Vertex Academy

Year 6 Maths workbook

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Year 6 · Number: Big Numbers, Squares & Negatives

Name: _____ Date: _____

Hi! This sheet gives you a good workout with place value, rounding, factors, square and cube numbers, and negative numbers. Take your time and show your thinking, a number line can really help!

Warm-up

1. Round 47,382 to the nearest thousand.

2. What is 9^2 (nine squared)?

3. Start at −3 and count backwards in 2s. Write the next three numbers.

4. Write '60,000 + 4,000 + 200 + 7' as a single numeral.

Practice

5. Order these numbers from smallest to largest: 8,540; 8,405; 8,054; 8,450.

6. Find all the factor pairs of 36.

7. Round 3.47 to the nearest tenth, and then round 3.47 to the nearest whole number.

8. One winter morning in Ohakune the temperature was −4°C at 6am. By midday it had risen 9°C. What was the temperature at midday?

9. Mere has $120 in her bank account. She pays a $185 power bill using the account. What will her balance be?

10. What is 4^3 (four cubed)? Show what 'cubed' means.

Challenge

11. Round 6,748,205 to the nearest million, and then to the nearest hundred thousand.

12. Find a number that is both a square number and a cube number, and is between 2 and 100. Show why it works.

Year 6 · Number: Order, Operations & Sharing Out

Name: _____ Date: _____

Kia ora! This sheet gives you practice with the order of operations, adding and subtracting big numbers, multiplying by two-digit numbers, and dividing with remainders. Take your time and show your working.

Warm-up

1. Work out: $6 + 4 \times 3$

2. Add: $348 + 275$

3. Subtract: $500 - 236$

4. Work out: $20 \div 4 + 5$

Practice

5. Use the order of operations: $84 - 6 \times 9$

6. Use the order of operations: $6^2 + 40 \div 5$

7. Multiply: 487×18

8. The Waterview School gala raised $3475 on Saturday and $2896 on Sunday. The stalls and prizes cost $1580. How much profit did the gala make?

9. A netball club has 158 balls. They want to share them equally into 6 storage bins. Using 1/6 of 158, how many balls go in each bin, and how many are left over?

10. Aroha pours 1450 mL of juice equally into 4 cups. How much juice is in each cup? Give your answer as a decimal.

Challenge

11. Work out: $3^2 \times (144 \div 12) - 45$

12. The Titirangi Sports Club buys 24 boxes of shirts. Each box holds 36 shirts. The shirts are shared equally among 5 teams. How many shirts does each team get, and how many are left over?

Year 6 · Number: Fractions, Decimals & Percentages

Name: _____ Date: _____

Kia ora! This sheet gives you a workout on fractions, decimals and percentages, writing them, comparing them, and using them to solve real problems. Take your time and show your thinking.

Warm-up

1. Write 7/1000 as a decimal.

2. Write 0.4 as a fraction and as a percentage.

3. Simplify the fraction 6/8 to its lowest terms.

4. Work out 2.5 × 100.

Practice

5. Order these decimals from smallest to largest: 0.7, 0.07, 0.77, 0.707

6. Convert the improper fraction 17/5 to a mixed number.

7. Work out 3/4 + 5/8.

8. At the Avondale Sunday market, a stall starts with 180 apples. During the morning 2/3 of the apples are sold. How many apples are sold?

9. Mere is making a bracelet. She has finished 3/4 of the beads, which is 90 beads. How many beads will the whole bracelet have?

10. Work out 5.6 − 2.375.

Challenge

11. In Room 12, 3/5 of the 25 students walk to school. In Room 13, 60% of the 30 students walk to school. Which room has more students who walk, and by how many?

12. A school fundraiser has a goal. So far 20% of the goal has been raised, which is $84. What is the full goal (100%), and how much is 75% of the goal?

Year 6 · Number: Money Smarts

Name: _____ Date: _____

Hi there! This sheet helps you find 10%, 25% and 50% of money amounts and work out if there's enough cash for a shopping trip. Take your time and show your working!

Warm-up

1. Find 50% of $60.

2. Find 10% of $80.

3. Find 25% of $40.

4. Write $4.50 + $2.25 as a total in dollars and cents.

Practice

5. Find 50% of $280.

6. Find 25% of $160.

7. Find 10% of $250.

8. A skateboard costs $120 at Rebel Sports. There is a 25% discount this weekend. How much money will be taken off the price?

9. Aroha has $50 to spend at the New World supermarket. She buys fruit for $12.50 and bread for $4.20. Does she have enough money, and how much is left?

10. A pair of shoes costs $90. In a half-price sale, what is the new price?

Challenge

11. A jacket at Kmart costs $60. It has 10% off. After that discount, an extra 25% is taken off the new lower price. What is the final price?

12. Liam has $100. He wants to buy a game for $45, headphones for 25% off their $40 price, and a $15 gift card. Can he afford everything? Show your working.

Year 6 · Algebra: Patterns, Points and Number Sentences

Name: _____ Date: _____

Hi! This sheet helps you spot rules in growing patterns, check if number sentences are true, and plot points on a coordinate plane. Take your time and show your working.

Warm-up

1. Fill in the missing number: $6 \times ___ = 42$

2. True or false? $15 - 3 \geq 12$

3. What are the coordinates of a point that is 4 to the right and 0 up from (0, 0)?

4. Continue the pattern: 5, 8, 11, 14, ___, ___

Practice

5. Aroha builds towers with blocks. Tower 1 has 4 blocks, Tower 2 has 7 blocks, Tower 3 has 10 blocks. Write the rule in words and find how many blocks Tower 6 has.

6. True or false? $8 \times 7 \leq 8 \times 5 + 20$. (Remember the order of operations.)

7. Complete the open number sentence: $36 \div ___ + 5 = 14$

8. Plot these points on a coordinate plane and say which one is on the y-axis: A(3, 2), B(0, 5), C(4, 0).

9. A food stall at the Avondale market charges $2 for entry plus $3 for each smoothie. Write a rule for the total cost, then find the cost of 5 smoothies.

10. A pattern follows the rule $y = 2 \times x + 1$. Complete the table of values for $x = 0, 1, 2, 3$.

Challenge

11. Use the rule $y = 3 \times x - 2$ to make a table for $x = 1, 2, 3, 4$, then plot the points on a coordinate plane. What do you notice about the shape they make?

12. A tiling pattern uses this rule: number of tiles = $4 \times$ step + 2. Kauri says step 10 needs more than 40 tiles. Write a true/false inequality to check, and find which step first has more than 50 tiles.

Year 6 · Measurement: Measure, Convert and Compare

Name: _____ Date: _____

Kia ora! This sheet helps you measure and estimate, swap between metric units, work out areas and volumes, find missing angles, and read the clock and timetables. Take your time and show your working.

