Grade 6

Introduction for teachers and parents

The Jamaica Primary Mathematics (NSC Edition) is designed to meet the standards, benchmarks, attainment targets and objectives detailed in the National Standards Curriculum. The material is presented sequentially in terms, with each term split into units and chapters that follow the progression outlined in the NSC. At the start of each term, you can find a simplified list of the content that will be covered in each unit.

You will notice that each chapter is colour-coded to indicate the main mathematical content strand covered:

- Number (red)
- Geometry (blue)
- Statistics and probability (yellow)
- Measurement (orange)
- Algebra (green)

Each chapter opens with a **focus question** and **starting point**. This is usually a photograph or picture that is aimed to stimulate open-ended discussion and questions. There are questions or an activity related to the picture in order to get students thinking about the ideas they will be working with in that chapter.

Throughout each chapter, **Key words** are presented next to the content in a purple box.

The **real-world maths activities** indicate contextualised questions situated in recognisable, real-world contexts.

Real-world maths: Run a supermarket

Cut out some of the products with their prices, and stick them onto cards. Write the prices on each product card. These will be the 'products' in your store. Take turns being customers and shopkeeper. Each customer chooses three products. The class should work together to work out each customer's total amount.

How does estimating help you at the supermarket?

Maths detective activities are designed to develop analytical skills.

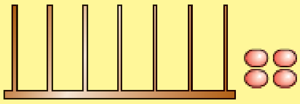
Maths detective: Large numbers

Case 1

1 Work in pairs. Write down ten 6-digit numbers you can make using only the digits 1 and 2.
2 Write them in order from least to greatest.
3 Compare with another pair.

Case 2

1 Look at the abacus. Make four different numbers. Draw your answers and write the numbers you made.
2 Now write the numbers in order from largest to smallest.



At the end of each chapter, you will find a consolidation and revision activity, titled **What I have learned**. Students can use this activity to demonstrate what they have learned in the chapter, and teachers may use it for continuous assessment of concept and skill development. There are also **Practice questions** and a **Self check** exercise for reflection.

Although we provide **answers** for most of the questions and activities, there are also many tasks which are open-ended, or do not have a fixed answer. Please use the answers as a general guideline only. Wherever possible, encourage students to share and explain where they have reached different answers or conclusions of their own. In many cases, this will offer rich opportunities for learning.

Chapter 1 Sets (pages 7–23)

- Venn diagrams are used to represent data visually. Give students extra guidance for the Starting point on page 7 if they cannot see that they can overlap the circles to make a category for people who use *both* types of transport.
- Let students conduct a class survey. Ask some or all the students to indicate whether they like any two relatively similar items or activities, e.g.:
  - Who likes Otaheite apples?
  - Who likes soursop?

  Remind students that they can like both. Record the information on the board.
- Then draw and label a large two-circle Venn diagram on the floor and ask students to stand in the part of the Venn diagram that shows their answer to the questions. Let students compare the information recorded on the board with where they are standing in the Venn diagram. Discuss what adjustments they need to make to how they have arranged themselves and why this is important. Pay attention to the overlap portion of the circles.
- Allow students to come up with different categories of questions which they can use to create human Venn diagrams of their own.

Chapter 2 Place value and exponents (pages 24–38)

- The activities in this chapter are largely practical games and activities that reinforce number work covered in earlier grades.
- The beanbag revision activity on page 25 is intended to reinforce students' understanding and knowledge of the division facts. You could have a table of division facts on a poster on the wall for students to refer to.
- Students have worked with place value, face value and actual value of numbers before. Begin by revising the place value of 3-, 4- and 5-digit numbers before moving up to 6- and 7-digit numbers, and later 8- and 9-digit numbers.
- Make sure that students understand that each place is 10 times the place to its right. At first you may need to write the values at the top of each column, as shown below.

Millions	Hundred thousands	Ten thousands	Thousands	Hundreds	Tens	Ones

  Later, students will be able to simply put the numbers in columns without labelling.
- Note that in some countries, 'standard form' is another name for 'scientific notation'. However, in most countries, 'standard notation' is the term used for expressing the usual way people write numbers (i.e. those not in expanded or scientific form). This is why we avoid talking about ordinary numbers as being in standard form, and instead talk about ordinary numbers or numbers in full.
- Very small (decimal) numbers can also be written in scientific notation, but have negative powers of ten. We do not deal with this at this level. If students ask, direct them to do their own research into how this notation works.

Chapter 3 Distance and scale (pages 39–53)

- Remind students how to measure accurately using rulers and tape measures. It is important to line up the end of the object being measured with the zero point on the ruler or tape measure.
- Teaching scale drawing can be a fun, activity-based way to learn. Scale drawing helps students to apply proportions using real-life experiences.
- Let students start by drawing simple objects or spaces on grids. Once they understand the concept of scale drawing, they will become more skilled at solving and understanding proportional relationships.

- The aim of the chapter is for students to be able to look at a map or plan, identify its scale as a proportion and solve for an unknown value.
- Note that when we give a map or plan scale as a ratio, e.g. 1:20 000, the first number in the ratio is usually a 1 (representing one unit on the map or plan) and the second number is a much higher number, representing the distance in real life.
- If you have access to computers and the internet, allow students to investigate computer-assisted scale drawing to find out how it works.
- Students could visit or interview local people to find out about the policies and standards that planners, builders and other construction industry workers need to know about and follow as they do their work.

Chapter 4 Time (pages 54–65)

- Begin this chapter with a discussion about time. Ask students to share what they do at particular times of the day, e.g.:
  - What do you do at 7 o'clock in the morning?
  - What do you do at 7 o'clock at night?
  - What time do you wake up/go to bed/eat dinner?
  - What do you do that takes about an hour?
  - What do you do that takes a few minutes?
  - What takes longer than an hour?
- As they work through the Starting point activity, you may need to remind them of the different ways to write the time.
- Make sure that students can explain the meaning of time expressed in 24-hour language, e.g. 16:45 (sixteen forty-five) using words and drawings. They should be able to use 12-hour and 24-hour time notation confidently by now.
- Continue to remind students that time is not metric. They can write half an hour as 0.5 hours, but they need to remember that this is equal to 30 minutes, not 50 minutes.
- Let students show time on an analogue and digital clock, using 12-hour time notation. Then let them show time on a digital clock using 24-hour notation.
- Select an activity that students do in the morning and show this time on both an analogue and digital clock using the 12-hour system. Then let them choose their own evening activity and show the time this activity occurs on a 24-hour clock.
- Encourage students to describe their daily activities using both the 12-hour and 24-hour system. They can use a number line to calculate time intervals.
- Let students use manipulatives (in this case a clock face) when working with the 24-hour format, if necessary.
- Point out to students that when we talk about different times, how much time has passed between events, or how long something takes, we may use the following terms:
  - Period: a period of time is an amount of time, e.g. a school lesson is usually a 45-minute period.
  - Duration: the duration of an event is how long it takes, e.g. the duration of one school lesson is 45 minutes and the duration of the school day may be seven hours.
  - Time interval: a time interval is the time that passes between two events. We usually use this term when we divide a period into smaller periods or to repeat given periods of time, e.g. an hour-long training session made up of six ten-minute intervals.

Chapter 5 Perimeter (pages 65–75)

- Revise the meaning of perimeter – the distance around the boundary of a shape.
- Remind students that perimeter is expressed as a linear measure. In other words, we imagine the length of the whole boundary of the shape, even though it is made up of smaller lines. Encourage students to use mathematical language to describe their understanding of perimeter.
- Revise the definition of a polygon – a closed shape with straight sides.
- Students can use rubber bands on geoboards to create polygons with different perimeters.
- Use tape to create polygons on the floor of the classroom. Students can work in groups to measure and record the length of all the sides and add them together to find the perimeter.
- Talk about instances in real life where people need to measure the perimeter of objects to do something. If your school has a running track, look at the perimeter of the inside track versus the outside track. Explore why the starting blocks are positioned differently in a race such as the 400 m.
- Students can use graph paper or grid paper to draw different shapes and objects, and then work out their perimeter.
- Remind students that when they need to calculate distances or lengths given on a diagram, they should not try to measure the shape to find the answer. Diagrams are generally not drawn to scale and they should use calculations or formulae to find the answer.
- Remind students that perimeter is a measure of length (or distance). The units we use are mm, cm, m or km. Which unit is chosen depends on what is appropriate for the size of the shape being measured. It is important to make sure that all the side lengths are measured using the same units before adding them together. Where necessary, students should convert lengths to the same unit.

Chapter 6 3D solids and nets (pages 76–89)

- Revise the names of the different polygons with students – triangle, quadrilateral, pentagon, hexagon, heptagon, octagon and nonagon. Revise regular polygons (whose sides are all equal in length) and irregular polygons.
- Spend some time looking at the different types of quadrilaterals. Make sure that students understand what parallel lines are and how to recognise right angles. Go over the notation for marking lines of equal length on a geometric diagram.
- Give students time to draw some examples of different types of quadrilaterals (squares, rectangles, parallelograms). Emphasise that these shapes can be drawn in different orientations. They will need to recognise different quadrilaterals as faces of polyhedra later in the chapter, so it important that they are familiar with the different terms.
- Students have worked with 3D solids before, including cubes, cylinders, cuboids, prisms and pyramids. You may need to revise these terms with them and remind them how to distinguish between a cube (with six square faces) and a cuboid (with six rectangular faces).
- Ensure that students understand that a face is a flat surface. Solids can also have curved surfaces. Distinguish between a prism (two parallel, identical faces that are polygons, joined by rectangular faces) and a pyramid. Pyramids have one polygon as a base and the remaining sides are triangles that join at the apex (the top vertex).
- For the Maths detective activity about nets (page 87), provide real dice for students to work with and compare. Encourage them to make small nets on square paper, cut them out and fold them up roughly to check whether they work or not.

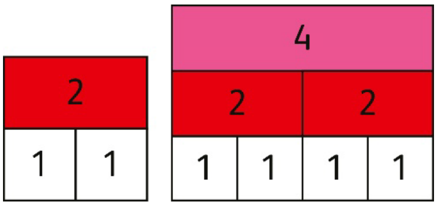
Chapter 7 Data handling (pages 90–115)

- Brainstorm situations in which students already use statistics in their daily lives.
- Let students discuss and research jobs in which people use statistics. Discuss why statistics are important.

- Make sure that students practise collecting, organising, representing, analysing and interpreting numerical data using different methods.
- For the Maths detective activity on pages 109–110, there are articles about Florence Nightingale and her charts available online.

Chapter 8 Types of number (pages 121–132)

- Use diagrams to help students distinguish between prime and composite numbers up to 10, as shown below. Look for students who notice that prime numbers only have two 'layers' made up of either the number itself or one.



- Practise representing square numbers and cube numbers in different ways so that students revisit the use of the exponential form, e.g. write $5 \times 5 = 25$ and $5^2 = 25$ to show that $5 \times 5 = 5^2$.
- Remind students that multiplication is commutative, so factors can be re-ordered if needed.
- Use a multiplication grid to explore numbers that are shared by more than one multiplication table. Look for students who notice that the numbers 12 and 24 are found frequently on the multiplication grid. You could use calculators to explore other multiples of 12 that appear regularly beyond the tenth multiple.
- Guide students to create tables or lists to record common time intervals to work out the answer to Case 2 of the Maths detective activity on page 129.

Chapter 9 Fractions (pages 133–149)

- Engage students in a discussion about examples of adding and subtracting fractions and mixed numbers in real life. Ask them if they can make a conjecture about why decimal fractions and decimal numbers are more likely to be used for calculations in fields such as engineering, science, commerce and medicine.
- Let students find out more about countries that still use imperial measurements. Measurements in the imperial system often involve fractions, e.g. $\frac{5}{8}$ inch.
- Encourage students to identify further examples of adding and subtracting fractions and mixed numbers.
- Conduct a class survey about how students choose to spend their leisure time, e.g. sports, reading, listening to music, going on outings. Students should then draw a pie chart and describe each set as a fraction of the whole. Extend the task by splitting each option further, e.g. reading can be split into fiction and non-fiction, outings can be split into the beach, park, visiting friends, shopping, and so on. Let students collect the data and then consider how to visually represent the data.
- Ask students to describe each new set as a fraction of the whole, e.g. in a class of 32, if reading represents $\frac{1}{8}$ of the whole and $\frac{3}{4}$ of these four students like fiction books, then $\frac{1}{8} \times \frac{3}{4} = \frac{3}{32}$ of the whole class like reading fiction books.
- Arrange for students to bring in their own recipes for cookies. Ask them to find the amount of each ingredient needed for a different number of servings.
- Finally, let students write a journal entry about the way maths was applied in this chapter and the other skills that they needed or learned.

Chapter 10 Decimals (pages 150–173)

- The first five short sections in this chapter mostly cover prior learning, so you can move through them quite quickly if students seem confident with the content.
- Explore using calculators to calculate decimals in the context of measurement, particularly with money. Look at interpreting the calculator display correctly, e.g. for $5000 – $2235.70, why is the answer $2764.30 even though the display shows $2764.3?
- Let students create a presentation using software or role play to explain how to multiply or divide decimals by any power of ten. They can work in small groups and discuss how to present the ideas so that they:
  - are memorable
  - help solve real-life problems
  - include advice about common mistakes.
- Explore the use of calculators to find equivalences for divisions with decimals. Investigate making equivalent multiplications with decimal numbers too, e.g. 0.4 × 0.6 as 0.04 × 6. Students should note how this differs from division and record their findings in their books.

Chapter 11 Ratio and proportion (pages 174–188)

- Give students 40 counters (or small objects) to share among some of the class so that for every one counter a 10-year-old takes, an 11-year-old takes three counters. Discuss the total number taken by 10-year-olds and the total number taken by 11-year-olds. Create equal groups using counters among the same age group to establish other equivalent ratios, e.g. 10:30, 5:15, 2:6.
- Let students work in pairs with a set of number cards from 1 to 20. They shuffle the cards and take turns to turn over two cards to make a ratio, e.g. one student turns over 5 and 20 and writes the ratio as 5:20 and 20:5. Challenge students to write each ratio in its simplest form (if it isn't already) and to then list five equivalent ratios.
- The Maths detective activities on pages 184–185 provide good opportunities to build in some STEAM links. Students can draw and then colour their designs (see Case 2) and use them to make a classroom display.
- If you wish, you can change the parameters of the task in Case 2 so that some students reduce the heart design in the ratio 2:1, while others copy it in the ratio 1:1 or enlarge it in the ratio 1:2. Students could also work in groups to do a much bigger enlargement (e.g. 1:10) on a poster, with different group members taking responsibility for completing different grid squares.
- Remind students that they have already learned about scale drawings and that this is an application of those skills.

Chapter 12 Percentages (pages 189–206)

- Give students the opportunity to represent and match different fractions to percentage amounts on 10 × 10 grids. Include examples such as $\frac{1}{2}$, $\frac{3}{4}$, $\frac{15}{100}$ and $\frac{9}{100}$, as well as examples that are made up of a number of tenths, e.g. $\frac{4}{10}$ as $\frac{40}{100}$ and 40%, so that students can discuss the relationship between tenths and hundredths.
- Use conversion between percentages, fractions with a denominator 100 and decimals as an opportunity to revisit division by 100. Students can use place value charts to model dividing by 100 and also use calculators, e.g. 41 ÷ 100 = 0.41.
- Extend learning by challenging students to give decimal equivalents for percentages expressed as mixed numbers, e.g. $12\frac{3}{4}$, $23\frac{1}{2}$, and so on.
- Look at entering a percentage value into a scientific calculator, e.g. key in 75 and then press the % button. Note how the value in the display is the decimal equivalent (0.75 in this example).

- Ask students to make 12 sets of three playing cards with equivalent decimals, percentages and fractions (in their simplest form), e.g. $\frac{2}{5}$, 0.4, 40% and 0.13, $\frac{13}{100}$, 13%, and so on. Students can play a matching game and decide on the rules.
- Invite students to calculate percentages of amounts related to their daily activities or interests, e.g. the percentage of the day they spend at school, the percentage of the day they do not spend at school, the percentage of their weekly allowance they use on going out, the percentage of goals their favourite team has scored so far this season, and so on.
- Provide students with a set of number cards from 50 to 100 and a set of cards with different percentages on them, e.g. 25%, $32\frac{1}{2}$%, 99%, 75%, and so on. They take turns to pick a card from each pile and together they find the percentage of the quantity. They then check with a calculator.
- Look at examples where it is easier to find the percentage that is the complement of 100%, e.g. to find 99% of a quantity, it is easier to find 1% and subtract from the whole.

