

Collins

Busy Ant
Maths
CONFIDENCE FROM THE START

TRY BUSY ANT MATHS
WITH YOUR YEAR 3 CLASS
TODAY!

Developed for
the new 2014
Curriculum

Written by maths expert
Peter Clarke and his team



GET THE MOST OUT OF YOUR BUSY ANT MATHS EVALUATION PACK

Contents:

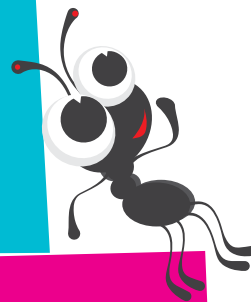
- Sample lessons from the Year 3 and the Year 4 Teacher's Guide, Progress Guide and Homework Guide
- Pupil Book 3A and Sample Pages from Pupil Book 4A
- Free access to Busy Ant Maths on Collins Connect
- Busy Ant Maths Course Guide
- A 'telling the time' poster for your classroom wall
- A Busy Ant Maths pen
- Fun stickers to use with your class

GET TO GRIPS WITH BUSY ANT MATHS IN 3 EASY STEPS:

1. GET ONLINE

connect.collins.co.uk/primary-teaching-resources

- Take a closer look at Busy Ant Maths on Collins Connect
- Discover the easy-to-use planning tool
- Explore the additional resources available on Collins Connect for each lesson



2. EXPLORE BUSY ANT MATHS' TEACHING RESOURCES:

- Within this Teaching Resources Sampler for Year 3 you will find:
 - a whole weeks worth of lessons to try with your class
 - sample enrichment and support resource sheets from the Busy Ant Progress Guide
 - sample resource sheets from the Busy Ant Homework Guide
- Everything you need to see how each Busy Ant component fits together to ensure pupils have every opportunity to master each lesson's objective

3. TRY A LESSON OUT WITH YOUR CLASS:

- See for yourself how straightforward Busy Ant Maths is to use
- Discover how the differentiation challenges every child

Letter from Peter Clarke

Welcome to *Busy Ant Maths*, the new whole-school mathematics programme from Collins.

The 2014 curriculum marks the greatest transformation to the format and content of maths teaching in England for more than a decade. We have approached this new curriculum with a completely blank slate by writing a brand new mathematics programme which is 100% matched to the new curriculum.

Busy Ant Maths addresses the higher expectations of the new curriculum whilst offering a highly effective and proven lesson structure based on best practice. It promotes the most effective pedagogical methods, alongside a flexible and individualised approach to the teaching of mathematics. We have written a programme that has assessment at its heart, and ensures conceptual understanding and mathematical fluency from the start.

As the author team that brought you *Collins New Primary Maths*, we have extensive experience in teaching and writing for primary mathematics education. We believe that *Busy Ant Maths* is a wonderful resource that will help you develop in pupils the mathematical knowledge, skills and understanding they need to meet the demands of the new curriculum. We hope that you agree.

Best wishes



Introduction

Key Principles of *Busy Ant Maths*

Busy Ant Maths is a mathematics course that ensures complete coverage of the 2014 Primary National Curriculum for Mathematics.

The course has at its core the following seven key principles:

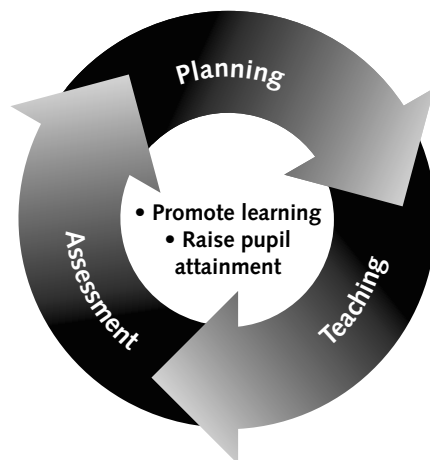
- 1 To inspire **enjoyment of maths**
- 2 To assist in developing pupils' **conceptual understanding of maths**
- 3 To help **raise levels** of attainment for every child
- 4 To provide a **rigorous and cohesive scope and sequence** of the primary maths curriculum, while at the same time allowing for schools' own curriculum design
- 5 To promote the most **effective pedagogical methods** in the teaching of mathematics
- 6 To offer manageable strategies for **effective diagnostic and summative assessment**, to inform planning and teaching
- 7 To strengthen the **home/school link**.

In addition to these seven key principles, *Busy Ant Maths* offers:

- a straightforward, yet flexible approach to the teaching of mathematics
- lesson plans following a highly effective and proven lesson structure
- a weekly bank of practical hands-on learning activities
- a detailed and systematic approach to the development of mental and written calculations
- extensive teacher support through materials which:
 - are sufficiently detailed to aid confidence
 - are rich enough to be varied and developed
 - take into account issues of pace and classroom management
 - give careful consideration to the key skill of appropriate and effective questioning
 - provide a careful balance of teacher intervention and pupil participation
 - encourage communication of methods and foster mathematical rigour
- controlled manageable differentiation with activities and suggestions for at least three different ability groups in every lesson
- a stand-alone resource aimed at developing children's fluency in number facts, containing hundreds of whole class, group, paired and individual games and activities
- pupil materials which are enjoyable and purposeful.

How *Busy Ant Maths* supports the 2014 Primary National Curriculum for Mathematics

All of the components of *Busy Ant Maths* emphasise, and provide guidance on, the importance of the cyclical nature of teaching in order to best promote learning and to raise pupils' attainment.



Planning

Busy Ant Maths supports teachers in planning a successful mathematics programme for their unique teaching context and ensures:

- a clear understanding of pupils' pre-requisite skills before undertaking particular tasks and learning new concepts
- considered progression from one lesson to another
- regular revisiting and extension of previous learning
- a judicious balance of objectives, and the time dedicated to each one
- the use of a consistent format and structure.

The elements of *Busy Ant Maths* that form the basis for planning can be summarised as follows:

Long-term plans

The 2014 Primary National Curriculum for Mathematics constitutes the long-term plan for schools to follow. By closely reflecting the programmes of study, the *Busy Ant Maths* programme embodies this long-term plan.

Medium-term plans

The *Busy Ant Maths* medium-term plans show termly outlines of units of work with National Curriculum Attainment Target references, and specific lesson objectives. Using the *Busy Ant Maths* online planning tool via Collins Connect, these plans can be easily adapted to meet the specific needs of individual schools.

Short-term plans

Individual lesson plans and accompanying learning activities represent the majority of each yearly Teacher's Guide. The lessons provide short-term plans that can easily be followed closely, or used as a 'springboard' and varied to suit specific needs of particular classes. An editable 'Weekly Planning Grid' is also provided on Collins Connect, which individual teachers can fully adapt.

