Department of
Education

AUSTRALIAN CURRICULUM

MATHEMATICS
YEAR 7

Collecting and displaying data

MATHEMATICS
YEAR 7

Collecting and displaying data

Student's name: _____

Teacher's name: _____

First published 2012

ISBN 9780730744498

SCIS 1564103

© Department of Education WA 2012 (Revised 2020) https://creativecommons.org/licenses/by-nc/4.0/

Requests and enquiries concerning copyright should be addressed to:

Manager Intellectual Property and Copyright
Department of Education
151 Royal Street
EAST PERTH WA 6004

Email: copyright@education.wa.edu.au

Department of
Education

This resource contains extracts from The Australian Curriculum Version 3.0 © Australian Curriculum, Assessment and Reporting Authority 2012.
ACARA neither endorses nor verifies the accuracy of the information provided and accepts no responsibility for incomplete or inaccurate information. In particular, ACARA does not endorse or verify that:

- the content descriptions are solely for a particular year and subject
- all the content descriptions for that year and subject have been used
- the author's material aligns with the Australian Curriculum content descriptions for the relevant year and subject.

You can find the unaltered and most up to date version of this material at www.australiancurriculum.edu.au. This material is reproduced with the permission of ACARA.

creativecommons.org/licenses/by-nc-sa/3.0/au/

Graphics used in this resource are sourced from http://openclipart.org under the creative commons license http://creativecommons.org/publicdomain/zero/1.0

This product will be registered through the National Copyright Unit for use in all Australian schools without remuneration.

Contents

Signposts **2**

Introduction **3**

Curriculum details **4**

1. Collecting numerical data **7**

2. Recording numerical data **17**

3. Collect and record numerical data **27**

4. Types of data displays **37**

5. Constructing data displays **47**

6. Comparing data displays **59**

7. Working with resources data **71**

8. Summary **79**

9. Review tasks **81**

Solutions **93**

© Department of Education WA 2012 – MATHSAC029

Signposts

Each symbol is a sign to help you.

Here is what each one means:

The recommended time you should take to complete this section.

An explanation of key terms, concepts or processes.

A written response.
Write your answer or response in your journal.

Correct this task using the answers at the end of the resource.

Calculators may not be used here.

Make notes describing how you attempted to solve the problem. Keep these notes to refer to when completing the Self-evaluation task. Your teacher may wish you to forward these notes.

© Department of Education WA 2012 – MATHSAC029

Introduction

This resource should take you approximately two weeks to complete. It comprises seven learning sections, a summary section and a review task section.

The learning sections have the following headings:

- **Key words**
  These are the main words that you need to understand and use fluently to explain your thinking.

- **Warm-up**
  Warm-up tasks should take you no longer than 10 minutes to complete. These are skills from previous work you are expected to recall from memory, or mental calculations that you are expected to perform quickly and accurately. If you have any difficulties in answering these questions, please discuss them with your teacher.

- **Review**
  Some sections have reviews immediately after the warm-up. The skills in these reviews are from previous work and are essential for that section. You will use these to develop new skills in mathematics. Please speak to your teacher immediately if you are having any trouble in completing these activities.

- **Focus problem**
  Focus problems are designed to introduce new concepts. They provide examples of the types of problems you will be able to solve by learning the new concepts in this resource. Do not spend too long on these but do check and read the solutions thoroughly.

- **Skills development**
  These help you consolidate new work and concepts. Most sections include skills development activities which provide opportunities for you to become skilled at using new procedures, apply your learning to solve problems and justify your ideas. Please mark your work after completing each part.

Correcting your work

Please mark and correct your work as you go. Worked solutions are provided to show how you should set out your work. If you are having any difficulty in understanding them, or are getting the majority of the questions wrong, please speak to your teacher immediately.

Journal

Please keep an exercise book to record your notes and to summarise your learning. At the end of each section, write definitions for the key words that were introduced for that section.

© Department of Education WA 2012 – MATHSAC029

Curriculum details

Content Descriptions

This resource provides learning and teaching to deliver the Australian Curriculum: Mathematics for the following Year 7 Content Descriptions.

Identify and investigate issues involving numerical data collected from primary and secondary sources (ACMSP169)

Construct and compare a range of data displays including stem-and-leaf plots and dot plots (ACMSP170)

Content Descriptions	1	2	3	4	5	6	7	R
ACMSP169								
ACMSP170								

Indicates the content description is explicitly covered in that section of the resource.

Previous relevant Content Descriptions

The following Content Descriptions should be considered as prior learning for students using this resource.

At Year 5 level

Pose questions and collect categorical or numerical data by observation or survey (ACMSP118)

Construct displays, including column graphs, dot plots and tables, appropriate for data type, with and without the use of digital technologies (ACMSP119)

Describe and interpret different data sets in context (ACMSP120)

At Year 6 level

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)

© Department of Education WA 2012 – MATHSAC029

Proficiency strand statements at Year 7 level

At this year level:

Understanding includes describing patterns in uses of indices with whole numbers, recognising equivalences between fractions, decimals, percentages and ratios, plotting points on the Cartesian plane, identifying angles formed by a transversal crossing a pair of lines, and connecting the laws and properties of numbers to algebraic terms and expressions

Fluency includes calculating accurately with integers, representing fractions and decimals in various ways, investigating best buys, finding measures of central tendency and calculating areas of shapes and volumes of prisms

Problem Solving includes formulating and solving authentic problems using numbers and measurements, working with transformations and identifying symmetry, calculating angles and interpreting sets of data collected through chance experiments

Reasoning includes applying the number laws to calculations, applying known geometric facts to draw conclusions about shapes, applying an understanding of ratio and interpreting data displays

General capabilities

General capabilities	1	2	3	4	5	6	7	R
Literacy	■	■	■	■	■	■	■	■
Numeracy	■	■	■	■	■	■	■	■
Information and communication technology (ICT) capability			■	■	■			
Critical and creative thinking	■	■	■	■	■	■	■	■
Personal and social capability		■				■	■	■
Ethical behaviour							■	■
Intercultural understanding						■		■

■ Indicates general capabilities are explicitly covered in that section of the resource.

© Department of Education WA 2012 – MATHSAC029

Cross-curriculum priorities

Cross-curriculum priorities	1	2	3	4	5	6	7	R
Aboriginal and Torres Strait Islander histories and cultures						■		
Asia and Australia's engagement with Asia							■	■
Sustainability							■	■

■ Indicates cross-curriculum priorities are explicitly covered in that section of the resource.

This resource contains extracts from The Australian Curriculum Version 3.0 © Australian Curriculum, Assessment and Reporting Authority 2012.
ACARA neither endorses nor verifies the accuracy of the information provided and accepts no responsibility for incomplete or inaccurate information. In particular, ACARA does not endorse or verify that:

- the content descriptions are solely for a particular year and subject
- all the content descriptions for that year and subject have been used
- the author's material aligns with the Australian Curriculum content descriptions for the relevant year and subject.

You can find the unaltered and most up to date version of this material at www.australiancurriculum.edu.au. This material is reproduced with the permission of ACARA.

creativecommons.org/licenses/by-nc-sa/3.0/au/

1. Collecting numerical data

When you complete this section you should be able to:

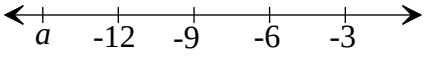
- identify issues involved in collecting numerical data
- understand which type of data is continuous data.

Key words

- data
- numerical data
- continuous data

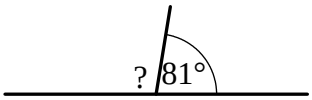
Warm-up 1

1. List the factors of 10. _____
2. $7 + 7 - 9 =$ _____
3. What is the missing number?



$a =$ _____

4. Circle the greater fraction. $\frac{2}{5}$ or $\frac{3}{10}$
5. Find three-halves of 12. _____
6. $60.5 + 91.6 =$ _____
7. $\begin{array}{r} 4.1 \\ \times \quad 9 \\ \hline \end{array}$
8. Write 2.25 as a mixed fraction. _____
9. Complete: 975, 987, 999, _____
10. Determine the size of the missing angle.



_____

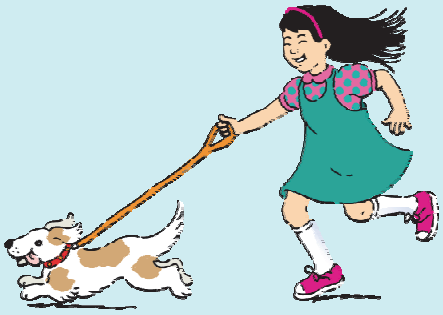
© Department of Education WA 2012 – MATHSAC029

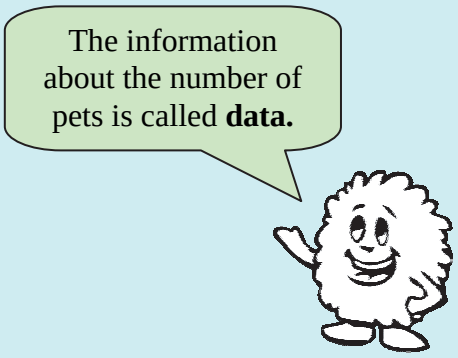
Review 1

Example

A year seven class was asked to record how many pets their family owned last week. The results follow.

0, 5, 3, 3, 4, 2, 10, 3, 3, 2, 1, 2, 3, 0, 1, 0, 2, 6, 1, 0, 0, 6, 2, 2





Draw up a table and use tally marks to record this data.

Solution

Number of pets	Tally marks	Number of families
0	𝍸	5
1	|||	3
2	𝍸 |	6
3	𝍸	5
4	|	1
5	|	1
6	||	2
7		0
8		0
9		0
10	|	1

© Department of Education WA 2012 – MATHSAC029

The **data** for the number of pets is called **numerical data** because the results are numbers.

Use the information from the previous table to answer the following questions.

1. How do you decide which numbers to include in the first column of the table and how do you arrange these numbers?

2. Why does the column for the number of pets include values that are not in the original list?

3. Why are some of the tally marks drawn across the others, for example 𝍸 ?

4. How many students were in the class?

5. How many families had no pets?

6. What is the most common number of pets per family?

© Department of Education WA 2012 – MATHSAC029

7. How many families had more than four pets?

8. Is this table the easiest way to record this **data**? Explain your answer.

9. Would this type of table be suitable to record the number of text messages each student in your class sent on their mobile phones or the number of emails they sent last week? Explain any problems you might have in recording that type of data.

Check your work before continuing.

© Department of Education WA 2012 – MATHSAC029

Focus problem 1

Leanne read in an article that doctors advise that children should not spend more than two hours a day in front of the television or on a computer. She plans to suggest to her friends some of the benefits of playing more sport instead of watching TV. For example, apart from the increase in fitness, it also helps with balance and coordination. Leanne has also found that the social aspect and greater self-confidence are a real bonus.

Leanne decides to ask at least ten of her friends and classmates to keep a record of their time playing sport and watching television over a two-week period. This will provide some **data** to analyse.

This is the first draft of the instruction Leanne wrote.

> Please fill in the details on this sheet about how much time you spent playing sport and watching television over the last two weeks.
>
> Name: _____
>
> Time spent playing sport: _____
>
> Time spent watching television: _____

1. List any problems you think could occur if this first draft is the instruction sheet Leanne hands out to her friends and classmates.

2. The type of **numerical data** Leanne is asking for is called **continuous data**. Why do you think is it called continuous data?

   (Hint: Think about the meaning of the word ‘continuous’.)

© Department of Education WA 2012 – MATHSAC029

3. How accurate do you think Leanne should ask the times to be? Should she ask for them to be to the nearest minute, the nearest hour or some other degree of accuracy?

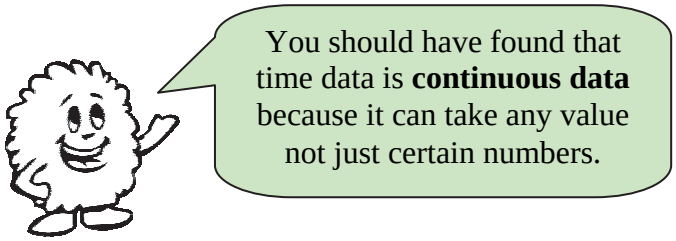
4. How should Leanne change her instructions to make the **data** easy to work with but also accurate enough to be useful?

5. Write a new draft instruction sheet to be handed out to gain the information she requires.

6. How could Leanne organise the information she obtains in a table?

© Department of Education WA 2012 – MATHSAC029

7. Can the **data** about Leanne's classmates be used to arrive at any conclusions about other Australian students of the same age?



ABS survey of children's participation in culture and leisure activities, Australia, 2009

During the 12 months prior to interview, 1.7 million or 63% of children aged 5 to 14 years participated in at least one sport outside of school hours that had been organised by a school, club or association. The participation rate for boys (70%) exceeded that for girls (56%), both overall and also within each age group category.

Children aged 9 to 11 years were those most likely to participate in sport. Their participation rate of 68% exceeded the rates for both 12 to 14 year olds (65%) and 5 to 8 year olds (58%).

The participation rates of children living in capital cities and children living elsewhere in Australia were similar at 63% and 64% respectively.

Source: Australian Bureau of Statistics (cc) BY

Check your work before continuing.

© Department of Education WA 2012 – MATHSAC029

Skills development 1

Example

When animals are taken to Mr Grant's veterinary clinic the first thing that happens is that they are weighed, since obesity may be a factor in an animal's health. The adult cats that attended the clinic were weighed as accurately as possible. The weights, in grams, were then recorded.

5 787	9 497	8 722	11 030	3 350	3 680
3 184	2 135	3 037	6 089	6 732	5 946
7 769	3 901	4 117	2 411	2 133	4 465
7 476	5 041	3 669	7 255	4 943	10 527
5 947	4 018	1 961	6 013	5 248	2 000

1. Explain why this is called **numerical data**.
2. Why is the data for the cat's weight known as **continuous data**?
3. Why would the weight of the cats be recorded to the nearest gram?
4. Why would the weight of a cat that weighed 2134.8 grams be recorded as 2135 grams?
5. How would the weight of a cat that weighs 6089.2 grams be recorded?
6. How would the weight of a cat that weighs 1899.5 grams be recorded?
7. What are the problems associated with organising this **data** into a table?

Solution

1. This is numerical data because the weights are recorded as numbers.
2. Since a cat can be any weight and its weight is not just recorded in whole numbers the data is called continuous data.
3. Grams are quite small units and anything smaller would not make any real difference to the weight of the cat. Grams are as accurate as the vet will need to decide if a cat's weight is a problem
4. 2134.8 is closer to 2135 than it is to 2134 so rounded to the nearest whole number it is 2135.
5. The cat's weight would be recorded as 6089 grams because 6089.2 is closer to that than it is to 6090.
6. The weight of a cat that weighs 1899.5 grams would be recorded as 1900 grams.
7. The main problem is that there is a big range of numbers so we can't write all the numbers from the smallest to the largest in the table. The weights would have to be grouped to be put into a table.

© Department of Education WA 2012 – MATHSAC029

1. Which of these would provide **numerical data**?

   Age

   Birthplace

   Weight

   Number of siblings

   Eye colour

   Favourite singer

2. Which of your answers to question 1 do not give **continuous data**? Give your reasoning.

3. Mr Grant's veterinary clinic also treats riding horses. The weights of the horses treated over the past six months were recorded on the computer. The smallest riding horse tends to be about 350 kg and the largest about 600 kg.

   (a) Will the **data** collected by the clinic be continuous data? Explain your answer.

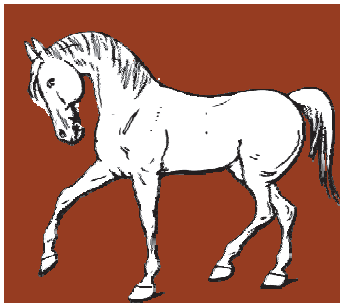
   (b) Although the scales could measure more accurately, the nurse was asked to record the weights to the nearest kilogram. Why is that a good choice for this data?

   (c) How will the nurse record the following weights?
   (i) 586.6 kg (ii) 330.1 kg (iii) 549.5 kg

© Department of Education WA 2012 – MATHSAC029

The nurse recorded the following weights in kilograms.

451	486	543	555	587
523	405	486	548	401
568	401	542	578	450
550	547	400	502	410
494	330	589	431	395



(d) What are the problems associated with organising this **data** into a table?

Check your work before continuing.

© Department of Education WA 2012 – MATHSAC029

2. Recording numerical data

When you complete this section you should be able to:

- identify issues relating to the recording of numerical data
- record data in a table
- use groups for data recording.

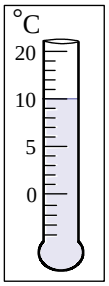
Key words

- grouped data
- frequency

Warm-up 2

1. Circle the largest common factor of 13 and 15. 1, 2, 3, 4, 5
2. 16 – 8 = _____
3. The temperature was 10 degrees but it dropped 18 degrees.

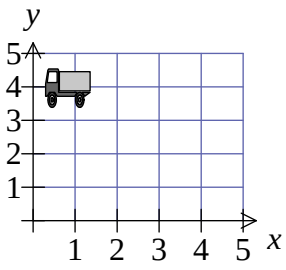
   What is the new temperature? _____



4. Insert <, > or = to make the following sentence true.

$$\frac{3}{8} \square \frac{2}{4}$$

5. $\frac{1}{2} \times 45 =$ _____
6. Round 6.729 to a whole number. _____
7. 6.606 ÷ 6 = _____
8. Write 190% as a decimal. _____
9. Write the next number: 8.86, 8.91, 8.96, _____
10. At what point is the truck?