Warm-up

1. Convert 350 cm into metres.

2. Convert 2.5 kg into grams.

3. Two angles sit on a straight line. One is 115°. What is the other?

4. Convert 1500 mL into litres.

Practice

5. A netball court section at Avondale is a rectangle 8 m long and 5 m wide. What is its area?

6. A right-angled triangle has a base of 6 cm and a height of 4 cm. What is its area?

7. A rectangular gift box measures 3 cm by 4 cm by 5 cm. Work out its volume.

8. Mere's backpack holds a drink bottle of 750 g and a lunchbox of 1 kg 250 g. What is the total mass in kilograms?

9. The bus leaves Avondale at 2:53 pm and reaches Britomart at 3:28 pm. How long is the trip?

10. Two straight lines cross. One of the four angles is 70°. Using vertically opposite angles, name the sizes of the other three angles.

Challenge

11. A fish tank is a rectangular prism 40 cm long, 25 cm wide and 30 cm high. (a) What is its volume in cm^3? (b) If 1000 cm^3 holds 1 litre of water, how many litres does the full tank hold?

12. At a point, three angles meet around the centre of a wheel. They measure 145°, x°, and 90°, and together they complete a full turn. Find x. Then say what fraction of a full turn 90° is.

Year 6 · Geometry: Sorting Shapes & Turns

Name: _____ Date: _____

Kia ora! This sheet helps you classify quadrilaterals, work with angles inside triangles and four-sided shapes, and figure out how many times a shape looks the same as it spins around. Take your time and enjoy!

Warm-up

1. Name the quadrilateral that has four right angles and four equal-length sides.

2. How many sides does a trapezium have, and how many pairs of parallel sides?

3. What do the three interior angles of any triangle add up to?

4. What is the order of rotational symmetry of a circle?

Practice

5. A parallelogram has two pairs of parallel sides. Explain how a rectangle is a special kind of parallelogram.

6. A kite has two pairs of equal-length adjacent sides. Is a rhombus a kite? Explain.

7. A triangle has two angles of 65° and 40°. What is the size of the third angle?

8. State the order of rotational symmetry of: (a) a square, (b) a rectangle (not a square), (c) an equilateral triangle.

9. Aroha is making a kite for the Manukau kite day. Three of its interior angles are 100°, 75° and 100°. What is the size of the fourth angle?

10. Tama sorts shapes for a display at school. He has a shape with four sides where every side is the same length but it has no right angles. What quadrilateral is it, and why is it not a square?

Challenge

11. A quadrilateral has interior angles in the ratio 1 : 2 : 3 : 3. Work out all four angles, then say whether the shape could be a trapezium.

12. Compare a triangular prism and a square-based pyramid. State how many faces, edges and vertices each has, and describe one key difference in their faces.

Year 6 · Geometry: Flips, Slides and Turns

Name: _____ Date: _____

Hi there! This sheet is all about moving shapes around, flipping, sliding and turning them, and spotting patterns called tessellations. Grab a pencil and ruler, and let's get moving!

Warm-up

1. Name the transformation for each word: (a) flip, (b) slide, (c) turn.

2. When you slide (translate) a triangle 5 cm to the right, does its size or shape change?

3. A shape is turned a full circle (360°) around a point. Where does it end up?

4. True or false: a tessellation can have small gaps between the shapes.

Practice

5. A letter 'b' is reflected in a vertical mirror line. Which letter does it look like?

6. A square tile is at position A. It is translated 3 squares right, then translated 2 squares up. Describe its final position compared to the start.

7. Amaia is making a tessellation using regular hexagons on the floor of the classroom. Explain why hexagons tessellate but regular pentagons do not.

8. An arrow shape points up (↑). It is rotated 90° clockwise, then rotated another 90° clockwise. Which way does it point now?

9. Tane draws a flag shape at the left of his page. He first reflects it in a vertical line, then translates the reflected shape 6 cm down. Describe what has happened to the flag overall.

10. A right-angled triangle has sides 3 cm, 4 cm and 5 cm. It is reflected across a line and then translated 4 cm to the right. What are the side lengths of the final triangle, and what stays the same?

Challenge

11. On grid paper, a triangle has corners at (1,1), (1,3) and (2,1). It is translated 3 right and 1 up, then reflected in the vertical line x = 6. Give the coordinates of all three corners after BOTH steps.

12. Ropata says: 'If I rotate a shape 180° and then reflect it in a horizontal mirror line, I get the same result as a single reflection in a vertical line.' Use an up-and-right arrow (↗) to test whether he is correct.

Year 6 · Statistics: Making Sense of Data

Name: _____ Date: _____

Hi! This sheet helps you find the mean (average) and the range of number data, and read time-series data collected over days. Take your time and show your working.

Warm-up

1. Find the mean of these numbers: 4, 6, 8.

2. Find the range of these numbers: 3, 9, 5, 2.

3. Find the mean of these test scores: 10, 20, 30, 40.

4. Find the range of these temperatures (°C): 18, 22, 15, 20.

Practice

5. Aria measured the mass of a bag of carrots each day for 5 days: 1000 g, 990 g, 985 g, 975 g, 970 g. What is the range of the masses?

6. Using Aria's carrot masses (1000, 990, 985, 975, 970 g), find the mean mass over the 5 days.

7. The Avondale Markets recorded rainfall (mm) for one week: 2, 0, 5, 8, 3, 6, 4. Find the mean daily rainfall.

8. Using the same rainfall data (2, 0, 5, 8, 3, 6, 4), find the range.

9. Tane counted the number of buses passing his house each morning for 5 days: 6, 8, 7, 5, 9. What is the mean number of buses per day?

10. Mere saved money over 4 weeks: $12, $15, $9, $16. Find both the mean weekly saving and the range.

Challenge

11. Over 5 days the temperature at Cornwall Park was recorded: 16°C, 18°C, 17°C, 19°C, and one missing day. The mean over the 5 days was 18°C. What was the missing temperature?

12. A shop weighed a kilogram of bananas each day for 6 days: 1000 g, 995 g, 985 g, 980 g, 975 g, 965 g. Find the mean and the range, then explain what the numbers tell you about the bananas over time.

Year 6 · Statistics: Graphing Data Over Time

Name: _____ Date: _____

Hi there! This sheet is all about time-series (line) graphs, the kind that show how something changes over time. You'll read them, build them, and decide when they're the best graph to use. Have your ruler and pencil ready!

Warm-up

1. On a time-series graph, which axis (the horizontal one or the vertical one) always shows the time?

2. A line graph shows the temperature in Avondale was 13°C at 8am and 19°C at 11am. By how many degrees did it rise?

3. You want to show how a kūmara plant's height changed each week for 8 weeks. Is a time-series graph a good choice? Why?