Teaching

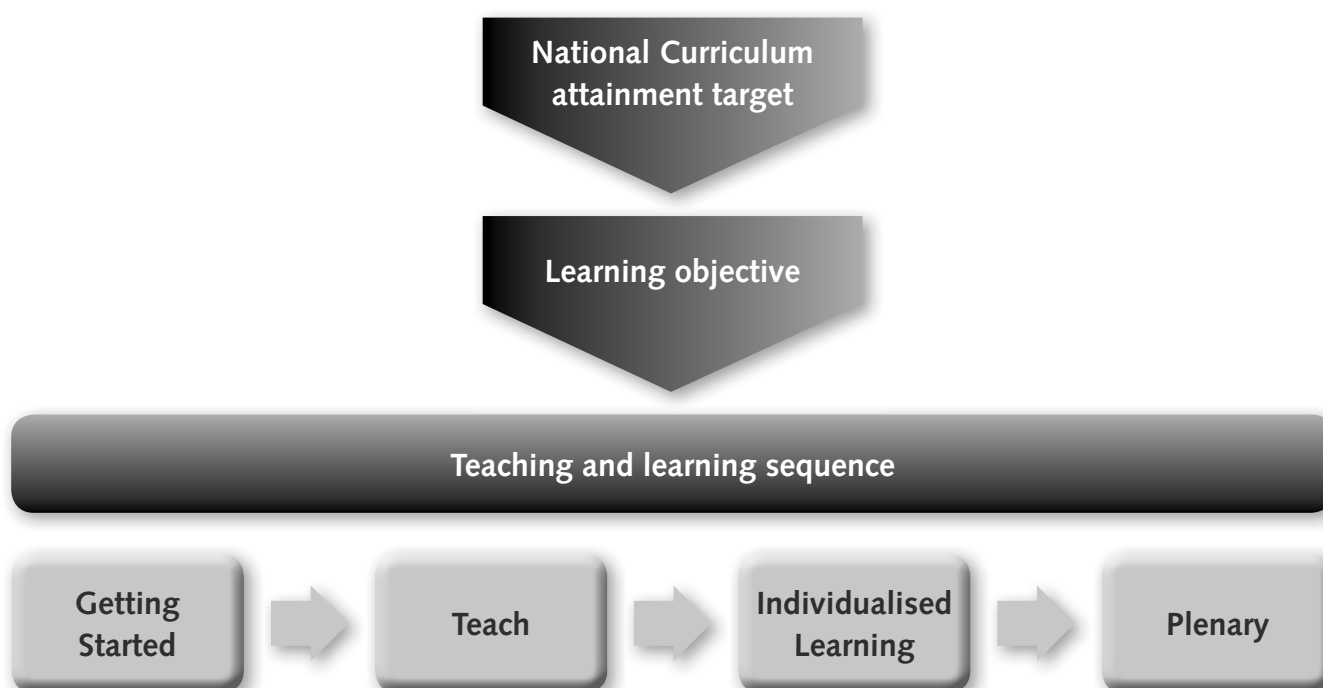
The most important role of teaching is to promote learning and to raise pupils' attainment. To best achieve these goals *Busy Ant Maths* believes in the importance of teachers:

- having high expectations for *all* pupils
- systematically and effectively checking pupils' understanding throughout lessons, anticipating where they may need to intervene, and doing so with notable impact on the quality of learning
- generating high levels of engagement and commitment to learning
- consistently providing high quality marking and constructive feedback to ensure that pupils make rapid gains
- offering sharply focused and timely support and intervention that matches pupils' individual needs.

To help teachers achieve these goals, *Busy Ant Maths* provides:

- highly focused and clearly defined learning objectives
- examples of targeted questioning, using appropriate mathematical vocabulary, that is aimed at both encouraging and checking pupil progress
- a proven lesson structure that provides clear and accurate directions, instructions and explanations
- meaningful and well-matched activities for pupils at all levels of understanding to practise and consolidate their learning
- highly effective models and images to clearly illustrate mathematical concepts, including interactive digital resources.

Each lesson in *Busy Ant Maths* has a specific learning objective derived from an Attainment Target from the 2014 Primary National Curriculum for Mathematics Programmes of Study, and follows the same teaching and learning sequence.



Assessment

Assessment, record keeping and reporting continue the teaching and learning cycle and are used to form the basis for adjustments to the teaching programme. *Busy Ant Maths* offers manageable and meaningful assessment on four levels:

- **Diagnostic assessment**

The Assessment Tasks from the *Busy Ant Maths Assessment Guide* are designed to assist teachers in determining pupils' readiness for a particular unit of work. They are designed to yield information that will directly support the teaching of individual pupils and whole-class teaching.

- **Short-term 'on-going' assessment**

Progress Check Questions are an important feature of every *Busy Ant Maths* lesson and are linked to specific learning objectives. They are designed to provide immediate feedback to pupils and to gauge pupil progress in order to adapt teaching.

Shared Success Criteria are also provided in each lesson to assist pupils in identifying the steps required to achieve the learning objective.

- **Medium-term 'formative' assessment**

As well as being used for diagnostic assessment, the Assessment Tasks, along with the Assessment Sheets, from the *Busy Ant Maths Assessment Guide* can be used to review and record the progress of both individual pupils and the class as a whole, in relation to the National Curriculum Attainment Targets. The formative assessment tasks and tests provide individual and/or group opportunities to identify those pupils who are not yet reaching, or who are exceeding, national expectations. They can also be used to set individual targets for pupils.

- **Long-term 'summative' assessment**

The End of Year Class Evaluation document shows individual pupils' attainment against national standards. It draws upon the data gathered throughout the year including results from Assessment Tasks and Assessment Sheets, performance in whole class discussions, participation in group work, written evidence and any other supplementary notes. This document forms the basis for reporting to parents and informing the next year's teacher. Importantly, it also helps to determine whether pupils are on track to meet expectations at the end of the key stage.

Collins Connect contains a powerful assessment tool for diagnostic, formative and summative assessments. Along with manageable and meaningful record-keeping formats it allows you to collect assessment data to store online and present digitally for class and whole school analysis.

The following pages will introduce you to the components of *Busy Ant Maths*. Please note that materials in this evaluation pack are draft versions, and not the final content.

Week 1: Number – Number and place value

National Curriculum attainment targets

Pupils should be taught to:

- recognise the place value of each digit in a three-digit number (hundreds, tens, ones)
- compare and order numbers up to 1000
- read and write numbers up to 1000 in numerals
- solve number problems and practical problems involving these ideas

Pupil targets

- Read and write numbers to 1000 and put them in order
- Split a number into 100s, 10s and 1s
- Explain how the digits in a number change when I count in 10s or 100s

Weekly overview

Pupils read and write numbers to 1000. They recognise the value of each digit in a two- and three-digit number and partition numbers using Base 10 material. Pupils compare and order three-digit numbers, focussing on the value of each digit. They solve number problems, recording their solutions systematically, explaining how they know that they have found all possible numbers.

Prerequisites for learning

- Count, read, write, compare, order and partition two-digit numbers, explaining what each digit represents

Assessment

Use the following assessments from *Busy Ant Maths Assessment Guide 3*:

- 2: Recognise the place value of each digit in a three-digit number
- 3: Compare and order numbers up to 1000
- 5: Read and write numbers up to 1000 in numerals and in words
- 6: Solve number problems and practical problems involving these ideas (i.e. Number and place value)

Tracking back and forward through the curriculum

Year 2		Year 3		Year 4	
• recognise the place value of each digit in a two-digit number (tens, ones)		• recognise the place value of each digit in a three-digit number (hundreds, tens, ones)		• recognise the place value of each digit in a four-digit number (thousands, hundreds, tens, ones)	
• compare and order numbers from 0 up to 100; use <, > and = signs		• compare and order numbers up to 1000		• order and compare numbers beyond 1000	
• read and write numbers to at least 100 in numerals and in words		• read and write numbers up to 1000 in numerals and in words			
• use place value and number facts to solve problems		• solve number problems and practical problems involving these ideas		• solve number and practical problems that involve all of the above and with increasingly large positive numbers	
Related Busy Ant Maths Units					
Y2 Units		Previous Y3 Units	Future Y3 Units	Y4 Units	
Unit 1, Week 1	Unit 9, Week 1		Unit 5, Week 1 Unit 9, Week 1	Unit 1, Week 1	Unit 9, Week 1
Unit 5, Week 1				Unit 5, Week 1	



Week 2: Number – Addition and subtraction

National Curriculum attainment targets

Pupils should be taught to:

- practise solving varied addition and subtraction questions. For mental calculations with two-digit numbers, the answers could exceed 100*
- add and subtract numbers mentally, including:
 - a three-digit number and ones
 - a three-digit number and tens

Pupil targets

- Add and subtract a pair of two-digit numbers
- Add and subtract a three-digit number and ones
- Add and subtract a three-digit number and tens

Weekly overview

Pupils continue to calculate mentally the addition and subtraction of two two-digit numbers using the empty number line to support their thinking. They use mental strategies and the empty number line to add and subtract a one-digit number and a multiple of 10 to and from a three-digit number.

