



It's raining cats and dogs ...and chickens?

Year 6 Mathematics



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It's raining cats and dogs...and chickens?

Year level	6
Duration of unit	12 hours*
Key learning area	Mathematics

Unit description

In this unit students will investigate the financial and non-financial costs of becoming a pet owner. They will consider other factors such as ethical considerations and the external factors that influence the choice of pet.

Students will make connections between equivalent fractions, decimals and percentages, and then use percentages to calculate discounts on expenditure necessary for pet ownership. They will examine national data on pet ownership and the costs involved, and construct a graph. Students will explore different pet enclosures in terms of area and perimeter, using correct units. They will construct simple prisms from nets to model different enclosures.

At the end of this unit, students will discuss keeping chickens at school and selling their eggs as a way to raise money. They will design an enclosure for chickens using their knowledge of area and perimeter. Students will evaluate the financial and ethical considerations of keeping chickens for this purpose.

Enduring understandings/Deep learnings

- ▶ A pet costs more than just the money you spend
- ▶ Percentages are a useful way to compare quantities
- ▶ Data can be displayed in a variety of forms
- ▶ Objects with the same area can have different shapes

* Timings are provided as guide only. Teachers will tailor the activities to suit the capabilities and interests of their class. The unit and all the student worksheets can be adapted to your need.



Links to the Australian Curriculum and National Consumer and Financial Literacy Framework

Australian Curriculum	National Consumer and Financial Literacy Framework
<p>Mathematics</p> <ul style="list-style-type: none"> ▶ Strand Number and Algebra <ul style="list-style-type: none"> Sub-strand Fractions and decimals Content Description <ul style="list-style-type: none"> — Make connections between equivalent fractions, decimals and percentages (ACMNA131) Sub-strand Money and financial mathematics Content Description <ul style="list-style-type: none"> — Investigate and calculate percentage discounts of 10%, 25% and 50% on sale items, with and without digital technologies (ACMNA132) ▶ Strand Measurement and geometry <ul style="list-style-type: none"> Sub-strand Using units of measurement Content Descriptions <ul style="list-style-type: none"> — Solve problems involving the comparison of lengths and areas using appropriate units (ACMMG137) — Convert between common metric units of length, mass and capacity (ACMMG136) Sub-strand Shape Content Description <ul style="list-style-type: none"> — Construct simple prisms and pyramids (ACMMG140) 	<p>(Note: the student learnings in the National Consumer and Financial Literacy Framework are divided into, and are applicable over, bands covering two chronological years.)</p> <p>Year 6</p> <ul style="list-style-type: none"> ▶ Dimension Knowledge and understanding <ul style="list-style-type: none"> Student Learnings <ul style="list-style-type: none"> — Analyse the value of a range of goods and services in relation to an identified need ▶ Dimension Competence <ul style="list-style-type: none"> Student Learnings <ul style="list-style-type: none"> — Evaluate the value of a range of goods and services in a variety of 'real-life' situations ▶ Dimension Responsibility and enterprise <ul style="list-style-type: none"> Student Learnings <ul style="list-style-type: none"> — Explain there are ethical considerations to some consumer and financial decisions — Examine and discuss the external factors that influence consumer choices



► **Strand** Statistics and Probability

Sub-strand Data representation and interpretation

Content Descriptions

- Interpret and compare a range of data displays, including side-by-side column graphs for two categorical variables (ACMSP147)
- Interpret secondary data presented in digital media and elsewhere (ACMSP148)

Australian Curriculum

General capabilities

Numeracy, Literacy, Information and communication technology (ICT) Capability, Critical and creative thinking, Personal and social capability, and Ethical behaviour.

Cross-curriculum priorities

N/A

Proficiency strands

Understanding

- Demonstrate an understanding of measurement through discussion and exploration of the relationship between perimeter and area ('Herdng cats')

Fluency

- Use knowledge of statistical representations to create appropriate graphs to display data using technology ('Cats or dogs?')
- Use knowledge of fractions, decimals and percentages to calculate percentage discounts ('Cheap, cheap!')

Problem solving

- Apply knowledge of problem solving to make choices, interpret and analyse data in comparison to national data ('Cheap, cheap!')
- Investigate specific mathematical concepts while designing and making ('Chicken run')

Prerequisite skills

Good to use at end of year and used as assessment as there is much pre-requisite knowledge needed to complete this unit:

- Understanding and working with area, perimeter and volume
- Understanding the relationship between fractions, decimals and percentages – converting one to the other
- Calculating percentages
- Graphs
- Using Excel to create graphs (optional)



Sequenced teaching and learning activities	Assessment tasks	Resources
▼ Introducing		
<p>Introduction: How much is that doggie in the window? (60 minutes)</p> <p>Students discuss types of pets and the considerations for selecting them, including ethical and personal. They make a list of pets, estimate the cost of each and then rank the costs in order. Students are encouraged to consult families about the cost of the pet as well as ongoing costs.</p>		<ul style="list-style-type: none"> ▶ Internet access ▶ YouTube access to, or pre-recorded version of, the song “How Much is that Doggie in the Window?” youtube.com/watch?v=fC5Yf9rmKto ▶ The Australian Companion Animal Council Inc acac.org.au ▶ Word wall
<p>Activity 1 How many scorpions to a python? (60 minutes)</p> <p>Students place the costs for some pets on an open number line and then make comparisons in terms of proportion (fractions, decimals and percentages).</p>	<p>Diagnostic</p> <p>Collect Worksheet 3: How many scorpions to a python to determine student understanding of proportion and ability to compare percentages.</p>	<ul style="list-style-type: none"> ▶ Long rope ▶ 8 clothes pegs or large paper clips ▶ Worksheet 1: Percentage cards ▶ Worksheet 2: Animal picture cards ▶ Worksheet 3: How many scorpions to a python?
▼ Developing		
<p>Activity 2 Cats and dogs (60 minutes)</p> <p>Students interpret pet ownership numbers from national data. They compare their data with that of the national data.</p>		<ul style="list-style-type: none"> ▶ Seven 10-sided dice numbered 0 – 9 ▶ Calculators ▶ Worksheet 4: Cats and dogs ▶ Word wall



Sequenced teaching and learning activities (cont)	Assessment tasks	Resources
▼ Developing (cont)		
Activity 3 Cheap, cheap! (120 minutes) Students brainstorm the costs involved in having a pet. They investigate percentages used for discount, calculating 10, 25 and 50 per cent discounts on goods and services for pets.	Formative Collect student work samples to determine students' abilities to calculate discounts.	<ul style="list-style-type: none"> ▶ Catalogues, newspapers ▶ Online advertisements ▶ Calculators ▶ Worksheet 5: Cheap cheap!
Activity 4 Cats or dogs? (60 minutes) Students examine the national data comparing the annual expenditure on cats and dogs. They classify the data and then construct a side-by-side column graph. Students identify areas for possible savings and justify their choices.	Formative Collect student worksheets to determine students' abilities to calculate area and perimeter.	<ul style="list-style-type: none"> ▶ Worksheet 6: Cats or dogs? ▶ Computer access – 'Excel' or similar software ▶ Word wall
▼ Culminating		
Activity 5 Herding hens (120 minutes) Students discuss and describe appropriate spaces (area, volume, capacity) for a range of pets. They review metric units and their conversions. Students explore the relationship between perimeter and area for rectangular shapes.		<ul style="list-style-type: none"> ▶ Measuring tapes ▶ Tape to lay out square metres ▶ Building blocks or boxes to make a cubic metre ▶ Worksheet 7: Herding hens



