairness and bias	108
Collecting information	110

Chapter 9 Presenting and interpreting data using charts and graphs 114

Using and interpreting pie charts	115
Bar graphs and double bar graphs	116
Line graphs	119
Choosing graphs	121

PEP task	128
----------------	-----

Term 2

Unit 1: Number

Chapter 10 Solving problems with fractional numbers 133

Decimal place value	135
Expanding decimal numbers	137
Equivalent decimal fractions	138
Comparing decimal fractions	140
Ordering decimals	141
Rounding numbers	142
Adding and subtracting decimal numbers	144
Multiplying decimal numbers by 10, 100 or 1 000	147
Multiplying whole numbers and decimals	149

Chapter 11 Working with fractions 155

Equivalent fractions	156
More about fraction and decimal equivalence	158
Simplifying fractions	159
Comparing and ordering fractions	160
Proper fractions, improper fractions and mixed numbers	162
Fractions that total 1	164
Adding and subtracting fractions	165
Subtracting fractions from whole numbers	166
Finding fractions of quantities	168
Multiplying proper fractions	169

Unit 2: Measurement

Chapter 12 Perimeter and area 175

Working with perimeter	176
Finding the perimeter of rectangles	178
Finding the perimeter of regular polygons	180
Measuring area	182
Square units	184
Areas of rectangles and squares	186

Areas of triangles	188
Reasoning about perimeter and area	189

Unit 3: Geometry

Chapter 13 Properties of triangles and quadrilaterals 195

Triangles	196
Quadrilaterals	198

Chapter 14 Properties of polygons 204

Regular and irregular polygons	205
Symmetrical figures	207

Chapter 15 Transformations 214

Translations	215
Rotation and reflection	217

Unit 4: Algebra

Chapter 16 Patterns and rules 222

Explore and predict patterns	223
Using symbols	225
Order of operations	226

Chapter 17 Expressions and variables 230

Order of operations in expressions	231
Variables and substitution	232
Expressions involving multiplication and division	233
Expressions in puzzles and problems	234

PEP task	238
----------------	-----

Term 3

Unit 1: Number

Chapter 18 Multiply and divide larger numbers 243

Revising what you know about multiplication and division	244
Multiplication and division facts	246
Divisibility tests for 5, 8 and 9	248
Working with division	250

Division with remainders	252
Dividing larger numbers by a 1-digit number	254
Working with 2-digit divisors	256
Working with 3-digit divisors	258

Chapter 19 Solving real-life problems 263

Using calculators	264
The three-step problem-solving approach	266
Solving two-step problems	268
Solving problems about patterns	270
Other types of problems	271
Financial institutions	273

Unit 2: Geometry

Chapter 20 Circles 279

Drawing circles	280
Lines through circles	281
Segments, sectors and arcs	282

Chapter 21 Polygons 288

Using grids to form polygons	289
Drawing parallel and perpendicular lines	291
Composite polygons	293

Chapter 22 Properties of pyramids 298

Properties of pyramids	299
------------------------------	-----

Unit 3: Algebra

Chapter 23 Variables and equations 304

Variables for changing quantities	305
Equations and unknown values	307

Chapter 24 Solving problems with equations 312

Using a formula	313
Equations and inequalities	314
Patterns and rules	316

Unit 4: Statistics and probability

Chapter 25 Averages 320

Line plots, mode and range	321
Mean	322
Median	324

Chapter 26 Probability 329

Language of probability	330
Possible outcomes	331
Probability experiments	332

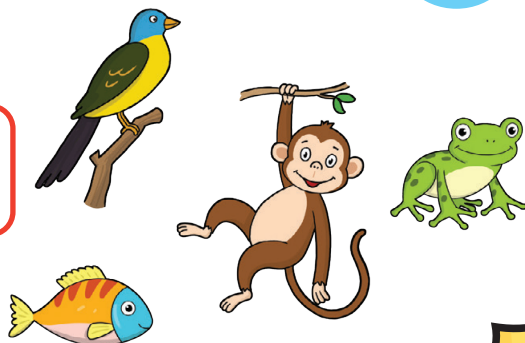
Glossary and Index	337
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UNIT 1: NUMBER