4. On a time-series graph the points for Monday to Friday are joined with lines. If the line goes downward from one day to the next, what does that tell you?

Practice

5. Mia recorded the number of library books borrowed at Avondale School each day: Monday 20, Tuesday 25, Wednesday 30, Thursday 22, Friday 35. Describe how you would set up a time-series graph for this data (what goes on each axis and a sensible scale).

6. Using Mia's data above, between which two days did the number of books borrowed drop the most, and by how many?

7. Rangi measured the water level in his rain tank on the 1st of each month (in litres): Jan 400, Feb 350, Mar 300, Apr 380, May 500. On his time-series graph, describe the overall trend from January to May.

8. A café owner has two sets of data: (a) how her daily coffee sales changed over one week, and (b) the favourite ice-cream flavours of 60 customers. Which set suits a time-series graph and which suits a bar graph? Explain.

9. Here are the midday temperatures for a week in Auckland: Mon 18°C, Tue 21°C, Wed 24°C, Thu 24°C, Fri 20°C, Sat 17°C, Sun 19°C. What was the highest temperature, and on how many days was the temperature 20°C or above?

10. Leah plots a point on her time-series graph at the position '3pm, 12 people'. Explain in words exactly what this point means.

Challenge

11. Two shops record their afternoon customers on the same time-series graph. Shop A: 1pm 10, 2pm 15, 3pm 25, 4pm 20. Shop B: 1pm 20, 2pm 18, 3pm 15, 4pm 22. At what time did the two shops have the same number of customers, and how would you show both shops clearly on one graph?

12. Sam has yearly rainfall totals for Auckland for 10 years and wants to see if rainfall is generally increasing or decreasing over time. He also has to present the average rainfall of 5 different NZ cities for one year. Which graph best suits each task, and for the 10–year data explain what a 'trend line' would add.

Year 6 · Probability: Chance, Spinners and Fair Games

Name: _____ Date: _____

Kia ora! This sheet helps you practise listing all the possible outcomes, working out how likely each one is, and checking that probabilities add up to 1. Take your time and show your thinking.

Warm-up

1. List the sample space for rolling a standard six-sided die.

2. A coin is flipped once. What is the probability it lands on tails?

3. On a number line from 0 to 1, what value shows an event that is certain to happen?

4. A bag holds 4 red and 4 blue marbles. What is the probability of pulling out a red marble?

Practice

5. A spinner has 8 equal sections: 4 red, 2 blue, 1 green and 1 yellow. What is the probability of landing on red?

6. Using the same spinner (4 red, 2 blue, 1 green, 1 yellow), what is the probability of landing on blue or yellow?

7. For the same spinner, show that the probabilities of all four colours add up to 1.

8. Aroha rolls a fair die. What is the probability of rolling an even number?

9. At the Avondale School gala, Mere spins the prize wheel 40 times. It lands on 'Win a prize' 8 times. What is the experimental probability of winning a prize on one spin?

10. A bag has 3 green, 5 red and 2 yellow jelly beans. Tane picks one without looking. What is the probability it is yellow, and what is the probability it is NOT green?

Challenge

11. A spinner is one-half blue and one-quarter red. The rest is split equally between green and yellow. What is the probability of each colour? Check your answers add up to 1.

12. Kauri rolls a fair die 60 times. (a) How many times would you expect to roll a 3? (b) He actually rolled a 3 fourteen times, write the experimental probability as a fraction in simplest form.

Answer key (for parents and tutors)

1. Round 47,382 to the nearest thousand.
   Look at the hundreds digit to decide. 47,382 has 3 hundreds. Because 3 is less than 5, we round down. The answer is 47,000.

2. What is 9^2 (nine squared)?
   Squared means multiply the number by itself: 9 × 9 = 81.

3. Start at −3 and count backwards in 2s. Write the next three numbers.
   Counting backwards means going further left on the number line, so the numbers get smaller: −3, then −5, then −7, then −9. Answer: −5, −7, −9.

4. Write '60,000 + 4,000 + 200 + 7' as a single numeral.
   Add the place values together: 60,000 + 4,000 + 200 + 0 tens + 7 = 64,207.

5. Order these numbers from smallest to largest: 8,540; 8,405; 8,054; 8,450.
   All start with 8 thousands, so compare the hundreds. 8,054 has 0 hundreds (smallest). Then 8,405 and 8,450 both have 4 hundreds, compare tens: 8,405 (0 tens) before 8,450 (5 tens). Largest is 8,540 (5 hundreds). Order: 8,054; 8,405; 8,450; 8,540.

6. Find all the factor pairs of 36.
   Look for two whole numbers that multiply to 36: 1 × 36, 2 × 18, 3 × 12, 4 × 9, 6 × 6. Those are all five factor pairs.

7. Round 3.47 to the nearest tenth, and then round 3.47 to the nearest whole number.
   Nearest tenth: look at the hundredths digit (7). Since 7 is 5 or more, round the tenths up from 4 to 5, giving 3.5. Nearest whole: look at the tenths digit (4). Since 4 is less than 5, round down to 3.

8. One winter morning in Ohakune the temperature was −4°C at 6am. By midday it had risen 9°C. What was the temperature at midday?
   Start at −4 on a number line and move up (right) 9 steps. From −4 to 0 is 4 steps, leaving 5 more steps: 0 + 5 = 5. The temperature at midday was 5°C.

9. Mere has $120 in her bank account. She pays a $185 power bill using the account. What will her balance be?
   She is spending more than she has, so the balance goes below zero. 120 − 185 = −65. Her balance will be −$65, meaning she owes the bank $65.

10. What is 4^3 (four cubed)? Show what 'cubed' means.
    Cubed means multiplying the number by itself twice: 4 × 4 × 4. First 4 × 4 = 16, then 16 × 4 = 64. So $4^3 = 64$.

11. Round 6,748,205 to the nearest million, and then to the nearest hundred thousand.
    Nearest million: look at the hundred-thousands digit (7). Since 7 is 5 or more, round the millions up from 6 to 7: 7,000,000. Nearest hundred thousand: look at the ten-thousands digit (4). Since 4 is less than 5, keep the hundred thousands the same: 6,700,000.

12. Find a number that is both a square number and a cube number, and is between 2 and 100. Show why it works.
    The answer is 64. It is a square number because 8 × 8 = 64 (so $8^2 = 64$). It is also a cube number because 4 × 4 × 4 = 64 (so $4^3 = 64$). So 64 is both a square and a cube number.

Answer key (for parents and tutors)

1. Work out: 6 + 4 × 3
   Do multiplication first: 4 × 3 = 12. Then add: 6 + 12 = 18. Answer: 18.

2. Add: 348 + 275
   348 + 275. Ones: 8 + 5 = 13 (write 3, carry 1). Tens: 4 + 7 + 1 = 12 (write 2, carry 1). Hundreds: 3 + 2 + 1 = 6. Answer: 623.