Sequenced teaching and learning activities (cont)	Assessment tasks	Resources
▼ Culminating (cont)		
Activity 6 All cooped up (120 minutes) Students construct a selection of chicken coops from nets. They calculate the area of each and the number of chickens each could house.	Summative Student designs of chicken coops, and the composition of an analytical article, will be used to assess student learning from the unit.	<ul style="list-style-type: none"> ▶ Class set of nets photocopied onto light cardboard ▶ Scissors ▶ Ruler ▶ Sticky tape or glue ▶ Worksheet 8: All cooped up
Activity 7 Chicken run (120 minutes) Students design a chicken coop, describing it in terms of area and perimeter. They evaluate the financial and ethical considerations of raising chickens to sell their eggs.		<ul style="list-style-type: none"> ▶ Worksheet 9: Chicken run ▶ Pencils and rulers

Diversity of learners

Teachers use the Australian Curriculum content and achievement standards first to identify current levels of learning and achievement, and then to select the most appropriate content (possibly from across several year levels) to teach individual students and/or groups of students. This takes into account that in each class there may be students with a range of prior achievement (below, at and above the year level expectations) and that teachers plan to build on current learning.



Connection to year level Achievement Standards

This unit of work contributes to the following aspects of the Achievement Standards in Mathematics for Year 6 (indicated in bold):

By the end of Year 6, students recognise the properties of prime, composite, square and triangular numbers. They describe the use of integers in everyday contexts. They solve problems involving all four operations with whole numbers. Students **connect fractions, decimals and percentages as different representations of the same number**. They solve problems involving the addition and subtraction of related fractions. Students make connections between the powers of 10 and the multiplication and division of decimals. They describe rules used in sequences involving whole numbers, fractions and decimals. Students connect decimal representations to the metric system and choose appropriate units of measurement to perform a calculation. They make connections between capacity and volume. They **solve problems involving length and area**. They interpret timetables. Students describe combinations of transformations. They solve problems using the properties of angles. Students compare observed and expected frequencies. They **interpret and compare a variety of data displays including those displays for two categorical variables**. They **evaluate secondary data displayed in the media**.

Students locate fractions and integers on a number line. They calculate a simple fraction of a quantity. They add, subtract and multiply decimals and divide decimals where the result is rational. Students **calculate common percentage discounts on sale items**. They write correct number sentences using brackets and **order of operations**. Students locate an ordered pair in any one of the four quadrants on the Cartesian plane. They **construct simple prisms and pyramids**. Students list and communicate probabilities using simple fractions, decimals and percentages.



Assessment rubric

- This rubric is intended as a guide only. It can be modified to suit teachers' needs and to be integrated into existing assessment systems.
- Teachers may also wish to collect the worksheets as work samples for individual student folios.

Student's name: _____

Relevant content description(s)	Skill	Relevant activities and worksheets	Competent	Developing at level	Needs further development	Notes
Make connections between equivalent fractions, decimals and percentages (ACMNA131)	The student can compare percentages and numbers proportionally and order/position them on a number line	Activity 1 Worksheets 1 and 2	The student orders and positions all percentages and numbers correctly and accurately and justifies decisions clearly	The student orders all percentages and numbers correctly but some are positioned inaccurately. The student cannot justify all decisions	The student orders some numbers and percentages correctly, but has little or no understanding of how to position them correctly	
	The student can recognise the connection between the multiple and the fraction (Example: \$5 = 1/5 of \$25)	Activity 1 Worksheet 3	The student calculates and writes the relationship between two numbers as a fraction without error in all examples and provides justification	The student calculates and writes the simple relationship between two numbers as a fraction but has difficulty explaining a less obvious example	The student has difficulty making the connection between the multiple and the fraction without teacher guidance	
Investigate and calculate percentage discounts of 10%, 25% and 50% on sale items, with and without digital technology(ACMNA132)	The student can calculate a discount to determine the price of sale goods using key percentages	Activity 3 Worksheet 5	The student calculates the amount of discount and the sale price using key percentage/fraction equivalents correctly with and without a calculator.	The student calculates the amount of discount and the sale price using key percentage/fraction equivalents with and without a calculator.	The student requires teacher guidance to recognise percentage/fraction equivalents and to use them with and without a calculator. The	



	with/without a calculator		calculator. The student also uses the link between percentages and decimals to obtain the same result correctly	Occasional errors are corrected with little or no assistance. The student attempts to use the link between percentages and decimals to obtain the same result with some success	student requires guidance to link percentages and decimals	
	The student can derive other percentages from key percentages	Activity 3 Worksheet 5	The student calculates the amount of discount and the sale price using 5% and 30% derived correctly from key percentages with and without a calculator. The student uses the link between percentages and decimals to obtain the same result correctly	The student calculates the amount of discount and the sale price using 5% and 30% derived from key percentages with and without a calculator. Occasional errors are corrected with little or no assistance. The student attempts to use the link between percentages and decimals to obtain the same result with some success	The student requires teacher guidance to derive 5% and 30% from key percentages	
Solve problems involving the comparison of lengths and areas using appropriate units (ACMMG137)	The student can calculate the perimeter of a rectangle	Activity 7 Worksheet 9	The student selects an appropriate length and width of a rectangle and correctly calculates the perimeter	The student selects a length and width of a rectangle and calculates the perimeter. Errors are corrected with little or no assistance	The student requires teacher guidance to select a length and width of a rectangle. The use of concrete materials may be required to support calculation of perimeter	



	The student can calculate the area of a rectangle	Activities 5, 6 and 7 Worksheets 7, 8 and 9	The student selects and accurately measures the length and width of a variety of rectangles and correctly calculates the areas	The student selects and measures the length and width of a variety of rectangles and calculates the areas. Occasional inaccuracies and errors are corrected with little or no assistance	The student requires teacher guidance to select and measure the length and width of a rectangle. The use of concrete materials may be required to support calculation of area	
	The student can determine the minimum and maximum areas enclosed by a given length of fencing	Activity 5 Worksheet 7	The student works independently to explore the concept of varying area in relation to perimeter. A correct, written solution is fully justified	The student attempts to explore the concept of varying area in relation to perimeter but is incorrect or may not reach a solution. Some attempt at written justification is provided	The student requires significant teacher guidance to understand the concept and attempt any working	
	The student can solve and report on real life problems using perimeter and area	Activity 7 Worksheet 9	The student designs (and constructs) an appropriate chicken coop that makes best use of materials and meets the given area requirement. The student clearly and thoroughly justifies all working with diagrams, calculations and written explanations.	The student designs (and constructs) a chicken coop that attempts to make best use of materials and meet the given area requirement. The student attempts to justify some working with diagrams, calculations and written explanations which may be incorrect, unclear or incomplete	The student requires teacher assistance to modify a design for a chicken coop to meet the given area requirement	