p7

Sets

Number value



Types of numbers

UNIT 2: MEASUREMENT

p55

Time and temperature



Length, mass and capacity



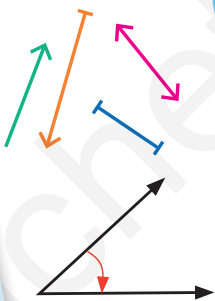
UNIT 3: GEOMETRY

p89

Lines and line segments



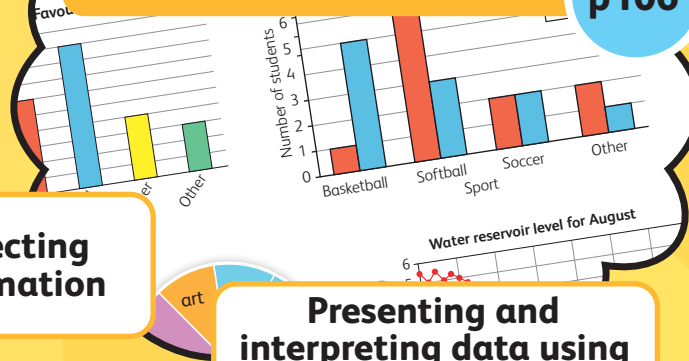
Types of angles



UNIT 4: STATISTICS AND PROBABILITY

p106

Collecting information



Presenting and interpreting data using charts and graphs

PEP TASK

p128

Unit 1: Number

Chapter ① Sets

In this chapter you will explore this focus question:



In what ways are sets represented?

To answer this question, you will:

- describe a set and differentiate between the set of real numbers
- describe a set as being finite, infinite or an empty set (null set)
- differentiate between sets of counting numbers, whole numbers, odd numbers, even numbers, prime numbers, composite numbers and fractional numbers.



▶▶ Starting point

- a Describe the objects in this group. What do they have in common? What is different about each object?
 - b Discuss with a partner how you could sort these objects into smaller groups. For example, you could sort them by colour. Think of two other ways you could sort them, and which would belong in each group.



- | | | | | | | | | | | | |
|---|---|----|----|----|----|----|----|---|---|----|----|
| 2 | 9 | 15 | 30 | 12 | 10 | 17 | 27 | 5 | 7 | 22 | 25 |
|---|---|----|----|----|----|----|----|---|---|----|----|

Some children are grouping these numbers in different ways.

- a Marva says: 'The numbers that belong in my set are 2, 5, 7 and 9.' What do the numbers in Marva's group have in common?
 - b Amy says: 'The numbers that belong in my set are 7, 17 and 27.' Describe Amy's set. List some other 2-digit numbers that could belong to this group.
 - c What other groups can you make from the set above? Describe them to a friend.
- 3 Tania also chooses a group of numbers. Each number can only be divided by 1 and the number itself. Explore Tania's idea. Which numbers did she choose?

You can use cubes or bottle tops to help you with dividing different numbers.

What is a set?

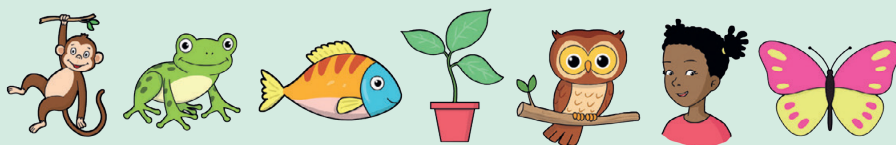
Key maths idea



A **set** is a collection or group of items that have a common attribute.

We can also say that the **members** (**elements**, or items) of a set share characteristics.

Example



There are seven members or elements in this set. All the members share the same attribute: they are living things.

We use a capital letter to name a set.

Let's use the letter L to name this set of living things.

We write the elements of the set in curly brackets (called braces), like this:

$L = \{\text{monkey, frog, fish, owl, plant, person, butterfly}\}$

An **empty set** has no members. It is also called the **null set**.

If set A is the set of living things that do not grow then it is a null set.

