A Complete Guide to ...

Algebra

Utilising the objectives as written in

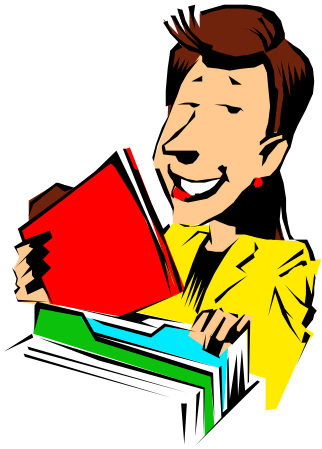
MATHEMATICS in the New Zealand CURRICULUM

for

Level 3

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



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Author: A. W. Stark

AWS Publications Ltd
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Algebra Zebra

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L3MA

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Note from the author:

This resource ...

*A Complete Guide to Algebra

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

Mathematics in the New Zealand Curriculum for Level 3.

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 3.
Resource Code: L3MN

A Complete Guide to Measurement
written utilising the objectives as stated in
Mathematics in the New Zealand Curriculum for Level 3.
Resource Code: L3MM

A Complete Guide to Geometry
written utilising the objectives as stated in
Mathematics in the New Zealand Curriculum for Level 3.
Resource Code: L3MG

***A Complete Guide to Algebra**
written utilising the objectives as stated in
Mathematics in the New Zealand Curriculum for Level 3.
Resource Code: L3MA

A Complete Guide to Statistics
written utilising the objectives as stated in
Mathematics in the New Zealand Curriculum for Level 3.
Resource Code: L3MS

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

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Acknowledgement:

I would like to thank the staff and pupils of **Mairehau Primary School, Christchurch** for their assistance in making these resources possible.

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.

Algebra

The following are the objectives for **Alegbra**, **Level 3**, as written in the **MATHEMATICS** *in the New Zealand Curriculum* document, first published 1992. ***[REFER PAGE 138]***

Exploring patterns and relationships

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

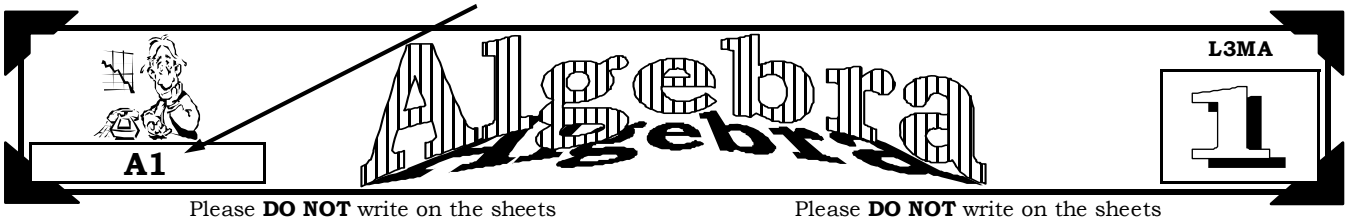
- **A1** describe in words, rules for continuing number and spatial patterns;
- **A2** make up and use a rule to create a sequential pattern;
- **A3** state the general rule for a set of similar practical problems;
- **A4** use graphs to represent number , or informal, relations.

Exploring probability

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

- **A5** solve problems of the type ☑ + 15 = 39.

At the top of each **'In-class' worksheet** and **Homework / Assessment worksheet**, the Algebra objective(s) being covered has been indicated. *EXAMPLE:* **A1** means objective 1, **A2** 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 3**.

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;
- **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;
- **MP14** use words and symbols to describe and continue patterns.

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

- **MP15** use their own language and mathematical language and diagrams to explain mathematical ideas;
- **MP16** devise and follow a set of instructions to carry out a mathematical activity;
- **MP18** record, in an organised way, and talk about the results of mathematical exploration.

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 3**. ***[REFER TO PAGES 23 - 29 OF THE CURRICULUM DOCUMENT]***

‘In-class’ Algebra Worksheets

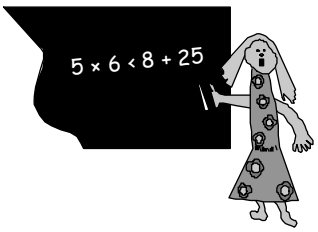
Table of Worksheet Number / Objectives Covered

See the opposite page for details of each objective.

	Algebra Objectives					Mathematical Processes Objectives								
Worksheet Number	A 1	A 2	A 3	A 4	A 5	MP 1	MP 2	MP 3	MP 6	MP 8	MP 9	MP 14	MP 15	MP 16	MP 18
1	Revision							✖			✖			✖	
2	✖							✖			✖	✖		✖	
3	✖	✖						✖			✖	✖			
4	✖	✖						✖			✖	✖		✖	
5		✖						✖			✖	✖		✖	
6			✖					✖			✖	✖			
7		✖			✖			✖			✖				
8				✖							✖				
9				✖							✖		✖		
10				✖				✖			✖	✖			
11					✖			✖						✖	
12					✖			✖			✖		✖		
13					✖			✖			✖		✖		
14					✖			✖			✖		✖		
15					✖			✖			✖			✖	

Table of Contents for the 'In-class' Worksheet Masters for Algebra, Level 3

Mathematical signs:



The symbols = means 'is equal to'

< means 'is less than'

> means 'is greater than'

Example: 8 < 10, 15 > 12, 20 = 20, 3 × 4 < 4 × 5

Task 1

Copy each question, then replace the □ between each pair of numbers, with one of the three symbols for 'is equal to', 'is less than' and 'is greater than', to show that you understand what the signs mean.