Prerequisites for learning

- Understand the place value of two- and three-digit numbers
- Count on and back in ones and tens from any two- or three-digit number
- Recall and use addition and subtraction facts to 20, and derive and use related facts up to 100
- Add and subtract a one-digit number or a multiple of 10 to or from a two-digit number
- Show that addition of two numbers can be done in any order (commutative) and subtraction of one number from another cannot

Assessment Guide 3:

Use the following assessments from *Busy Ant Maths Assessment Guide 3*:

- 7: Add and subtract numbers mentally, including:
- a three-digit number and ones
 - a three-digit number and tens
 - a three-digit number and hundreds

Tracking back and forward through the curriculum

Year 2		Year 3		Year 4	
<ul style="list-style-type: none"> • recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100 • add and subtract numbers using concrete objects, pictorial representations, and mentally, including: <ul style="list-style-type: none"> - a two-digit number and ones - a two-digit number and tens - two two-digit numbers - adding three one-digit numbers 		<ul style="list-style-type: none"> • practise solving varied addition and subtraction questions. For mental calculations with two-digit numbers, the answers could exceed 100.* • add and subtract numbers mentally, including: <ul style="list-style-type: none"> - a three-digit number and ones - a three-digit number and tens - a three-digit number and hundreds 		<ul style="list-style-type: none"> • continue to practise [both] mental methods [and columnar addition and subtraction] with increasingly large numbers to aid fluency * 	
Related Busy Ant Maths Units					
Y2 Units		Previous Y3 Units	Future Y3 Units	Y4 Units	
Unit 1, Week 2	Unit 7, Weeks 1 & 2		Unit 3, Weeks 1 & 2	Unit 1, Week 2	Unit 7, Weeks 1 & 2
Unit 2, Weeks 1 & 2	Unit 9, Week 2		Unit 5, Week 2	Unit 3, Week 1	Unit 9, Week 2
Unit 5, Week 2	Unit 11, Weeks 1 & 2		Unit 7, Weeks 1 & 2	Unit 5, Week 2	Unit 11, Week 1
			Unit 9, Week 2		
			Unit 11, Weeks 1 & 2		

* Notes and guidance (non-statutory)

Week 3: Geometry – Properties of shape

National Curriculum attainment targets

Pupils should be taught to:

- make 3-D shapes using modelling materials; recognise 3-D shapes in different orientations and describe them

Pupil targets

- Recognise, name and describe prisms
- Visualise the skeletal outline of a 3-D shape

Weekly overview

Pupils recognise and define prisms, including triangular prisms, cubes and hexagonal prisms. They understand that edges and vertices form the skeleton to which faces (2-D shapes) are fitted to complete a 3-D shape. Pupils identify 3-D shapes with particular attributes, e.g. shape of faces/bases. They are introduced to the term “vertex” as a corner where three or more faces meet (prism) or as a point (cone).

Prerequisites for learning

- Name, describe the properties of, and sort common 3-D shapes and recognise them in pictures

Assessment

Use the following assessments from *Busy Ant Maths Assessment Guide 3*:

28: Draw 2-D shapes and make 3-D shapes using modelling materials; recognise 3-D shapes in different orientations and describe them

Tracking back and forward through the curriculum

Year 2		Year 3		Year 4	
<ul style="list-style-type: none"> • identify and describe the properties of 3-D shapes, including the number of edges, vertices and faces 		<ul style="list-style-type: none"> • draw 2-D shapes and make 3-D shapes using modelling materials; recognise 3-D shapes in different orientations and describe them 		<ul style="list-style-type: none"> • continue to practise [both] mental methods [and columnar addition and subtraction] with increasingly large numbers to aid fluency * 	
Related Busy Ant Maths Units					
Y2 Units		Previous Y3 Units	Future Y3 Units	Y4 Units	
Unit 1, Week 3	Unit 5, Week 3		Unit 9, Week 3		

Naming 3-D shapes

National Curriculum attainment target

- Make 3-D shapes using modelling materials; recognise 3-D shapes in different orientations and describe them

Lesson objective

- Recognise and name 3-D shapes lying in any position

Previous related lessons

None

Prerequisites for learning

Pupils need to:

- recognise and name 3-D shapes: cube, cuboid, sphere, cone and cylinder

Vocabulary

straight, curved, prism, triangular prism, hexagonal prism, square-based pyramid

Future related lessons

Unit 1, Week 3, Lesson 2; Unit 1, Week 3, Lesson 3; Unit 1, Week 3, Lesson 4

Success criteria

Pupils can:

- match 3-D shapes to objects and pictures of objects
- define a prism
- use partial sightings of 3-D shapes and clues to identify them



Getting Started

- Choose an activity from Geometry – Properties of shape.

Collins
Connect
Year 3, Unit 1,
Week 3

Teach

Resources

3-D shapes: cube, cuboid, triangular prism, hexagonal prism, sphere, cone, cylinder, square-based pyramid; shopping bag containing the following items: orange, cube of paper tissues, cereal packet, tin soup; two cards labelled: "prisms" and "not prisms"; 18 logiblocks: six equilateral triangles, six hexagons and six squares (per class)

- Prior to the lesson, decide whether to display actual 3-D solids and the 4 items in the shopping bag and/or the representations of these as displayed on the slides.
- Arrange the pupils in a U-shape on the carpet.
- Display the 3-D shapes and the shopping items or Slide 1.
- From the shopping bag, produce an orange and ask a pupil to find and name the matching 3-D shape (sphere). Repeat for paper tissues (cube), cereal (cuboid) and tin of soup (cylinder).
- Display the pyramid and ask: **Can anyone tell me the name of this shape?** (pyramid) **Which country is famous for having ancient building of this shape?** (Egypt). Say: **A pyramid gets its name from the shape of its base. A pyramid has a square base and four triangular sides that slope and come to a point.**
- Ask: **Putting together what we have found out about this shape, who can give me its name?** (square-based pyramid)
- Display the 3-D shapes only and sort them into two sets: flat faces and curved faces.
- Say: **Tell your partner how you think the shapes have been sorted.** (flat faces only to the left, curved and flat faces to the right)
- Now sort the shapes into two sets. Stand all four prisms on their bases and move the pyramid to the other set.
- Ask pairs to share their rule for sorting the shapes with the class. (straight-sided or not straight-sided).
- Focus on the straight-sided set and establish that the end faces for each shape are identical. Introduce the term "prism" and label the sets "prisms" and "not prisms". Say: **A prism is the same size and shape all the way through its length.**
- Refer to the cuboid and say: **The base of this cuboid is a rectangle so we call it a rectangular prism.**



i A prism has the same cross-section along its length and its two end faces are identical. The shape of the base – triangle, rectangle and so on – describes the prism. In strict mathematical terms, a cylinder, that has a uniform cross-section, is not a prism as it is not a straight-sided polyhedron



- Ask a pupil to find a shape with a triangular base. Ask: **Who can name this shape?** (triangular prism)
- Repeat for the hexagonal prism and square prism.
- Point to the last shape and ask: **By what other name do we know this shape?** (cube)
- Ask: **Who can explain why the cube can also be called a square prism?** (prisms are named after the shape of their base and the cube has a square base)
- Build a stack of six equilateral triangles with the logiblocks to form a triangular prism and ask pupils to name the shape.
- Ask: **Who can find the matching 3-D shape?** Together count the number of faces (two triangular and three rectangular), vertices (six) and edges (nine).
- Repeat for a stack of six hexagons and six squares.
- Display the square-based pyramid and the cube.
- Ask: **In what way are these shapes alike?** (square bases) **Tell me two ways that they are they different.**
- Point to the cylinder and say: **We could build this shape with circles. However this solid is not a prism.**
- Ask: **Can anyone explain why this is so?** (it has a curved face)

Individualised Learning

Refer to Activity 1 from the Learning Activities on page 30.