_____

© Department of Education WA 2012 – MATHSAC029

Review 2

Example

Your task is to find out what time people wake up in the morning.

Design a question or instruction to get the data. Plan how you will record the data in a table. Explain your thinking as you complete the task.

Solution

(The answer is provided by a student name Adel.)

I thought that people might wake up at a different time each day so I had to choose a day. I chose Wednesday because it is in the middle of the week.

When I first thought about it my instruction was:

'Next Wednesday when you wake up, check a clock or watch and record the time. Write it on a piece of paper and return it to me. I would like the time to the nearest minute, if possible please.'

I expected the times to range from about 5 am to 8 am so I would need to group them. I decided it might be easier for me to give a range of times to start with, as people might find it hard to put an accurate time. So I changed my instruction.

'Next Wednesday when you wake up, check a clock or watch and record the time that you wake up by putting a cross (X) in the right section then return the paper to me. If you woke at a different time please add it next to "Other".'

Waking time	X for time
5.00 am–5.15 am	
5.15 am–5.30 am	
5.30 am–5.45 am	
5.45 am–6.00 am	
6.00 am–6.15 am	
6.15 am–6.30 am	
6.30 am–6.45 am	
6.45 am–7.00 am	
7.00 am–7.15 am	
7.15 am–7.30 am	
7.30 am–7.45 am	
7.45 am–8.00 am	
Other	

Once I get the results back I will be able to use the groups in my table and add to it if necessary from any other times given.

© Department of Education WA 2012 – MATHSAC029

1. Which of these questions is the best to obtain the heights of children in order to provide uniforms for a baseball competition?

   (a) How tall are you?

   (b) What is your height to the nearest centimetre?

   (c) What is your height in metres?

2. You want a group of students to record the amount of time they spend reading books each week outside of school time. What instruction would you give them to obtain:

   (a) an approximate result

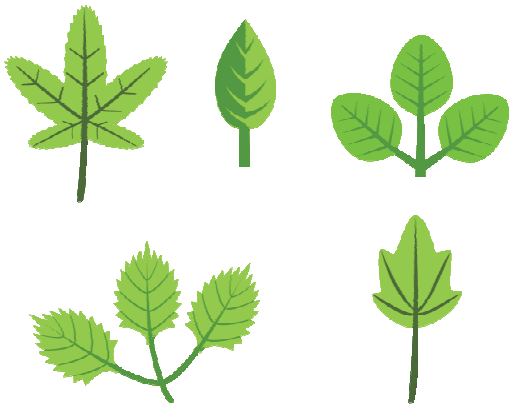
   (b) a more accurate result?

3. The ages of the 100 volunteers at a cat welfare centre range from 10 to almost 83. How could you obtain and then group these ages so that the data is easy to record?

Check your work before continuing.

© Department of Education WA 2012 – MATHSAC029

Focus problem 2



Some plants have leaves that are of almost the same size and others have very different sized leaves.

Select a tree or bush in your garden and collect at least 20 leaves to measure. If taking the leaves is a problem then measure them whilst they are on the plant.

Decide on the accuracy required for your measurements before recording the length of each leaf. Look at the list of the lengths and decide how the lengths could be grouped. If it is **grouped data** the measurements should be in equal sized groups for easier recording.

List of lengths:

Record the data in the table below, or use your own table. Use a tally and then convert it to numbers. These numbers are the **frequency** for each group.

Lengths	Tally	Number of leaves

© Department of Education WA 2012 – MATHSAC029

Summarise any important features you notice about the leaves and comment on the degree of accuracy used in your measurements.

Share the information you have found with others in your class.

Some leaves are big

Banana trees can have leaves up to 6 metres long, but palms are the trees with the largest leaves in the world.

The Raffia Palm with leaves up to about 25 metres in length and 3 metres in width is considered the one with the biggest leaves.

Check your work before continuing.

© Department of Education WA 2012 – MATHSAC029

Skills development 2

Example

Once again we will use the weights of the adult cats at the vet clinic.

5 787	9 497	8 722	11 030	3 350	3 680
3 184	2 135	3 037	6 089	6 732	5 946
7 769	3 901	4 117	2 411	2 133	4 465
7 476	5 041	3 669	7 255	4 943	10 527
5 947	4 018	1 961	6 013	5 248	2 000

1. Organise the data into a table using equal sized groups of weights starting with 1000 grams to less than 2000 grams, then 2000 grams to less than 3000 grams.

2. From your table answer the following questions.
   (a) How many cats would be considered obese if an obese cat is one that weighs over 10 kg?
   (b) What is the most common weight group for the cats?
   (c) Why can't the weight of the smallest cat be found?

3. Explain why the table might be slightly different if the weights, which are continuous data, were not rounded to the nearest gram.

Solution

1. The smallest weight is 1961 grams and the largest is 11 030 grams so it would be impossible to write all the numbers in the table.

   The weights will need to be organised in groups. There are 30 numbers and organising the groups in kilograms or 1000 grams would make sense.

© Department of Education WA 2012 – MATHSAC029

Weight range of cats in grams	Tally	Number of cats in group
1000–2000	|	1
2000–3000	||||	4
3000–4000	𝍸 |	6
4000–5000	||||	4
5000–6000	𝍸	5
6000–7000	|||	3
7000–8000	|||	3
8000–9000	|	1
9000–10000	|	1
10000–11000	|	1
11000–12000	|	1

The column headed 'Number of cats in group' could also be headed with the word '**Frequency**'. The frequency tells you how often something occurs.

2. (a) There would be two obese cats.

   (b) The most common weight group for the cats is from 3000 grams to 3999 grams.

   (c) The smallest weight could not be found from the table because there is only a range of weights not the actual weights.

3. There may be a weight that is just below the cut-off for the group. When it is rounded up it goes to the next group. This could be a problem. For example, a weight of 1999.7 grams would go in the 1000–2000 group if not rounded. When it is rounded to the nearest gram it is 2000 grams and would go in the 2000–3000 group.

© Department of Education WA 2012 – MATHSAC029

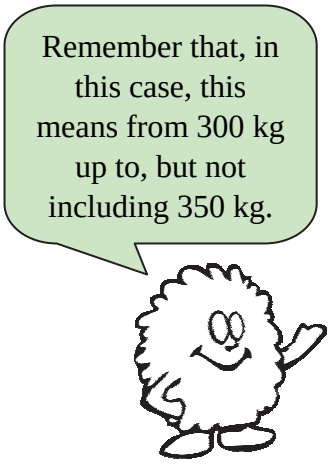
1. List any obvious errors in the table below. Note how the word '**frequency**' is used.

Length of shoe laces	Tally	Frequency
0–50	||||	4
50–70	||||||	7
70–100	𝍸	5
101–130		
131–160	𝍸 𝍸	9
180	|	1

2. The weights of the horses used in Skills development 1, are recorded to the nearest kilogram below.

451	486	543	555	587
523	405	486	548	401
568	401	542	578	450
550	547	400	502	410
494	330	589	531	395

(a) Organise the data into the table using groups of 50 kg weights starting with 300 kg to 350 kg.



Weight in kilograms	Tally	Frequency (number of horses)
300–350		
350–400		

© Department of Education WA 2012 – MATHSAC029

(b) Answer the following questions from the previous table.

(i) How many of these horses would be considered underweight if an underweight horse is one that weighs less than 340 kg? _____

(ii) Which is the most common weight range of the horse? _____

(iii) Why can't the weight of the largest horse be worked out from the table?

(c) Why is the data in the table called **grouped data**?

(d) When you have some spare time you might like to use an internet search to find out the sizes of the largest and smallest fully matured horses on record. Write your findings below.

Check your work before continuing.

© Department of Education WA 2012 – MATHSAC029

© Department of Education WA 2012 – MATHSAC029

3. Collect and record numerical data

When you complete this section you should be able to:

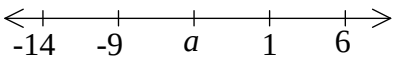
- collect and record numerical data using the most suitable method.

Warm-up 3

1. Circle the composite numbers. 13, 15, 17, 19, 21

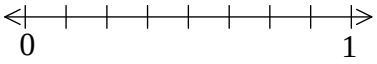
2. $9 \times 11 =$ _____

3. What is the missing number?



$a =$ _____

4. Locate $\frac{5}{8}$ on the number line.



5. Find four-thirds of 9. _____

6. Estimate the difference by first rounding to whole numbers

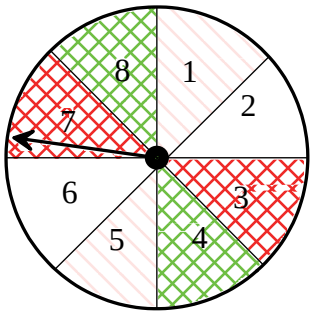
$87.1 - 56.5 \approx$ _____

7. $21.03 \times 4 =$ _____

8. Write $2\frac{1}{3}$ as a percentage. _____

9. Write in the next number: $\frac{1}{3}, \frac{2}{3}, 1,$ _____

10.



Determine the probability the spinner will land on a factor of 4.

Express your answer as a percentage.

_____

© Department of Education WA 2012 – MATHSAC029

Review 3

Example
Students were given the following task.

Find out how far people can jump from a standing start. Design a question to collect the records from up to 40 people. Organise the data into a table. Make a note of any problems you had to consider when designing the question. Also note any problems when recording the data into the table.

Solution
(The answer is from a student named Harry.)

First I tried a standing jump myself to see what I had to do. There would need to be a line to jump from and the measurements taken to the nearest centimetre for enough accuracy. It would be hard to measure to the nearest millimetre.

My instruction sheet that I gave to people is shown here.

> Please draw a line on the ground and with your toes just touching the line, jump as far forward as you can. It will be useful to have someone else mark where your toes land. Measure your jump to the nearest centimetre. Record it below and give it to me.
>
> Name: _____
>
> Jump length: _____

The results are given below.

123,	154,	168,	105,	136,	59,	83,	139,	132,	75,
88,	112,	107,	121,	92,	101,	166,	108,	75,	86,
114,	73,	120,	92,	75,	63,	100,	79,	133,	97

The numbers ranged from 59 to 168. There was a gap of 109 centimetres so I decided to organise the data into groups with a 10 cm range on my table. This will give me about 11 groups which is a good number. Because the distances have already been rounded I will start with 50–59 then 60–69 etc, so it is clear which group any number falls into.

© Department of Education WA 2012 – MATHSAC029

Jump length (cm)	Tally	Number of people
50–59	|	1
60–69	|	1
70–79	𝍸 |	5
80–89	|||	3
90–99	|||	3
100–109	𝍸 |	5
110–119	||	2
120–129	|||	3
130–139	||||	4
140–149		0
150–159	|	1
160–169	||	2

1. (a) Using the values in the example complete a new table with the groups being twice as big, starting with 50–69 then 70–89 and so on.

© Department of Education WA 2012 – MATHSAC029

(b) Compare the two tables. Which do you think is better to use for this data? Why?

2. The jumps in the example were taken to the nearest centimetre so there is a gap between 59 cm and 60 cm. A jump of 59.6 cm would be recorded as 60 cm. This means it would go in the group 60–69. Where would it have gone if all measurements were correct to one decimal place and the first two groups were written as 50–60 then 60–70? Would this need to be taken into account when designing questions?

Check your work before continuing.

© Department of Education WA 2012 – MATHSAC029

Focus problem 3

Many sports followers have been commenting that the players are much taller now than in the past. What information do you need to be able to investigate these opinions?

(a) Choose a sport and use the internet or other means to find profiles of players that list their heights. Two of the sports that have these easily available are football and tennis.

Possible terms you could use in the internet search are 'football player profiles' or 'tennis player profiles'.

(b) Make a record of the heights of at least 30 players and organise them into a table. Explain any processes you went through.

(c) Do you think the information you have found indicates that the players today are taller than those in the past? Explain your answer.

(d) Was it easier to answer the question in (c) from the individual heights you found or from the table? Explain your answer.

© Department of Education WA 2012 – MATHSAC029

The golf ball

Did you know that the type of golf ball that is used to play the game of golf today was based on a ball designed in 1898?

The first golf balls were made from wood and were used up to the 17th century. After that there was a ball made from feathers encased by some animal hide. The next type was made from a tree sap that acted like rubber.

When you have some spare time and you want to learn more, make an internet search for the history of the golf ball.

Check your work before continuing.

© Department of Education WA 2012 – MATHSAC029

Skills development 3

Example

A local nursery grows trees. The heights of the trees when sold were recorded for future reference. Three different workers at the nursery, Kelvin, Amy and Freda, recorded the data.

Kelvin recorded the heights as individual results and measured as accurately as he could. He used centimetres, correct to one decimal place.

Amy didn't record the individual heights but recorded her results in a table. Freda did the same. They checked the height of the smallest and the tallest tree to give them an idea for their groupings. They used a tally and then changed the tally marks to a number.

Kelvin's record follows.

97,	95.1,	191,	121.7,	188.7,	38.5,	114.1,	56.6,	197.9,	188.6
154.5,	121.6,	151.8,	82,	51.1,	199.2,	163.3,	162,	163.5,	75.3
198.3,	183.5,	42.1,	137.9,	118.2,	38.5,	167.3,	77.7,	157.6,	181.2
140,	111.4,	191.3,	133.5,	53,	59,	114.4,	154.7,	186.6,	184.6
171,	127.7,	154.9,	50.6,	42.7,	166.7,	56.5,	105.6,	80.9,	103.2

Amy's table

Height of tree (cm)	Frequency
35–85	14
85–135	12
135–185	16
185–235	8

Freda's table

Height of tree (cm)	Frequency
35–55	7
55–75	3
75–95	4
95–115	7
115–135	5
135–155	6
155–175	7
175–195	8
195–215	3

1. Why don't some of Kelvin's results have decimal points in them?
2. What does 35–85 mean in Amy's table?
3. Why should Amy and Freda add an explanation of how the groups are organised?
4. Which group in Freda's table do the following measurements fit into?
   (a) 154.7
   (b) 95.1
5. Which way of recording the results do you think is best? Explain your choice.

Solution

© Department of Education WA 2012 – MATHSAC029

1. The numbers where Kelvin did not have a decimal point are like that because the first decimal place is zero and does not need to be written in.
2. 35–85 means the height range for that group is from 35 cm to less than 85 cm.
3. They need to explain where a measurement that lies on the end or beginning of a group is to be included. For example, 35–85 means the height range for that group is from 35 cm to less than 85 cm.
4. (a) 154.7 fits into the 135–155 group.

   (b) 95.1 fits into the 95–115 group.
5. Freda's table would be best because it is easy to read and the range of each group is only 20 cm. Amy's table does not have enough detail and Kelvin's list is confusing and hard to get details from.

1. Use the table on the following page to answer these questions.

   (a) What does the heading of the table tell you about the data?

   (b) The information in this table is obtained from continuous data? Why is it continuous data?

   (c) What degree of accuracy is used for the given measurements?

   (d) Why are the notes at the bottom of the table needed?

   (e) Is this table easy to understand? Why or why not?

   (f) What information does it tell you about the time spent on reading?

© Department of Education WA 2012 – MATHSAC029

Time spent on weekdays/weekend 2006

The average amount of time that people spent on recreation and leisure activities increased on the weekend compared with weekdays, with men spending more time (5 hours and 32 minutes a day) on the weekend on these activities than women (4 hours and 33 minutes a day).

Men spent more time on the weekend on sport and outdoor activity than women (37 minutes compared with 21 minutes).

Average time spent on free time activities, by weekday/weekend and sex – 2006

	Males		Females	
	Weekday minutes per day	Weekend minutes per day	Weekday minutes per day	Weekend minutes per day
Socialising	6	20	7	19
Visiting entertainment venues(a)	2	8	4	8
Attendance at sports event	*1	6	-	4
Religious activities(b)	*2	8	4	10
Community participation	8	7	11	9
Associated travel	7	22	9	21
Social and community interaction (c)	27	71	35	73
Sport and outdoor activity	20	37	16	21
Games, hobbies, arts, crafts	13	18	11	15
Reading	19	25	23	29
Audio/visual media	144	181	117	134
Other free time	20	29	16	24
Talking and correspondence(d)	21	31	34	43
Associated travel	5	10	4	6
Recreation and Leisure(c)	243	332	223	273
Total free time	270	403	259	346

* estimate only and should be used with caution
- nil or rounded to zero (including null cells)
(a) Includes cultural venues.
(b) Includes ritual ceremonies.
(c) Includes additional activities not separately included.
(d) Includes talking on phone or reading/writing own correspondence.

Based on Australian Bureau of Statistics data (cc) BY

© Department of Education WA 2012 – MATHSAC029

2. The council in the town of Kinghead obtained data from 40 families about the width of the block of land their house is built on. The survey asked the results to be given to the nearest metre. This was considered to be accurate enough to make decisions about providing community services in the future.

   The measurements that were submitted are shown below. These include those that were not measured to the nearest metre as instructed.