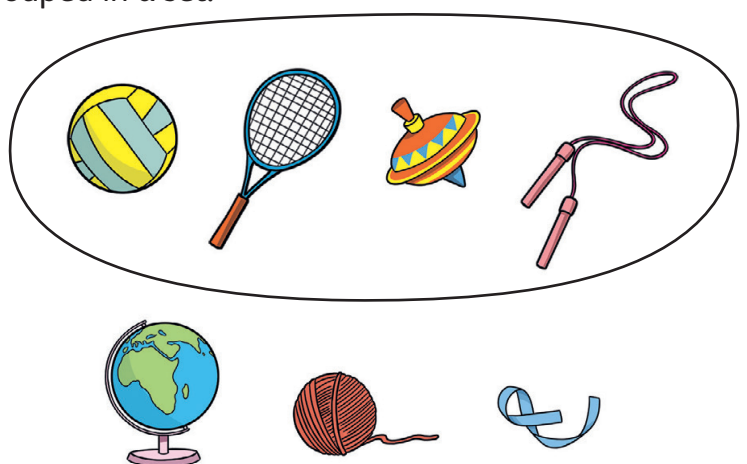
We write this null set as set $A = \{ \}$ or $\emptyset$

Key words

set
member
element
empty set
null set

1 Look at the objects that have been grouped in a set.

- Write a sentence to describe the set. Think about the attributes (or characteristics) all members of the set share.
- Use curly brackets (braces) to list the members of the set.
- How can you group the objects in the picture in a different way to make another set? Describe your new set and list the members.



2 Tamika groups some numbers in a set.
 $\{0, 2, 4, 6, 8\}$

- How can you describe this set?
- Use curly brackets and create your own set of numbers. Challenge a friend to describe your set.

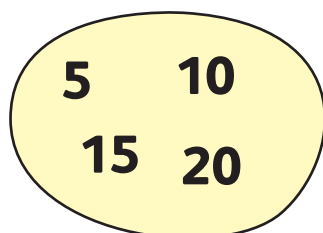
3 Look at these sets.

Set A	Set B	Set C	Set D
Days of the week	Five polygons	Continents of the world	Four fractions that are equivalent to one-half

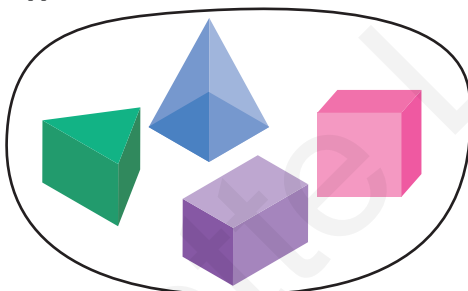
- Name and list the members of each set. Remember to use curly brackets.
 - Which sets have the same number of members?
- 4 Choose objects from the classroom to match each description of a set. Remember to name and list the elements of each set.
- colour is blue
 - used for maths lessons
 - used for writing
 - longer than 15 cm
 - have a curved surface

5 Here are some more sets. What attribute do the members of each set share?

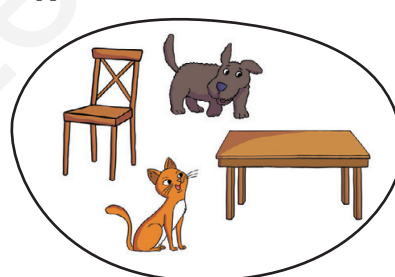
V



W

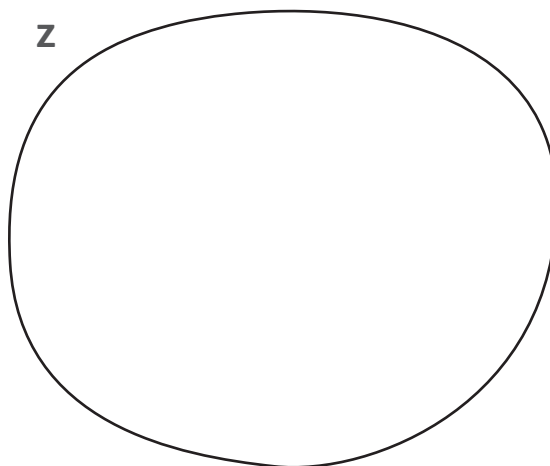


X



- 6 Think back to the objects you chose for the sets in question 4. Can you use some of the objects to create a new set, Z?
- Photograph, sketch or list the elements in your new set Z.
 - Ask a friend to describe the set by identifying the common attribute.

Z



- 7 I'm going to make a set of polygons with curved sides.

Can you explain why this will be a null set?



Finite and infinite sets

Key maths idea



A set that has a limited or countable number of elements is called a **finite set**. For example, if set C is the set of colours in the Jamaican flag, then $\text{set } C = \{\text{black, gold, green}\}$.



This set is a finite set because it is possible to count how many elements or members it has.

When a finite set has a greater number of elements, we can use three dots (...) to show that the set continues in the same way, rather than listing them all.