1.	12 □ 16	2.	17 □ 16	3.	21 □ 21	4.	86 □ 89
5.	27.6 □ 27.7	6.	0.4 □ 0.8	7.	45.36 □ 45.41	8.	92.78 □ 92.75
9.	9 + 7 □ 8 + 8	10.	7 × 4 □ 36 – 5	11.	48 ÷ 4 □ 23 – 14	12.	16 + 15 □ 4 × 8

Renaming numbers:

It is possible to rename any number in many different ways, using all four mathematical signs +, –, ×, and ÷.

Example: The number 12 can be written as ...
2 + 10, 17 – 5, 4 × 3, 24 ÷ 2

Task 2

Rename each number **four** times, each time using a different mathematical sign (+, –, ×, and ÷).

1.	8	2.	11	3.	13	4.	20
5.	17	6.	25	7.	32	8.	63
9.	75	10.	100	11.	120	12.	150

Finite and Infinite: What do they mean?

If you stand in your classroom and look at the door, you could measure the distance from you to the door. This distance is said to be a **finite** distance. A finite distance can be measured.

If you look up into the night sky, some stars are so far away that it would be almost impossible to measure the distance from you to the stars. If you cannot measure the distance between two objects, the distance is said to be **infinite**.

Task 3

Do you understand the difference between **finite** and **infinite**?

1. Make a list of **five** things that are finite.
   Example: The number of pupils at your school.
2. Make a list of **three** things that are infinite.
   Example: The counting numbers.

Continuing and describing shape patterns:

When a series of **shapes** form a pattern it is sometimes called a sequence.

Example: The first four shapes in this pattern are shown below.

1st shape *2nd shape* *3rd shape* *4th shape*

What is the next shape in this pattern?

Answer: 5 circles as drawn in the example.

When describing this pattern we would say, *"Each new shape in this pattern or sequence is created by adding one more circle".*

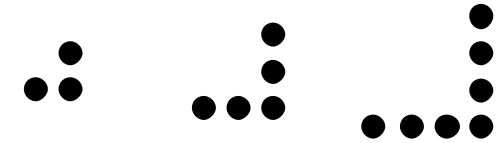
Task 4

Below are the first three shapes of a pattern.
Draw the next **three** shapes for each pattern.

1.

1st shape *2nd shape* *3rd shape*

2.

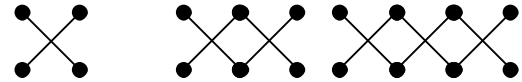


1st shape *2nd shape* *3rd shape*

3.

1st shape *2nd shape* *3rd shape*

4.



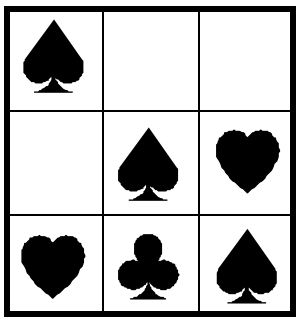
1st shape *2nd shape* *3rd shape*

5. In words, **describe** how each pattern in questions 1, 2, 3, and 4 above have been created.

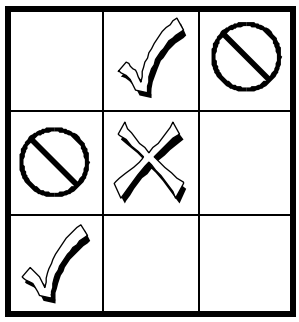
6. Make up **four** patterns of your own. Describe how you created them.

Copy these squares. **Draw** the shapes in the empty squares to finish each pattern.
In words, **describe** how each pattern is created.

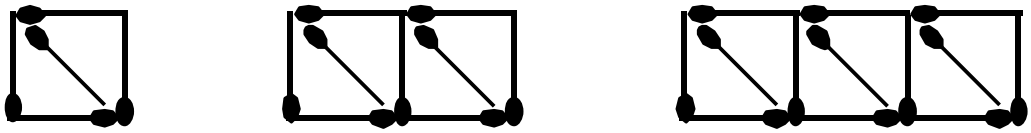
7.



8.



9. **Draw** the next shape in this match stick pattern.



10. How many triangles will there be in the next shape of this pattern?
11. How many matchsticks will there be in the next shape?

Continuing and describing number patterns:

When a series of **numbers** form a pattern it is called a **sequence**. The numbers of a sequence are often found by adding or subtracting the same number to each previous number.

Example: Listing the number of squares in each diagram will create a sequence of numbers.
How many squares are added to each previous diagram of this sequence?
How many squares are in the next diagram?

2 squares *4 squares* *6 squares*

Answer: Numbers would be 2, 4 and 6. Two squares are added to each previous diagram, with the next diagram having 8 squares.

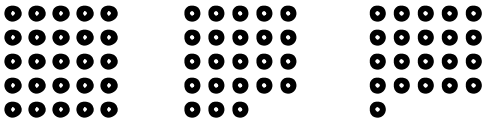
What do you think the next 5 numbers will be in this sequence?

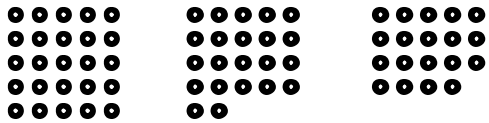
Task 5

Count the number of dots in each diagram and **write** your answers as a number sequence.

1. 

2. 

3. 

4. 

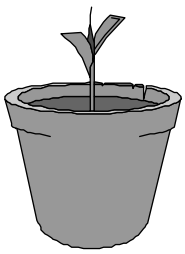
5. **Describe** how each sequence was created and **write** the next **five** numbers in the sequence.

Look at each number sequence to work out each pattern, then **write** the next **five** numbers in each sequence. **Describe** how each of these number sequences has been created.