3. Subtract: 500 − 236
   500 − 236. Rename: 500 becomes 4 hundreds, 9 tens, 10 ones. Ones: 10 − 6 = 4. Tens: 9 − 3 = 6. Hundreds: 4 − 2 = 2. Answer: 264.

4. Work out: 20 ÷ 4 + 5
   Do division first: 20 ÷ 4 = 5. Then add: 5 + 5 = 10. Answer: 10.

5. Use the order of operations: 84 − 6 × 9
   Multiplication first: 6 × 9 = 54. Then subtract: 84 − 54 = 30. Answer: 30.

6. Use the order of operations: 6^2 + 40 ÷ 5
   Exponent first: 6^2 = 36. Then division: 40 ÷ 5 = 8. Then add: 36 + 8 = 44. Answer: 44.

7. Multiply: 487 × 18
   Split 18 into 10 and 8. 487 × 10 = 4870. 487 × 8 = 3896. Add them: 4870 + 3896 = 8766. Answer: 8766.

8. The Waterview School gala raised $3475 on Saturday and $2896 on Sunday. The stalls and prizes cost $1580. How much profit did the gala make?
   First add the two days: 3475 + 2896 = 6371. Then take away the costs: 6371 − 1580 = 4791. Answer: The gala made $4791 profit.

9. A netball club has 158 balls. They want to share them equally into 6 storage bins. Using 1/6 of 158, how many balls go in each bin, and how many are left over?
   Finding 1/6 of 158 is the same as 158 ÷ 6. 6 × 26 = 156, so 158 ÷ 6 = 26 remainder 2. As balls are whole objects, each bin gets 26 balls, with 2 balls left over. (As a fraction this would be 26 2/6 = 26 1/3.)

10. Aroha pours 1450 mL of juice equally into 4 cups. How much juice is in each cup? Give your answer as a decimal.
    1450 ÷ 4. 4 × 362 = 1448, so 1450 ÷ 4 = 362 remainder 2. The remainder 2 out of 4 is 2/4 = 0.5. Answer: 362.5 mL in each cup.

11. Work out: 3^2 × (144 ÷ 12) − 45
    Brackets first: 144 ÷ 12 = 12. Exponent next: 3^2 = 9. Then multiply: 9 × 12 = 108. Then subtract: 108 − 45 = 63. Answer: 63.

12. The Titirangi Sports Club buys 24 boxes of shirts. Each box holds 36 shirts. The shirts are shared equally among 5 teams. How many shirts does each team get, and how many are left over?
    First find the total: 24 × 36. 24 × 30 = 720, 24 × 6 = 144, so 720 + 144 = 864 shirts. Now share among 5 teams: 864 ÷ 5. 5 × 172 = 860, so 864 ÷ 5 = 172 remainder 4. Answer: Each team gets 172 shirts, with 4 shirts left over.

Answer key (for parents and tutors)

1. Write 7/1000 as a decimal.
   7/1000 means 7 thousandths. The thousandths place is the third place after the decimal point, so 7/1000 = 0.007.

2. Write 0.4 as a fraction and as a percentage.
   0.4 is 4 tenths = 4/10. As a percentage, 4/10 = 40/100 = 40%. So 0.4 = 4/10 = 40%.

3. Simplify the fraction 6/8 to its lowest terms.
   The common factor of 6 and 8 is 2. Divide both by 2: 6 ÷ 2 = 3 and 8 ÷ 2 = 4. So 6/8 = 3/4.

4. Work out 2.5 × 100.
   Multiplying by 100 moves each digit two places to the left, so the decimal point effectively shifts two places right: 2.5 × 100 = 250.

5. Order these decimals from smallest to largest: 0.7, 0.07, 0.77, 0.707
   Line up the place values (use trailing zeros): 0.700, 0.070, 0.770, 0.707. Compare tenths, then hundredths, then thousandths. Smallest is 0.070, then 0.700, then 0.707, then 0.770. Answer: 0.07, 0.7, 0.707, 0.77.

6. Convert the improper fraction 17/5 to a mixed number.
   Divide 17 by 5: 17 ÷ 5 = 3 remainder 2. The 3 is the whole number and the remainder 2 is over 5. So 17/5 = 3 2/5.

7. Work out 3/4 + 5/8.
   8 is a multiple of 4, so make the denominators the same. 3/4 = 6/8. Then 6/8 + 5/8 = 11/8. As a mixed number, 11 ÷ 8 = 1 remainder 3, so the answer is 1 3/8.

8. At the Avondale Sunday market, a stall starts with 180 apples. During the morning 2/3 of the apples are sold. How many apples are sold?
   First find 1/3 of 180: 180 ÷ 3 = 60. Then 2/3 is two of those parts: 60 × 2 = 120. So 120 apples are sold.

9. Mere is making a bracelet. She has finished 3/4 of the beads, which is 90 beads. How many beads will the whole bracelet have?
   If 3/4 is 90 beads, then 1/4 is 90 ÷ 3 = 30 beads. The whole bracelet is 4 quarters: 30 × 4 = 120 beads.

10. Work out 5.6 – 2.375.
    Write 5.6 as 5.600 so both numbers have three decimal places. Subtract: 5.600 – 2.375. Thousandths: 0 – 5 needs borrowing. Working it out gives 3.225. So 5.6 – 2.375 = 3.225.

11. In Room 12, 3/5 of the 25 students walk to school. In Room 13, 60% of the 30 students walk to school. Which room has more students who walk, and by how many?
    Room 12: 1/5 of 25 = 25 ÷ 5 = 5, so 3/5 = 5 × 3 = 15 walkers. Room 13: 10% of 30 = 3, so 60% = 3 × 6 = 18 walkers. Room 13 has more walkers, by 18 – 15 = 3 students. (Notice 3/5 and 60% are equal as fractions of the whole, but the wholes are different sizes.)

12. A school fundraiser has a goal. So far 20% of the goal has been raised, which is $84. What is the full goal (100%), and how much is 75% of the goal?
    If 20% is $84, then 1% is $84 ÷ 20 = $4.20. The full goal is 100% = $4.20 × 100 = $420. For 75%: 75 × $4.20 = $315 (or three-quarters of $420 = $315). So the goal is $420 and 75% is $315.