Pupil Book 3A – Page 12: Naming 3-D shapes

Plenary



- Display: Slide 2.
- Display the 3-D shapes. Taking each shape in turn, ask the children to name it and to state whether or not the shape is a prism.
- Say: **Imagine you are phoning a friend. Take it in turn to describe one of these 3-D shapes to your friend then ask them to name the shape.**
- Display: Slide 3.
- Display the objects in Challenge 1 and 2 of the Pupil Book.
- Ask: **Can you find an object in the picture that has a square, circular, or rectangular base?**



Homework Guide 3

Homework: Shapes about the house

Models of 3-D shapes

National Curriculum attainment target

- Make 3-D shapes using modelling materials; recognise 3-D shapes in different orientations and describe them

Lesson objective

- Make models of 3-D shapes using straws and 2-D shapes

Previous related lessons

Unit 1, Week 3, Lesson 1

Prerequisites for learning

Pupils need to:

- recognise and name cube, cuboid, square-based cuboid, triangular prism, hexagonal prism
- know how to work out the number of faces, vertices and edges for the above shapes

Vocabulary

prism, tetrahedron, skeletal, model, face, vertex, vertices, edge

Future related lessons

Unit 1, Week 3, Lesson 3; Unit 1, Week 3, Lesson 4

Success criteria

Pupils can:

- visualise the skeletal outline of a 3-D shape and relate this to its number of edges then vertices and faces



Getting Started

- Choose an activity from Geometry – Properties of shape.

**Collins
Connect**

Year 3, Unit 1,
Week 3

Teach

Resources

full and half-length straws (per group); joiners or sticky-putty (per group); cuboid (per class)



1



2



3



4



- For this lesson you can use the Nets tool on Collins Connect.
- Display: Slide 1.
- Ask: **What is holding this tent up off the ground? (the frame) Can we see the frame from outside the tent? (No) What must we do to see the frame? (go inside the tent)**
- Display: Slide 2. Say: **Imagine that you are now inside the tent.** Ask: **Who can tell the class what the frame looks like from the inside of the tent?**
- Display: Slide 3.
- Display the cuboid and discuss its properties with the pupils (six faces, eight vertices and 12 sides).
- Display: Slide 4.
- Display the skeletal outline of the cuboid showing its vertices and edges. Demonstrate that the edges of the cuboid relate to the frame of the tent.
- Ask pairs to suggest materials that could be used to make a skeletal model of the cuboid.
- Distribute materials to each group. Demonstrate how to join a vertex of two or three straws.
- Ask: **The straws come in two lengths, long and short. How many straws of each length will you need for the edges of a cuboid? (four long, eight short) Work with a partner and make a skeletal model of the cuboid.**
- Ask: **What if you had eight long straws and four short straws? How might this shape be the same as the cuboid you have just built? How might it be different?**
- Take suggestions and ask the pupils to test their ideas by building the skeletal model.
- Say: **In the next part of the lesson you are going to make models of 3-D shapes. Some models will show the skeletal outline of the shape and some will show the faces of the shape.**
- Ask pairs to suggest suitable materials that could be used to build the faces of a cuboid. (interlocking squares and rectangles)

Individualised Learning

Refer to Activity 2 from the Learning Activities on page 30.

Pupil Book 3A – Page 13: Making models of 3-D shapes

Resources: Challenge 1: interlocking triangles, squares, rectangles hexagons (per pair);
Challenge 2: 8 and 4 short straws (per pair), sticky putty (per pair);
Challenge 3: interlocking triangles and squares (per pair)

Progress Guide 3 – Support: Building 3-D shapes

Resources: green, yellow, red and blue pencils (per pupil)

– Extension: 3-D spreadsheet

Plenary

Resources

skeletal model of the cuboid constructed in Teach (per class)



• Display: Slide 5.



• Ask: **How many 3-D shapes can you name with three straws or flat faces that meet or come together at every vertex?** (cube, cuboid, triangular prism, hexagonal prism, tetrahedron)

• Ask: **Can you name a 3-D shape that has four or more straws (edges) meeting at one vertex?** (square-based pyramid, pentagonal pyramid)

• Discuss why a 3-D shape must have a minimum of three edges meeting at every vertex. (gives the shape stability) Hold up the skeletal model of the cuboid and ask: **What would happen to this shape if I removed one of the straws?** (the shape would collapse)



• Draw children's attention to the hexagonal prism.

• Ask pairs to share with the class how they built a hexagonal prism using only interlocking triangles and squares.

Overcoming Barriers

- Children may have difficulty in visualising the 3-D shape they should make with the long and short straws. If this happens, ask them to work out the total number of edges the shape has and to find, in the collection of 3-D shapes, one which could match that number of straws.

Properties of 3-D shapes

National Curriculum attainment target

- Make 3-D shapes using modelling materials; recognise 3-D shapes in different orientations and describe them with increasing accuracy

Lesson objective

- Use properties to classify and describe 3-D shapes

Prerequisites for learning

Pupils need to:

- know the properties of a prism

Vocabulary

tetrahedron, triangular, square-based, pentagonal, prism, pyramid, end face, vertex

Success criteria

Pupils can:

- recognise and name the tetrahedron, square-based pyramid, pentagonal prism
- identify the end face of a prism with up to six sides
- use a pattern to predict the number of edges for a prism with an end face of at least eight sides



Getting Started

- Choose an activity from Geometry – Properties of shape.

**Collins
Connect**
Year 3, Unit 1,
Week 3

Teach

Resources

set of 3-D solids: cube, cuboid, cone, cylinder, sphere, triangular and hexagonal prism, triangular and square-based pyramid (per group); triangular (tetrahedron) and pentagonal pyramid (per class)

- Provide each group with a set of 3-D shapes. Revise previous work by asking the pupils to hold up shapes with particular attributes.
- Use the Nets tool to display and rotate the cube, cuboid, sphere, triangular and hexagonal prism, triangular and square based pyramid. Use a physical cone and cylinder. Revise previous work by asking pupils to identify shapes with particular attributes.
- Say: **Show me a shape that has circular/rectangular faces.** Hold up a shape with two identical triangular/hexagonal end faces/bases. **What do we call this shape?**
- Say: **Show me a shape that is the same size and shape all the way through its length. Who can remember the name we give to this type of solid?** (prism)
- Ask the pupils to sort their solids into prisms and not prisms. Ask: **How many prisms do you have?** (4) **Can you name them?** (cube, cuboid, triangular and hexagonal prisms)
- Repeat for the criteria: curved surfaces/no curved surfaces and six or more/less faces.
- Recall that the term “vertex” is a corner where three or more faces meet and its plural is “vertices”. As a class, count the number of vertices for a prism and a square-based pyramid.
- Ask: **Can you name a shape that has no vertices?** (sphere, cylinder) **What do these shapes have in common?** (curved face) **Which shape has one vertex?** (cone)
- Display the cuboid and rotate it about an axis. As a class, count the number of edges. (12)
- Repeat for a triangular prism (9 edges) and a hexagonal prism (18 edges)
- Display: Slide 1.
- Display the square-based, triangular and pentagonal pyramids.
- Ask: **In what ways are these three shapes the same?** (they are not prisms; the sides meet at a point/vertex; they are pyramids)
- Say: **Tell your partner which 2-D shape forms the base of each pyramid.** Take answers and say: **The name of the 2-D shape gives us the name of the pyramid.**





- Display: Slide 2 and complete it through class discussion.
- Display: Slide 3 when you have completed the exercise.