6. 5, 11, 17, ...
7. 63, 58, 53, ...
8. 3, 14, 25, 36, ...
9. 7, 16, 25, ...
10. 2.0, 2.5, 3.0, ...
11. 24.6, 23.9, 23.2, ...
12. Karen has weekly meetings on Tuesdays, starting on the 3rd of July. If the meetings are to go on for six more weeks, what are the dates for each meeting?

Continuing and describing number patterns:

The numbers of a sequence can also be created by multiplying each previous number by the same number.



Example: The sequence, 2, 4, 8, 16, ... is created by multiplying each previous number by 2.

What do you think the next 5 numbers will be in this sequence?

Task 6

Look at each number sequence to work out each pattern, then **write** the next **five** numbers in each sequence. **Describe** how each of these number sequences has been created.

1. 4, 12, 36, ...
2. 1, 5, 25, ...
3. 3, 18, 108, ...
4. A bean plant doubles its height every week. If it was 7cm high after week one, how tall will it be at the end of each of the next 5 weeks?

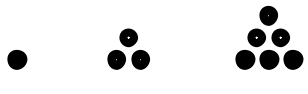
Special number patterns:

Some number sequences are based on special numbers, such as odd or even, multiples, squares, cubes, triangular, pentagonal, hexagonal numbers.

Task 7

These diagrams show the first three triangular, square, pentagonal and hexagonal numbers.
Look at each pattern. **Draw** the next 2 diagrams for each pattern, then **list** the number of dots in each diagram to continue each sequence.

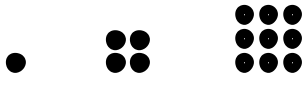
1.



1 3 6

Triangular numbers

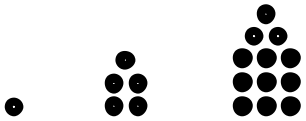
2.



1 4 9

Square numbers

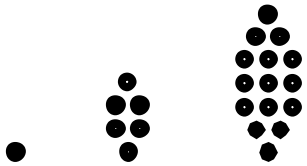
3.



1 5 12

Pentagonal numbers

4.

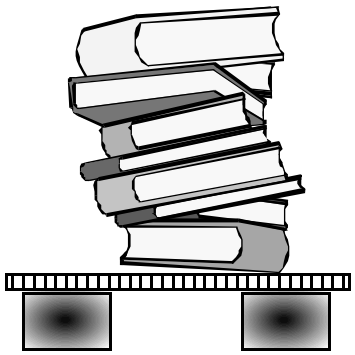


1 6 15

Hexagonal numbers

5. How many dots will be needed to draw the 6th diagram in each sequence?

Creating patterns given a rule:



Peter builds a book shelf out of bricks and planks of wood, as shown in this diagram. For every book shelf layer, Peter needs two bricks and one plank.

Write the sequence of numbers to show how many bricks are needed for the first 10 layers of this book shelf.

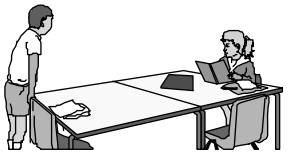
Answer: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20

The rule for this sequence is *'the number of bricks needed is twice the number of layers in the book shelf'*.

Task 8

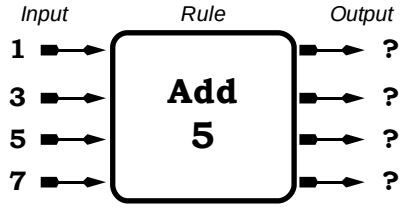
Given each rule, work out the first **five** numbers in each sequence.

1. Start with 5, then multiply each new number by 2.
2. Start with 4, then add 13 to each new number.
3. Start with 100, then subtract 17 from each new number.
4. Make up **five rules** of your own. Check that your rules work by having a classmate create the first five numbers of your sequences using your rules.
5. New desks for a classroom can seat 4 pupils around each desk. Use the rule, *'the number of chairs needed is four times the number of desks'*, to work out the number of chairs needed if there are seven desks.
6. If there are 32 pupils in this class, how many desks and chairs are needed?



Using a rule to create a number sequence:

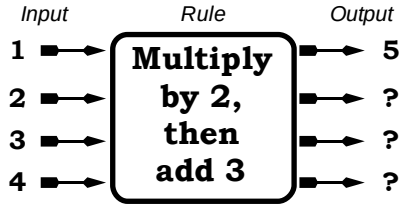
Example: Use the rule in the box to create part of a number sequence.



Answer: The four 'output' numbers, using the rule in the box, would be 6, 8, 10, 12.

If the imput is 21, what is the output?
Answer: 21 + 5 = 26

If the output is 32, what is the imput?
Answer: 32 – 5 = 27



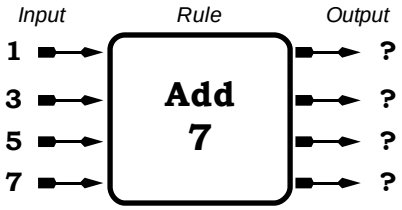
Using the rule in the second box, what are the three missing 'output' numbers?

Answer: 2 × 2 + 3 = 7
3 × 2 + 3 = 9
4 × 2 + 3 = 11

Task 9

Use the **rules** in each box to find the missing 'output' numbers to create part of these number sequences.

1.



