A Complete Guide to ...

Statistics

Utilising the objectives as written in

MATHEMATICS in the New Zealand CURRICULUM

for

Level 5

This resource contains:

- ☑ Table of contents
- ☑ Teaching notes
- ☑ In class activity sheets involving
  - ▫ worked examples
  - ▫ basic skills
  - ▫ word problems
  - ▫ problem solving
  - ▫ group work
- ☑ Homework / Assessment activity sheets
- ☑ Answers

These resources are supplied as PHOTOCOPY MASTERS

Author: A. W. Stark

AWS Publications Ltd
Formerly *AWS* Teacher Resources

L5MS

A Complete Guide to ...

Statistics

Utilising the objectives as written in

MATHEMATICS in the New Zealand CURRICULUM

Level 5

This resource contains:

- ☑ Table of contents
- ☑ Teaching notes
- ☑ In class activity sheets involving
  - ▫ worked examples
  - ▫ basic skills
  - ▫ word problems
  - ▫ problem solving
  - ▫ group work
- ☑ Homework / Assessment activity sheets
- ☑ Answers

Author:
A. W. Stark

AWS Teacher Resources

L5MS

Author:
A. W. Stark

First Published March 1998

Formatting and publishing by
Andrew Stark

Formerly trading as:
AWS Teacher Resources

NOW trading as:
AWS Publications Ltd

P O Box 21304
Edgeware
CHRISTCHURCH 8143
NEW ZEALAND

☎ +64 3 379 0516 or 📠 +64 3 379 0619

Note from the author:

This resource ...

*A Complete Guide to Statistics

is one of a series of **FIVE** resources written utilising the objectives as stated in

Mathematics in the New Zealand Curriculum for Level 5.

With my experiences as a specialist mathematics teacher, I enjoyed mathematics as a subject, but I am aware that not all teachers feel the same way about mathematics. It can be a difficult subject to teach, especially if you are unsure of the content or curriculum and if resources are limited.

This series of resources has been written with you in mind. I am sure you will find this resource easy to use and of benefit to you and your class.

Resources in this series:

A Complete Guide to Number written utilising the objectives as stated in ***Mathematics in the New Zealand Curriculum for Level 5***	**Resource Code: L5MN**
A Complete Guide to Measurement written utilising the objectives as stated in ***Mathematics in the New Zealand Curriculum for Level 5.***	**Resource Code: L5MM**
A Complete Guide to Geometry written utilising the objectives as stated in ***Mathematics in the New Zealand Curriculum for Level 5.***	**Resource Code: L5MG**
A Complete Guide to Algebra written utilising the objectives as stated in ***Mathematics in the New Zealand Curriculum for Level 5.***	**Resource Code: L5MA**
A Complete Guide to Statistics** written utilising the objectives as stated in ***Mathematics in the New Zealand Curriculum for Level 5.	**Resource Code: L5MS**

For more information about
these and other resources,
please contact ...

AWS Publications Ltd

☎ +64 3 379 0516

+64 3 379 0619

This resource has been divided into EIGHT sections as listed below.

Although there are no page numbers, the sections follow in sequential order as listed.

Note: **'In-class' Worksheets Masters** are lesson by lesson reuseable worksheets that can be photocopied or copied on to an OHP.

Homework / **Assessment Worksheets Masters** can be used as homework to reinforce work covered in class or they can be used for pupil assessment.

1 Statistics

The following are the objectives for **Statistics**, **Level 5**, as written in the **MATHEMATICS** *in the New Zealand Curriculum* document, first published 1992. ***[REFER PAGE 186]***

Statistical investigations

Within a range of meaningful contexts, students should be able to:

- **S1** plan and conduct statistical investigations of variables associated with different categories within a data set, or variations of variables over time;
- **S2** consider the variables of interest, identify the one(s) to be studied, and select and justify samples for collection;
- **S3** find, and authenticate by reference to appropriate displays, data measures such as mean, median, mode, inter-quartile range, and range;
- **S4** discuss discrete and continuous numeric data presented in quality displays;
- **S5** collect and display comparative samples in appropriate displays such as back-to-back stem-and-leaf, box-and-whisker, and composite bar graphs.

Interpreting statistical reports

Within a range of meaningful contexts, students should be able to:

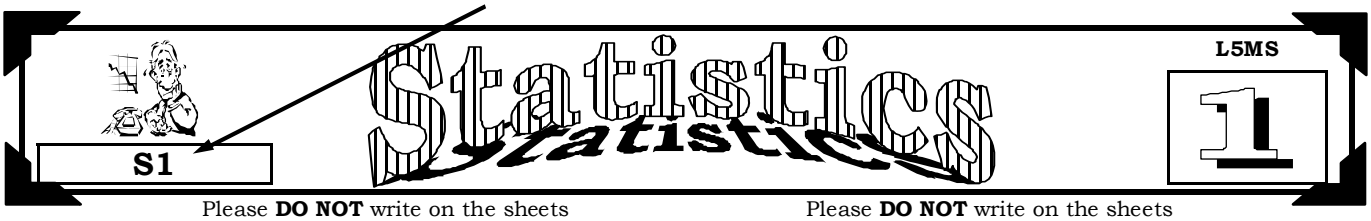
- **S6** use data displays and measures to compare data associated with different categories;
- **S7** make statements about time-related variation as a result of a statistical investigation;
- **S8** report on possible sources of error and limitations of an investigation.

Exploring probability

Within a range of meaningful contexts, students should be able to:

- **S9** determine probabilities of events based on observations of lone-run relative frequency;
- **S10** determine the theoretical probabilities of the outcomes of an event such as the rolling of a die or drawing a card from a deck;
- **S11** predict the outcome of a simple probability experiment, test it, and explain the results;
- **S12** find the probability of a given sequence of events, using tree diagrams.

At the top of each **'In-class' worksheet** and **Homework / Assessment worksheet**, the Statistics objective(s) being covered has been indicated. *EXAMPLE:* **S1** means objective 1, **S2** means objective 2, etc.



Please **DO NOT** write on the sheets Please **DO NOT** write on the sheets

The **Mathematical Processes Skills:** **Problem Solving**, **Developing Logic & Reasoning,** **Communicating Mathematical Ideas,**

are learned and assessed within the context of the more specific knowledge and skills of number, measurement, geometry, algebra and statistics. The following are the **Mathematical Processes Objectives** for **Level 5**.

Problem Solving Achievement Objectives ***[Refer page 24]***

- **MP1** pose questions for mathematical exploration;
- **MP2** effectively plan mathematical exploration;
- **MP3** devise and use problem-solving strategies to explore situations mathematically;
- **MP4** find, and use with justification, a mathematical model as a problem-solving strategy;
- **MP6** use equipment appropriately when exploring mathematical ideas.

Developing Logic and Reasoning Achievement Objectives ***[Refer page 26]***

- **MP8** classify objects, numbers and ideas;
- **MP9** interpret information and results in context;
- **MP10** make conjectures in a mathematical context;
- **MP11** generalise mathematical ideas and conjectures;
- **MP15** use words and symbols to describe and generalise patterns.

Communicating Mathematical Ideas Achievement Objectives ***[Refer page 28]***

- **MP16** use their own language and mathematical language and diagrams to explain mathematical ideas;
- **MP17** devise and follow a set of instructions to carry out a mathematical activity;
- **MP20** record information in ways that are helpful for drawing conclusions and making generalisations;
- **MP21** report the results of mathematical explorations concisely and coherently.

Note:
The codes **MP1**, **MP2**, etc. have been created by numbering the **Mathematical Processes Achievement Objectives** in order as listed in the **MATHEMATICS** *in the New Zealand Curriculum* document. The numbering gaps occur as not all objectives are covered at **Level 5**. ***[REFER TO PAGES 23 - 29 OF THE CURRICULUM DOCUMENT]***

‘In-class’ Statistics Worksheets
Table of Worksheet Number / Objectives Covered

See the opposite page for details of each objective.

	Statistics Objectives												Mathematical Processes Objectives											
Worksheet Number	S 1	S 2	S 3	S 4	S 5	S 6	S 7	S 8	S 9	S 10	S 11	S 12	MP 1	MP 2	MP 3	MP 4	MP 6	MP 8	MP 9	MP 10	MP 15	MP 16	MP 17	MP 20	MP 21
1	✖												✖	✖	✖				✖	✖					
2	✖	✖											✖	✖	✖				✖						
3	✖	✖											✖	✖	✖				✖						
4			✖										✖		✖				✖				✖		
5			✖										✖		✖				✖				✖		
6			✖										✖		✖				✖				✖		
7			✖										✖		✖				✖				✖		
8				✖									✖						✖			✖		✖	
9				✖									✖	✖					✖			✖		✖	
10				✖										✖			✖		✖	✖		✖		✖	
11				✖										✖			✖		✖			✖		✖	
12				✖										✖			✖		✖			✖		✖	
13				✖	✖								✖	✖			✖		✖	✖		✖		✖	✖
14				✖									✖	✖			✖		✖			✖		✖	
15				✖									✖	✖			✖		✖			✖		✖	
16				✖									✖	✖			✖		✖			✖		✖	
17				✖									✖	✖			✖		✖			✖		✖	
18				✖									✖	✖			✖		✖			✖		✖	
19			✖	✖	✖								✖		✖		✖		✖	✖		✖	✖	✖	
20								✖					✖		✖				✖			✖			✖
21						✖	✖	✖					✖	✖	✖		✖		✖			✖		✖	✖
22									✖				✖		✖				✖	✖		✖		✖	
23									✖	✖	✖		✖		✖				✖	✖				✖	
24												✖	✖		✖				✖			✖	✖		
25											✖	✖	✖		✖				✖	✖		✖		✖	

Table of Contents for the 'In-class' Worksheet Masters for Statistics, Level 5

Introduction to statistical investigations:

If a crime is committed, the police will do an investigation, by asking questions of the people involved, to find out what happened. In a **statistical investigation** questions will also be asked and i**nformation** or **data** collected.
Example: "50% of the pupils at Mairehau High School bike to school", stated Kate.

Discuss how Kate could have collected this information, to be able to make this statement. What questions would she have asked? Who would she have asked?

Task 1

Before conducting a statistical investigation, there are some **important statistical words** that need to be understood. **Copy** and **complete** sentences 1 to 7 by adding a **statistical word** from the list below.

random **population** **biased** **sample** **questionnaire** **representative sample** **survey**

1. In statistics, a group of anything such as the pupils at your school is called a …… .
2. A ……..is part of the population we are interested in.
3. If we wish to comment about a population, we often …… a population or a sample of the population.
4. For the results of a survey to apply to that population, the sample must be a …… .
5. A sample that is not a representative sample is called a …… sample.
6. A …… sample means that every person, or item, has an equal chance of being chosen.
7. A …… is one way of obtaining people's opinions.
8. **List** 5 examples of **populations**, remembering that a population does not have to be people.
   Example: The chairs in Room 8.
9. From your answers in question 8, **name** a **sample** of each population that could be surveyed.
   Example: The trees under 2 metres tall.
10. Why is it sometimes easier to **survey** a **sample** of a population, rather than the whole population?

Calculating a representative sample:

When we want to make statements about a population, using a survey to sample the population, the sample should be a **representative sample**.
Example: 10% of a school are to be surveyed. There are 110 girls and 90 boys, a total of 200 pupils.

How many girls and how many boys should be surveyed, if a representative sample is taken?

Answer: To be a representative sample, 10% of the girls and 10% of the boys would be surveyed.
Therefore, 11 girls and 9 boys would be surveyed.

Task 2

Calculate the number of each group required for the **sample to be representative**, given the following information.

1. A 20% sample from a school of 160, 75 boys and 85 girls.
2. A 15% sample from 3200 tourists, 1240 from New Zealand and 1960 from Australia.
3. An 8% sample from 8000 households, 1131 in Christchurch, 1214 in Wellington, 2406 in Hamilton and 3249 in Auckland.

Mairehau High School has a school roll of 568 pupils made up of 64 Year 13 pupils, 96 Year 12, 136 Year 11, 140 Year 10 and 132 Year 9. There are to be changes to the school uniform and it was decided that 25% of the pupils should be surveyed.

4. Calculate the number of each year group to be surveyed so that the sample is representative.
5. If all Year 9 pupils were the only group surveyed, why would that be considered a **biased sample**?

Random sampling methods:

When surveying a population, a representative sample means that groups within a population are fairly represented. To ensure the sample is not biased, the method for sampling should be random. A random sample means that every person, or item, has the same chance of being chosen.

Example: Every 5th person coming through the door at a supermarket.

Discuss other ways that random samples can be collected.

Task 3

At a small country school each family was asked the following question ...

"How many children are in your family?"

The results are displayed in this table, A, B, C, D, E and E.

1. How many families were surveyed?
2. If you wanted to work out the average number of children in a family at this school, how could this be done?

It was decided that a random sample of 15 families would be selected and from this sample, the average number of children per family would be calculated.

Example: Add up and calculate the average (mean) of column A in the table.

3. Describe at least 3 different ways you could sample this population of families.
4. Randomly sample this population of families using the 3 different methods you outlined in Question 3.
5. What was the average number of children per family? Compare and comment on the results of your sampling.
6. Using your results from one of your random samples, predict how many of the families would have 2 children.

Results of Family Size Survey

A	B	C	D	E	F
2	3	4	3	3	1
1	3	2	5	1	1
2	2	4	4	3	2
1	3	1	1	3	1
1	5	3	1	3	3
4	1	3	3	5	1
3	2	1	5	3	1
3	2	2	2	4	2
3	4	2	3	5	4
2	4	3	3	2	5
1	2	2	1	3	1
3	2	3	5	2	2
5	2	5	1	4	5
1	1	2	3	1	3
5	1	3	3	1	2

Conducting a statistical investigation:

There are many issues that affect you personally, your school or your local community.

Task 4

Working in a small group, decide on **3 important issues** that you could investigate.

Points to consider when carrying out an investigation:

- **A:** **Decide** on the purpose of your investigation.
- **B:** **Decide** what data needs to be collected and how it is going to be collected.
- **C:** **Collect** and **organise** the data.
- **D:** **Interpret** the data and draw conclusions from it.
- **E:** **Write** a **report** based on your investigation.

Discuss how you are going to **complete** the **first 3 points** above. **Compare** your methods with other groups.

Designing a questionnaire:

A **questionnaire** is used when we are asking opinions about an issue.
The **design** of a questionnaire, that is, the way the questions are worded, the way the answers are to be given and the overall look or layout of the questionnaire is most important.

Some **points** to consider about **designing a good questionnaire** would be ...

- ☑ What questions relating to the 'issue/s' are you going to ask?
- ☑ Do not ask questions that are not important to the issue.
- ☑ Make the questions clear and concise and not too many of them.
- ☑ How are these questions going to be answered?
  Example: multi-choice, single words, short answers or long answers.
- ☑ Have you allowed for every possible answer?
- ☑ Do you need to give instructions as to how the questionnaire has to be filled out?
- ☑ How are you going to organise and display the data you have collected?

Discuss other points that might be important when designing a questionnaire.

Task 5

A new teacher of a Year 10 class wanted to know more about the pupils in his class.
He asked pupils to answer the questions below, which require only **'Yes'** or **'No'** answers.
Record your answers to these questions.

1. *Were you born in New Zealand?*
2. *Have you lived in New Zealand all your life?*
3. *Do you like watching the All Blacks play rugby?*
4. *Do you like doing homework?*
5. *Is mathematics your favourite subject?*
6. *Do you like cats?*
7. *Do you have any brothers?*
8. *Have you flown on a plane?*

9. **Make up** 5 more **'Yes'** or **'No'** questions that the teacher might ask.

He then asked some more questions that required answers other than 'Yes' or 'No'.
Record your answers to these questions.

10. *How old are you?*
11. *In which month is your birthday?*
12. *How many brothers or sisters do you have?*
13. *What pets did you have?*
14. *Where did you go on your last holiday?*
15. *What type of music do you like?*
16. *What was the name of the last movie you went to?*
17. *What time do you go to bed each night?*

For some questions, being given a choice of answers is a good idea. **Record** your answers to these questions.

18. *How do you travel to school?*
19. *How far do you travel to school?*

walk	bike	bus	car	other

less than 1 km	1 km to 2 km	2 km to 3 km	more than 3 km

20. **Make up** 5 more questions that cannot be answered by **'Yes'** or **'No'** answers.
Supply a choice of answers for your questions.

Task 6

Working in a small group, **choose one** of the **issues** you discussed in **Task 4, Worksheet 2**.

Who are you going to survey to gain opinions or ideas about the issue you are investigating?

Design a questionnaire for your sample population to fill out. How are you going to get them to fill it out?

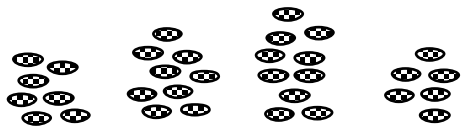
Include questions in your questionnaire that require a **'Yes' / 'No'** answer, some **word answers** and / or answers where the **choices** are given.

Discuss how the data collected could be organised and presented.

Calculating the mean (average score):

A data display can tell you a lot about the data just by looking at it, but there are various calculations that can be done that will also provide some useful information.

Example: Four children have some chocolates as shown.



If these chocolates are to be shared equally amongst the four pupils, how many will each pupil have? Answer: 8

By doing this calculation, you are finding the '**average**' or **mean** number of chocolates that each child would have.

To find the mean for a list of scores (numbers), there are two steps.

Step 1: **Add** up all the scores.

Step 2: **Divide** this total by the number of scores you added up.

Example: Find the mean of 10, 12, 8, 9 and 11.

The working is as follows ...

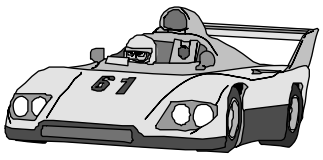
Add 10 + 12 + 8 + 9 + 11 = 50. There are 5 scores, so 50 ÷ 5 = 10. The **mean** of these numbers is **10**.

Task 7

Calculate the **mean** (average) for each list of scores. Round your answers to 2 d.p.

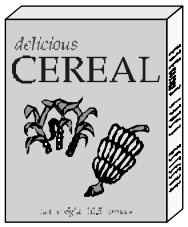
1.	12, 11, 7, 21, 32	2.	14, 18, 19, 9, 24, 27	3.	45, 61, 39, 47, 50
4.	12, 47, 64, 27, 35, 51	5.	23, 14, 27, 39, 53, 87, 64	6.	129, 116, 212, 115, 157, 211, 189
7.	5.3, 9.4, 3.9, 0.7, 8.6	8.	3.9, 1.7, 9.6, 1.1, 4.6, 5.4	9.	5.3, 4.7, 2.9, 6.3, 8.1, 6.9, 4.2
10.	1.2, 3.4, 2.3, 2.7, 0.9, 4.6, 3.7	11.	9.2, 10.5, 18.1, 6.3, 9.4, 4.1	12.	126.3, 165.4, 117.9, 158.4, 146.2
13.	$2.65, $5.75, $5.85, $6.70	14.	$8.70, $2.25, $5.30, $9.35	15.	$3.27, $4.88, $4.83, $9.82

Samuel has been playing a computer car racing game. He recorded the time taken to complete each race several times. The times are recorded in seconds.



45.6, 55.3, 47.2, 53.5, 49.9, 54.8, 46.4, 50.9, 53.2, 49.7, 51.4, 47.6

16. How many times did Samuel play this car racing game?
17. Find the **mean** time taken for these races.
18. What was the difference between the fastest and slowest times?



As cereal boxes are filled, they are weighed in grams by a machine.

1005, 998, 1001, 995, 992, 1014, 1003, 999, 1004, 1009, 997, 1009, 994, 993, 1012

19. How many boxes of cereal have been filled so far?
20. Calculate the **mean** weight for these cereal boxes.
21. What was the difference between the lightest and the heaviest cereal box?

Angela listed the price of houses for sale in her area.

$185600, $193500, $202000, $175900, $209000, $212900, $185400, $199000, $185310

22. How many houses are for sale in Angela's area?
23. Calculate the **mean** price for these houses.
24. What is the difference between the cheapest and the most expensive house?
25. If three more houses worth $168500, $194500 and $185200 are now for sale, what is the new **mean** price for the houses in this area?

26. **Create** your own list of scores or numbers, then get a classmate to **calculate** the **mean** value for each list.

Calculating the median (middle score):

A second type of 'average' that can be found for a list of scores is called the **median**.

The **median** is the middle score, once the scores have been placed in order from smallest to largest.

Example: Find the median for each list of scores.

List A 20, 13, 6, 17, 9, 8, 10, 12, 5

List B 5, 21, 7, 20, 9, 18, 12, 13, 15, 17

To find the **median**, list the scores in order.

Then, start counting one off from each end until there is only one number left in the middle.

Example: ***List A*** 5, 6, 8, 9, 10, 12, 13, 17, 20

Answer: median for ***List A*** = 10

However, in ***List B*** there are two numbers left in the middle. The median would be the 'average' or **mean** of these two numbers in the middle.

Example: ***List B*** 5, 7, 9, 12, 13, 15, 17, 18, 20, 21

Answer: median for ***List B*** = (13 + 15) ÷ 2 = 14

Task 8

Calculate the **median** (middle score) for each list of scores. To help, **rewrite** the scores in order.

1.	8, 12, 14, 19, 24, 27, 29	2.	11, 13, 17, 19, 27, 32	3.	12, 19, 24, 32, 36, 45, 51, 52
4.	15, 17, 12, 19, 24, 13	5.	11, 8, 14, 19, 13, 0	6.	8, 16, 4, 12, 11, 9, 8, 6, 13
7.	11, 13, 6, 12, 16, 9, 17, 3	8.	1.8, 1.4, 1.1, 1.7, 1.2, 1.5	9.	3.7, 3.1, 3.3, 3.1, 3.7, 3.2, 3.1, 3.8
10.	0.8, 4.9, 2.7, 1.6, 7.4, 1.3	11.	8.1, 2.6, 6.0, 9.9, 2.3, 4.7	12.	13.3, 14.6, 10.7, 17.4, 16.4, 12.8
13.	113, 169, 149, 127, 119, 142	14.	15.6, 4.6, 9.7, 13.6, 6.6, 12.9	15.	3.09, 3.65, 3.75, 3.44, 3.12, 3.01

Miri has been training for the school cross-country race later this term. Below are the distances she has been running in training.

2.4km, 2.9km, 2.6km, 2.8km, 2.4km, 2.5km, 2.9km, 2.2km, 2.4km, 2.3km

16. How many times has Miri been out training?
17. Find the **median** distance of her training runs.
18. What was the difference between the shortest and the longest run?

A machine is used to fill milk cartons with 1 litre of milk. Below are the volumes in millimetres for some cartons that had their volumes checked.

995, 1009, 995, 1012, 1008, 999, 1014, 996, 1009, 1006, 998, 996, 1010, 997, 1009, 995

19. How many cartons of milk had their volumes checked?
20. Calculate the **median** volume of these checked milk cartons.
21. What was the difference between the greatest and least volume of the milk cartons?

Shane likes playing golf and below are his scores for each hole for his latest round of golf.

3, 4, 7, 6, 3, 4, 5, 3, 7, 6, 5, 5, 4, 3, 3, 4, 5, 6

22. How many holes of golf did he play?
23. Calculate the **median** number of shots taken during this round.
24. What is the difference between the best and the worst hole score?
25. What was Shane's total score for this round of golf?

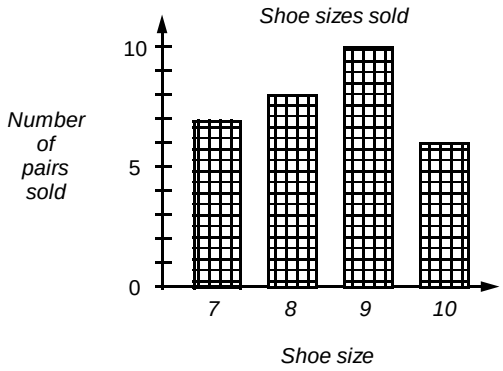
26. **Create** your own list of scores or numbers, then get a classmate to **calculate** the **median** value for each list.

Finding the mode (most common score):

A third type of 'average' that can be found for a list of scores is known as the **mode**.
The mode can often be worked out by looking at a data display.

> The most common score is known as the **mode**.
> There may be **more than one** mode or no mode, if all scores are different.

Example: What is the most popular shoe size sold during one day?



Looking at this graph, we can see that a size 9 shoe was the most common shoe size sold.

Find the mode for these scores.

7, 11, 13, 11, 8, 7, 5, 9
Answer: Both 7 and 11 are modes.

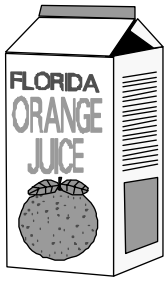
7, 8, 14, 11, 12, 9, 10, 5
Answer: There is no mode.

Task 9

Find the **mode** (most common number) for each list of scores.

1.	8, 9, 12, 11, 7, 8, 12, 10	2.	10, 12, 10, 11, 6, 14, 15, 6, 13	3.	4, 2, 7, 9, 4, 5, 3, 2, 4, 7, 3
4.	14, 15, 10, 11, 13, 12, 5, 7	5.	33, 24, 25, 33, 27, 25, 23, 31	6.	8, 13, 22, 13, 8, 4, 6, 8, 1, 8
7.	16, 15, 12, 14, 16, 15, 14, 11	8.	21, 30, 34, 38, 36, 26, 22, 24	9.	55, 22, 45, 74, 35, 24, 45
10.	4.3, 4.6, 4.3, 4.4, 4.3, 4.9, 4.6	11.	6.3, 9.6, 8.2, 5.2, 6.3, 8.2, 7.5	12.	136, 175, 127, 168, 166, 171
13.	15.03, 15.10, 15.03, 15.00, 15.09	14.	4, 5, 4, 5, 4, 7, 4, 6, 4, 6, 5, 2, 1	15.	4, 7, 3, 2, 4, 3, 2, 5, 3, 4, 2, 3

At a local supermarket, juice cartons come in three sizes, 250mL, 600mL and 1000mL.
The sales are recorded below.

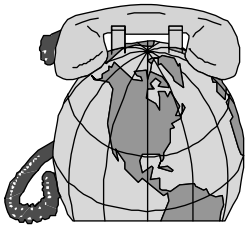


> 250, 600, 250, 1000, 1000, 600, 250, 600, 250, 1000, 600, 250, 250, 250, 600, 1000, 250, 600,
> 250, 600, 600, 1000, 1000, 600, 250, 250, 600, 250, 600, 1000, 1000, 600, 250, 250, 1000, 250

16. **Organise** this data into a **frequency table**.
17. From your frequency table, state the **mode** or most common size sold.
18. How many juice cartons were sold altogether?

In the evenings and weekend, telephone calls cost only $3.00 and you can talk for as long as you like. The length of some telephone calls is shown below, recorded to the nearest minute.

> 14, 17, 18, 15, 19, 14, 15, 17, 18, 11, 14, 13, 14, 13, 11, 18, 18, 14, 15, 16, 19,
> 19, 17, 14, 15, 12, 18, 13, 15, 14, 19, 18, 11, 18, 16, 14, 15, 14, 16, 14, 16, 18



19. **Organise** this data into a **frequency table**.
20. From your frequency table, state the **mode** or most common length of telephone call.
21. How many telephone calls were made altogether?
22. If 5 more calls of 15, 18, 18, 19 and 16 minutes were made, does this affect the mode or most common length of telephone call?