Answer key (for parents and tutors)

1. Find 50% of $60.
   50% means one half. Half of $60 = $60 ÷ 2 = $30.
2. Find 10% of $80.
   10% means one tenth. $80 ÷ 10 = $8.
3. Find 25% of $40.
   25% means one quarter. $40 ÷ 4 = $10.
4. Write $4.50 + $2.25 as a total in dollars and cents.
   $4.50 + $2.25 = $6.75.
5. Find 50% of $280.
   50% is one half. $280 ÷ 2 = $140.
6. Find 25% of $160.
   25% is one quarter. $160 ÷ 4 = $40.
7. Find 10% of $250.
   10% is one tenth. $250 ÷ 10 = $25.
8. A skateboard costs $120 at Rebel Sports. There is a 25% discount this weekend. How much money will be taken off the price?
   25% of $120 = $120 ÷ 4 = $30. So $30 is taken off the price.
9. Aroha has $50 to spend at the New World supermarket. She buys fruit for $12.50 and bread for $4.20. Does she have enough money, and how much is left?
   Add the costs: $12.50 + $4.20 = $16.70. Money left: $50 – $16.70 = $33.30. Yes, she has enough, with $33.30 left over.
10. A pair of shoes costs $90. In a half-price sale, what is the new price?
    Half price means 50% off. 50% of $90 = $90 ÷ 2 = $45. The new price is $45.
11. A jacket at Kmart costs $60. It has 10% off. After that discount, an extra 25% is taken off the new lower price. What is the final price?
    First discount: 10% of $60 = $6, so new price = $60 – $6 = $54. Second discount: 25% of $54 = $54 ÷ 4 = $13.50, so final price = $54 – $13.50 = $40.50.
12. Liam has $100. He wants to buy a game for $45, headphones for 25% off their $40 price, and a $15 gift card. Can he afford everything? Show your working.
    Headphones: 25% of $40 = $10 off, so they cost $40 – $10 = $30. Total cost: $45 + $30 + $15 = $90. Since $90 is less than $100, yes he can afford everything, with $100 – $90 = $10 left over.

Answer key (for parents and tutors)

1. Fill in the missing number: 6 × ___ = 42
   42 ÷ 6 = 7, so the missing number is 7. Check: 6 × 7 = 42. ✓

2. True or false? 15 − 3 ≥ 12
   15 − 3 = 12. The symbol ≥ means 'greater than or equal to'. Since 12 = 12, the statement is TRUE.

3. What are the coordinates of a point that is 4 to the right and 0 up from (0, 0)?
   Moving 4 right gives x = 4, and 0 up gives y = 0. The point is (4, 0), which sits on the x-axis.

4. Continue the pattern: 5, 8, 11, 14, ___, ___
   The pattern goes up by 3 each time. 14 + 3 = 17, then 17 + 3 = 20. The next two terms are 17 and 20.

5. Aroha builds towers with blocks. Tower 1 has 4 blocks, Tower 2 has 7 blocks, Tower 3 has 10 blocks. Write the rule in words and find how many blocks Tower 6 has.
   Each tower adds 3 blocks. In words: 'Start with 4 and add 3 for each extra tower', or 'multiply the tower number by 3 and add 1'. Check: Tower 1 = 3 × 1 + 1 = 4 ✓. Tower 6 = 3 × 6 + 1 = 18 + 1 = 19 blocks.

6. True or false? 8 × 7 ≤ 8 × 5 + 20. (Remember the order of operations.)
   Left side: 8 × 7 = 56. Right side: do multiplication first, 8 × 5 = 40, then 40 + 20 = 60. Is 56 ≤ 60? Yes, so the statement is TRUE.

7. Complete the open number sentence: 36 ÷ ___ + 5 = 14
   First subtract 5 from both sides: 36 ÷ ___ = 14 − 5 = 9. Then 36 ÷ 9 = 4, so the missing number is 4. Check: 36 ÷ 4 + 5 = 9 + 5 = 14. ✓

8. Plot these points on a coordinate plane and say which one is on the y-axis: A(3, 2), B(0, 5), C(4, 0).
   A is 3 right and 2 up. B is 0 right and 5 up, so it lies on the y-axis. C is 4 right and 0 up, so it lies on the x-axis. The point on the y-axis is B(0, 5) (its x-value is 0).

9. A food stall at the Avondale market charges $2 for entry plus $3 for each smoothie. Write a rule for the total cost, then find the cost of 5 smoothies.
   Rule: total cost = 2 + 3 × (number of smoothies). For 5 smoothies: 2 + 3 × 5 = 2 + 15 = $17.

10. A pattern follows the rule y = 2 × x + 1. Complete the table of values for x = 0, 1, 2, 3.
    When x = 0: y = 2 × 0 + 1 = 1. When x = 1: y = 2 × 1 + 1 = 3. When x = 2: y = 2 × 2 + 1 = 5. When x = 3: y = 2 × 3 + 1 = 7. Table: (0,1), (1,3), (2,5), (3,7). These points rise by 2 each step, forming a straight line.

11. Use the rule y = 3 × x − 2 to make a table for x = 1, 2, 3, 4, then plot the points on a coordinate plane. What do you notice about the shape they make?
    x = 1: y = 3 × 1 − 2 = 1. x = 2: y = 3 × 2 − 2 = 4. x = 3: y = 3 × 3 − 2 = 7. x = 4: y = 3 × 4 − 2 = 10. Points: (1,1), (2,4), (3,7), (4,10). When plotted, the points line up in a straight line, going up 3 each time you move 1 right. This shows the pattern is a constant (linear) rule.

12. A tiling pattern uses this rule: number of tiles = 4 × step + 2. Kauri says step 10 needs more than 40 tiles. Write a true/false inequality to check, and find which step first has more than 50 tiles.
    Step 10: 4 × 10 + 2 = 42 tiles. Inequality: 42 > 40, which is TRUE, so Kauri is right. To pass 50 tiles we need 4 × step + 2 > 50, so 4 × step > 48, meaning step > 12. Step 12 gives 4 × 12 + 2 = 50 (not more than 50), and step 13 gives 4 × 13 + 2 = 54. So step 13 is the first step with more than 50 tiles.

Answer key (for parents and tutors)

1. Convert 350 cm into metres.
   There are 100 cm in 1 m, so divide by 100. 350 ÷ 100 = 3.5 m.

2. Convert 2.5 kg into grams.
   There are 1000 g in 1 kg, so multiply by 1000. 2.5 × 1000 = 2500 g.

3. Two angles sit on a straight line. One is 115°. What is the other?
   Angles on a straight line add to 180°. 180° − 115° = 65°.

4. Convert 1500 mL into litres.
   There are 1000 mL in 1 L, so divide by 1000. 1500 ÷ 1000 = 1.5 L.

5. A netball court section at Avondale is a rectangle 8 m long and 5 m wide. What is its area?
   Area of a rectangle = length × width. 8 m × 5 m = 40 m².