For example, the set of counting numbers up to 50 = $\{1, 2, 3, \dots, 50\}$.

When a set has an endless number of elements, we call it an **infinite set**.

We can use the three dots to show that the set continues without end.

Examples

The set of **even** numbers = $\{2, 4, 6, 8, \dots\}$.

The set of **odd** numbers = $\{1, 3, 5, 7, \dots\}$.

Key words

finite set

infinite set

even

odd

whole numbers

counting numbers

The three dots are called an ellipsis.



1 Say whether these sets are infinite or finite. If they are finite, list the members:

- a the set of **whole numbers**
- b the set of even numbers between 60 and 70
- c the set of **counting numbers**
- d the set of 2-digit multiples of 5
- e the set of objects on your table
- f the set of stars in the universe
- g the set of months in the year.

2 Describe each set and say whether it is finite or infinite.

- a $\{3, 6, 9, 12, 15, 18, \dots\}$
- b $\{1, 3, 5, 7, 9, \dots, 99\}$
- c $\{0, -1, -2, -3, -4, -5, \dots\}$
- d $\{\text{Asia, Africa, North America, South America, Antarctica, Europe, Australia}\}$

3 Work with a partner to create three finite sets and three infinite sets. Name and list the elements of each set.

Remember to use an ellipsis to show when a set continues on.



Subsets

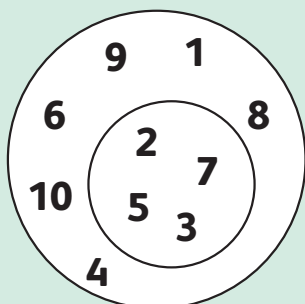
Key maths idea

Sometimes we sort the elements of a set into further sets. These are **subsets** of the main set. The diagram shows the main set of animals inside the larger circle. Animals with a backbone (vertebrates) make a subset of the main set.



Let's think about a set of numbers.

The main set is all the counting numbers from 1 to 10.



You will learn more about prime numbers in Chapter 3.

The set of **prime numbers** is a subset of the main set, so we can say that $\{2, 3, 5, 7\}$ is a subset of $\{1, 2, 3, \dots, 10\}$ because 2, 3, 5 and 7 are still part of the counting numbers from 1 to 10. $\{11, 13, 17\}$ is a set of prime numbers, but it is not a subset of $\{1, 2, 3, \dots, 10\}$.

Can you explain why?

2 is a prime number, because $2 \div 2 = 1$ and $2 \div 1 = 2$. It cannot be divided by any other number without leaving a remainder.

4, 6 and 8 are not prime numbers.

They are **composite numbers**, because they can be divided by more than two numbers.

Key words

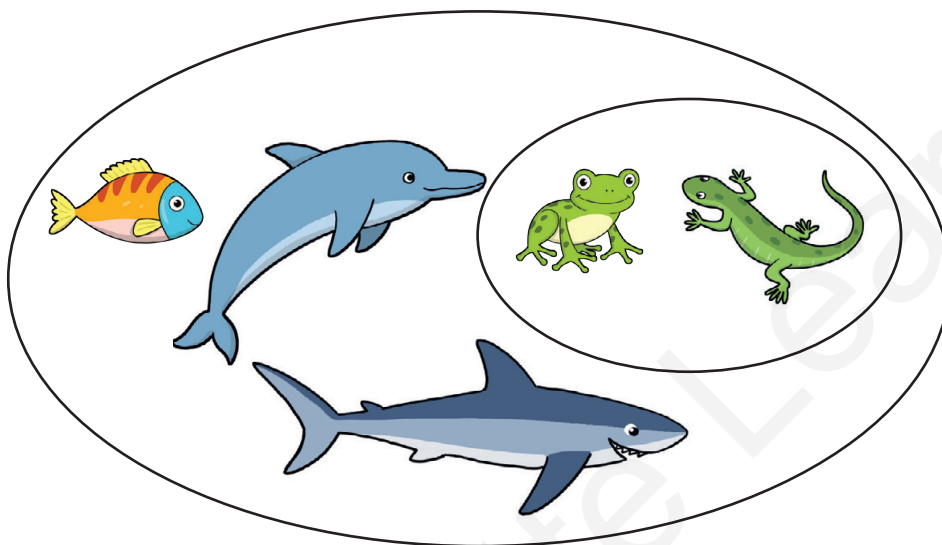
subset
prime numbers
composite numbers

Why has an ellipsis been used for the main set? Is this set finite or infinite?