23. **Create** your own list of scores or numbers, then get a classmate to **state** the **mode** value for each list.

Calculating the range (spread) & finding the appropriate 'average':

Finding the mean, median or mode for a list of scores can tell us a lot about the scores, but consider these two lists ...

List A 11, 23, 34, 42, 50

List B 25, 28, 34, 36, 37

Both of these sets of scores have a mean of 32 and a median of 34, but the highest and lowest scores from List A are quite different to the highest and lowest scores of List B.

How spread out the scores are is called the **range**.

Range = highest score – lowest score

Find the range for List A and List B above. Answer: List A, 50 – 11 = 39 List B, 37 – 25 = 12

Task 10

Calculate the **range** (spread) for each list of scores.

1.	6, 8, 13, 15, 18, 22, 25	2.	7, 11, 18, 13, 8, 32, 14	3.	7, 8, 15, 13
4.	7, 13, 19, 17, 28, 31	5.	7, 2, 14, 19, 7, 0	6.	6, 13, 2, 11, 9, 6, 3, 2, 15
7.	9, 1, 4, 17, 19, 7	8.	1.2, 1.9, 1.1, 1.7, 1.8	9.	2.2, 2.8, 2.9, 2.3, 2.5
10.	0.7, 3.3, 1.7, 0.2, 2.9	11.	6.3, 7.1, 4.0, 8.7	12.	14.1, 12.9, 11.9, 19.1
13.	142, 117, 137, 116, 124, 139	14.	12.2, 5.4, 3.9, 14.4, 7.2, 11.8	15.	3.09, 3.65, 3.87, 3.42, 3.07

Ken has been looking at buying a new set of golf clubs. He has been around several shops looking at the prices of golf clubs. Below is a list of the prices he saw.

$695, $735, $795, $675, $820, $665, $775, $705, $695

16. How many sets of golf clubs did Ken look at?
17. Calculate the **range** of prices for these golf clubs.
18. Calculate the **mean** and **median** price of these golf clubs.

Fruit is sold by weight. Below is a list of fruit purchased from a local supermarket, measured in kgs.

0.965kg, 1.23kg, 2.33kg, 1.25kg, 2.75kg, 4.36kg, 0.86kg, 2.67kg, 3.9kg, 1.42kg, 2.35kg, 3.45kg, 0.86kg

19. How many purchases of fruit have been made so far?
20. Calculate the **range** of weights for these fruit purchases.
21. Find the **mean** and **median** weight of the fruit sales.

Jeremy likes playing golf and below are his scores for each hole, for his latest round of golf.

5, 6, 7, 8, 5, 4, 4, 7, 3, 4, 7, 5, 6, 5, 4, 4, 7, 5

22. How many holes of golf did he play?
23. Calculate the **range** for the number of shots taken per hole during this round.
24. What was the **median** and **mode** or most common score that Jeremy got?
25. What was Jeremy's total for this round of golf?

26. If the highest score is 131 and the range is 48, calcluate the lowest score.
27. If the highest score is 205 and the range is 148, calcluate the lowest score.
28. If the lowest score is 69 and the range is 63, calculate the highest score.
29. If the lowest score is 71 and the range is 42, calculate the highest score.
30. If the range is 54 and the score 61 is exactly in the middle, calculate the lowest and highest scores.
31. If the range is 68.8 and the score 75 is exactly in the middle, calculate the lowest and highest scores.

32. **Create** your own list of scores or numbers, then have a classmate **calculate** the **range** value for each list.

Collecting and organising discrete data using a frequency table:

There are **two types** of data that can be collected, **discrete** data and **continuous** data.
A **frequency table** (tally chart) is a good way to organise both types of data as the data is being collected.

Discrete data is data that is **obtained by counting**.
Example: Andrew records the number of people in cars as the cars go past the school gate.

Example: This frequency table shows the results of Andrew's survey.

How many cars had only one person?

Answer: 17 cars.

Number of people	Tally	Frequency
1	𝍸 𝍸 𝍸 II	17
2	𝍸 𝍸 IIII	14
3	𝍸 𝍸 𝍸 IIII	19
		50

The total of the **frequency column** is 50.

What does this tell us?

Answer: There were 50 cars in Andrew's survey.

What other information is contained within this frequency table?

Continuous (measurement) **data** is **obtained by measuring** and will be looked at in **Worksheet 12**.
Example: Amanda measured the height of her younger sister every week.

Task 11

The following data shows the grades that students in Year 10 obtained in a Mathematics assignment. Grade 5 is the best grade.

5, 2, 4, 3, 5, 2, 4, 2, 5, 4, 1, 3, 4, 5, 5, 4, 5, 4, 3, 4, 5, 4, 3, 5, 3, 4, 3, 2, 4, 3, 4, 3, 5, 4, 3, 5, 4, 2, 3, 4, 4, 5, 3, 5, 4, 2, 1, 3, 3, 3, 4, 5, 2, 4, 3, 5, 5, 4, 3, 1

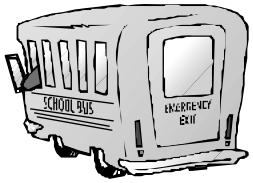
Grades	Tally	Frequency
5		
4		
3		
2		
1		

1. **Copy** and **complete** the frequency table.
2. How many pupils completed the assignment?
3. What was the most common grade for this assignment?
4. What percentage of students scored grade 3 or higher?

Pupils in Year 9 were surveyed to find out how they travelled to school, how far away from school they lived (measured to the nearest km) and how many children, including themselves, are in their family. Below are the results of the survey.

walk 2km 1, bike 3km 2, walk 1km 3, bus 4km 1, walk 2km 2, bike 2km 3, walk 1km 2, walk 1km 2, bike 3km 4, walk 2km 1, bus 6km 3, car 4 km 2, walk 2km 2, bike 3km 1, walk 1km 2, bus 7km 5, bike 5km 2, walk 2km 3, bus 6km 2, car 5km 2, bike 2km 2, walk 1km 3, bike 3km 1, walk 1km 2, walk 1km 3, bike 2km 4, car 5km 2, walk 2km 2, bike 3km 2, bus 7km 3, bus 5km 3, walk 1km 2, bike 2km 3, car 6km 2, walk 1km 4, bike 2km 3, car 5km 2, walk 2km 3, bike 3km 2, bus 7km 2, bus 5km 3, walk 1km 2, bike 2km 4, car 6km 3

5. **Organise** the results of this survey into **two frequency tables**.
6. How many pupils in Year 9?
7. **Study** the results in both frequency tables, then write a statement about the 'average' Year 9 pupil - how he/she travels to school, how far she/he has to travel and the number of children in a family.
8. What fraction of the pupils walk to school?
9. What percentage of the pupils has 2 children in his / her family?



10. **Conduct** a similar survey, or a different survey of interest to you, of the pupils in your class and organise and display your results in frequency tables.

Task 12

Look at the **questions** in the questionnaire you created in **Task 6**, **Worksheet 3.**

For some of your questions, using a **frequency table** may be a good way to collect and organise the data.

Create frequency tables for those questions, **then** proceed to **collect** the **data** using your frequency tables.

Organising grouped discrete data:

To avoid having too many rows in a frequency table, the data can be grouped into categories or **class intervals**. Usually 6 to 7 class intervals is the maximum number to have in any one frequency table.

Each category or **class interval** should be the **same width**.

Example: The number of people entering a local shop was recorded every hour, as displayed in this frequency table.

Number of shoppers / hour		
Class Interval	**Tally**	**Frequency**
1 - 5	𝍸 IIII	9
6 - 10	𝍸 III	8
11 - 15	𝍸 II	7
16 - 20	𝍸	5
21 - 25	I	1
		30

What numbers would be recorded in the class interval 11 - 15?

How many times were there less than 11 people / hr in the shop?

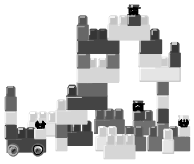
Answers: The numbers 11, 12, 13, 14 and 15 would go in the 11 - 15 class interval.
On 17 occasions, less than 11 people / hr were in the shop.

What other information is contained within this frequency table?

Task 13

The following data shows the number of Lego blocks used to create some 3D block structures.

18, 27, 32, 29, 24, 18, 15, 12, 22,
30, 32, 25, 17, 19, 22, 13, 14, 32,
22, 26, 20, 22, 18, 12, 23, 29, 21,
34, 23, 29, 20, 23, 19, 13, 24, 27,
21, 35, 23, 29, 21, 25, 17, 13, 24



Number of Lego blocks used		
Class Interval	**Tally**	**Frequency**
11 - 15		
16 - 20		
21 - 25		
26 - 30		
31 - 35		

1. **Copy** and **complete** the frequency table, recording the numbers in the appropriate class interval.
2. What was the most common class interval?
3. How many block structures used less than 21 blocks?
4. How many block structures were made all together?
5. Sample this population by selecting every 4th number in the box above until you have 10 numbers. Use these numbers to calculate the mean number of blocks used to create the block structure.

This data shows the points scored by the pupils in Room 8 in a school speech competition, entitled '*A sports person I admire the most*'.

15, 21, 18, 22, 29,
30, 18, 16, 23, 29,
24, 11, 19, 17, 22,
17, 11, 27, 26, 21,
23, 19, 18, 14, 29,
19, 24, 27, 23, 25,
29, 30, 14, 26, 27

6. **Organise** this data in a frequency table using the class intervals 11 - 15, 16 - 20, 21 - 25 and 26 - 30.
7. What was the top mark in the speech competition?
8. How many pupils scored more than 20?
9. How many pupils entered the competition?
10. Sample this population by selecting each 4th number in the box until you have 8 numbers. Use these numbers to calculate the mean score for the speech competition.

This data shows the number of trees planted in the gardens of houses along one street.

11. **Organise** this data in a frequency table using 4 class intervals.
12. What was the most common class interval?
13. How many gardens had less than 11 trees?
14. How many houses were surveyed?
15. Sample this population by selecting each 5th number in the box until you have 10 numbers. Use these numbers to calculate the mean number of trees in a garden.

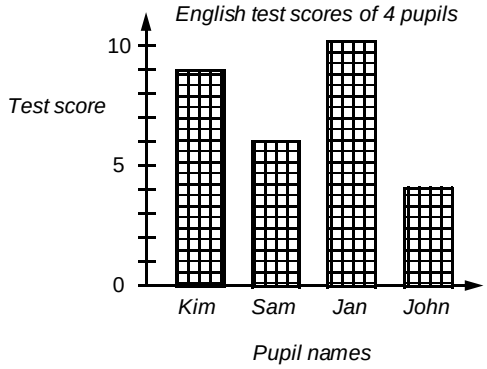
8, 18, 9, 17, 6, 9, 12, 17,
6, 13, 11, 3, 18, 14, 12,
20, 9, 9, 12, 17, 3, 8, 15,
9, 17, 9, 6, 9, 12, 17, 6,
13, 11, 3, 18, 14, 12, 20,
9, 9, 12, 17, 3, 8, 15, 9,
17, 9, 10, 8, 7, 15, 17, 8

16. **Collect** your own data that can be recorded in a frequency table with class intervals.

Displaying ungrouped discrete data as a column graph:

Ungrouped discrete data, organised using a frequency table, can be displayed as a **column graph**.

Example:



All column graphs should have ...

- ☑ a **title** or name,
- ☑ a **label** on each axis,
- ☑ a **scale** on the frequency axis (vertical axis),
- ☑ all **columns** should be the **same width**.

All column graphs MUST have gaps between the columns.

What other information is contained within this column graph?

Task 14

This frequency table shows the tries scored by 5 players in the Christchurch Rugby Club during one season.

Player's Name	Number of tries scored
Wayne	8
Mark	4
Andrew	10
Todd	6
Craig	7

1. **Create** a **column graph** to display these results.
2. Who scored the most number of tries?
3. How many tries did Craig score?
4. Who scored 6 tries?
5. How many tries did these 5 Christchurch Rugby Club players score in this season?
6. Calculate the mean number of tries scored by these 5 players.

James surveyed a sample of pupils at his school, asking them three questions.

1. How many children in your family, including yourself?
2. In which month of the year is your birthday?
3. If you had to make a choice between having a cat or a dog as a pet, which pet would you choose?

Below are the results of his survey, in the order the questions were asked.

7. How could James improve the way he recorded this data?

3, October, dog	2, April, cat	3, August, dog	5, December, dog	3, May, cat	1, April, dog
3, December, dog	1, June, cat	4, December, dog	2, October, cat	1, May, cat	2, April, cat
2, August, dog	3, February, cat	2, November, cat	3, January, dog	3, July, cat	3, September, dog
4, September, dog	1, March, cat	1, May, dog	3, September, dog	4, December, dog	2, August, dog
3, September, cat	3, March, dog	2, January, cat	2, September, cat	1, May, dog	4, September, cat
2, November, cat	3, September, dog	4, December, dog	2, August, dog	2, April, cat	3, October, dog
2, June, cat	2, September, cat	1, August, dog	3, July, cat	3, March, cat	3, March, dog

8. **Reorganise** these survey results into **3 frequency tables**.
9. **Draw 3 column graphs** to display these results.
10. Calculate the mean number of children in each family.
11. **Write several statements** about the pupils at James's school, based on the data he collected.

Task 15

Create column graphs from the frequency tables created in **Task 11, questions 1 and 5**, **Worksheet 8**.

Look back at the frequency tables you used to collect and organise data from your questionnaire.
Create column graphs from the frequency tables you created in **Task 12, Worksheet 8** (if appropriate).

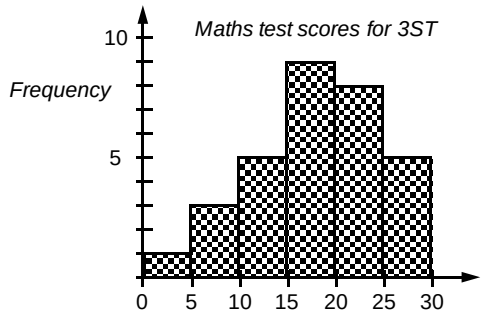
Displaying grouped discrete data as a histogram:

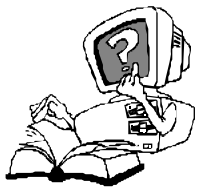
Grouped discrete data, organised using a frequency table with class intervals, can be displayed as a **histogram**.
A histogram is like a column graph without the gaps.
Continuous (measurement) **data** can also be displayed as a **histogram**.
Example: The results of a class test are shown in this **frequency table** and drawn as a **histogram**.

How many pupils scored between 10 and 14 marks in the test?

How many pupils got exactly 23 in the test?

Test scores	Frequency
0 - 4	1
5 - 9	3
10 - 14	5
15 - 19	9
20 - 24	8
25 - 30	5
	31





Answers: 5 pupils scored. It is impossible to tell if any pupils scored exactly 23. We can only say that 8 pupils scored between 20 - 24.

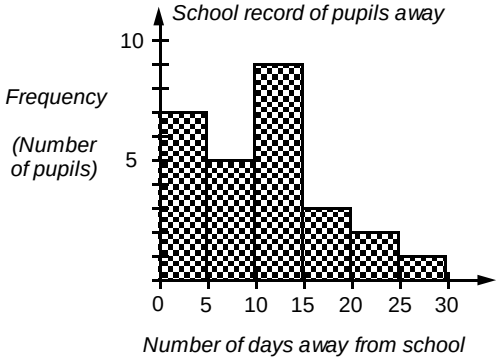
All histograms should have ...

- ☑ a **title** or name,
- ☑ a **label** on each axis,
- ☑ a **scale** on each axis,
- ☑ **class intervals** that have the same interval,
- ☑ all **columns** should be the **same width**.

A histogram DOES NOT have gaps between the columns.

Task 16

Every school has to keep a record of pupils who are absent from school.



This **histogram** shows the number of days pupils were away from school in one year, for a small country school.

1. How many pupils were away for less than 5 days?
2. How many pupils were away for more than 9 days but less than 20?
3. Which class interval shows that 5 pupils were away?
4. How many pupils attend this school?
5. What fraction of the pupils was away for more than 15 days?
6. What percentage of the pupils was away for less than 10 days?

7. **Draw** a **histogram** from the **grouped data** contained in this frequency table.

Points scored in a test

Score	Frequency
1 - 10	8
11 - 20	5
21 - 30	11
31 - 40	9
41 - 50	7
	40

8. ***Organise*** this data into a frequency table using 4 class intervals of 10.

Points scored by Year 10 pupils in a speech competition

21, 35, 20, 40, 19, 41, 32, 28, 33, 24, 27, 17, 49, 23, 24, 47, 36, 24, 22, 37, 11, 24, 29, 46, 35, 24, 37, 19, 47, 24, 18, 45, 24, 28, 41, 33, 25, 32, 48, 49, 33, 27, 43, 34, 27, 41, 29, 37, 42, 24, 21, 45, 32, 44, 32, 31, 41, 43, 37, 39

9. **Draw** a histogram to display these results.
10. What were the top and bottom scores?
11. Which class interval was the most common?
12. What percentage of scores was greater than 30?

12. **Collect** some grouped discrete data of your own and **draw histograms** to display your data.

Collecting and organising continuous data using a frequency table:

The second type of data that can be collected is called **continuous data**.

Continuous data is obtained by measuring. Because continuous data can take on any value, it is recorded in frequency tables that have **class intervals**, similar to frequency tables for grouped discrete data.

Example: The heights of Year 9 pupils are shown in this frequency table.

Heights of Year 9 Pupils

Height (m)	Tally	Frequency
1.30m —	𝍸 𝍸 IIII	14
1.40m —	𝍸 𝍸 III	13
1.50m —	𝍸 𝍸 𝍸	15
1.60 - 1.70m	𝍸 𝍸 II	12
		54

What range of heights would appear in the class interval 1.50m — ?

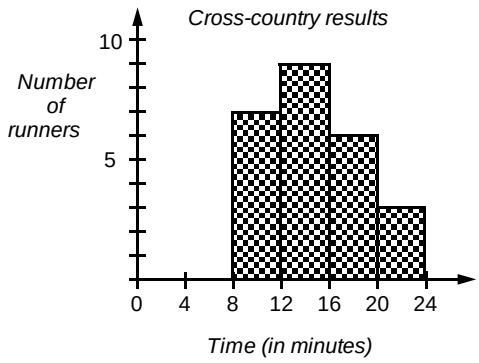
Answer: Any heights ranging from 1.50m to 1.599m, that is, just below 1.60m.

Although we know that 13 pupils were in the class interval 1.40m —, we do not know their exact heights.

What other information is contained within this frequency table?

Task 17

This **histogram** shows the results of a school cross-country race.



1. How many runners ran the course in under 12 minutes?
2. How many runners took longer than 16 minutes to run the race?
3. What fraction of the runners was faster than 16 minutes?
4. What percentage of the runners was slower than 20 minutes?
5. How many runners took part in the race?

Each year there is a salmon fishing competition at the Rakaia river.
The data below shows the weight of each fish caught during the competition.

Fish weights for the Rakaia Salmon Competition (kg)

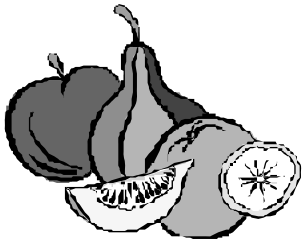
2.4, 1.7, 3.2, 2.9, 2.3, 1.7, 5.2, 4.5, 2.8, 3.9, 4.2, 3.0, 2.7, 1.9, 3.1, 2.6, 4.3, 5.9, 3.2, 4.7, 5.9, 1.7, 5.7, 4.8, 3.1, 2.4, 3.7, 3.8, 4.7, 1.6, 2.2, 3.6, 1.8, 4.2, 3.8, 1.3, 1.9, 3.5, 2.2, 4.7, 5.5, 3.6, 4.3, 5.6, 2.9, 5.9, 4.6, 3.7, 2.2, 3.9, 3.7, 4.3, 1.9, 2.4, 3.9, 1.7, 4.3, 3.7, 1.2, 3.8

6. **Organise** this data into a frequency table with class intervals 1.0kg —, 2.0kg —, 3.0kg —, 4.0kg — and 5.0kg — 6.0kg.
7. **Draw** a **histogram** to display this information.
8. What was the heaviest fish in the competition?
9. How many fish were lighter than 4.0kg?
10. How many fish were heavier than 5.0kg?
11. How many fish were caught in this competition?
12. Sample this population of fish weights by selecting every 4th weight until you have 12 scores. Use the data to calculate the mean weight of fish caught in this competition.
13. Into which class interval does the median weight fall?

Task 18

Collect some **continuous** (measurement) data of your own, recording the data in a frequency table.
Decide on no more than 7 appropriate **class intervals** for each set of data you collect.

Example: The height of pupils in your class.
The weight of various sizes of apples, fruit or vegetables.
The volume of water various containers will hold ... etc.



Try to obtain at least 20 measurements for each set of data.

Draw histograms to display your results.

Creating stem and leaf graphs:

Just as tally charts and frequency tables can be used to record data as it is being collected, so too can a **stem and leaf graph** be used this way.

Example: The birth dates of pupils in Michelle's class are recorded in this stem & leaf graph.

Birthday dates for pupils in Michelle's class

0	7, 8, 3, 2, 1, 9
1	8, 9, 1, 2, 5, 8, 2, 4
2	9, 5, 4, 2, 7, 8, 3, 1, 6
3	1, 0, 0

The numbers 0, 1, 2 and 3 written between the parallel lines, form the **stem** part of the graph.

The numbers outside the parallel lines form the **leaf** part of the graph. **Leaf numbers** are usually written as single digits.

The first row of numbers shown by this graph are 7, 8, 3, 2, 1 and 9.
The fourth row of numbers are 31, 30 and 30.

List the numbers that are in the 20's. Answer: 29, 25, 24, 22, 27, 28, 23, 21 and 26.

A **back-to-back** stem and leaf graph has **'leaf'** numbers on both sides of the **'stem'** numbers.This type of graph can be used when comparing two sets of scores.

Task 19

List the numbers that are represented in these **stem & leaf graphs**, then answer the questions below.

1. *Test results for Year 9 pupils*

5	6, 2, 4, 9, 5, 0
6	0, 2, 9
7	3, 9, 0, 8, 7, 4, 7, 1
8	8, 5, 2, 9
9	7, 4, 3, 0, 5, 3, 8, 4

2. *Cost of buying lunch ($)*

2	2, 3, 8, 3
3	4, 3, 9, 0, 1, 7, 2, 6
4	8, 1, 0, 8, 4, 6, 8, 8
5	2, 7, 3, 7, 0
6	7, 5, 9, 1, 3

3. *Time taken to run a race (seconds)*

12	5, 7, 6
13	2, 6, 9, 7, 0
14	3, 7, 9, 4, 6, 2, 7
15	2, 6, 3, 4, 4, 0
16	9, 4, 5, 4

4. How many Year 9 pupils sat the test?
5. What was the median score for the test?
6. What were the most expensive and the least expensive lunches bought?
7. What fraction of the lunches cost over $49.00?
8. Convert the fastest and slowest times for this race into minutes / seconds.
9. What was the median time for the race?

Pupils in 10St had their heights measured in metres. The results are shown in Box A.

Box A

1.37, 1.29, 1.54, 1.18, 1.33, 1.44, 1.46, 1.37, 1.36, 1.28, 1.36, 1.19, 1.35, 1.41, 1.39, 1.33, 1.25, 1.29, 1.31, 1.19, 1.45, 1.54, 1.48, 1.35, 1.46

10. **Create** a stem & leaf graph, using the numbers 1.1, 1.2, 1.3, 1.4 and 1.5 as the stem numbers, to display these results.
11. What were the tallest and shortest heights?
12. What is the range for these height measurements?
13. How many pupils were measured?

Pupils in 10Cr sat an English test and a Mathematics test. Both tests were marked out of 50. The results are shown below.

14. **Organise** this data as a **back-to-back** stem & leaf graph.

English test results

44, 31, 8, 12, 25, 44, 36, 14, 49, 37, 30, 26, 8, 15, 50, 40, 29, 28, 18, 16, 21, 9, 26, 24, 43, 27, 38, 25, 34

Mathematics test results

36, 18, 50, 45, 26, 48, 39, 40, 22, 50, 10, 23, 49, 31, 25, 8, 21, 22, 46, 49, 32, 33, 48, 36, 44, 50, 37, 28, 35

15. Look at the stem & leaf graph you have created and comment about the results of the two tests. Support your comments by calculating the range, mean, median and mode for each set of scores.

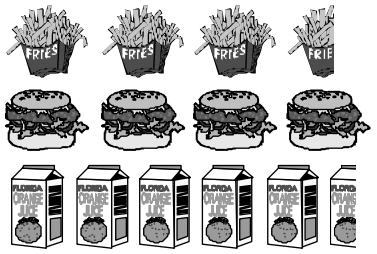
16. **Collect** your own data and present your data as **stem & leaf graphs**.

Please **DO NOT** write on the sheets Please **DO NOT** write on the sheets

Creating pictograms:

Discrete data that has been collected using frequency tables can be represented as **pictograms**.
Example: This pictogram shows the number of each food item sold during one lunchtime at a local shop.

Food items sold



Key
= fries
= hamburgers
= juice
Each picture = 12 items

Pictograms represent data with pictures.

All **pictograms** should have ...

- a title or name,
- a key,
- a scale stating the value of each picture.

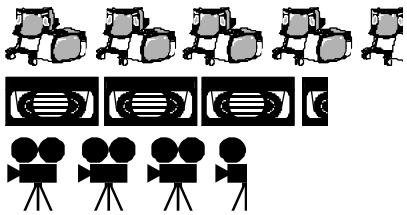
From this pictogram we can work out that 42 cartons of fries were sold.
Were there 54, 66 or 78 cartons of juice sold? Answer: 66 cartons

What other information is contained in this pictogram?

Task 20

A survey was conducted to find out if people preferred to watch TV, watch a video or go to the movies.
This pictogram displays the results.

What people perferred to watch



Key
= television
= videos
= movies
Each picture = 20 people

1. How many people does each picture represent?
2. How many people preferred to watch a video?
3. How many people preferred to go to the movies?
4. How many people were surveyed?
5. What percentage of the people preferred to watch television?

A second survey 6 months later was conducted, with the following results. 105 people preferred watching TV, 60 people preferred watching videos and 90 people preferred to go to the movies.

6. **Draw** a **pictogram** to display these results.
7. What percentage preferred watching television?
8. What fraction preferred watching movies?
9. What fraction preferred to watch videos?

Draw pictograms for the data contained in these frequency tables. **Comment** about each graph.

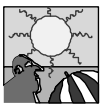
Survey on women's dress sizes

10.

Dress size	F
10	12
12	30
14	18
16	6

Weather conditions recorded for 50 days

11.



Weather	F
sunny	20
cloudy	12
raining	16
snowing	2

Number of each type of book sold

12.

Type of book	F
adventure	100
nature	160
fiction	180
travel	40

13. What fraction of the dresses sold were size 16?
14. What percentage of the days were sunny?
15. What percentage of the books sold were fiction?
16. **Collect** your own data and present your data as **pictograms**.