Convert between metric units of lengths, mass and capacity (ACMMG136)	The student can convert between mm, cm and m	Activities 5 and 6 Worksheets 7 and 8	The student converts between mm, cm and m correctly	The student converts between mm, cm and m with occasional errors that are corrected with little or no assistance	The student requires teacher guidance and/or concrete materials to convert between mm, cm and m	
Construct simple prisms and pyramids (ACMMG140)	The student can use a given net to construct and describe a 3D shape	Activities 6 and 7 Worksheets 8 and 9	The student correctly identifies and names the prisms from nets. The student carefully cuts, accurately folds and glues the tabs of the net to successfully complete construction of the prism	The student describes the prisms from nets but may not be able to name them all correctly. The student cuts, folds and glues the tabs of the net to complete construction of the prism	The student requires teacher guidance to fold and glue the tabs of the net to complete construction of the prism before attempting to describe its shape	
	The student can design a suitable 3D shape to meet specific requirements		The student accurately and neatly draws the net of a suitable chicken coop and labels all dimensions clearly.	The student draws the net of a chicken coop with some omissions or inaccuracies	The student requires teacher guidance to attempt drawing a net	
Interpret and compare a range of data displays, including side-by-side column graphs for two categorical variables (ACMSP147)	The student can determine the value of numerical data presented in a concise way ('000 or '000 000)	Activities 2 and 4 Worksheets 4 and 6	The student correctly interprets tabulated numerical data and analyses it accurately	The student interprets and analyses tabulated numerical data with occasional errors that are corrected with little or no assistance	The student requires teacher guidance to determine the value of tabulated numerical data and to analyse it	



Interpret secondary data presented in digital media and elsewhere (ACMSP148)	The student can interpret and discuss data created and represented from another source	Activity 4 Worksheet 6	The student examines the national data comparing annual expenditure on cats and dogs to accurately transfer entries to the appropriate category in the summary table. The student summarises the information in a thorough, written report	The student examines the national data comparing annual expenditure on cats and dogs to transfer most entries to the appropriate category in the summary table. The student summarises some of the information in a written report	The student transfers purchase cost and food to the appropriate category in the summary table but requires teacher guidance to categorise other information. The student reports on one or two very obvious points only	
Suggested Summative Assessment (including assessing the written composition against English (ACEY1714) if teachers wish)	Criteria in Teacher notes * See student competency level descriptors for these activities/worksheets in this rubric	*Activities 6 and 7 *Worksheets 8 and 9		report		

Introduction: How much is that doggie in the window? (60 minutes)

- ▶ Play the song “How Much is that Doggie in the Window?” [youtube.com/watch?v=fC5Yf9rmKto](https://www.youtube.com/watch?v=fC5Yf9rmKto) and initiate a conversation on the financial and non financial costs of owning a pet.
- ▶ Australia has one of the world’s highest rates of pet ownership per capita: 36% of households own dogs and 23% own cats.
- ▶ Discuss pets.
 - Why do people have pets? (It may be necessary to distinguish between working animals and companion animals.)
 - What sorts of animals are not suitable as pets? Why?
 - Do you think owning a pet is ethical?
 - What are some of the considerations for selecting a pet?
 - What are pedigreed animals?
 - How do they differ from non-pedigreed animals?
 - What are the advantages and disadvantages of owning a pedigreed animal?
 - Where can you go to get pets?
- ▶ Start a class word wall about pets listing nouns, verbs and adjectives.
- ▶ Students brainstorm a list of pets. As a class, they estimate how much each pet might cost to buy (there are likely to be large differences of opinion and knowledge). Rank the costs in order from highest to lowest.
- ▶ Students brainstorm a list of other costs involved in having a pet. Financial costs may include:
 - food
 - an enclosure
 - equipment
 - registration
 - training
 - kennelling
 - vet’s fees and so on.
- ▶ Non-financial costs can include time given for exercising or grooming, being responsible for the care of a pet, and the emotional costs involved in a pet’s illness or death.
- ▶ Suggest that students ask their families about the pets they have owned and how much they have cost to buy. What things must be considered when purchasing a pet (e.g. allergies, space at home, the ability to look after a pet properly)? Students could research pet ownership statistics on the Australian Companion Animal Council website: acac.org.au

Note:

Students may use calculators for many of their calculations.

Extension ideas:

- look at pets from different perspective eg – as shop keeper or breeder
- building a scale model of a chicken coup
- researching battery hens and free range hens on the internet and discuss ethical issues
- add some budgeting activities

Start collecting magazines and catalogues well before starting the unit – perhaps send letter home to ask for these.



Activity 1

How many scorpions to a python? (60 minutes)

- Review percentages using the activity below:

Peg a percentage

Aim: to correctly position percentage cards

Players need: a long rope, clothes pegs or large paperclips, eight percentage cards – **Worksheet 1:**

Percentage cards marked with 0%, 10%, 20%, 25%, 30%, 50%, 100%, 150% respectively

How to play: Hang the rope across the classroom (alternatively, draw a long horizontal line on the board, the floor or the ground, and position the cards instead of pegging them).

- Peg the 0% card to the left end of the rope and the 100% card a considerable distance to its right.
- Ask what the 100% represents if it were expressed as a number.
- Students should recognise that between 0% and 100% there is one whole.
- Ask students to suggest where the 50% card belongs and to justify their reasoning.
- Peg this card in its correct position. Do the same for the 25% card and then the 10% card.
- Challenge students to nominate where the 20% card and the 30% card should go, giving their reasons.
- Where would they peg the 150% card?

Peg a pet

Aim: to correctly position pet price cards

Players need: a long rope; clothes pegs or large paperclips, seven animal picture cards – **Worksheet 2:**

Animal picture cards that contain the pictures and values indicated below:

mouse \$6	ferret \$25	kitten \$85
rat \$10	rabbit \$50	puppy \$195
guinea pig \$20		

How to play:

Discuss the pictures on the cards and ask students to identify the similarities between the animals (e.g. all have fur, four legs, a tail (even if rudimentary) and are mammals).

- Would each be suitable to keep as a pet? Ask students to help you arrange the cards in order from the lowest to the highest price.
- Identify a zero point at the left end of the rope.
- Peg the card of the most expensive pet to the opposite end.
- Select the next card at random.
- Ask students to suggest where this card belongs on the rope, and to justify their decision.
- Once consensus has been reached, peg that card in place. Continue with the remaining cards.
- Do students understand that the price of a kitten is just under half the price of a puppy?
- Can they see that the price of a rabbit is about one-quarter of the price of a puppy, and that the price of a ferret is half the price of a rabbit?
- Relate each fractional representation to its percentage (and decimal) equivalent.
- After each new card was selected, did the pegged cards need to be repositioned to ensure all the cards were in the correct places on the line?



Students work independently on **Worksheet 3: How many scorpions to a python?** to compare the relationship between various prices. Share answers and the strategies used to complete the questions. Challenge students to convert their fractions in question to percentages.

Diagnostic assessment

Use **Worksheet 3: How many scorpions to a python?** to assess students' ability to make the connections between the multiple and the fraction.

- Consider student ability to compare fractions and percentages.
- Identify that some numbers could not be multiplied by a whole number to reach another.
- Students explain their reasoning when connecting one price proportionally to another.

Activity 2

Cats and dogs (60 minutes)

Warm-up: revisit large numbers. Roll five 10-sided dice (numbered 0–9) one at a time. Using the digits that are rolled, students say the number out loud (e.g. 3, 4, 0, 1, 3 is thirty-four thousand and thirteen). Repeat several times. Increase the size of the numbers by using six dice and then seven dice. This also presents an opportunity to revisit **place value** (e.g. by asking 'how many in the hundreds place?', 'how many in the thousands place?' and so on).