Remember that a prime number can only be divided by itself and 1. So, only two division sentences can be made.

Can you explain why the number 1 is not a prime number or a composite number?

- 1 Use the main set of animals on the previous page and list the animals that belong to these subsets:
 - a can live in water
 - b can fly
 - c have no backbone (are invertebrates).
 - d Choose one of these three subsets and draw it as part of the main set.
- 2 Look at this diagram.
 - a Describe and list the members of the main set.
 - b Describe the subset. List the members as: { } is a subset of { }.



The symbol $\subset$ also means 'is a subset of'.

- 3 Work with a partner. Collect at least 6 different objects from the classroom for a main set. Some of the objects will need to make up a subset so think about common attributes. Represent your sets. For example, you can use a piece of paper for the main set and a loop of string or draw a hoop to show the subset. Invite other students from your class to describe your sets.
- 4 True or false? Copy the statements that are true. Correct the statements that are false by writing 'is not a subset of'.

a    $\subset$ {types of transport}

b     $\subset$ {vertebrates}

c $\{12, 15, 18\} \subset \{0, 2, 4, 6, \dots 20\}$

d $\{\text{prime numbers}\} \subset \{\text{composite numbers}\}$

e $\{\text{multiples of 8}\} \subset \{\text{multiples of 4}\}$

- 5 Subsets can have 0 or more elements. How many different subsets of set F can you find? List them.

F = {apple, banana, cherry}

The symbol $\not\subset$ also means 'is not a subset of'.

You may find it useful to organise your results in a table.



Venn diagrams

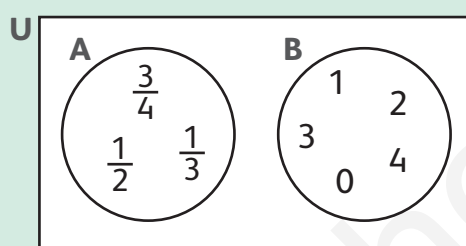
Key maths idea

We can use a **Venn diagram** to display different types of sets. The members of each set are chosen by **collecting** or **grouping** items according to their specific characteristics.

The **universal set** is the set of all the elements we are talking about in a specific case, so all the numbers inside the rectangle make up the universal set. We use the symbol U for the universal set.

The elements in the hoop make up a set within the universal set.

This Venn diagram has been drawn a little differently. It shows the numbers as two sets, A and B.



The elements in set B are all whole numbers!

We call these **disjoint sets** because they share no common elements.