Task 21

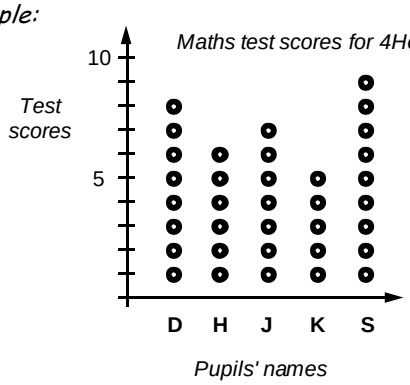
Create pictograms from the frequency tables created in **Task 11, questions 1 and 5**, **Worksheet 8**.

Look back at the frequency tables you created to collect and organise data from your questionnaire.
Create pictograms from the frequency tables you created in **Task 12, Worksheet 8** (if appropriate).

Creating dot plot graphs:

Just as tally charts, frequency tables and stem & leaf graphs can be used to record data as it is being collected, so too can a **dot plot graph** be used this way. A new dot can be added at any time.

Example:



All **dot plot** graphs should have ...

- a title,
- a label on each axis,
- a scale on the frequency axis.

From this graph we can read the scores as follows ...

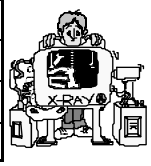
(D) David scored 8, (H) Helen scored 6, (J) John scored 7, (K) Ken scored 5 and (S) Sam scored 9.

Task 22

Draw dot plot graphs for the data contained in these frequency tables. **Comment** about each graph.
Remember to choose an appropriate scale on the frequency (vertical) axis.

1. Number of pupils away

Day	F
Monday	7
Tuesday	11
Wednesday	5
Thursday	10
Friday	6



2. Number of cars of each colour sold

Colour	F
red	80
white	120
blue	50
grey	70
yellow	20

3. Pupils' scores in a Maths test

Name	Score
David	20
Jason	16
Karen	14
Jackie	18
Andrew	12

At a local restaurant orders were being taken for dinner using the menu below.

(S) Soup	*$4.50*
(G) Garlic Bread	*$2.95*
(C) Chicken	*$11.95*
(P) Pork	*$12.95*
(F) Fish	*$10.95*
(A) Apple Pie	*$6.50*
(I) Ice-cream	*$3.95*

The orders are shown in this table below.

S, G, F, I	**S, P, A, I**	**G, F, A, I**	**S, C, I**	**S, G, C, A**
G, C, A	**G, P, A, I**	**S, G, P, A**	**S, C, A**	**G, F, A, I**
S, F, A, I	**S, F, I**	**S, G, P, I**	**G, C, A, I**	**S, G, F, I**
S, G, C, I	**S, G, F, A**	**S, P, A, I**	**G, C, A, I**	**S, G, C, I**
G, P, I	**S, G, C, A**	**S, G, F, I**	**S, G, P, I**	**G, C, A, I**
S, G, F, I	**S, G, P, A**	**G, F, A, I**	**S, G, F, I**	**S, G, P, A**
G, F, A, I	**S, G, F, A**	**S, G, F, I**	**S, G, P, A**	**G, F, A, I**

4. **Organise** this data into a **dot plot graph**.
5. How many people ordered chicken?
6. What was the most popular food item ordered ?
7. How many people ordered pork?
8. What fraction of the orders included soup?
9. What percentage of the orders included fish?
10. If Jan ordered **S, C, A** and **I** what would it cost her and how much change would she receive from $40.00?
11. If Pam ordered **S, G, P, A** and **I** what would it cost her and how much change would she receive from $50.00?
12. List what you would order and how much it would cost.
13. **Collect** your own data and present your data as **dot plot graphs**.

Task 23

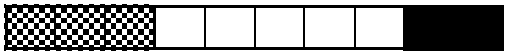
Create dot plot graphs from the frequency tables created in **Task 11, questions 1 and 5, Worksheet 8**.

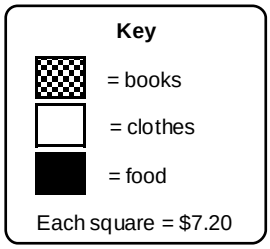
Look back at the frequency tables you created to collect and organise data from your questionnaire.
Create dot plot graphs from the frequency tables you created in **Task 12, Worksheet 8** (if appropriate).

Creating strip graphs / percentage bar graphs:

In a **strip graph**, all the data is contained in a single **strip** or **bar**.
The strip graph is divided into sections, based on the data involved.
A **strip graph** can also be called a **bar graph** or **percentage bar graph**.
Example: Richard has $72. This strip graph shows what he did with his money.

How Richard spent his money





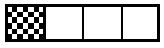
All **strip graphs** or **percentage bar graphs** should have ...
- a title or name,
- a key,
- a scale stating the value of each square or section, expressed as a percentage or as a number.

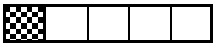
In this example, there are 10 squares, so each square equals 10%.
10% of $72 is $7.20, so each square represents $7.20.

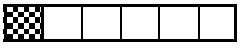
How much did Richard spend on books, clothes and food? Answers: $21.60, $36.00 and $14.40.

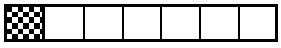
Task 24

Given the total for each **strip graph** below, **work out** what **one square** represents.

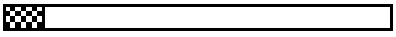
1. 
Total = $70.00

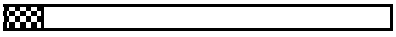
2. 
Total = 95cm

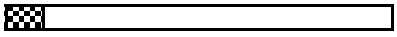
3. 
Total = 84kg

4. 
Total = $45.50

For each **strip graph** below **work out 10%** of each total.

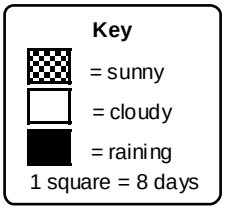
5. 
Total = 36kg

6. 
Total = $54.00

7. 
Total = 108m

Andrew recorded the daily weather conditions as mainly sunny, cloudy or raining. This **strip graph** shows the results.

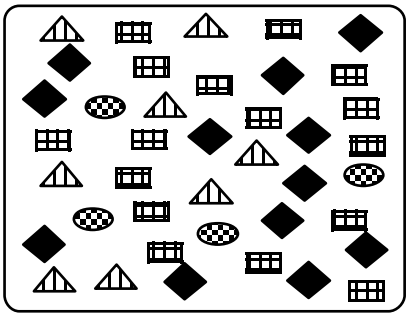
Weather conditions recorded daily



8. How many days does each square of the strip graph represent?
9. For how many days did Andrew record the weather conditions?
10. How many days was it raining?
11. Which weather condition occurred on 24 days?
12. Write the weather conditions in a ratio of sunny to cloudy to raining, then simplify the ratio.
13. What percentage of the days was sunny?

In Keith's year group there are 36 girls and 18 boys.
14. **Draw** a **strip graph** that is **nine** squares long and shade in the squares needed to display these results.
15. Write this information as a ratio of boys to girls, then simplify.

Graham has a collection of different mathematical shapes, as drawn.



16. **Organise** this data into a **frequency table**.
17. **Draw** a **percentage bar graph** (10 squares) to display these results.
18. How many shapes are represented by 10%?
19. What percentage of the shapes are triangles?
20. What percentage of the shapes are rectangles?
21. What fraction of the shapes are ellipses?
22. What fraction of the shapes are rhombi?

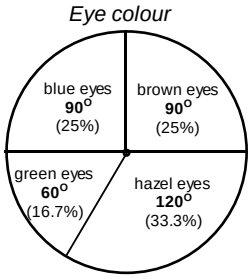
23. **Collect** your own data and present your data as a **strip graph** or a **percentage bar graph**.

Creating pie graphs using a protractor:

By using a **protractor** and **compass**, a pie graph can be divided into sectors to represent the data. To draw a pie graph we must first calculate the angles needed to be able to divide the pie graph into sectors.

Example: This table shows the eye colours of pupils in Room 4.

Eye colour	F
blue	18
hazel	24
brown	18
green	12
	72



Follow these steps to calculate the pie graph sector angles.

Step 1: **Add** up the frequency column. *Example:* 72

Step 2: **Divide** the number of degrees in a circle (360°) by the frequency total.
Example: 360° ÷ 72 = 5°. This means that each person is represented by a 10° angle sector in the pie graph.

Step 3: **Multiply** each group of data by your answer in Step 2.
Example: blue eyes is 18 × 5° = 90°, hazel eyes colour is 24 × 5° = 120°, brown eyes is 18 × 5° = 90°, green eyes is 12 × 5° = 60°

Step 4: **Draw** a circle with a compass, **draw** in one radius, then **draw** the **sectors** using your angle answers from Step 3, using a protractor.

Task 25

1. **Draw** a pie graph with sector angles of 70°, 120° and 170°.
2. **Draw** a pie graph with sector angles of 35°, 50°, 110° and 165°.

Calculate the **sector angles** required to draw pie graphs for the data in these frequency tables, following the steps outlined above.

3. Survey on pupils' shoe sizes

Shoe size	F
6	24
7	8
8	16
9	12
	60

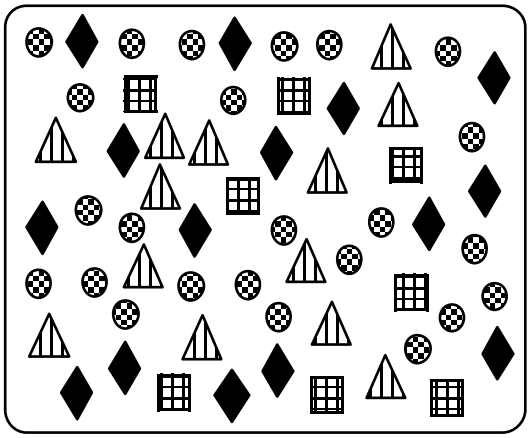
4. Weather conditions recorded for 45 days

Weather	F
sunny	15
cloudy	8
raining	20
snowing	2
	45

5. Number of each type of book sold

Type of book	F
adventure	35
nature	55
fiction	75
travel	15
	180

Andrew has a collection of different mathematical shapes, as drawn.



6. **Organise** this data into a **frequency table**.
7. How many shapes are there altogether?
8. What percentage of the shapes are triangles?
9. What fraction of the shapes are circles?
10. Which shape makes up $^{2}/_{15}$ of the total number?
11. Which shape makes up 25% of the total number?
12. **Calculate** a **sector angle** for each mathematical shape.
13. To display this data, **draw** a **pie graph** using a compass, protractor and the sector angles calculated in question 12.
14. **Collect** your own data and present your data as a **pie graph**.

Task 26

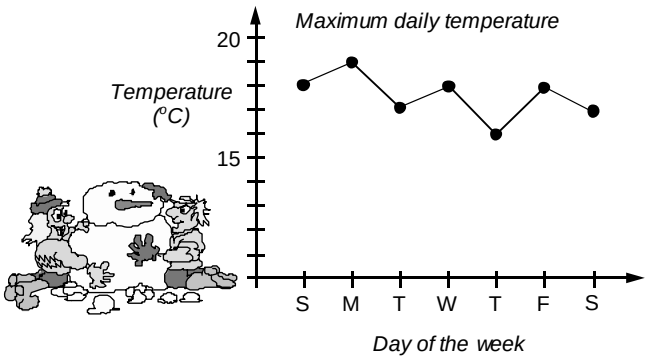
Create pie graphs from the frequency tables created in **Task 11, questions 1 and 5, Worksheet 8**.

Look back at the frequency tables you used to collect and organise data from your questionnaire.
Create pie graphs from the frequency tables you created in **Task 12, Worksheet 8** (if appropriate).

Creating time-series graphs:

Data that changes with time can be graphed as a time-series graph. Time-series graphs will always have time on the horizontal axis. This may be in years, months, weeks, days, minutes or seconds.

Example: Jeremy recorded the maximum daily temperatures for one week.



All **time-series** graphs should have ....

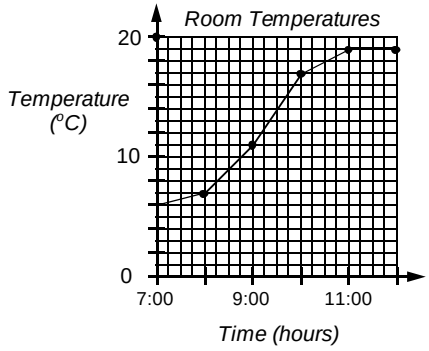
- a title or name,
- time on the horizontal axis,
- a label and scale on each axis,
- ● or X to mark each point, joined by lines.

In this example, the maximum temperature on Sunday was 18°C. List the maximum temperatures for the other days of the week, in order.

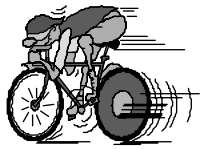
Answers: 19°C, 17°C, 18°C, 16°C, 18°C and 17°C

Task 27

A large room is heated by a gas heater which turns on at 7:00 o'clock and is controlled by a thermostat. The time-series graph below shows the temperature of the room.



1. What was the temperature of the room at 7:00 o'clock?
2. How long did it take for the temperature to rise to 17°C?
3. What was the temperature of the room at 8:00 o'clock?
4. How much did the temperature rise between 9:00 a.m. and 11:00 a.m.?
5. Use the graph to estimate what the temperature of the room was at 10:30 a.m.
6. Calculate the mean temperature for the time period from 7:00 a.m. to 12:00 a.m.



Carl has been training each day for a cycling race. He rides the same distance each day and this table shows how long it takes him, with time recorded in minutes.

Day	M	T	W	T	F	S	S
Time (min)	47	53	49	51	56	48	50

7. Draw a time-series graph to display this data.
8. On which day did he cycle the fastest time?
9. On which day was he feeling really tired?
10. What is the difference between his fastest and slowest training times?
11. Calculate the total time Carl has been training this week. Express your answer in hrs / minutes.
12. Calculate the mean time taken for these rides.

Rainfall is collected in a rain gauge and is measured in millimetres.
This table shows the volume of rain that fell, collected in Sam's rain gauge.

Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Rainfall (mm)	9	16	5	21	17	8	19	0	13	12	27	11	15	10

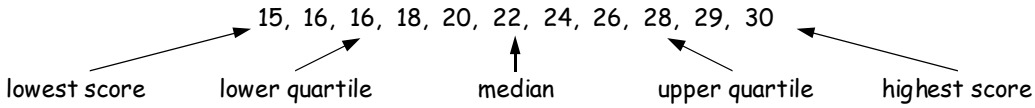
13. Draw a time-series graph to display this data.
14. In which week did it rain the most?
15. In which week was there the least rain?
16. Calculate the range for the rainfall figures.
17. How much rain fell in the 12th week?
18. In which week did 17mm of rain fall?
19. Calculate the median rainfall.
20. How much rain fell altogether?
21. Calculate the mean rainfall.

22. **Collect** your own time-series data and present your data as a **time-series graph**.

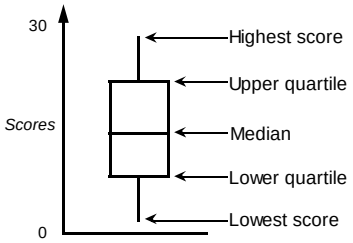
Box & whisker graphs:

From a list of scores, data such as **mean**, **median**, **mode** and **range** can be obtained. There is other information that may also be useful, such as finding the **highest** and **lowest scores**, and the **upper** and **lower quartiles**.

Example:



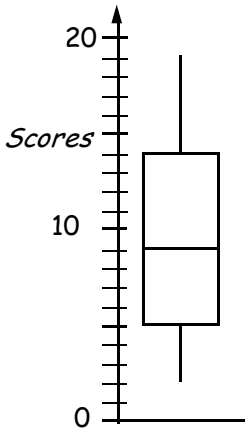
From this information a **'box and whisker'** graph can be created. The graph is so named because of its shape.

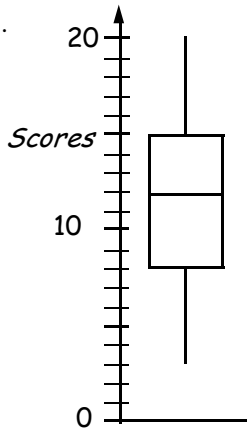


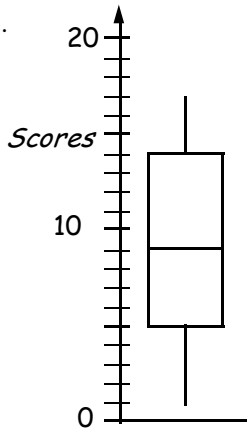
The **'box and whisker'** graph is an appropriate graph to display comparative samples.

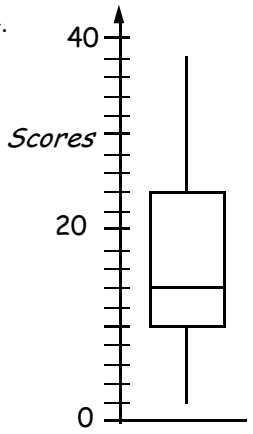
Task 28

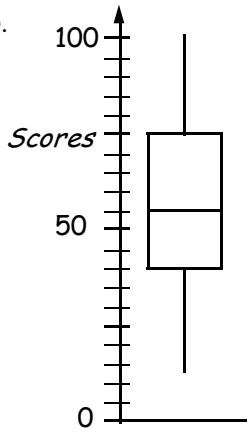
State the lowest and highest scores, range, median, lower and upper quartiles for the following box and whisker graphs.

1.


2.


3.


4.


5.


Draw box and whisker graphs using the following the information.

6. LS = 4, LQ = 10, M = 17, UQ = 21, HS = 28
7. LS = 7, LQ = 13, M = 19, UQ = 25, HS = 32
8. LS = 2, LQ = 9, M = 16, UQ = 23, HS = 31
9. LS = 11, LQ = 15, M = 23, UQ = 27, HS = 35

State the lowest and highest scores, range, median, lower and upper quartiles for the following list of scores.

10. 5, 9, 10, 12, 16, 19, 21
11. 6, 12, 14, 18, 21, 26, 30, 31, 37
12. 4, 5, 21, 24, 25, 29, 30, 41, 55
13. 8, 9, 10, 3, 6, 7, 14
14. 23, 10 ,4, 15, 7, 9, 8
15. 12, 9, 52, 14, 32, 14, 27, 19, 7
16. 26, 16, 31, 45, 37, 21
17. 14, 21, 61, 18, 13, 42, 17, 24
18. 23, 9, 17, 36, 19, 7, 31, 17, 8, 11

Pupils in 9Rd sat a pretest for the next mathematics topic they were about to study. The test was out of 20 and the results are shown in Box A. At the end of the topic, the pupils were retested, with the results displayed in Box B.

Box A

12, 15, 14, 10, 9, 8, 11, 10, 15, 13, 11, 9, 14, 13, 14, 15, 8, 9, 12, 16, 10, 10, 9, 8, 6, 12, 13, 11, 9

Box B

16, 19, 18, 16, 13, 12, 15, 18, 19, 18, 16, 14, 13, 17, 16, 20, 16, 12, 18, 20, 14, 17, 15, 14, 11, 19, 16, 17, 17

19. Draw box and whisker graphs to display the pre and post tests for this mathematics topic.
20. Look at the box and whisker graphs you have created and comment about the results of the two tests.
21. Calculate the mean score for each test. Does it support your comments above?

22. **Collect** your own data and present your data as a **box and whisker graph**.

Interpreting data displays:

The purpose of drawing various graphs and working out means, medians, modes and ranges is to be able to answer questions that have been raised by an investigation.
The ability to interpret a data display is an important skill.

Example: Joanne scored 37%, 41%, 43%, 47%, 75% and 75% in her exams, but said, "I did well because my most common mark was 75%!" Was she right?

Answer: While the mode was 75%, her other 4 scores were all under 50, so she did not do that well.

Task 29

Look at each data display. **Read** the comments written beside them.
Are the comments correct? **Explain** your answers.

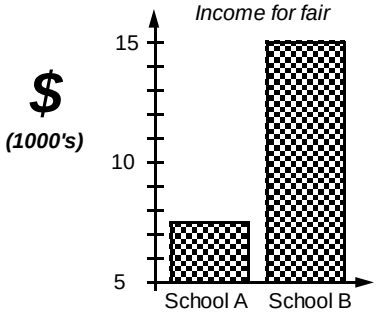
Movie Types

Movie type	Frequency
horror	31
comedy	65
action	25
thriller	19
	140

1. At a small movie theatre, the number of people attending different types of movies was recorded for 1 week, as shown in this table. A comment was made …
"Most movie goers prefer comedy movies."
Is this statement correct?

2. If 350 people went to the movies, based on the results in the table, how many people would you expect to go to each type of movie?

3. This column graph shows the amount of money raised at two different school fairs. A comment was made …
"School B raised four times as much money as School A!"
Is this statement correct? Explain your answer.



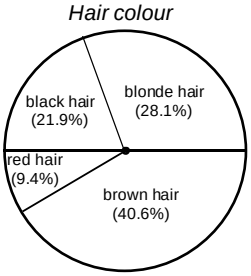
4.

Test scores for 10He		*Test scores for 10St*
5, 8, 9, 4, 3, 6, 2	1	8, 9, 7
2, 0, 6, 7, 6	2	2, 6, 2, 3, 9
3, 1	3	9, 8, 5, 9, 6, 8, 7, 5
0, 0, 0	4	0

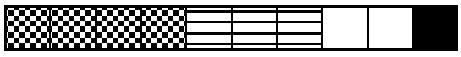
This is a back-to-back stem and leaf graph showing test scores for two classes. A comment was made …
"10He is the better class as 3 pupils got 40 out of 40."
Is this statement correct?

5. This pie graph shows the hair colour of pupils in a Year 9 class.
A comment was made …
"Most pupils have brown hair." Is this statement correct?

6. If there are 32 pupils in this class, calculate the number of pupils with each hair colour.



7. This percentage bar graph shows the results of a survey about Internet providers.



= X-Free Internet Provider

Each square = 20 connections

A comment was made …
"X-Free must be the cheapest Internet provider as it has the most connections." Is this statement correct?

8. If there are 120 new connections, how many would you expect to be using the X-Free provider?

Task 30

Collect some **frequency tables /data displays** from the newspaper or some magazine.

Look at each table / data display and **talk** about the features that make the data displays stand out.

Please **DO NOT** write on the sheets Please **DO NOT** write on the sheets

Creating statistical reports:

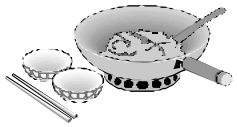
Working in small groups of 2 or 3, your task is to **create** a **statistical report**.

Organise the data into various tables and / or displays, perform calculations such as finding the **mean**, **median**, **mode**, **quartiles** and **range**, as you try to prove or disprove the statement written beside the data.

Remember to **finish** your report with a **conclusion**.

Task 31

1. At a local restaurant, records are kept about people who attend the restaurant.



Key for main meals

C = chicken
F = fish
B = beef
P =pork

Size of group	Choice for main meal	Total cost of meal	Time spent at restaurant
4 people	C, C, F, P	$60.50	2¼ hrs
6 people	F, F, P, C, C, P	$117.00	3½ hrs
3 people	C, B, B	$66.90	1¾ hrs
5 people	B, B, C, F, F	$88.25	3 hrs
3 people	B, C, C	$58.50	2¾ hrs
6 people	P, B, C, C, F, P	$127.50	3¼ hrs
7 people	C, F, P, P, B, B, C	$163.80	4½ hrs
4 people	C, F, B, F	$68.80	3½ hrs

The owner of the restaurant believes that …

- average group size is about 4 people,
- most people like chicken best,
- the average price per meal is $21.00 per person,
- people stay for about $2\frac{1}{2}$ hours.

Is the owner correct?

Two Year 9 classes were given a Mathematics test at the beginning of the year and the same test again 3 months later. The test was out of 50 and the class results are shown in the boxes below.

9Pr **Test 1** **9St**

9Pr	9St
21, 35, 41, 27, 34, 21, 19, 26, 30, 34, 28, 17, 23, 34, 20, 24, 36, 14, 19, 21, 38, 36, 32, 29, 20	24, 37, 44, 29, 37, 27, 38, 19, 23, 24, 40, 38, 35, 33, 27, 23, 21, 29, 32, 37, 29, 18, 25, 37, 25

9Pr **Test 2** **9St**

9Pr	9St
33, 47, 50, 39, 46, 36, 48, 28, 33, 33, 50, 48, 44, 41, 32, 33, 31, 38, 42, 46, 40, 29, 35, 46, 32	43, 41, 38, 36, 30, 26, 24, 32, 35, 40, 32, 21, 28, 40, 28, 27, 40, 47, 32, 40, 30, 41, 22, 25, 27,

2. Conduct an investigation, involving drawing a comparative display and performing various calculations, to determine which class obtained the best results in Test 1.
3. Compare the two test results of each class by using a comparative display and performing various calculations. Comment on your investigation.

Each month 50 shoppers at a shopping Mall were asked … *"Do you own a cellular telephone?"*
The results of the survey are shown in the table below.

Month	Yes	No
May	15	35
June	18	32
July	22	28
August	27	23

4. Draw a display to show these results.
5. From these results, a cellular phone company is trying to predict the number of people owning a cell phone next month. What is your prediction? Explain.
6. Based on the August figures how many people in a city of 245000 would you expect might own a cellular telephone? How accurate would this prediction be?

Task 32

By now you know how to

- ☑ plan an investigation, write a questionnaire / conduct a survey,
- ☑ collect and display data,
- ☑ perform calculations on this data
- ☑ make predictions and write a conclusion based on the results of the investigation.

Conduct an investigation to demonstrate the above skills.

Calculating relative frequency / probability scales:

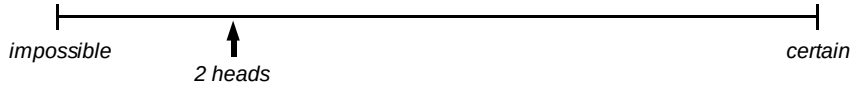
The **relative frequency** of an **event** occurring is the fraction or proportion of times the event occurs.
Relative frequency could also be known as **experimental probability**.

Example: In an experiment, two coins are tossed 50 times (50 **trials**).
The **event** that Kaye recorded is, '*how many times two heads occur*'. This occurred 12 times.

Relative frequency = $\frac{\text{Number of times the event occurs}}{\text{Total number of trials}}$

In Kaye's **experiment** the number of **trials** was 50, and the number of times the **event** occurred was 12, therefore the **relative frequency** of this event was $^{12}/_{50}$.

This event could be marked on a probability scale.



Task 33

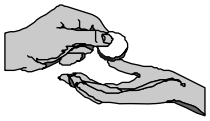
Below is a frequency table recording the results of an experiment where two coins were tossed.

1. **Copy** this frequency table and **complete** the frequency column.