Chapter 13 Area and tessellations (pages 207–225)

- Give students the opportunity to explore tessellations using simple drawing software. Look at the use of different colours to create designs. Perhaps they could design a new range of tiles for a bathroom design company. They could also research to find out about the Dutch artist M.C. Escher and the ingenious tessellations he created.
- Group students and ask them to make estimates of the areas of square or rectangular regions. To make estimates, they should think about how many one square centimetre (1 cm^2) or one square metre (1m^2) tiles would cover the area. They can then check their estimates by covering the regions with square-centimetre pieces or square-metre pieces. Make links to square numbers, e.g. 64 square units are used to cover an 8 × 8 square, 144 square units cover a 12 × 12 square, etc. Students may make connections to previous work on arrays in multiplication. They could also carry out a similar task using computer software.
- Give students the opportunity to arrange a page layout for articles and advertisements they have cut out from newspapers. Let them imagine that they work for a newspaper and want to cover the maximum possible area of a page. Lead a discussion about the way newspapers make money from advertisements, as well as from people buying the paper, so a good balance is needed.

Chapter 14 Area and volume (pages 226–236)

- Begin the chapter by asking groups of students to use estimates to help rank the boxes in the Starting point activity on page 226 using a 'diamond ranking' strategy. If your class is unfamiliar with this strategy, explain that they have to arrange the nine objects in a diamond formation, with the largest at the top and the smallest at the bottom. The second, third and fourth rows of the 'diamond' will consist of two, three and two boxes, respectively.
- Ask each group to explain their choice of ranking. Smaller groups can be combined to form a larger group of students to find the class consensus of ranking. Remind students that they will need to decide which boxes hold a similar amount. Challenge them to think about how they could use sand or polystyrene packaging to help them decide. You could carry out a similar investigation in the classroom with a set of boxes of different shapes and sizes.
- Give students the opportunity to build solids from the nets of different cubes. Challenge them to decide how many cubic centimetres each one will hold. They should also build unit solids of 1 cm^3 and 1 dm^3. Challenge groups of students to construct a unit solid of 1 m^3.
- Challenge students to make a computer presentation about the differences between finding the area of 2D shapes, the surface area of 3D objects and the volume of 3D objects. They can include information written in any form, pictures, diagrams, photographs or other visual representations.

Chapter 15 Symmetry and congruence (pages 237–249)

- Remind students of the polygons they have worked with earlier in this grade, particularly the different types of triangles and quadrilaterals. If possible, provide cut-outs of the different types – rhombus, parallelogram, square, trapezium, kite, isosceles triangle, scalene triangle and equilateral triangle. Let them explore which shapes have line symmetry.
- If possible, allow students to use paint or ink to explore design aspects of symmetry by creating blob paintings or paint drizzles, and folding the paper to create the mirror image. They could even use this activity to make creative greeting cards or wrapping paper.
- It is important that students can distinguish between:
  - shapes that are congruent
  - shapes that are similar but not congruent
  - shapes that are neither similar nor congruent.
- Students need to be able to test for congruency of a polygon by checking the lengths of corresponding sides and sizes of interior angles.
- Give groups of students some sets of plane shapes and 3D solids. Let them group and classify them in a variety of ways. Encourage them to discuss how they chose to classify them. Ensure that there are some shapes that are similar or congruent to each other.
- Remind students that when a figure is enlarged or reduced in proportion, the resulting figure is similar to the original.
- If students have access to online drawing programs, they can explore enlarging and reducing diagrams of 2D and 3D figures.

Chapter 16 Coordinates and reflections (pages 250–261)

- Begin the chapter by giving students the opportunity to revise locating points on a grid and identifying coordinates. You can draw a simple table on the board with five rows and five columns. Label the columns A, B, C, D, E and the rows 1, 2, 3, 4, 5. Ask them to describe what you have drawn and let them suggest how they would name or identify each block or cell on the table.
  If necessary, revise the following vocabulary:
  - Table: a grid of rows and columns
  - Vertical: going up and down
  - Horizontal: running from left to right
- Draw shapes in some of the cells in the table and let students name the positions using the letters and numbers (A3, D5, etc.). You could also name a cell and ask a student to come up to draw a shape in the correct cell. Ask guiding questions, such as:
  - What is the name of the cell two rows above B2?
  - What is the name of the cell three blocks to the right of A1? and so on.
- A fun alternative is to draw a coordinate grid in chalk on the ground outside and ask students to identify and move to specific locations. You can also play a version of 'Simon says' using instructions relating to the coordinates grid.
- The Starting point activity gives students the opportunity to practise using coordinates by playing a game of Battleships. They can play this in pairs. Note that it is not necessary to have special game sets – the game can simply be played with paper and pencils, as shown on page 250.
- Relate the work of coordinates to map work in Social Studies. Students can look at a map in an atlas and identify towns, cities or countries in specific cells of the coordinates grid. This can also be a good opportunity to show students how to use the index of an atlas, which will often use grid coordinates (e.g. A5, B9, etc.) to make it possible to locate places on a map.
- When students work with reflections, draw their attention to the position of the mirror line.
  In earlier grades, students identified mirror lines within symmetrical shapes. Once they start reflecting shapes across a mirror line on a grid, the distance of the original shape from the mirror

line becomes important. This distance should be the same for the object (the original shape) and the image (the reflection).

Chapter 17 Inequalities, variables and number patterns (pages 262–279)

- Prepare cards with simple open sentences for students to solve, e.g.:
  - $p + 200 = 500$. What is the value of p?
  - $\frac{1}{4}$ of $j = 75$. What is the value of j? and so on

  Use a variety of different operators and variables.
- Prepare cards with simple expressions and encourage students to think of a number and then calculate the value of the expression with their given number. They can then exchange results with a partner to work backwards to identify each other's starting numbers. Some examples of expressions are:
  - $2n + 10$
  - $4j + 25$
  - $7k \div 2$
- Show students various cards with expressions and equations. Ask them to identify whether or not each one is an equation and to explain their choice.

Chapter 18 Money matters (pages 281–297)

- If possible, have representatives from different financial institutions come in to talk to students about their roles and functions, as well as their products and services. Give students the opportunity to ask questions. If allowed, make recordings that can be referred to and discussed again at a later stage. Students could then imagine that they are founders of a new financial institution and create a brochure to show what it offers their customers.
- Provide opportunities for students to participate in discussions about real-world examples of profit and loss. Extend the theme to consider how countries profit financially from what and how much they export, and why those that import more than they export could face difficulties.

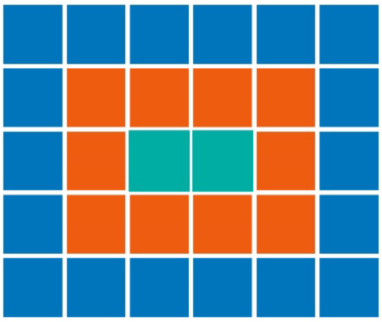
Chapter 19 Problem solving (pages 298–312)

- Set up opportunities for students to work collaboratively, e.g. divide them into groups of four and let each student take on a role in the three-step problem-solving approach (understand, plan, solve). The fourth student has the responsibility of estimating and checking. They can then swap roles.
- In the section on Problems involving percentages, talk about how question 7 on page 305 can be solved in a number of different steps, e.g.:
  - Step 1: find 15% of 1 million.
  - Step 2: find 40% of 1 million.
  - Step 3: find the total of step 1 and step 2.
  - Step 4: subtract step 3 total from 1 million.

  Or
  - Step 1: find the total percentage for the two days given, so 15% + 40% = 65%.
  - Step 2: find the difference between 65% and 100%.
  - Step 3: find 35% of 1 million.

  Students may find other ways to solve the problem too.

- Give students a scenario, e.g. you would like to make a mosaic of small tiles as a feature in your garden. You want to start with two central square tiles and then surround these a layer at a time, as shown below:



  Encourage students to work collaboratively and use pieces of square card to build up the mosaic pattern. They should use the previous layer to work out the number of tiles in the next layer and record their findings in a table. Let them reason about the different algebraic expressions that could be used to describe the term-to-term rule for this pattern linked to perimeter, e.g. the number of tiles in the next layer is the perimeter of the previous layer + 4 tiles, so:
  - $l + l + w + w + 4$ or
  - $2l + 2w + 4$ or
  - $2(l + w) + 4$

  Discuss why all these expressions are equivalent.
- In the Maths detective activity on investigating pressure and weight (page 309), point out that the calculations use metric units (kg and cm^2) and pressure is measured in bars.
- Explain that car tyre pressure can also be measured in PSI (pounds per square inch). If using this unit, the area of contact needs to be measured in square inches and the weight of the car needs to be given in pounds.

Chapter 20 Circles (pages 313–324)

- This chapter builds on earlier work with circles. Explain that Samira Mian is an artist who uses geometry to make beautiful designs and patterns. Give students the opportunity to do their own research to find out more about this artist and her work. Students could find one of her online video tutorials and follow the instructions to draw the design.
- When covering the section on Exploring circumference and diameter on pages 318–319, let students work with a partner to carefully draw circles of different sizes and measure the diameter and circumference of each one as accurately as possible. They can also use a flexible ruler instead of string to measure the circles. Let them work out the relationship between the diameter and the circumference by themselves, if possible. Encourage them to use a calculator to check the circumference of each circle. How close were they with their measuring?
- Remind students to use 3.14 for π.
- In the Maths detective activity about dendrochronology (pages 320–322), students use their measuring skills, knowledge of circles, formulae and graphs to solve the problems. You could show students an engaging video to demonstrate how scientists measure the age of trees using their circumference. There is a clear and interesting video showing how giant redwoods are measured at www.youtube.com/watch?v=s2lWZ4BSHQ4.
- Give students the opportunity to use what they have found out to answer each of the Maths detective cases in their book. Ask: Is it always true that a tree with a longer diameter is older than a tree with a shorter diameter? They should be able to find examples from the lessons to help them explain.

Chapter 21 Speed, time and distance (pages 325–337)

- When you work through the Key maths idea on speed, distance and time (page 327), make sure that students understand the time travelled to cover a specific distance will depend on the mode of transport used and thus on how fast you can travel. For example, the child who lives furthest away may come by car and need less time than the child who walks a shorter distance. Encourage students to begin to generalise that distance and speed have an effect on time taken.
- Remind students that when we multiply speed by the time taken, we can find the distance travelled: distance = speed × time. Show students the diagram on page 329 and ask guiding questions, such as:
    - How do you think you can use the diagram to find the speed when you know the distance covered and the time taken?
    - How do you think you can use the diagram to find the time taken when you know the distance covered and the speed?

  Let students explain to a partner how the diagram represents this.
- Help students explore using the formula triangle. Show them that when they cover the value they need to find, the formula will be revealed by the two remaining values that they can see.
- Give students the opportunity to work in groups to create a drama presentation about how pedestrians and other road users can stay safe. Their presentations should include rules for crossing a road safely. Let them do their presentations in class.
- If you have the right equipment, encourage students to carry out their own experiments with rolling objects across different surfaces to compare the time different objects take on the same surface. Let them change the slope of the ramp to see how this affects the speed of the objects.
- Do some activities to test students' sense of time, e.g. ask them to sit silently for 30 seconds and to raise their hands when they think the time has passed. Use a timer or watch with a timer function that buzzes to show when the time has passed.
- Do some experiments with walking and running speeds. Students could also compare their own speeds to the speeds at which different animals can run or swim.

Chapter 22 Angles (pages 338–349)

- Do some fun practical warm-ups to revise angles. Let students hold their arms outstretched and together, and then open them to form a small angle, then open them wider to form a larger angle. Ask them to keep going and stop at a right angle. Ask guiding questions, such as:
    - Who remembers how many degrees are in a right angle?
    - What happens if we open up our arms by another 90°?
- Remind them that a straight line measures 180° and a full turn is 360°.
- Let them come up with their own definitions for angles. They can work together to refine their definitions and then check against the information in the section on Classifying angles (page 339).
- Throughout the chapter, use real-life examples to illustrate the different types of angles, e.g.:
    - opening and closing a book (viewing it from the top so that it forms a V-shape when open)
    - the angles formed by clock hands at different times
    - the angles formed by scissors opening and closing
    - the angles formed by a door or window.
- Remind students that they learned how to use a pair of compasses to draw circles in Chapter 20 (pages 316–317).

Chapter 23 Solving simple equations (pages 350–360)

- Spend some time reviewing the conventions for writing algebraic expressions. It is important that students are able to simplify expressions where possible, e.g. $b + b + b = 3b$.

- It is very common for students to get confused about the distinction between $2k$ (which means $2 \times k$ or $k + k$) and k^2 ($k \times k$), especially when an expression has both a coefficient and an index, e.g. $4k^2$. It is worth practising expanding these expressions (e.g. $4 \times k \times k$) and using real-life contextual examples wherever possible.
- For the balancing weights questions (pages 353–354), you can make cut-out shapes for students to 'balance' on a ruler to model a see-saw or balance scale. Emphasise that to keep it balanced, whatever is taken away from one side should be take away from the other side. Similarly, whatever is added to one side should be added to the other side to keep both sides equal.
- Throughout the chapter, use a variety of forms of representation to help students make sense of expressions and equations. One idea is modelling the different terms using different counting objects, shapes or counters. For example, $3p + 2m$ could be represented as three triangles and two squares. Another idea is to use bar models, such as those in question 1 on page 355, which students also used in Chapter 19 (pages 302–303).
- When working through the equations, allow students to share their working and understanding in pairs or groups, rather than focusing on getting the problems right individually.

Chapter 24 Probability (pages 361–372)

- Students should by now know the probability scale, which goes from 0 to 1, from impossible to certain. It is important that they understand the maximum probability is 1 (or 100%).
  Other probabilities, for events that are possible but not certain, are always expressed as a fraction or as a percentage.
- Students should be able to work out the theoretical probability of something happening, e.g. a coin can land only on heads or tails, so there are two possibilities. This means that for a fair coin, there is an equal chance of heads or tails.
- A probability can be expressed as a fraction. Remind students to compare the number of favourable outcomes with the total number of outcomes, e.g.:
  - The probability of getting tails when flipping a coin is $\frac{1}{2}$.
  - The probability of getting a six when you roll a normal die is 1 of 6 possible outcomes or $\frac{1}{6}$.
  - The probability of rolling an even number is 3 out of 6 possible outcomes or $\frac{1}{2}$.
- Experimental probability can be a little confusing to grasp. Students need to realise that experimental probability is what *actually* happens in a given set of trials or events. If a coin is flipped six times, the theoretical probability is that it will land three times on heads and three times on tails – an even chance of both outcomes. If the coin is flipped and lands on heads all six times, the experimental probability is 100% heads. This does not, however, change the theoretical probability the next time.

Chapter 1 Sets

Members of sets (pages 9–10)

1 Student's own work

2 a 4 members

b 12 members

c 26 members

d 1 member

3 a A = {squares}, B = {triangles}

b Shapes could be organised into colours, so notation would be A = {red shapes}, B = {blue shapes} or vice versa.