6. A right-angled triangle has a base of 6 cm and a height of 4 cm. What is its area?
   A right-angled triangle is half of a rectangle with the same base and height. Rectangle area = 6 × 4 = 24 cm². Triangle = 24 ÷ 2 = 12 cm².

7. A rectangular gift box measures 3 cm by 4 cm by 5 cm. Work out its volume.
   Volume of a rectangular prism = length × width × height. 3 × 4 × 5 = 60 cm³.

8. Mere's backpack holds a drink bottle of 750 g and a lunchbox of 1 kg 250 g. What is the total mass in kilograms?
   Change 1 kg 250 g to grams: 1250 g. Total = 750 + 1250 = 2000 g. Convert to kilograms: 2000 ÷ 1000 = 2 kg.

9. The bus leaves Avondale at 2:53 pm and reaches Britomart at 3:28 pm. How long is the trip?
   From 2:53 pm to 3:00 pm is 7 minutes. From 3:00 pm to 3:28 pm is 28 minutes. 7 + 28 = 35 minutes.

10. Two straight lines cross. One of the four angles is 70°. Using vertically opposite angles, name the sizes of the other three angles.
    Vertically opposite angles are equal, so the angle directly opposite the 70° is also 70°. The other two angles are on a straight line with the 70°: 180° − 70° = 110° each. So the four angles are 70°, 110°, 70°, 110°.

11. A fish tank is a rectangular prism 40 cm long, 25 cm wide and 30 cm high. (a) What is its volume in cm³? (b) If 1000 cm³ holds 1 litre of water, how many litres does the full tank hold?
    (a) Volume = 40 × 25 × 30. First 40 × 25 = 1000, then 1000 × 30 = 30000 cm³. (b) 30000 ÷ 1000 = 30 litres.

12. At a point, three angles meet around the centre of a wheel. They measure 145°, x°, and 90°, and together they complete a full turn. Find x. Then say what fraction of a full turn 90° is.
    Angles at a point add to 360°. So x = 360 − 145 − 90 = 125°. A full turn is 360°, and 90 ÷ 360 = 1/4, so 90° is one quarter of a full turn.

Answer key (for parents and tutors)

1. Name the quadrilateral that has four right angles and four equal-length sides.
   A square. It has four right angles (like a rectangle) and four equal sides (like a rhombus), so it fits both descriptions.
2. How many sides does a trapezium have, and how many pairs of parallel sides?
   A trapezium has 4 sides and exactly 1 pair of parallel sides.
3. What do the three interior angles of any triangle add up to?
   They add up to 180°.
4. What is the order of rotational symmetry of a circle?
   Infinite. A circle looks exactly the same no matter how far you turn it.
5. A parallelogram has two pairs of parallel sides. Explain how a rectangle is a special kind of parallelogram.
   A rectangle has two pairs of parallel sides, so it is a parallelogram. It is 'special' because it also has four right angles, which not every parallelogram has.
6. A kite has two pairs of equal-length adjacent sides. Is a rhombus a kite? Explain.
   Yes. A rhombus has four equal sides, so its adjacent (next-to-each-other) sides are equal in two pairs. That fits the kite rule, so a rhombus can be classed as a special kite.
7. A triangle has two angles of 65° and 40°. What is the size of the third angle?
   The three angles add to 180°. 65° + 40° = 105°. Third angle = 180° − 105° = 75°.
8. State the order of rotational symmetry of: (a) a square, (b) a rectangle (not a square), (c) an equilateral triangle.
   (a) A square has order 4, it matches its original position 4 times in a full turn. (b) A rectangle has order 2. (c) An equilateral triangle has order 3.
9. Aroha is making a kite for the Manukau kite day. Three of its interior angles are 100°, 75° and 100°. What is the size of the fourth angle?
   The four interior angles of any quadrilateral add up to 360°. 100° + 75° + 100° = 275°. Fourth angle = 360° − 275° = 85°.
10. Tama sorts shapes for a display at school. He has a shape with four sides where every side is the same length but it has no right angles. What quadrilateral is it, and why is it not a square?
    It is a rhombus. A rhombus has four equal-length sides. It is not a square because a square must also have four right angles, and this shape has none.
11. A quadrilateral has interior angles in the ratio 1 : 2 : 3 : 3. Work out all four angles, then say whether the shape could be a trapezium.
    The parts add to 1 + 2 + 3 + 3 = 9 parts. The four angles total 360°, so one part = 360° ÷ 9 = 40°. The angles are 40°, 80°, 120° and 120°. This could be a trapezium: a pair of equal angles (120° and 120°) sitting next to the other angles can occur when one pair of sides is parallel, so a trapezium is possible.
12. Compare a triangular prism and a square-based pyramid. State how many faces, edges and vertices each has, and describe one key difference in their faces.
    Triangular prism: 5 faces (2 triangles + 3 rectangles), 9 edges, 6 vertices. Square-based pyramid: 5 faces (1 square + 4 triangles), 8 edges, 5 vertices. Key difference: a prism has two identical parallel end faces joined by rectangles, while a pyramid has one base and triangular faces that all meet at a single apex point.

Answer key (for parents and tutors)

1. Name the transformation for each word: (a) flip, (b) slide, (c) turn.
   (a) flip = reflection, (b) slide = translation, (c) turn = rotation. These are the three ways we move a shape without changing its size.

2. When you slide (translate) a triangle 5 cm to the right, does its size or shape change?
   No. A translation only changes the position. The size, shape and the direction it points all stay exactly the same.

3. A shape is turned a full circle (360°) around a point. Where does it end up?
   Back in exactly the same place it started. A full turn of 360° brings a shape right back to where it began.

4. True or false: a tessellation can have small gaps between the shapes.
   False. A tessellation is a repeating pattern with NO gaps and NO overlaps, the shapes fit together perfectly.

5. A letter 'b' is reflected in a vertical mirror line. Which letter does it look like?
   It looks like a 'd'. A reflection makes a mirror image, so the bump swaps from the right side to the left side.

6. A square tile is at position A. It is translated 3 squares right, then translated 2 squares up. Describe its final position compared to the start.
   The tile ends up 3 squares to the right and 2 squares up from where it started. Doing the two slides in either order gives the same finishing spot.

7. Amaia is making a tessellation using regular hexagons on the floor of the classroom. Explain why hexagons tessellate but regular pentagons do not.
   At every point where hexagons meet, three hexagons fit together and their angles add to 360° (3 × 120° = 360°), leaving no gaps. Regular pentagons have 108° angles; three make only 324° (a gap) and four make 432° (an overlap), so they cannot fit together neatly.

8. An arrow shape points up (↑). It is rotated 90° clockwise, then rotated another 90° clockwise. Which way does it point now?
   It points down (↓). Each 90° clockwise turn is a quarter turn. Two quarter turns make a half turn (180°), so an up arrow becomes a down arrow: ↑ → → → ↓.