Event	Tally	F
HH	𝍸 𝍸 𝍸 IIII	
HT	𝍸 𝍸 𝍸 𝍸 II	
TH	𝍸 𝍸 𝍸 𝍸 I	
TT	𝍸 𝍸 𝍸 III	

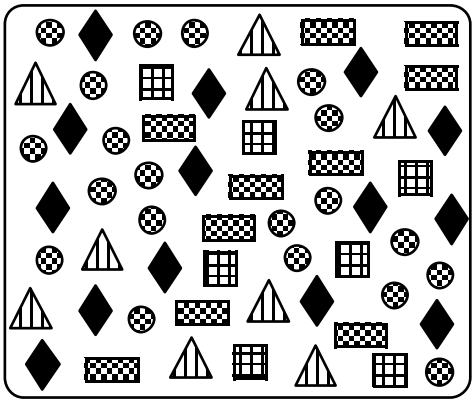
2. How many trials were there in this experiment?
3. **Calculate** the relative frequency for the event head / head.
4. Which event had a relative frequency of $^{11}/_{40}$?
5. **Calculate** the relative frequency for the event tail / head, in any order.
6. **Draw** a probability scale and **mark** on the scale where these three events would be ... HH, TT and HT / TH combined.
7. If the coins are tossed 160 times, how many times would you expect HH to occur?

Working in small groups, repeat the above experiment of tossing two coins 100 times.



8. **Record** your results in a **frequency table**,
9. Work out the **relative frequency** of all events.
10. **Mark** the results of your experiment on a **probability scale**.

Inside a container are the mathematical shapes shown in this diagram.



11. **Organise** the data in a **frequency table**.
12. If a shape is selected at random from the container, work out the relative frequencies that it could be ...
    a rectangle, a circle, a square, a triangle or a diamond.
13. **Draw** and **mark** on a **probability scale** these events ...
    Event A: a square is selected from the container.
    Event B: a diamond is selected from the container.
    Event C: a mathematical shape is selected from the container.
    Event D: a hexagon is selected from the container.
    Event E: a rectangle or circle is selected from the container.

Working in small groups, place up to 20 coloured Lego blocks, preferably all the same size, in a container or bag, noting how many of each coloured block you have.

14. **Select** a Lego block from your container and record which one. Replace the block and repeat 100 times.
15. Based on your results, work out the **relative frequency** of selecting each different coloured block.
16. **Mark** the results of your experiment on a **probability scale**.
17. Using your relative frequency values calculated in Question 15, how many of each coloured block would you expect to be selected if you repeated the experiment 2000 times?

18. **Design** and **conduct** experiments to determine probabilities as long-run relative frequencies.

Calculating theoretical probability:

For equally likely outcomes, the probability of the event occurring can be worked out using the following ...

$$\text{Theoretical Probability} = \frac{\text{Number of ways the event can occur}}{\text{Total number of outcomes}}$$

Example: A coin is thrown in the air. There are two outcomes - heads or tails.
The probability of getting heads is 1 chance out of 2 or $\frac{1}{2}$ or 0.5. Written as P(heads) = $\frac{1}{2}$.

Question: If a coin is tossed 1000 times, in theory how many times should heads occur?

Answer: P(heads) = $\frac{1}{2}$ × 1000 = 500 times

To be able to work out theoretical probabilities, you need to be able to work out all possible outcomes.
This can be done using **grids** or **tree diagrams**.

Task 34

1. A coin and six sided die are thrown at the same time.
Copy and complete this grid to work out all possible outcomes.

coin	6 sided die: 1	2	3	4	5	6
H	H1					
T						

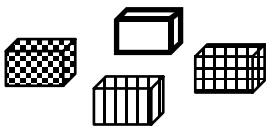
2. How many outcomes are possible?

Use this information to work out the following probabilities.

3. P(H,1)
4. P(T, any even number)
5. P(H,3) or P(T,3)
6. P(H,7)

7. If a coin and a die were thrown 480 times, many times would you expect (Heads, 6) to occur?
8. If the experiment was repeated 720 times, many times would you expect (T,1) or (T,3) or (T,6) to occur?
9. **Conduc**t your own experiment of rolling a six sided die and tossing a coin 96 times.
Record how many times each combination occurs, using an appropriate display.
10. Using your results, work out the **relative frequency** (experimental probability) of each event and compare your figures with the **theoretical probabilities** for each event.
11. **Combine** results with other classmates and again compare the experimental and theoretical probabilities.
Comment on these combined results.

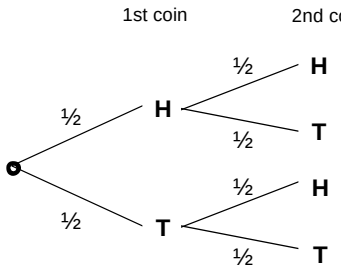
Michelle has two bags containing differently coloured Lego blocks.
Bag A has (R) red, (Bu) blue and (G) green blocks in a ratio of 5 : 2 : 3.
Bag B has (W) white, (Bl) black and (Y) yellow blocks in a ratio of 3 : 1 : 6.



12. Calculate the probability of selecting P(R), P(Bu) and P(G) from Bag A.
13. Michelle selects a block at random from Bag A 72 times, replacing the block after each selection.
How many times would you expect each coloured block to be selected (Theoretical probability) during this experiment?
14. Calculate the probability of selecting P(W), P(Bl) and P(Y) from Bag B.
15. Michelle selects a block at random from Bag B 120 times, replacing the block after each selection.
How many times would you expect each coloured block to be selected (Theoretical probability) during this experiment?
16. Michelle now selects one block from each bag. Use a **grid** to help work out all possible combinations of the two coloured blocks she could select.
17. **Create** your own **experiments**, such as the one above, where you can work out **theoretical probabilities**, conduct an experiment to obtain **experimental probabilities** and compare your results.

Finding outcomes / probabilities using tree diagrams:

A **tree diagram**, so named because of its shape, is a good way of working out all possible outcomes.
Example: Two coins are thrown at the same time. The possible outcomes are shown in this tree diagram.



To find all possible outcomes, follow each branch of the tree diagram. There are four branches so there will be four outcomes.

The outcomes would be ...(H, H), (H, T), (T, H) &, (T,T).

The probability of each event can also be added to the diagram ... that is P(H) = $\frac{1}{2}$ and P(T) = $\frac{1}{2}$. (Note: P(H) means 'probability of getting heads'.)

To work out the probability of an event, such as P(H, T) , multiply the probability of 1st coin (heads) and 2nd coin (tails), as you follow the branches of the tree diagram.

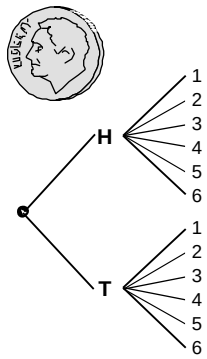
Example: P(H) × P(T) = $\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$

To find the probability of more than one event, such as P(H, H) or P(T, T) occurring, calculate the probability of each event as above, then add the probabilities together.

Example: If P(H, H) = $\frac{1}{4}$ and P(T, T) = $\frac{1}{4}$, the chance of P(H, H) or P(T, T) occurring equals $\frac{1}{4} + \frac{1}{4} = \frac{1}{2}$.

Task 35

This tree diagram shows the possible outcomes when a coin and six sided die are tossed together.



1. Use the tree diagram to list all possible outcomes.

State the probabilities of the following events involving the coins ...

2. P(Heads) 3. P(Tails) 4. P(H or T)

State the probabilities of the following events involving the 6 sided die...

5. P(1) 6. P(3) 7. P(0) 8. P(4 or 5)

9. Copy the tree diagram and add the probabilities for each event.

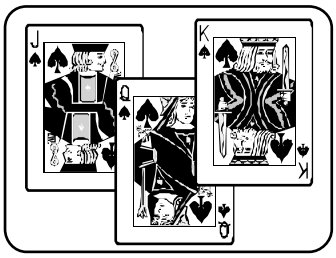
Use the tree diagram to find the probabilities for the following events ....

10. P(H, 5) 11. P(T, 3) 12. P(H orT, 6)
13. P(H, 1 or 2 or 3) 14. P(H or T, factor of 6)

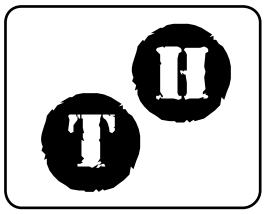
15. In an experiment involving 120 trials how many times would you expect (H,3) to occur?

Michelle is going to select a picture card, toss a coin and select a numbered ball from a bag.

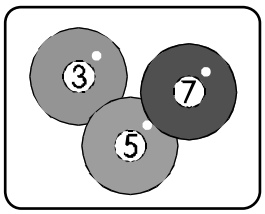
Cards: Jack, Queen or King



Coin: Heads or Tails



Numbered balls: 3, 5, or 7



16. **Draw** a tree diagram to help work out all possible combinations, as Michelle selects a card, tosses a coin and selects a numbered ball, in that order. Include probability values for each event on your tree diagram.
17. Use your tree diagram to list all possible outcomes.

State the probabilities of the following events ...

18. P(King, Tails, 3) 19. P(Jack, H, 7) 20. P(Queen, T, 5)
21. P(King or Queen, H, 7) 22. (Jack, H or T, 3) 23. P(Queen, H, 3 or 5 or 7)

24. In an experiment involving 180 trials how many times would you expect (Jack, H, 3) to occur?

Predicting outcomes, finding probabilities & tree diagrams:

Use the skills acquired from Worksheet 24, Task 35 to find probabilities and use tree diagrams.

Task 36

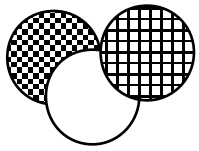
'Breakfast Menu'		
(B)	Bacon & Eggs	$7.50
(T)	Toast & Jam	$3.50
(Ce)	Cereal	$4.00

'Fruit'		
(O)	Orange	$0.50
(K)	Kiwi fruit	$0.25
(A)	Apple	$0.40
(P)	Pear	$0.45

'Drinks'		
(Co)	Coffee	$2.50
(F)	Fruit juice	$0.90

For breakfast, John has a choice of one of the three *'Breakfast Menu'* items, a piece of *'Fruit'* and one of the *'Drinks'*.

1. **Draw** a **tree diagram** to help work out all the possible combinations or outcomes that John could have.
2. How many outcomes are there altogether?
3. State the probability of selecting one of the 'Breakfast Menu' items.
4. State the probability of selecting one of the 'Fruit' items.
5. State the probability of selecting one of the 'Drink' items.
6. Use your tree diagram to find the probability of John having bacon and eggs, kiwi fruit and coffee for breakfast.
7. If 240 people selected breakfast during one week, how many people would you expect to have toast & jam, an orange and a drink of coffee?
8. If John's breakfast cost $10.25, what did he have to eat?



Stewart has a bag of coloured marbles containing 5 black (B), 4 red (R) and 3 white (W).

Calculate the probability of selecting each differently coloured marble from the bag.

9. P(black) 10. (P(red) 11. P(white)

Use your probability values above to predict the following.

12. A marble is selected at random from the bag and replaced each time. If this is done 120 times, how many times would you expect each coloured marble to be selected?

Stewart now selects two marbles, replacing the first marble before selecting the second.

13. Draw a tree diagram to show all possible selections.
14. Use your tree diagram to list all possible colour combinations or outcomes.
15. On your tree diagram write the probability of selecting each differently coloured marble.

Use the probabilty values on the tree diagram to find the following probabilities.

16.	P(black, black)	17.	P(red, red)	18.	P(white, white)
19.	P(R, B) in that order	20.	P(W, R) in that order	21.	P(B, W) in that order
22.	P(R, W) in any order	23.	P(B, R) in any order	24.	P(W, R) in any order

Stewart conducts an experiment of selecting TWO marbles 72 times, replacing the first marble before the second marble is drawn.

25. Calculate the number of times he would expect the two marbles to be red and black, in that order.
26. Calculate the number of times he would expect the two marbles to be white and red, in that order.
27. Calculate the number of times he would expect the two marbles to be black and white, in any order.

In a second experiment, TWO marbles were selected but this time the first marble was not replaced.

28. If a white marble was selected first, what is the probability of selecting another white marble?
29. Calculate the probability of P(B, B) and P(R, R) in this second experiment.

30. **Create** your own **experiment**, such as the one above, where you can work out **theoretical probabilities**, conduct the experiment to obtain **experimental probabilities** and compare your results.

‘In-class’ Worksheets

Teaching Notes & Answers

How to use this section:
Teaching notes are enclosed in a box with a ‘push-pin’ at the top left corner. The teaching notes precede the answers for each worksheet / task. The teaching notes have been included to provide assistance and background information about each topic or unit of work.

Introduction:

The topic of **Statistics** is concerned with the planning of investigations, providing an opportunity to study issues that are important to the pupils at your school. The ability to collect the appropriate data and to display the data in various tables or graphs to communicate the results of the investigation is an important skill. From the displays, distinctive features can be highlighted and further calculations can be performed, to interpret the data to support the investigation. From these interpretations, statements and conclusions can be made that are consistent with the results of the statistical investigation.

Exploring probability is also investigated through the use of relative frequency tables and tree diagrams.

Worksheets 1 to 3

Introduction to statistical investigation:
Designing a questionnaire:

In **Task 1** pupils revisit important statistical words and their meanings, first introduced at Level 4.

Key **statistical words** are listed below:

Survey: A **survey** is a brief or detailed study, whereby data that is collected can be used to draw various statistical graphs, interpret the information and make conclusions or predictions based on the evidence of the survey.

Questionnaire: A **questionnaire** is one way of surveying a population when you are asking for an opinion about an issue. A good questionnaire has questions that are clear and concise, but not too many questions.

Population: In everyday language the word **‘population’** refers to the number of people in a town, city or country. In statistics, a ‘population’ can refer to a group of not just people or animals, but a group of anything. *Example:* a population of trees, a population of books, etc.

Sample: A **sample** is part of a population you are interested in. A sample of a population is used if the population is very large or if it is not necessary to survey the whole population.

Representative sample: When we want to make statements about a population, using a survey to sample the population, the sample should be a **representative sample**.
Example: 10% of the pupils at a school are to be surveyed. If there are 500 pupils, 10% would be 50 pupils. If there are 120 boys and 110 girls and 10% are to be surveyed, for the sample to be a representative sample, there would be 12 boys and 11 girls surveyed, giving us a total of 23 pupils.

Random sample: Choosing at **random**, means that every person, or item, has an equal chance of being chosen.

Biased sample: A sample that is not a representative sample is called a **biased sample**.
Example: In a class of 15 girls and 15 boys, if 10 boys and 5 girls were surveyed about what sport they wanted to play at lunchtime, the pupils surveyed would be a biased sample as more boys were asked than girls.

In **Task 2** pupils are to calculate representative samples, given the size of the population and the percentage to be sampled.

In **Task 3** pupils are to investigate various methods of random sampling for a given population, trial these methods and come up with an average (mean) value for a population.

Possible random sampling methods could include ...
Selecting every 3rd, 5th or 7th family until the number of families required is selected, ... selecting a column, ... rolling a die to select a family.

The aim of this task is to highlight that there are many ways to select a sample, but the important point is that the sampling method MUST be random to ensure the sample is not biased.

In **Task 4** pupils are to work in small groups and decide on any important issues that they could investigate. The main features of an investigation are listed with the task.

In **Task 5** pupils are to consider what type of questions they would use when designing a questionnaire, given points about what makes a good questionnaire. Questions are to have 'yes' / 'no' answers and pupils are to create similar questions. Other questions to be answered are created where choices for answers are given.

In **Task 6** pupils are to look back at the issues they considered investigating in Task 4, Worksheet 2 and design a suitable questionnaire. Having designed the questionnaire, pupils are to decide what is the best way the data can be collected, organised and presented.

Task 1

1. population 2. sample 3. survey 4. representative sample 5. biased 6. random
7. questionnaire 8.- 9. - 10. The whole population may be too large to survey, cost too much money or be too spread out etc.

Task 2

1. 15 boys, 17 girls 2. 186 from New Zealand, 294 from Australia
3. 90 from Christchurch, 97 from Wellington, 192 from Hamilton, 260 from Auckland
4. 16 Year 13, 24 Year 12, 34 Year 11, 35 Year 10, 33 Year 9
5. It is biased because not all age groups are represented.

Task 3

1. 90 families 2. Calculate the mean, add up family sizes divide by the number of families.

Worksheets 4 to 7

Calculating the mean (average):
Calculating the median (middle score):
Finding the mode (most common score):
Calculating the range (spread) & finding the appropriate 'average':

There are three different 'averages' that can be worked out, depending on the data and what you are trying to find out.

The **mean** is commonly known as the '**average**'. To find the mean, add up all the scores and divide by the total number of scores, including any zeros that are among the scores.

The **median** is the middle score or half way between the two scores in the middle, once the scores have been placed in numerical order from smallest to largest.

The **mode** is the most common score. There can be more than one mode or no mode at all.

The **range** is a measure of how spread out the scores are. It is calculated by finding the difference between the highest and the lowest scores.

In **Task 7** pupils are to calculate the **mean**, given a list of scores, and solve word problems involving finding the mean.

In **Task 8** pupils are to calculate the **median**, given a list of scores, and solve word problems involving finding the median.

In **Task 9** pupils are to find the **mode**, given a list of scores, and solve word problems involving finding the mode.

In **Task 10** pupils are to calculate the **range**, given a list of scores, and solve word problems involving finding the range.

Task 7

1. 16.60 2. 18.50 3. 48.40 4. 39.33 5. 43.86 6. 161.29 7. 5.58 8. 4.38 9. 5.49 10. 2.69
11. 0.68 12. 142.84 13. $5.24 14. $6.40 15. $5.70 16. 12 times 17. 50.46 seconds 18. 9.7 seconds
19. 15 boxes 20. 1001.67g 21. 22g 22. 9 houses 23. $194290 24. $37000 25. $191400

Task 8

1. 19 2. 18 3. 34 4. 16 5. 12 6. 9 7. 11.5 8. 1.45 9. 3.25 10. 2.15 11. 5.35 12. 13.95
13. 134.5 14. 11.3 15. 3.28 16. 10 times 17. 2.45km 18. 0.7km 19. 16 cartons 20. 1002.5mL
21. 19mL 22. 18 holes 23. 4.5 24. 4 25. 83

Task 9

1. 8, 12 2. 10, 6 3. 4 4. none 5. 25, 33 6. 8 7. 14, 15, 16 8. none 9. 45 10. 4.3 11. 6.3
12. none 13. 15.03 14. 4 15. 3 16. see table 17. 250mL 18. 36 cartons 19. see table
20. 14 minutes 21. 42 calls 22. yes, the mode is now 14 and 18

16.

	Tally	Total
250mL	𝍸 𝍸 𝍸	15
600mL	𝍸 𝍸 II	12
1000mL	𝍸 𝍸	9

19.

	11	12	13	14	15	16	17	18	19
Tally	III	I	III	𝍸 𝍸	𝍸 I	IIII	III	IIII III	IIII
Total	3	1	3	10	6	4	3	8	4

20. 14 minutes 21. 42 calls 22. yes, it is now 14 & 18 minutes

Task 10

1. 19 2. 25 3. 8 4. 24 5. 19 6. 13 7. 18 8. 0.8 9. 0.7 10. 3.1 11. 4.7 12. 7.2 13. 26
14. 10.5 15. 0.8 16. 9 sets 17. $155 18. mean = $728.89, median $705.00 19. 13 purchases 20. 3.5kg
21. mean = 2.184kg, median = 2.33kg 22. 18 holes 23. 5 24. median = 4, mode = 4 & 5 25. 96 26. 83
27. 57 28. 132 29. 113 30. 34, 88 31. 40.6, 109.4

Worksheets 8 & 9

Collecting and organising discrete data using a fequency table:
Organising grouped data:

The are two types of data, **discrete** and **continuous** data. **Discrete** data is any data that has been collected by **counting**. **Continuous** data is any data that has been collected by **measuring**.

The use of a **frequency table** (or tally chart) is an effective way to collect data that is randomly being collected, called out or presented as a random list. Encourage pupils to count in 'fives' as this makes it easier when adding up. Marking data in the appropriate row as you go, rather than searching for all the same data at once, will make it less likely that data items are overlooked. By adding up the frequency column, the number of data items collected can be found.

To use a frequency table to collect discrete data that is well spread out, the data can be **grouped**. Grouping data avoids having too many rows in the frequency table and the grouped data is easier to display. Each grouping or category is called a **class interval**. Class intervals should be the same width or size.
Example: The class interval 1 - 5 includes the numbers 1, 2, 3, 4 & 5 The class interval 6 - 10 includes the numbers 6, 7, 8, 9, 10. Both class intervals are made up of five numbers.

The only disadvantage with grouped data is that you do not know exactly what the number is, once the number has been recorded, only that it falls within a certain class interval.
Example: There are 5 numbers in the class interval 6 - 10, but are the numbers 6's, 7's, 8's , 9's or 10's?

In **Task 11** pupils are to organise discrete data in a frequency table, utilising a tally column, marking off

in fives. The number of items collected is found by adding up the frequency column. By studying the frequency tables created, pupils are to write a statement about the data.

In **Task 12** pupils are to create frequency tables for any appropriate questions that were created in Task 6, Worksheet 3. Having created the frequency tables, pupils are to collect the data, recording the responses in the frequency table.

In **Task 13** pupils are given data that is to be recorded in frequency tables that have class intervals already given. In later questions, pupils are to decide on the class intervals that will be used. As a general rule, somewhere between 5 and 7 equal class intervals is usually enough.

Task 11

1.

Grades	Tally	F
5	𝍸 𝍸 𝍸	15
4	𝍸 𝍸 𝍸 IIII	19
3	𝍸 𝍸 𝍸 I	16
2	𝍸 II	7
1	III	3
		60

5.

Travel	Tally	F
walk	𝍸 𝍸 𝍸 II	17
bike	𝍸 𝍸 III	13
bus	𝍸 III	8
car	𝍸 I	6
		44

Distance	Tally	F
1	𝍸 IIII	10
2	𝍸 𝍸 III	13
3	𝍸 I	6
4	II	2
5	𝍸 I	6
6	IIII	4
7	III	3
		44

Family Size	Tally	F
1	𝍸	5
2	𝍸 𝍸 I	16
3	𝍸 𝍸 III	18
4	IIII	4
5	I	1
		44

2. 60 pupils 3. grade 4 4. 83.3% 6. 44 pupils

7. The 'average' pupil in Year 9 walks between 1 and 2km to school and has one brother or sister.

8. $^{17}/_{44}$ 9. 47.7%

Task 13

1. *Number of Lego blocks used*

C I	Tally	F
11 - 15	𝍸 II	7
16 - 20	𝍸 IIII	9
21 - 25	𝍸 𝍸 I	16
26 - 30	𝍸 III	8
31 - 35	𝍸	5
		45

6. *Speech competition scores*

C I	Tally	F
11 - 15	IIII	5
16 - 20	𝍸 IIII	9
21 - 25	𝍸	10
26 - 30	𝍸 I	11
		35

11. *Number of trees per garden*

C I	Tally	F
1 - 5	IIII	4
6 - 10	𝍸 𝍸 𝍸 II	22
11 - 15	𝍸 𝍸	15
16 - 20	𝍸 III	13
		54

2. 21 - 25 3. 16 structures 4. 45 5. 29, 12, 25, 13, 26, 12, 34, 23, 27, 29 mean = 23

7. 30 8. 21 pupils 9. 35 pupils 10. 22, 16, 11, 17, 21, 14, 27, 30 mean = 19.75

12. 6 - 10 13. 26 gardens 14. 54 houses 15. 6, 13, 12, 17, 17, 17, 18, 9, 15, 8 mean = 13.2

Worksheets 10 to 12

Displaying ungrouped discrete data as a column graph:
Displaying grouped discrete data as a histogram:
Collecting and organising continuous data using a frequency table:

To avoid confusion I would suggest that **column graphs** are always referred to as column graphs and are not called bar graphs. A bar graph is a different type of graph and is referred to in more detail in Worksheet 16, Creating strip graphs /Percentage bar graphs.

A **column graph** is used to display **ungrouped discrete data**, that is, data that has been collected by counting. All column graphs should have ...

- a title or name
- a label on each axis
- a scale on the vertical axis, usually starting from zero
- **gaps between columns**
- all columns should be the same width

The gaps occur between the columns because the data is ungrouped **discrete**, discrete meaning separate. *Example:* A column graph displaying the number of cars of each colour in the staff car park has gaps because each column represents a different colour.

If a **column graph** is drawn **without gaps** between the columns it is called a **histogram**. A histogram is used to display **grouped discrete data** or **continuous data**. Within each column there will be various scores represented. The 'groupings' are called **class intervals**. All class intervals on the same graph should be the same width, just as they are for frequency tables. The features of histograms are the same as for column graphs, except there are no gaps between the columns.

In **Task 14** pupils are to **create column graphs**, given data presented in a frequency table. Data is also presented in a table, from which frequency graphs can be created, followed by the drawing of column graph. Remind pupils to present the graph neatly, with all necessary labels etc.

In **Task 15** pupils are to **create column graphs** from frequency tables created in Task 11, questions 1 & 5, Worksheet 8 and from data collected in their investigations. Having created the column graphs, pupils are to write statements about the data. Remind pupils that the whole purpose of drawing any form of graph is to 'tell a story about the data', so presentation is important.

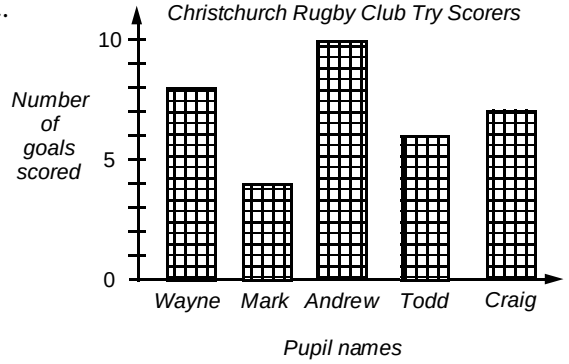
In **Task 16** pupils are to interpret **grouped discrete data** displayed as a histogram and create histograms from grouped discrete data. Remind the pupils, there are **NO GAPS** between columns in a histogram.

In **Task 17** pupils are to interpret **continuous data** displayed as a histogram and to create **histograms** from **continuous data** organised into frequency.

In **Task 18** pupils collect their own continuous data, utilising frequency tables and then drawing histograms to display the data.

Task 14

1.



2. Andrew 3. 7 tries 4. Todd 5. 35 tries 6. 7 tries

7. James could have set up a frequency table and recorded the pupils' responses in them directly, rather than in the table he used.

8.