55	83.9	23	74	40.1	74.5	86	94
34	54	26	99	99	71	34	45
37	32	27	91	20	67	46	27
84	32	89.7	89.6	63	39	84	43.15
29	90	90	34	65	53	86	56

   One councillor, Mr Brown, said that if the numbers were rearranged into ascending order they would be easier to read and use. Mrs Green suggested that organising the results into a grouped data table with groups having a range of ten metres would be a lot easier. She said that the individual values were not needed.

   Which of them do you agree with? Why?

Check your work before continuing.

© Department of Education WA 2012 – MATHSAC029

4. Types of data displays

When you complete this section you should be able to:

- recognise and choose different ways to display data
- recognise a histogram
- draw graphs of data.

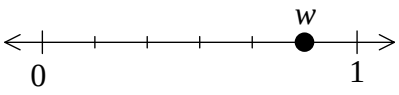
Keywords

- dot plot
- column graph
- histogram

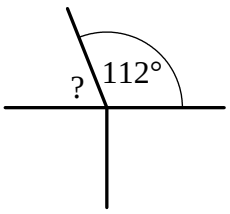
Warm-up 4

1. Circle the square numbers. 18, 25, 33, 38, 46, 49
2. $27 \div 9 =$ _____
3. The temperature was minus 2 degrees but it went up 13 degrees.

   What is the new temperature? _____
4. Express the value of w as a fraction.



   _____
5. $\frac{5}{4} \times 20 =$ _____
6. $0.0076 \times 10\,000 =$ _____
7. $3\overline{)9.612}$
8. Write 225% as fraction. _____
9. Complete by adding the next number: 1022, 1011, 1000, _____
10. Determine the size of the missing angle.

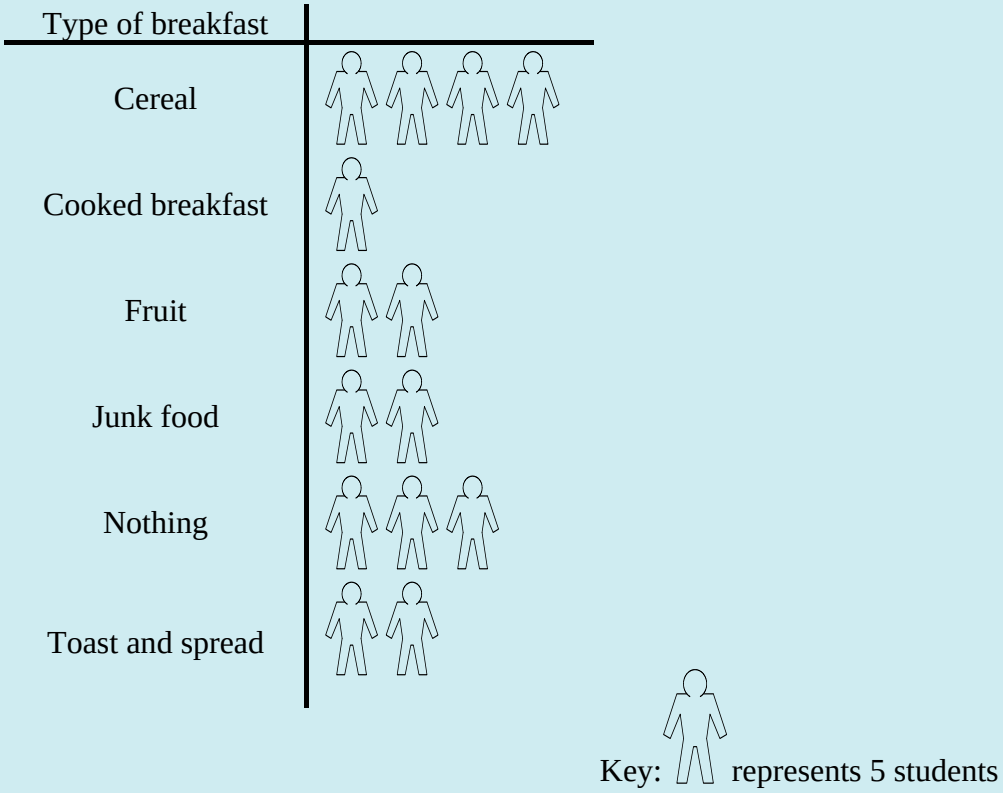


© Department of Education WA 2012 – MATHSAC029

Review 4

Example

The teacher asked each student she had during the day what they had for breakfast that morning. She then got the students to draw the following picture graph to display the data obtained.

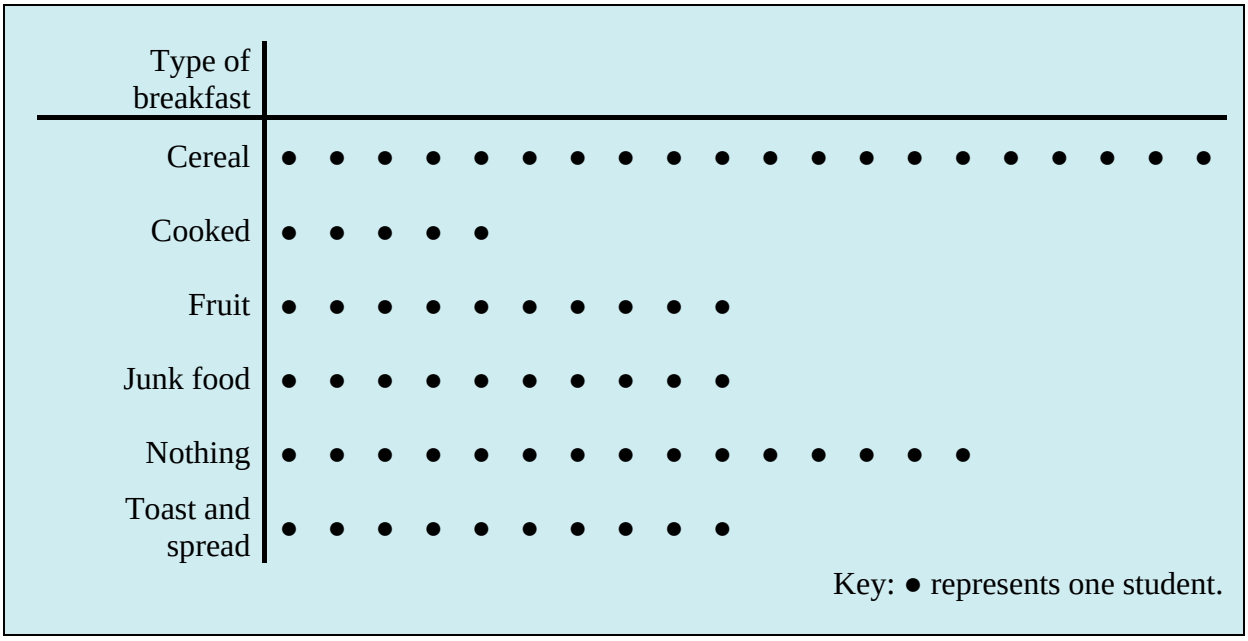


1. How many students did the teacher ask about their breakfast?
2. Why was a key necessary for the graph?
3. What would be the problem with this key if the teacher had asked 68 students about their breakfast?
4. Draw a **dot plot** of the same information where one dot is used to represent one student.

Solution

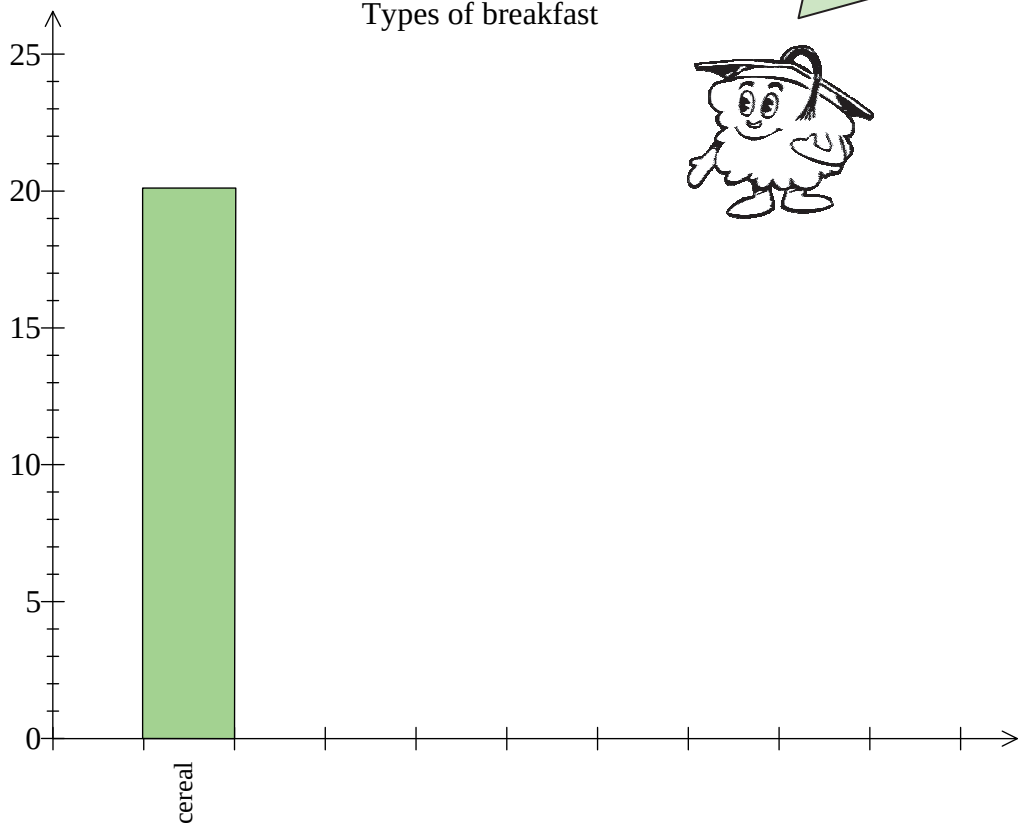
1. There are 14 figures so the teacher asked 70 students.
2. Without the key it would be assumed that each figure represented just one student. The key is needed to show the real numbers involved.
3. The key wouldn't be suitable for any numbers other than multiples of 5 because it would be hard to draw the part of the figure to represent 3 students.
4. The dot plot could be drawn horizontally or vertically. It is drawn horizontally below.

© Department of Education WA 2012 – MATHSAC029



1. (a) For the data in the example above complete the following **column graph**.

A **column graph** has columns whose height is the same as the frequency of the data item.



© Department of Education WA 2012 – MATHSAC029

(b) Which of the three types of graphs, picture graph, **dot plot** or **column graph**, is easiest and most accurate to use for this data about breakfast cereals? Explain your answer.

2. For continuous data there is no gap between the end of one group and the beginning of the next. How would you show this on a column graph?

3. The graph below (a **histogram**) shows the ages of the people living in a housing estate.

(a) The histogram is a particular type of column graph. What makes it different to other types of column graphs?

© Department of Education WA 2012 – MATHSAC029

(b) The ages are grouped as shown on the **histogram**. What is the range of ages for each group?

(c) What is the youngest and what is the oldest age for the first group?

(d) How many people are in the 45–55 age group? _____

(e) If you were asked the age of the oldest person living in the housing estate what answer would you give?

Check your work before continuing.

© Department of Education WA 2012 – MATHSAC029

Focus problem 4

Each of the children in a class was asked to provide two pieces of data. One was how long the battery in their mobile phone lasted before it needed recharging. The other was how many books they had read in the last month.

The answers that were given are shown below.

The instruction for recording the battery life was to write it in hours and minutes then divide the minutes by 60 to get a decimal value, correct to two decimal places. For example, 4 hours 57 minutes was written as 4.95 because $57 \div 60 = 0.95$.

Mobile phone battery life	Numbers of books read in the last month
4.25	0
4.95	1
3.36	1
5.21	2
5.62	5
6.13	4
12.37	0
4.14	8
5.36	3
6.27	6
7.08	2
7.52	1
5.73	1
4.34	3
6.11	4
10.45	5
13.40	0
9.59	2
7.88	2
6.44	4
14.55	1
6.95	3

© Department of Education WA 2012 – MATHSAC029

Organise each set of data into a different table.

	Tally	

	Tally	

Now use one of the following graph types to illustrate each set of data. You should choose the graph that gives the best representation.

- picture graph
- **dot plot**
- **column graph**
- column graph for continuous data (called a **histogram**)

© Department of Education WA 2012 – MATHSAC029

Give a reason for your choice of each graph.

Recycling

There are around 28 million mobile phones in use in Australia.

What happens to the old phone when you get a new one?

Almost all of the material in a mobile phone can be recycled to make new products. There are varying levels of plastic, gold, silver, copper, nickel and cadmium that can be re-used. Throwing old mobile phones away may mean they go into landfill and parts of the components like cadmium could leach into the environment where they can be dangerous.

Check your work before continuing.

© Department of Education WA 2012 – MATHSAC029

Skills development 4

Example

The weights of 45 babies born in hospital in a month were recorded.

The weights ranged from 1500 g to 4200 g but we will use 1.5 kg to 4.2 kg with all values rounded to one decimal place, for ease of use. For example, the weight of Ethan, who was 3572 g at birth, will be recorded as 3.6 kg.

2.7	1.7	4.1	1.6	4.1	3.4	3.9	3.4	3.8
2.4	3.9	3.6	2.5	2.6	3.3	2.2	3.7	2.5
1.5	1.8	3.6	2.9	3.2	1.5	2.3	1.6	1.5
3.0	2.6	3.1	3.5	1.7	3.3	4.1	1.6	3.6
4.0	2.3	3.1	2.0	3.2	1.6	2.4	1.6	2.9

(a) Explain why a picture graph and a **dot plot** would not really be suitable to display this information.

(b) Why would a **column graph** be best to display this data. Would it need to be a simple column graph or a **histogram**?

(c) What preparation would you need to do before you could use a graph to display the data?

(d) What details about the weight of each of the babies will be lost by organising the data to use in a column graph?

Solution

(a) The weights vary a lot so putting a dot or picture for each individual weight would be difficult.

(b) A column graph is best because the data would need to be grouped. A histogram would be best as weight data is continuous data.

(c) The values would need to be put into a grouped table before the graph could be drawn.

(d) The individual weights would be lost and the weight of the baby would only be recorded in a group.

© Department of Education WA 2012 – MATHSAC029

1. Choose whether a picture graph, a **dot plot**, bar graph or a **column graph** would be best to display data for each of the following topics. Explain why you made the choice.

   (a) musical instruments played by students at a school

   (b) ages of pupils at a country school

   (c) the time each child in the school woke up on Monday morning

2. You should be able to use a word processing or spreadsheet program on the computer to draw graphs of data. Find a program that will allow you to draw the graph for the data used in the previous example. Draw the graph and if possible save it so you can show it to your teacher along with your description of how it was done.

   If you are having problems with doing this on your computer now might be the time to ask for help.

Check your work before continuing.

© Department of Education WA 2012 – MATHSAC029

5. Constructing data displays

When you complete this section you should be able to:

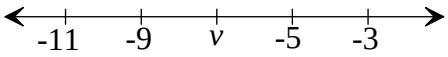
- construct data displays including stem-and-leaf plots.

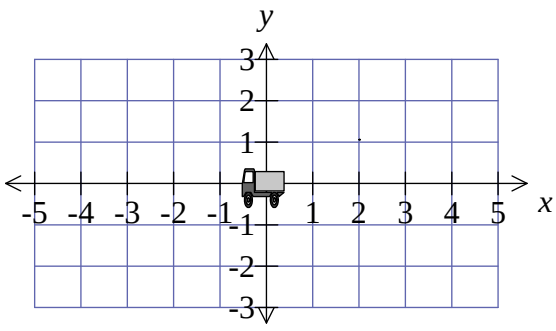
Keywords

- stem-and-leaf plot
- ordered stem-and-leaf plot

Warm-up 5

1. Express 15 as factors of primes. _____
2. 18 + 547 = _____
3. What is the missing number?



   v = _____
4. $\frac{3}{4} + \frac{7}{4} =$ _____
5. Find five-quarters of 12. _____
6. 0.02 m = _____ mm
7. $15 - 4 \times 2 =$ _____
8. Write $4\frac{2}{3}$ as a decimal. _____
9. Complete: 124.8, 112.6, 100.4, _____
10. 

The truck is shown at (0, 0).

If the truck moves 2 units right and 5 units down, where will it then be?