4 a $\in$

b $\notin$

c $\in$

d $\in$

Equal and equivalent sets (page 11)

1 B and F

2 a $\not\leftrightarrow$

b $\leftrightarrow$

c $\leftrightarrow$

d $\leftrightarrow$

e $\leftrightarrow$

f $\not\leftrightarrow$

3 Student's own work

Finite and infinite sets (page 12)

1 a Finite

b Infinite

c Finite

d Infinite

e Finite

2 a Finite

b Finite

c Infinite

d Infinite

3 a {1, 2, 3, 4, 6, 8, 12, 24}

b {9, 18, 27, 36, 45, …}

c {2, 3, 5, 7, 11, 13, 17, 19, 23, 29}

d {42, 44, 46, 48, 50, …}

e {2, 12, 22, 32, 42, …}

Subsets (pages 13–14)

1 a True

b True

c True

d False

2 a Squares $\subset$ rectangles

b Rectangles $\not\subset$ rhombuses

c C $\subset$ B but B $\not\subset$ A

3 a $\not\subset$

b $\subset$

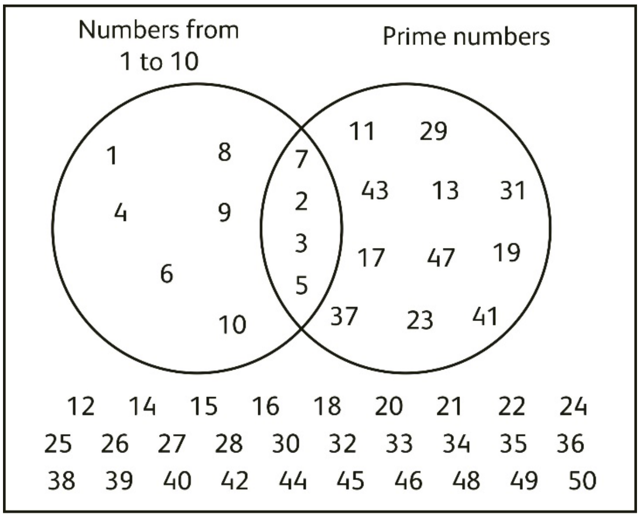
c $\not\subset$

d $\subset$

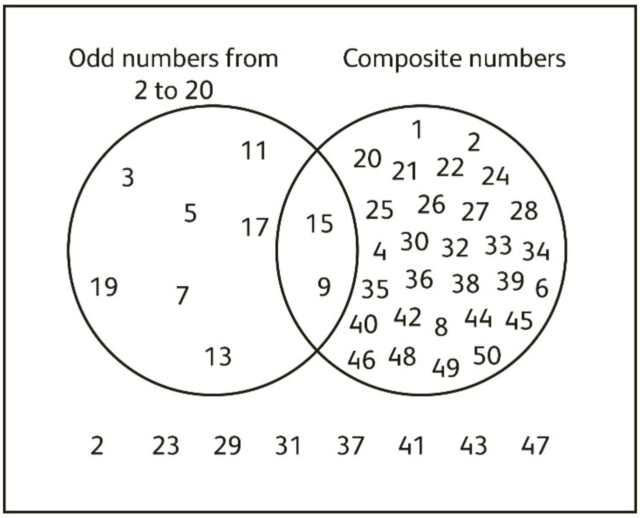
4–5 Student's own work

Venn diagrams (pages 14–15)

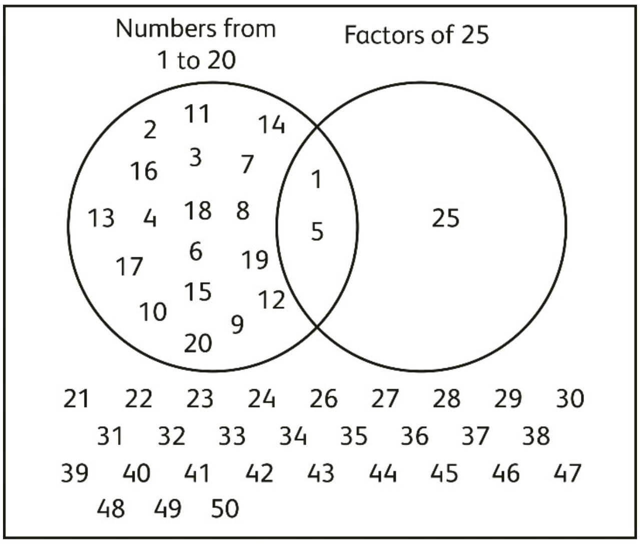
1 a



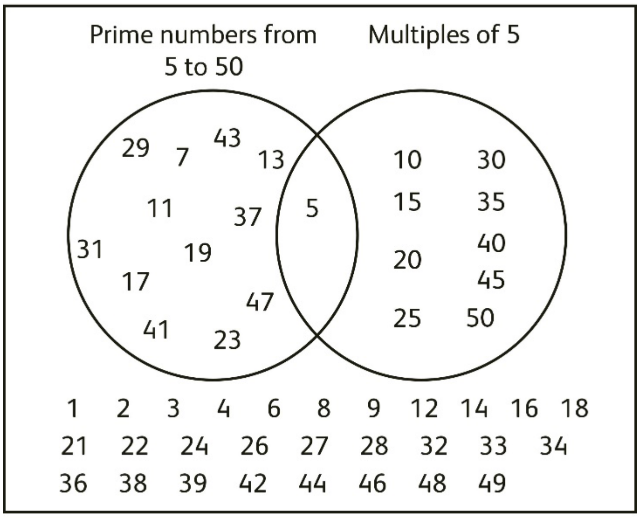
b



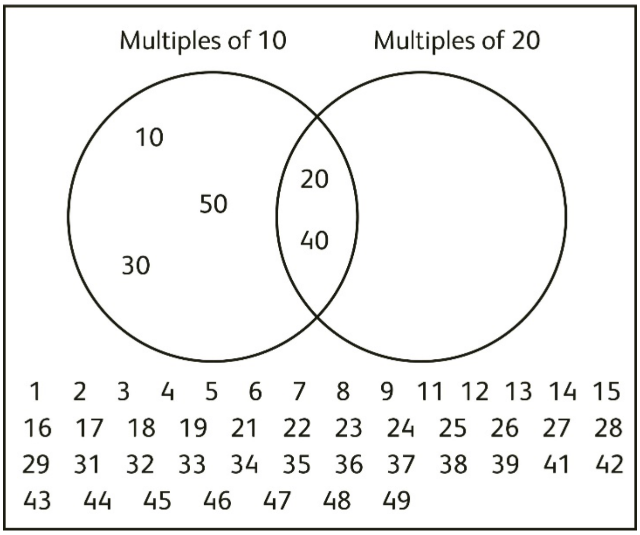
c


Numbers from 1 to 20
Factors of 25
2 11 14 16 3 7 13 4 18 8 17 6 19 15 12 10 9 20
1
5
25
21 22 23 24 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

d


Prime numbers from 5 to 50
Multiples of 5
29 7 43 13 11 37 31 19 17 47 41 23
5
10 30 15 35 20 40 45 25 50
1 2 3 4 6 8 9 12 14 16 18
21 22 24 26 27 28 32 33 34
36 38 39 42 44 46 48 49

e


Multiples of 10
Multiples of 20
10 50 30
20
40
1 2 3 4 5 6 7 8 9 11 12 13 14 15
16 17 18 19 21 22 23 24 25 26 27 28
29 31 32 33 34 35 36 37 38 39 41 42
43 44 45 46 47 48 49

2 a 7 people

b 3 people

c 21 people

d 30 people

e People who were asked whether they liked cats and dogs.

3 a 10 members

b Maths lessons after school = {Luca, Jay, Lee, Ann, Leo}

c 2 students

d Does not do maths or Spanish lessons after school = {Lydia, Micah}

Intersection and union of sets (pages 16–17)

1 a $A \cap B$ = {April, August}

b Student's own work

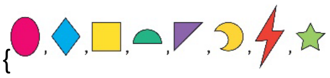
c Months of the year

d Words beginning with the letter 'A'

e Not in set A or set B

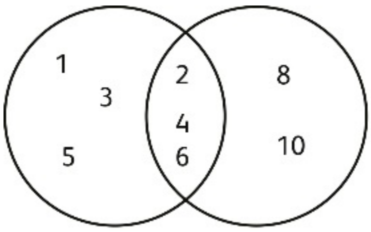
2 a $C \cup D$ = {a, b, c, d, e, f, g, h, i, j, k, l, m}

$C \cap D$ = {f, g, h}

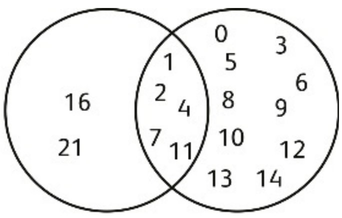
b $X \cup Y$ = {}

c $X \cap Y$ = {}

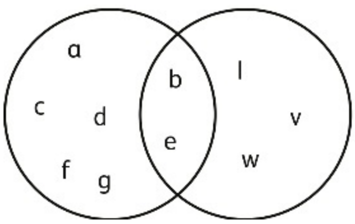
3 a {2, 4, 6}



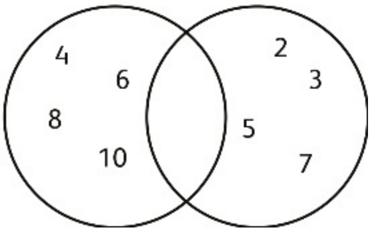
b {1, 2, 4, 7, 11}



c {b, e}



d { }



4 a {1, 4, 8, 9, 10, 12, 14, 16, 25}

b {Liam, Kyle, Amelia, Ariana, Ashley}

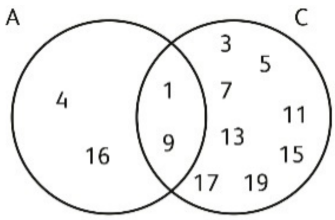
c {80, 88, 89, 90, 91, 92, 100}

5 a ∪

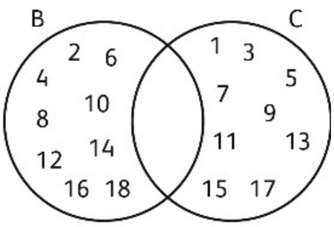
b ∪

c ∩

6 a



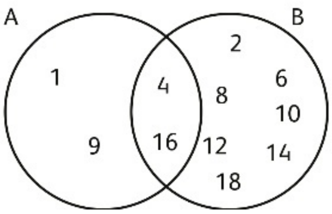
b



c {4, 16}

d {1, 2, 4, 6, 8, 9, 10, 12, 14, 16, 18}

e



Disjoint sets (page 18)

1 Not disjoint

2 Disjoint

3 Disjoint

4 Disjoint

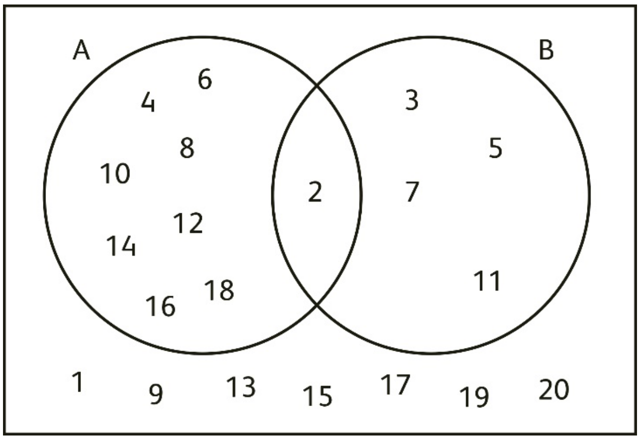
5 Disjoint

Practice questions (page 22)

1 a 5 members

b $R \cap C = \{6\}$

2



3 a $Y = \{1, 2, 3, 5, 6, 9\}$

b 8 members

c {1, 2, 3, 6}

d {1, 2, 3, 4, 5, 6, 7, 9}

Chapter 2 Place value and exponents

Reviewing HCF and LCM (pages 25–26)

1 a Factors of 10: 1, 2, 5, 10

Factors of 25: 1, 5, 25

Factors of 30: 1, 2, 3, 5, 6, 10, 15, 30

Common factors: 1, 5

HCF: 5

b Factors of 12: 1, 2, 3, 4, 6, 12

Factors of 18: 1, 2, 3, 6, 9, 18

Factors of 40: 1, 2, 4, 5, 8, 10, 20, 40

Common factors: 1, 2

HCF: 2

c Factors of 24: 1, 2, 3, 4, 6, 8, 12, 24

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

Factors of 16: 1, 2, 4, 8, 16

Common factors: 1, 2, 4

HCF: 4

2 Class activity

Exploring place value (pages 27–28)

1–6 Class activities

7 b 3 thousands = 3000

c 4 ones = 4

d 9 thousands = 9000

e 9 thousands = 9000

f 5 thousands = 5000

g 8 hundred thousands = 800 000

h 5 ten thousands = 50 000

8 Student's own work

9 a 12 385

b 95 000 000

c 2 952 000

d 307 493 229

e 580 203

f 673 111 307

g 712 966

h 37 926 061

i 909 105

j 17 006

Large numbers in real life (pages 29–30)

1 a Mr John

b Ms Brown

c $29 000, $48 000, $49 440, $96 780, $120 944

2 a India

b Bermuda

c Costa Rica, Jamaica, Bermuda

d India, United States, United Kingdom

e One billion, three hundred eighty million, four thousand, three hundred eighty-five

f Sixty-two thousand, two hundred seventy-eight

g Sixty-seven million, eight hundred eighty-six thousand, eleven

h 300 000 000 + 30 000 000 + 1 000 000 + 2000 + 600 + 50 + 1

i 10 000 000 + 7 000 000 + 900 000 + 10 000 + 5000 + 500 + 60 + 8

j 5 000 000 + 90 000 + 4000 + 100 + 10 + 8

Exponential form (pages 30–31)

1 a 100 000

b 8

c 16

d 27

e 125
f 81
g 64
h 32
i 625
j 216
k 1
l 7

2 a 10 000
b 16
c 9
d 256
e 25
f 36
g 144
h 343
i 4096
j 1

3 a 4
b 6
c 0
d 5
e 3
f 1
g 7
h 2

Scientific notation and standard form (page 32)

1 Class activity

2 a 10^2
b 10^3
c 10^4
d 10^5
e 10^6

3 a 1024
b 4096
c 8303.77
d 1.91

4 a 2130
b 349 900

c 9 189 700

d 500 010 000

5 a 1.5×10^1

b 4.5×10^2

c 9.828×10^3

d 8.4735×10^4

e 4.00289×10^5

Practice questions (page 37)

1 a 5, 10, 15, 20, 25, 30, 35, 40, 45, 50

7, 14, 21, 28, 35, 42, 49, 56, 63, 70

10, 20, 30, 40, 50, 60, 70, 80, 90, 100

b 35

c 2

2 Student's own work

3 a False. Odd numbers can have factors that make them composite numbers.

b True. All even numbers greater than two have 2 as a factor and therefore are composite numbers, not prime numbers.

4 a 10 000 000 + 4 000 000 + 500 000 + 60 000 + 9000 + 500 + 80 + 8

b 30 000 + 3000 + 90 + 8

c 10 000 000 + 7 000 000 + 800 000 + 10 000 + 5000 + 80 + 9

d 40 000 + 5000 + 900 + 10 + 6

5 Student's own work

6 a 9999

b 100 000

c 99 999 999

d 1000

e 999

f 10 000

g 99 999

h 1 000 000

i 999 999

j 10 000 000

7 Student's own work

8 a 100 000

b 1 000 000

9–10 Student's own work

Chapter 3 Distance and scale

Revising fractions and ratios (pages 40–41)

1 a 7

b Circles

c $\frac{4}{7}$

d Triangles : circles

2 a 4 cm on the map = 1 km in real life

b If 4 cm = 1 km, then 1 cm = $\frac{1}{4}$ km = 250 m

3 Class activity

Correct scale is c: 250 m = 25 000 cm, so 1 cm on the map = 25 000 cm in real life)

Revising units of measurement (pages 41–42)

1 a m to km: 1 : 1000

cm to m: 1 : 100

mm to m: 1 : 1000

b Multiply 2 by 1000: 2 km = 2000 m

c 1.5 m

d Multiply by 1000 and then by 100.

2 Measurements to the nearest centimetre:

a 4 cm; 40 mm

b 2 cm; 20 mm

c 4 cm; 40 mm

d 1 cm; 10 mm

3 a 2.6 cm

b 1.3 cm

c 3.8 cm

d 5.2 cm

4–5 Student's own work

Scale measurements (pages 44–46)

1 Class activity

2 a 70 km

b 2.85 cm

3 a 4.25 km

b 8.75 km

c 2.05 km

4 a 1 cm on the scale = 16 km in real life

b Students should measure the scale shown and explain that distance measured on the drawn scale is equal to the indicated distance of 16 km in the scale image.

c Around 3.1 cm. (16 km = 1 cm, so 3 × 16 km = 48 km = 3 cm.)

d 72 km

5 a 8 cm

b 16 cm

c 5.5 cm

Scale drawings (page 48)

1 Accept measurements within 2 mm of those given in the table.

Measurement	Length on floorplan	Length in real life (cm)
Length of passage	5.4	432
Width of passage	1.6	128
Width of Bedroom 1	3.6	288
Width of bathroom	1.6	128
Width of house (at widest point)	11.7	936

2 Length of passage = 4.32 m

Width of passage = 1.28 m

Width of Bedroom 1 = 2.88 m

Width of bathroom = 1.28 m

Width of house (at widest point) = 9.36 m

Practice questions (pages 52–53)

1 a 10

b 100

c 1000

2 a 6600

b 66

c 0.066

d 26 500

e 26.5

f 0.0265

g 25 500

h 2550

i 0.0255

j 1 500 000

k 150 000

l 1500

3 60 km

4 a 400 m

b 750 m

c 9 cm

5 4 cm

6 24 m

Chapter 4 Time

The 24-hour time system (pages 56–58)

1 a 23:15

b 13:00

c 20:30

2 a 08:00

b 7:30 a.m.

c 8:15 a.m.

d 11:35

e 12:00

3 Purple clock – 07:10 Green clock – 21:20

Blue clock – 13:10 Red clock – 00:45

4 Pink clock – 13:25 Brown clock – 03:30

Yellow clock – 22:40 Purple clock – 01:55

5 a 10:14 a.m.

b 1:30 p.m.

c 6:15 p.m.

d 9:17 p.m.

e 7:08 p.m.

6 a 16:30

b 10:15

c 18:45

d 11:20

7 a 20:00

b 23:00

c 9:45 p.m.

d 23:55

e 00:00

8 If Lamar is looking at his clock very early in the morning, he is correct. If he is looking at his clock in the afternoon, he is incorrect and the 24-hour time should be 14:22.