- ▶ Students consider the data on **Worksheet 4: Cats and dogs**
 - How many pet dogs are there in Australia?
 - How many pet birds are there?
- ▶ Focus students' attention on the heading of the second column ('000) and explain that it means each number in that column must be multiplied by 1000 to find the actual number of that pet in Australia (e.g. $8100 \times 1000 = 8\,100\,000$ or eight million, one hundred thousand birds). Discuss why statistical information might be presented like this.
- ▶ Analyse the data in the table for question 1. Ask students:
 - Why are there so many fish compared with cats and dogs.
 - What might be represented in the 'Other' category?
 - What other things do students find interesting about this table?
- ▶ Students answer questions a–e to practise some simple arithmetic with large numbers. Encourage students to use estimation, a variety of written and mental strategies, and digital technologies. Share the questions that the students created for themselves.
- ▶ Look at the second table on **Worksheet 4: Cats and dogs**. Record the total number of students in the class (include yourself if you are going to contribute data), as calculating percentages forms part of question 2.
- ▶ Conduct a class survey and use the results to fill in the second column of the table in question 2. Some students might own more than one dog or cat, and some might own both. Students can discuss this and think about the implications for the table. How many students own neither a cat nor a dog? Complete the third column of the table by calculating the answer in the second column as a percentage of the number of students in the class. It is appropriate to use a digital technology (calculator) for this part of the activity.
- ▶ Discuss how families decide whether or not to have a pet.
 - How do they choose what kind of pet to get?
 - Which family member(s) has the most influence in this decision?
 - Ask students to imagine that they are adults and can make decisions about having a pet.
 - How many would like a dog?
 - How many would like a cat?
 - Discuss reasons why. Record the results in the fourth column of the table in question 2. (It may be interesting to discuss the range of other pets students would like to have when they are adults.) Students work in pairs or small groups to complete the table.
- ▶ After completing the table in question 2, students write a few sentences about what the results tell them about pet ownership.



- What are the similarities and differences between the three percentages for dogs? for cats?
- Are there any surprising figures?
- Do the results predict a change in the numbers of dogs and cats in Australia when the students become adults?
- Do the percentages in the third column add to 100? If not, why?

At the end of the lesson, select some students to share their thinking about pet ownership and add any ideas and words generated to the **word wall**.

Activity 3

Cheap, cheap! (120 minutes)

Warm-up: starting at 100, halve that number and then continue to halve each result. State each result as a fraction, a decimal and a percentage (e.g. half of 50 is 25, which is $\frac{1}{4}$, 0.25 and 25%).

Discuss the main times of the year when big retailers hold **sales**. What might this mean for both buyers and sellers? Talk about the language used to describe sale prices (e.g. ‘up to 50% off’, ‘half price’, ‘buy one get one free’, and so on).

Demonstrate how to calculate the sale price of an item by discounting the regular price by 10%, 25% and 50%. Encourage students to suggest ways to calculate a 5% discount.

Students work independently using **Worksheet 5: Cheap, cheap!** to complete questions 1–3 and catalogues or online advertisements to complete Question 4. Students calculate the sale price of various items **marked down** using key **percentages** of 10%, 25%, 50% and other percentages derived from those.

Share students’ answers and the strategies they used for calculating percentages and sale prices. Explain that knowing key percentages enables students to use mathematical thinking to derive other percentages, for example:

$$30\% \text{ (} 10\% + 10\% + 10\% \text{)}$$

$$85\% \text{ (} 50\% + 25\% + 10\% \text{)}$$

$$17\frac{1}{2}\% \text{ (} 10\% + \frac{1}{2} \text{ of } 10\% + \frac{1}{4} \text{ of } 10\% \text{)}$$

Explain the link between **percentages** and **decimals**. Show that multiplying on the calculator by the decimal equivalent of a percentage can lead to the same result in another way. For example, 35% of a number can be found by multiplying that number by 0.35 on the calculator.

Challenge students to find a more efficient way to calculate a discounted price other than by identifying the discount and subtracting it from the original price. Can they see that a 50% discount is simply halving the price? and that a 25% discount leaves 75% of the original price? Demonstrate the connection with 100%.

Continue to add to the class **word wall**.

Formative assessment

Collect students’ answers. Assess their ability to calculate the **percentage discounts**. Were they able to use the basic operations when calculating with money? How effective were students at deriving other percentages from the key percentages?

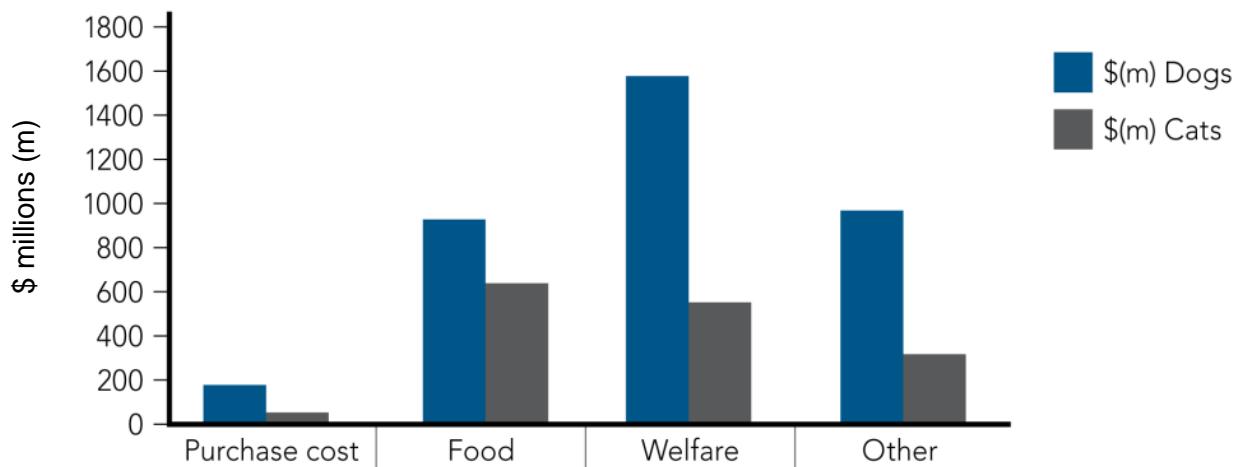


Activity 4

Cats or dogs? (60 minutes)

Note: This activity may not be completed in the estimated time if you use it as an opportunity for your students to embrace technology.

- ▶ Consider Australian expenditure on cats and dogs in the table in **Worksheet 6: Cats or dogs?** Discuss the figures that the students find interesting and/or surprising (e.g. over \$2 billion spent on veterinary services for dogs and cats; \$111 000 000 spent on cat litter; or the relatively small amounts spent on buying pets compared with the ongoing costs of owning them). Do the students have a sense of the magnitude of these figures?
- ▶ Discuss the blank summary table in **Worksheet 6: Cats or dogs?** question 2. Talk about how to transfer the entries from the main table in question 1 to an appropriate category in the summary table. Students should be able to justify their decisions.
 - What differences are there between the items required for dogs and those for cats (e.g. ‘dog training’ and ‘cat litter’)?
- ▶ Although the numbers involved are large, addition can be done by mental or written means.
- ▶ Either manually or using ‘Excel’ or a similar program, students use the information in their completed summary table to generate a side-by-side column graph. They can either use the template with labelled y-axis that appears in **Worksheet 6: Cats or dogs?** or create their own graphs either by hand or by using appropriate software. If creating their own graphs, students need to consider the labelling of their axes and the scale they employ. Below is a rough representation of what the graph might look like.



- ▶ As a class, compare the expenditures that are summarised in the graph.
- ▶ You might discuss the following:
 - Does one type of pet have more spent on it than the other?
 - Why might that be?
 - What do you notice about the purchase costs compared to other categories?
 - Is this observation the same for dogs and cats? Are the amounts in each category distributed in a similar pattern for both dogs and cats?
 - What differences do you notice?
 - Emphasise the language of relativity (e.g. ‘more than three times as big’, ‘about half the size’, and so on).
- ▶ Ask students if the graph is easy to read. Can they think of a better way to present the summarised data?
- ▶ Continue to add to the class **word wall**.