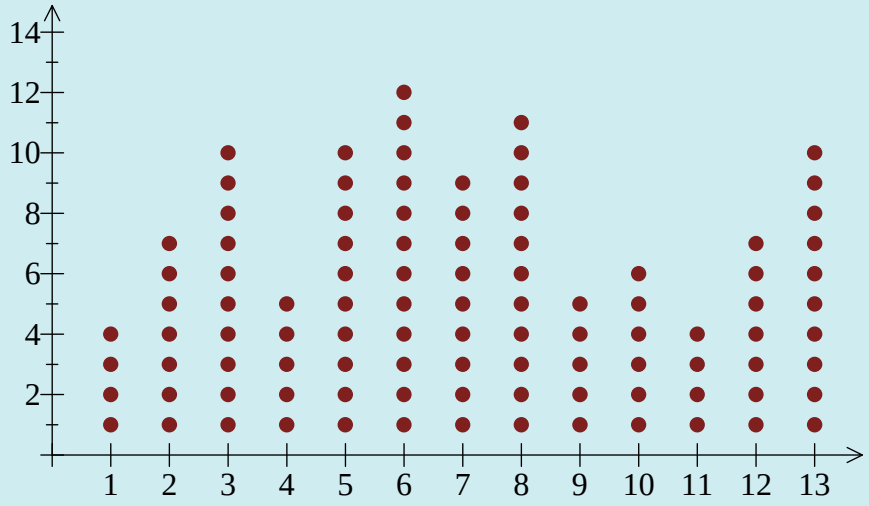
_____

© Department of Education WA 2012 – MATHSAC029

Review 5

Example

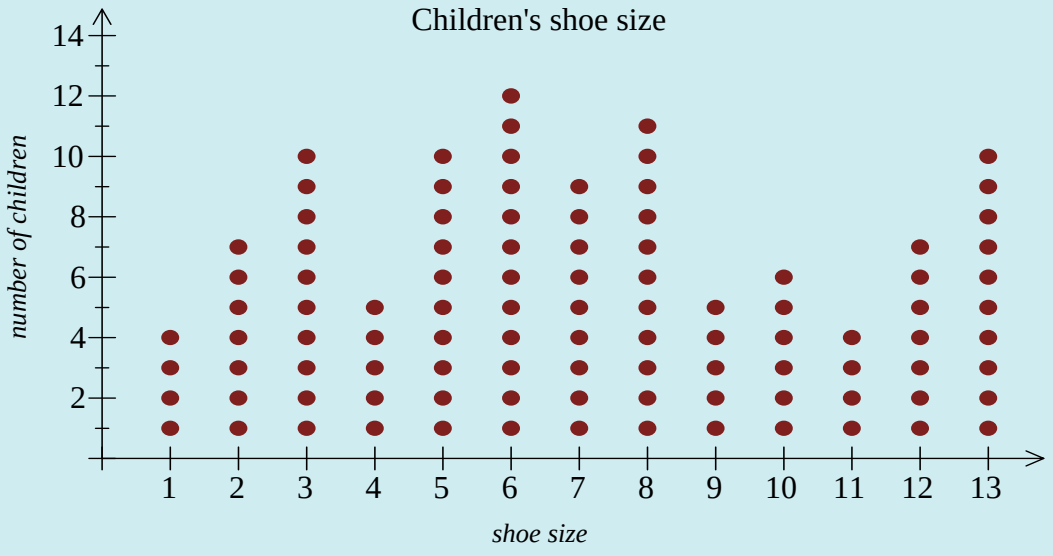
The dot plot below shows the shoe sizes of a group of children.



1. Provide a heading for the graph and label each of the axes.
2. Rewrite the data into a table.
3. What is the most common shoe size?
4. How many of the children wear size 8 shoes?
5. Would this data also be suitable to be displayed using a histogram? Explain your answer.

Solution

1.



© Department of Education WA 2012 – MATHSAC029

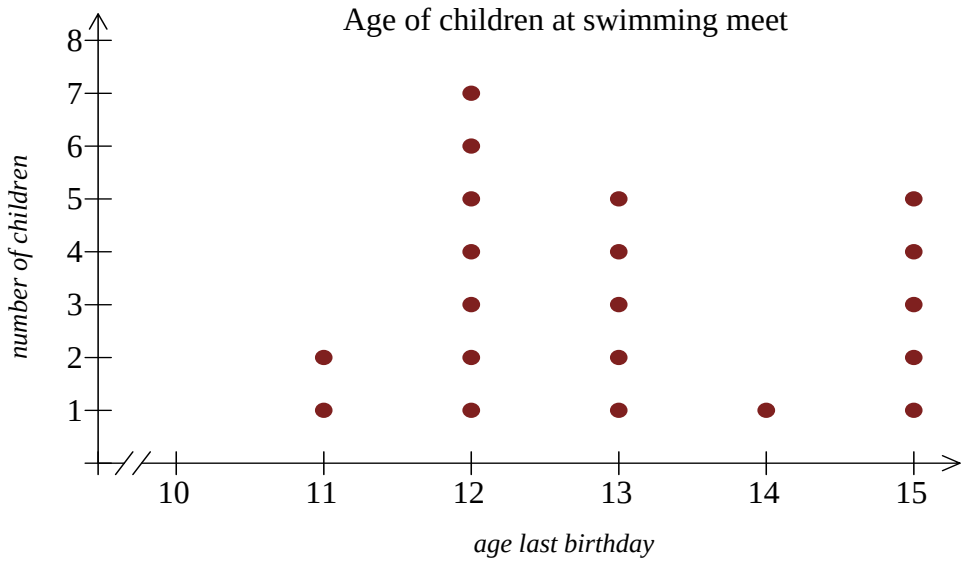
2.

Shoe size	Number of children
1	4
2	7
3	10
4	5
5	10
6	12
7	9
8	11
9	5
10	6
11	4
12	7
13	10

3. The most common shoe size is 6.
4. Eleven children wear size 8.
5. The data is not continuous as the sizes can only be whole numbers. A histogram would not be suitable to display this data but a normal column graph would be suitable.

© Department of Education WA 2012 – MATHSAC029

1. The ages of children at a Saturday meet at a swimming club are recorded in the dot plot below.



(a) Age data is usually continuous data. How is the age data that is recorded here different?

(b) What is the most common age at the meet?

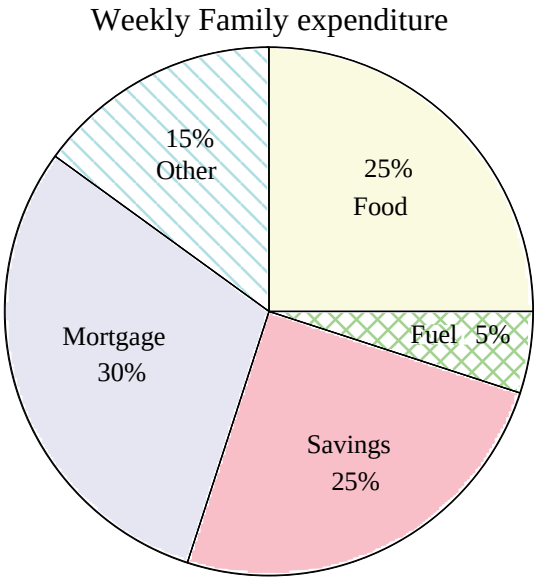
(c) How many 13 year olds are there at the meet?

(d) Two 12 year old boys and a 9 year old girl were missing that Saturday. How would the graph have to change to be able to add them?

(e) What changes would have to be made to the axes if a column graph was to be drawn instead of a dot plot?

© Department of Education WA 2012 – MATHSAC029

2. The pie chart below shows how a family distributes their weekly income of $1000. The data is represented in the graph as percentages of the whole.



(a) Why is this type of graph a good choice for this data?

(b) How much is actually spent on the mortgage?

(c) How much of the weekly income is spent on food?

(d) The angle at the centre of a circle is 360°. Find the size of the angle for the mortgage section, which is 30% of 360°.

(e) How big is the angle for the following?

(i) savings

(ii) fuel

Check your work before continuing.

© Department of Education WA 2012 – MATHSAC029

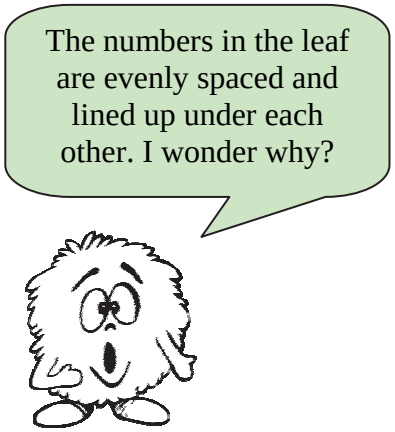
Focus problem 5

In some cases where we obtain numerical data we do want to retain the actual values. We do not want to lose them by putting the data values into groups. To do this a **stem-and-leaf plot** could be used. The data is broken into a stem and a leaf. For example, 25 has a stem of 2 (representing 20) and a leaf of 5.

The Year 7 class was given a revision test and the marks ranged from 20 to 87 out of 100.

The teacher recorded the scores and showed the class the results.

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



1. What do the numbers in the stem column represent?

2. What do the numbers in the leaf columns represent?

3. How many students did the test? _____

4. What were the actual marks for the students who got less than 50 in the test?

5. Why are the numbers in the leaf evenly spaced and under each other?

© Department of Education WA 2012 – MATHSAC029

6. The previous **stem-and-leaf plot** is not ordered. Make it an **ordered stem-and-leaf plot** by rewriting the leaves on the right, in ascending order. For example, for the stem labelled with a 4, it should read 43 and then 48.

Stem-and-leaf plots should have a heading.

7. Provide a heading for the graph.

Keystone

A keystone in a building is the last piece to be put into position in an arch made from stone. It helps to lock all the stones into their correct place so that the arch is strong.

The term is also used sometimes to refer to an important part of an organisation without which the whole thing would collapse.

Try an internet search for images of keystones when you have some spare time. Many are very decorative as well as being necessary for the strength of the structure.

Check your work before continuing.

© Department of Education WA 2012 – MATHSAC029

Skills development 5

Example
Draw a **stem-and-leaf plot** to illustrate the following data about the time, in seconds, it took each child in a class to run 100 metres.

17, 24, 33, 26, 18, 19, 14, 21, 30,
29, 26, 20, 21, 19, 25, 26, 22, 22,
18, 21, 42, 23, 17, 19, 23, 24, 35

Solution

Time to run 100 metres, in seconds

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

1. The stem-and-leaf plot below shows the length, in centimetres, of the snakes in a snake house at a reptile park.

Stem	Leaf
10	6 2 0 9 2
11	2 6 3
12	8 4 4
13	7 2 5 4 9
14	2 0 1
15	8

(a) The stem 10 represents 100 in this case. What does a stem of 15 represent?

© Department of Education WA 2012 – MATHSAC029

(b) Rewrite the stem-and-leaf plot as an **ordered stem-and-leaf plot** and add a heading and a key.

(c) What is the length of the shortest and longest snake in the snake house?

(d) Would this be a suitable type of graph to use if there were 500 snakes in the snake house? Why?

© Department of Education WA 2012 – MATHSAC029

2. Construct a **stem-and-leaf plot** for the following data.

   The number of cars that passed through a crossroad each morning in April, between 6 am and 8 am, are shown below.

208	201	247	233	253	254	235	212	243	214
206	200	210	255	207	228	210	243	214	255
214	248	228	207	233	211	202	204	236	216

3. The graph below is called a back-to-back stem-and-leaf plot. The teacher from Focus problem 5 gave the class another test two weeks later and recorded the results on the same graph.

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

   (a) Provide a heading and a key for the graph.

© Department of Education WA 2012 – MATHSAC029

(b) What were the lowest and highest scores in each test?

(c) How many students got a passing score of 50 or better in each test?

(d) The teacher considered that the tests were of the same difficulty. What conclusion can be made about the performance of the class on the second test compared to the first test? Use the evidence in the **stem-and-leaf plot.**

Check your work before continuing.

© Department of Education WA 2012 – MATHSAC029

© Department of Education WA 2012 – MATHSAC029

6. Comparing data displays

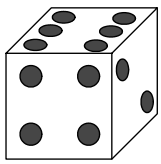
When you complete this section you should be able to:

- compare data displays and decide the most appropriate display for the data.

Warm-up 6

1. $0.207 \times 10 =$ _____
2. $154 - 108 =$ _____
3. The temperature is minus 8 degrees.

   How much will it need to increase to get to 5 degrees? _____
4. $\frac{9}{6} - \frac{3}{6} =$ _____
5. $\frac{7}{4} \times 16 =$ _____
6. 0.001 kg = _____ g
7. $20 \div 4 - 3 =$ _____
8. Write 3.25 as a percentage. _____
9. $7\frac{1}{4}, 5\frac{3}{4}, 4\frac{1}{4},$ _____
10. A six-sided dice is rolled.



Express as a decimal, the probability that it lands on a triangular number.

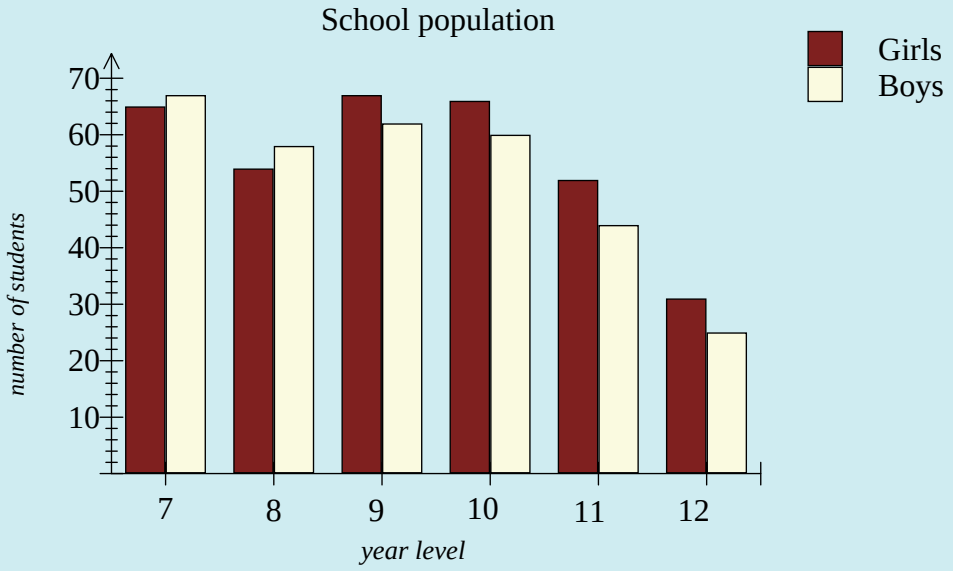
_____

© Department of Education WA 2012 – MATHSAC029

Review 6

Example

The school population was recorded at the end of the first month of the year. The following graph was produced of the results showing the number of girls and boys separately.



1. Why was it better to draw a side-by-side column graph instead of two separate column graphs?
2. In which year levels were there less girls than boys?
3. Approximately how many girls and boys were in the following years?

   (a) year 7

   (b) year 12

Solution

1. It is easier to compare the number of boys and girls if the columns for each year group are beside each other.
2. There were less girls than boys in years 7 and 8.
3. (a) There are 65 girls and 67 boys in year 7.

   (b) There are 31 girls and 25 boys in year 12.

© Department of Education WA 2012 – MATHSAC029

1. Two home gardeners weighed each of the tomatoes from one of their plants. It was found that the tomatoes ranged from 140 grams to close to 200 grams. They were entered on the following stem-and-leaf plot.

Weights of tomatoes in grams

Leaf – Gary				Stem	Leaf – Glenda						
				14	2	0					
			2	15	1	4	6				
		9	1	16	8	3					
	8	8	6	17	7	3	4				
7	3	1	0	18	0	6	3	5	1	4	1
	9	6	4	19	2						

(a) Which of the two gardeners used an ordered stem-and-leaf plot? How can you tell this?

(b) Write a key for the plot.

(c) Who had the lightest tomato?

(d) Who had the heaviest tomato?

(e) Which gardener do you think had the best crop and why?

Check your work before continuing.

© Department of Education WA 2012 – MATHSAC029

Focus problem 6

In the physical education class the teacher tested the students for fitness at the beginning of the term and again after six weeks.
One of the tests was the number of sit-ups each student could do.
The teacher put the week one results onto a stem-and-leaf plot.

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

She didn't get the chance to do the plot for the week six results which were:

18, 47, 93, 35, 34, 38, 42,
55, 61, 40, 30, 31, 42, 57,
30, 46, 51, 71, 76, 32, 44.

The teacher needs to be able to compare the results. She wants to decide if the fitness of the class has improved.

1. Draw up back-to-back ordered stem-and-leaf plots, with the week one results on the left, so that the results can be compared.

© Department of Education WA 2012 – MATHSAC029

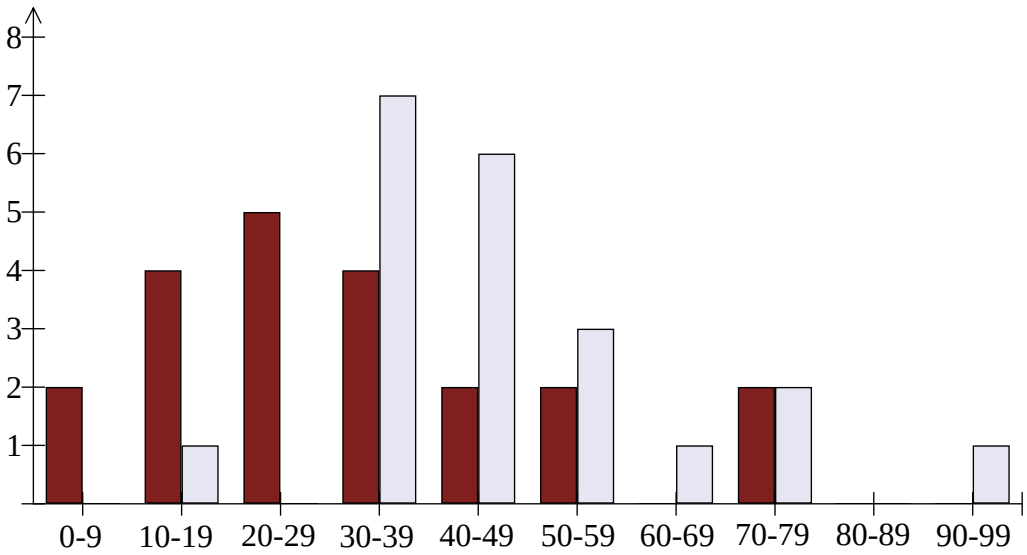
So that the parents could see the general trend, the teacher also completed side-by-side column graphs.