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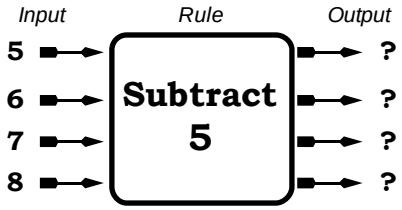

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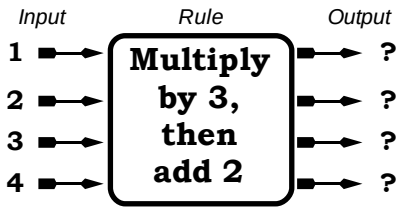

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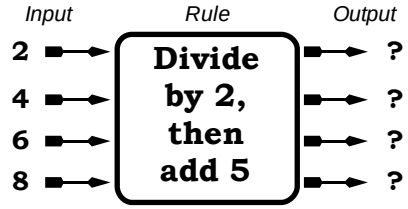


5. The 'input' number is 13. If the rule is ***'multiply by 3, then subtract 7'***, what is the output number?

6. The 'input' number is 24. If the rule is ***'divide by 4, then add 9'***, what is the output number?

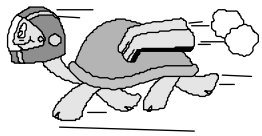
7. The 'input' number is 7. If the rule is ***'add 3, then multiply by 4'*** what is the output number?

8. The 'input' number is 19. If the rule is ***'subtract 4, then divide by 5'***, what is the output number?

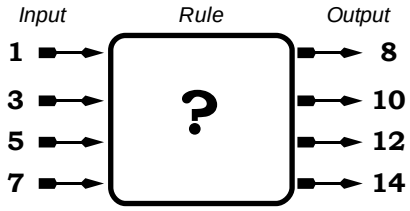
Task 10

Create five of your own diagrams with **4 'input' numbers** and a **rule**. Exchange your diagrams with a classmate, so that they can work out the 'output' numbers.

Finding a rule given the input / output numbers:



Example: Work out the rule that created these input / output numbers.



To work out the rule, look at each pair of numbers ...
1 and 8, 3 and 10, 5 and 12, 7 and 14.

What is common about the difference between these numbers?

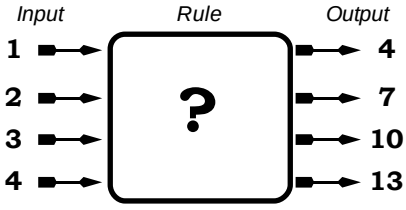
Answer: The difference between each pair is 7.
The rule is therefore, **'add 7'**.

More difficult rules may require two steps, such as multiplying first, then adding or subtracting.

Can you work out the rule for this input / output diagram?

Rules of this type can be worked out by a 'trial and error' method.

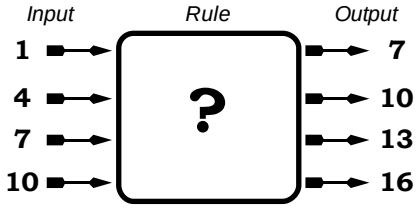
Answer: Multiply by 3, than add 1.



Task 11

Work out the **rules** that would go in the boxes between these input / output numbers.
All of these rules involve only adding or subtracting.

1.



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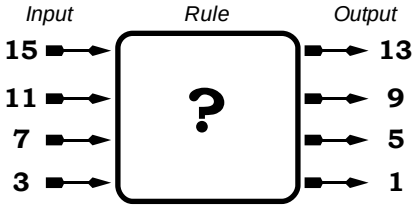

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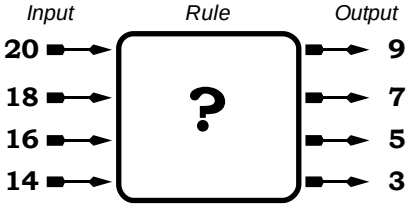

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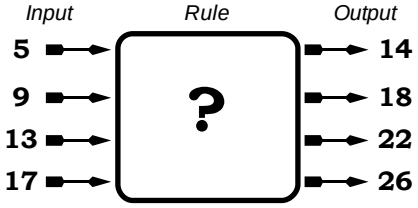
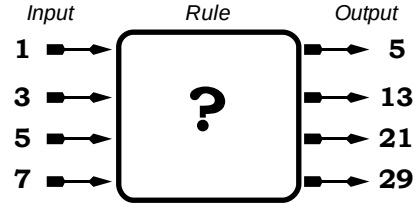


Work out the **rules** that would go in the boxes between these input / output numbers.
These two rules involve multiplying first, followed by either adding or subtracting.

5.



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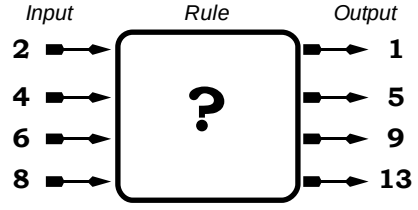
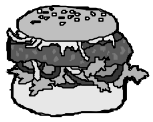


Task 12

Create five of your own rules and use them to create **4 input / output numbers**, drawing diagrams as above. Exchange your 5 diagrams with a classmate, so that they can work out your rules.

Practical problems involving rules:

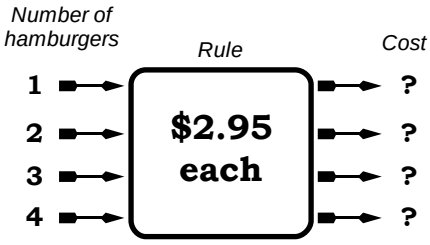


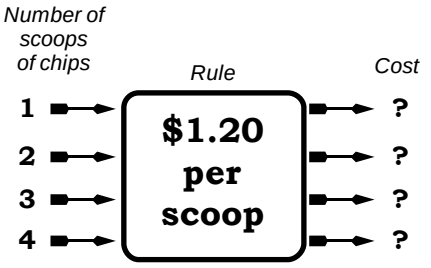

When you buy anything from a shop, a rule can be written.