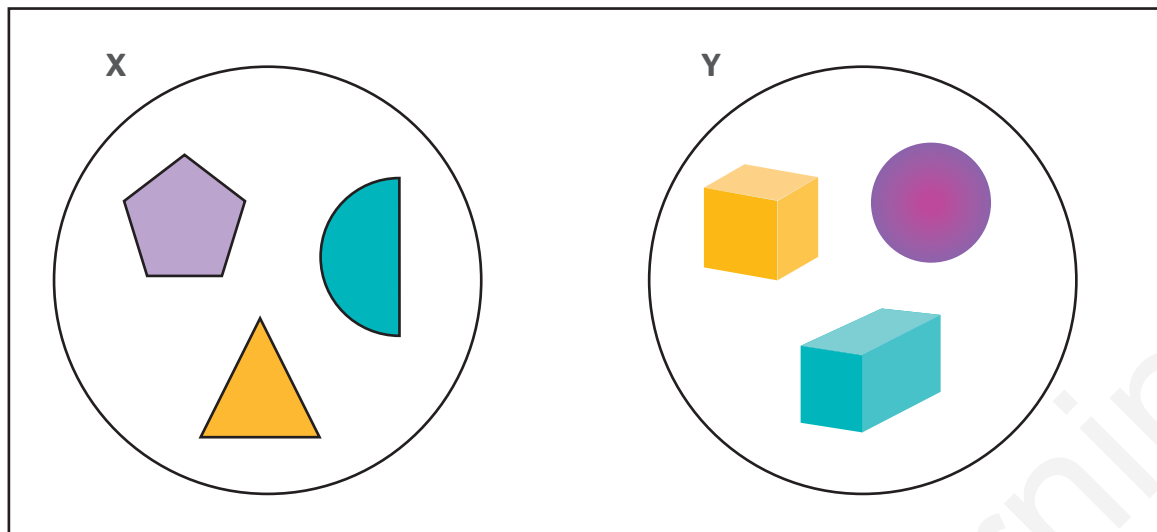
Key words

Venn diagram
collecting
grouping
universal set
disjoint sets

1 Draw Venn diagrams to show the following:

	Universal set	Set
a	Days of the week	Weekend days
b	Months of the year	Months with 30 days
c	Numbers from 1 to 10	Composite numbers
d	Prime numbers from 1 to 10	Odd numbers
e	2-digit multiples of 5	Multiples of 10
f	$0, \frac{1}{5}, \frac{1}{4}, \frac{1}{3}, \frac{1}{2}, 1$	Fractional numbers

2 Look at this Venn diagram.



- Explain why sets X and Y are disjoint sets.
- List the members of each set.
X = Y =
- How many members are in the universal set?
- Choose another member of your own for each set.

3 Look at this universal set of living things:

$U = \{\text{beetle, elephant, bird, crocodile, bee, snail, shark}\}$

Draw a Venn diagram to show these disjoint sets: V, the set of vertebrates and W, the set of invertebrates.

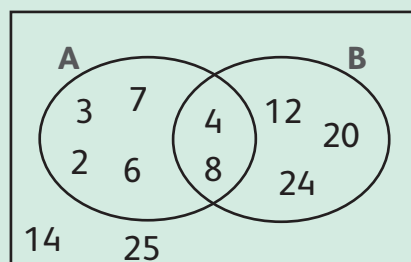
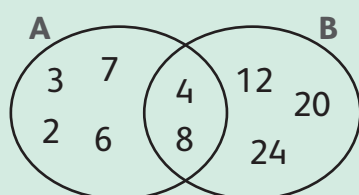
Intersection of sets

Key maths idea

When some members of one set are also members of another, we can overlap the sets and show the **intersection** of the sets.

Example

The members of the intersecting set have both characteristics of set A and set B as they are single-digit numbers and multiples of four. We say these are **jointed sets** because they do share common elements.

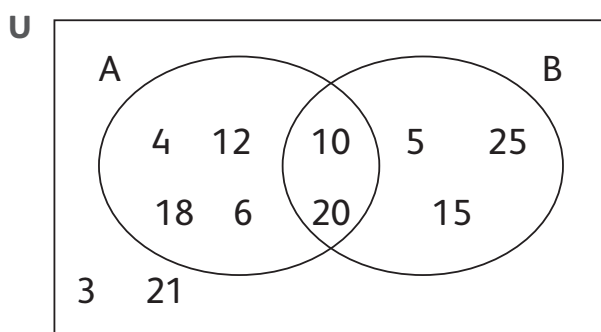


Key words

intersection
jointed sets

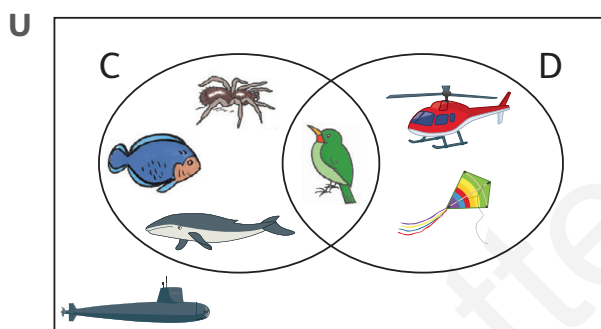
Can you explain why 14 and 25 are members of the universal set but not members of set A or set B?

1 Look at this Venn diagram.



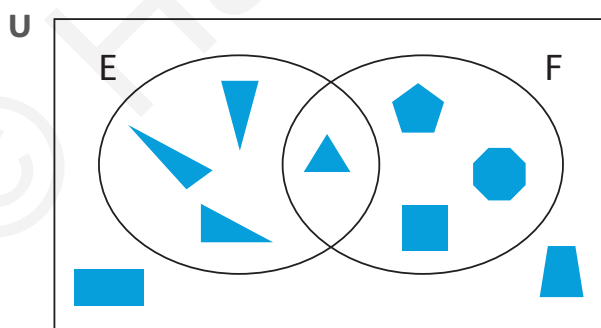
- List the members of set A . Remember to use curly brackets. $A =$
- List the members of set B . $B =$
- List the members of the intersecting set.
- Explain why these are members of both sets A and B .