9. Tane draws a flag shape at the left of his page. He first reflects it in a vertical line, then translates the reflected shape 6 cm down. Describe what has happened to the flag overall.
   First the flag becomes a mirror image (facing the opposite direction). Then that mirror image slides 6 cm straight down. So the final flag is a flipped version of the original, sitting 6 cm lower down the page.

10. A right-angled triangle has sides 3 cm, 4 cm and 5 cm. It is reflected across a line and then translated 4 cm to the right. What are the side lengths of the final triangle, and what stays the same?
    The side lengths stay 3 cm, 4 cm and 5 cm. Reflections and translations never change lengths or angles, they keep the shape and size identical (congruent). Only the triangle's position and its facing direction have changed.

11. On grid paper, a triangle has corners at (1,1), (1,3) and (2,1). It is translated 3 right and 1 up, then reflected in the vertical line x = 6. Give the coordinates of all three corners after BOTH steps.
    Step 1 (translate 3 right, 1 up): (1,1)→(4,2), (1,3)→(4,4), (2,1)→(5,2). Step 2 (reflect in x = 6): to reflect, the new x is 6 + (6 − old x). For x=4: 6+(6−4)=8. For x=5: 6+(6−5)=7. The y-values stay the same. Final corners: (8,2), (8,4) and (7,2).

12. Ropata says: 'If I rotate a shape 180° and then reflect it in a horizontal mirror line, I get the same result as a single reflection in a vertical line.' Use an up-and-right arrow (↗) to test whether he is correct.
    Start with ↗ (pointing up-right). Rotate 180°: it now points down-left (↙). Reflect that in a horizontal line (flip top-to-bottom): down-left becomes up-left (↖). Now test a single vertical-line reflection of the original ↗: flipping left-to-right gives up-left (↖) too. Both routes give ↖, so Ropata is correct for this arrow, a 180° rotation followed by a horizontal reflection matches a single vertical reflection.

Answer key (for parents and tutors)

1. Find the mean of these numbers: 4, 6, 8.
   Add them: 4 + 6 + 8 = 18. There are 3 numbers, so divide: 18 ÷ 3 = 6. The mean is 6.
2. Find the range of these numbers: 3, 9, 5, 2.
   The highest value is 9 and the lowest is 2. Range = highest – lowest = 9 – 2 = 7. The range is 7.
3. Find the mean of these test scores: 10, 20, 30, 40.
   Add them: 10 + 20 + 30 + 40 = 100. There are 4 scores, so 100 ÷ 4 = 25. The mean is 25.
4. Find the range of these temperatures (°C): 18, 22, 15, 20.
   Highest = 22, lowest = 15. Range = 22 – 15 = 7. The range is 7°C.
5. Aria measured the mass of a bag of carrots each day for 5 days: 1000 g, 990 g, 985 g, 975 g, 970 g. What is the range of the masses?
   Highest = 1000 g, lowest = 970 g. Range = 1000 – 970 = 30 g. The range is 30 g.
6. Using Aria's carrot masses (1000, 990, 985, 975, 970 g), find the mean mass over the 5 days.
   Add them: 1000 + 990 + 985 + 975 + 970 = 4920 g. Divide by 5 days: 4920 ÷ 5 = 984 g. The mean mass is 984 g.
7. The Avondale Markets recorded rainfall (mm) for one week: 2, 0, 5, 8, 3, 6, 4. Find the mean daily rainfall.
   Add them: 2 + 0 + 5 + 8 + 3 + 6 + 4 = 28 mm. There are 7 days, so 28 ÷ 7 = 4 mm. The mean daily rainfall is 4 mm.
8. Using the same rainfall data (2, 0, 5, 8, 3, 6, 4), find the range.
   Highest = 8 mm, lowest = 0 mm. Range = 8 – 0 = 8 mm. The range is 8 mm.
9. Tane counted the number of buses passing his house each morning for 5 days: 6, 8, 7, 5, 9. What is the mean number of buses per day?
   Add them: 6 + 8 + 7 + 5 + 9 = 35. Divide by 5 days: 35 ÷ 5 = 7. The mean is 7 buses per day.
10. Mere saved money over 4 weeks: $12, $15, $9, $16. Find both the mean weekly saving and the range.
    Mean: 12 + 15 + 9 + 16 = 52, then 52 ÷ 4 = $13. Range: highest $16 – lowest $9 = $7. The mean is $13 and the range is $7.
11. Over 5 days the temperature at Cornwall Park was recorded: 16°C, 18°C, 17°C, 19°C, and one missing day. The mean over the 5 days was 18°C. What was the missing temperature?
    If the mean of 5 values is 18, the total must be 18 × 5 = 90°C. The four known values add to 16 + 18 + 17 + 19 = 70. The missing value = 90 – 70 = 20°C. The missing temperature was 20°C.
12. A shop weighed a kilogram of bananas each day for 6 days: 1000 g, 995 g, 985 g, 980 g, 975 g, 965 g. Find the mean and the range, then explain what the numbers tell you about the bananas over time.
    Mean: 1000 + 995 + 985 + 980 + 975 + 965 = 5900 g, then 5900 ÷ 6 = 983.33 g (about 983 g). Range: 1000 – 965 = 35 g. The masses go down a little each day, so this time-series data shows the bananas are slowly losing mass (drying out) as the days pass. The range of 35 g tells us the difference between the heaviest and lightest days is small.

Answer key (for parents and tutors)

1. On a time-series graph, which axis (the horizontal one or the vertical one) always shows the time?
   The horizontal axis, the x-axis, always shows the time. The vertical axis (y-axis) shows the other measurement, such as temperature or amount.

2. A line graph shows the temperature in Avondale was 13°C at 8am and 19°C at 11am. By how many degrees did it rise?
   19 – 13 = 6. The temperature rose by 6°C.

3. You want to show how a kūmara plant's height changed each week for 8 weeks. Is a time-series graph a good choice? Why?
   Yes. A time-series graph is a good choice because the data is measured over time (each week), and a line graph clearly shows how the height changes and whether it is going up or down.

4. On a time-series graph the points for Monday to Friday are joined with lines. If the line goes downward from one day to the next, what does that tell you?
   A downward line means the value went down (decreased) from one day to the next, for example, fewer visitors or a lower temperature.

5. Mia recorded the number of library books borrowed at Avondale School each day: Monday 20, Tuesday 25, Wednesday 30, Thursday 22, Friday 35. Describe how you would set up a time-series graph for this data (what goes on each axis and a sensible scale).
   Put the days (Monday to Friday) along the horizontal x-axis. Put the number of books on the vertical y-axis. The values range from 20 to 35, so a sensible scale is going up in 5s: 0, 5, 10, 15, 20, 25, 30, 35. Plot a point above each day at the correct height, then join the points with straight lines.