Answer:

Shape of base	Number of sides	3-D shape
Triangle	3	Triangular pyramid
Square	4	Square-based pyramid
Pentagon	5	Pentagonal pyramid

- Say: **The more common name for the triangular pyramid is the tetrahedron.**

Individualised Learning

Refer to Activity 3 from the Learning Activities on page 31.

Pupil Book 3A – Page 14: Classifying and describing 3-D shapes

Progress Guide 3 – Support: Describing sweet shapes
– Extension: Properties of pyramids

Plenary

Resources

set of prisms: cube, cuboid, triangular and hexagonal prism; set of pyramids: triangular, square-based and pentagonal pyramid (per class)



- Display the selection of 3-D shapes.
- Display: Slide 4.
- Pointing to one of the shapes, tell the class a fact that describes a particular attribute, e.g. **It has a triangular base.**
- Ask a child to add another fact.
- Continue around the class until several facts have been suggested. Repeat for other shapes.
- Ask: **How many faces meet at a vertex of:**
 - a prism? (3)
 - a triangular pyramid? (3)
 - a square-based pyramid? (4)
 - a pentagonal pyramid? (5)
- Ask: **Who would like to explain to the class how they found the number of edges for a prism with an end face of i) eight sides, ii) 10 sides, iii) 12 sides?**

Overcoming Barriers

- When working on the Pupil Book tasks, some pupils may find it helpful to have access to the set of 3-D solids used by their group during the teaching activities.

Building shapes with cubes

National Curriculum attainment target

- Make 3-D shapes using modelling materials; recognise 3-D shapes in different orientations and describe them with increasing accuracy

Lesson objective

- Build 3-D shapes with cubes

Prerequisites for learning

Pupils need to:

- know the number of faces of a cube and cuboid

Vocabulary

cube, cuboid, face

Success criteria

Pupils can:

- build models of 3-D shapes with cubes from 2-D drawings
- count the number of square faces of each colour in a 3-D shape



Getting Started

- Choose an activity from Geometry – Properties of shape.

**Collins
Connect**
Year 3, Unit 1,
Week 3

Teach

Resources

four large cubes (per class); one red and one blue interlocking cube (per child); a supply of interlocking cubes in three colours (per pair)



- Show the pupils a large cube. Establish that when you rotate the cube or stand it on another face, the cube is unchanged, that three faces are visible and that three faces are hidden.
- Use four cubes to make two cuboids, one lying horizontally and one in a vertical position.
- Ask: **How are these cuboids the same? How are they different? What can you tell me about their faces?** (two square faces and four rectangular faces)
- Say: **Take one red and one blue cube each.** Ask: **How many square faces are red?** (six) **How many square faces are blue?** (six)
- Say: **Now join them together and build a cuboid.** Ask: **How many square faces are red?** (five) **How many square faces are blue?** (five)
- Say: **We seem to have lost two square faces. Discuss with your partner what might have happened to them.** Elicit that two faces are hidden when the two cubes are joined together.
- Say: **Work with your partner. Decide on three different colours of cube.** Ask: **Using all three colours each time, how many different shapes can you build with your cubes?**
- After sufficient time, check that each pair has six shapes, three in a row with the centre cube a different colour and three in an L-shape with the corner cubes a different colour.
- Point to an L-shape and ask: **How many square faces of this cube can you see?** (four) Elicit that two of the faces of the cube are hidden when cube is joined to two other cubes.

Individualised Learning

Refer to Activity 4 from the Learning Activities on page 31.

Pupil Book 3A – Page 15: Building models with cubes
Resources: interlocking cubes (per child)

Plenary

Challenge 2



- Display: Slide 1.
- Identify which of the shapes the pupils found easy/difficult to build.
- Say: **One of these four shapes is the “odd man out”. Which shape do you think it is? (d) Share your ideas with your partner.** (All four cubes have two faces that join to other cubes.)
- Ask pairs to share their reasoning with the class.
- Ask: **Can you name shape d? (cuboid) How many faces are square? (two) How many are rectangular? (four)**
- Display: Slide 2.
- Review answers to Challenge 3 in the Pupil book and ask: **Can you predict how many more cubes will you need to build the eleventh model? (three)**
- Ask: **Why do you need three more cubes?** (The pattern is going up in threes.)
- Ask pairs to share their explanations with the class.



Homework Guide 3

Homework: Patterns of 3-D shapes

Overcoming Barriers

- If pupils have difficulty in counting the number of square faces for a colour, ask them to attach small blobs of sticky-putty to each visible face of that colour as they count.

Learning Activities

Activity 1 Challenge 2

Objective

- Recognise and name 3-D shapes lying in any position

Resources

bag containing two sizes of each shape: cube, cuboid, cone, cylinder, triangular and hexagonal prisms, sphere (per group); cards labelled: curved, circular, straight, triangular, rectangular, square, hexagonal, will roll (per group)

What to do

- Pupils should lay the cards face up in the middle of the table.
- They must take turns to choose a shape from the bag and display only a part of it to the rest of the pupils in the group.
- The pupil who chose the shape should ask questions such as: **Can you name this shape? Which cards describe the shape?**

Variations

Challenge 1

- As above but not including hexagonal prism and card labelled hexagonal

Challenge 3

Resources

In addition to the resources listed above, include a tetrahedron and a square-based pyramid (per group)

- Each child should take it in turn to select two 3-D shapes and ask: **How are these two shapes the same? How are they different?**

Activity 2 Challenge 2

Objective

- Make models of 3-D shapes using straws and 2-D shapes

Resources

a supply of interlocking 2-D shapes, e.g. polydron (per pair); selection of small objects, e.g. glue stick, table-tennis ball, 10 new pencils/10 crayons, six felt tip pens etc. (per group)

What to do

- Pupils should choose interlocking shapes to design a triangular prism to hold the object or set of objects of their choice.
- Explain that the contents should fit snugly and the container should have an opening lid.

Variations

Challenge 1

- Ask pupils to build a cube or cuboid to hold their object.

Challenge 3

- Ask pupils to make their triangular prism with end faces that are right-angled or isosceles triangles.



Activity 3

Objective

- Use properties of 3-D shapes to classify and describe them

Resources

prisms with three, four, five and six sides of end face, cuboid (per group); digit cards 5–10 and 12, 15 and 18 (per group); 1 minute timer (per group)

What to do

- Pupils should shuffle the cards, turn the top card over and display the number, e.g. 8 and set the timer.
- They must take turns to state, in 1 minute, as many facts as they can about the prisms that use the number, e.g. a cube and a cuboid have eight vertices. A hexagonal prism has eight faces.
- Award one point for each correct answer.
- The winner is the first player to score 10 points.

Variations

 Challenge 1

As per Challenge 2 but pupils should take the top two digit cards, match each card to a prism and give a fact which uses that number.