2. Using the stem-and-leaf plots complete the grouped frequency table for each set of data.

Week one	
Number of sit-ups	Frequency
0–9	2
10–19	4
20–29	
30–	
–49	

Week six	
Number of sit-ups	Frequency
0–9	
10–19	
50–	
90–99	

3. Now complete the side-by-side column graph below by adding the labels to each axis, a key to explain the different shadings and a heading.



© Department of Education WA 2012 – MATHSAC029

4. Which of the stem-and-leaf plot, the table or the column graph is easiest to produce from the original data?

5. Are the column graphs the best way to show the information to the parents? Explain your answer.

6. An individual student wants to know where they fell in the class fitness results. Which of the stem-and-leaf plot, the table or the column graphs would be best to look at? Explain your answer.

Sit-up records

You may not be surprised to know that there are world records for the number of sit-ups that have been done. Some of these restrict the time to one minute or one hour.

If you can complete over 30 sit-ups in one minute you are doing pretty well.

With no time limit you would need to do over 125 000 sit-ups to beat the world record.

Check your work before continuing.

© Department of Education WA 2012 – MATHSAC029

Skills development 6

Example

Which is the best way to display each of the following types of data: a column graph, a grouped table, a stem-and-leaf plot, a dot plot, a list of data, a pie chart, a histogram or a picture graph?

1. The number of pages in each of the 200 books on a bookshelf
2. The average daily temperature in June of the capital cities in Australia
3. The times of all the 15 000 runners in a run from the city to the beach
4. The weights of 20 pets which range from 10 kg to 60 kg
5. The spread of year groups across a school population

Solution

1. A grouped table or a column graph
2. Column graph
3. Histogram
4. Stem-and-leaf plot
5. Pie chart

1. Which is the best way to display each of the following types of data: a column graph, a grouped table, a stem-and-leaf plot, a dot plot, list of data, a histogram and or a picture graph?

   (a) The average number of sunny days in December for the capital cities in Australia

   (b) The number of push-ups a class of 18 students can do

   (c) The number of people in the family for each student in a class

   (d) The heights of 30 boys, given to the nearest centimetre, in a soccer squad whose heights range from 140 cm to 180 cm

   (e) The heights of 300 boys at soccer camp whose heights range from 140 cm to180 cm

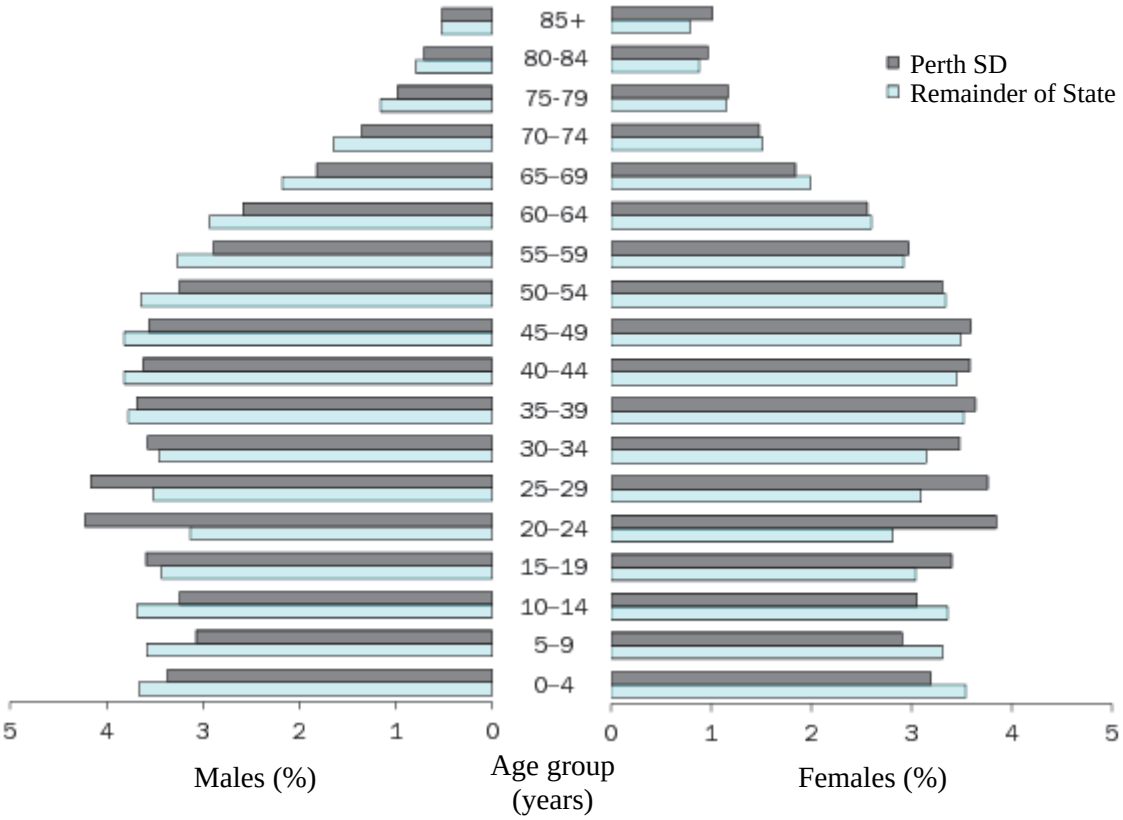
© Department of Education WA 2012 – MATHSAC029

2. Answer the questions below using this information.

West Australian population statistics 2010

SD stands for Perth Statistical Division where 74% of the state population lived in 2010.

AGE AND SEX DISTRIBUTION (%), Western Australia – 30 June 2010



At 30 June 2010, the estimated resident population of Western Australia (WA) was 2.29 million.

Source: Australian Bureau of Statistics (cc) BY

(a) Can you explain a reason why the results are given as percentages rather than actual numbers?

(b) One type of information that is illustrated here is the percentage of females in each age group in the Remainder of State. What are the other three types of information that are illustrated?

© Department of Education WA 2012 – MATHSAC029

(c) Approximately what percentage of the population is in the 10–14 age group:

(i) in the Perth Statistical Division (SD) (ii) in the Remainder of State?

(d) What are the advantages of displaying this information on this particular type of graph?

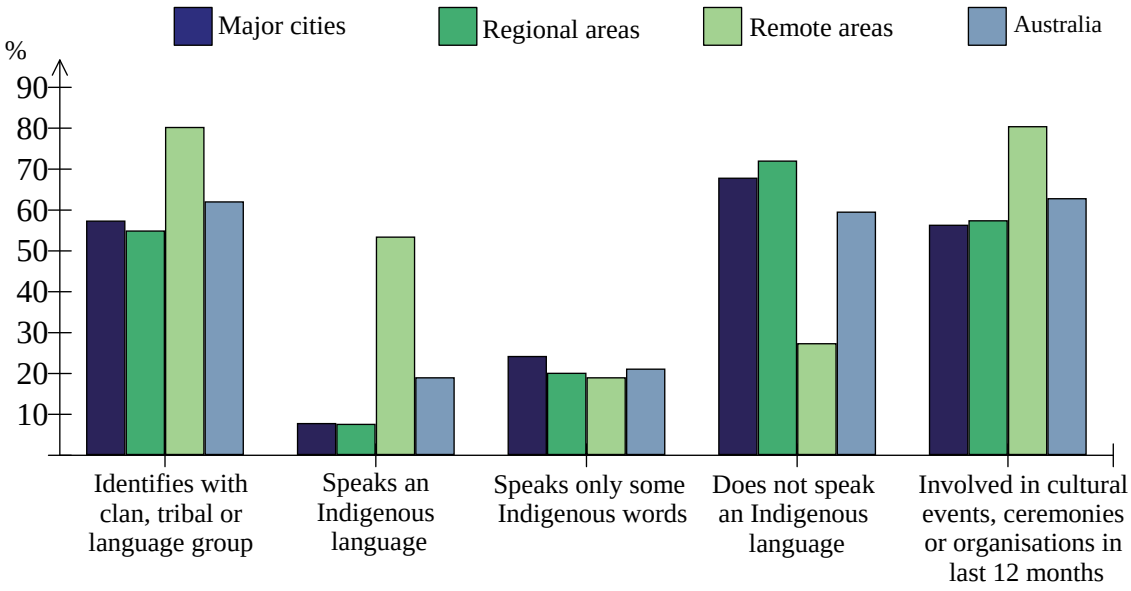
© Department of Education WA 2012 – MATHSAC029

3. Examine the information provided in the table and graph and answer the questions that follow.

Cultural Statistics

SELECTED INDICATORS OF CULTURAL ATTACHMENT, Aboriginal and Torres Strait Islander people aged 15 years and over, by remoteness area–2008

	Major cities %	Regional areas %	Remote areas %	Australia %
Identifies with clan, tribal or language group	57.4	55.0	80.3	62.1
Speaks an Indigenous language	7.9	7.7	53.5	19.1
Speaks only some Indigenous words	24.3	20.2	19.1	21.2
Does not speak an Indigenous language	67.9	72.1	27.4	59.6
Involved in cultural events, ceremonies or organisations in last 12 months	56.4	57.5	80.5	62.9



Source: Table 02; National Aboriginal and Torres Strait Islander Social Survey, 2008 (cat. no. 4714.0)

Based on Australian Bureau of Statistics data (cc) BY

© Department of Education WA 2012 – MATHSAC029

(a) What do you notice about the information provided in the table and the graph?

(b) What are the advantages of displaying information using the side-by-side column graphs?

(c) How does the graph show that more than half of Aboriginal and Torres Strait Islanders identify with clan, tribal or language groups?

(d) Look at the information relating to those people who speak an Indigenous language. Determine the area where the largest percentage of Indigenous language speakers live.

(e) Write a summary of the things you have learned by examining the data provided by the Bureau of Statistics.

Check your work before continuing.

© Department of Education WA 2012 – MATHSAC029

© Department of Education WA 2012 – MATHSAC029

7. Working with resources data

When you complete this section you should be able to:

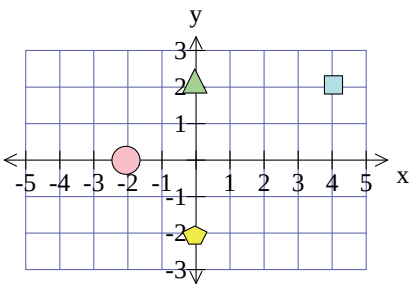
- use the data for non-renewable resources to complete tables and displays.

Warm-up 7

1. $0.05 \div 10 =$ _____
2. $82 \times 2 =$ _____
3. The temperature is 8 degrees.

   How much will it need to decrease to get to minus 6 degrees? _____
4. $\frac{6}{3} - \frac{1}{6} =$ _____
5. $\frac{8}{5} \times 45 =$ _____
6. 72 500 mL = _____ L
7. $12 \times 2 \div 6 =$ _____
8. Find 25% of $75. _____
9. Describe the rule for the following pattern.

   654, 550, 446, 342, 238, …

   _____
10. 

    Which shape is at (0, -2)?

    _____

© Department of Education WA 2012 – MATHSAC029

Focus problem 7

Coal, oil and gas are non-renewable sources of energy. That means, at some time in the future, supplies of them will run out.

The table below shows some of the resources mined in Australia.

Mineral, oil and gas production in Australia

(Value in millions of dollars)

Resource	2002–03	2003–04	2004–05	2005–06	2006–07
Black coal (saleable) (excludes Tasmania)	12 724	11 566	17 720	26 317	24 368
Copper	2 260	2 543	3 777	6 290	7 525
Gold	5 046	4 731	4 635	5 609	6 284
Iron ore and concentrate	5 298	5 359	8 330	12 897	15 975
Zinc	1 778	1 649	1 852	3 484	5 785
Crude oil	7 888	6 721	8 471	10 080	11 416
Liquefied natural gas	3 131	2 776	3 953	4 930	4 986

Based on Australian Bureau of Statistics data (cc) BY

1. Choose at least two of the resources. Use side-by-side column graphs to show how the production for the two resources you chose has changed over the years shown in the table.

© Department of Education WA 2012 – MATHSAC029

2. Has the production of each of the resources increased or decreased over the years?

Black coal

Coal is a fossil fuel. Australia is the largest exporter of black coal in the world. It is used to generate electricity. Australia has about 35 open cut mines and about 98 underground mines.

Gold

Gold is a metal which is widely used in electronics and computers as well as for monetary reserves and jewellery. Australia is the second largest producer of gold in the world. The export value of gold in recent years has been around $10 billion dollars.

Check your work before continuing.

© Department of Education WA 2012 – MATHSAC029

Skills development 7

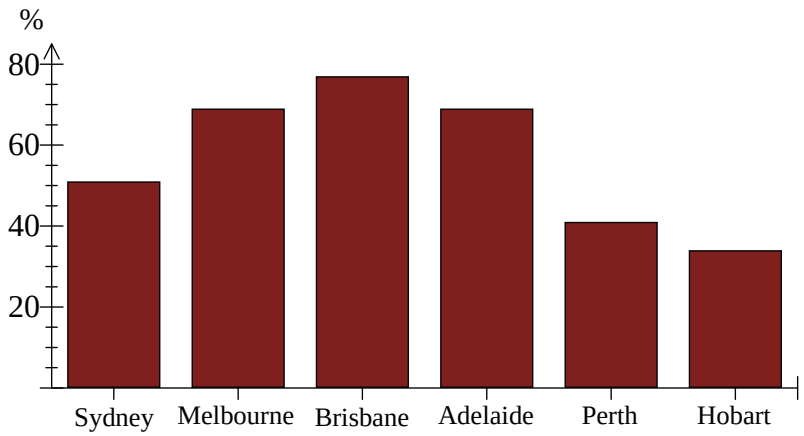
1. Examine the information below and then answer the following questions.

Personal water use − views and behaviours

In 2007–08, the *Environmental Views and Behaviour Survey* found that almost nine in ten adults aged 18 years or over in Perth were concerned about water shortages.

However, a lower proportion of people in Perth than in most other state capital cities in Australia reported that they reduced their personal water use.

Decreased personal water use in the previous year, 2007–08



(a) What do the numbers on the vertical axis represent?

(b) Which city, other than Perth, had a small reduction in personal water use?

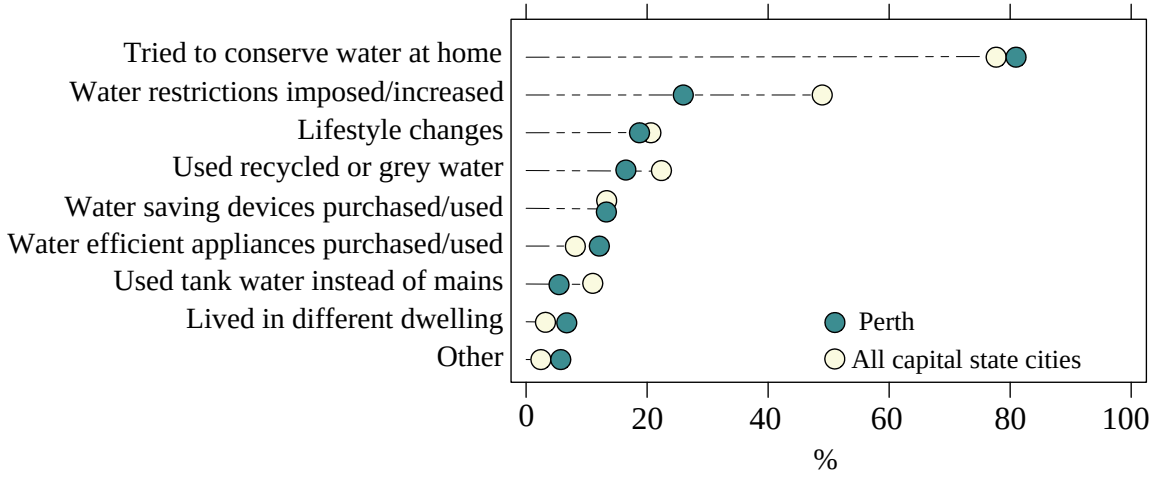
(c) What does the column for Brisbane indicate?

(d) Which two cities had almost the same percentage decrease in personal water use?

© Department of Education WA 2012 – MATHSAC029

In this survey the respondents who reported a decrease in their personal water use were also asked to identify reasons for the decrease. The results are graphed below.

Reasons given for reducing personal water use 2007–08



Based on Australian Bureau of Statistics data

(e) Which reason given shows the biggest percentage difference between Perth and all capital state cities?

(f) Approximately what percentage of Perth people in the survey purchased or used water efficient appliances?

(g) Could this graph have been drawn as side-by-side column graphs? Explain your answer.

(h) Water is considered a renewable resource because it renews itself through the water cycle. However bigger and bigger demands on water make it important to try to conserve it. Do these graphs show that people in Australia are decreasing their water use? Explain your answer.

© Department of Education WA 2012 – MATHSAC029

2. The following table is based on the Department of Foreign Affairs and Trade (DFAT) publication 'Australia's trade with East Asia 2010'.

   China, Japan and the Republic of Korea are our biggest export traders in East Asia. The values for East Asia are totals that include other countries apart from these three.

   The minerals and fuels Australia exports include the non-renewable resources of iron ore, coal, other ores and concentrates – mainly lead, zinc and manganese and crude petroleum.