Solve problems involving time (pages 59–60)

1 a 1 hour, 10 minutes

b No, the 07:43 bus does not stop at Albion.

c 50 minutes

d 07:37

e 07:58

2 a 3 hours, 10 minutes
b 2 hours, 20 minutes
c 23 hours, 30 minutes
d 2 hours, 15 minutes
e 2 hours, 25 minutes
f 7 hours, 15 minutes

3 16:20

4 a 1 hour, 35 minutes
b 50 minutes
c 5 minutes
d 45 minutes
e You do not know the end time of the Nightly News.

Practice questions (pages 63–64)

1 34 minutes

2 a 11:59 p.m.
b Midnight

3 Longer by 1 hour and 22 minutes

4 a Badminton and tennis
b Swimming and gym
c Football

5 b, 3 h 34 min

6 20:55 – Five minutes to nine
13:50 – Ten minutes to two
09:55 – Five minutes to ten
15:05 – Five minutes past three
02:50 – Ten minutes to three
16:10 – Ten minutes past four

7 a 70 minutes (or 1 hour, 10 minutes)
b 35 minutes
c 17:36

Chapter 5 Perimeter

Measuring and calculating perimeter (pages 66–67)

1 a 10 cm
b 16 cm
c 16 cm

2 a 160 mm
b 140 mm
c 147 mm

Using properties of shapes to work out perimeter (pages 67–68)

a 40 cm

b 36 cm

c 70 cm

d 340 cm

e 520 mm

f 72 cm

Finding the perimeter of regular polygons (page 69)

1 a P = 5s

b P = 6s

c P = 7s

d P = 8s

2 $P = 2s_1 + 2s_2$

3 a 24 cm

b 50 cm

c 50 cm

d 5 cm

4 Student's own work

Solving problems involving perimeter (pages 70–71)

1 30 cm

2 48 m

3 80 cm

4 a 10 m

b 32 m

5 a 6.5 m

b Irregular hexagon, perimeter 8.8 m

6 a 180 cm

b 45 cm

7 9.5 cm

8 Student's own work

Practice questions (page 74)

1 a x = 90 cm

b y = 22 mm

c z = 15 cm

2 5 cm and 9 cm

3 576 mm

4 d, 24 cm

5 a 15 rose bushes

b 30 marigold plants

Chapter 6 3-D solids and nets

Revising what you know about shapes and their properties (pages 77–78)

1 a Circle; not a polygon

b Hexagon; polygon

c Parallelogram (or hexagon); polygon

d (Irregular) pentagon; polygon

e (Irregular) quadrilaterals and pentagons; polygons

f Pentagons and heptagons; polygons

2 Square: 2 pairs of opposite sides equal in length
all sides equal in length
2 pairs of parallel sides
2 pairs of adjacent sides equal in length
4 right angles
2 lines of symmetry

Rectangle: 2 pairs of opposite sides equal in length
2 pairs of parallel sides
4 right angles
2 lines of symmetry

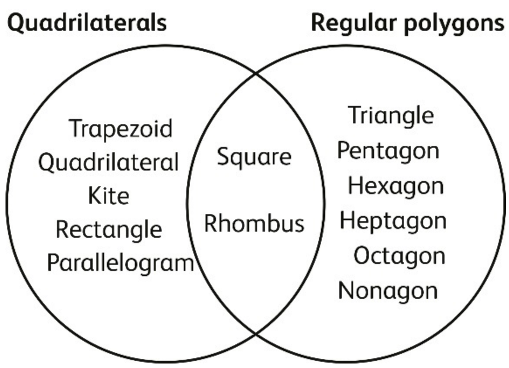
Trapezium: 1 pair of parallel sides
1 line of symmetry

Parallelogram: 2 pairs of opposite sides equal in length
2 pairs of parallel sides

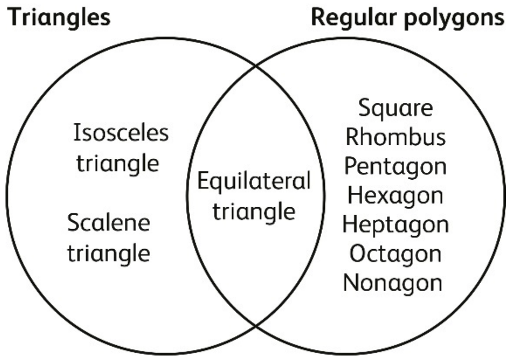
Rhombus: 2 pairs of opposite sides equal in length
all sides equal in length
2 pairs of parallel sides
2 pairs of adjacent sides equal in length
2 lines of symmetry

Kite: 2 pairs of adjacent sides equal in length
1 line of symmetry

3 a



b



Solid shapes (pages 79–80)

1 a Cube; squares

b Cylinder; circle (face), rectangle (curved surface)

c Cylinder; circle (face), rectangle (curved surface)

d Cylinder; circle (face), rectangle (curved surface)

e Triangular prism; triangles and rectangles

f Square-based pyramid; triangles and square

2–3 Class activities

Exploring polyhedra (pages 81–82)

1 a 6 faces, 12 edges, 8 vertices; faces are rectangles

b 5 faces, 8 edges, 5 vertices; faces are a square and four triangles

c 6 faces, 12 edges, 8 vertices; faces are squares

d 5 faces, 9 edges, 6 vertices; faces are two triangles and three rectangles

e 4 faces, 6 edges, 4 vertices; faces are triangles

2 a Sometimes true

b True

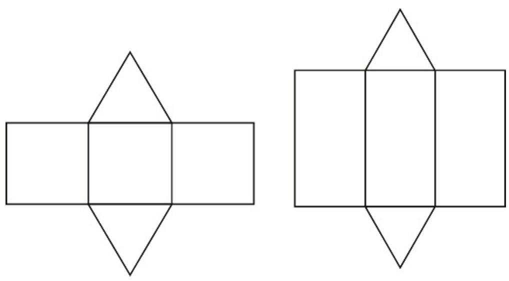
c True

d Sometimes true

3–4 Class activities

Nets (pages 83–85)

1 Below are examples of the nets students may produce.



2 Seven polygons: two pentagons and five rectangles

3 a She added one too many rectangles.

b Student's own work

4

Shape	Number of faces	Shapes of faces	Number of edges	Number of vertices
Purple	20	Equilateral triangles	30	12
Blue	6	Squares	12	8
Yellow	8	Equilateral triangles	12	6
Red	4	Equilateral triangles	6	4
Green	12	Regular pentagons	30	20

5 The shape on the left is made from regular tetrahedra.

The shape on the right is made from regular pentagonal pyramids.

Practice questions (page 88)

1 A circle does not have straight lines/sides.

2 It has two pairs of sides that are equal in length, but all of its sides are not equal in length.

3 Student's own work

4 Example answers:

a square

b rectangle or square

c rectangle or square (both have 2 pairs of parallel sides)

d rhombus

e parallelogram

f trapezium

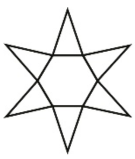
5 Sphere because it does not have vertices and edges.

6 a Triangular and rectangular faces, triangular prism

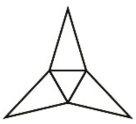
b Square and triangular faces, square-based pyramid

c Square faces, cube

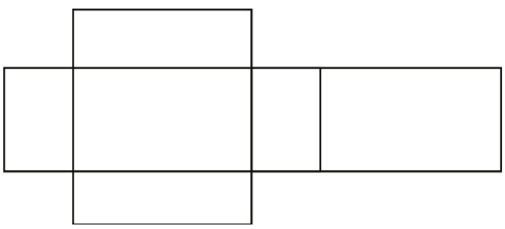
7 a



b



c



Chapter 7 Data handling

Data handing (pages 92–93)

1–4 Student's own work

Collecting information (pages 93–94)

1 a A: Bar graph

B: Pictograph

C: Pie chart

D: Tally chart

E: Bar graph

b A: How many Grade 6 students use different types of transport to travel to school

B: How many house points different teams scored

C: Colours of cars that drove past in an hour

D: Number of baskets that each person collected

E: Information missing – headings and axis titles

c Student's own work

2 a 32 people

b It is not presented in a way which is easy to process.

c Put the data into a frequency table or tally chart, or use it to draw a bar chart.

3 a Sandwich, cookies, muffin, chocolate, fruit

b

Food	Tally
Sandwich	~~IIII~~
Cookies	~~IIII~~ I
Muffin	~~IIII~~
Chocolate	II
Fruit	IIII

c Students like cookies the most, and chocolate the least.

Presenting data in graphs (page 95)

a Pictograph. It uses triangles to represent information that can be counted, with a key to show what each triangle represents. The graph answers the question: 'What activities has Mike doen on weekends over the last 2 months? It shows the activities Mike has done.

b Pie chart. It is a circle with portions representing different parts of the data set. The data answers the question: 'How did Ali spend their day'. It shows what Ali did during the day.

c Line graph. It shows a variable changing over time. It answers the question: 'How does the temperature of water in a pot change over time? It shows how the temperature of water in a pot changes over 14 minutes.

d Bar graph. It has vertical bars on a pair of axes. It answers the question: 'How much recycling was collected by classes A and B over three weeks? It shows how much recycling was collected by the two classes over the course of three weeks.

Revising tables, tallies and pictographs (page 96)

1 Both have a symbol/tally to represent items that were counted. A tally chart uses lines but a pictograph uses symbols (small images). A tally chart does not need a key because each line is always one item, but a pictograph needs a key because the symbols can represent different numbers of items.

2 If the pictograph does not have a key, it is not possible to know how much data was collected.

3 Student's own work

Bar graphs (pages 97–99)

1 The scale is too small. Andre should use a scale with increments of 5 or 10 so he can fit the data into the graph accurately. Andre should also label the axes: horizontal axis is 'Day' and vertical axis is 'Number of tickets sold'.

2 a

Transport	Number of children
Car	12
Walk	14
Bus	8
Cycle	10

b Walking

c Bus

d 44 children

e 2 children

f Student's own work

3 a 4 times

b 5 more

c The bar for bus number 39 is the smallest.

4 a It has two bars next to one another for each section of data.

b The pink bars represent Class 6A and the blue bars represent Class 6B.

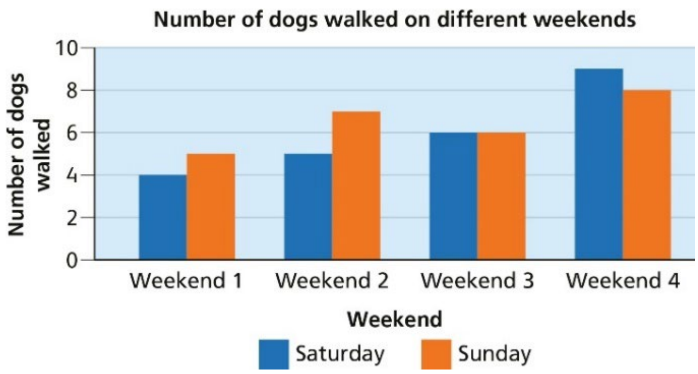
c Wednesday

d Monday, Tuesday, Thursday and Friday

5 a Saturday: 5

Sunday: 3

b



Histograms (pages 100–101)

1 2 tomatoes

2 7 tomatoes

3 a Mass between 150 and 200 grams

b Mass between 250 and 300 grams

4 Bar graph, because the data is discrete (it can be divided into categories)

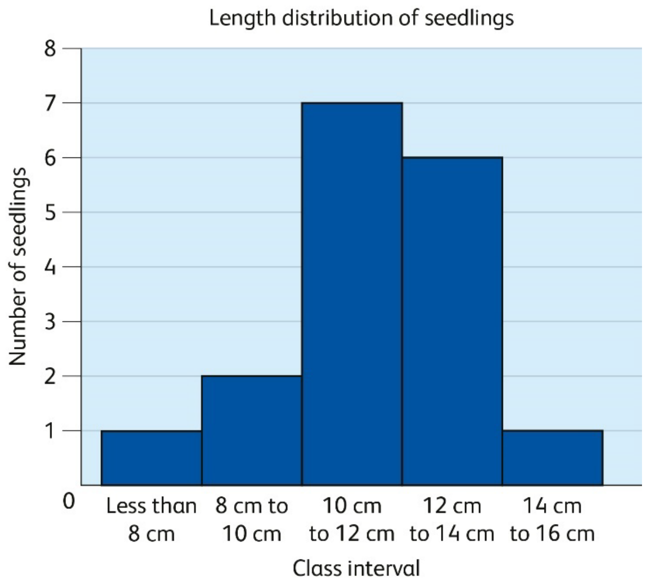
5 a Greatest: 15.2 cm

Smallest: 7.3 cm

b

Class interval	Values		
Less than 8 cm	7.3 cm		
Equal to or greater than 8 cm and less than 10 cm	8.5 cm	9.9 cm	
Equal to or greater than 10 cm and less than 12 cm	10.1 cm 10.5 cm 10.9 cm	11 cm 11.5 cm	11.7 cm 11.9 cm
Equal to or greater than 12cm and less than 14 cm	12.1 cm 12.2 cm	12.6 cm 13 cm	13.3 cm 13.8 cm
Equal to or greater than 14 cm and less than 16 cm	15.2 cm		

c–d



Drawing a line graph (page 102)

1 a 16 °C

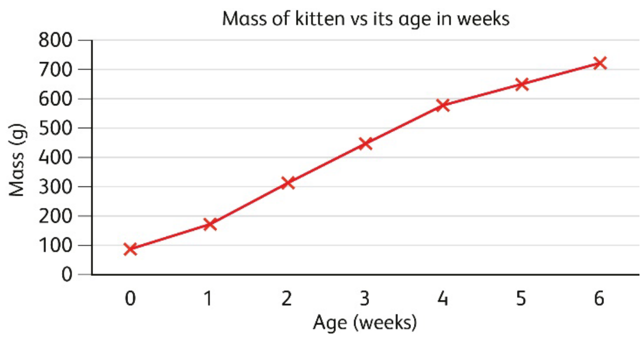
b 45 minutes

c 1 hour 15 minutes; the temperature starts to go up again

d Student's own work

2 a Student's own work

b



3 Class activity

Pie charts (pages 103–104)

1 a Computer

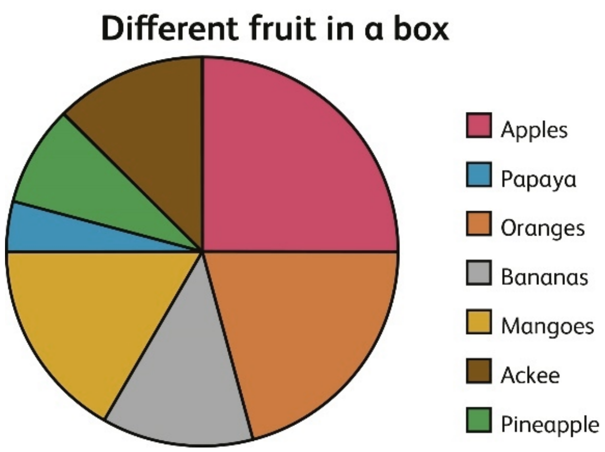
b Other things

c We do not know how much free time she has in total.

d Students may find it difficult to estimate the number of hours. Remind them that they do not need to measure accurately. Help them to work out that, as the student has 40 hours of free time, 90° in the pie chart represents 10 hours of free time. Students might then estimate the following rough times: 14 hours computer, 12 hours of sport, 4 hours TV, 8 hours books, 2 hours other. Accept any suitable estimates.

2 c; this pie chart shows $\frac{3}{4}$ of the circle labelled Jamaica and $\frac{1}{4}$ labelled Other.

3



4 Student's own work

Stem-and-leaf plots (pages 105–107)

1 a A student took 3.0 seconds to tie the pair of shoelaces.

b How they are distributed among the whole seconds.

c Two students had a time of 2.9 seconds and two students had a time of 3.4 seconds.

2 a 55 years

b Median: 55.5 years

Mean: 52.9 years

c

Stem	Leaf
2	3 8 9
3	4
4	3 3 9
5	0 4 7 8
6	3 5 5 9
7	0 4 8

Key: 2 I 3 means 23 years

3

Stem	Leaf
4	3 9
5	4 4
6	4 7
7	3 7 8

Key: 4 I 3 means 43

4 a

Stem	Leaf
7	2 3 4 5 6 7 9
8	1 2 3 4 5 8
9	0 0 5 6 7

Key: 7 I 2 means $72

b $90

c $83.17

d $82.50

e $25

5 a 30 minutes

b 27 minutes

c 34 minutes

d 29.4 minutes

6 a

Stem	Leaf
0	9
1	3
2	2 5 8
3	2 4
4	2 5

Key: 0 I 9 = 9 minutes

b 36 minutes

c There is no modal time. The modal group is 20–30 minutes.

d 28 minutes

e 28 minutes

Using data (pages 107–108)

1 Student's own work

2 a Yes, a higher percentage of people agreed than disagreed with the plans.

b Example answer:

Should the school dig up one of the school sports fields to build a bigger cafeteria? Choose one option.