 Challenge 3

Resources

As well as the resources listed above, include a tetrahedron, a square-based pyramid, a pentagonal pyramid and digit card 4 (per group)

- Pupils should engage in the activity, as described in Challenge 2.

Activity 4

Objective

- Build 3-D shapes with cubes

Resources

24 interlocking cubes (per pair); three pieces of paper (per pupil)

What to do

- Each pupil should use all 24 cubes to build a cuboid and write a description of it, e.g. "The cuboid is three cubes long, two cubes high and has four layers."
- Pupils should swap papers and build each other's cuboids as described.
- Repeat the activity for another two turns each.

Variations

 Challenge 2

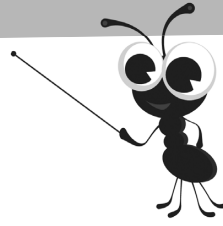
Resources

36 interlocking cubes (per pair); paper (per child)

- Pupils should investigate how many different cuboids they can make using 36 cubes and make a table of their results.
- Encourage pupils to work in a systematic way beginning with one layer of cubes.

Name: _____ Date: _____

Building 3-D shapes

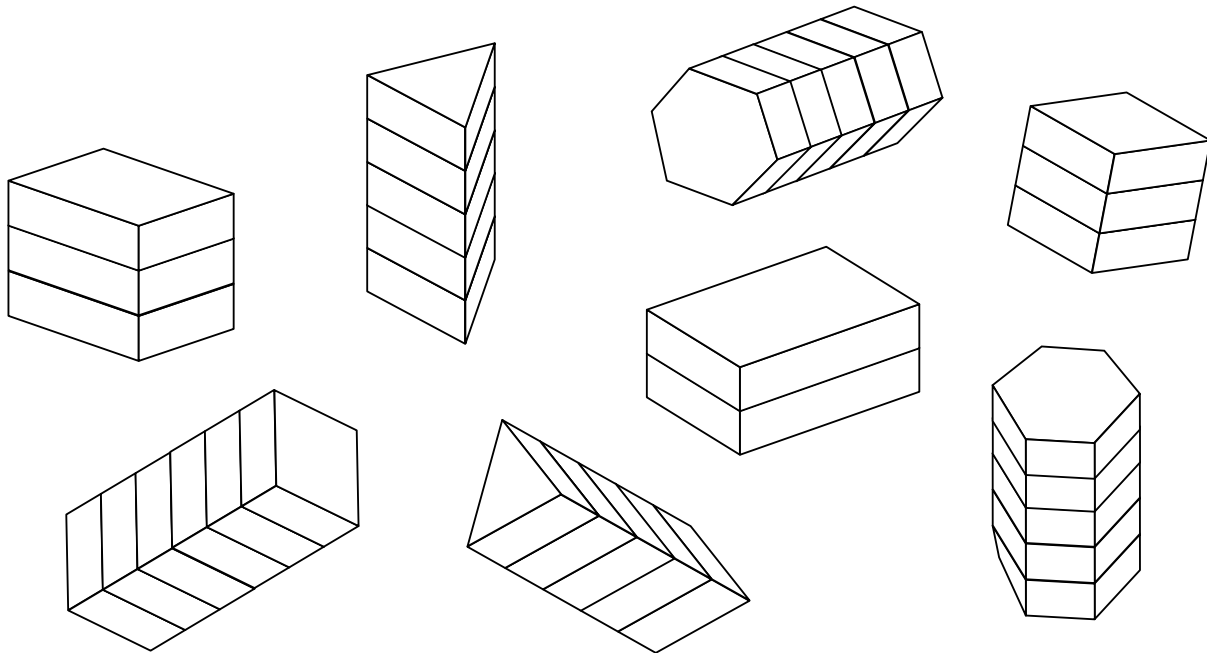
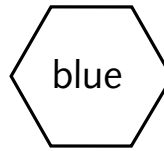
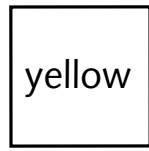
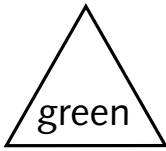


Recognise and name different prisms

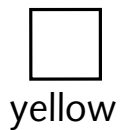
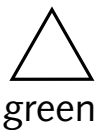
1 Jonny used flat shapes to build these 3-D models. Colour the shapes with these end faces as follows:

You will need:

- green, yellow, red and blue pencils



2 Match the colour to the name of the shape with an arrow.



square prisms

triangular prisms

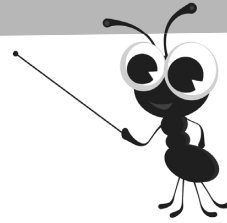
rectangular prisms

hexagonal prisms

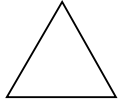
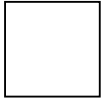
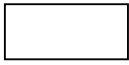
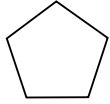
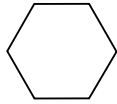
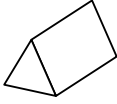
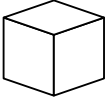
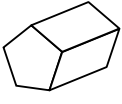
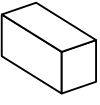
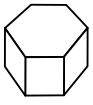
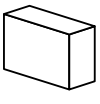
Name: _____ Date: _____

3-D spreadsheet

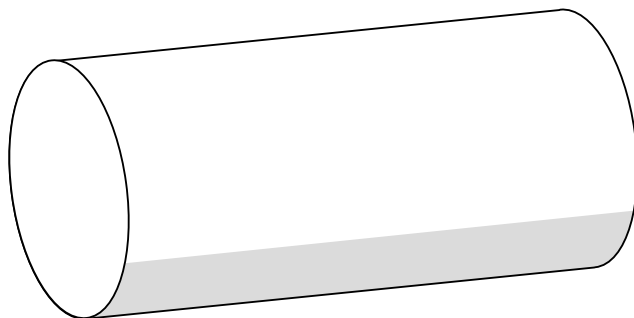
Make models of 3-D shapes using 2-D shapes



1 How many of each 2-D shape do you need to make a model of each 3-D shape?

		2-D face				
						
3-D shape	a 					
	b 					
	c 					
	d 					
	e 					
	f 					

2 a Make a model of a cylinder.



You will need:

- sheet of card
- ruler
- plastic circle
- scissors
- sticky tape

b On the back of this sheet, describe how you made your model of a cylinder.

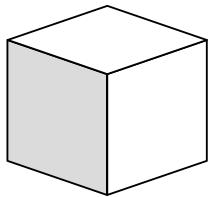
Name: _____ Date: _____

Describing sweet shapes

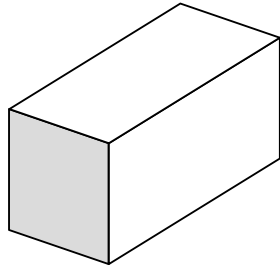
Describe 3-D shapes

Lena sorts the sweets then puts them into packets.
Decide which packet each sweet will go into.
Write the letter on the packet.

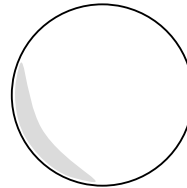
A sweet can go into more than 1 packet.