2 Here is another Venn diagram.



- List the members of the universal set. Remember to use curly brackets. $U =$
- What are the characteristics of the intersecting set?
- Why is the submarine outside the sets C and D ?

3 Dana and Akiel have been thinking about this Venn diagram. They write $E \cap F = \{\text{equilateral triangle}\}$



- What do you think the symbol $\cap$ means?
- What are the two characteristics that the equilateral triangle has?
- Why are the rectangle and the trapezium outside the sets E and F ?

- 4 Work with a partner. Use a set of small objects to create your own Venn diagram to show jointed sets. List the members of each set.

Challenge:

- 5 Dana and Akiel write down what they notice about another Venn diagram.

$U = \{\text{months of the year}\}$

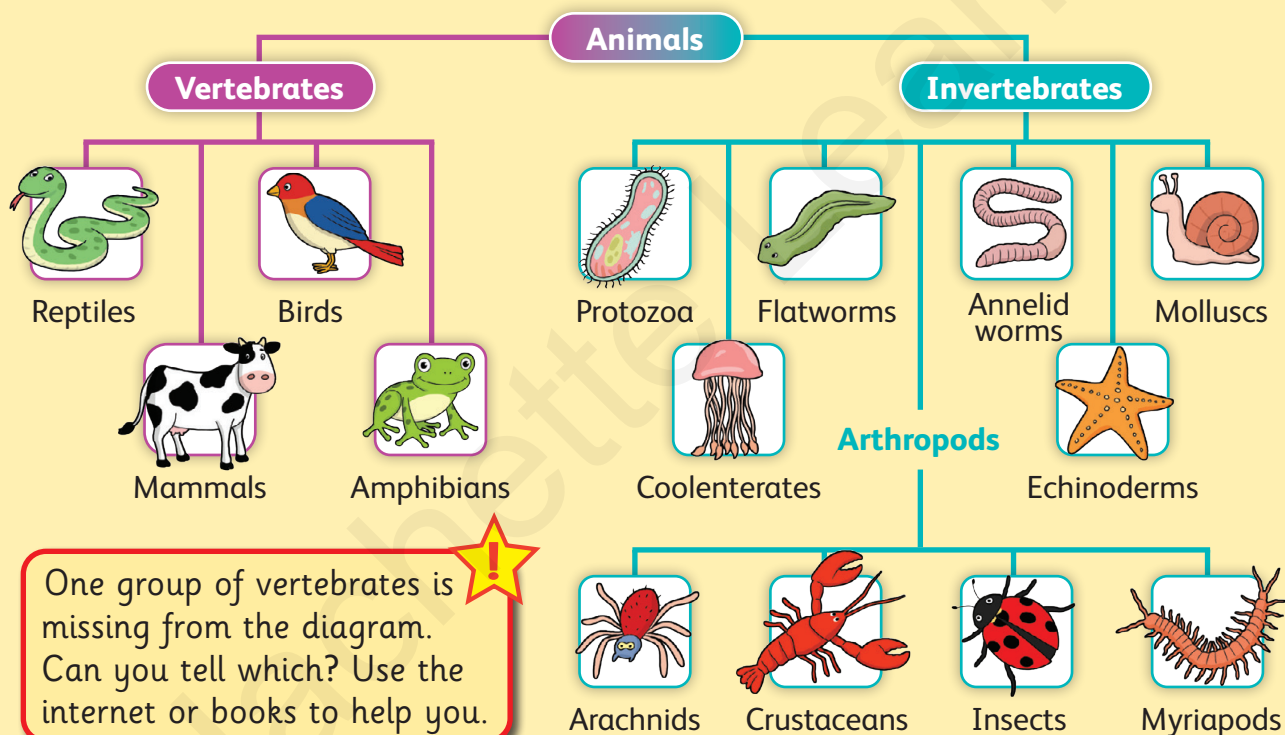
$A = \{\text{months with 31 days}\}$

$B = \{\text{months that include the letter r in their names}\}$

$A \cap B = \{\text{January, March, October, December}\}$

Use the given information to draw the Venn diagram.

Real-world maths: Classifying animals



Animals can be grouped together by similar characteristics or attributes.

Discuss the classification of animals with a partner and talk about the following types of sets. You can research ideas in more depth using the internet:

- a universal set
- b set
- c subsets
- d disjoint sets
- e jointed sets.