Number in Family

Number	Tally	F
0	𝍸 II	7
1	𝍸 𝍸 III	13
2	𝍸 𝍸 𝍸 I	16
3	𝍸	5
4	I	1
		42

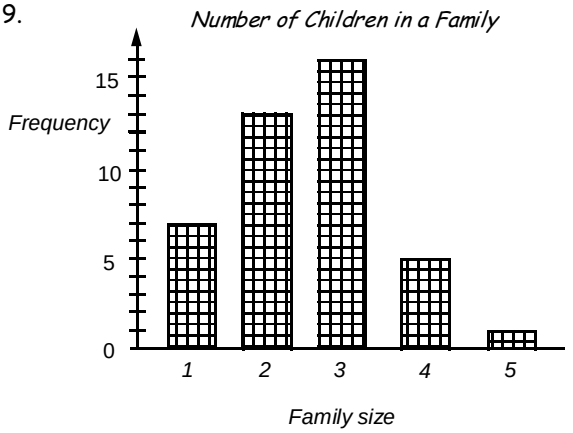
Favourite pet

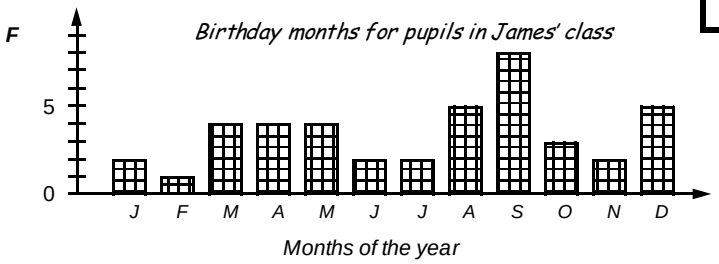
Pet	Tally	F
cat	𝍸 𝍸 𝍸 𝍸	20
dog	𝍸 𝍸 𝍸 𝍸 II	22
		42

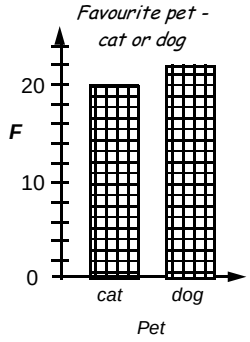
Birthday months

Month	Tally	F
J	II	2
F	I	1
M	IIII	4
A	IIII	4
M	IIII	4
J	II	2
J	II	2
A	𝍸	5
S	𝍸 III	8
O	III	3
N	II	2
D	𝍸	5
		42

9.



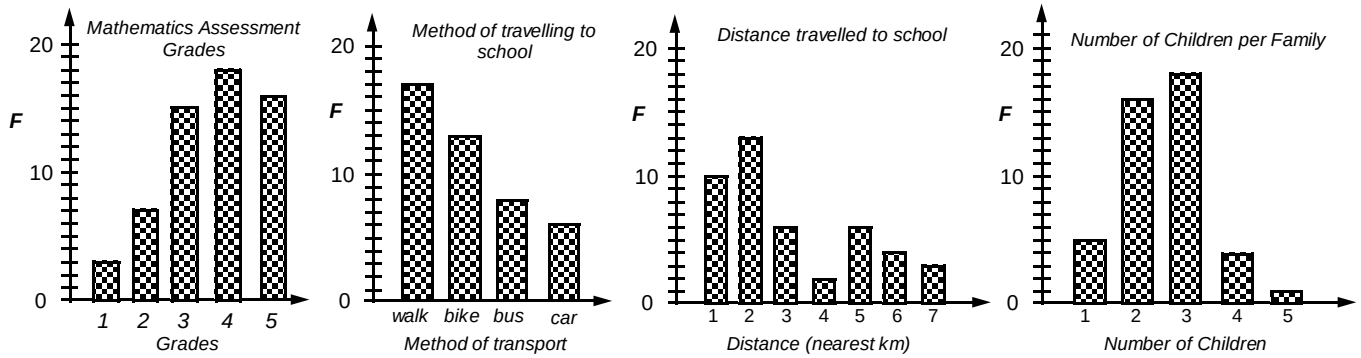




10. 2.52 children / family
11. 69% of the families have 2 or 3 children, September is the most common birthday month, 52% of the children preferred dogs as pets, etc….

Task 15

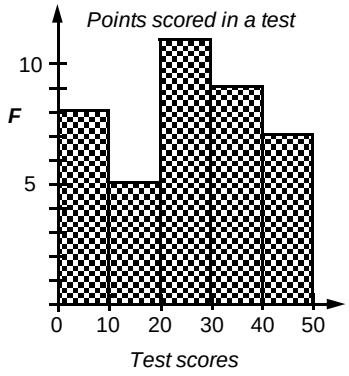
Column graphs using the data from Task 11, Questions 1 and 5, Worksheet 8.



Task 16

1. 7 pupils 2. 12 pupils 3. 5 - 10 4. 27 pupils 5. $^{6}/_{27} = {}^{2}/_{9}$ 6. 44.4%

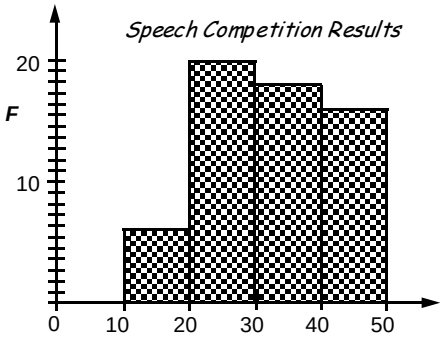
7.



8. *Speech competition scores*

C I	Tally	F
11 - 20	𝍸 I	6
21 - 30	𝍸 𝍸 I	20
31 - 40	𝍸 III	18
41 - 50	𝍸	16
		60

9.



10. 49, 11 11. 21 - 30 12. 56.7% (1 d.p.)

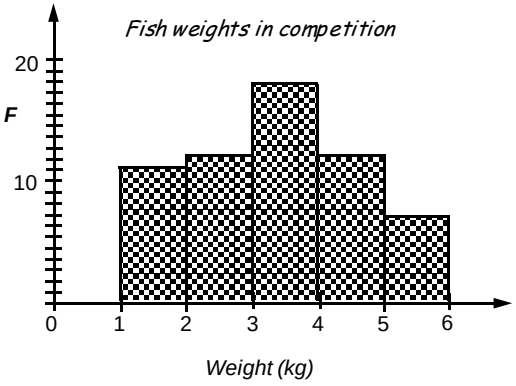
Task 17

1. 7 runners 2. 9 runners 3. $^{16}/_{25}$ 4. 12% 5. 25 runners

6. *Fish weights in competition*

Weights	Tally	F
1.0 -	𝍸 𝍸 I	11
2.0 -	𝍸 𝍸 II	12
3.0 -	𝍸 𝍸 𝍸 III	18
4.0 -	𝍸 𝍸 II	12
5.0 - 6.0	𝍸 II	7
		60

7.



8. 5.9kg 9. 41 fish 10. 7 fish 11. 60 fish 12. 2.9, 4.5, 3.0, 2.6, 4.7, 4.8, 3.8, 3.6, 1.3, 4.7, 5.6, 3.7 mean = 3.77
13. 3.0 -

Worksheet 13

Creating stem and leaf graphs:

A **stem & leaf** graph is so called because of its shape. Stem & leaf graphs can be used to collect data in the same way as a frequency table can be used. Visually stem & leaf graphs can be useful when displaying two sets of similar data, when you want to compare results. When drawn this way, it is called a back-to-back stem & leaf graph. Stem & leaf graphs should have a title.

In **Task 19** pupils are to interpret the data displayed as a stem & leaf graph and create graphs given the data. Pupils are to collect and present data as stem & leaf graphs.

Task 19

1. 56, 52, 54, 59, 55, 50, 60, 62, 69, 73, 79, 70, 78, 77, 74, 77, 71, 88, 85, 82, 89, 97, 94, 93, 90, 95, 93, 98, 94
2. 22, 23, 28, 23, 34, 33, 39, 30, 31, 37, 32, 36, 48, 81, 40, 48, 44, 46, 48, 48, 52, 57, 53, 57, 50, 67, 65, 69, 61, 63
3. 125, 127, 126, 132, 136, 139, 137, 130, 143, 147, 149, 144, 146, 142, 147, 152, 156, 153, 154, 154, 150, 169, 164, 165, 164 4. 29 pupils 5. 77 6. \$69, \$22 7. $^{10}/_{30} = {}^{1}/_{3}$ 8. 2 min 49 sec, 2 min 5 sec 9. 2 min 27sec

10. *Heights of pupils in Room 10*

1.1	8, 9, 9,
1.2	9, 8, 5, 9,
1.3	7, 3, 7, 6, 6, 5, 9, 3, 1, 5
1.4	4, 6, 1, 5, 8, 6
1.5	4, 4

14.

English test results		*Mathematics test results*
9, 8, 8	0	8
6, 8, 5, 4, 2	1	8, 0
5, 7, 4, 6, 1, 8, 9, 6, 5	2	6, 2, 3, 5, 1, 2, 8
4, 8, 0, 7, 6, 1	3	6, 9, 1, 2, 3, 6, 7, 5
3, 0, 9, 4, 4	4	5, 8, 0, 9, 6, 9, 8, 4
0	5	0, 0, 0

11. 1.54m & 1.18m 12. 0.36m 13. 25 pupils

15. In both tests the lowest mark was 8 and the highest mark was 50, therefore the range was the same for each test. For the Mathematics test there were three pupils who scored 50, whereas only one pupil scored 50 in the English test. the mean test result for the Maths test was 34.5 and the English test mean was only 27.8. The median for the Maths test was 36 and the English test median was only 27. The Maths test mode was 50 and the English test mode 8, 26 and 44. All calculations support the fact that pupils scored better in the Maths test.

Worksheet 14

Creating pictograms:

As the name implies, **pictograms** are created using pictures to represent data. All pictograms should have ...

- a title or name
- a key
- a scale stating how much each picture is worth

Each picture represents a certain number of data items and part pictures can also be used, therefore the number of pictures drawn for pictogram questions will vary depending on the value of each picture.

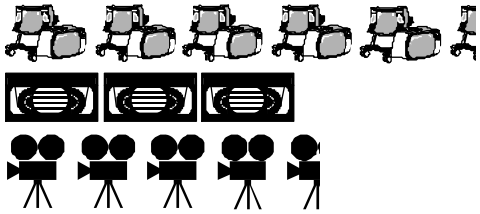
In **Task 20** pupils are to interpret the data displayed as a pictogram and create graphs given the data. Pupils are to collect and present data as pictograms.

In **Task 21** pupils are to create pictograms from the frequency tables created in Task 11, Questions 1 & 5, Worksheet 8. Pupils are to look back at the data they collected during their investigation and graph appropriate data as a pictogram.

Task 20

1. 20 people 2. 65 people 3. 70 people 4. 225 people 5. 40%

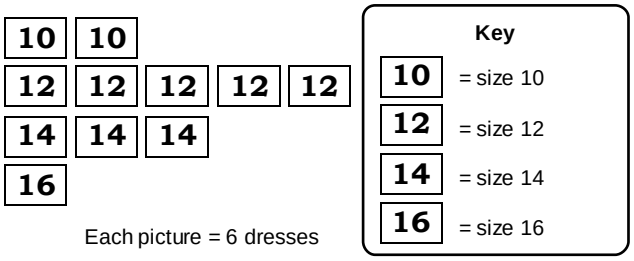
6. *What people perferred to watch*



Key
= television
= videos
= movies
Each picture = 20 people

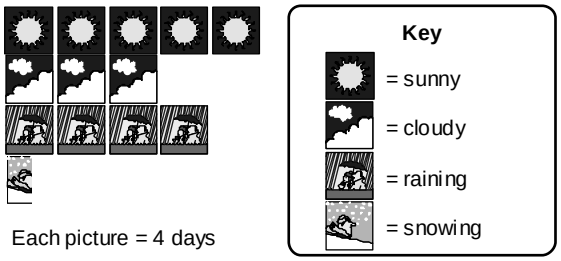
7. 41.2% 8. $^{90}/_{255} = {}^{6}/_{17}$
9. $^{60}/_{255} = {}^{4}/_{17}$

10. *Survey on women's dress sizes*



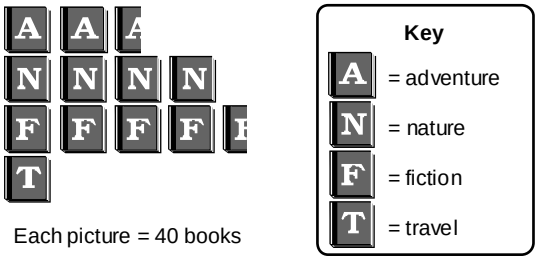
This survey shows that 66 dresses were sold altogether. Of these $^{5}/_{11}$ or about 45% were size 12 dresses, the most popular size sold. The size 10 dresses made up about $^{2}/_{11}$ or about 18%, $^{3}/_{11}$ or about 27% were size 14 and only $^{1}/_{11}$ or about 9% were size 16.

11. *Weather conditions recorded for 50 days*



The weather conditions were recorded for 50 days. On 40% or $^{2}/_{5}$ of the days it was sunny, on 32% or $^{8}/_{25}$ of the days it rained, on 24% or $^{6}/_{25}$ of the days it was cloudy and on only 4% or $^{1}/_{25}$ of the days it snowed.

12. *Number of each type of book sold*



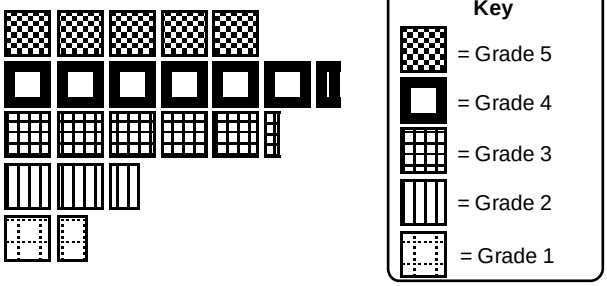
The total number of books sold was 480. The most popular books sold were the fiction books making up 37.5%, followed closely by the nature books with 33.3% of sales. The least popular books were the travel books, making up only 8.3% of sales. Adventure books made up 20.8% of sales.

13. $^{6}/_{66} = {}^{1}/_{11}$ 14. 40% 15. 37.5%

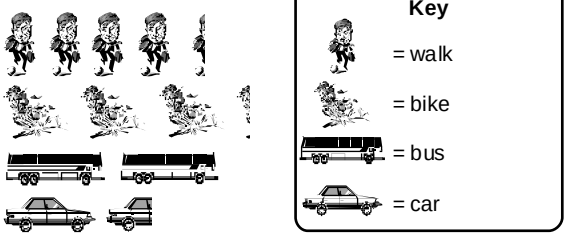
Task 21

Pictograms using the data from Task 11, Questions 1 and 5, Worksheet 8.

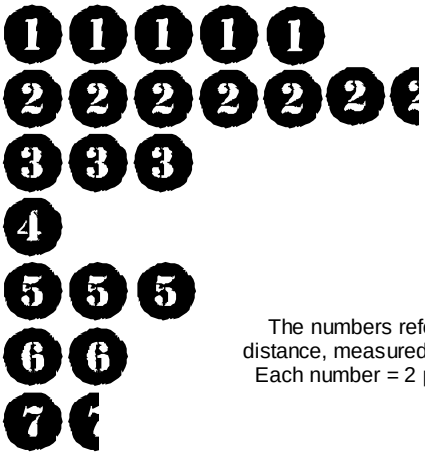
1. *Grades in a Mathematics Assignment*



5. *Method of travelling to school by pupils in Year 9*

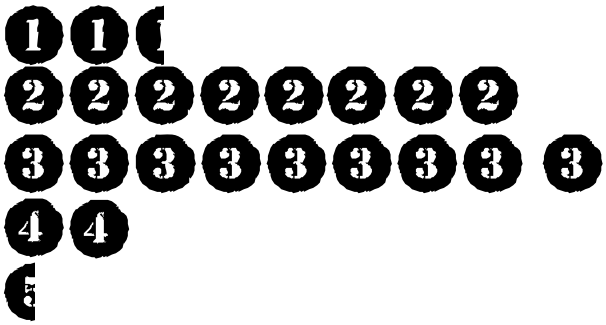


Distance travelled to school by pupils in Year 9, in kilometres



The numbers refer to distance, measured in km.
Each number = 2 pupils

Number of children in each family for pupils in Year 9



The numbers refer to number of children in the family
Each number = 2 children

Worksheet 15

Creating dot plot graphs:

A **dot plot graph** is basically the same as a column graph, where the columns have been replaced by dots. Like the frequency table and stem & leaf graphs, items of data can be added to the graph at any time, in any order, once the axes have been drawn up.

All dot plot graphs should have ...

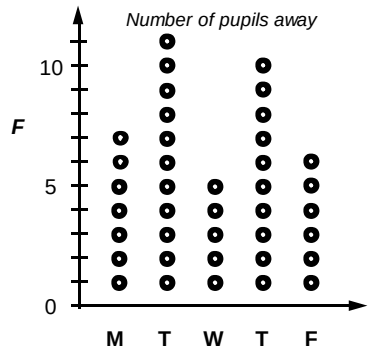
- a name or title
- a scale on the vertical axis
- all dots should be the same size.
- a label on each axis
- gaps between the dots

In **Task 22** pupils are to organise data and create dot plot graphs, plus answer questions related to the data. Having collected their own data, pupils are to create their own dot plot graphs.

In **Task 23** pupils are to create dot plot graphs from the frequency tables created in Task 11, Questions 1 & 5, Worksheet 8. Pupils are to look back at the data they collected during their investigation and graph appropriate data as dot plot graphs.

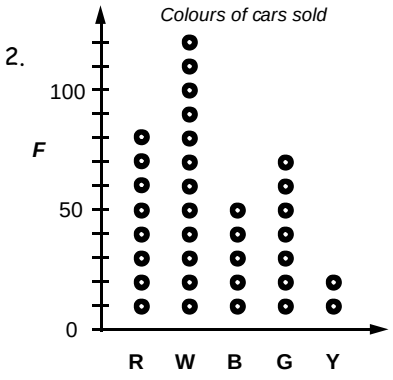
Task 22

1.



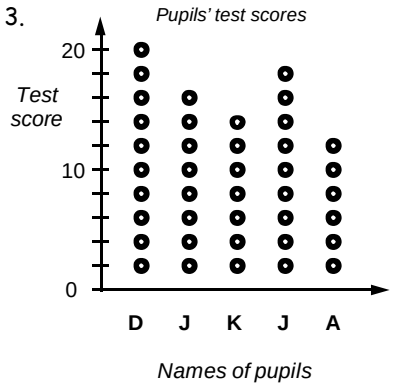
In total there were 39 pupils away during this week, however you cannot tell if it was 39 different pupils or some pupils away for more than one day. The most pupils were away on Tuesday. The least number of pupils away was on Wednesday. The mean number of pupils away each day was 7.8, or almost 8 a day.

2.



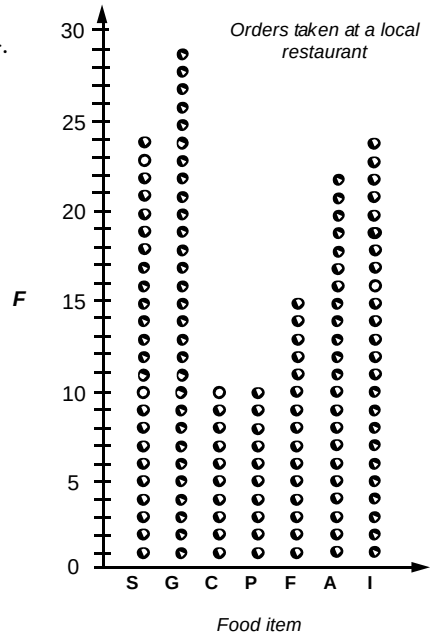
White coloured cars seem to be the most popular although they only make up 120 out of 340 cars noted, or 35.3%. The least popular car colour was yellow (5.9%). Without knowing how many of each coloured car was produced, drawing conclusions from this data may not be very accurate.

3.



David scored the highest test score of 20 and Andrew scored the lowest of 12. The range was 8, the mean was 16 and the median was 16.

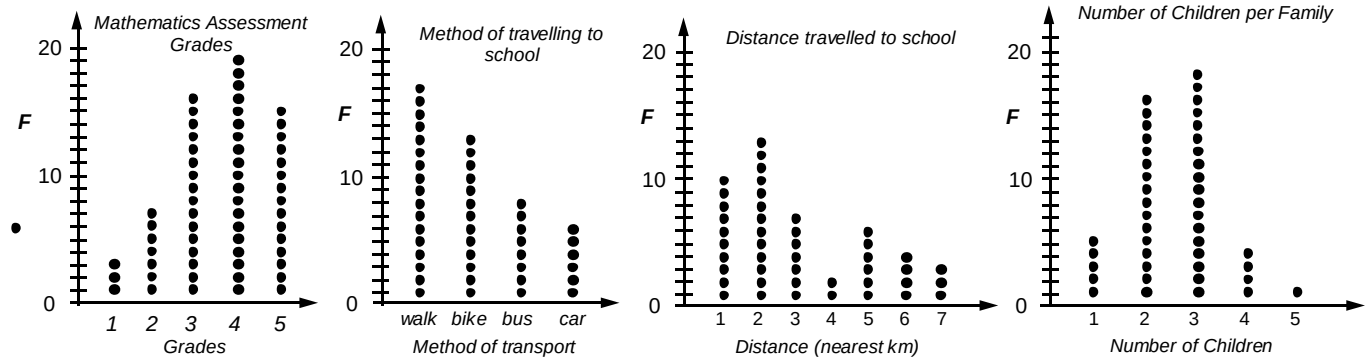
4.



5. 10 people 6. garlic bread 7. 10 people 8. $^{24}/_{35}$ 9. 42.9%
10. $26.90, $13.10 11. $30.85, $19.15

Task 23

Dot plot graphs using the data from Task 11, Questions 1 and 5, Worksheet 8



Worksheet 16

Creating strip graphs / percentage bar graphs:

A **strip graph** is also known as a **bar graph** or **percentage bar graph**. The strip graph can be divided into squares, where the squares represent a known number of items.
Example: A strip graph made of 8 squares, where each square represents 20 items.

All strip graphs or percentage bar graphs should have ...
- a title or name
- a key
- a scale stating how much each square is worth (optional)

If a **percentage bar graph** is being created, the strip is divided into sections based on the percentage of each data item that is being represented. A percentage bar graph could be divided into 10 squares where each square represents 10% of the total.
Example: With a score of 120, each square represents 10% of 120 = 12.

If the data is not conveniently worked out to fit neatly into a known number of squares, a percentage bar graph can be created using percentages. Follow these steps.

Step 1: Work out what percentage each group of data is of the total.
Example: 20 out of 80 pupils play soccer. (20 ÷ 80 × 100% = 25%)
Repeat this calculation for all groups of data.
Step 2: Draw a strip of known length. *Example:* 10cm long
Step 3: Divide the strip up using the percentages calculated in step 1.
Example: 10cm × 25% = 2.5cm

In **Task 24** pupils are to calculate how much each shaded square of a strip graph is worth, given a strip that is divided into squares and the total for all squares. Pupils are to calculate what 10% of a strip graph total is and interpret information displayed as strip graphs. Having learnt these skills, pupils are to create strip and percentage bar graphs from data that is first organised into a frequency table.

Task 24

1. $17.50 2. 19cm 3. 14kg 4. $6.50 5. 3.6kg 6. $5.40 7. 10.8m 8. 8 days 9. 80 days
10. 16 days 11. cloudy weather 12. 40 : 24 : 16 = 5 : 3 : 2 13. 50%

14. *Number of boys and girls in Karen's class*

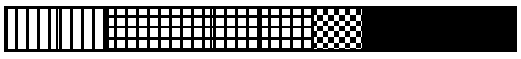
Key: *Each square = 6 pupils* = girls B = boys

15. 18 : 36, 1 : 2

16. *Mathematical shapes*

Shape	Tally	F
△	𝍸 III	8
▭	𝍸 𝍸 𝍸 I	16
⬭	IIII	4
◆	𝍸 𝍸 II	12
		40

17. *Mathematical shapes*



Key: *Each square = 4 shapes*

▯ = △ ▦ = ▭ ▩ = ⬭ ■ = ◆

18. 4 shapes 19. 20% 20. 40%
21. $^{4}/_{40} = {}^{1}/_{10}$ 22. $^{12}/_{40} = {}^{3}/_{10}$

Understanding pie graphs:
Creating pie graphs using a protractor:

A **pie graph** that is divided into sectors is very similar to a strip graph that has been divided into squares. Each sector, just like each square, will represent a certain amount of data. Simple pie graphs can be created this way. All pie graphs should have ...

- a title or name
- a key
- a scale stating how much each sector is worth, given as a number, a fraction, a percentage or in degrees

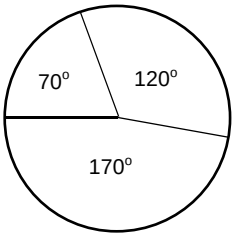
For data that cannot be divided up conveniently, calculations can be done to work out what fraction or percentage of the whole pie graph is required to be shaded to represent the data. The steps to work this out are outlined at the top of Worksheet 17.

In **Task 25** pupils are to draw accurate pie graphs using protractors to create the sector sizes following the steps outlined at the top of Worksheet 17. Having created the pie graphs, pupils are to answer questions related to the information displayed.

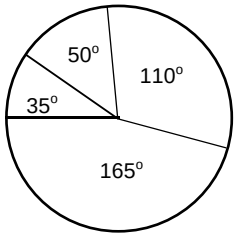
In **Task 26** pupils are to create pie graphs from the frequency tables created in Task 11, Questions 1 & 5, Worksheet 8. Pupils are to look back at the data they collected during their investigation and graph appropriate data as pie graphs.

Task 25

1.



2.



3. Total of 60 pupils surveyed. Therefore 360° ÷ 60 = 6°, sector angles: Size 6 = 24 × 6° = 144°, Size 7 = 8 × 6° = 48°, Size 8 = 16 × 6° = 96°, Size 9 = 12 × 6° = 72°
4. Total of 45 days surveyed. Therefore 360° ÷ 45 = 8°, sector angles: Sunny = 15 × 8° = 120°, Cloudy = 8 × 8° = 64°, Raining = 20 × 8° = 160°, Snowing = 2 × 8° = 16°

5. Total of 180 books sold. Therefore 360° ÷ 180 = 2°, sector angles: Adventure = 35 × 2° = 70°, Nature = 55 × 2° = 110°, Fiction = 75 × 2° = 150°, travel = 15 × 2° = 30°

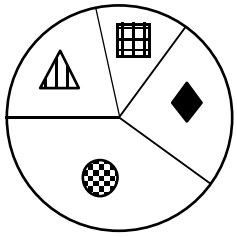
6. *Mathematical shapes*

Shape	Tally	F
	𝍸 𝍸 𝍸 𝍸 IIII	24
	𝍸 𝍸 𝍸	15
	𝍸 III	8
	𝍸 𝍸 III	13
		60

7. 60 shapes 8. 21.6·% 9. $^{24}/_{60} = {}^{2}/_{5}$
10. squares 11. rhombi or diamonds

12. Total of 60 shapes. Therefore 360° ÷ 60 = 6°, sector angles: circles = 24 × 6° = 144°, rhombi = 15 × 6° = 90°, squares = 8 × 6° = 48°, triangles = 13 × 6° = 78°

13. *Andrew's collection of mathematical shapes*



Task 26

Below in the tables are the sector angle calculations, but the pie graphs have not been drawn.

1. F = 60, 360° ÷ 60 = 6°

G	F	sector angles
5	15	15 × 6° = 90°
4	19	19 × 6° = 114°
3	16	16 × 6° = 96°
2	7	7 × 6° = 42°
1	3	3 × 6° = 18°
	60	

4. F = 44, 360° ÷ 44 = 8.18°

T	F	sector angles
walk	17	17 × 8.18° = 139.1°
bike	13	13 × 8.18° = 106.3°
bus	8	8 × 8.18° = 65.4°
car	6	6 × 8.18° = 49.1°
	44	

D	F	sector angles
1	10	10 × 8.18° = 81.8°
2	13	13 × 8.18° = 106.3°
3	6	6 × 8.18° = 49.1°
4	2	2 × 8.18° = 16.4°
5	6	6 × 8.18° = 49.1°
6	4	4 × 8.18° =32.7°
7	3	3 × 8.18° = 24.5°
	44	

D	F	sector angles
1	5	5 × 8.18° = 40.9°
2	16	16 × 8.18° = 130.9°
3	18	18 × 8.18° = 147.2°
4	4	4 × 8.18° = 32.7°
5	1	1 × 8.18° = 8.2°
	44	

Worksheet 18

Time-series graphs:

As the name implies, **time-series graphs** are used to display data that has been collected over time. *Example:* temperature, height or weight changes, etc. This type of data is often continuous data as it is obtained by measuring.