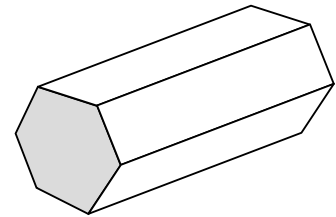
a cube



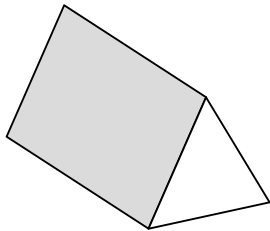
b cuboid with square end face



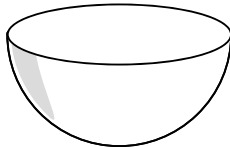
c sphere



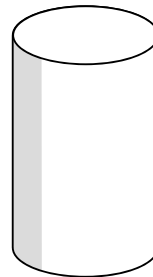
d hexagonal prism



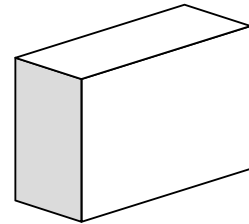
e triangular prism



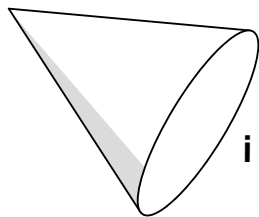
f hemisphere



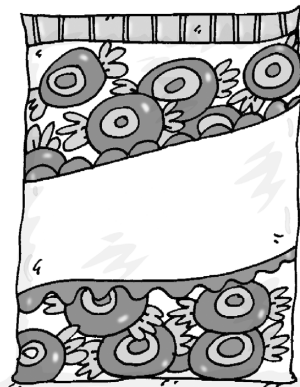
g cylinder



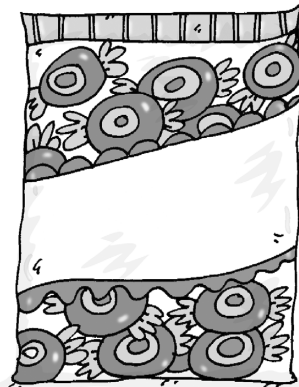
h cuboid



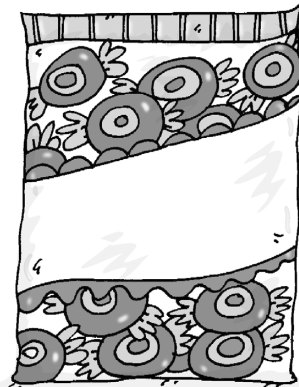
i cone



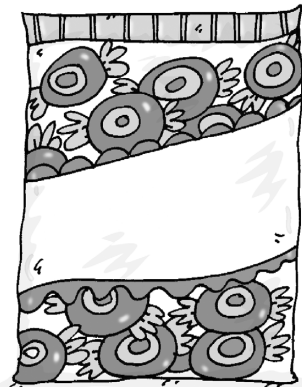
Peppermint prisms



Fruity five faces



Raspberry rectangles

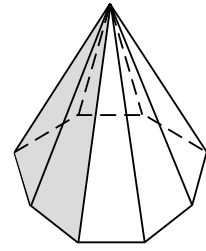
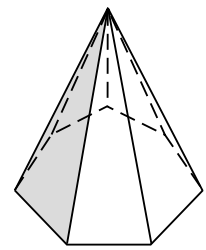
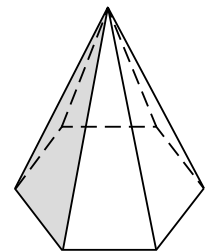
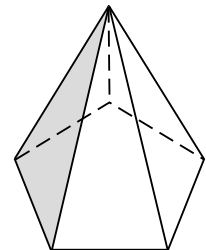
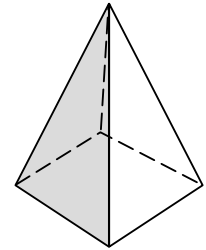
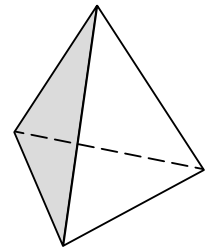
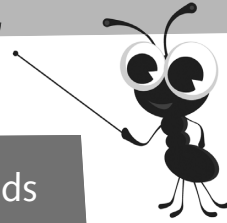


Caramel curves

Name: _____ Date: _____

Properties of pyramids

Use properties of 3-D shapes to describe pyramids



1 Complete the table.

Pyramid base	Number of sides of base	Number of faces of pyramid
Triangle	3	4
Square		
Pentagon		
Hexagon		
Heptagon		
Octagon		

2 Predict the number of faces for a pyramid with a base of:

a 10 sides

b 12 sides

3 Complete the table.

Pyramid base	Number of sides of base	Number of edges of pyramid
Triangle	3	6
Square		
Pentagon		
Hexagon		
Heptagon		
Octagon		

4 Predict the number of edges for a pyramid with a base of:

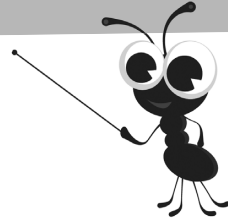
a 10 sides

b 12 sides

5 Is there a relationship between the number of sides of the base of a pyramid and the number of its vertices? Use the other side of this sheet to draw a table similar to those in Questions 1 and 3 for the number of vertices of a pyramid. Predict the number of vertices for pyramids with bases of 10 and 12 sides.

Name: _____ Date: _____

Shapes about the home



Recognise 3-D shapes in any position

Challenge 1

Find objects in your home that have these bases.
Write the name of the object in the table. Two are done for you.

Circular	Square	Rectangular
tin of beans		packet of cereal

Challenge 2

- Find about 12 different containers in your home. Arrange them into 3 sets according to the shape of their base.
- Complete the table.
- Circle the objects that are prisms.



Shape of base	Objects
Circular	
Square	
Rectangular	

Challenge 3

There are different types of container in your kitchen: jar, bottle, box, packet and tin. Write your answers on the back of this sheet.

- What shape of base do most cardboard containers have? Why do you think this is?
- What shape of base do most tins have? Can you think why this is?

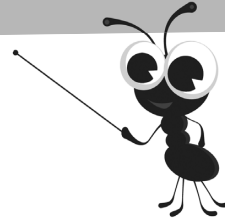


Find 2 different empty cardboard containers. Open each container and lay them flat to reveal the faces.

Discuss and compare the shape and size of the faces of each container.

Name: _____ Date: _____

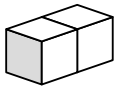
Patterns of 3-D shapes



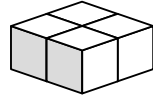
Build 3-D shapes with cubes

Challenge 1

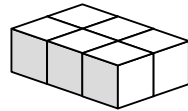
- 1 Count the number of cubes in each cuboid and write your answers in the table.



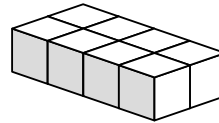
1st



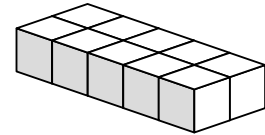
2nd



3rd



4th



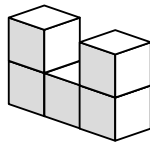
5th

- 2 How many cubes do you need for the 6th model?

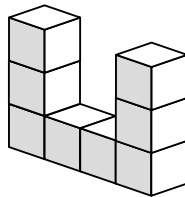
Model	1st	2nd	3rd	4th	5th	6th
Number of cubes	2					

Challenge 2,3

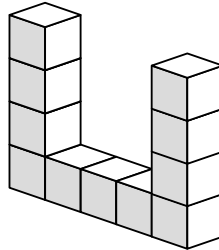
- 1 Draw the 4th model in this row of cubes.



1st



2nd



3rd

4th

- 2 Record your results in the table.
 3 Record the number of cubes you need for the 5th and 6th models.

Model	1st	2nd	3rd	4th	5th	6th
Number of cubes	5					

Challenge 3

Look at the table of results for Challenge 2.

How many cubes would you need for the 10th model?



- 1 Using the bricks, work together to design and build your own pattern of 4 models.
 2 Discuss how you could use the pattern to make the 5th, 6th or even the 10th model.