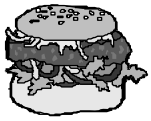
Example: Buying hamburgers and chips.
One rule could be, *'each hamburger costs $2.95'*.
The other rule could be, '*one scoop of chips costs $1.20'.*

Using these rules, we can work out the cost of buying any combinations of hamburgers and chips.

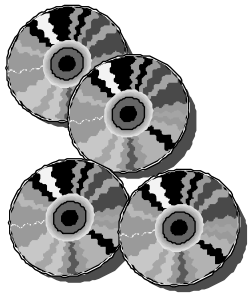

Task 13



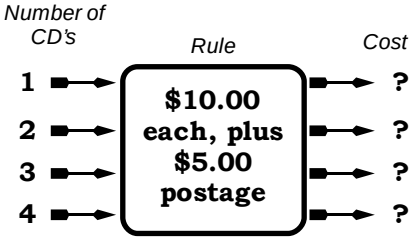




1. Use the **rules** in each box above to work out the cost of buying 1, 2, 3 and 4 hamburgers and the cost of buying 1, 2, 3, and 4 scoops of chips.
2. Use your answers above to work out the cost of buying 3 hamburgers and two scoops of chips.
3. How many scoops of chips could you buy with $7.20?
4. How many hamburgers could you buy with $29.50?
5. What would it cost to buy 5 hamburgers and 6 scoops of chips?



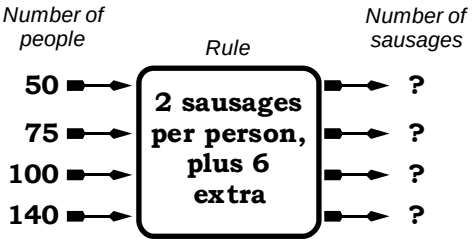
When you buy something by mail-order, there is often a charge for the postage. This diagram below shows the cost of CD's, plus postage for mail orders.



6. Work out the cost of buying 1, 2, 3 and 4 CD's by mail order.
7. What would it cost to buy 12 CD's by mail-order?
8. Sam spent $65.00 on mail order CD's. How many CD's did he buy?

A school is running a fair on Saturday. They are going to have a barbecue and sell sausages. For every person they expect at the fair, they will buy 2 sausages and to that total will add 6 extra sausages.

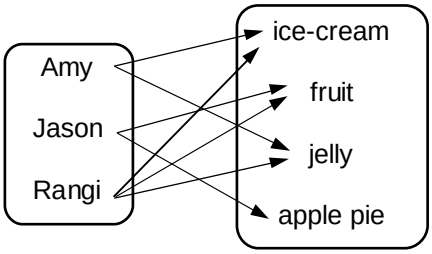
9. Use the **rule** to work out how many sausages are needed if 50, 75, 100 and 140 people were to turn up.
10. If sausages cost 50 cents each, how much would it cost to buy sausages for 100 people?
11. If sausages sell for $1.20 each, how much money would they raise if they sell 126 sausages?
12. How many people could they feed if they purchased 56 sausages?



Relationship graphs:

It is possible to draw many different types of graphs that show relationships.

Example: Three children like many types of desserts. This graph shows which ones they like.



The graph shows the relation *'children and the desserts they like'*.
Note, the arrows point from the children to the dessert.

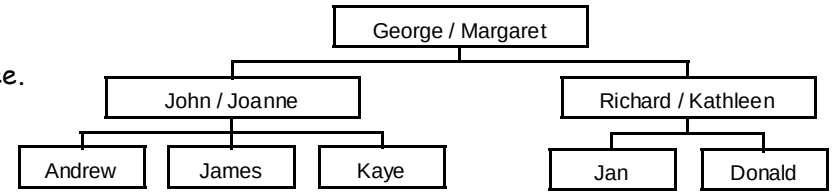
Which desserts did each child like?

Answer: Amy liked ice-cream and jelly. Jason liked fruit and apple pie. Rangi liked ice-cream, fruit and jelly.

Task 14

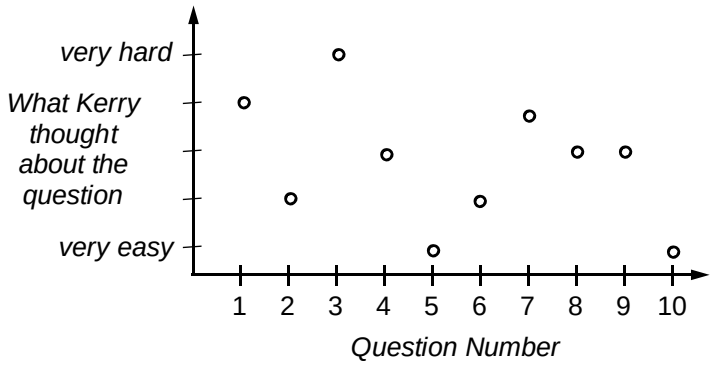
1. Ask 5 pupils in your class which desserts they like best, then **draw** a relationship graph to show your results.

This relationship graph is of a family tree. George / Margaret means that George married a woman called Margaret.



2. George and Margaret had two sons. What are their names?
3. Who did John marry and give the names of their children?
4. What is the relationship between Jan and George?
5. What is the relationship between Jan and Donald?
6. What is the relationship between James and Donald?
7. What is the relationship between Richard and Kaye?

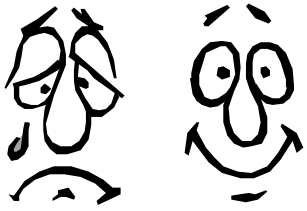
Kerry sat a test and recorded how he felt about each question. This graph shows his results.