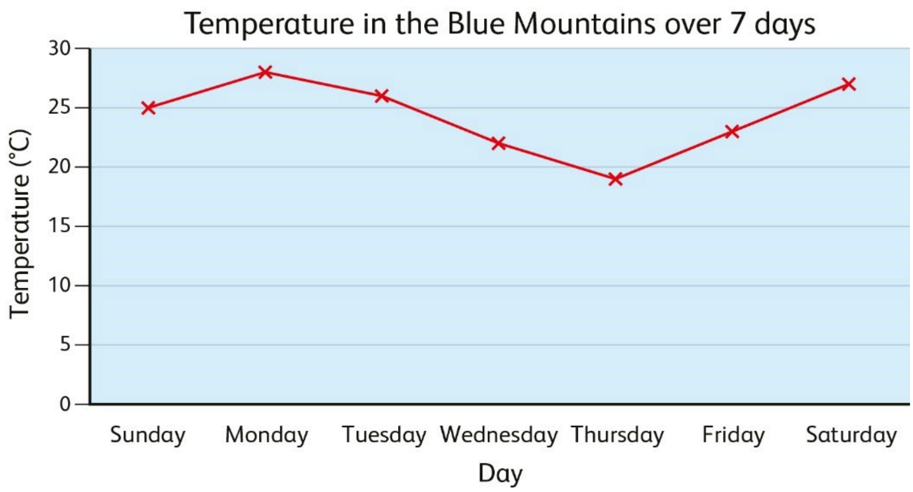
Strongly agree *Agree* *Neutral* *Disagree* *Strongly disagree*

c Student's own work

3 a The question does not give a time period (for example, 'How many hours do you spend watching TV each week?'). The groups overlap: if a student watches 5 hours of TV, they could tick 1–5 hours or 5–10 hours.

b Student's own work

4 a



b 19°C; Thursday

c Tuesday

d It shows how a variable (temperature) changes with time.

Practice questions (pages 113–114)

1 a Student's own work

b A pictograph. (A bar chart would also work but is not listed as one of the options.)

2 a A histogram has all bars touching one another and a line graph shows a variable changing with time. This graph has bars separated from one another.

b He did not look at the axis title – Usain Bolt has 12 million followers.

c 41 million followers

d Student's own work

3 a 40 students

b Orange juice

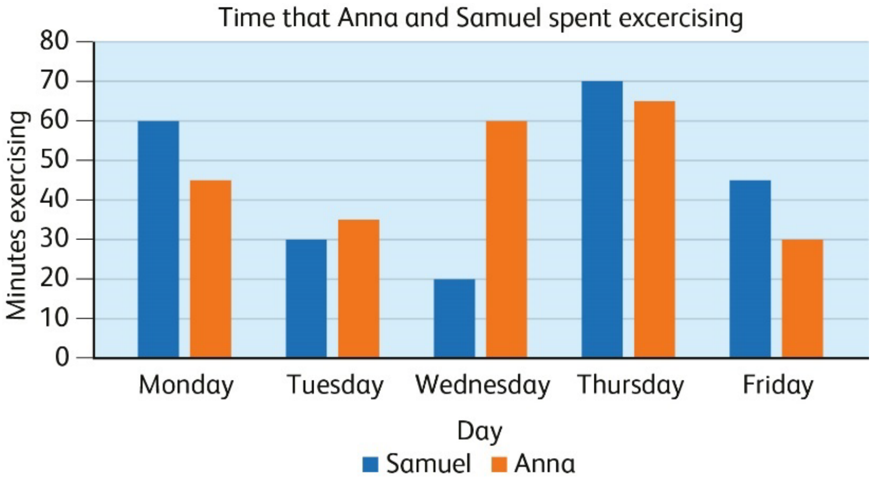
c Fractions multiplied by 360 will give you the angles that the data represents.

4

Stem	Leaf
12	4 5 8
13	2 5 8 9
14	1 3 4 4 7
15	1 1 2 7 8 9
16	0 2 5 6 7
17	1

Key: 12 I 4 = 124 cm

5



PEP task: A chocolate brownie fundraiser (pages 116–119)

Part 1

1 a 5 cm × 5cm

b 62.5 cm^3

c $57.50

d White chocolate: 15%

Milk chocolate: 20%

Dark chocolate: 65%

2 a 356 °F

b 356 °F, because this is the same as 180 °C

c 14:05

Part 2

a Student's own work. Area of 20 × 20 pan is 400 cm^2 but area of 30 × 30 pan is 900 cm^2 so they need 2.25 times the ingredients.

b 20 cm × 20 cm = 400 cm^2

30 cm × 30 cm = 900 cm^2

20 cm × 15 cm = 300 cm^2

900 + 300 = 1200, which is three times 400 cm^2

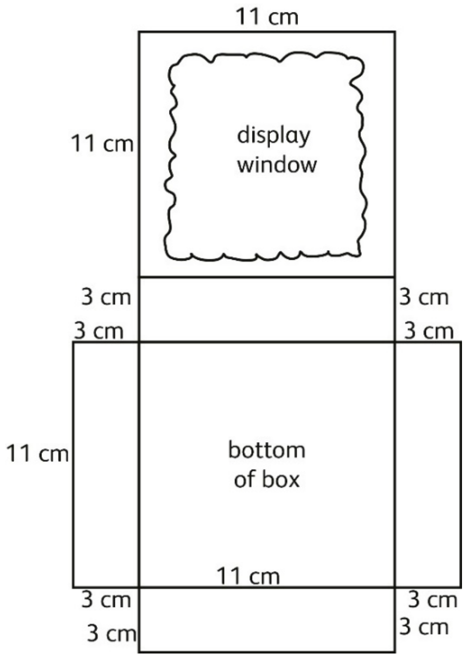
They will need to triple the recipe.

c $2760

d Student's own work

Part 3

a Remind students to make sure that the four brownies fit the box comfortably. This means they will need to leave some room (about 5 mm) around the edges of the box and about 5 mm for the height, so the brownies will not be squashed. This means they will need a box with dimensions around 11 × 11 × 3 cm.



b The display window in the sketch above shows that there is a cardboard edge of about 1 cm on each of the four sides of the 11 cm × 11 cm face that forms the lid of the box. So students might reasonably suggest that the display window will have an area of about 9 cm × 9 cm = 81 cm^2.

Part 4

1 a 30 people

b $200 – $300

c 76 people

d Student's own work

2 Student's own work

Chapter 8 Types of number

Prime and composite numbers (pages 122–123)

1 a {1, 3, 5, 7, 9, 11, 13, 15, 17, 19}

b {2, 4, 6, 8, 10, 12, 14, 16, 18}

c {2, 3, 5, 7, 11, 13, 17, 19}

d {4, 6, 8, 9, 10, 12, 14, 15, 16, 18}

2 a

~~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~~

b 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79, 83, 89, 97

3 Two is a prime number and an even number, therefore Leon is wrong.

Nine is an odd number and not a prime number, therefore Candice is wrong.

4 a 17, 91, 21, 15

b 24, 64, 38

c 17

d 24, 64, 91, 21, 15, 38

5 a 5, 17, 29, 41, 53, 65, 77, 89, 101, 113

b No

Factors and prime factors (pages 124–125)

1 a 1, 2, 4, 8, 16, 32

b 1, 5, 25

c 1, 3, 9, 27, 81

d 1, 2, 4, 5, 10, 20, 25, 50, 100

e 1, 2, 3, 4, 6, 8, 12, 16, 24, 48

2 a 2

b 5

c 3

d 2, 5

e 2, 3

3

Number	Factors	Prime factors
16	1, 2, 4, 8, 16	2
20	1, 2, 4, 5, 10, 20	2, 5
30	1, 2, 3, 5, 6, 10, 15, 30	2, 3, 5
42	1, 2, 3, 6, 7, 14, 21, 42	2, 3, 7

4 Student's own prime factor trees

a $24 = 2 \times 2 \times 2 \times 3$

b $18 = 2 \times 3 \times 3$

c $28 = 2 \times 2 \times 7$

d $36 = 2 \times 2 \times 3 \times 3$

e $50 = 2 \times 5 \times 5$

f $120 = 2 \times 2 \times 2 \times 3 \times 5$

g $225 = 3 \times 3 \times 5 \times 5$

5 a $40 = 2^3 \times 5$

b $236 = 2^2 \times 59$

c $498 = 2 \times 3 \times 83$

d $56 = 2^3 \times 7$

e $624 = 2^4 \times 3 \times 13$

f $2000 = 2^4 \times 5^3$

g $500 = 2^2 \times 5^3$

The highest common factor (HCF) (pages 125–126)

1 a 3

b 15

c 8

d 9

e 6

2 a 1, 2, 4, 5, 10, 20

b 20

c Outside both circles: three is not a factor of 20 or 40.

3 a 6

b 1, 2, 3, 6

c 32

d 1, 2, 4, 8, 16, 32

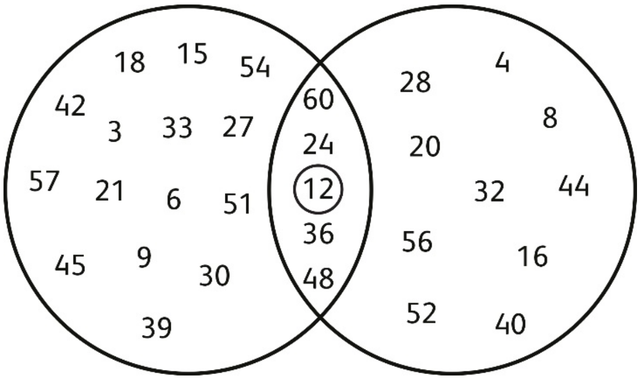
The lowest common multiple (LCM) (page 127)

1 a 4, 8, 12, 16, 20, 24, 28, 32, 36, 40
b 8, 16, 24, 32, 40, 48, 56, 64, 72, 80
c 7, 14, 21, 28, 35, 42, 49, 56, 63, 70
d 9, 18, 27, 36, 45, 54, 63, 72, 81, 90
e 11, 22, 33, 44, 55, 66, 77, 88, 99, 110

2 a 6, 12, 18
b 30, 60, 90
c 20, 40, 60
d 36, 72, 108

3 a 12
b 24
c 24
d 10

4 a



b In the intersection of the two circles
c Make sure that students have circled the number 12 in the intersection.

5 110

Practice questions (pages 130–131)

1 a False
b True
c True
d True
e False
f False
g False

2 a 12
b 1: no other number is a factor of all of the numbers.

3 a 14 = 2 × 7
b 32 = 2 × 2 × 2 × 2 × 2
c 40 = 2 × 2 × 2 × 5
d 36 = 2 × 2 × 3 × 3

e $100 = 2 \times 2 \times 5 \times 5$

f $156 = 2 \times 2 \times 3 \times 13$

g $225 = 3 \times 3 \times 5 \times 5$

h $80 = 2 \times 2 \times 2 \times 2 \times 5$

i $24 = 2 \times 2 \times 2 \times 3$

j $1000 = 2 \times 2 \times 2 \times 5 \times 5 \times 5$

4 a 1, 2, 3, 4, 6, 9, 12, 18, 36

b 2, 3

c 36, 72, 108, 144

d 4, 9, 36

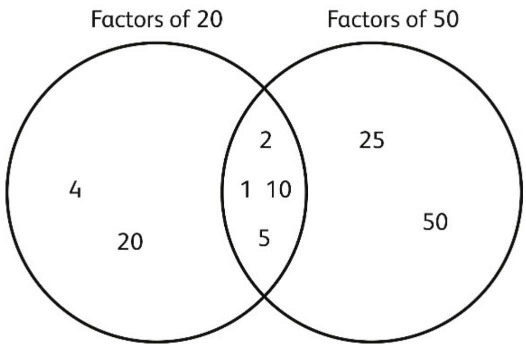
5 43

6 a 1, 2, 4, 8

b The region in the Venn diagram where the circles overlap, containing numbers that are factors of both 32 and 56.

c 8

7



a 10

b 1, 2, 4, 5, 10, 20, 25, 50

c 1, 2, 5, 10

8 a No: 4 is not a prime factor. $168 = 2 \times 2 \times 2 \times 3 \times 7$

b No, he has written the bases and the exponents the wrong way around. $392 = 2^3 \times 7^2$

9 9.00 p.m.

10 Student's own work

Chapter 9 Fractions

Skills to help you calculate with fractions (pages 134–135)

1 a $\frac{2}{3}, \frac{7}{10}, \frac{4}{5}$

b $\frac{9}{3}, \frac{10}{3}, 3\frac{2}{3}$

c $\frac{13}{10}, 1\frac{1}{2}, 1\frac{3}{5}$

2 a $\frac{13}{15}$

b $\frac{26}{36}$

c $\frac{7}{2}$

3 a True

b False, $5\frac{20}{30} = 5\frac{2}{3}$

c False, $12\frac{5}{9}$ rounded to the nearest whole number is 13.

d False, the fraction can be simplified to $4\frac{1}{2}$

4 a $\frac{27}{20}$

b $\frac{5}{6}$

c $\frac{35}{24}$

d $\frac{15}{4}$

e $1\frac{4}{9}$

f $7\frac{2}{5}$

Adding fractions and mixed numbers (pages 135–136)

1 a $\frac{9}{8}$

b $\frac{3}{2}$

c $\frac{21}{16}$

d $\frac{23}{16}$

e $\frac{17}{16}$

f $\frac{25}{12}$

g $\frac{17}{9}$

h $\frac{29}{30}$

2 a Iris

b Joshua

c $\frac{1}{60}$

3 a $\frac{22}{15}$

b $\frac{43}{8}$

c $\frac{9}{2}$

d $\frac{46}{15}$

4 a $\frac{149}{30}$

b $\frac{164}{21}$

c $\frac{343}{60}$

d $11\frac{3}{10}$

5 $5\frac{23}{24}$ cups

Subtracting fractions and mixed numbers (pages 137–138)

1 a $\frac{6}{16}$

b $\frac{11}{36}$

c $\frac{1}{16}$

d $\frac{5}{16}$

e $\frac{5}{14}$

f $\frac{1}{4}$

2 a $4\frac{4}{6}$

b $\frac{33}{20}$

c $1\frac{4}{7}$

d $\frac{5}{8}$

e $1\frac{4}{15}$

f $2\frac{1}{3}$

3 $\frac{3}{5}$ of the cookies remain. Andrea gave 8 cookies to Leon.

4 a $\frac{23}{40}$

b $\frac{1}{8}$

5 $1\frac{1}{4}$ kg

6 $2\frac{5}{12}$

Multiplying fractions (pages 138–139)

1 a $\frac{3}{8}$

b $\frac{5}{8}$

c $\frac{49}{64}$

d $\frac{2}{5}$

e $\frac{5}{9}$

2 a $4\frac{1}{4}$

b $9\frac{4}{5}$

c 1

d $2\frac{1}{2}$

e $6\frac{2}{9}$

3 $\frac{3}{20}$

4 $\frac{3}{16}$

5 $70\frac{7}{8}\,\text{m}^2$

Making calculating easier (page 140)

1 a $\frac{1}{2}$

b $\frac{2}{3}$

c $\frac{2}{3}$

d $\frac{2}{5}$

e 1

2 a $\frac{5}{12}$

b $\frac{1}{4}$

c $\frac{4}{7}$

d $\frac{1}{2}$

e $\frac{5}{18}$

3 a Convert $1\frac{4}{5}$ to $\frac{9}{5}$, then simplify the calculation to $\frac{3}{5} \times 2 = 1\frac{1}{5}$

b Convert $2\frac{3}{4}$ to $\frac{11}{4}$, then multiply: $\frac{55}{4} = 13\frac{3}{4}$

c Convert $3\frac{5}{8}$ to $\frac{29}{8}$, then simplify the calculation to $\frac{29}{2} \times \frac{1}{7} = \frac{29}{14} = 2\frac{1}{14}$

4 Student's own work

Dividing a fraction by a whole number (pages 141–142)

1 a $\frac{2}{3} \times \frac{1}{5}$

b $\frac{9}{10} \times \frac{1}{4}$

c $\frac{7}{8} \times \frac{1}{3}$

2 a $\frac{2}{5}, \frac{4}{15}, \frac{1}{5}$

b $\frac{1}{8}, \frac{5}{48}, \frac{5}{56}$

c $\frac{27}{40}, \frac{9}{20}, \frac{27}{80}$

3 $\frac{6}{10} \div 3, \frac{8}{9} \div 4$; The numerator is perfectly divisible by the divisor.