Activity 5

Herding hens (120 minutes)

Warm-up: ‘How tall is your teacher?’ Ask students to guess how tall you are. Record their estimates on a sheet or the board. Did the students answer in **metric** or **imperial** units? How accurate were their estimates? (Don’t reveal your height—the answer is required in Activity 6.)

- ▶ Review metric units of length, **area** and volume. Ask students to select objects around the classroom and estimate their lengths.
 - How accurate are their estimates?
 - How can they check the actual length?
 - Do they use suitable units?
 - Prompt some conversions (e.g. if the desk is about 150 cm long, how much is that in millimetres? metres? kilometres?).
 - Do the same for ‘area’.
 - Do students have a sense of the size of one square metre?
 - Can they explain why there are 10 000 cm^2 in 1 m^2 ?
 - Repeat the investigation for ‘volume’.
 - Do students have a sense of the size of 1 m^3 ? To help with area and volume, use tape to lay out square metres on the classroom floor, and building blocks or packing boxes to make a cubic metre.
- ▶ Discuss the kinds of enclosures and environments pets might need.
 - What sort of pets might need to be caged? Why might a cage be needed?
 - How big should the caged area be?
 - How does the reason for the cage influence its size?
 - How might the caged area be measured?
 - What sort of pets might need to be fenced?
 - How big should the fenced area be?
 - How might it be measured?
 - What other factors might need to be considered?
 - Encourage students to share their experiences and knowledge.
- ▶ Model the calculation of **perimeter** and area for a simple rectangle. Emphasise the importance of using square units for area. **Worksheet 7: Herding hens** explores the concept of varying area in relation to perimeter. Use concrete materials to explore this. Explain that the measurements for cages use three **dimensions**—width, breadth and height. Which measurement is the height (most typically this is the third measurement)? Which is the width? Does it matter which is the width and which is the breadth?
- ▶ Students work independently on **Worksheet 7: Herding hens**. Some may require the support of concrete materials to assist their thinking. Encourage the use of estimation to get a sense of the answer.

Formative assessment

Collect students’ worksheets.

- Were their calculations accurate?
- Did they use efficient mental and written strategies?
- Were they able to convert units appropriately?
- How did they order the area of the cages?
- Did they use formal calculations or an estimate of lengths?



Activity 6

All cooped up (120 minutes)

Warm-up: ‘How tall is your teacher?’ Again, ask students to guess how tall you are. Record their estimates next to those from the previous activity. Have the figures changed following the students’ measurement work in Activity 5? Are the estimates closer to your actual height? Tell students the answer (in millimetres, centimetres and metres).

- ▶ Brainstorm reasons why people keep animals (other than as pets). These could include:
 - as a direct food source (e.g. chickens, lambs, snails);
 - for their edible products (e.g. eggs, milk, honey);
 - as a means of transport (e.g. donkey, horse, sled dogs);
 - as working animals (e.g. sheepdog, guard llama, guide-dog, draught horse);
 - other by-products (e.g. furs, leather, wool, feathers); medicines and research. Some reasons may be challenging for some students to consider.
- ▶ Continue to add to the class **word wall**.
- ▶ Explain that the scenario in the final activity involves raising extra funds for a school. The school’s student representative council is interested in keeping chickens and selling their eggs to raise money.
- ▶ Discuss the chickens’ need for a home, called a ‘coop’, in which to roost (sleep), lay eggs, forage and exercise. How much space does a chicken need? Students may be familiar with the terms ‘free-range’, ‘barn-raised’ and ‘battery’ chickens. Discuss their understanding of these terms. Talk about the different conditions in which these chickens live.
 - Which option do students consider to be the best? Why?
 - Why aren’t all chickens kept in ‘free-range’ conditions?
- ▶ Battery hens can live their entire lives in cages that allow less than 500 cm² of floor space per bird. Ask students to guess how big this is. Ask students to measure an A4 piece of paper and note its dimensions.
 - How is the area of the paper calculated?
 - In how many ways can the area be calculated?
 - Students share strategies and answers. What degree of accuracy is important in the context of this problem?
- ▶ Discuss the area of an A4 piece of paper (approximately 630 cm²) compared to the space allocated to a battery hen. It is generally recommended that a coop for a domestically raised chicken be approximately 0.5 m² (as well as this, the chickens need a lot more outside space).
 - What fraction of this recommended area is the area given to a battery chicken?
 - What percentage is this?
- ▶ Explain that the Happy Chicken Company produces flat pack coops (the term ‘flat pack’ may need to be explained). These coops are put together with some screws, and a latch for the wire door at one end. The design for these coops is reproduced on the nets at the end of these teacher notes. Each net represents a scaled drawing of a chicken coop with a floor, solid sides and/or a roof (marked with lines to represent corrugated iron), and two ends made of wire netting (marked in a checked pattern). The coops are different sizes and hold different numbers of chickens. The chickens enter and leave the coop through one of the wire ends.
- ▶ Explain that a ‘net’ is a plane figure that can be folded to form a polyhedron (in other words, a two-dimensional ‘plan’ for a three-dimensional object); the tabs on the edges are folded over and stuck to other tabs to build the three-dimensional structure. Each student will need one set of nets photocopied onto light card, scissors, a ruler (for making neat folds), glue or sticky tape.
- ▶ Students make their own three-dimensional chicken coops and answer the questions in **Worksheet 8: All cooped up**.

After the activity:

- How well did the students predict the shapes that the nets would make?
- Were they able to identify the floor?
- Were they able to calculate accurately the area of each floor?
- Did they use division to find the number of chickens that could fit in each coop?



- If not, what method did they use?
- One of the coops measures just below the recommended area.
- Did the students discuss this small difference in area and decide that it was not significant enough to change the number of chickens?
- Or did they reduce the number of chickens and discuss the advantages of having extra space per chicken?
- How well did the students complete their constructions?
- Did they cut carefully and accurately? Were they able to make the folds in the right direction?
- Could they understand how the tabs were used?

Note: The recommended minimum floor space required for a chicken varies across different studies.

Activity 7

Chicken run (120 minutes)

It is now the students' turn to design a chicken coop that provides sufficient space for 24 chickens. Students need to keep the construction materials to a reasonable limit to keep costs down. Reinforce the relationship between a fixed area and variations of the perimeter (i.e. that a fixed area can have many perimeter lengths).

- ▶ Students are also required to write an article for the school newsletter – it should explore the issues around keeping chickens, and make a recommendation on whether the school should go ahead with the plan to keep chickens for their eggs. The article could consider the following questions:
 - Who will care for the chickens during the term and during the school holidays?
 - Where will the chickens live?
 - Does the school have enough room for the chickens to be free-range?
 - How much does their food cost?
 - What are the other ongoing costs?
 - How much will it cost to build the coop and the fenced foraging area?
 - Who will collect the eggs?
 - How will the eggs be sold?
 - Who will manage the finances?
 - What happens when the chickens no longer produce eggs?
- ▶ Discuss the instructions for the successful completion of this task, as follows:
 - design a coop to house 24 chickens happily; it should be based on one or more of the designs in activity 6
 - draw your coop clearly and include the dimensions
 - calculate the area and perimeter of the coop, and show your workings
 - change the dimensions of your coop and then redraw it
 - calculate the area and perimeter of this revised coop, and show your workings
 - choose the better design, and explain the reasons for your choice
- ▶ Write a brief article for a school newsletter about whether the school should keep chickens and sell their eggs to raise money (ensure that you discuss ethical as well as financial considerations)
 - present your work clearly.
- ▶ Share their results and consider the following questions.
 - Were all of the areas the same?
 - What were the biggest and the smallest areas?
 - Compare the perimeters.
 - What were the longest and the shortest perimeters?
 - What are the implications of a long perimeter on the cost of the coop?
- ▶ As a class, decide what criteria should be used to judge the 'best' design. Conduct a class vote to find the 'best' design. Students could share their articles with the class by reading them aloud and discussing as a class the following questions.
 - How many recommended going ahead with the plan to keep chickens?
 - What were the three most persuasive arguments?