All time-series graphs should have ...

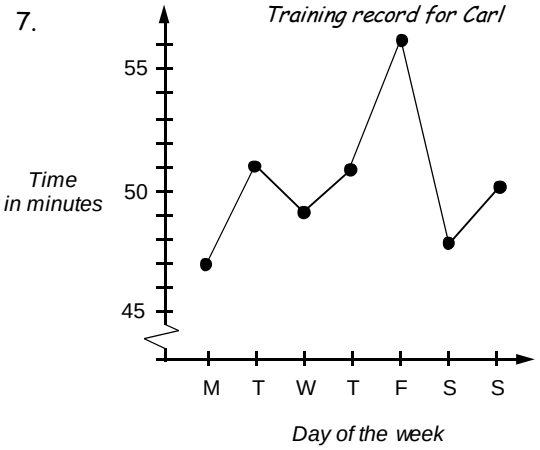
- a title or name
- a scale on the vertical frequency axis
- time on the horizontal axis
- a label on each axis
- dots or X to mark points, joined by lines

In **Task 27** pupils are to interpret a time-series graph, create graphs given the data, and answer questions using the data display. Pupils are to collect and graph their own time-series data.

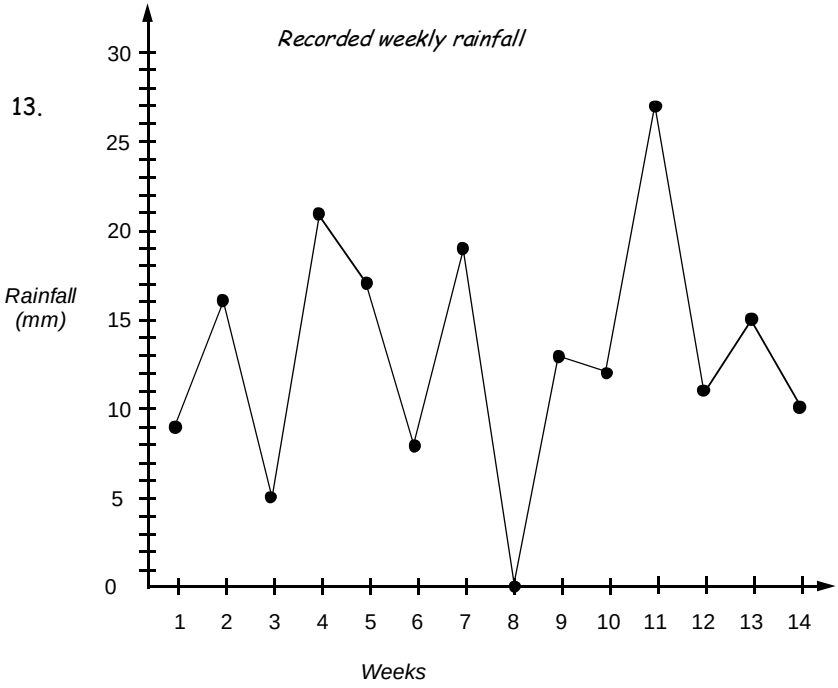
Task 27

1. 6°C 2. 3 hours 3. 7°C 4. 7°C 5. 18°C 6. 13.2°C (1 d.p.)

7.



13.



8. Monday 9. Friday 10. 9 minutes
11. 5 hrs 54 mins 12. 50 mins 34.3 sec

14. week 11 15. week 8 16. 27mm
17. 11mm 18. week 5 19. 12.5mm
20. 183mm 21. 13.1 mm (1 d.p.)

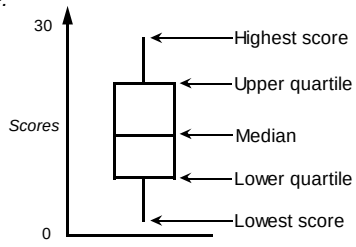
Worksheet 19

Box & whisker graphs:

As the name implies, **box and whisker graphs** are so named because of their shape, being made up of a 'box' with 'whiskers. The **'box and whisker'** graph is an appropriate graph to display comparative samples. To create this graph, the following scores for a set of data must be known ....

the highest and lowest scores,
the median,
upper quartile (half way between the highest score & median),
lower quartile (half way between the lowest score & median).

Example:



All box and whisker graphs should have ...

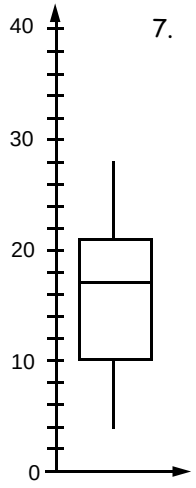
- a title or name
- a label on the axis parallel to the 'box and whiskers'
- a scale on the axis parallel to the 'box and whiskers'
- a box shape to indicate the UQ and LQ range, plus a line indicating the median
- two lines coming from the box to indicate highest and lowest scores

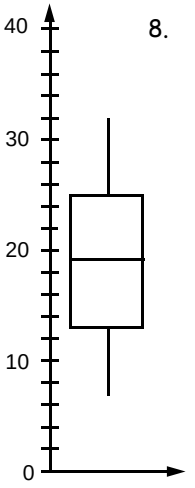
In **Task 28** pupils are to interpret box & whisker graphs, create graphs given the HS, UQ, M, LQ and LS, calculate the HS, UQ, M, LQ and LS from lists of data and create more graphs. Pupils are to collect and graph their own box and whisker graphs data.

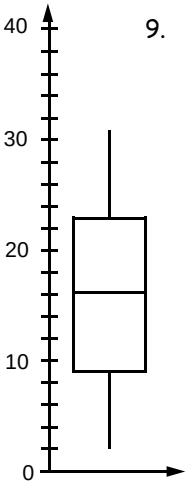
Task 28

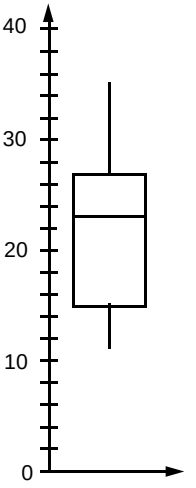
	LS	HS	R	M	LQ	UQ
1.	2	19	17	9	5	9
2.	3	20	17	12	8	15
3.	1	17	16	9	5	14
4.	2	38	36	14	10	24
5.	12.5	100	87.5	55	40	75

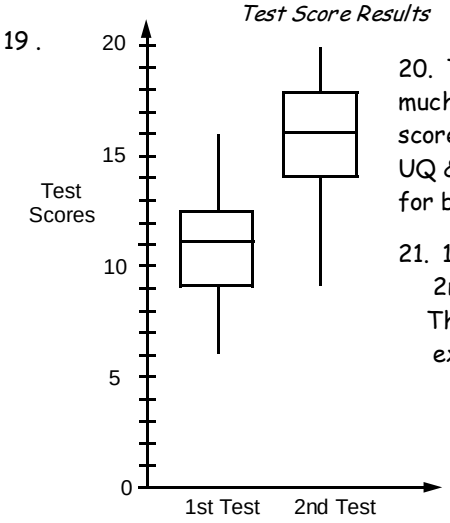
	LS	HS	R	M	LQ	UQ
10.	5	21	16	12	9	19
11.	6	37	31	21	13	30.5
12.	4	55	51	25	13	35.5
13.	3	14	11	8	6	10
14.	4	23	19	9	7	15
15.	7	52	45	14	10.5	29.5
16.	16	45	29	28.5	21	37
17.	13	61	48	19.5	15.5	33
18.	7	36	29	17	9	23

6. 

7. 

8. 

9. 

19. 

20. The second test scores were much better than the first test scores, with all scores, LS< LQ, M, UQ & HS all improving. The ranges for both scores were the same.

21. 1st test mean = 11.2 (1 d.p.)
2nd test mean = 16.1 (1 d.p)
The 2nd test mean is better, as expected.

Worksheets 20 & 21

Interpreting data displays:
Creating a statistical report:

The whole purpose of creating a data display, doing calculations using the data, is to convey a message or prove or disprove a statement. A data display tells a story about the data and being able to interpret that story is an important skill.

Task 29 is a revision exercise where pupils are to interpret various data displays.

In **Task 30** pupils are to look at and talk about data displays that have been collected from newspapers or magazines, discussing the features that make the displays stand out.

In **Task 31** pupils are presented with some data. Using all the skills they have previously learnt about creating data displays and doing calculations using the data, pupils are to create a statistics report to prove or disprove a statement about the data.

In **Task 32** pupils are to conduct an investigation to demonstrate the statistical skills he / she has learnt.

Task 29

1. The statement is not exactly true. 65 out of 140 or 46.4% movie goers went to a comedy movie. While comedy movies were popular, over half of the people went to movies that were not a comedy movie.
2. horror = 78, comedy = 162, action = 63, thriller = 48
3. This statement is incorrect. The scale on the vertical axis is misleading as it does not start at zero. Reading from the scale, School A raised $7500 and School B raised $15000, twice as much, not 4x as stated.
4. While 10He had three pupils who scored 40 out of 40, most of its pupils scored below 30, with a median of 22 and mean of 24.2. Class 10St had only one pupil who scored 40 out of 40,but had more pupils who scored over 30, with a median of 35 and a mean of 30.2.

5. It is correct to say more pupils have brown hair than blonde, black OR red hair. However, 40.6% of the total number of pupils had brown hair, which is not MOST of the pupils as it is not even half.
6. blonde hair = 9 pupils, brown hair = 13 pupils, red hair = 3 pupils, black hair = 7 pupils
7. The statement is not correct as only 40% of Internet connections are with X-Free. That means that 60% do not use X-Free. The reason that it is 'cheapest' cannot be proven as the bar graph gives us no information about price.
8. 48 connections

Task 31

1. Possible displays and calculations that could be done, as you consider the restaurant owner's statements:

Group size: Organise data into a frequency table and then draw a graph.
Calculate the mean, median and mode for group size.
Mean = 38 ÷ 8 = 4.75 people, Median (3, 3, 4, 4, 5, 6, 6, 7) = 4.5 people, Mode = 3, 4 & 6

Choice of main meal: Organise data into a frequency table and then draw a graph.
13 out of 38 mains were chicken, 34.2%. While chicken was the single most popular choice, more people had a main that was not chicken.

Meal	F
chicken	13
fish	9
beef	9
pork	7

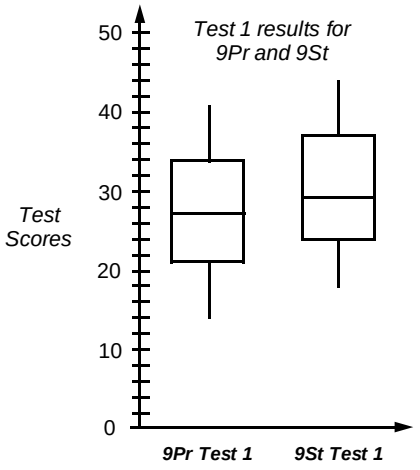
Cost per meal per person: Calculate the mean cost of a meal.
Total cost of all meals = $751.25. Total number of meals = 38
Mean cost = $751.25 ÷ 38 = $19.77

Length of time spent at the restaurant: Draw column or dot plot graph.
Calculate the mean, median and mode times.
Mean = 24.5hrs ÷ 8 = 3hrs 3.75 min, Median ($1\frac{3}{4}$, $2\frac{1}{4}$, $2\frac{3}{4}$, 3, $3\frac{1}{4}$, $3\frac{1}{2}$, $3\frac{1}{2}$, $4\frac{1}{2}$) = $3^1/_8$hrs , Mode = $3\frac{1}{2}$hrs

Conclusion: To summarise the results, the average number of people per group is 4.75, closer to 5 rather than 4 as suggested by the restaurant owner. While chicken was a popular main, more people had a main other than chicken. The average cost per person was about $19.80, slightly less than predicted. The groups stay for an mean (average) time of 3.125 hours, which was longer than predicted.

2. **9Pr Test 1 calculations**:
lowest score = 14
highest score = 41
range = 27
median = 27
lower quartile = 20.5
upper quartile = 34
mean = 27.2 (1 d.p.)

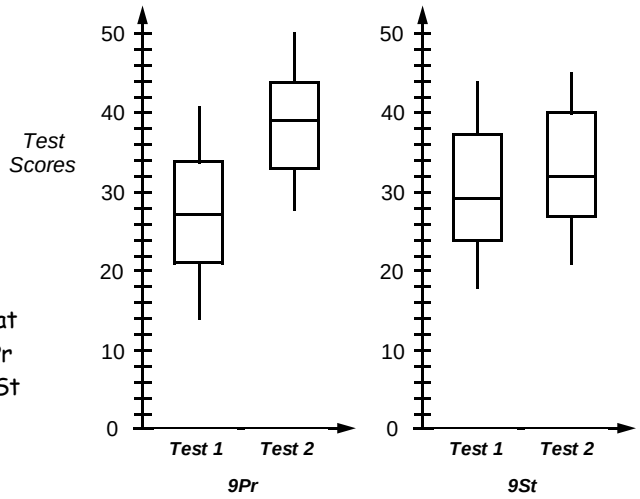
9St Test 1 calculations:
lowest score = 18
highest score = 44
range = 26
median = 29
lower quartile = 24
upper quartile = 37
mean = 30.0 (1 d.p.)



Looking at the results, class 9St scored better than class 9Pr in test 1.

3. **9Pr Test 2 calculations**:
lowest score = 28
highest score = 50
range = 22
median = 39
lower quartile = 33
upper quartile = 46
mean = 39.2 (1 d.p.)

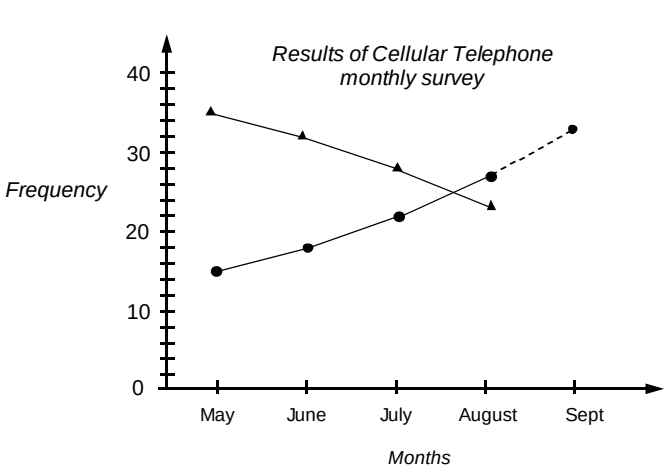
9St Test 2 calculations:
lowest score = 21
highest score = 47
range = 26
median = 32
lower quartile = 27
upper quartile = 40
mean = 33.0 (1 d.p.)



Comparing the Test 1 and Test 2 results for each class shows that 9Pr improved more than 9St. The mean and median marks for 9Pr both increased by 12, whereas the mean and median marks for 9St only increased by 3.

Note: Other comparative graphs such as stem & leaf graphs could be used to compare the above results.

4. Below is a time-series graph, but different graphs could be drawn.



●——● = answered 'YES' to question

▲——▲ = answered 'NO' to question

5. The monthly increases were 3, 4 and 5 more than the month before. A pattern appears and from this a prediction of an increase of 6 more new connections might occur in September. The dotted line on the graph shows the prediction for next month sales - a total of 33 out of 50 will own a cellular phone.

6. If all 245000 people had an equal chance of owning a cellular phone, then 132300 might own a cellular phone. However, not all people in a city would want a cellular phone as some will be children, elderly, or only need one phone / family etc. This would make the prediction too high.

Worksheets 22 to 25

Calculating relative frequency / probability scales:
Calculating theoretical probability:
Finding outcomes and using tree diagrams:
Predict outcomes, finding probabilities and using tree diagrams:

Probability is a measure of the chance of how likely something will happen. Different words can be used to describe the chance of something happening and there are several probability calculations that can be performed. Some important probability words include **experiment, trial, outcome** & **event.**
The rolling of a die, the drawing of a card are called **experiments**. When a die is rolled it is called a **trial**. An **outcome** is the result of an experiment. Finding all possible outcomes can be a challenge. An **event** is one of the possible outcomes.

In **Task 33** pupils are to calculate the **relative frequency** of something happening. Relative frequency can also be known as experimental probability. The relative frequency is worked out on actual results of an experiment. Having calculated the relative frequencies of various events, these results are to be displayed on a probability scale.

Pupils are to conduct similar experiments and use the results to calculate relative frequencies and make predictions.

In **Tasks 34** pupils are to work out the theoretical probability of various events. Having worked out the theoretical probabilities of an event, pupils are to conduct experiments and compare the theoretical probability with the experimental (relative frequency) probability, commenting on the results. The main point to reinforce is that the larger the number of trials in an experiment, the closer the two probabilities will be to each other.

In **Tasks 35 & 36** pupils are to use tree diagrams to work out the probability of events happening and list all possible outcomes. Probability values for events can be written on each branch of a tree diagram to assist pupils to calculate the probability of various events, as indicated at the top of Worksheet 24.

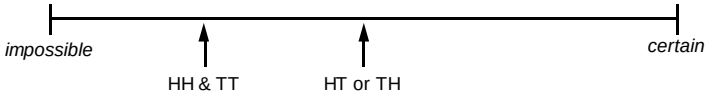
Task 33

1.

Event	F
HH	19
HT	22
TH	21
TT	18
	80

2. 80 trials 3. $^{19}/_{80}$ 4. (Heads, Tails) on that order 5. $^{22}/_{80} + {}^{21}/_{80} = {}^{43}/_{80}$

6.

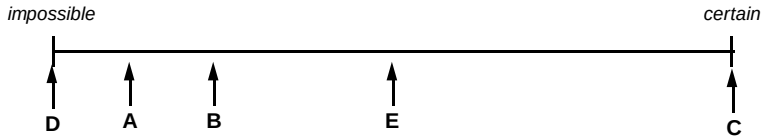


7. Based on relative frequency results $^{19}/_{80} \times 160 = 38$ times, but using theoretical probability, 40 times

11. *Mathematical shapes*

Shape	Tally	F
	𝍸 III	9
	𝍸 𝍸 𝍸 I	7
	IIII	20
	— —	14
	IIII IIII II	10
		60

12. rectangle = $^{10}/_{60}$ or 0.16·, circle = $^{20}/_{60}$ or 0.3··, square = $^{7}/_{60}$ or 0.116··
triangle = $^{9}/_{60}$ or 0.15, diamond = $^{14}/_{60}$ or 0.23·

13. 

Task 34

1. *6 sided die*

coin		1	2	3	4	5	6
	H	H1	H2	H3	H4	H5	H6
	T	T1	T2	T3	T4	T5	T6

2. 12 outcomes 3. $^{1}/_{12}$ 4. $^{3}/_{12}$ or $^{1}/_{4}$ 5. $^{2}/_{12}$ or $^{1}/_{6}$ 6. 0
7. 40 times 8. 180 times

12. P(R) = $^{5}/_{12}$, P(Bu) = $^{2}/_{12}$, P(G) = $^{3}/_{12}$
13. red = 30, blue = 12, green = 18
14. P(W) = $^{3}/_{10}$, P(Bl) = $^{1}/_{10}$, P(Y) = $^{6}/_{10}$
15. white = 36, black = 12, green = 72

16. *Bag B*

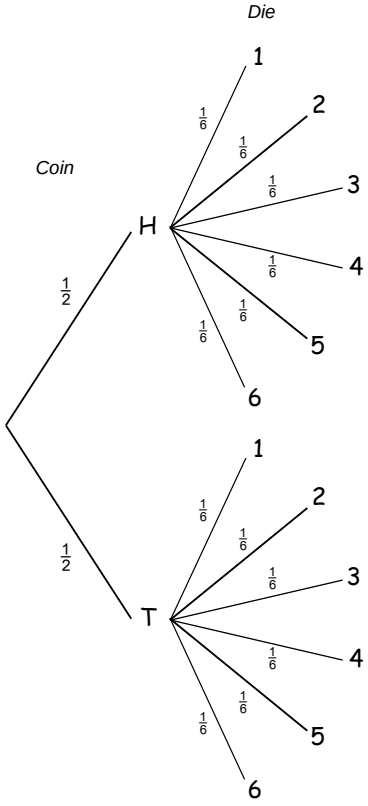
Bag A		W	Bl	Y
	R	RW	RBl	RY
	Bu	BuW	BuBl	BuY
	G	GW	GBl	GY

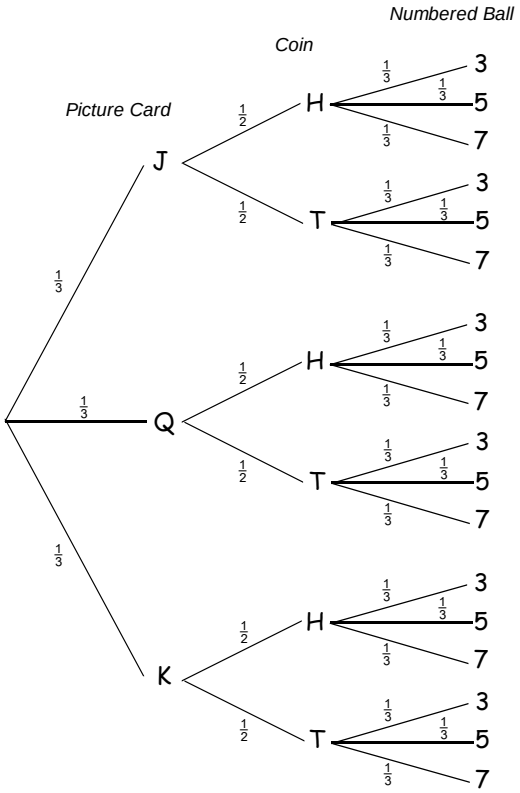
9 outcomes

Task 35

1. H1, H2, H3, H4, H5, H6, T1, T2, T3, T4, T5, T6 2. $\frac{1}{2}$ 3. $\frac{1}{2}$
4. 1 5. $\frac{1}{6}$ 6. $\frac{1}{6}$ 7. 0 8. $\frac{1}{3}$

10. $^{1}/_{12}$ 11. $^{1}/_{12}$ 12. $^{1}/_{6}$ 13. $^{1}/_{4}$ 14. $^{2}/_{3}$ 15. 10 times

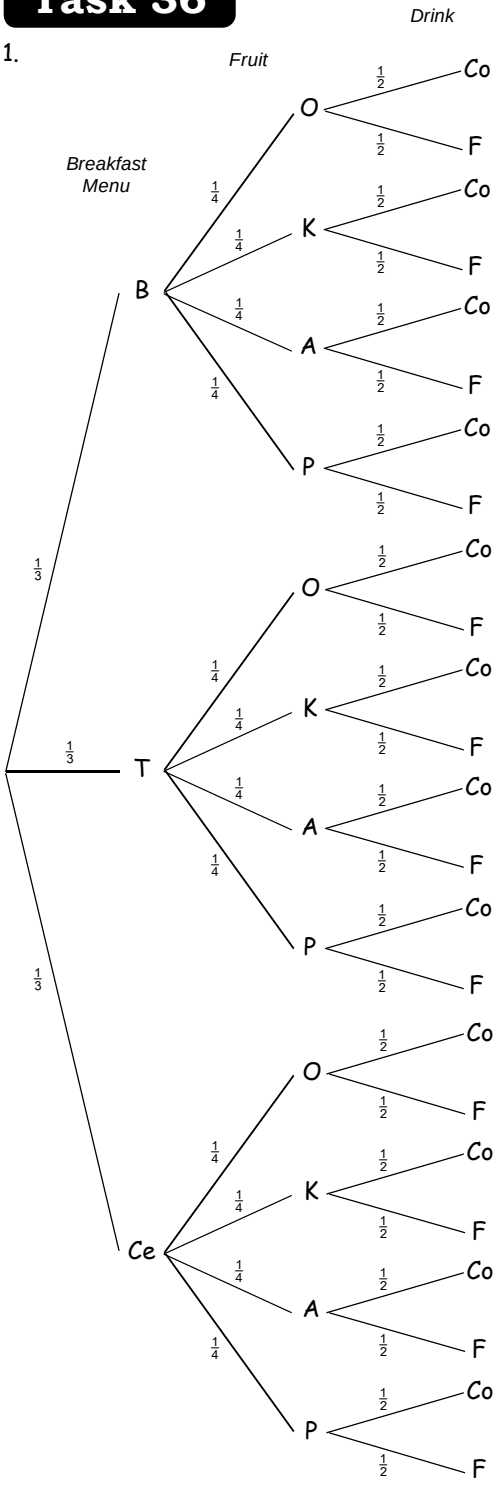
9. 

16. 

17. JH3, JH5, JH7, JT3, JT5, JT7, QH3, QH5, QH7, QT3, QT5, QT7, KH3, KH5, KH7, KT3, KT5, KT7
18. $^{1}/_{18}$ 19. $^{1}/_{18}$ 20. $^{1}/_{18}$ 21. $^{1}/_{9}$ 22. $^{1}/_{9}$ 23. $^{1}/_{6}$
24. 10 times

Task 36

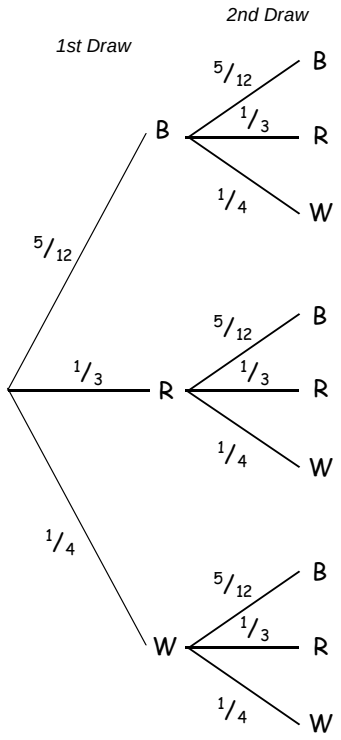
1.



2. 24 outcomes 3. $\frac{1}{3}$ 4. $\frac{1}{4}$ 5. $\frac{1}{2}$ 6. $^1/_{24}$ 7. 10 people
8. bacon & eggs, kiwi fruit and coffee

9. $^5/_{12}$ 10. $^4/_{12} = ^1/_3$ 11. $^3/_{12} = ^1/_4$
12. 50 black, 40 red, 30 white

13..