4 a $\frac{7}{12}$

b $\frac{3}{20}$

c $\frac{7}{48}$

d $\frac{5}{16}$

Reciprocals (page 143)

1 a $\frac{1}{6}$

b $\frac{1}{10}$

c $\frac{1}{24}$

d $\frac{1}{17}$

e $\frac{1}{9}$

f $\frac{1}{12}$

2 a 2

b 6

c $\frac{7}{2}$

d $\frac{8}{5}$

e $\frac{12}{11}$

f $\frac{24}{17}$

3 a $\frac{3}{2}, \frac{2}{3}$

b $\frac{24}{5}, \frac{5}{24}$

c $\frac{99}{10}, \frac{10}{99}$

d $\frac{35}{3}, \frac{3}{35}$

e $\frac{61}{9}, \frac{9}{61}$

f $\frac{37}{7}, \frac{7}{37}$

Using reciprocals for division (pages 144–145)

1 a $\frac{3}{8}$

b $\frac{7}{30}$

c $\frac{2}{15}$

d $\frac{5}{24}$

e $\frac{1}{3}$

f $\frac{17}{24}$

2 a $\frac{1}{4}$

b $\frac{5}{64}$

c $\frac{1}{5}$

d $\frac{1}{10}$

e $\frac{1}{12}$

f $\frac{1}{2}$

3 a Most of them have one as a numerator.

b Student's own work

4 a 6

b 50

c 32

d $21\frac{3}{5}$

e $4\frac{4}{9}$

f 15

5 a 3

b 3

c 6

d 8

e 2

f 6

6 Always true

7 a $\frac{2}{3}$

b 1

c $1\frac{1}{3}$

d $1\frac{2}{3}$

Practice questions (page 148)

1 a $\frac{4}{5}, \frac{3}{4}, \frac{1}{2}, \frac{2}{5}, \frac{1}{3}$

b $\frac{2}{3}, \frac{3}{5}, \frac{1}{6}, \frac{1}{10}, \frac{1}{12}$

c $\frac{11}{12}, \frac{9}{10}, \frac{5}{6}, \frac{4}{5}, \frac{2}{3}$

2 54 guavas

3 $3\frac{17}{24}$ kg of sugar

4 128 passengers

5 a $\frac{9}{20}$

b $1\frac{1}{4}$

c $\frac{17}{21}$

6 a $\frac{11}{12}$

b $2\frac{7}{24}$

c $2\frac{1}{8}$

7 a $3\frac{3}{4}$

b 8

c $7\frac{4}{5}$

8 a $\frac{1}{6}$

b $\frac{2}{15}$

c $\frac{1}{5}$

d $9\frac{3}{5}$

e 6

f $7\frac{1}{7}$

Chapter 10 Decimals

Skills to help work and calculate with decimals (pages 152–154)

1 a 0.35, 1.25, 3.67, 4.328

b 0.6, 0.62, 1.5, 1.55

c 0.4 = $\frac{2}{5}$, 0.5, $\frac{7}{10}$

d 3.2, 5.36, 12.45, 20.5

2 a 0.08

b $\frac{1}{5}$

c 0.07

3 a False, $3.45 < 3.5$

b True

c False, 13.6 rounded to the nearest whole number is 14.

d True

e False, 4.306 rounded to the nearest hundredth is 4.31.

4 a 1

b 1

c 1.2

d 0.5

e 1

f 0.95

5 Anthony is correct. $\frac{83}{100}$ is equal to 0.83, which is less than 0.85.

Adding decimals (pages 154–156)

1 a 0.9
b 1
c 1.1
d 3.9
e 10
f 0.88
g 0.91
h 1
i 1.02
j 1.16

2 a 2.48
b 2.41
c 10.8
d 6.89
e 11.55
f 3.378
g 7.778
h 7.775

3 a 252.4
b 537.49
c 844.09

4 a 2.88 m
b 19.268 m
c Yes
d 2.395 m
e 30.102 m

5 371.455 km

Subtracting decimals (pages 158–159)

1 a 0.5
b 0.3
c 0.7
d 1.1
e 1.7
f 0.05
g 0.03
h 0.07
i 0.11
j 0.14

2 a 8.8
b 8.78
c 11.27
d 11.265
e 4.639
f 4.637
g 5.361

3 a 200.135
b 118.45
c 283.2
d 54.913
e 131.23
f 289.012

4 Blue: 294.75 m
Pink: 94.55 m
Yellow: 111.314 m
Orange: 80.995 m
Green: 162.385 m

5 a 7.94 kg
b 5.58 kg
c 2.05 kg
d 5.89 kg
e 8.08 kg
f 5.44 kg
g Joan and May
h 0.14 kg

6 $2764.30

Multiplying decimals and whole numbers (pages 160–161)

1 a 4.5
b 0.45
c 0.045
d 19.5
e 39
f 192.79
g 755.84
h 27.462

2 a 2.25 litres
b 4.5 litres
c 15.75 litres
d 8.75 litres

3 4.852 kg

Multiplying decimals together (pages 162–163)

1 a 0.09
b 0.24
c 0.72
d 0.3

2 a 18
b 19.2
c 78.74
d 22.825
e 24.702
f 36.8
g 7.3048
h 7.94

3 a False: $5 \times 0.05 = 0.25$
b True
c True
d False: $10.6 \times 0.4 = 4.24$
e False: $3.2 \times 4.5 = 14.4$
f False: $11.7 \times 1.2 = 14.04$

4 a $489.38
b $978.75
c $342.56
d $851.51
e $364.10
f $454.14

5 a Student's own work
b 8.28

Dividing decimals by powers of 10 (pages 164–165)

1 a 0.5, 1.5, 11.5, 115
b 0.03, 0.23, 2.32, 23.25
c 0.003, 0.005, 0.015, 0.023, 0.115, 0.232

2 a 10
b 5040

c 1.9
d 7.8

3 a 0.34 m, 2.91 m, 0.03 m, 12.8 m, 0.5 m
b 0.034 m, 0.291 m, 0.003 m, 1.28 m, 0.05 m
c 0.034 m
d One hundredth of 3.4 m is equal to one thousandth of 34 m.

4 Student's own work

Dividing a decimal number by a whole number (pages 165–166)

1 a 0.2
b 0.4
c 0.3
d 0.1

2 Three tenths (0.3) of the cake

3 a 0.04
b 0.08
c 0.24
d 0.12
e 0.08

4 a 6.4
b 4.9
c 2.25
d 6.15
e 8.23
f 4.123
g 2.582
h 1.043

5 a 7.32 m
b 9.84 m
c 4.485 m
d 1.83 m
e 3.28 m
f 2.76 m

6 26.18 seconds

Dividing decimals by decimals (pages 167–168)

1 a 3
b 7
c 5
d 8
e 4
f 4

	g	4
	h	9
2	a	12
	b	6
	c	40
	d	10.5
	e	31.2
3	a	7.75
	b	14.5
	c	14
	d	0.775
	e	1.45
	f	1.4
4	a	0.833
	b	0.875
	c	0.714
	d	0.222
	e	0.857
	f	0.667
5	a	0.38
	b	0.44
	c	0.14
	d	0.63
	e	1.75
	f	1.5

Practice questions (pages 171–172)

1	a	A, B and E
	b	0.85 m
	d	B
	d	C and D
2	a	10.9
	b	16.86
	c	23.998
	d	9.549
3	2.445 m	
4	28.15 m	
5	3.795 kg	
6	6 batches	

7

	÷10	÷100	÷1 000
30	3	0.3	0.03
3 kg	300 g	30 g	3 g
9	0.9	0.09	0.009
9000	900	90	9.0
909	90.9	9.09	0.909

8 a 9

b 0.84

c 0.18

d 0.96

9 a 0.82

b 3.04

c 0.085

d 9.9

10 2256.75 m

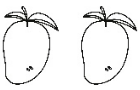
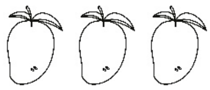
Chapter 11 Ratio and proportion

Reading, writing and representing ratios (pages 175–176)

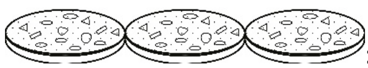
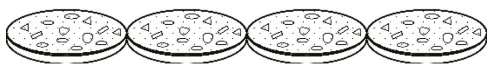
1 a For every two butterflies, there is one flower.

b For every three oranges, there are two limes.

c For every five triangles, there are three squares.

2 a Jada  : Joshua 

b Femi  : Anthony 

c Lamar  : Sophia 

d Jada : Joshua = 2 : 3

Femi : Anthony = 1 : 2

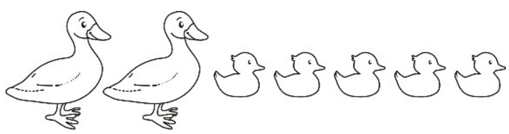
Lamar : Sophia = 3 : 4

3 a False. The ratio of blue counters to red counters is 3 : 2.

b False. The ratio of crabs to fish is 2 : 7.

c True

4 a



b $\frac{2 \text{ ducks}}{5 \text{ ducklings}}$

Equivalent ratios (pages 177–178)

1 a False

b True

c True

d False

e True

f Ratio for statement a = 1 : 4

Ratio for statement d = 4 : 16

2 Student's own work

3 a 8

b 16

c 24

d 4

e 6

4 6 : 15 is equivalent to 2 : 5.

More about equivalent ratios (pages 179–180)

1 16 mangoes

2 a 6 : 3 = 2 : 1

b 15 : 60 = 1 : 4

3 Student's own work

4 a 2 : 1

b 1 : 3

c 1 : 4

d 2 : 1

e 4 : 1

f 1 : 5

5 There is no common factor that 3 and 8 can be divided by (except 1).

Ratio and proportion (pages 181–182)

1 a A: The ratio of butterflies to ants is 2 : 5.

B: The ratio of cars to boats is 7 : 3.

C: The ratio of squares to pentagons is 5 : 4.

D: The ratio of balls to bats is 8 : 2.

b A: $\frac{2}{7}$ of the insects are butterflies and $\frac{5}{7}$ of the insects are ants.

B: $\frac{7}{10}$ of the transport is cars and $\frac{3}{10}$ of the transport is boats.

C: $\frac{5}{9}$ of the shapes are squares and $\frac{4}{9}$ of the shapes are pentagons.

D: $\frac{8}{10}$ of the toys are balls and $\frac{2}{10}$ of the toys are bats.

2 a 1 : 3 circles to triangles
b 3 : 2 circles to triangles
c 5 : 3 circles to triangles
d 7 : 5 circles to triangles

3 a 5 : 21
b $\frac{5}{26}$
c $\frac{21}{26}$

4 a 30 seeds
b 70 seeds
c 30% did grow, 70% did not grow

Applying our understanding of ratio (pages 183–184)

1 a 4 bottles
b 12 cups
c 4 tall glasses
d 8 capfuls

2 a 20 kiwis
b 10 bananas
c 15 apples
d 10 bananas, 15 apples and 25 kiwis

3 a 2 : 7
b 4 : 5
c 2 : 3
d 3 : 5

4 Both new ratios have a larger proportion of red to white, but students may argue that a ratio of 1 part white to 5 parts red would be more red than pink.

5 a 40 : 70 : 90
b $280
c $200
d $360
e $\frac{70}{200}$ or $\frac{7}{20}$
f 35%

Practice questions (pages 186–187)

1 a 1 : 35 teachers to students
b 3 : 1 water to rice
c 2 : 1 Jayden's height to his brother's height

2 a A: $\frac{8}{15}$
B: $\frac{3}{4}$

C: $\frac{6}{9} = \frac{2}{3}$

D: $\frac{9}{12} = \frac{3}{4}$

b A: $\frac{7}{15}$

B: $\frac{1}{4}$

C: $\frac{3}{9} = \frac{1}{3}$

D: $\frac{3}{12} = \frac{1}{4}$

c A: 8 : 7

B: 3 : 1

C: 6 : 3 = 2 : 1

D: 9 : 3 = 3 : 1

3 a 1 : 25

b 1 : 10 : 5

4 a False

b False

c True

5 a 4 eggs

b 1 egg

c 5 eggs

6 16 seconds

7 3.5 days

8 8 days

9

Hours worked	Amount earned ($)
1	275
3	825
5	1375
7	1925
9	2475
11	3025

10 $256 and 68 cents

11 192 oranges

Chapter 12 Percentages

Introducing percentages (page 190)

1 a 6%

b 80%

c 45%

d 16.5%

2 a $\frac{6}{100}$

b $\frac{15}{100}$

c $\frac{35}{100}$

d $\frac{75}{100}$

e $\frac{100}{100}$

3 a 84%

b 17%

c 6%

d 20%

4 This is true. $\frac{1}{10}$ is an equivalent fraction of $\frac{10}{100}$, which is equal to 10%.

5 a $\frac{8}{100}$, 9%, $\frac{1}{10}$, $\frac{15}{100}$, 80%

b $\frac{1}{100}$, 20%, $\frac{25}{100}$, $\frac{99}{100}$, 100%

c 10%, $\frac{11}{100}$, $\frac{1}{2}$, $55\frac{1}{2}$%, $\frac{100}{100}$

Equivalent percentages and fractions (pages 191–192)

1 a $\frac{100}{100}$, 100%

b $\frac{30}{100}$, 30%

c $\frac{40}{100}$, 40%

d $\frac{60}{100}$, 60%

2 a 22%

b 70%

c 12%

d 40%

e 90%

f 80%

3 a 30%

b 70%

c 25%

d 50%

e 100%

f 70%

g 80%

h 75%

i 50%

4 Leon got more correct. He got 80% correct, while Candice got 75% correct.

5 Malcolm still needs to cycle further. He has only cycled 30% of the perimeter, while Rhianna has cycled 35%.

Fractions, decimals and percentages (pages 192–194)

1 a 0.05
b 0.7
c 0.45
d 0.12
e 0.98
f 0.125
g 0.4575
h 0.4075
i 0.833
j 0.076

2 a 12%
b 4%
c 48%
d 30%
e 30%
f 55.5%
g 62.5%
h 75%
i 80%
j 65%

3 a $\frac{4}{5}$
b $\frac{7}{50}$
c $\frac{1}{4}$
d $\frac{2}{5}$
e $\frac{16}{25}$
f $\frac{7}{10}$

4 a 25%
b 80%
c 75%
d 32%
e 75%
f 50%

5 A: 35%, 0.35, $\frac{7}{20}$

B: 9%, 0.09, $\frac{9}{100}$

C: 24%, 0.24, $\frac{6}{25}$

6 a 60%

b 40%

Percentages of quantities (pages 194–196)

1 a 20

b 40

c 80

d 160

e 16

f 6

g 3

h 9

i 0.6

j 9.6

k 7.5

l 36

2 a 200

b 450

c 200

d 400

e 70

f 80

3 a 280 students

b 120 students

4 a 50%

b 10%

c 40%

d 20%

5 a 60 oranges

b 80%

c 48 oranges

6 **3**0 is 50% of 60

75% of 400 is 300

45 is **2**0% of 225

30% of 180 is 5**4**

99% of **8**00 is 792

Using a calculator to find percentages of quantities (pages 196–197)

1 a $128
b $102.40
c $24
d $15.36
e $3.18

2 a 256 kg
b 204.8 kg
c 48 kg
d 30.72 kg
e 6.368 kg

3 a 5275 km^2
b 1539 km^2
c 1099 km^2

4 a 0.375 kg
b 0.125 kg

Increasing and decreasing by percentages (pages 199–200)

1 $25 000

2 Desk: $10 080
Chair: $7840
Closet: $44 800

3 a $3800
b $15 200
c $4200
d $16 800
e $1000
f $4000

4 $9000

5 30%

Converting between ratios, fractions and percentages (pages 201–202)

1 a 15 people
b 25%
c $11 250

2 a 30%
b 105 people
c 245 people
d $16 800

3 a 7 : 13
b 35%

c 65%

d 30%

Practice questions (pages 204–205)

1 a 0.75

b 75%

c $\frac{7}{20}$

d $\frac{35}{100}$

e $\frac{5}{8}$

f 62.5%

g 0.67

h $\frac{66.67}{100}$

i $\frac{7}{50}$

j $\frac{14}{100}$

k 14%

2 a 55%

b 70%

c 45%

d 8%

3 a 40%

b 80%

c 17%

d 6%

4 a $\frac{79}{100}$, 0.79

b $\frac{21}{50}$, 0.42

c $\frac{7}{100}$, 0.07

d $\frac{4}{5}$, 0.8

5 a 30%

b 28%

c 25%

6 a 54%

b 56%

7 History

8 Level A

9 a $1700

b $8500

c $425

Chapter 13 Area and tessellations

Tessellation (pages 208–209)

1 a Rectangles
b Rectangles, squares
c Triangles, squares
d Hexagons
2 Student's own work
3 Hexagons and triangles

Area of rectangles (pages 211–213)

1

Figure	Length	Width	Length × width	Area
a	6 cm	3 cm	6 × 3	18 cm^2
b	7 cm	5 cm	7 × 5	35 cm^2
c	4 cm	4 cm	4 × 4	16 cm^2