- How many advised against the plan?
- What were the three most persuasive arguments?

Summative assessment:

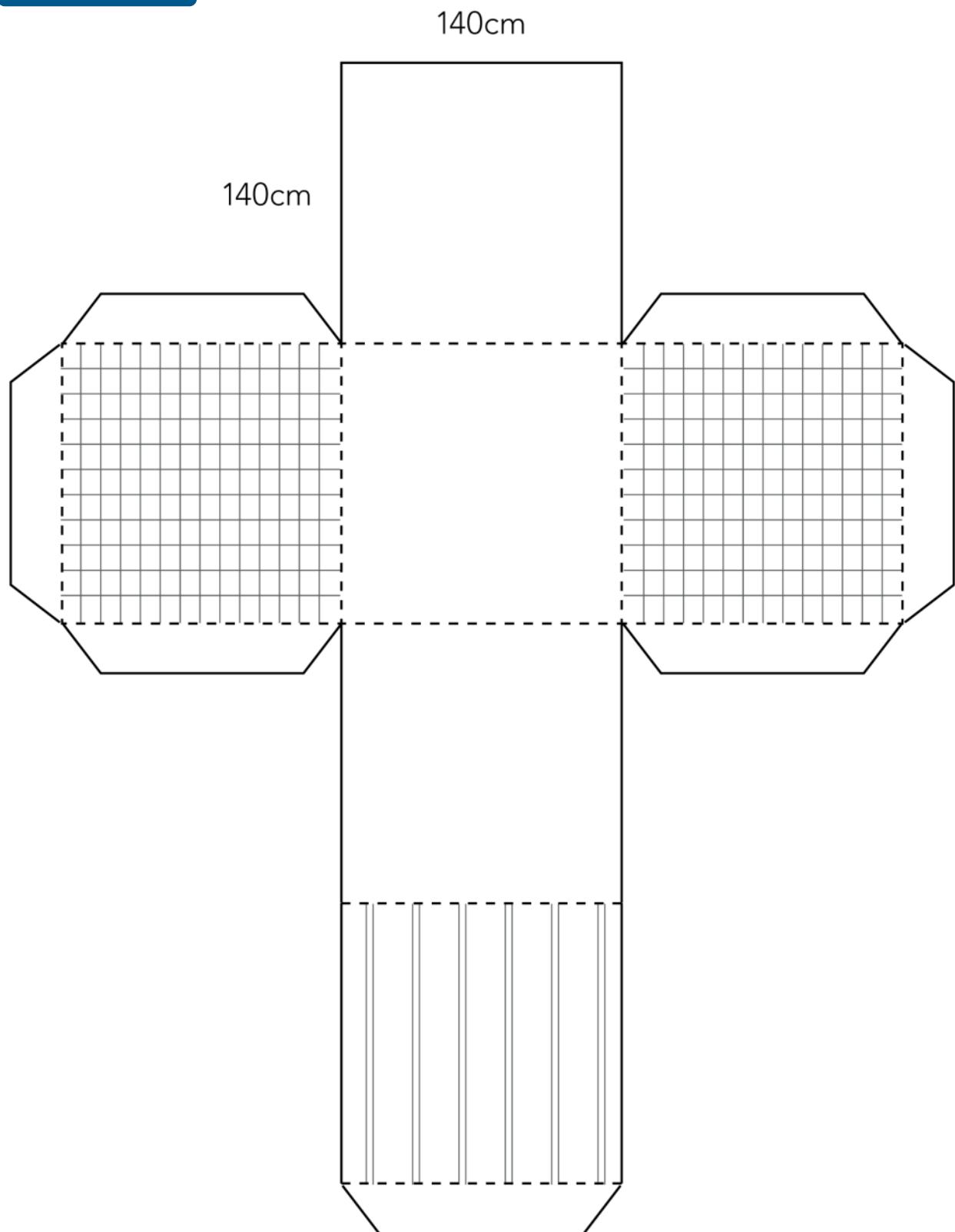
As a class, consider how each of the designs aligns with the initial instructions. Assess students's ability to calculate area and perimeter accurately using the workings provided. You may wish to assess the written composition against **English – strand Literacy, Sub-strand Creating texts (ACEY1714)**.

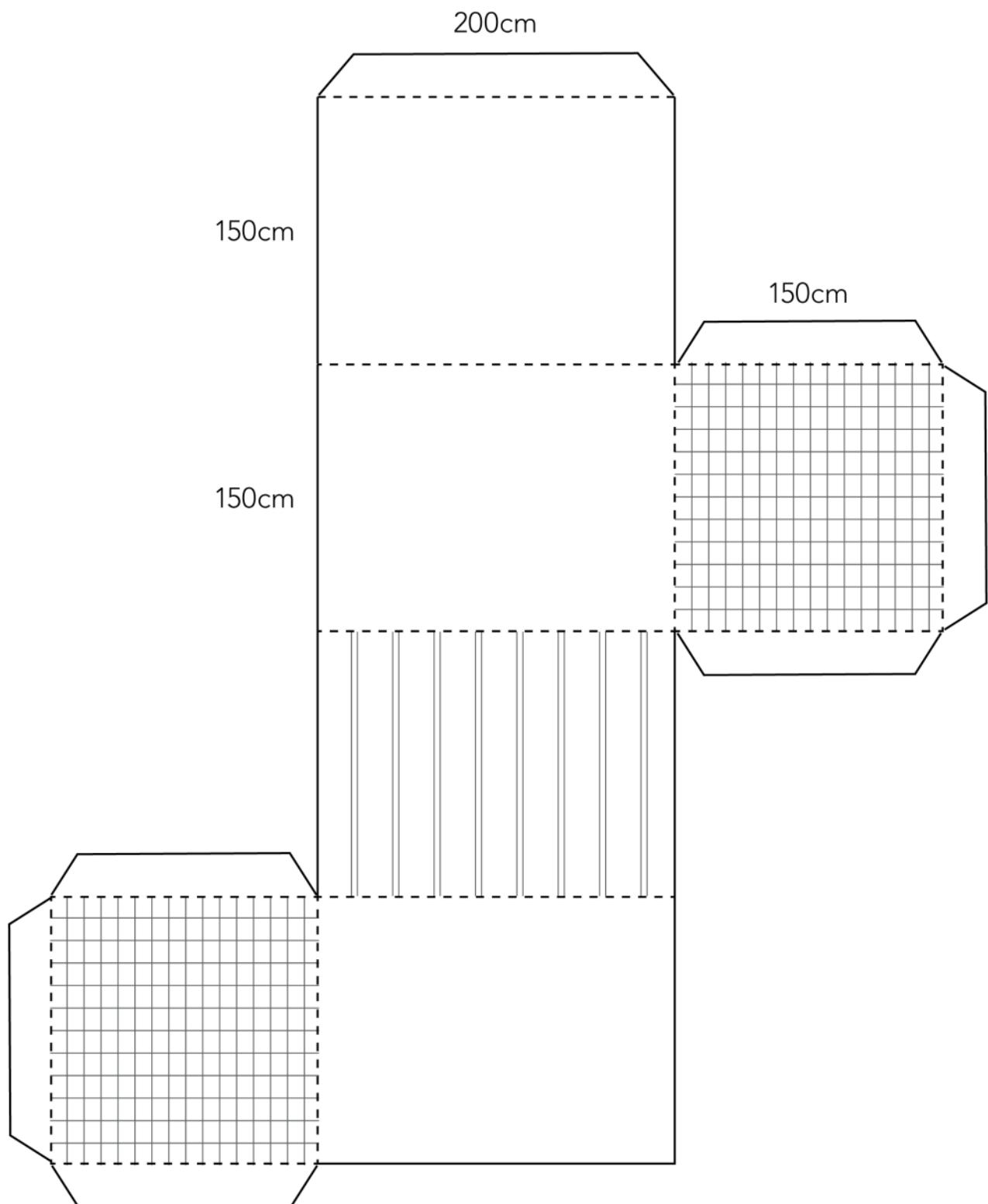
Note: Students may wish to draw a scaled net of their coops and construct them.