6. Using Mia's data above, between which two days did the number of books borrowed drop the most, and by how many?
   The values change like this: Mon→Tue up 5, Tue→Wed up 5, Wed→Thu down 8 (30 to 22), Thu→Fri up 13. The only drop is Wednesday to Thursday, a fall of 30 – 22 = 8 books. That is the biggest (and only) drop.

7. Rangi measured the water level in his rain tank on the 1st of each month (in litres): Jan 400, Feb 350, Mar 300, Apr 380, May 500. On his time-series graph, describe the overall trend from January to May.
   The level falls from January (400) to March (300), then rises again to May (500). So the trend is: a decrease over the first three months, then an increase over the last two months, ending higher than it started (500 is more than 400).

8. A café owner has two sets of data: (a) how her daily coffee sales changed over one week, and (b) the favourite ice-cream flavours of 60 customers. Which set suits a time-series graph and which suits a bar graph? Explain.
   Set (a), daily coffee sales over a week, suits a time-series (line) graph because it is measured over time and we want to see how it changes. Set (b), favourite flavours, suits a bar graph because the flavours are separate categories, not time, and bars let us compare the size of each group.

9. Here are the midday temperatures for a week in Auckland: Mon 18°C, Tue 21°C, Wed 24°C, Thu 24°C, Fri 20°C, Sat 17°C, Sun 19°C. What was the highest temperature, and on how many days was the temperature 20°C or above?
   The highest temperature was 24°C (on Wednesday and Thursday). Days at 20°C or above: Tuesday (21), Wednesday (24), Thursday (24), Friday (20) = 4 days.

10. Leah plots a point on her time-series graph at the position '3pm, 12 people'. Explain in words exactly what this point means.
    It means that at 3pm (read from the x-axis) there were 12 people (read from the y-axis). The point sits directly above the 3pm mark and level with the 12 mark, showing the two measurements at that moment.

11. Two shops record their afternoon customers on the same time-series graph. Shop A: 1pm 10, 2pm 15, 3pm 25, 4pm 20. Shop B: 1pm 20, 2pm 18, 3pm 15, 4pm 22. At what time did the two shops have the same number of customers, and how would you show both shops clearly on one graph?
    Compare each time: 1pm A=10 B=20, 2pm A=15 B=18, 3pm A=25 B=15, 4pm A=20 B=22, none are exactly equal at the recorded times. However, between 2pm and 3pm Shop A rises (15→25) while Shop B falls (18→15), so their lines cross between 2pm and 3pm, meaning they were equal at some point in that interval. To show both clearly, draw

two separate lines on the same axes using different colours (or one solid and one dashed line) and add a key/legend saying which line is Shop A and which is Shop B.

12. Sam has yearly rainfall totals for Auckland for 10 years and wants to see if rainfall is generally increasing or decreasing over time. He also has to present the average rainfall of 5 different NZ cities for one year. Which graph best suits each task, and for the 10-year data explain what a 'trend line' would add.
For the 10-year rainfall (data over time), a time-series (line) graph is best because it shows changes across the years and any pattern. For comparing 5 cities in one year (separate categories), a bar graph is best. A trend line is a single straight line drawn to follow the general direction of the plotted points; it smooths out the ups and downs so Sam can see the overall pattern, for example, whether rainfall is slowly increasing or decreasing over the 10 years, even if individual years jump around.

Answer key (for parents and tutors)

1. List the sample space for rolling a standard six-sided die.
   The sample space is all the possible outcomes: 1, 2, 3, 4, 5, 6. That is 6 outcomes altogether.

2. A coin is flipped once. What is the probability it lands on tails?
   There are 2 equally likely outcomes (heads or tails). Tails is 1 of these, so the probability is 1 out of 2 = ½ = 0.5.

3. On a number line from 0 to 1, what value shows an event that is certain to happen?
   A certain event has a probability of 1. (0 means impossible, ½ means equally likely, and 1 means certain.)

4. A bag holds 4 red and 4 blue marbles. What is the probability of pulling out a red marble?
   Total marbles = 4 + 4 = 8. Red marbles = 4. Probability = 4 out of 8 = 4/8 = ½ = 0.5.

5. A spinner has 8 equal sections: 4 red, 2 blue, 1 green and 1 yellow. What is the probability of landing on red?
   Red covers 4 of the 8 equal sections. Probability = 4/8 = ½ = 0.5.

6. Using the same spinner (4 red, 2 blue, 1 green, 1 yellow), what is the probability of landing on blue or yellow?
   Blue = 2/8 and yellow = 1/8. Add them: 2/8 + 1/8 = 3/8. So the probability of blue or yellow is 3/8.

7. For the same spinner, show that the probabilities of all four colours add up to 1.
   Red 4/8 + blue 2/8 + green 1/8 + yellow 1/8 = (4 + 2 + 1 + 1)/8 = 8/8 = 1. The total is 1, as it should be.

8. Aroha rolls a fair die. What is the probability of rolling an even number?
   The even numbers are 2, 4 and 6, that is 3 outcomes out of 6. Probability = 3/6 = ½ = 0.5.

9. At the Avondale School gala, Mere spins the prize wheel 40 times. It lands on 'Win a prize' 8 times. What is the experimental probability of winning a prize on one spin?
   Experimental probability = number of wins ÷ number of spins = 8/40 = 1/5 = 0.2.

10. A bag has 3 green, 5 red and 2 yellow jelly beans. Tane picks one without looking. What is the probability it is yellow, and what is the probability it is NOT green?
    Total jelly beans = 3 + 5 + 2 = 10. Yellow = 2/10 = 1/5. Not green means red or yellow = 5 + 2 = 7, so 7/10. Probability yellow = 1/5; probability not green = 7/10.

11. A spinner is one-half blue and one-quarter red. The rest is split equally between green and yellow. What is the probability of each colour? Check your answers add up to 1.
    Blue = ½ and red = ¼. Used so far = ½ + ¼ = ¾. Remaining = 1 − ¾ = ¼, shared equally between green and yellow, so each is ¼ ÷ 2 = 1/8. Check: ½ + ¼ + 1/8 + 1/8 = 4/8 + 2/8 + 1/8 + 1/8 = 8/8 = 1. Correct.

12. Kauri rolls a fair die 60 times. (a) How many times would you expect to roll a 3? (b) He actually rolled a 3 fourteen times, write the experimental probability as a fraction in simplest form.
    (a) The probability of a 3 is 1/6, so expected rolls = 60 × 1/6 = 10 times. (b) Experimental probability = 14/60. Divide top and bottom by 2 = 7/30. So the experimental probability is 7/30, a little higher than the expected 1/6 (which equals 10/60).