Export and import trade with East Asia in millions of $A

Total exports to East Asia			
Products	2008	2009	2010
Minerals	37 901	37 221	58 877
Fuels	40 842	37 577	39 867
Exports to China			
Minerals	21 949	25 426	39 333
Fuels	1 281	6 614	7 033
Exports to Japan			
Minerals	9 267	6 746	10 395
Fuels	22 788	17 647	16 612
Exports to Republic of Korea			
Minerals	4 698	3 523	6 511
Fuels	8 081	6 850	7 863

Total imports from East Asia		
2008	2009	2010
209	109	137
25 909	16 746	18 912
Imports from China		
54	25	31
136	181	162
Imports from Japan		
31	20	16
1 417	1 354	1 135
Imports from Republic of Korea		
14	8	7
1 099	1 197	1 267

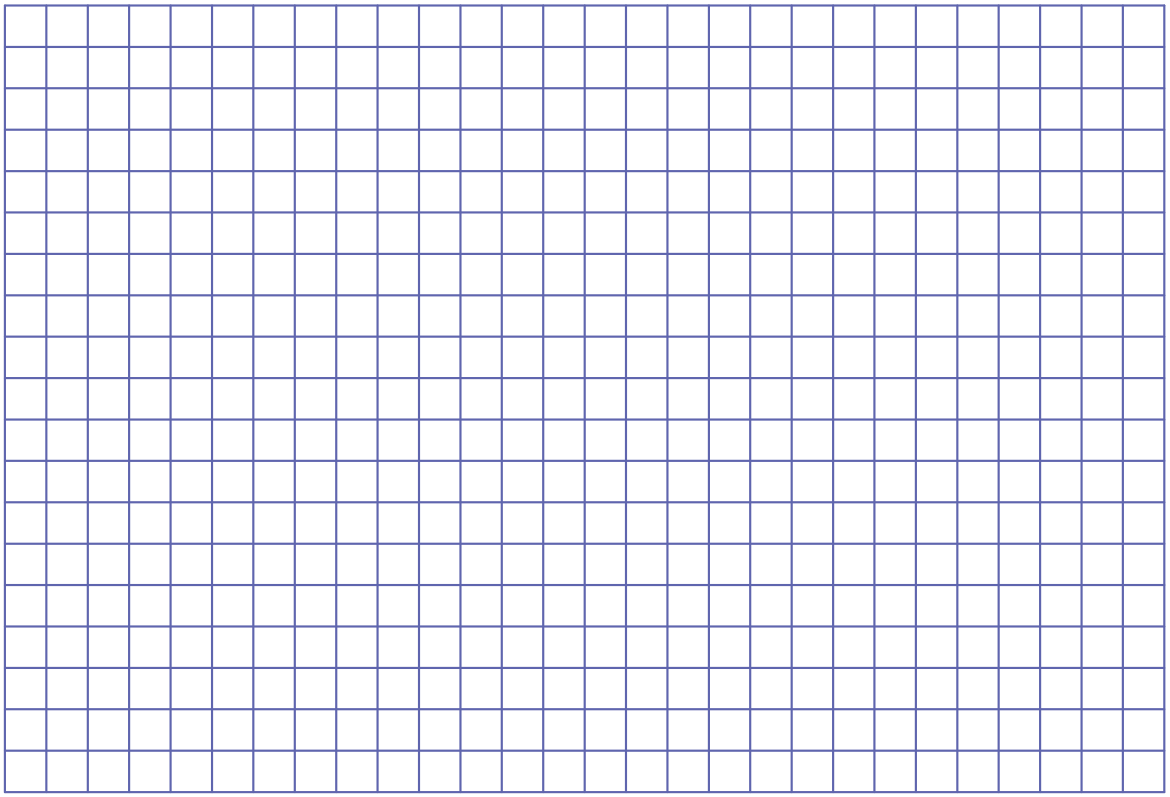
Based on the DFAT publication 'Australia's trade with East Asia 2010' (cc) BY

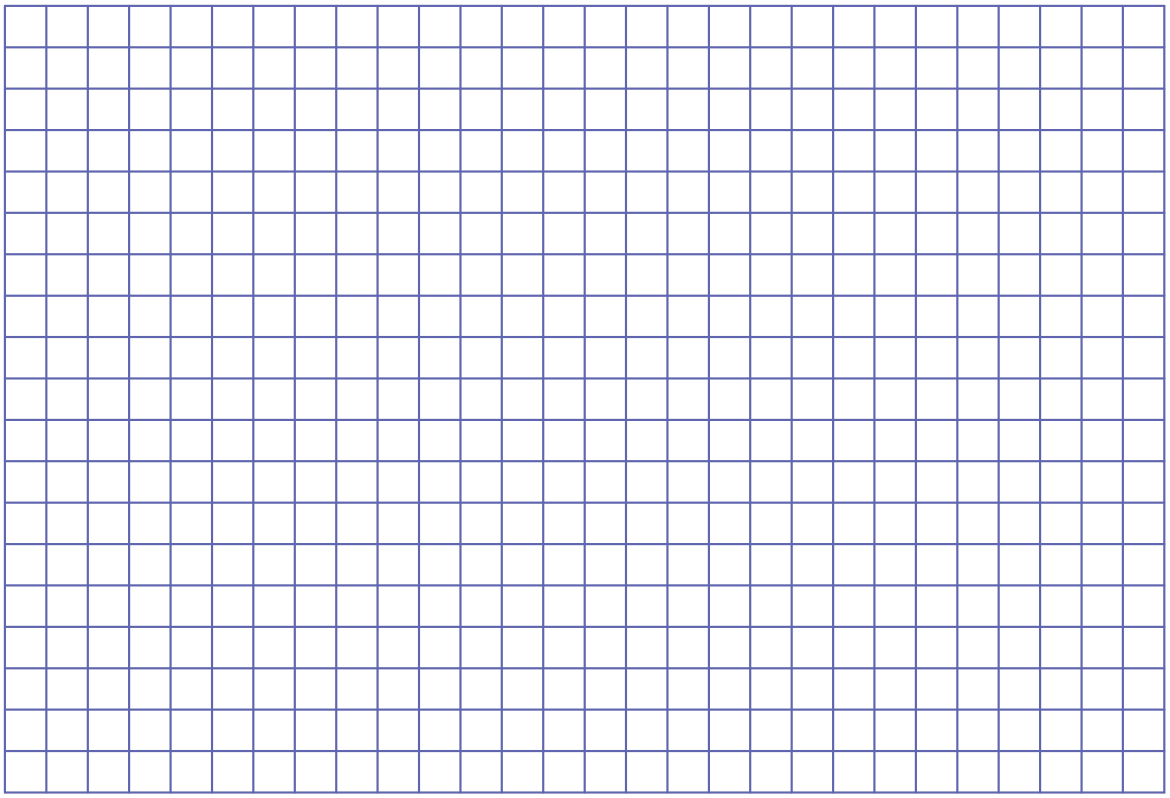
(a) Draw two column graphs. Draw one column graph for the exports of minerals and one for the export of fuels with the years across the horizontal axis and four side-by-side columns for East Asia, China, Japan and the Republic of Korea. Remember to include a key for the columns.

Use the graph paper supplied over the page or your own.

(b) Write a couple of short sentences about any trends you can see from the graphs.

 © Department of Education WA 2012 – MATHSAC029





Check your work before continuing.

© Department of Education WA 2012 – MATHSAC029

© Department of Education WA 2012 – MATHSAC029

8. Summary

- The items of information that are collected in statistics are called data.
- If the collected data is numbers then it is referred to as numerical data.
- To collect data the purpose must be clear so the question and the instructions must be detailed enough to get the correct data.
- Continuous data is data that can take any value within a range of values.
- Data in a table is easier to understand and make decisions about than a list of separate data items.
- Data usually needs to be organised into a table with equal sized groups in the first column and a tally column, if necessary. The tally is then converted to a number for the frequency. The frequency is the number of times the score or the group of scores occurs.
- If there is a large range of scores they need to be organised into groups. The forming of the groups needs to be clear.
- Data can be displayed in graphs. Some of the graphs to use include:
  - picture graphs
  - dot plots
  - bar graphs
  - column graphs
  - histograms
  - stem-and-leaf plots.
- All graphs need to have a heading, clear labelling and a key where necessary.
- Picture graphs are generally not accurate unless the number of items is small.
- A histogram is a joined column graph and is used for continuous data.

© Department of Education WA 2012 – MATHSAC029

- Stem-and-leaf plots are used when the number of scores is low and the scores are within a reasonable range of values.
  - An ordered stem-and-leaf plot is one where the leaf numbers are in increasing order away from the stem.
  - A back-to-back stem-and-leaf plot allows two sets of data to be put onto the same graph and then compared.

- Data can be organised and used to make future predictions.

© Department of Education WA 2012 – MATHSAC029

9. Review tasks

The following tasks will assist you to consolidate your learning and understanding of the concepts introduced in this resource, and assist you to prepare for assessments.

Task A

Name: _____ Suggested time: 50 minutes

Actual time taken: _____

Instructions:

Complete this work on your own.

You may use a calculator, but show how you got your answer.

Attempt every question. Take as long as you need and record the time in the space provided above after you have finished.

1. (a) Which of the following would provide numerical data?

   I. Hair colouring

   II. Width of hand spans

   III. Depth of swimming pools

   IV. Favourite food

   V. Number of windows in a house

   VI. Cost of petrol

(b) Which of the following would provide continuous data?

   I. Length of feet

   II. Height of plants in a garden

   III. Number of TVs in a household

   IV. The population of a country town

   V. Speed of cars passing a speed camera

   VI. Age

© Department of Education WA 2012 – MATHSAC029

2. The speeds of cars passing a school crossing at 8 am on a school day were measured in kilometres per hour. They were written as follows.

35.6, 41.9, 54.3, 38.9, 50.0, 39.8, 40.2, 41.3
37.0, 40.2, 46.1, 33.8, 23.7, 39.9, 37.2, 40.5

(a) Rewrite the speeds if they were rounded to the nearest whole number.

(b) Complete the following table using the two different sets of data.
(Note that 20–30 means from 20 kph up to, but not including, 30 kph.)

	Original speeds		Rounded speeds	
Speed (kph)	Tally	Number of cars	Tally	Number of cars
20–30				
30–40				
40–50				
50–60				

(c) Why do some of the results differ in the 'number of cars' column?

(d) At this particular time of the day the speed limit in a school zone is 40 kph. Do the original speeds or the rounded speeds give the better idea of how many motorists are breaking the speed limit? Explain your answer.

(e) Complete a joined column graph for this data using the original speeds. (Use either a computer program or a piece of grid paper.)

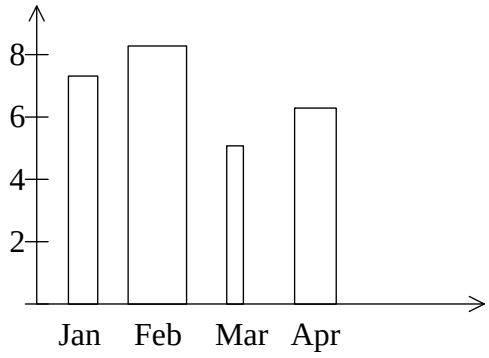
(f) What is the special name given to this type of column graph?

© Department of Education WA 2012 – MATHSAC029

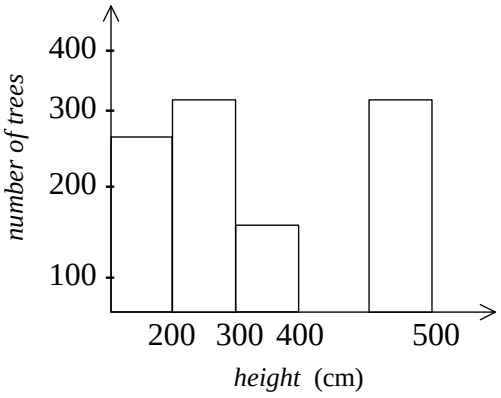
(g) Why is it important to make sure that drivers keep to the speed limit in a school zone?

3. The graphs below have errors in their construction. List or write a sentence to explain what the errors are.

Ice-cream sales in thousands



Heights of trees at a nursery



© Department of Education WA 2012 – MATHSAC029

4. The plot below shows the distance (cm) each child in a class covered in one normal walking step.

Walking step distance (cm)

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

(a) What is the name given to this type of graph?

(b) What does each number in the stem represent?

(c) What do the numbers in the leaf represent?

(d) How many children were in the class? _____

(e) What is the shortest walking step for the class? _____

(f) What is the longest walking step for the class? _____

(g) What is the advantage of this type of graph over a column graph for the data?

© Department of Education WA 2012 – MATHSAC029

5. The price of petrol can be different depending on which day of the week it is. The local petrol station recorded the number of cars filled with petrol on weekdays for one week. The picture graph shows the result.

Number of cars filled with petrol

represents 10 cars

(a) Discuss the disadvantages of using this type of graph for this data.

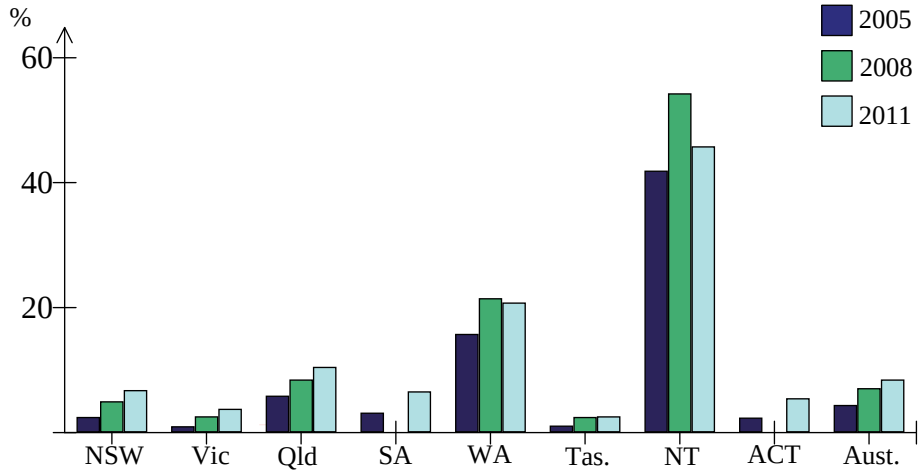
(b) Suggest a better type of graph that could be used for this data. Give a reason for your choice.

© Department of Education WA 2012 – MATHSAC029

6. Using the graph, answer the questions that follow.

SOLAR HOT WATER USE IN DWELLINGS

While solar hot water systems usually require some boosting (electric or gas), they produce significantly less greenhouse gas emissions than electric systems, which depend largely on coal-fired electricity.



Note: SA and ACT data not published for 2008.

Based on Australian Bureau of Statistics data (cc) BY

(a) Which three years does the graph cover?

(b) According to this graph, which state or territory of Australia is best at using solar power for their hot water?

(c) Is there an increasing trend to using solar hot water systems? Use the graph to explain your answer.

 © Department of Education WA 2012 – MATHSAC029

7. What are the errors in this ordered stem-and leaf plot?

Stem	Leaf
7	2 3 4 5 7
8	9 8 0
8	1 1 2 3
1	10 11 15

8. A class of teenagers was asked how many hours of sleep they had last night. The results were as follows.

6.5,	7.5,	8,	8.5,	7.5,	8.5,	7,	8,	8,	6.5,
7.5,	7,	8,	7,	8.5,	6,	7.5,	9,	8,	7,
7.5,	7,	8,	8.5,	5.5,	7.5,	8,	8.5,	9,	7.5

(a) What type of accuracy was asked for, as indicated by the answers?

(b) Use a dot plot to graph the results. (Use either a computer program or a piece of grid paper.)

(c) Medical experts have often said that teenagers need between eight and nine hours of sleep a night to be able to function properly during the day. Does the graph show that most of this class is getting enough sleep? Should there be any concern about the amount of sleep some of the class are getting? Explain your answers.

© Department of Education WA 2012 – MATHSAC029

Task B

Name: _____ Suggested time: 40 minutes

Actual time taken: _____

Instructions:

Complete this work on your own.

You may use a calculator, but show how you got your answer.

Attempt every question. Take as long as you need and record the time in the space provided above after you have finished.

1. (a) This problem involves using the statistics you have studied to compare the difficulty of sentences used in government documents to those used in children's books.

Problem solving often involves more than one step. To solve problems by yourself you need to decide what steps you need to take and the order of those steps. To practise this skill first make a list of the steps you think you should take to solve this problem. Later compare your list to the instructions given.

© Department of Education WA 2012 – MATHSAC029

Working life in Australia in the 1960s.

Below is a short passage that has been adapted from the Australian Bureau of Statistics website.

In the 1960s, tea ladies still did the rounds, smoking in the workplace was the norm, and the standard working week was Monday to Friday, nine to five. Three weeks annual leave became the standard across Australia in 1963, and it wasn't until more recent decades that the Australian Council of Trade Unions (ACTU) secured personal carer's leave and maternity/paternity/adoption leave for Australian workers.

The labour force was characterised by a marked division of the sexes and their expected roles in society. For men, the traditional role was to be the breadwinner and support a wife and young family. Consequentially, part-time work was uncommon and childcare was rare, leaving women the option of either starting a family, or working full time, but not in the public service – it wasn't until 1966 that married women were allowed to work for the Commonwealth Public Service! In 1961 it was common for women to marry young. The median age for first brides was 21 years, and it was common for women to have their first baby in their early 20s. The fertility rate was 3.5 babies per woman.