8. What relationship is this graph displaying?
9. How did he feel about question 3?
10. How did he feel about questions 5 and 10?
11. **Write** three suitable words that would describe how he felt about questions 2, 4 and 7.

Task 15

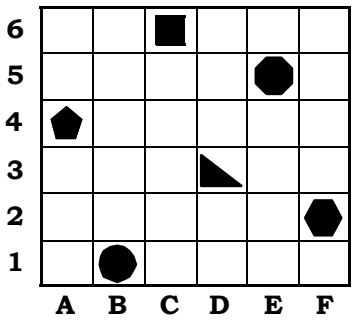
Draw three relationship graphs of your own.
Remember to name the relationship that you are drawing about.
Example: 'The moods I felt during a scary movie.'



Map grids:

Have you ever looked for a street or a place on a map? How do you know which part of the map to look at? All maps usually have **grid references**, so that it makes it easier to find what you are looking for.

Example: On this grid all squares can be defined by a letter and a number, such as (A,4). The A means the first column and the 4 means the fourth row up.
(A,4) is known as a **grid reference**.



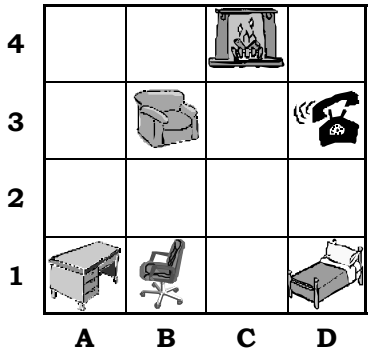
What shape is in the square (A,4)?
Answer: The pentagon.

In which square is the hexagon?
Answer: (F,2).

Name all the other shapes and the squares they are in.

Task 16

Miri draw a grid of her room, showing the major items.



1. What items are in the squares ... (D,1)
(B,3)
(A,1)
and (D,3)?
2. Write the grid references for the fireplace and the desk chair.

Use this grid to break the code and find out what this message says.

6		a	b	c	
5	d	e	f	g	h
4	i	j	k	l	m
3	n	o	p	q	r
2	s	t	u	v	w
1		x	y	z	
	A	B	C	D	E

3. (E,4), (B,6), (B,2), (E,5), (B,5), (E,4), (B,6), (B,2), (A,4), (D,6), (A,2) / (A,4), (A,2) / (D,5), (E,3), (B,5), (B,6), (B,2) / (C,5), (C,2), (A,3).
4. **Write** your own message using this grid.
Exchange messages with a classmate and see if you can decode their message.

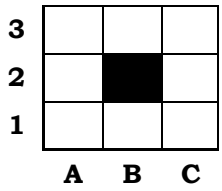
Task 17

1. **Draw** a plan of your classroom on maths paper so that you can have a grid set up with letters across the bottom and numbers up the side.
2. Using your grid references, state where 10 items in your classroom can be found.

Map grid references / mathematical graphs:

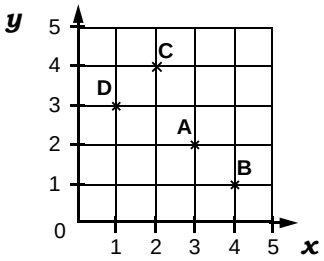
Grid references on a map refer to anything within the square or grid named.

Example: On this grid the square (B,2) is shaded.
If this was a map, there could be many streets, buildings, places etc. within the shaded square.



On a **mathematical graph** we have numbers on both sides, where the first number always means across to the right, and the second number always means up.

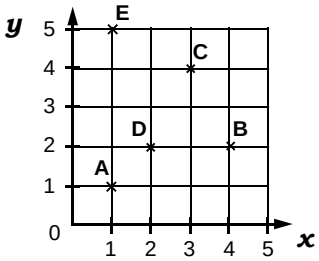
Example: The letter **A** marks the point (3,2) on this graph. This means 3 lines to the right and 2 lines up. An **X** is marked on the graph, **where the two lines cross**, and it is this point only that (3,2) refers to. A dot could be used instead of an **X**.



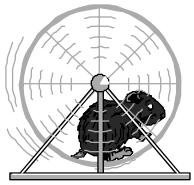
What two numbers would you use to refer to the points **B, C** and **D**?

Answer: B = (4,1), C = (2,4), D = (1,3). Remember, the order is important.

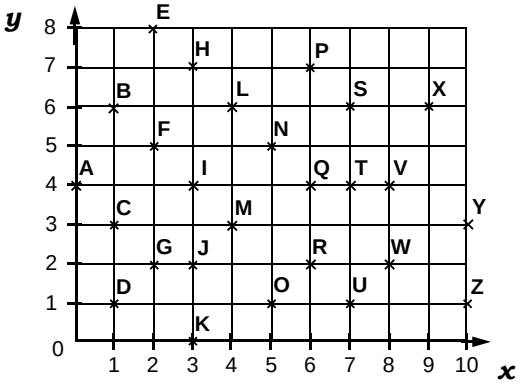
Task 18



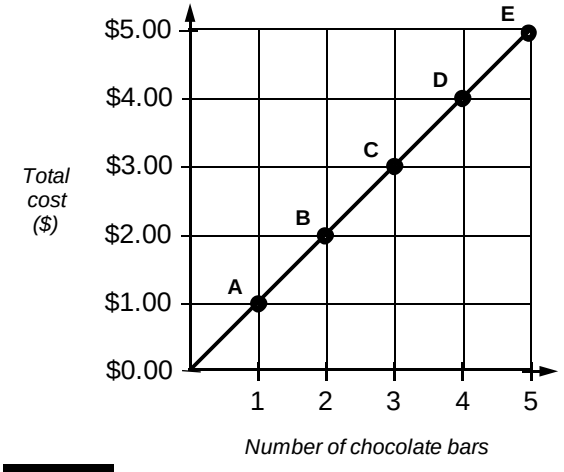
1. On this graph there are **five** points marked.
   What two numbers are used to refer to each point?
2. **Draw** a graph that is the same as drawn here. On your graph, **mark** the points.
   F = (5,1) G = (1,4) H = (2,3) I = (4,5) J = (0,2)



Use this graph to break the code and find out what this message says.