2 a 28 cm^2
b 19.5 cm^2
c 20.68 cm^2
3 a 3 cm
b 3 cm
c 4 cm
d 8 cm
4 a 192 cm^2
b 24 cm^2
c 168 cm^2
d 1296 cm^2
e 68 cm^2
f 1228 cm^2
g 2640 cm^2
h (36 + 32 =) 68 cm^2
i 2572 cm^2

Area of squares (pages 213–214)

1 a 9 cm^2
b 100 cm^2
c 42.25 cm^2
d 114.49 cm^2
2 64 cm^2
3 12 m
4 a 121 cm^2, 25 m^2, 1 ha, 4 km^2
b 11 cm, 5 m, 100 m, 2 km

5 59.29 m^2

6 a 150 m

b 22 500 m^2

Area of triangles (pages 215–216)

1 a 12 mm^2

b 18 cm^2

c 35 mm^2

d 42 m^2

e 400 mm^2

f 10 cm^2

g 6 cm^2

2 17.5 cm^2

3 a 48 cm^2

b 32 cm^2

c 63 cm^2

d 96 mm^2

Area of compound shapes (pages 217–219)

1 a 56 m^2

b 99 cm^2

c 330 cm^2

d 15.5 cm^2

2 a 17 m^2

b 18 cm^2

c 1250 mm^2

d 48 cm^2

e 44 m^2

f 108 mm^2

Surface area (pages 220–221)

1 a 54 cm^2

b 224 cm^2

c 241 cm^2

d 30.5 m^2

e 218 cm^2

f 102 cm^2

2 a 54 m^2

b 48 m^2

c 354 m^2

d 6 tins

Practice questions (pages 223–224)

1 d, pentagons

2 37 730 m^2

3 a $12.25\ m^2$
b $25\ cm^2$
c $40\ m^2$
d $40\ cm^2$

4 $28\ cm^2$

5 $87\ m^2$

6 $256\ cm^2$

7 a $1633.5\ cm^2$
b $234 815.63

Chapter 14 Area and volume

Unit solids (page 227–228)

1 a $8\ cm^3$
b $5\ cm^3$
c $3\ cm^3$
d $12\ cm^3$
e $15\ cm^3$
f $13\ cm^3$
g $16\ cm^3$

2 a $24\ cm^2$
b $22\ cm^2$
c $14\ cm^2$
d $36\ cm^2$
e $46\ cm^2$
f $46\ cm^2$
g $40\ cm^2$

3 a 24 containers
b 72 containers

4 5 layers

5 6 cartons

6 $1000\ cm^2$

7 Student's own work

Volume of cuboids (pages 229–230)

1 a 5 cm
b 3 cm
c 4 cm
d $5 \times 3 \times 4 = 60\ cm^3$

2 a $64\ cm^3$
b $216\ cm^3$

3 a 200 cm^3

b 288 cm^3

4 4 cm

5 a No: the box is wider than one decimetre cube.

b A likely estimate is 80 dm^3 because it looks as though 4 decimetre cubes would fit across the width of the box. (Accept other estimates with sensible reasoning.)

6 7 cm

7 7 cm

8 $(7 \times 3 \times 3) + (5 \times 3 \times 8) = 63 + 120 = 183$ cm^3

9 Volume: 10 500 cm^3

Surface area: 3050 cm^2

Practice questions (pages 234–235)

1 A, D, C, B

2 Jada, student's own explanation

3 a

Layer	Number of unit cubes
A	20
B	20
C	20
D	20
Total cubes	80

b The total number of unit cubes represents the volume of the rectangular prism.

4 a Cuboid (or rectangular prism)

b 3 cm

c 1 cm

d 5 cm

e $3 \times 1 \times 5 = 15$ cm^3

5 90 m^3

6 Student's own work

Chapter 15 Symmetry and congruence

Symmetry in common shapes and objects (page 238–239)

1 Blue triangle: 3 lines of symmetry

Hexagon: 6 lines of symmetry

Green shape: 1 line of symmetry

Purple triangle: 0 lines of symmetry

Star: 5 lines of symmetry

Cross: 4 lines of symmetry

2 a A: Square

B: Rectangle

C: Kite

D: Kite

E: Trapezium

F: Trapezium

G: Parallelogram

H: Equilateral triangle

I: Isosceles triangle

b F and G

c A, B and H

d Student’s own work

3 a A, C, H, M, O, X and Y

b H, O and X; student’s own work

4 b and c

5 a 0 lines of symmetry

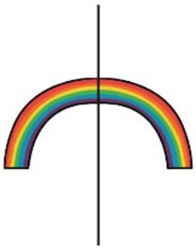
b 3 lines of symmetry

c 0 lines of symmetry

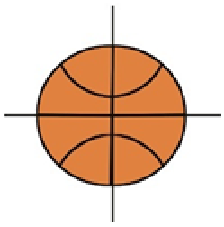
d Infinite lines of symmetry

6 a

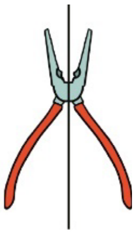
b



C



d



Similar and congruent shapes (pages 241–243)

1 a Similar

b Congruent

c Similar

d Congruent

e Neither

f Neither

2 a A and C

b A and C

c A and E

3 a, b, e, g and h

4 a Blue and yellow

b Yellow and red

c Yellow and red

d Red and blue

5 Correct(ed) statements:

All squares are *similar*, but not all rectangles are *similar*.

All congruent shapes are also similar.

It is impossible for a triangle to be congruent with a quadrilateral.

All cubes are similar.

Symmetry in compound shapes (pages 244–245)

1 a (Irregular) octagon

b (Irregular) decagon

c (Irregular) dodecagon

2 a A: 1 line of symmetry

B: 1 line of symmetry

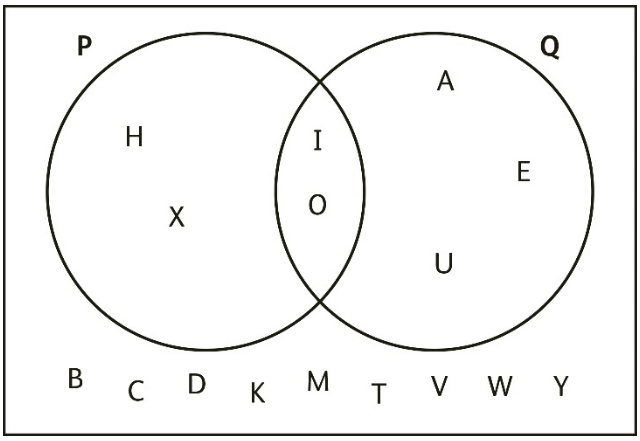
C: 1 line of symmetry

D: 2 lines of symmetry

E: 4 lines of symmetry

b Student's own work

3



4 a Rhombus

b Congruent

c Parallelogram

d i Neither

ii Both

iii A

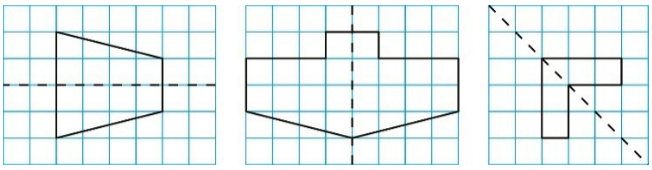
iv Both

v A

vi A

Practice questions (pages 248–249)

1



2 a C, E and H

b A, B, D and G

c F

3 C

4 10 cm

Chapter 16 Coordinates and reflections

Using coordinates (pages 251–253)

1 A(5, 5)

B(0, 9)

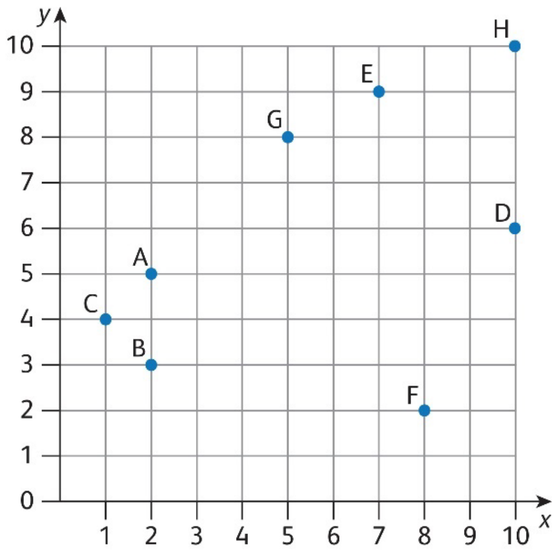
C(9, 0)

2 (9, 1)

3 a As the value of x increases, it moves in the positive (right) direction on the x-axis.
When the value of x decreases, it moves in the negative (left) direction on the x-axis.

b As the value of y increases, the point moves up.
As the value of y decreases, the point moves down.

4



5 A(9, 13)

B(4, 7)

C(3, 11)

D(8, 8)

E(6, 6)

F(12, 2)

G(3, 4)

H(16, 9)

I(20, 1)

J(2, 20)

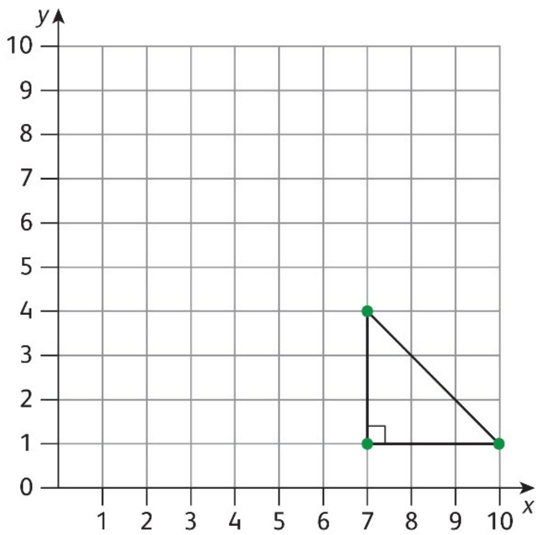
K(18, 16)

L(7, 12)

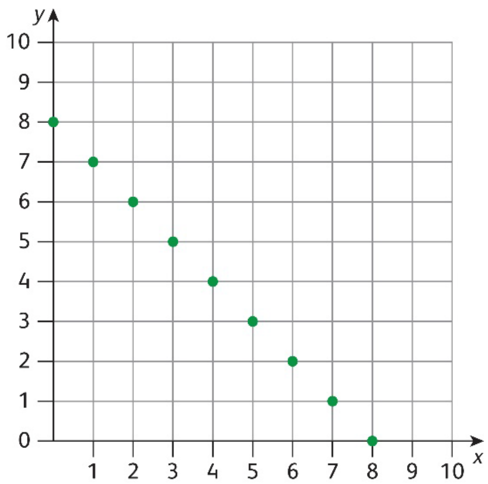
M(9, 3)

N(15, 15)

6 (Right-angled, isosceles) triangle



7 Coordinates: (0, 8), (1, 7), (2, 6), (3, 5), (4, 4), (5, 3), (6, 2), (7, 1), (8, 0)



b The points create a straight line.

c Student's own work

Reflections (pages 254–256)

1 A(5, 9), reflection(3, 9)

B(7, 6), reflection(1, 6)

C(8, 2), reflection(0, 2)

2 a The right-hand shape is further away from the mirror line than the left-hand shape.

b The bottom shape is rotated the wrong way.

c The width of the bottom shape is smaller than the width of the top shape.

3 Green triangle: (1, 2), (2, 1), (4, 4)

Reflection of green triangle: (1, 8), (2, 9), (4, 6)

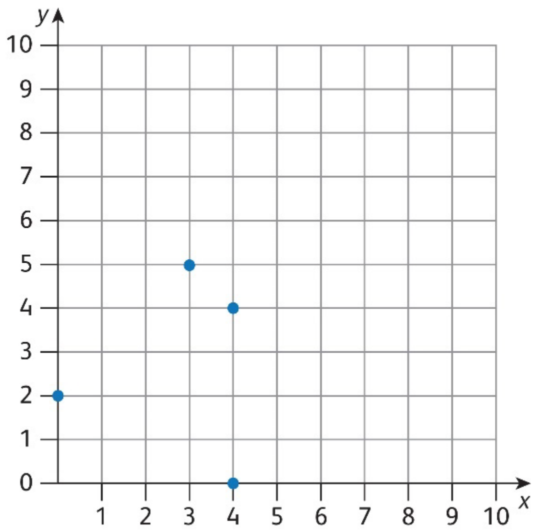
Yellow shape: (6, 5), (6, 7), (8, 9), (10, 7), (8, 5)

Reflection of yellow shape: (6, 5), (6, 3), (8, 1), (10, 3), (8, 5)

4 No, the last point should be (5, 9).

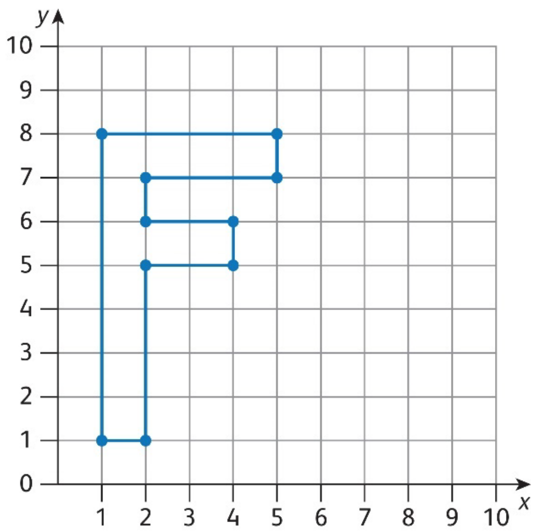
Practice questions (pages 259–260)

1



2 (0, 24), (0, 28), (28, 28), (28, 24)

3 a



b Letter F

4 Point B is at (7, 2) not (2, 7). Point C is at (4, 3) not (3, 4).

5 (3, 5), (3, 7), (7, 7)

Chapter 17 Inequalities, variables and number patterns

Using letters and symbols (page 263)

1 a $k = 48$, $m = 52$

b $p = 120$, $n = 30$

c $x = 500$, $y = 1000$

2 We insert the value into the equation where the variable would be, and thus 'substitute' it.

3 a $7500

b $9000

c $6300

The language of algebra (page 264)

1 a 35

b 110

c 6.5

2 a 14

b 76

c 180

3 $8x - 14$

4–5 Student's own work

Order of operations (pages 265–266)

1 a 40

b 72

c 18

d 78

e 22

f 6

g 53

h 5

2 a 22

b $6\frac{2}{3}$

c 8

d 20

e 25

f 5

g 113

h 15

i 70

j 56

k 16

l 28

3 a $48 - 3 \times 4 = 6 \times 6$

b $\frac{1}{2} \times 22 + 5 = 4 \times 4$

c $90 - (\frac{1}{4} \times 40) = 100 - 20$

d $8 \times 5 = \frac{1}{2} \times (100 - 20)$

4 a $4 \times (5 + 7) = 48$

b $14 \div (10 - 3) = 2$

c $2 + (4 \times 3) - 7 = 7$

d $(7 \times 4) - 3 + 2 = 27$

e $(12 \div 3) \times 2 = 8$

f $12 + (3 \times 0) = 12$

g $8 + (6 \div 3) + 4 = 14$

h $(100 - 3) \times (6 + 4) = 970$

5 Student's own work

6 Parenthesis, Exponents, Multiplication, Division, Addition, Subtraction

Inequalities (page 267)

1 $x > 4$

2 $x \leq 11$

3 $y \geq 50$

4 $p < 9$

5 $q \geq 8$

6 $5 + 7 \neq d$

More inequalities (pages 268–269)

1 a 1, 2, 3, 4

b 1, 2, 3

c 1, 2, 3, 4, 5

d 1, 2, 3

e 1, 2, 3, 4, 5

f 1, 2, 3, 4, 5, 6, 7, 8, 9

2 a 2, 3, 5, 7, 11, 13

b 4, 6, 8, 10, 12, 14, 16, 18, 20

c 1, 3, 5, 7, 9, 11, 13, 15, 17

d 4, 8, 12, 16, 20

e 60, 70, 80, 90, 100

f 1, 2, 3, 6

g 15, 45

h 23, 29

3 a x is greater than or equal to four and less than or equal to twelve.

b y is greater than one and less than or equal to five.

c p is greater than ten and less than or equal to twenty-five.

d q is greater than seventy-five and less than ninety-nine.