Based on Australian Bureau of Statistics data (cc) BY

(b) Your task is to record, in a list, the number of the words in each sentence of the passage. Before you start counting, you will need to decide how to treat any numbers in the passage.

(i) Explain of how numbers are to be treated.

(ii) List the number of words in each sentence.

© Department of Education WA 2012 – MATHSAC029

2. The next passage is typical of a children's storybook.

> It was a bright and sunny day. The dog called Spot and his friend Toby went for a walk. On the way they met Tilly the goat. Tilly said hello with a grunt.
>
> They walked over the bridge and past the big gum tree. After that they turned around and went home. When they got back home they had a long drink of water.

Use a list to record the number of words in each sentence in this passage.

3. Draw a graph to show the comparison between the two passages. Choose between a side-by-side column graph and a back-to-back stem-and-leaf plot.

4. Which passage appears to be the most difficult to read? Is there anything else in the passages that shows this difference?

© Department of Education WA 2012 – MATHSAC029

Self-evaluation task

Please complete the following.

How well did you manage your own learning using this resource?

	Always	Usually	Rarely	Not sure
Each section took approximately 45 minutes to complete.	☐	☐	☐	☐
I needed extra help.	☐	☐	☐	☐
I marked and corrected my work at the end of each section.	☐	☐	☐	☐
I made the journal entries and summaries when asked.	☐	☐	☐	☐
I have kept to my work schedule.	☐	☐	☐	☐

How much mathematics have you learnt using this resource?

	Always	Usually	Rarely	Not sure
Understanding				
I can recognise numerical data.	☐	☐	☐	☐
I understand which type of data is continuous data.	☐	☐	☐	☐
Fluency				
I can summarise data in a frequency table	☐	☐	☐	☐
I draw accurate dot plots and column graphs.	☐	☐	☐	☐
I produce accurate stem-and-leaf plots.	☐	☐	☐	☐
I include the correct headings and labelling on my graphs.	☐	☐	☐	☐
Problem Solving				
I can interpret data provided in tables and graphs.	☐	☐	☐	☐
I am able to use tables and graphs to solve word problems.	☐	☐	☐	☐
Reasoning				
I can explain how to collect the required data.	☐	☐	☐	☐
I am able to explain errors in frequency tables and graphs.	☐	☐	☐	☐
I can compare frequency tables and graphs and decide on the best choice.	☐	☐	☐	☐

© Department of Education WA 2012 – MATHSAC029

Write a list of topics for which you need additional assistance. Discuss this with your teacher.

© Department of Education WA 2012 – MATHSAC029

Solutions

1. Collecting numerical data

Solutions to Warm-up 1

1. 1, 2, 5, 10 are the factors of 10 because they all divide into 10 with no remainder.
2. 5
3. $a = (-15)$
4. $\boxed{\frac{2}{5}}$ or $\frac{3}{10}$ Working: $\frac{2}{5} = \frac{4}{10}$ and $\frac{4}{10} > \frac{3}{10}$.
5. $\frac{3}{2} \times 12 = 3 \times 6 = 18$
6. 152.1
7. 36.9
8. $2\frac{1}{4}$
9. 1011
10. 99^o because a straight line has 180^o and $180^o - 81^o = 99^o$

Solutions to Review 1

The wording in the answers may vary. Check with your teacher if you are unsure.

1. You find the smallest number and the largest number in the list and then start the first column with the smallest number and increase, in steps of one, to the largest number.
2. You have to include all the numbers from the start to the finish of the column and they have to increase by equal amounts.
3. The crossed tally mark forms the group of five. It makes the tally easier to add up.
4. There were 24 students in the class. This is the total of the 'Number of families' column.
5. Five families had no pets.
6. The most common number of pets was two.
7. Four families had more than four pets.
8. Yes it is. There are only 11 possible values so the table will not be too big. Tally marks are easy to use and then change to numbers.
9. Having three columns would still make sense. However, because the numbers might be large, listing them individually would make the table large. The numbers could be placed into groups, which would then make the table smaller.

   For example, if the number of texts ranges from 1 to 100 that would be too many numbers to put into the table. It would be better to group the numbers into 1–10, 11–20, 21–30 etc and then tally the results.

© Department of Education WA 2012 – MATHSAC029

Solution to Focus problem 1

What you were asked to do was help Leanne design a question and collect data about the amount of time spent by her friends and classmates playing sport and watching television.

The wording in your answers may vary.

1. The people filling in the sheet may have the following questions.
    - Should I include any sport I play at school?
    - How accurate should the times be? Will they need to be to the nearest minute, half hour, hour or some other value?
    - Should both answers be given to the same accuracy?
    - What does Leanne mean by two weeks? Is it only weekdays or does it include weekends?
    - What happens if I can't remember how much time I spent?

2. The data is continuous data because it is a measurement which can take any value not just whole numbers. There is no gap in measuring time. The way it is recorded depends on how accurate your measuring implement is.

3. I think that measuring to the nearest quarter of an hour, or 15 minutes, would be accurate enough. The times are easy to write as decimals then. Using hours would not be accurate enough and minutes too accurate.

4. Leanne should indicate that the sport is only that played outside school time and that the times should be given to the nearest quarter of an hour or 15 minutes, for example, 1 hour 15 minutes, 1 hour 30 minutes, and 1 hour 45 minutes.

    She should also ask them to do it for the next two weeks so that people will be able to keep a record of how much time they spend. They may not remember how much they played in the previous two weeks.

© Department of Education WA 2012 – MATHSAC029

5. The following could be a new draft instruction sheet.

> Please fill in the details on this sheet about how much time you spend playing sport outside school time and watching television over the next two weeks (14 days).
>
> Please give your answers to the nearest quarter of an hour or 15 minutes, for example, 1 hr 45 mins.
>
> Name: _____
>
> Time spent playing sport: _____
>
> Time spent watching television: _____
>
> Thank you, Leanne

6. If the numbers are not too big Leanne could do a simple tally table with each possible time listed. If the numbers are too big she may want to change to half hour groups.

7. Leanne couldn't make any decisions about other groups of students her age from her data because her data is only from a very small group.

Solutions to Skills development 1

1. Numerical data is found in Age, Weight and Number of siblings.
2. 'Number of siblings' does not give continuous data because you can only have a whole number of siblings.

Continuous data is data found by measuring, for example weight, height, time.

3. (a) The data is continuous data but to be recorded it has to be rounded.
   (b) Horses are quite heavy so kilograms is a good choice.
   (c) (i) 587 kg
   (ii) 330 kg
   (iii) 550 kg

549.5 ends in a 5 so we round up to the next whole number.

   (d) The smallest weight is 330 kg and the largest is 589 kg so you couldn't put every number between the two into the weight column. It would be necessary to group the weights.

© Department of Education WA 2012 – MATHSAC029

2. Recording numerical data

Solutions to Warm-up 2

1. The answer is 1, since 13 is a prime number.
2. 8
3. −8 degrees
4. $\frac{3}{8} < \frac{2}{4}$
5. $22\frac{1}{2}$ or 22.5
6. 7
7. 1.101
8. 1.9
9. 9.01 (The numbers are increasing by 0.05 each time.)
10. (1, 4)

Solutions to Review 2

1. Choice (b) is best. You need to be accurate to produce uniforms that fit.
2. Please record the times that you spend reading books (a) to the nearest hour for an approximate result (b) to the nearest minute for a more accurate result.
3. I would ask them to give their ages last birthday or get them to choose an age group, for example, 10–19, 20–29.

Solution to Focus problem 2

What you were asked to do was to collect some leaves from a bush or tree, measure their lengths and then organise the data into tables.

Firstly you will have a list of the lengths of the leaves.

The accuracy of your measurements should be stated to either the nearest centimetre or the nearest millimetre.

Your table may be set out like this.

Lengths(mm)	Tally	Number of leaves
0–9		
10–19		
20–29		

Your summary may include comments on:

- the most common group for length
- whether the accuracy you used was a problem for this data.

© Department of Education WA 2012 – MATHSAC029

Solutions to Skills development 2

1. No type of measurement is given for the laces. It probably should be centimetres.

   The groups in the first column are not all the same size.

   The tallies are not all written correctly. Every fifth stroke should be across the other four to make it easy to count.

   Some of the numbers in the 'Frequency' column do not match their tally.

   There should be a zero in the gap so there is an entry in every row of the 'Frequency' column.

2. (a)

Weight in kilograms	Tally	Frequency (Number of horses)
300–350	|	1
350–400	|	1
400–450	𝍸	5
450–500	𝍸	5
500–550	𝍸 ||	7
550–600	𝍸 |	6

(b) (i) One horse may be underweight as there is one horse in the 300–350 group but we couldn't be certain from the table.

(ii) The most common range is 500–550.

(iii) There are six horses in the highest weight group but individual weights cannot be found.

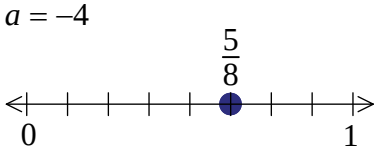
(c) It is called grouped data because it is organised in groups of weights instead of individual weights.

(d) The answers you obtain may vary according to which webpage you access. The largest are usually shire horses that have been known to be up to 1500 kg and the smallest are dwarf horses that can be below 30 kg.

© Department of Education WA 2012 – MATHSAC029

3. Collect and record numerical data

Solutions to Warm-up 3

1. 15 and 21 are composite numbers and should be circled.
2. 99
3. $a = -4$
4. 

5. 12
6. 30
7. 84.12
8. $233\frac{1}{3}\%$
9. $1\frac{1}{3}$
10. 37.5%

Solutions to Review 3

1. (a)

Jump length (cm)	Tally	Number of people
50–69	||	2
70–89	𝍸 |||	8
90–109	𝍸 |||	8
110–129	𝍸	5
130–149	|||	4
150–169	|||	3

   (b) Solutions may vary. For example, the first table is larger and the range of scores for each group is smaller, which gives the reader a more accurate representation of the results. However, the second table would be quicker to construct, so if time was an issue, it would be the better choice.

2. A jump of 59.6 cm would go in the 50–60 group because anything less than 60 would go there. It would make a difference in the table so the degree of accuracy needs to be taken into account when designing questions.

© Department of Education WA 2012 – MATHSAC029

Solution to Focus problem 3

What you were asked to do was to investigate if sports players are taller these days than in the past.

(a) You will need to get your teacher to check your answers.

It is expected that you will include in your answer:

- the name of the sport you chose
- where you found the information
- a list of heights of players.

(b) You should have provided a table and an explanation if you had to form groups of heights, with a heading which includes the units of height.

(c) The answer is probably yes. The heights of players from previous times are generally shorter when checked against the heights of current players.

(d) The decision should be easier from the table as it is organised and you could easily see a range from the shortest to the tallest.

Solutions to Skills development 3

1. (a) The heading of the table tells you what it is about. In this case, it is the average time spent on free time activities divided into weekdays and weekends, and by sex. The data was for 2006.

   (b) Time is a measurement so it is continuous data.

   (c) The columns are labelled as ‘minutes per day’ so that indicates that the times were given to the nearest minute.

   (d) The notes at the bottom explain other things about the entries. For example, ‘correspondence’ includes talking on a phone or reading and writing their own correspondence.

   (e) The table is easy to understand because the headings are clear and the accuracy is given.

   (f) The reading averages are:
   - 19 minutes on weekdays and 25 minutes at weekends for males
   - 23 minutes on weekdays and 29 minutes at weekends for females.

2. Answers will vary. For example, you will agree with Mr Brown if you think individual values are important and with Mrs Green if you think they are not important.

© Department of Education WA 2012 – MATHSAC029

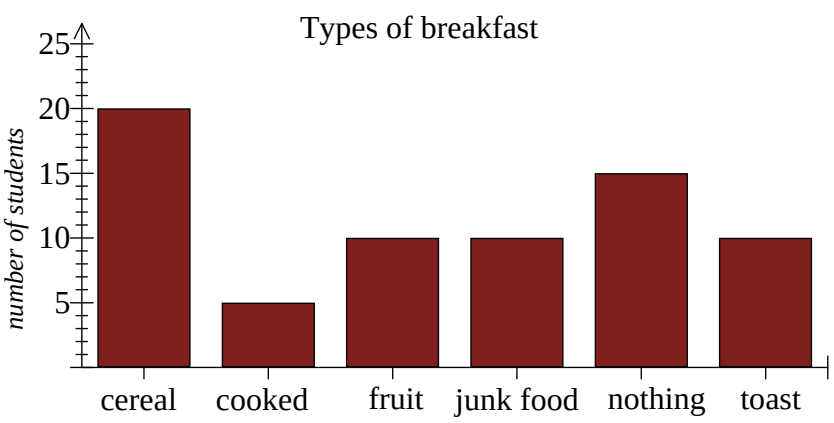
4. Types of data displays

Solutions to Warm-up 4

1. 25 and 49 are square numbers and should be circled.
2. 3
3. 11 degrees
4. $\frac{5}{6}$
5. 25
6. 76
7. 3.204
8. $2\frac{1}{4}$
9. 989
10. 68°

Solutions to Review 4

1. (a)



(b) The dot plot is probably easiest to draw and is accurate enough with one dot representing one student.

2. To graph continuous data the columns in the column graph would have no gaps between them. Where one group finishes the next one starts so the same would happen with the columns.

3. (a) The histogram is a column graph used for continuous data and the columns are joined.

(b) The range for each group is 10 years.

(c) The youngest is 5 and the oldest is 15 because each group has a 10 year range and 10 is in the middle of the first column.

(d) There are nine people in the 45–55 age group.

(e) The oldest person could not be found exactly but they will be between 55 and 65 years of age.

© Department of Education WA 2012 – MATHSAC029

Solution to Focus problem 4

You were asked to organise and graph the data for mobile phone battery life and numbers of books read and then to comment on the use of the different graphs.

Mobile phone battery life in hours.

Note: 3–4 means a life from three to less than four hours.

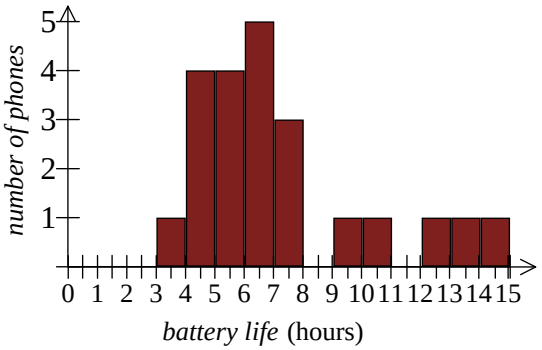
Battery life hours	Tally	Number of phones
3–4	|	1
4–5	||||	4
5–6	||||	4
6–7	||||	5
7–8	|||	3
8–9		0
9–10	|	1
10–11	|	1
11–12		0
12–13	|	1
13–14	|	1
14–15	|	1

Number of books read in the last month

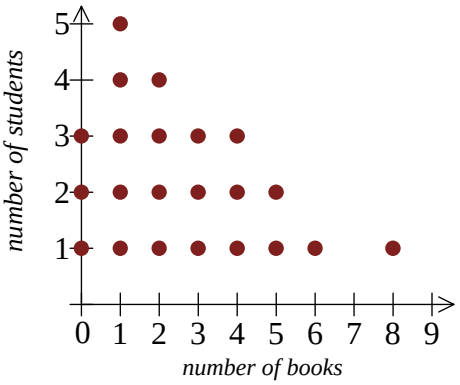
Number of books	Number of students
0	3
1	5
2	4
3	3
4	3
5	2
6	1
7	0
8	1

A histogram would be best for the first table and a dot plot for the second table.

Battery life of mobile phones



Number of books read in a month



The histogram is best for the battery life because there are so many different values and it is continuous data. It is easy to see where the majority of the phones fall.

The dot plot is easy to use for the number of books read as the numbers are quite small and it is quick to complete.

© Department of Education WA 2012 – MATHSAC029

Solutions to Skills development 4

1. (a) A dot plot, bar graph or column graph would all be suitable. However, if there was a large amount of data a dot plot may not be very good.

   (b) A column graph (histogram) would be best as the ages are continuous data.

   (c) A column graph (histogram) would be best as the times are continuous data.

2. The graph will depend on which program you use and which type of graph. Check with your teacher.

5. Constructing data displays

Solutions to Warm-up 5

1. $15 = 3 \times 5$
2. 565
3. $v = (-7)$
4. $\frac{10}{4}$ or $2\frac{1}{2}$
5. 15
6. 20 mm
7. 7
8. 4.666... or $4.\overline{6}$
9. 88.2
10. (2, -5)

Solutions to Review 5

1. (a) The age was asked for as 'last birthday' so it is just whole numbers and not continuous data.

   (b) The most common age is 12.

   (c) There are five thirteen year olds.

   (d) The horizontal axis would have to include a 9 before the 10 and the vertical axis would have to go to at least 9.

   (e) If it was going to be a column graph rather than a dot plot no changes would need to be made to the axes.

2. (a) A pie chart is a good choice because the data is given as percentages of the whole expenditure.