14. BB, BR, BW, RB, RR, RW, WB, WR, WW

15. see diagram
16. $^{25}/_{144}$
17. $^1/_9$
18. $^1/_{16}$
19. $^5/_{36}$
20. $^1/_{12}$
21. $^5/_{48}$
22. $^1/_6$
23. $^5/_{18}$
24. $^5/_{24}$
25. 10 times
26. 6 times
27. 20 times

28. $^2/_{11}$
29. P(B, B) = $^5/_{12} \times ^4/_{11} = ^{20}/_{132} = ^5/_{33}$
P(R, R) = $^1/_3 \times ^3/_{11} = ^3/_{33} = ^1/_{11}$

Table of Contents for the Homework / Assessment Worksheet Masters for Statistics, Level 5

Statistics

L5MS

S2 / S4

Homework / Assessment Worksheet

1

Term: **Week:** **To be completed by:**

A: 10 Quick Questions

1. $48 \div 8 - {}^{-}9 =$ .....
2. Solve $3x + 7 = 31$
   $x =$ .....
3. Find the missing angle (♣)

   ♣ = ...
4. Calculate the area of a square that has sides of 8.5cm .....
5. Simplify $12x - 15x$ .....
6. Round off 5.059 to 1 d.p. .....
7. How many minutes in 3.75 hours? .....
8. Convert 4156m to km .....
9. $\$6.14 \times 13 =$ .....
10. $0.59 \times 2.5 + 24$ .....

B: Types of data / frequency tables

There are two types of data that can be collected, **discrete** data and **continuous** data. Complete these sentences using these words.

1. Data that is obtained by **counting** is called ..... data.
2. Data that is obtained by **measuring** is called ..... data.

In a Year 9 assessment, grades of 1 to 5 were awarded as shown in this table. Grade 5 is the highest.

3. **Organise** this data in the frequency table below.

Grades	Tally	F
1		
2		
3		
4		
5		

Assessment Grades

1, 3, 1, 2, 4, 3, 1, 2, 3,
3, 4, 2, 1, 4, 3, 4, 2, 5,
3, 2, 3, 2, 5, 3, 1, 3, 4,
1, 5, 4, 3, 3, 2, 3, 4, 1,
4, 3, 1, 5, 4, 3, 4, 2, 3,
2, 4, 3, 4, 2, 4, 5, 4, 3,
3, 5, 2, 1, 3, 2, 5, 3, 4
4, 2, 3, 2, 5, 2, 3, 2, 2
5, 1, 3, 4, 2, 3, 1, 2, 4

4. What was the most common grade? .....

5. How many pupils gained a grade 3 or better? .....
6. How many Year 9 students sat the assessment? .....

C: More frequency tables

Continuous data can be organised using a frequency table divided into class intervals.

Native plant seedlings were measured (cm) after 1 year's growth. The results are displayed in this table.

5.8, 12.6, 4.7, 14.4, 17.3,
7.3, 13.4, 11.9, 19.1, 12.4,
3.9, 8.2, 9.4, 11.7, 17.4,
16.2, 13.9, 7.9, 9.1, 13.7,
16.3, 8.9, 8.2, 13.9, 16.4,
6.9, 16.8, 7.3, 4.9, 15.7,
14.7, 7.3, 6.9, 13.7, 16.7,
18.4, 12.9, 16.3, 12.7, 9.4,
14.5, 8.1, 17.7, 12.3, 13.8

Height of seedlings (cm)	Tally	F
1 -		
5 -		
10 -		
15 +		

1. **Organise** the data into the frequency table.
2. What is the most common class interval? .....
3. How many seedlings are discarded, if seedlings less than 5cm are thrown away? .....
4. If seedlings 10cm or taller are replanted outside, how many seedlings will be replanted outside? .....
5. How many seedlings were measured? .....

D: What type of data?

State if the data is **discrete** or **continuous**.

1. Number of students in your class. .....
2. The population of New Zealand. .....
3. Weight of metal used to build a bicycle. .....
4. Money earned in one day by a pupil. .....
5. Volume of water in a cup. .....
6. Age of students in your class. .....
7. The height of trees in a park. .....
8. The number of people at a rugby match. .....
9. The weight of apples on a tree. .....

Comments:

Please sign:
Parent / Caregiver

AWS

S1 / S2 / S3

Statistics

Homework / Assessment Worksheet

L5MS

2

Term: **Week:** **To be completed by:**

A: 10 Quick Questions

1. $45 \div 5 + 6 \times 9 =$ .....
2. $26 \times \$0.65 =$ .....
3. 4706mL = ... L
4. Convert 0.66 to a fraction (simplify) .....
5. How many days in $8\frac{1}{2}$ weeks? .....
6. Estimate the answer (do not calculate)
   $5.1 \times 9.9 + 30.9 =$ .....
7. Name this shape

   .....
8. Divide \$81 in a ratio of 4 : 5 ..... : .....
9. Simpilify $-9x + 13x$ .....
10. Solve $7x - 9 = 31$
    $x =$ .....

B: Find the 'average' person ?

The table contains data collected from a survey of Kiri's class. From this data, your task is to work out the 'average' of each feature listed, and then describe the 'average' person.

1. Find the average height (add up all heights, then divide by 14) .....
2. Complete the frequency tables for the other features.

Height (m)	Body Type	Eye Colour	Hair Colour	Shoe Size
1.63	slim	brown	black	7
1.58	medium	blue	blonde	6
1.43	slim	blue	black	5
1.75	medium	grey	brown	7
1.42	solid	hazel	black	6
1.53	medium	grey	blonde	4
1.49	solid	brown	brown	6
1.64	medium	blue	blonde	9
1.71	solid	blue	black	7
1.43	medium	hazel	brown	6
1.69	solid	brown	black	7
1.34	slim	grey	blonde	5
1.58	medium	hazel	black	7
1.72	slim	blue	brown	8

Body type	Tally	F
slim		
medium		
solid		

Eye colour	Tally	F
brown		
blue		
hazel		
grey		

Hair colour	Tally	F
black		
blonde		
brown		

Describe the 'average' pupil based on the height calculation and on the results from these frequency tables.

Shoe size	4	5	6	7	8	9	10
Tally							
F							

3. .....
   .....
   .....

C: Walk, bicycle, bus, car ?

Andrew walks to school, as do most of his friends, as they live close to the school.

Conduct a survey in your class, or of 20 to 30 pupils at your school, as to the **way pupils travel to school**.

Use the table below to help collect the data.

	Tally	F
Walk		
Bicycle		
Bus		
Car		
Other		

What is the most common way that pupils travel to school?

.....

D: Dogs or cats ?

Rangi thinks that cats are the most liked pets, compared to dogs. Is he right ?

Survey at least **30 people** as to whether they like **dogs, cats, neither or both as pets.**

	Tally	F
Dogs		
Cats		
Neither		
Both		

Was Rangi right with his guess ? .....

Comments:

Please sign:
Parent / Caregiver

Statistics

L5MS

S3

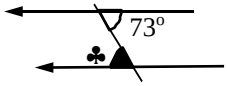
Homework / Assessment Worksheet

3

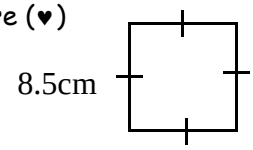
Term: **Week:** **To be completed by:**

A: 10 Quick Questions

1. $0.7 \times 9 + {}^{-}12$ = ...
2. Solve $8x + 11 = 43$
   x = ...
3. Find the missing angle (♣)



   ♣ = ...
4. Find the perimeter of this square (♥)



   ♥ = ...
5. Simplify $9x + 5x - 12x$
   .....
6. Round off 7.265 to 2 d.p.
   .....
7. How many minutes in $4\frac{3}{4}$ hours? .....
8. Convert 5314mm to metres .....
9. \$12.60 × $\frac{1}{4}$ = ...
10. 1.9 + 6.7 × 1.4 = ...

D: Which average ?

Choose which average is best to use, Mean, Median or Mode for the following situations.

1. A shop keeper wishes to know which size shoe he sells the most of. .....
2. Peter wishes to know what his average mark for his class tests was. .....
3. The class is to be split into two groups based on their ability using their marks in a test .....
4. A golfer played 10 rounds of golf and wants to work out what he can expect to score next time he plays.
   .....

B: Which average is that?

Fill in the gaps with one of the words below. (use one word twice)

1. The ..... is commonly known as the average. It is worked out using the formula below.

$$\text{.....} = \frac{\text{Sum of all the data}}{\text{Number of items of data}}$$

2. The ..... is the middle data value, once the data values are in order from smallest to biggest.
3. The most common score is called the ..... There may be more than one, or none at all.

median	mode	mean

C: Finding averages

Calculate the **mean**(A), **median**(B) and **mode**(C) for the scores below.

1. 7, 9, 12, 12, 15 — A = ... B = ... C= .....
2. 5, 9, 13, 15, 20, 22 — A = ... B = ... C= .....
3. 1, 2, 4, 5, 3, 1, 3 — A = ... B = ... C= .....
4. 3, 6, 8, 9, 9, 5, 7, 9, 7, 1, 1 — A = ... B = ... C= .....
5. 2, 3, 3, 6, 4, 9, 12, 15, 15, 7 — A = ... B = ... C= .....

E: Word problems

1. During the past week, Rangi has been shearing the following number of sheep each day, 67, 73, 60, 84, 82, 74, 78. Find the average number of sheep shorn each day. .....

2. The bottom half of the field in a golf match is to be dropped before the final round. What is the 'cut-off' score, if the following scores were recorded?
   66, 70, 71, 72, 74, 76, 76, 77, 77, 78 .....
3. What was the most common score for this round of golf? .....
4. 5 cars at an auction sold for \$92500 altogether. What is the average price of each car? .....

5. A sixth car sold for \$23000, what is the new average price of the 6 cars? .....
6. 12 cars were sold with an average price of \$13750. What was the total value of all cars sold? .....

7. Kelly must average 50% in **all** his class tests to pass Maths this year. If he has scored 53, 62, 41, 39 and 45 % in 5 tests, what is his average so far?
   .....
8. What must he score in his final test, if he is to average 50 % in all 6 tests, as required to pass? .....

Comments:

Please sign:
Parent / Caregiver

AWS

Statistics

L5MS

S3

Homework / Assessment Worksheet

4

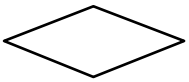
Term: **Week:** **To be completed by:**

A: 10 Quick Questions

1. Find 30% of $85.00 .....
2. 16 × $0.72 = ...
3. Find the missing angle (♣)

♣ = ...

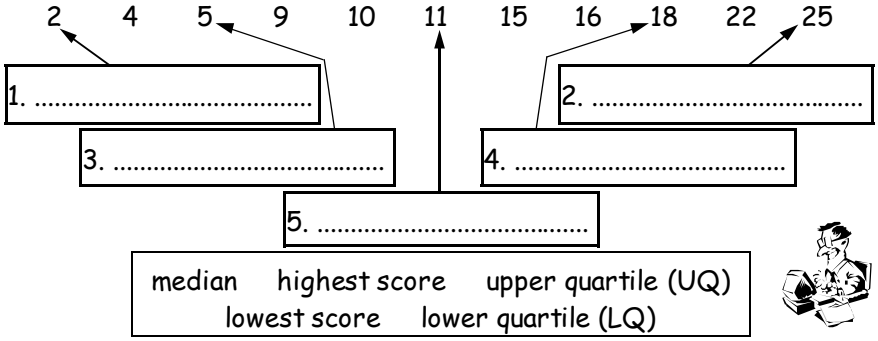
4. Convert 68% to a fraction (simplify) .....
5. Write 920000 in standard form .....
6. Round off 8715 to 2 s.f. .....
7. Draw in the lines of symmetry on this shape



8. Find the next 3 numbers
   4, 8, 16, ..., ..., ...
9. Express 15 as a % of 60 .....
10. Solve $7x + 12 = 51$
    x = ...

B: Range / quartiles

A list of scores can be divided into quartiles and its range calculated.
From the words below, **fill in** the spaces, for the scores as marked.



6. Find the range of the scores listed above. .....

C: Calculating the range, median and quartiles

For each list of scores find the range, LQ, median and UQ, and fill in the table with your answers.

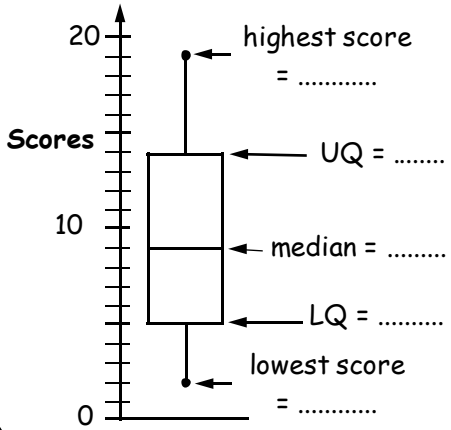
1. 3, 5, 5, 5, 6, 8, 8, 9, 15
2. 1, 2, 5, 6, 7, 11, 14, 17, 19
3. 6, 7, 8, 9, 9, 10, 20, 21 ,22, 26
4. 14, 10, 9, 12, 14, 3, 7
5. 3, 7, 13, 2, 9, 18, 10, 9, 11, 2

	Range	LQ	Median	UQ
1.				
2.				
3.				
4.				
5.				

D: Drawing box and whisker graphs

A box and whisker graph is so called because of its shape.

1. The graph below shows the results of a class test, as they might appear using a box and whisker graph. **Read off** the various scores.



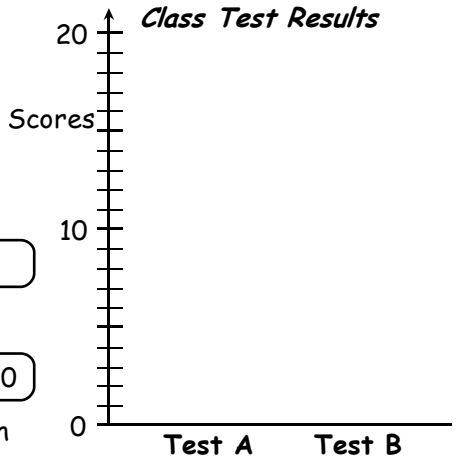
2. **Circle** the LQ, median and UQ for the two class tests listed below. Then **draw** two box and whisker graphs,on the same graph in the space provided.

Test A

2, 3, 4, 5, 5, 6, 9, 10, 12, 14, 17

Test B

5, 6, 8, 9, 10, 14, 16, 17, 18, 19, 20



3. Calculate the range for each test. A = ... B = ...
4. Calculate the mean for each test. A = ... B = ...
5. Comment on the test results. .....
   .....

Comments:

Please sign:
Parent / Caregiver

Statistics

L5MS

5

S2 / S3

Homework / Assessment Worksheet

Term: **Week:** **To be completed by:**

A: 10 Quick Questions

1. Find $\frac{1}{4}$ of \$84 .....
2. List the first 4 multiples of 14 .....
3. Find the missing side (♣)

Perimeter = 38cm

13cm

♣ .....

♣ = ...

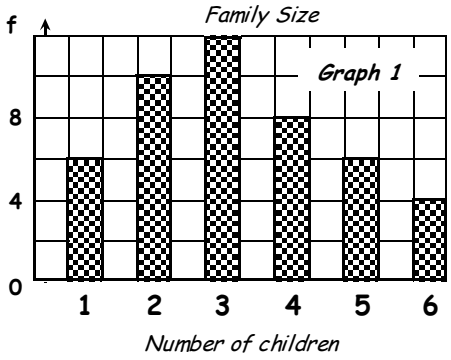
4. The area of a triangle is 18cm^2. If the base is 4cm, what is the height?

.....

5. Convert 0.6 to a fraction (simplify) .....
6. 27 - 9 × 4 = ...
7. $^-4 + 7 - {}^-10$ = ...
8. How many sides does a decagon have ? .....
9. 7362m = ...km
10. 0.63 × 4.1 + 9.6 = ...

B: Column graphs

Graph 1 shows the number of children in each family, for the pupils in Rebecca's class.



1. How many families have 3 children only?

.....

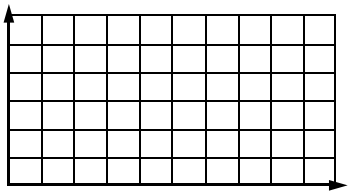
2. How many families have at least 2 children? .....
3. How many families have more than 3 children? .....
4. How many pupils have no brothers or sisters? .....

C: Creating a column graph

The frequency table shows the number of pupils in Mark's class who were away from school during one week.

Days away	1	2	3	4	5
No. of pupils (f)	4	5	3	1	3

Draw a column graph to illustrate this data. (**Label** each axis clearly)



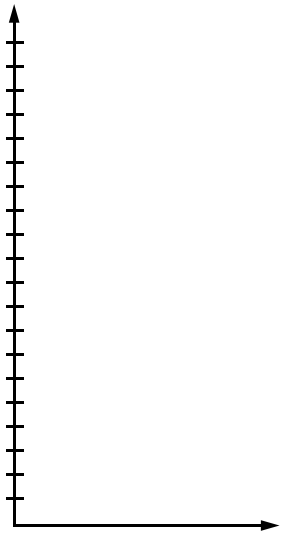
D: More column graphs

In an assessment for Year 10, the following grades were given.

Assessment Grades

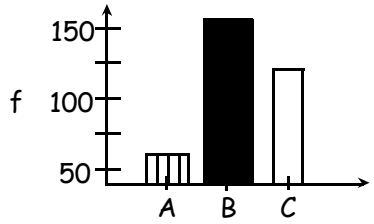
3, 5, 3, 4, 1, 5, 3, 4, 5, 3, 1, 4, 3, 1, 5, 1, 4, 2, 1, 4, 5, 4, 2, 5, 3, 5, 1, 3, 2, 1, 5, 4, 4, 5, 1, 3, 1, 5, 3, 2, 1, 5, 2, 4, 5, 4, 1, 5, 2, 4, 1, 2, 2, 1, 1, 5, 2, 4, 3, 5, 4, 2, 5, 1

Grades	1	2	3	4	5
Tally					
f					



1. Use the tally chart to complete the frequency table.
2. **Draw** a column graph for this data.
3. How many pupils scored a grade 3? .....
4. Which grade did 15 pupils score? .....
5. Pupils who scored a grade 2 or less have to redo the assessment. How many pupils redo the assessment? .....
6. If there are two Year 10 classes of equal size, how many pupils in each class? .....

E: Misleading graph



Find three things in the above graph, which make it misleading.

1. .....
2. .....
3. .....

Comment on this statement.

More road accidents occur on sunny days than wet days. Therefore it is safer to drive on wet roads.

4. .....

Comments:

Please sign:
Parent / Caregiver

AWS

S2 / S3

Statistics

Homework / Assessment Worksheet

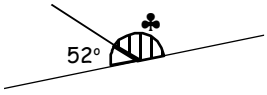
L5MS

6

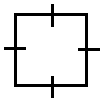
Term: **Week:** **To be completed by:**

A: 10 Quick Questions

1. $45 \div 9 + {}^{-}9 =$ .....
2. Solve $5x + 11 = 42$
   $x =$ .....
3. Find the missing angle (♣)



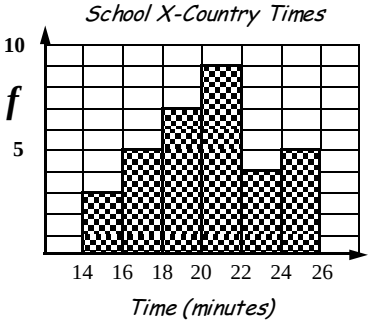
   ♣ = ...
4. Find the area of this square (♥)



   ♥ = ...
5. Simplify $3x + 8x - 12x$
   .....
6. Round off 9.57 to 1 d.p.
   .....
7. How many hours in 3.75 days? .....
8. Convert 952 metres to km
   .....
9. $\$9.35 \times 13 =$ .....
10. $0.72 \times 5.7 + 14 =$ .....

B: Histograms

This graph shows the time taken by runners in the school cross-country race.



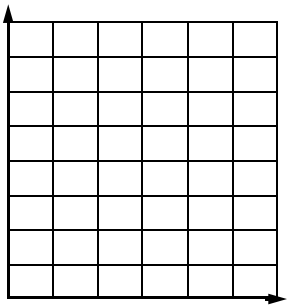
1. How many took 20 to 22 minutes ? .....
2. How many took longer than 24 minutes ? .....
3. How many took less than 16 minutes ? .....
4. How many ran the race ? .....
5. All runners faster than 18 minutes will run in an interschool race. How many will this be ? .....

C: Creating a histogram

The frequency table shows the length of time Shane spent playing a computer game.

Time (minutes)	0 – 1	- 2	- 3	- 4	- 5
F	7	5	6	2	4

Draw a histogram to illustrate this data. Remember to label your graph.



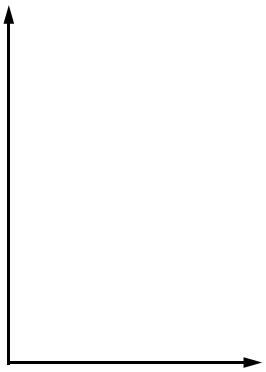
D: Creating a histogram

During a science experiment Miri cut and measured (mm) blades of grass, recording these results.

18, 11, 15, 10, 17, 26, 24, 27, 23, 13, 22, 26, 20, 15, 25, 10, 14, 17, 16, 23, 11, 25, 17, 22, 16, 10, 14, 15, 21, 11, 17, 27, 23, 16, 15, 13

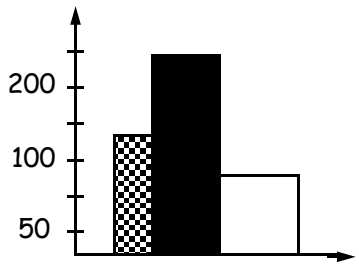
1. Use the tally chart below to **organise** into **class intervals**.

Length (mm)	10 -	15 -	20 -	25 +
Tally				
F				



2. **Draw** the histogram to display this data, labelling your graph.
3. What is the most common group for grass length? .....
4. How many grass blades were less than 25mm long? .....
5. How many grass blades were 15mm or more long? .....
6. How many blades of grass were cut and measured? .....

E: Misleading graph



Find four things in the above graph, which make it misleading.

1. .....
   .....
2. .....
   .....
3. .....
   .....
4. .....
   .....

Comments:

Please sign:
Parent / Caregiver

AWS

Statistics

L5MS

S3

Homework / Assessment Worksheet

Term: **Week:** **To be completed by:**

A: 10 Quick Questions

1. What is the area of a square with sides of 6.5cm? .....
2. How many kilolitres is 2750 litres? .....
3. Find 40% of 650mL .....
4. How many minutes in 6.25 hours? .....
5. $19 \times -8 =$ .....
6. $9^2 + \sqrt{400} =$ .....
7. $19.3 + 7.3 \times 4.5 =$ .....
8. $16.8 \div 1.2 =$ .....
9. Divide $108.00 in a ratio of 5 : 7 .....
10. If $7x + 8 = 47$, find what $x =$ .....

B: Pictographs

The pictograph shows what people thought of a movie,

☺ = liked the movie,

😐 = the movie was OK,

☹ = disliked the movie.

☺☺☺☺☺☺☺☺☺☺
😐😐😐😐😐😐
☹☹☹☹☹☹☹☹
Each picture = 5 people

1. How many people liked the movie ? .....
2. How many people watched the movie ? .....
3. What percentage thought the movie was OK ? .....
4. What fraction liked the movie ? .....

Clothes	$$$$$
Food	$$$$
C.D.'s	$$$
Savings	

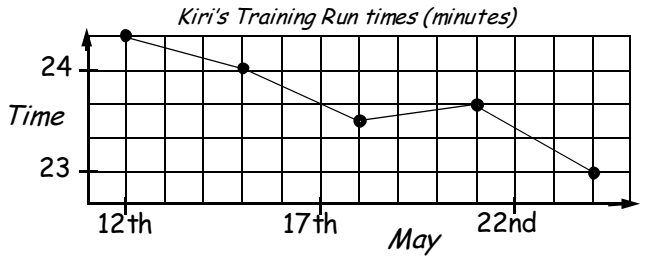
Key: $ = $6.00

Shanna has $90.00. She spends some of her money as shown in the pictogram.

5. How much has she spent on clothes ....., food ..... and C.D.'s .....?
6. **Complete** the **savings** part of the pictogram.

C: Time series graphs

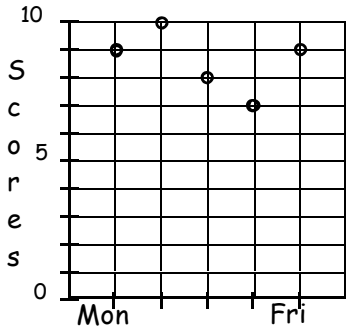
Kiri began training for the school cross-country race. She recorded her times (t = minutes) for a 5km circuit she was running daily, as shown in this line graph.



1. On what day did Kiri start training? .....
2. How long did this first run take? .....
3. How often does she record her time? .....
4. How long did it take her to run the circuit on May 18th? .....
5. On which day did her run take 24 minutes? .....
6. How much faster was she on the 24th of May run, than on her first run of the 12th of May? .....
7. Calculate the average (mean) time for her runs. .....

D: Dot plots

Glen plotted his scores for the ***'10 Quick Questions'*** he did each maths period for one week.



1. What was his highest score? .....
2. What was his most common score? .....
3. What was the average (mean) score for the week? .....

E: % bar graphs

James worked out how he spends his time during the day, as follows ...

40% Sleeping **25% School** **10% T.V.**
10% Homework **15% Other**

Shade in the bar graph below to show this data. Remember to label your graph and draw a key.

Comments:

Please sign:
Parent / Caregiver

Statistics

L5MS

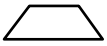
S3 / S8

Homework / Assessment Worksheet

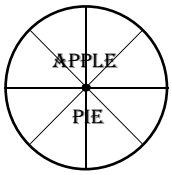
8

Term: **Week:** **To be completed by:**

A: 10 Quick Questions

1. 347 + ♥ = 198
   Find ♥ .....
2. How many metres in 7.05 kilometres? .....
3. 4 × ⁻15 = ...
4. How many millilitres in 4.65 litres? .....
5. 1.7 × 0.9 = ...
6. How many seconds in 8.5 minutes? .....
7. $7.26 × 9 = ...
8. 1.08 ÷ 1.2 = ...
9. Name this shape  .....
10. A square has an area of 64m^2. What is the perimeter? .....

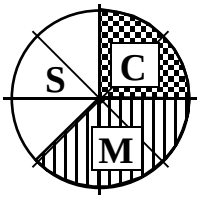
B: Pie graphs



1. Ten boys and six girls are going to share equally an apple pie. **Shade** in the pie to show how much of it was eaten by the girls.

Brent drew a pie graph to show what he did with $96.00.

What Brent did with $96.00



2. How many sectors is the graph divided into? ..... and each sector = $ .....
3. What fraction did he save (**S**)? .....
4. What fraction did he spend on clothes (**C**)? .....
5. How much did he spend on clothes ..... and model aeroplanes (**M**)? .....
6. How much did he save? .....

C: Pie graph calculations

The **DAISY VALLEY HIGH SCHOOL** has a roll of 200 students, as follows.

Y9	Y10	Y11	Y12	Y13
50	50	40	35	25

Write each Year Group as a fraction of the whole school.

Example: *Year 9* $^{50}/_{200}$

1. Y10 = ... Y11 = ...
   Y12 = ... Y13 = ...

Calculate the angle for each of a pie graph needed to display this data.