Expressions, variables and equations (pages 270–271)

1 a 3

b 18

c 30

d 9

e 18

f 216

2 a 16

b 5

c 23

d 10

e 2.5

f 25

3 a 10

b 29

c 53

d 56

e 23

f 256

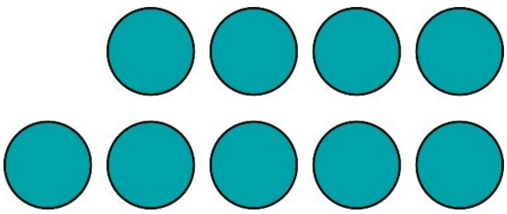
4 a Two multiplied by y subtracted from nineteen.

b 3

5 There are infinite decimal answers but using whole numbers: $x = 3$, $y = 7$

Number patterns and sequences (page 272)

1 a



b 11 circles

2 a 4, 14, 24, 34, 44, 54; common difference = +10

b 35, 33, 31, 29, 27, 25; common difference = −2

c 7, 11, 15, 19, 23, 27; common difference = +4

3 a ×4; 3, 12, 48, 192, 768, 3072

b ÷4; 1024, 256, 64, 16, 4, 1

c double the difference each time; 1, 4, 10, 22, 46, 94, 190

4 a 51, 47, 43, 39, 35, 31

b 1500, 2600, 3700, 4800, 5900, 7000

c 7.25, 7.45, 7.65, 7.85, 8.05, 8.25

Exploring number patterns and using tables (pages 273–274)

1

Term	1	2	3	4	5	6	7	8
Number of dots	1	4	9	16	25	36	49	64

2 No; $12^2 = 144$ and $13^2 = 169$ so 150 is not a square number.

3

Term	1	2	3	4	5	6	7	8
Number of dots	1	3	6	10	15	21	28	36

4 a

Term	1	2	3
Number of matchsticks	3	5	7

b 9 and 11; student's own work

5 Student's own work

The *n*-th term (page 275)

1 a

Term	1	2	3	4	5	6	n
Number	5	10	15	20	25	30	$5n$

b

Term	1	2	3	4	5	6	n
Number	0	7	14	21	28	35	$7(n - 1)$

c

Term	1	2	3	4	5	6	n
Number	100	99	98	97	96	95	$100 - (n - 1)$

2 a $5n$

b $7(n - 1)$

c $100 - (n - 1)$

3 a 500
b 693
c 1

Practice questions (pages 278–279)

1 a 323
b 43
c 19
d 800

2 a 1, 2, 3, 4
b 1, 2, 3, 4
c 1, 2, 3, 4
d Any positive number greater than or equal to 34.

3 a 1
b 30
c 25
d 22

4 b, 25, 36, 49

5 a Rule is + 80. Next three terms: 720, 800, 880
b Rule is −100. Next three terms: 5150, 5050, 4950

6 a Square
b Square

7 $7n$

8 a 230
b 290
c 350

Chapter 18 Money matters

The financial sector (pages 283–284)

1 a Financial institution
b Deposit
c Loan
d Central bank

2–3 Student's own work

Deposits and withdrawals (pages 286–288)

1 Student's own work

2 $27 405

3–4 Student's own work

Interest (pages 288–290)

1 a $200

b $2000

c $480

d $2700

e $4500

2 $92 000

3 a Standard: $480

Premium: $600

Super Premium: $720

Bonus: $420 + $2000 bonus

b She should open the bonus savings account. She will have $14 420 at the end of the year.

4 a $3000

b $17 000

c $20 400

d $850

Profit and loss (pages 291–292)

1 a $392.50

b $236.00

c $355.70

d $295.80

e $79.45

2 a $14 profit

b $29.50 profit

c $9.01 profit

d $255.75 loss

e $55.85 loss

f $33.50 profit

3 $21 208

4 a March and May

b The bars are red and they extend into the negative area of the y-axis.

c April

d It is in a good financial situation because it made an overall profit. However, it would be worth looking at why they made a loss in some months, and trying to improve any problems.

5 a $74 500

b $67 500

c $7000 loss

Practice questions (pages 295–296)

1 a Commercial bank
b Insurance company
c Bank of Jamaica

2 He left out his signature. He also did not give his full name.

3 $20 000

4 $10 500

5 Student's own work

6 20%

7 a Loss
b 16.67%

8 a $2 000 000
b $225 000
c $675 000
d $675 000

9 a $6437.50
b $2625
c The monthly payment is lower.

Chapter 19 Problem solving

More about two-step problems (pages 299–301)

1 7030 beads

2 114 m^2

3 $3\frac{2}{5}$ pies

4 $725

5 a 200 cm
b 9600 cm^2

6 Student's own work

Problems involving decimals (pages 302–303)

1 a 3.6 kg (or 3600 g)
b 1.78 m
c 1.14 m
d $886.50

2 Student's own work

3 3.1 hours

4 a 0.8 kg
b 32 cartons
c $1499.85

5 22.3 m

6 16 friends

7 2.08 m

Problems involving percentages (pages 304–305)

1 15 part-time employees

2 26 buttons

3 14 people

4 12 students

5 168 cheese sandwiches

6 a 290 members

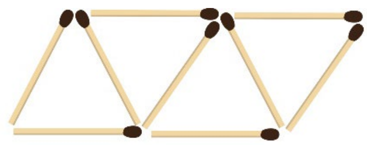
b 42 children (42% of the members are younger than 60 years old; this is 210 members. 20% of 210 = 42)

7 450 000 people

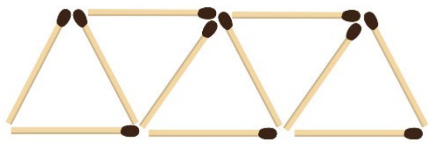
8 Student’s own work

Using patterns and rules to solve problems (pages 307–308)

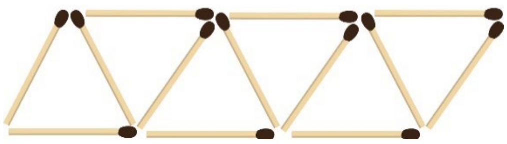
1 a Term 4



Term 5



Term 6



b

Term	1	2	3	4	5	6	n
Number of matchsticks	3	5	7	9	11	13	$2n + 1$

c Add 2 to the previous number of matchsticks.

d $2n + 1$

e 15th term: 31; 100th term: 201

2 a 12.5

b Add 2.5 to the previous number.

c $2.5n$

d 12th term: 30; 31st term: 77.5

3 a Student’s own work

b Add 3 to the previous number.

c 5th term: 16; 6th term: 19

d $3n + 1$

e 25th term: 76; 60th term: 181

Practice questions (page 311)

1 23.55 km

2 26.3 mℓ

3 Student's own work

4 382.5 km

5 40 sodas

6 $7n$

7 $25 500

Chapter 20 Circles

Parts of a circle (pages 314–316)

1 a C shows a chord, not a diameter.

b B is the only one that does not show the radius.

c A is the only one that does not show a sector.

2 a True

b False. A chord is a straight line that connects two points on the perimeter, dividing the circle into two parts.

c True

d True

e False. The blue part of the circle in the picture is called the major sector.

3 a O

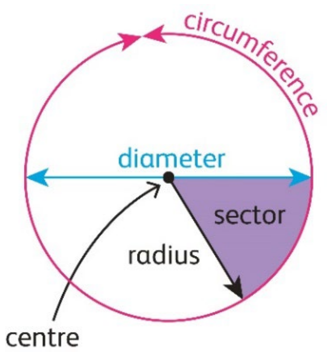
b CD and EF

c CO, AO, EO, DO and BO

d Any three letters, as long as O is the middle one (e.g. COF, FOB, BOE etc.).

e A chord

4



5 Class activity

Drawing circles (pages 316–317)

Student's own work

Exploring circumference and diameter (pages 318–319)

1 a 20 cm
b 40 mm
c 6 m
d 9 cm

2 a 6 cm
b 5 mm
c 10 m
d 7.5 cm

3 a 25.12 cm
b 37.68 cm
c 18.84 cm
d 28.26 cm

4 a 81.64 m
b 326.56 m
c 816.4 m

5 175.84 cm

Practice questions (page 323)

1 A: radius
B: centre
C: diameter
D: circumference

2 8 cm

3 5 cm

4 a 47.1 cm
b 25.12 cm
c 21.98 cm

5–6 Student’s own work

7 a 25.12 cm
b 6 cm
c 76 cm

Chapter 21 Speed, time and distance

Speed, distance and time (pages 327–328)

1 a 16 km
b 60 km
c 120 km
d 180 km
e 300 km

f 30 km

g 15 km

2 Leroy: 12 km

Rhianna: 2.5 km

Malcolm: 1 km

3 225 km

Calculating average speed and time taken (pages 329–330)

1 a 8 km/h

b 10.67 km/h

c 10.44 m/s

2 120 km/h

3 a 3 hours

b 2.5 hours

4 333.33 seconds, 5.56 minutes

5 a 2 hours

b 54 km

c 48 km/h

Road safety (pages 332–333)

1 a True

b False. They are walking at an average speed of 4 m/s.

c False. The car is travelling at almost 17 m/s so it will travel 30 m in less than 2 s. You do not have enough time to cross.

2 Kat, Adjani, Beth

Kat followed the shortest path and therefore spent less time on the road.

3 Student's own work

4 Car C. After car C has passed, no other cars are coming, making it safe to cross the road.

Practice questions (page 336)

1 68 km/h

2 a 90 km/h

b 675 km

c 12 hours

3 320 km

4 5 hours

5 a 320 km

b 440 km

c 180 km

6 No, the driver took 1.5 hours to drive 84 km so they drove at an average speed of 56 km/h.

7 15 km

Chapter 22 Angles

Classifying angles (pages 339–340)

1 Acute
2 Obtuse
3 Acute
4 Obtuse
5 Straight line
6 Right angle
7 Right angle
8 Reflex
9 Right angle
10 Obtuse
11 Right angle
12 Revolution
13 Obtuse
14 Acute
15 Acute

More angles (pages 341–342)

1 a TQP and PQR, TRS and SRW
b PSR, SRW and PQT
2 a DCE, CDE and CED
b CBF and CBA, ACB and BCE, ECD and ACD
c ECB and DCA
d CBF
3 a True. It is supplementary to angle JLM, which is 90°.
b False. It must be a right angle.
c False. The angles are on a straight line so they are supplementary angles.
d True. All four angles are right angles and two pairs of parallel sides are equal.
e True. This would divide the rectangle exactly in half so the two triangles would be identical (congruent).
4 a It is a right-angled triangle.
b 35°

Measuring angles with a protractor (pages 343–344)

1 Some of the angles are more difficult to measure than others, so give students 2° allowance either way.
a 45°
b 100°
c 68°

d 162°

e 120°

f 90°

2 a Accept estimates that seem reasonable, e.g. orange 45°, yellow 60°, pink 40° and larger yellow 135°.

b Check that students can comfortably use the formula to convert angles to percentages. For the answers above, the percentages would be 12.5%, 16.7%, 11.1% and 37.5%.

3 Student's own work

Drawing angles with a protractor (page 345)

Student's own work. Check that students have used the correct scale on their protractors.

Practice questions (page 348)

1 a Obtuse

b Straight line

c Reflex

2 a Acute

b Reflex

c Obtuse

d Right

e Obtuse

f Acute

g Reflex

h Reflex

i Obtuse

j Straight

3 $a = 13°$

$b = 90°$

$c = 45°$

$d = 135°$

$e = 45°$

$f = 28°$

$g = 152°$

$h = 62°$

$i = 90°$

$k = 155°$

$l = 115°$

$m = 90°$

4–5 Student's own work

6 Orange clock: Right angle and reflex

Purple clock: Obtuse and reflex

Blue clock: Acute and reflex

Chapter 23 Solving simple equations

Simplifying and evaluating algebraic expressions (page 351)

1 a $5p + 2m$
b $7p + 4b$
c $14c + 3j$
d $10m + 10o$

2 a $4j$
b $2a + 2b$
c $8a + 3q + 6$
d $8n + 8$
e $2d^2$

3 a 28
b 38
c 169
d 808
e 32

Writing equations to solve problems (page 352)

1 a Solve the equation $x + 3 = 5$. This tells you that $x = 2$.
b Add 3 to the number and see whether you get 5.

2 Student's own work

3 a and b

4 b and c

5 a $n = r + 8$
b True, as we do not know how old either of them are.

Balance the weights (pages 353–354)

1 a 3 kg
b 7 kg
c 10 kg
d 8 kg

2 Student's own work

Solving equations (pages 354–355)

1 a $4x = 16$, $x = 4$
b $k + 3 = 15$, $k = 12$
c $5 + x = 21$, $x = 16$
d $2p + 7 = 31$, $p = 12$

2 a $a = 4$
b $y = 5$
c $n = 10$

d $q = 6$

e $k = 3$

f $m = 12$

3 a $y = 8$

b $d = 10$

c $x = 10$

d $x = 12$

e $x = 4$

f $x = 11$

4 18

5 9

6 2

7 7

8 35

Solving word problems with algebra (pages 357–358)

1 3 km

2 $4s = 24$ so $s = 6$ years. Anthony's age is $3s = 18$ years old.

3 $200

4 15 years old

5 Peta-Gaye: 120 cards

Sophia: 12 cards

Alicia: 240 cards

6 a $s = 7$ cm

b $n = 13$ cm

Practice questions (pages 359–360)

1 a $7n - 10$

b $\frac{14 + n}{2}$

c $2n - 25$

2 a $10p + 11h$

b $8n + 50$

c $13q + 3z$

d $10r^3$

e $2n^2$

f $9 + 8t^2$

3 10

4 a $3 + q$

b $3 + 4q$

c $3 + 18q$

d $3 + (m - 1)q$

5 a $x = 127$

b $x = 500$

c $x = 75$

d $x = 2100$

6 a $m = 32$

b $r = 9$

c $p = 10$

d $b = 5$

e $n = 10$

Chapter 24 Probability

Probability concepts (pages 362–363)

1 a Impossible

b Possible

c Impossible

d Certain

e Certain

f Possible

g Impossible

h Possible

i Possible

2–3 Student's own work

The probability scale (pages 363–364)

1 a Certain

b Impossible

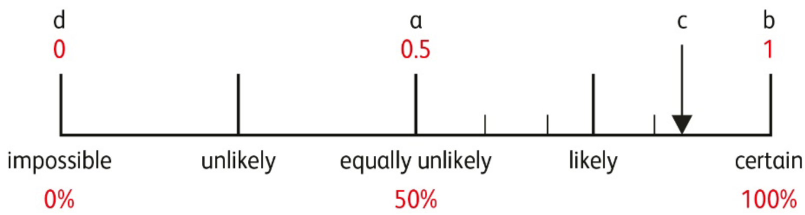
c Likely (or Certain, depending on student's confidence!)

d Impossible

e Possible / Even chance

f Likely / Possible

2



Possible outcomes (pages 365–366)

1 Soup with chicken, soup with beef, soup with pizza

Prawn cocktail with chicken, prawn cocktail with beef, prawn cocktail with pizza

Melon with chicken, melon with beef, melon with pizza

2 Tea with a muffin, tea with a brownie, tea with crisps, tea with a pastry

Coffee with a muffin, coffee with a brownie, coffee with crisps, coffee with a pastry

Juice with a muffin, juice with a brownie, juice with crisps, juice with a pastry

3

	Spinner 1					
Spinner 2		**1**	**2**	**3**	**4**	**5**
	1	2	3	4	5	6
	2	3	4	5	6	7
	3	4	5	6	7	8
	4	5	6	7	8	9
	5	6	7	8	9	10

Calculating probability (pages 366–367)

1 a $\frac{1}{2}$

b $\frac{1}{2}$

c 0

2 a Three

b Blue: $\frac{1}{4}$

Red: $\frac{1}{2}$

Yellow: $\frac{1}{4}$

3 a $\frac{1}{2}$

b $\frac{1}{13}$

c $\frac{1}{52}$

d $\frac{1}{4}$

e $\frac{9}{13}$

f $\frac{1}{13}$

g $\frac{3}{13}$

4–5 Student’s own work

Probability experiments (page 368)

1 Student's own work

2 a The coin only landed on heads. This created a bias in Danny's data.

b No, he does not have a 100% chance of landing on heads. If the coin is fair, it always has an even chance of landing on either heads or tails.

Practice questions (pages 371–372)

1 a Certain

b Unlikely

c Possible

d Impossible

e Unlikely

f Likely

g Certain

2 Student's own work

3 $\frac{1}{2}$

4 a Certain

b Impossible

c Unlikely

d Even chance

5 Student's own work

Practice test (pages 373–380)

1 c
2 b
3 b
4 c
5 c
6 d
7 b
8 b
9 b
10 c
11 c
12 c
13 d
14 b
15 b
16 c
17 c
18 a
19 c
20 c
21 c
22 c
23 d

24	d
25	b
26	c
27	a
28	c
29	a
30	c
31	c
32	b
33	c
34	a
35	c
36	a
37	c
38	b
39	c
40	b
41	c
42	c
43	d
44	d
45	d
46	b
47	c
48	a
49	c
50	b
51	b
52	c
53	b
54	a
55	c
56	d
57	b
58	b
59	c
60	d