   (b) $300

   (c) $250

   (d) 108 degrees

   (e) (i) 90 degrees (ii) 18 degrees

© Department of Education WA 2012 – MATHSAC029

Solution to Focus problem 5

1. The numbers in the stem column represent the tens part of the test score. For example, a stem of 4 represents 40.
2. The leaf columns show the units value of the score. For example, the score of 48 has a units value of 8 so it has a leaf of 8.
3. 21
4. The students who got less than 50 had marks of 20, 25, 31, 36, 38, 35, 48 and 43.
5. The numbers are equally spaced and under each other so it can easily be seen which stem has the most values associated with it. It makes it easier to count how many scores there are as well.
6.

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

7. Heading: Year 7 revision test marks

Solutions to Skills development 5

1. (a) The stem of 15 represents 150.

   (b) Length of snakes in cm

Stem	Leaf				
10	0	2	2	6	9
11	2	3	6		
12	4	4	8		
13	2	4	5	7	9
14	0	1	2		
15	8				

   (c) The shortest snake is 100 cm and the longest is 158 cm.

   (d) For 500 snakes it would be too time consuming to graph the data this way. A column graph would be easier and the individual snake lengths would not be as important so the lengths could be grouped.

© Department of Education WA 2012 – MATHSAC029

2. Cars passing the crossroad

Stem	Leaf							
20	0	1	2	4	6	7	7	8
21	0	0	1	2	4	4	4	6
22	8	8						
23	3	3	5	6				
24	3	3	7	8				
25	3	4	5	5				

3. (a) Heading: Class test results for two tests

   (b) Test 1 had a low score of 20 and a high score of 87.

   Test 2 had a low score of 32 and a high score of 83.

   (c) Test 1 had 14 students get 50 or better and test 2 had 18 students get 50 or better.

   (d) The evidence shows that the marks in general improved. More people passed and there are more marks in the seventies and eighties.

6. Comparing data displays

Solutions to Warm-up 6

1. 2.07
2. 46
3. 13 degrees
4. 1
5. 28
6. 1 g
7. 2
8. 325%
9. $2\frac{3}{4}$
10. 0.5 (The triangular numbers are 1, 3 and 6.)

© Department of Education WA 2012 – MATHSAC029

Solutions to Review 6

1. (a) Gary had the ordered stem-and-leaf plot. His leaf values are all in increasing order as they move away from the stem.

   (b) Glenda: 19|2 means 192 and Gary: 4|19 means 194

   (c) Glenda had the lightest tomato at 140 g.

   (d) Gary had the heaviest tomato at 199 g.

   (e) Answers may vary.

   Gary had the heavier tomatoes but Glenda got more tomatoes from her plant and more in the 170-180 g range.

Solution to Focus problem 6

You were asked to help the teacher provide evidence for the fitness of her class.

1. Number of sit-ups per student

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

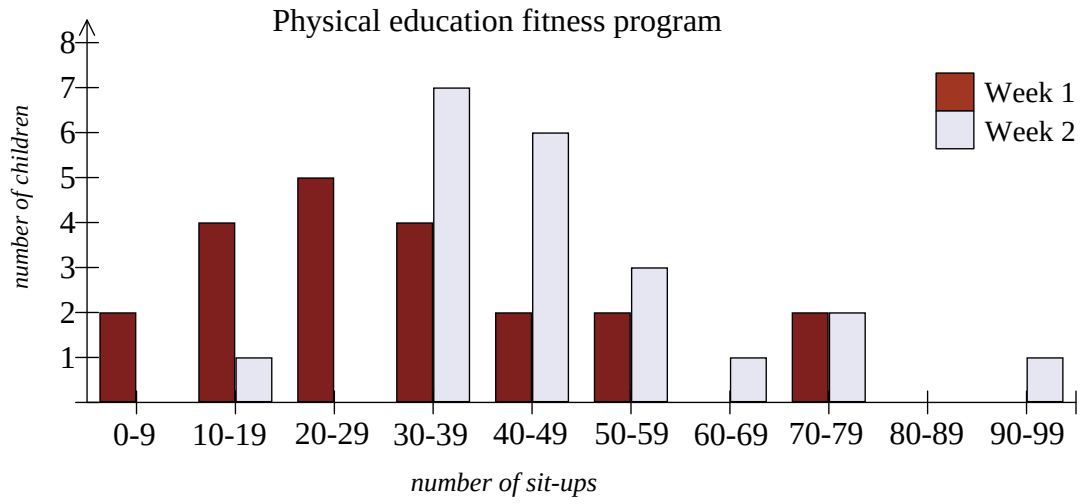
© Department of Education WA 2012 – MATHSAC029

2.

Week one	
Number of sit-ups	Frequency
0–9	2
10–19	4
20–29	5
30–39	4
40–49	2
50–59	2
60–69	0
70–79	2

Week six	
Number of sit-ups	Frequency
0–9	0
10–19	1
20–29	0
30–39	7
40–49	6
50–59	3
60–69	1
70–79	2
80–89	0
90–99	1

3. Solutions may slightly vary.



4. The stem-and-leaf plot

5. Yes, because they show, in easy-to-read graphs, how the class has generally increased their fitness.

6. The stem-and-leaf plot because it shows the individual marks in order

© Department of Education WA 2012 – MATHSAC029

Solutions to Skills development 6

1. (a) Column graph

   (b) It depends on the range of the values. A stem-and-leaf plot may be suitable.

   (c) Dot plot

   (d) A stem-and-leaf plot

   (e) Histogram

2. (a) The actual numbers would be quite big and hard to graph and compare. Percentages are much easier.

   (b) The three are:

   - percentage of females in Perth SD
   - percentage of males in Perth SD
   - percentage of males in Remainder of State.

   (c) (i) About 6.25% altogether (ii) About 7.2% altogether

   (d) The information is easy to see. All the labelling is clear to read.

3. (a) They both use the same data.

   (b) The side-by-side column graphs show the differences more clearly.

   (c) The column for all of Australia in the section about identifying with clan goes above the 50% mark.

   (d) The remote areas have the greatest percentage of people speaking an Indigenous language. The smallest percentage is in the regional areas, closely followed by the major cities.

   (e) Answers will vary but they may include observations like the following.

   Although only a small percentage of people in major cities speak an Indigenous language, more than 50% of them identify with clan and are involved in cultural events, ceremonies or organisations.

   Just over a quarter of the people living in a remote area do not speak an Indigenous language.

© Department of Education WA 2012 – MATHSAC029

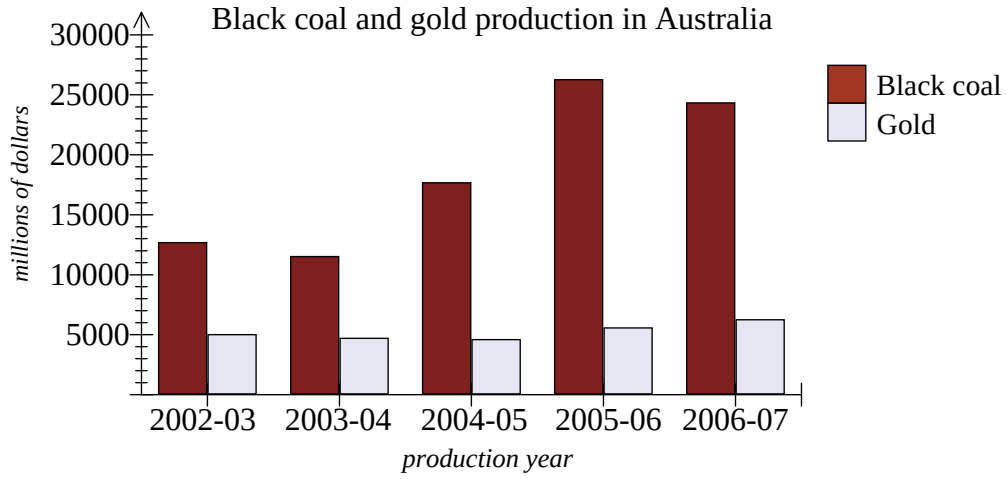
7. Working with resources data

Solutions to Warm-up 7

1. 0.005
2. 164
3. 14 degrees
4. $\frac{12}{6} - \frac{1}{6} = \frac{11}{6}$ or $1\frac{5}{6}$
5. 72
6. 72.5 L
7. 4
8. $18.75
9. Subtract 104 from each number to get the next number.
10. Pentagon

Solution to Focus problem 7

1. The answers will depend on which two resources are chosen. For example, the following graph compares the production of black coal and gold.



2. The production of all the resources has increased over the years. Some at a greater rate than others.

© Department of Education WA 2012 – MATHSAC029

Solutions to Skills development 7

1. (a) The percentage of the people from the survey who decreased their personal water use in 2007–08

   (b) Hobart was also low.

   (c) In Brisbane between 70% and 80% of people from the survey decreased their personal water use.

   (d) Melbourne and Adelaide

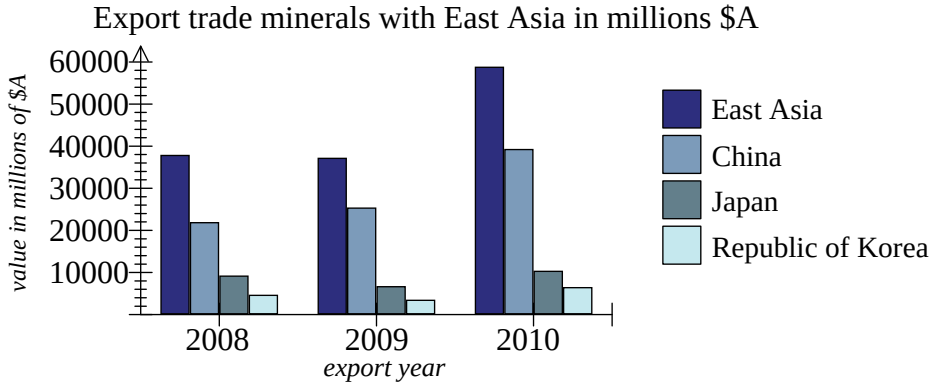
   (e) In the reasons 'water restrictions imposed/increased' and to a lesser degree in 'used recycled or grey water' and 'used tank water instead of mains'

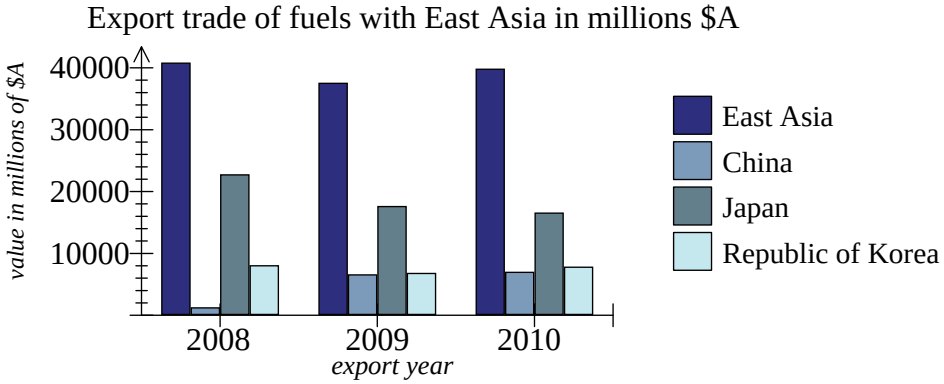
   (f) Between 10% and 15%

   (g) Yes, it could have been drawn as side-by-side column graphs as there are two values to compare for each reason.

   (h) Answers may vary. For example, the graphs show a large percentage of people are trying to conserve water and that there has been a decrease in personal water use in 2007-08 from the previous year. However, it does not show if this is a long-term trend.

2. (a) See graphs below.





   (b) Answers will vary. Possible observations are given below.

   Mineral exports to China were much higher than to the other two countries.

   Exports to Japan of fuels were a lot higher than to China and Korea.

© Department of Education WA 2012 – MATHSAC029

Solutions to Review tasks

Solutions to Task A

1. (a) II, III, V, VI

   (b) I, II, V, VI*

   * Note that age data can be considered continuous although it is generally rounded and grouped. You may like to discuss this with your teacher.

2. (a) 36, 42, 54, 39, 50, 40, 40, 41
   37, 40, 46, 34, 24, 40, 37, 41

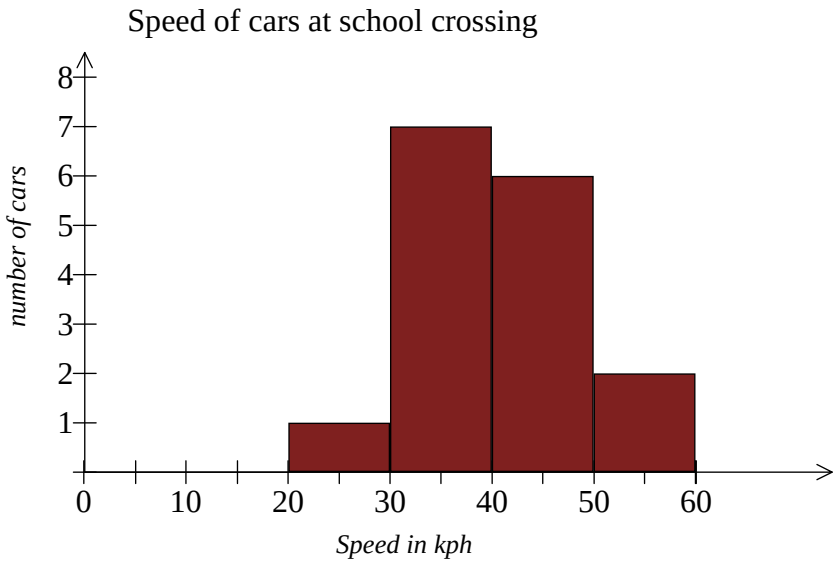
   (b)

	Original speeds		Rounded speeds	
Speed (kph)	Tally	Number of cars	Tally	Number of cars
20–30	|	1	|	1
30–40	𝍸 ||	7	𝍸	5
40–50	𝍸 |	6	𝍸 |||	8
50–60	||	2	||	2

   (c) The results differ because 39.8 and 39.9 were both rounded up to 40 and so changed groups.

   (d) The original speeds are best because they show which are 40 kph or below.

   (e)



   (f) A histogram

   (g) Answers could include the fact that it is dangerous because children could be crossing the road.

© Department of Education WA 2012 – MATHSAC029

3. Ice-cream sales in thousands:

   - The vertical axis isn't labelled to show what the numbers represent.
   - The columns are different widths and they should be the same.

   Heights of trees at a nursery:

   - The scale on the vertical axis is not evenly spaced.
   - The scale on the horizontal axis is not evenly spaced.
   - There shouldn't be a gap between the last two columns.
   - There needs to be a gap from 0 to 100 on the horizontal axis.

4. (a) Ordered stem-and-leaf plot

   (b) They represent the tens value of the number. For example 2|0 has a value of 20.

   (c) The leaf represents the units value of the distance in one walking step.

   (d) 16

   (e) 27 cm

   (f) 62 cm

   (g) The individual scores don't get lost as they would in a column graph. A column graph would have to use grouped data.

5. (a) Comments should mention that this graph is okay if every day there is a multiple of 10 cars but showing smaller values is hard to do.

   (b) A dot plot would need to have a very large number of dots so a column graph would be best. The columns would then be drawn the correct height for the number of cars on a particular day.

6. (a) 2005, 2008, 2011

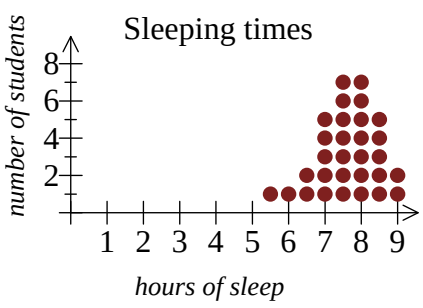
   (b) Northern Territory (NT) and Western Australia (WA)

   (c) The Northern Territory does not show an increasing trend but it had a high use anyway. The other states show an increasing trend to using solar hot water. It is shown in the graph where the columns for 2011 are taller than for the other years.

7. - Some values are repeated in the stem.
   - The numbers in the stem are not in order.
   - The numbers in the leaf are not in line.

8. (a) The results indicate whole hour or half-hour time.

   (b)



© Department of Education WA 2012 – MATHSAC029

Solutions to Task B

The answers will depend on the decisions made about counting numbers.

1 (a) The steps need to be checked by your teacher.

The solutions below have included the numbers by counting the digits as letters. Any apostrophe is not counted.

(b) (i) Solutions may vary. Please ask your teacher to check your method.

For example, each digit could be considered and counted as a letter.

(i) Solutions may vary. Please ask your teacher to check your results.

For example, if each number is counted as a word then the results are as follows. 28, 38, 18, 17, 45, 10, 24, 8

2. The numbers of words per sentence are as follows. 7, 12, 8, 6, 11, 8, 12

The solutions below have included the numbers by counting the digits as letters. Any apostrophe is not counted.

3. With these values a back-to-back stem-and-leaf plot would be best to use to compare them.

Numbers of words in sentences

Leaf – passage 2				Stem	Leaf – passage 1		
8	8	7	6	0	8		
	2	2	1	1	0	7	8
				2	4	8	
				3	8		
				4	5		

4. The government publication appears to be the most difficult to read. Compared to those used in the children's storybook, the lengths of the sentences and words are much longer.

© Department of Education WA 2012 – MATHSAC029

Department of
Education

MATHSAC029
COLLECTING AND DISPLAYING DATA
ISBN: 9780730744498