Example: *Year 9*
$^{50}/_{200} × 360° = 90°$

2. Y10 = ...° Y11 = ...°
   Y12 = ...° Y13 = ...°
3. What do all the 5 angles for the pie graph add up to? .....

D: Creating pie graphs

Cory believes that *'white cars are the most popular'*, so he conducted a survey outside the school gate, collecting the following data, to see if he was right.

1. **Complete** the frequency column of this frequency table.
2. How many cars did he count? .....
3. **Write** each colour as a **fraction** of the total number of cars.

Colour	Tally	f
black	𝍸 𝍸 𝍸 I	*16*
blue	𝍸 𝍸 𝍸 𝍸	
red	𝍸 𝍸 IIII	
white	𝍸 𝍸 𝍸 𝍸 III	
other	𝍸 𝍸 𝍸 II	
	Total	

black = ... blue = ...

red = ... white = ...

other = ...

4. **Calculate** the angle of each pie graph sector, for each colour.

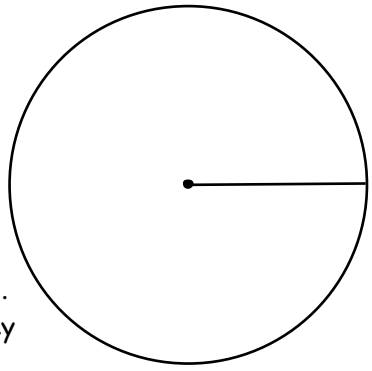
black = ...

blue = ...

red = ...

white = ...

other = ...



5. **Draw** the sectors of the pie graph.
6. **Shade** the graph, and **fill** in the key below: ☐black ☐blue ☐red ☐white ☐other
7. Based on his results, Cory says *'white cars* ***are*** *the most popular in N.Z.!'* Is he correct in saying this? .....

Comments:

Please sign:
Parent / Caregiver

AWS

Statistics

S3 / S5

Homework / Assessment Worksheet

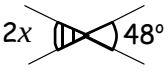
L5MS

9

Term: **Week:** **To be completed by:**

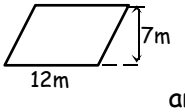
A: 10 Quick Questions

1. Find 120% of $90.00 .....
2. 25 × $0.73 = ...
3. Find the value of x



x = ...

4. Convert $^5/_8$ to a percentage .....
5. Write 0.0009 in standard form .....
6. Round off 6390 to 2 s.f. .....
7. Find the area of this shape



area = ...

8. 9 × 8 – 56 ÷ 7 = ...
9. 0.536km = ... metres
10. Solve $5x + 17 = 63$

x = ...

B: Stem and leaf graphs

Stem and leaf graphs are so called because of their shape.

Example:

4	1, 4, 6, 9
5	3, 4, 6, 7, 8, 9
6	0, 2, 4, 5, 8
7	3, 4, 6, 7

stem leaf

1. **Complete** the set of numbers that this stem and leaf graph represents.

41, 44, 46, ..., ..., ..., ..., ..., ..., ..., ..., ..., ..., ..., ..., ..., ..., ..., ..., ..., ...

Sarah was conducting a science experiment involving playing music to barley plants, to see if it affects their growth. The length of the barley grass, measured in millimetres is shown below..

Barley Plot A
45, 36, 30, 54, 25, 38, 41, 26, 46, 55, 41, 34, 44, 29, 42, 29, 27

Barley Plot B
54, 37, 31, 52, 47, 44, 34, 38, 44, 55, 49, 45, 44, 59, 39, 43, 39

2. **Draw** a back-to-back stem and leaf graph of the results.

[***Music played only to Barley Plot B***]

..... | ....
..... | ....
..... | ....
..... | ....

Barley Plot A *Barley Plot B*

3. Do Sarah's results prove anything? **Complete** the table opposite to help prove if the music has improved the barley plants growth. Comment on the results.

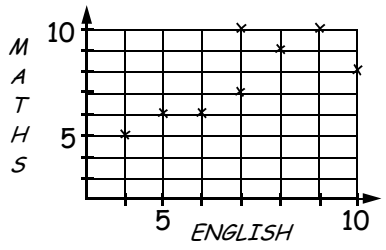
	Plot A	Plot B
Range		
Median		
Mean		

.....

.....

C: Scatter graphs

The scatter graph shows the results of 8 pupils who sat both an English **(E)** and a Maths **(M)** test, both marked out of 10.



1. **Complete** the table below for the 8 pupils where E = English & M = Maths.

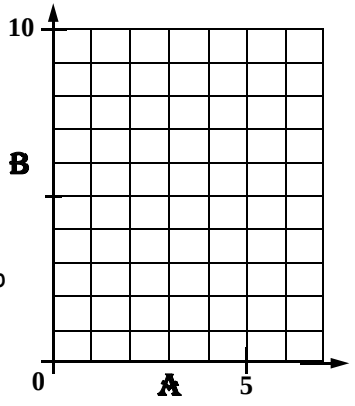
E	4							
M	5							

2. How many pupils scored above 7 in the English test and above 6 in the Maths test? .....

D: Scatter graphs

1. **Plot** this table of data on the graph, as a scatter graph.

A	2	3	4	4	5	5	6	6	7	7
B	1	3	2	4	5	6	6	7	7	9



2. Does there seem to be a relationship between **A** and **B** ? .....
3. Why ? .....
.....

Comments:

Please sign:
Parent / Caregiver

AWS

S9 / S10

Statistics

Homework / Assessment Worksheet

L5MS

10

Term: **Week:** **To be completed by:**

A: 10 Quick Questions

1. $45 \div 5 + 6 \times 7 =$ .....
2. $31 \times \$0.47 =$ .....
3. 309mL = ... litres
4. Convert $^{7}/_{8}$ to a decimal .....
5. How many weeks in $80\frac{1}{2}$ days? .....
6. Estimate the answer (do not calculate)
   $19.5 \times 3.2 + 9.9 =$ .....
7. Name this shape

.....

8. Divide \$40 in a ratio of 3 : 1 : 4 .....
9. Simplify $7y - 12y + 6y$ .....
10. Solve $\frac{1}{2}z - 12 = 7$
    $z =$ .....

C: Listing outcomes

1. If a 6-sided die and a coin are tossed, list all possible outcomes.
   .....
   .....
2. A bag contains some red, white and pink jelly beans. If two jelly beans are drawn out, list all possible outcomes.
   .....
   .....
3. Karen has a part-time job she can do on any 2 school days of the week, but which 2 days? List all possible outcomes.
   .....
   .....
   .....
   .....
   .....

B: Definitions

Complete these definitions by using the words listed below.

1. The rolling of a die, the drawing of a card, etc are called .....
2. The result of an experiment is called an .....
3. The list of all possible outcomes of an experiment is called the ....
4. Part of the sample space is called an .....

event	sample space	experiments	outcome

D: Finding relative frequencies / probabilities

Relative frequency = $\dfrac{\text{Number of times the given event has occurred}}{\text{Number of trials in the experiment}}$

Relative frequency = Experimental Probability (Long-run exp.)

1. A coin is thrown 80 times and heads occurs 42 times. What is the relative frequency of a head occurring? .....
2. A die is thrown 200 times and the results are recorded in this table.

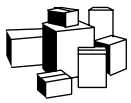
Die	1	2	3	4	5	6
f	38	33	30	26	38	35

   State the **relative frequency** of each number occurring.
   1 = ... 2 = ... 3 = ... 4 = ... 5 = ... 6 = ...

A box of Lego contains the following number of coloured blocks.

red	blue	black	white	green
42	38	66	10	44

3. How many blocks are in the box? .....
4. If a block is selected from the box, calculate the relative frequency of selecting each colour of block.
   red = ... blue = ... black = ...
   white = ... green = ...



5. If the relative frequency of selecting a block is 0.33, which block was selected? .....
6. If the relative frequency of selecting a block is 5%, which block was selected? .....

Toss a coin at least 50 times and **record** your results in this **table**.

	Tally	F	Relative Frequency
H			
T			

7. **Calculate** the relative frequency for both heads and tails.
8. Using **your answer** for the relative frequency for heads in question 7, **calculate** how many heads could turn up if the coin was tossed 1000 times. .....

Comments:

Please sign:
Parent / Caregiver

S10 / S11

Statistics

Homework / Assessment Worksheet

L5MS

11

Term: **Week:** **To be completed by:**

A: 10 Quick Questions

1. $72 \div 9 + {}^{-}7$ = ...
2. Solve $3x + 13 = 41$
   x = ...
3. What do the interior angles of a pentagon add up to? .....
4. Find the volume of a cube with sides of 8cm  .....
5. Simplify $11x + 5y - 16x$ .....
6. Round off 0.542 to 1 d.p. .....
7. How many hours in 3 weeks? .....
8. Convert 0.315km to m .....
9. \$9.54 × 14 = ...
10. $6.73 - 4.1 \times 1.8$ = ...

B: Calculating probabilities

$$\text{Theoretical Probability} = \frac{\text{Number of ways the event can occur}}{\text{Number of all possible outcomes}}$$

A normal six-sided die is thrown. Find the probability of getting

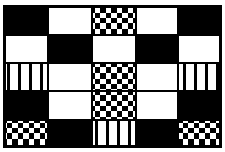
1. the number 2 .....
2. an even number .....
3. a factor of 4 .....
4. the number 8 .....
5. a number greater than 5 .....

A card is drawn from a 52 card pack. Find the probability of drawing

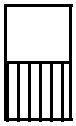
6. a black card .....
7. a nine .....
8. a jack .....
9. a red ace .....
10. a picture card .....
11. the 8 of clubs .....

C: What chance ?

At a fair, a target was coloured as below for an archery competition.

1.  

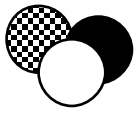
Calculate the chance of hitting each of the coloured rectangles.

 = ...  = ...

= ..... = ...

2. How many times would you expect to hit the black rectangles, if you had 75 attempts? .....
3. Ben hit the white 31 out of 75 attempts. Was that more then expected? .....
4. Sam hit the black 53 out of 100 attempts. Was that more then expected? .....

D: Tree diagrams



Fred has a box of marbles which contains, 4 white, 1 black and 3 yellow.

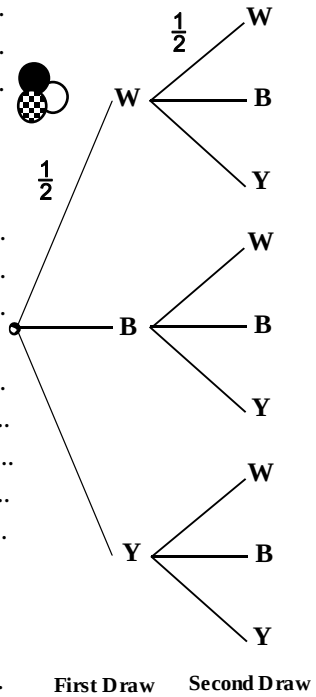
1. If he **draws one** marble from the box, find the **probability** that it is white ....., black ....., or yellow ..... .
2. If he **replaces** the first marble and **draws** a **second** marble, have the probabilities for drawing each colour changed ? .....
3. Fred now draws **two marbles**, the **first** being **replaced** before the second is drawn. **Enter** the **probability values** for each colour on the tree diagram. White has been done for you.
4. List all the possible outcomes for two marbles being drawn. (Use W = white, B = black, Y = yellow), *Eg:* ***(W, W)***

   .....
   .....
   .....
5. How many total outcomes are there?

   .....

Find the following probabilities.

6. P(white, white) .....
7. P(black, black) .....
8. P(yellow, yellow) .....
9. P(white, black) in that order .....
10. P(black, yellow) in that order .....
11. P(yellow, white) in that order .....
12. P(white, black) in any order .....
13. P(yellow, white) in any order .....
14. P(black, yellow) in any order .....
15. If the first marble is yellow and is **not replaced**, what will be the **new probability** value of drawing a second black marble? .....



Comments:

Please sign:
Parent / Caregiver

AWS

Homework / Assessment Worksheet

Answers

Worksheet 1

A:

1. 15 2. 8 3. 141^{o} 4. $72.25cm^{2}$ 5. -3x 6. 5.1 7. 225 min 8. 4.156km 9. $79.82
10. 25.475

B:

1. discrete 2. continuous
3.

Grade	1	2	3	4	5	
F	11	19	24	18	9	81

4. Grade 3 5. 51 pupils 6. 81 pupils

C:

1.

Height	1 -	5 -	10 -	15 +	
F	3	14	16	12	45

2. 10 - 3. 3 seedlings 4. 28 seedlings
5. 45 seedlings

D:

1. discrete 2. discrete 3. continuous 4. continuous 5. continuous 6. continuous 7. continuous
8. discrete 9. continuous

Worksheet 2

A:

1. 63 2. $16.90 3. 4.706L 4. $^{66}/_{100} = {}^{33}/_{50}$ 5. 59.5 days 6. 80 7. octagon 8. $36:$45 9. 4x
10. $5^{5}/_{7}$

B:

1. 1.567m (3 d.p.)
2.

Body type	F
slim	4
medium	6
solid	4

Eye colour	F
brown	3
blue	5
hazel	3
grey	3

Hair colour	F
black	6
blonde	4
brown	4

Shoe size	4	5	6	7	8	9	10
F	1	2	4	5	1	1	0

3. The 'average' pupil is 1.567m tall, is of medium build with blue eyes, black hair and has a shoe size of 7.

Worksheet 3

A:

1. -5.7 2. 4 3. 73^{o} 4. 34cm 5. 2x 6. 7.27 7. 285 minutes 8. 5.314m 9. $3.15 10. 11.28

B:

1. mean, mean 2. median 3. mode

C:

1. A = 11, B = 12, C = 12
2. A = 14, B = 14, C = no mode
3. A = 2.7 (1 d.p.), B = 3, C = 1 & 3
4. A = 5.9 (1 d.p.), B = 7, C = 9
5. A = 7.6 (1 d.p.), B = 6.5, C = 3 & 15

D:

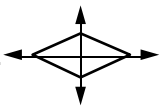
1. mode 2. mean 3. median 4. mean or mode

E:

1. 74 sheep 2. 75 or lower 3. 76 & 77 4. $18500 5. $19250 6. $165000 7. 48% 8. 60%

Worksheet 4

A:

1. $25.50 2. $11.52 3. 47° 4. $^{68}/_{100} = {}^{17}/_{25}$ 5. 9.2×10^5 6. 8700 7. 
8. 32, 64, 128 9. 25% 10. $5\frac{4}{7}$

B:

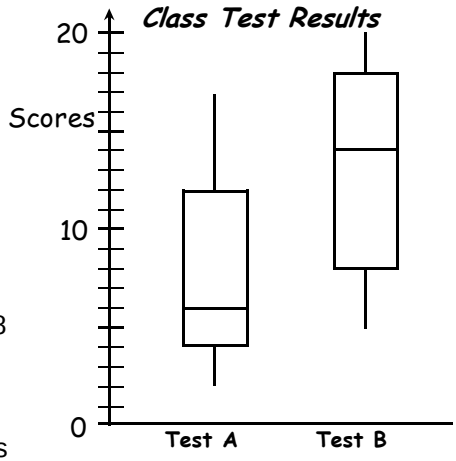
1. lowest score 2. highest score 3. lower quartile 4. upper quartile
5. median 6. 23

C:

	Range	LQ	Median	UQ
1.	12	5	6	8.5
2.	18	3.5	7	15.5
3.	20	8	9.5	21
4.	11	7	10	14
5.	16	3	9	11

D:

1. HS = 19, UQ = 14,
median = 9, LQ = 5, LS = 2
2. See graph opposite
   Test A: LQ = 4, M = 6, UQ = 12
   Test B: LQ = 8, M = 14, UQ = 18
3. A = = 15, B = 15
4. A = 7.9, B = 12.9
5. Test B results were better in all aspects, but the range was the same as Test A.



Worksheet 5

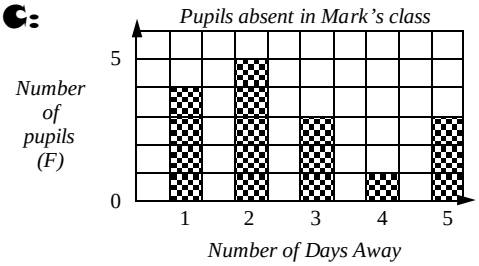
A:

1. $21 2. 14, 28, 42, 56 3. 6cm 4. 9cm 5. $^{6}/_{10} = {}^{3}/_{5}$ 6. -9 7. 13 8. 10 9. 7.362km
10. 12.183

B:

1. 12 families 2. 40 families 3. 18 families 4. 6 pupils

C:

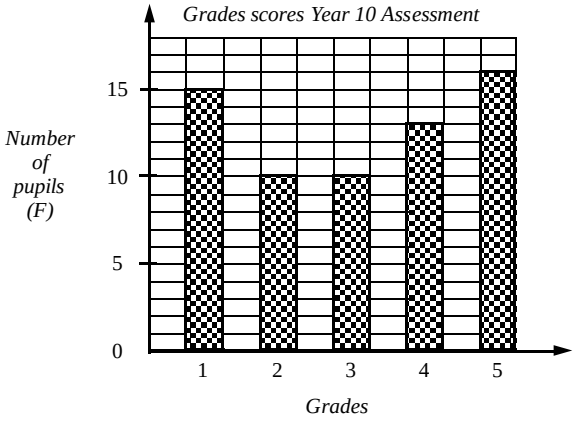


D:

1.

Grades	1	2	3	4	5
f	15	10	10	13	16

3. 10 pupils 4. Grade 1 5. 25 pupils 6. 32 pupils



E:

1. inadequate labeling
2. vertical scale not constant
3. different colours and widths of columns
4. It does not mean it is safer to drive on wet roads, as more people drive on sunny days.

Worksheet 6

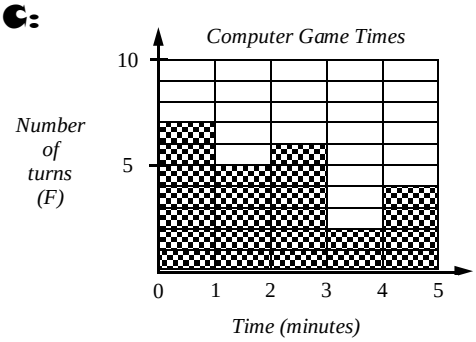
A:

1. -4 2. $6^1/_5$ 3. 128^o 4. $20.25mm^2$ 5. -x 6. 9.6 7. 90hrs 8. 0.952km 9. $121.55 10. 18.104

B:

1. 9 runners 2. 5 runners 3. 3 runners 4. 33 runners 5. 8 runners

C:

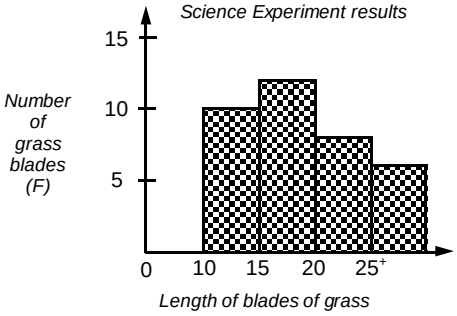


D:

1.

Length	10 -	15 -	20 -	25 +
f	10	12	8	1

2. see graph 3. 15 -
4. 30 blades 5. 26 blades
6. 36 blades



E:

1. Vertical scale un-named and numbered incorrectly 2. Width and colour of columns vary 3. No title
4. No name on x-axis or y-axis

Worksheet 7

A:

1. $42.25cm^2$ 2. 2.75kL 3. 260mL 4. 375 min 5. -152 6. 101 7. 52.15 8. 14 9. $45:$63
10. $5^4/_7$

B:

1. 50 people 2. 120 people 3. 25% 4. $^5/_{12}$ 5. clothes =$30, food = $24, C.D.'s = $18 6. $ $ $

C:

1. 12th May 2. 24 minutes 30 seconds 3. every 3rd day 4. 23 minutes 30 seconds 5. 15th May
6. 1 minute 20 seconds faster 7. 23 minutes 42 seconds

D:

1. 10 2. 9 3. 8.6

E:

Key: Sl = sleeping, S = school, TV = television, HW = homework, O = other

Sl	Sl	Sl	Sl	S	S	S	TV	HW	O	O

Worksheet 8

A:

1. -149 2. 7050m 3. -60 4. 4650mL 5. 1.53 6. 510 seconds 7. $65.34 8. 0.9
9. (isosceles) trapezium 10. 32m

B:

1. 

2. 8 sectors, $12 3. $^3/_8$ 4. $^2/_8$ or $^1/_4$ 5. clothes = $24, model aeroplanes = $36
6. $36

C:

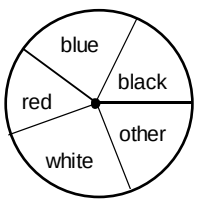
1. Y10 = $^{50}/_{200}$, Y11 = $^{40}/_{200}$, Y12 = $^{35}/_{200}$, Y13 = $^{25}/_{200}$, 2. Y10 = 90^o, Y11 = 72^o, Y12 = 63^o, Y13= 45^o 3. 360^o

D:

1.

Colour	black	blue	red	white	other	
F	16	20	14	23	17	90

2. 90 cars
3. black = $^{16}/_{90}$, blue = $^{20}/_{90}$, red = $^{14}/_{90}$, white = $^{23}/_{90}$, other = $^{17}/_{90}$
4. black = 64^o, blue = 80^o, red = 56^o, white = 92^o, other = 68^o

5. 

6. check key
7. Of all car colours, white cars were the most common colour. However, of the 90 cars counted, only 23 were white car, therefore Cory's statement is NOT correct.

Worksheet 9

A:

1. $108 2. $18.25 3. $x = 24^o$ 4. 62.5% 5. 9.0×10^{-4} 6. 6400 7. $84m^2$ 8. 64 9. 536m
10. $9^1/_5$

B:

1. 41, 44, 46, 49, 53, 54, 56, 57, 58, 59, 60, 62, 64, 65, 68, 73, 74, 76, 77 2.

7, 9, 9, 6, 5	2	
4, 8, 0, 6	3	7, 1, 4, 8, 9, 9
2, 4, 1, 6, 1, 5	4	7, 4, 4, 9, 5, 4, 3
5, 4	5	4, 2, 5, 9

3.

	Plot A	Plot B
Range	30	30
Median	38	44
Mean	37.8	44.4

While the range values are the same, Plot B barley plants had a higher median & mean, therefore the music had improve barley plant growth

C:

1.

E	4	5	6	7	7	8	9	10
M	5	6	6	7	10	9	10	8

2. 3 pupils

D:

1. check graph 2. yes 3. all points are almost in a straight line

Worksheet 10

A:

1. 51 2. $14.57 3. 0.309L 4. 0.875 5. 11.5 weeks 6. 70 7. trapezium 8. $15:$5:$20 9. y
10. $z = 38$

B:

1. experiment 2. outcome 3. sample space 4. event

C:

1. H1, H2, H3, H4, H5, H6, T1, T2, T3, T4, T5, T6 2. RR, RW, RP, WW, WP, PP
3. MTu, MW, MTh, MF, TuW, TuTh, TuF, WTh, WF, ThF

D:

1. $^{42}/_{80}$ 2. $1 = {}^{38}/_{200}$, $2 = {}^{33}/_{200}$, $3 = {}^{30}/_{200}$, $4 = {}^{26}/_{200}$, $5 = {}^{38}/_{200}$, $6 = {}^{35}/_{200}$
3. 200 blocks 4. red = $^{42}/_{200}$ or 0.21, blue = $^{38}/_{200}$ or 0.19, black = $^{66}/_{200}$ or $0.33^{\cdot}$, white = $^{10}/_{200}$ or 0.05, green = $^{44}/_{200}$ or 0.22 5. black 6. white

Worksheet 11

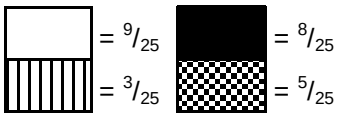
A:

1. 1 2. $9^1/_3$ 3. 540^o 4. $512cm^3$ 5. 5y - 5x 6. 0.5 7. 504hrs 8. 315m
9. $133.56 10. -0.65

B:

1. $^1/_6$ 2. $^3/_6 = {}^1/_2$ 3. $^3/_6 = {}^1/_2$ 4. 0 5. $^1/_6$ 6. $^{26}/_{52} = {}^1/_2$ 7. $^4/_{52} = {}^1/_{13}$
8. $^4/_{52} = {}^1/_4$ 9. $^2/_{52} = {}^1/_{26}$ 10. $^{12}/_{52} = {}^3/_{13}$ 11. $^1/_{52}$

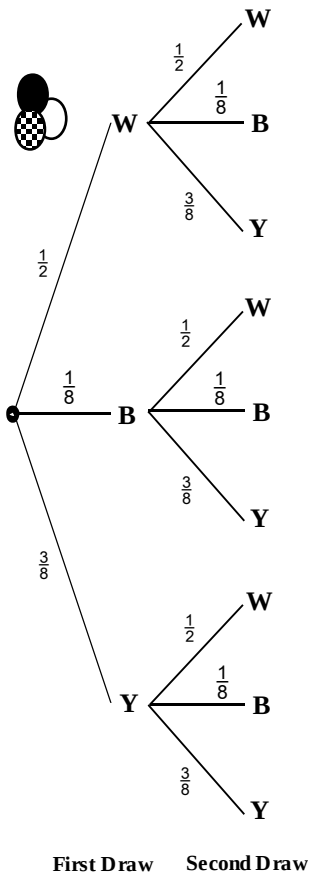
C:

1.  $= {}^9/_{25}$ $= {}^8/_{25}$ $= {}^3/_{25}$ $= {}^5/_{25}$

2. 24 times 3. yes 4. yes

D:

1. $W = {}^4/_8 = {}^1/_2$, $B = {}^1/_8$, $Y = {}^3/_8$ 2. no 3. see tree diagram
4. (W,W), (W,B), (W,Y), (B,W), (B,B), (B,Y), (Y,W), (Y,B), (Y,Y) 5. 9 outcomes
6. $^1/_4$ 7. $^1/_{64}$ 8. $^9/_{64}$ 9. $^1/_{16}$ 10. $^3/_{32}$ 11. $^3/_{16}$ 12. $^1/_8$ 13. $^3/_8$ 14. $^3/_{16}$
15. $^2/_7$



Tracking Sheet: ‘In-class’ Activity Sheets

Worksheet	Objectives	Comments														
13	S4 / S5															
12	S4															
11	S4															
10	S4															
9	S4															
8	S4															
7	S3															
6	S3															
5	S3															
4	S3															
3	S1 / S2															
2	S1 / S2															
1	S1															
Statistics	Name															

Tracking Sheet: 'In-class' Activity Sheets

Worksheet	Objectives	Comments														
25	S11 / 12															
24	S12															
23	S9/10/11															
22	S9															
21	S6 / 7 / 8															
20	S8															
19	S3 / 4 / 5															
18	S4															
17	S4															
16	S4															
15	S4															
14	S4															
Statistics	Name															

Tracking Sheet: Homework / Assessment Worksheets

Worksheet	Objectives	Comments														
11	S10 / 11 / 12															
10	S9 / 10 / 11															
9	S3 / S5															
8	S4 / S8															
7	S4															
6	S4															
5	S4															
4	S3 / S5															
3	S3															
2	S1 / S2 / S3															
1	S2 / S3															
Sociologics		Name														