3. (1,1), (5,1) / (10,3), (5,1,), (7,1) / (3,0), (5,5), (5,1), (8,2) / (0,4), (4,6), (4,6) / (10,3), (5,1), (7,1), (6,2) / (1,6), (0,4), (7,6), (3,4), (1,3) / (5,5), (7,1), (4,3), (1,6), (2,8), (6,2) / (2,5), (0,4), (1,3), (7,4), (7,6)?
4. **Write** your own message using this graph.
   Exchange messages with a classmate and see if you can decode their message.



The line on this graph shows the relationship between the cost of a chocolate bar and the number of chocolate bars bought.

5. Point **A** would be written as (1, $1.00). What would you write for the points **B, C, D** and **E**.
6. What is the rule for this relationship?
7. Use your rule to work out the cost of buying 12 chocolate bars.
8. How many chocolate bars could you buy with $16.00?

'Guess the number' game:

Consider these problems ...

Think of a number.
I add 13.
The result is 25.
What is the number?

'Trial and error' is one way to work out these problems.

Example:	Try 10.	10 + 13 = 23	The result is not 25.
	Try 14.	14 + 13 = 27	The result is not 25.
	Try 12.	12 + 13 = 25	The result is 25, so 12 was the number.

Think of a number.
I multiply by 2, then add 5.
The result is 13.
What is the number?

Use 'trial and error' to work out this problem.

Example:	Try 2.	2 × 2 + 5 = 9	The result is not 13.
	Try 5.	5 × 2 + 5 = 15	The result is not 13.
	Try 4.	4 × 2 + 5 = 13	The result is 13, so 4 was the number.

Can you think of another way to work these problems out?

Task 19

Use a 'trial and error' method to 'guess' these numbers.

1. *Think of a number.*
I add 10.
The result is 27.
What is the number?

2. *Think of a number.*
I subtract 9.
The result is 14.
What is the number?

3. *Think of a number.*
I subtract 17.
The result is 8.
What is the number?

4. *Think of a number.*
I multiply by 7.
The result is 56.
What is the number?

5. *Think of a number.*
I divide by 6.
The result is 9.
What is the number?

6. *Think of a number.*
I multiply by 12.
The result is 108.
What is the number?

7. *Think of a number.*
I multiply by 3, then add 4.
The result is 13.
What is the number?

8. *Think of a number.*
I divide by 2, then add 5.
The result is 13.
What is the number?

9. *Think of a number.*
I multiply by 2, then subtract 5.
The result is 13.
What is the number?

10. *Think of a number.*
I divide by 3, then subtract 5.
The result is 3.
What is the number?

11. Make up **5** of your own problems, following these steps.

Step 1: Choose a number less than 12.

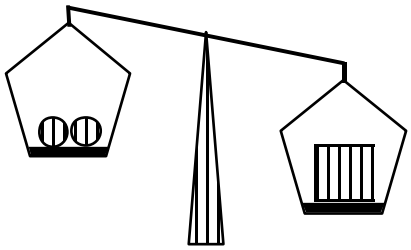
Step 2: Multiply by a number less than 8.

Step 3: Add a number less than 25. The result is ... ?

Step 4: Write your problem in words as above.

Give your problems to a classmate to work out or solve. You might like to make up some more problems that involve dividing and subtracting instead of multiplying and adding.

Introduction to equations:

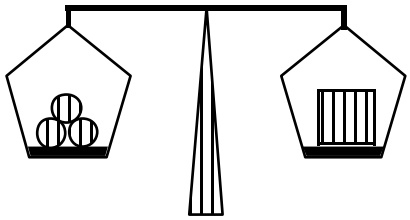


This diagram is of a set of scales.

The two circles are not as heavy as one square. These scales are **not balanced** as there are different weights on each side.

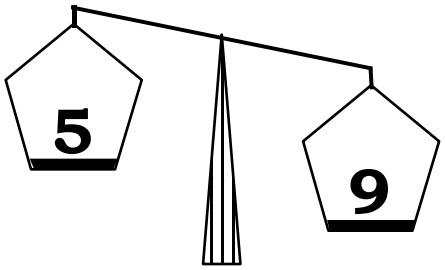
What is needed to balance these scales?

On this set of balance scales, the three circles are the same weight as one square. These scales are **balanced** because there is the same weight on both sides.



If there were two squares on one side, how many circles would you need on the other side to balance the scales?

Answer: 6 circles



These scales have the number 5 on the left side and the number 9 on the right side. We could write this as **5 + ☒ = 9**, where the ☒ is the number missing, needed to balance these scales.

5 + ☒ = 9 is called **an equation**.

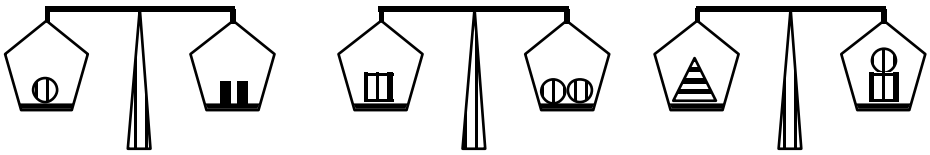
This equation can also be written as **9 – ☒ = 5**.