You will need:

- building bricks

Naming 3-D shapes



Recognise and name 3-D shapes lying in any position

Challenge 1

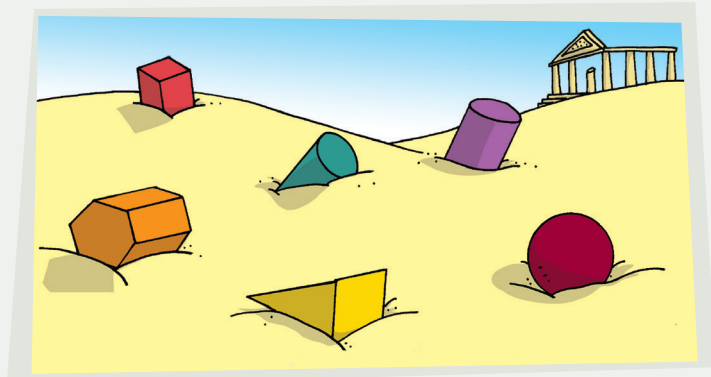
Match each picture to its 3-D shape. Copy and complete the table.

1 2 3 4 5 6 7 8 9 10
 sphere cuboid cylinder cube cone

Picture	3-D shape
1	cube
2	
3	
4	
5	
6	
7	
8	
9	
10	

Challenge 2

- Name the six 3-D shapes that are lying in the sand.
- Use the clues to name the 3 shapes below.



Shape a

- 6 rectangular faces
- 8 vertices
- 12 edges

Shape b

- 6 rectangular faces
- 2 triangular faces
- 9 edges

Shape c

- flat circular face
- curved sides that come to a point

Challenge 3

Write 3 clues to help identify each shape.

a cube

b hexagonal prism

c square-based pyramid

d cylinder

Making models of 3-D shapes

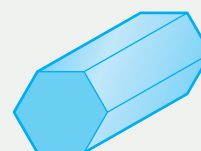
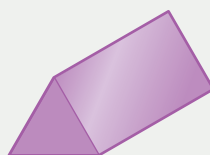
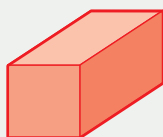
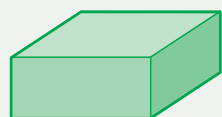
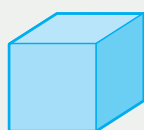


Make models of 3-D shapes using straws and 2-D shapes

Challenge 1

Work with a partner.

Make models of these 3-D shapes with the interlocking 2-D shapes.



You will need:

- interlocking triangles
- interlocking squares
- interlocking rectangles
- interlocking hexagons

Challenge 2

Work with a partner.

Make skeletal models of these 3-D shapes with straws and sticky putty. Name each shape you make.

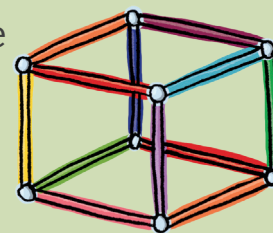
3-D shape	Long straws	Short straws	Sticky putty blobs
<i>cube</i>	12	0	8
a	8	4	8
b	3	6	6
c	3	3	4
d	5	10	10
e	4	4	5

You will need:

- 8 long straws
- 10 short straws
- sticky putty

Example

cube



12 long straws,
8 blobs of sticky putty

Challenge 3

Work with a partner.

Using interlocking triangles and squares only:

- Explore the different 3-D shapes you can make.
- Find a way to make a hexagonal prism.

You will need:

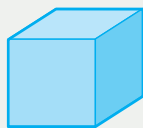
- interlocking triangles
- interlocking squares



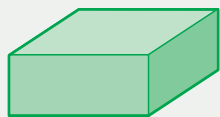
Classifying and describing 3-D shapes



Sort and describe 3-D shapes



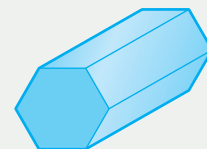
A cube



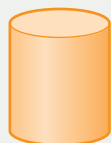
B cuboid



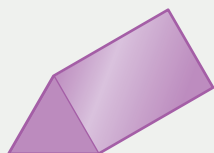
C cone



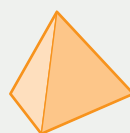
D hexagonal prism



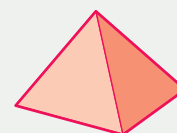
E cylinder



F triangular prism



G tetrahedron



H square-based pyramid

Challenge 1

Copy and complete the table.

3-D shape	A	B	C	D	E	F	G	H
Prism	✓							
Not a prism								

Challenge 2

1 Look at the faces of shapes **A** to **H** above. Write the names of shapes with **one or more faces** that are:

- a** square **b** triangular **c** rectangular **d** curved

2 Copy and complete the table.

Prism end face	Number of sides of end face	Total number of edges
Triangle	3	9
Square		
Pentagon		
Hexagon		

3 Predict the number of edges for a prism with an end face of:

- a** 8 sides **b** 10 sides **c** 12 sides

Challenge 3

Is there a relationship between the number of vertices and the number of edges of a prism? Investigate.

Building models with cubes



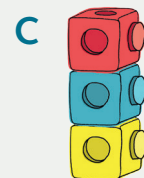
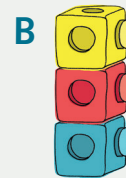
Build 3-D shapes with cubes

You will need:
• interlocking cubes

Challenge 1

- 1 Build each model with 3 cubes. Count the number of square faces for each colour.
- 2 Copy and complete the table.

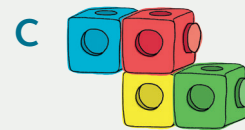
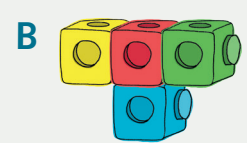
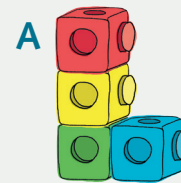
3-D model	Number of square faces		
	Red	Blue	Yellow
A	5		
B			
C			
D			



Challenge 2

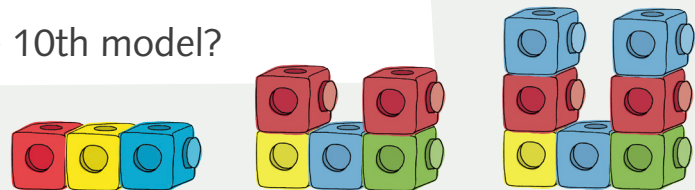
- 1 Build each model with 4 cubes. Count the number of square faces for each colour.
- 2 Copy and complete the table.

3-D model	Number of square faces			
	Red	Green	Blue	Yellow
A				
B				
C				
D				



Challenge 3

- 1 Build these models with cubes. Continue until the 6th model.
- 2 Record your results in a table. Look for a pattern.
- 3 How many cubes will you need for the 10th model?



HOW DO I FIND OUT MORE AND PLACE AN ORDER?

Contact the Special Busy Ant consultant in your area:
www.collins.co.uk/findyourrep



www.collins.co.uk/busyantmaths



0844 576 8126



education@harpercollins.co.uk

BUSY ANT BASICS

- ✓ 2014 CURRICULUM MATCHED
- ✓ STRAIGHTFORWARD PRICING THAT OFFERS GREAT VALUE FOR MONEY
- ✓ RIGOROUSLY TESTED AND DEVELOPED
- ✓ ENCOURAGES PROGRESSION FOR EVERY CHILD
- ✓ ASSESSMENT THAT IS USEFUL FOR ALL
- ✓ SUPPORTS THE DEVELOPMENT OF YOUR SCHOOL CURRICULUM