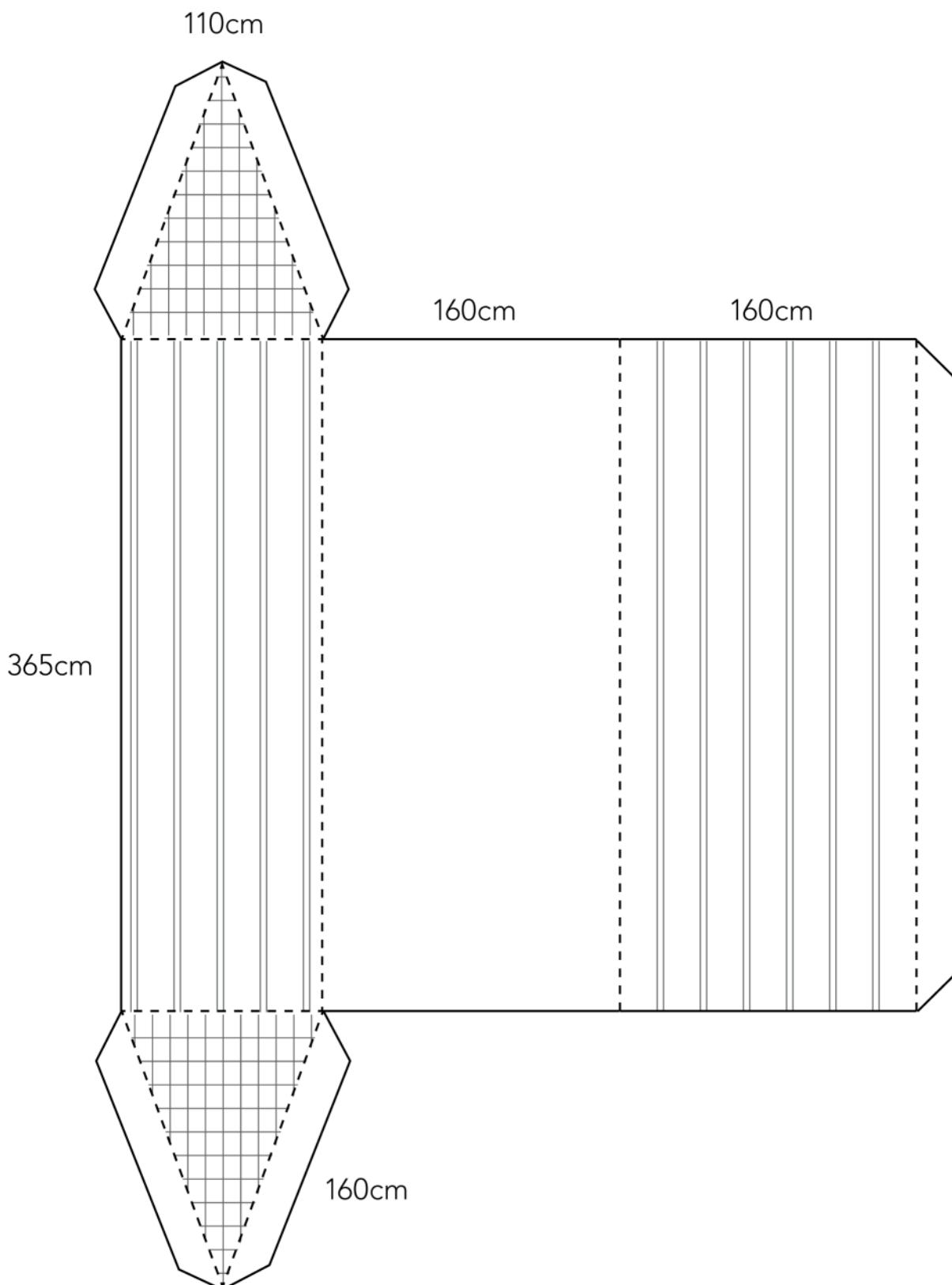


Note: You might wish to enlarge these nets.

Chicken Cube



**Chicken Condo**

**Chicken**



Worksheets

Name: Class: Date:

Worksheet 1: Percentage cards

0%

10%

20%

25%

30%

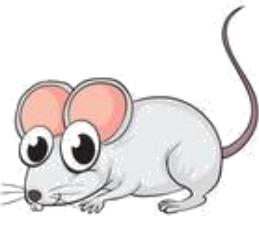
50%

100%

150%

Name: Class: Date:

Worksheet 2: Animal picture cards

	
Mouse \$6	Rat \$10
	
Guinea pig \$20	Ferret \$25
	
Rabbit \$50	Kitten \$85
	
Puppy \$195	

Worksheet 3: How many scorpions to a python?

Use the following list to complete questions 1 – 4.



A blue sign titled "Pet shop prices" featuring a paw print logo. It lists animal names and their prices.

gecko	\$5	scorpion	\$50
monitor lizard	\$75	python	\$200
goanna	\$250	frog	\$40
skink	\$25	tortoise	\$400

- 1 Complete this table using the information from the price list. The first one has been done for you.

Number	Type of animal	Cost the same as	Type of animal
5	geckos	cost the same as a	skink
8	geckos	cost the same as a	
2		cost the same as a	tortoise
15	geckos	cost the same as a	
	geckos	cost the same as a	goanna
4		cost the same as a	python
	geckos	cost the same as a	tortoise

Worksheet 3: How many scorpions to a python?

- 2 Find the price combinations that complete these three sentences.

Ten _____ cost the same as one _____
Ten _____ cost the same as one _____
Ten _____ cost the same as one _____

- 3 Insert the correct fraction to complete these sentences. The first one has been done for you.

A gecko costs $\frac{1}{5}$ of the price of a skink.
A python costs _____ of the price of a tortoise.
A scorpion costs _____ of the price of a python.
A skink costs _____ of the price of a goanna.
A scorpion costs _____ of the price of a tortoise.
A skink costs _____ of the price of a monitor lizard.

- 4 Which of the prices cannot be multiplied by a whole number to make another listed price? Give reasons for your answer.

- 5 Three skinks cost the same as one monitor lizard. How many scorpions could you buy for the same amount? Using this information only, explain the relationship between the price of a skink and the price of a scorpion.