Sketch Venn diagrams to help you explain.

Taxonomists use classification for plants and animals to help them classify newly discovered plants or animals.

Find out more about John Venn, the creator of Venn diagrams.

Maths detective: Attributes of sets

Can you spot which members from the previous set need to be deleted each time to suit the attribute of the new set?

Set A = {0, 1, 2, 3, 4, 5, 6}

- whole numbers

Set B = {____, ____, ____, ____, ____, ____}

- counting numbers

Set C = {____, ____, ____}

- even numbers

Set D = {____, ____}

- composite numbers

Set E = {____}

- common factor of 16 and 24

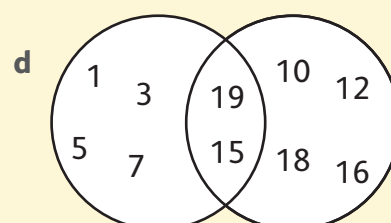
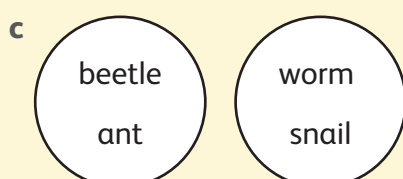
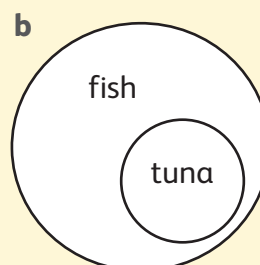
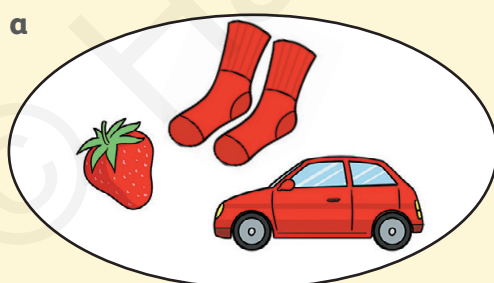
What I have learned

Copy and complete these sentences and definitions.

- 1 The members or elements of a set all ____.
- 2 A set with no members is called a null set or an ____ set.
- 3 A set that has a limited or countable number of elements is called a ____ set.
- 4 A set with an endless number of elements is called an ____ set.
- 5 A subset is ____.
- 6 The universal set is ____.
- 7 Disjoint sets are sets that ____.
- 8 Jointed sets are sets that ____.
- 9 The intersecting set is ____.

Practice questions

- 1 Use what you know about sets to describe what you see. Remember to think about the types of sets and the characteristics of the members.



2 Look at this Venn diagram about pets.

- a How many members are in the universal set?
b Use the Venn diagram to help write a sentence to describe what you know about:

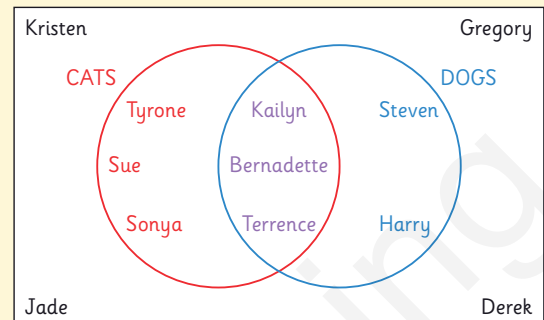
- Sue • Terrence
- Harry • Kristen

c Write the members of each set.

CATS =

DOGS =

$CATS \cap DOGS =$



1 Self check

Check you can do this:



If you have difficulty, try this:



1 Identify and list members of a set, and describe common attributes.	Go back to pages 8–9. Look at some of the sets you described and how you decided what belonged in the set.
2 Create your own sets and describe the common attributes.	Make groups of objects or numbers and say what they have in common.
3 Describe a set as being finite, infinite or a null set.	Go back to pages page 10. Remember that finite numbers can be counted. If something is infinite it goes on forever so you cannot count it.
4 Talk about and represent different types of sets, for example, universal, subset and disjoint sets.	Go back to pages 13–14 and go over the definitions of the different types of sets.
5 Work with Venn diagrams, explain what each region represents and use symbols to describe sets, for example, U for the universal set.	Revise the activities from the section on pages 13–16.
6 Identify and compare sets of counting numbers, whole numbers, odd numbers, even numbers, prime numbers, composite numbers and fractional numbers.	Revise the work from the Maths detective section on page 17.

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