Worksheet 4: Cats and dogs

1 The following table shows the number of pets in Australia.

Pet	Number ('000)
Dogs	3405
Cats	2350
Fish	18397
Birds	8100
Other	1060
Total	

a How many pets are there in total?

b What is the combined total of dogs and cats?

c How many more birds are there than 'other' pets?

d Write **three** more numerical questions based on the data.

Worksheet 4: Cats and dogs

- e Solve your numerical questions and show your working.

- 2 a Your teacher will conduct a class survey. Use the information gathered to complete the following table.

Total number of student sparticipating in the survey: _____

Pet	Number of students that own this pet	% of class	Number of students that want this pet when they are grown up	% of class	ownership in % of Australian households
Dog					35.8
Cat					22.8
Neither a cat nor a dog					N/A

- b What does the completed table tell you about cat and dog ownership?

Worksheet 5: Cheap, cheap!

During sale times, businesses reduce the cost of their stock.

- 1 The table below lists the cost of horse equipment sold at a pet shop. Calculate the sale price of each item by deducting the discount from the original price, and write your result in the correct space in the table. The first one has been done for you.

Item/ regular price	Halter \$19	Saddle \$685	Bridle \$126	Stirrups \$89.80	Clippers \$97.50	Rug \$57.90	Brush \$25	Hoof polish \$9.60
% Discount	10%	10%	25%	25%	50%	50%	5%	5%
Amount of discount	\$1.90							
Sale price	\$17.10							

- 2 The pet shop owner is given a discount of 25% on the bulk purchase of 15 pond filters each priced at 96 dollars. What are the total savings made by the shop owner? Show your workings in the box provided.

Worksheet 5: Cheap, cheap!

- 3 The shop owner is given a discount of 30% on the bulk purchase of 62 bird ladders that usually cost \$3.50 each. How much will the shop save? Show your workings.

- 4 Find five items in a newspaper, sales catalogue or online advertisement that you would like to buy for a pet. List each item and its price in the table below.

Calculate the sale prices if each item were marked down by 10%, 25% and 30%, and enter these amounts in the table.

Item	Advertised price	Sale price at 10% off	Sale price at 25% off	Sale price at 30% off

Worksheet 6: Cats or dogs?

- 1 The following table shows the amount of money spent in one year on cats and dogs in Australia.

Dogs		Cats	
Item	\$ ('000 000)	Item	\$ ('000 000)
Veterinary services	1576	Veterinary services	533
Wet food	474	Wet food	363
Dry food	448	Dry food	212
Boarding and minding	375	Litter	111
Clipping and grooming	204	Boarding and minding	99
Treats	185	Transport	44
Purchase cost	135	Purchase cost	33
Transport	72	Treats	7
Walking	71	Registration	5
Training	25	Grooming	3
Registration	18	Insurance	3
Insurance	7	Show competition fees	2
Burial	5		
Show competition fees	2		

Worksheet 6: Cats or dogs?

- 2 Use the information from the table above to complete the following summary table. Use the working space provided to group your information before adding it to the table. Fill in the final row to show the total amount spent on cats and dogs.

Dogs		Cats	
Item	\$ ('000 000)	Item	\$ ('000 000)
Purchase cost		Purchase cost	
Food		Food	
Welfare		Welfare	
Other goods and services		Other goods and services	
Total		Total	

Worksheet 6: Cats or dogs?

- 3 Use the blank column graph below, draw your own column graph or use an Excel spreadsheet to create your graph to show the information contained in the summary table. Identify the categories that you need to show, and draw the column for dogs next to the column for cats. Remember to label the axes and your graph, provide a key and colour it in.



Name: Class: Date:

Worksheet 6: Cats or dogs?

- 4** Write a report that summarises the information in the table and the graph.

Worksheet 7: Herding hens

1 Some animals spend much of their time in cages.

a Calculate the area of the **base** of the following animals' cages.

Estimate your answer first. Show your working in the box below.

Budgie 45cm x 45cm x 60cm _____

Guinea pig 75cm x 85cm x 40cm _____

Parakeet 600mm x 600mm x 900mm _____

Rat 700mm x 550mm x 400mm_____

Macaw 0.9m x 1.2m x 1.5 m _____

Worksheet 7: Herding hens

- b** Order the cages from the one with the largest base area to the one with the smallest base area. Explain how you did this.

- 2** Every year Penny takes her two ponies to the agricultural show. She uses temporary fencing to keep them enclosed. The show's organisers prefer the fencing to be in rectangular shapes so that it is easier to fit into the grounds.

Penny has 30 metres of temporary fencing. Use the grid below to help plan your answers.

- a** Using only whole numbers, what is the biggest area that the fence can enclose? _____

- b** Using only whole numbers, what is the smallest reasonable area that the fence can enclose? _____

- c** Is there another arrangement of fencing that is more reasonable? Show your working and thinking in the box on the next page.

Name: Class: Date:

Worksheet 7: Herding hens

A blank 10x10 grid of squares, suitable for various applications such as drawing or data representation.

- d** If Penny's fencing came in 1.5 metre lengths, how would your solution change? Show your working and thinking in the following box.

Name: Class: Date:

Worksheet 7: Herding hens

Worksheet 8: All cooped up

The Happy Chicken Company makes three kinds of chicken coops. Each comes in a flat pack and can be built using only a few screws and some latches for the entry.

Your teacher will provide you with a ‘net’ of each of the chicken coops. A ‘net’ is a one-dimensional plan that you can cut out and build to make a three-dimensional shape.

- 1 a** In the table below, describe or draw the shape that you think each net will make when it is cut out, folded and joined together.

Coop	Predicted shape
Chicken Cube	
Chicken Condo	
Chicken Chalet	

- b** Make your coops by cutting, folding and gluing or taping. Were your predictions about the shape correct? Give reasons for your answer.

- 2** Identify the ends and the sides/roof of each net by using a different colour to colour them in. Which part of the net is the floor? Colour it in a third colour.
- 3 a** Calculate the floor area of each net and enter your results in the table on the next page. Show your working in the last column.

Worksheet 8: All cooped up

b A happy chicken needs approximately 0.5 square metres of floor space in a coop. Calculate how many happy chickens will fit into each coop, and enter your results in the table. Show your working in the last column.

Coop	Area	Number of chickens	Working out
Chicken Cube			
Chicken Condo			
Chicken Chalet			

Worksheet 9: Chicken Run

Imagine that a student representative council has decided that their school should keep 24 chickens.

- 1 If a chicken needs 0.5 m^2 of floor space in order to be happy, what should the area of the coop be? Show your working.

Name: Class: Date:

Worksheet 9: Chicken Run

- 2 Your job is to design a suitable coop for the 24 chickens, based on one of the three designs you have already worked with. Draw your design in the space provided below.

Name: Class: Date:

Worksheet 9: Chicken Run

- a** Label the dimensions of your coop. Calculate the perimeter and area. Show your working in the box below.

- b** Change the dimensions of your coop so that your design makes the best use of the building materials. Re-calculate the perimeter and area. Show your working in the box below.

Name: Class: Date:

Worksheet 9: Chicken Run

- c Which coop do you think is best? Give reasons for your answer.

- 3** Write a short article for a school newsletter on the topic, ‘Should our school keep chickens and sell their eggs’. Remember to discuss both money and ethics in your article.

Data cited from the Australian Companion Animal Council (2010), reproduced with permission. From 'Contribution of the pet care industry to the Australian economy', accessed 19 March 2012 from acac.org.au/ACAC_Report_2010.html