What number needs to be added to the left side to balance these scales? Finding this number is called **solving the equation**.

Answer: The number 4, because 5 + 4 = 9 and 9 – 4 = 5.

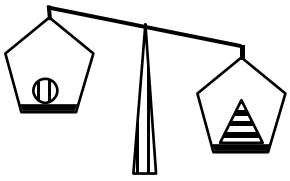
Task 20

These three scales are balanced. Use the information in these scales to answer these questions below.



What **shapes** need to be **added** to the left side of these scales, so that each **scale balances?** Find **more than one way** that each scale can be balanced.

1.



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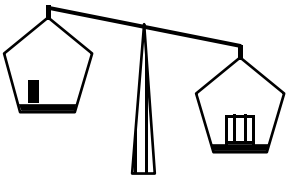

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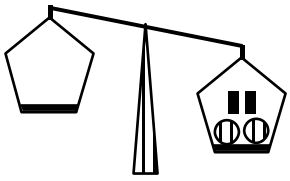

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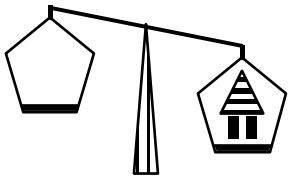
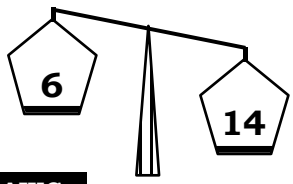


Below are some more scales that can be written as equations. *Example:* 6 + ☒ = 14 or 14 – ☒ = 6

Write two equations for each set of scales, then work out or **solve** each equation.

5.



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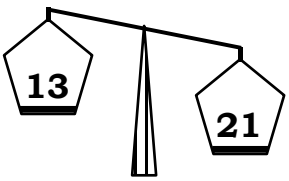

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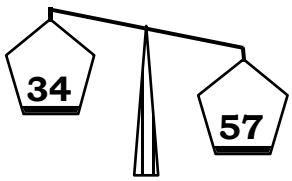

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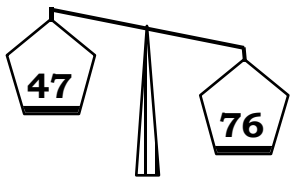


Solving equations:

12 – ☒ = 5
☒ + 14 = 21
9 – 5 = ☒
☒ – 14 = 21 are all equations.

The symbol ☒ represents the missing number, that you are trying to find. However, usually a letter is used in an equation. *Example:* **12 + *d* = 21**.

Solving an equation means, 'find the missing number' that would replace the letter or symbol so that both sides equal each other. Equations can be worked out using a 'trial and error' method.

Can you come up with any other methods for solving equations?

Task 21

Solve these equations.

1.	12 + ***a*** = 26	2.	***b*** + 17 = 31	3.	24 – ***c*** = 19	4.	***d*** – 9 = 23
5.	***f*** + 24 = 49	6.	24 – 15 = ***g***	7.	49 – 23 = ***h***	8.	***i*** + 26 = 26
9.	41 + 27 = ***j***	10.	***k*** + 28 = 49	11.	47 – ***l*** = 29	12.	37 – ***m*** = 5
13.	65 + ***n*** = 81	14.	81 – 47 = ***o***	15.	***p*** – 54 = 13	16.	64 + 87 = ***q***
17.	***r*** + 45 = 102	18.	92 – ***s*** = 27	19.	105 – 59 = ***t***	20.	***u*** + 51 = 119

Writing and solving equations:

Consider this problem.

Jim has $12.00 and was given some more money for his birthday.
If he now has $26.00, how much was he given for his birthday?

Write this information as an equation, then solve it.

Answer: $12.00 + ***x*** = $26.00, where ***'x'*** equals the birthday money given.
x = $14.00, as $12.00 + $14.00 = $26.00.

or it could be written as $26.00 – $12.00 = ***x*** , where ***'x'*** equals the birthday money given.
x = $14.00, as $26.00 – $12.00 = $14.00.

Task 22

Write an **equation** for each of these word problems, then **work out** the answer.

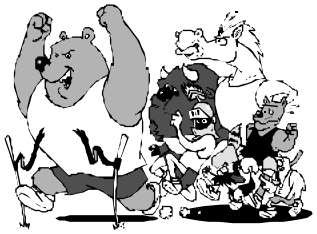
1. In two classes at a school there are 54 pupils. If there are 29 pupils in one class, how many are in the other class?

2. Mr Smith has been in a meeting for 34 minutes. The meeting is expected to last for a total of 75 minutes. How long before the meeting ends?

3. Kerry bought 52 soccer cards, but gave away 18 to his friends.
How many soccer cards does he now have?

4. Make up **5** of your own word problems, similar to those above, that can be written as equations. Give your questions to a classmate to solve.

Solving more equations:



These equations below involve multiplication or division. Can you solve them?

$6 \times a = 24$	$a = ?$
$b \times 8 = 40$	$b = ?$
$12 \times 4 = c$	$c = ?$
$24 \div d = 3$	$d = ?$
$e \div 4 = 5$	$e = ?$
$32 \div 2 = f$	$f = ?$

Explain your method for solving these equations above. Did you use a 'trial and error' method?

Answers: $a = 4$, $b = 5$, $c = 48$, $d = 8$, $e = 20$, $f = 16$,

Task 23

Solve these equations.

1.	$4 \times a = 36$	2.	$b \times 7 = 56$	3.	$64 \div c = 8$	4.	$d \div 9 = 5$
5.	$f \times 9 = 108$	6.	$42 \div 7 = g$	7.	$9 \times 8 = h$	8.	$i \times 7 = 77$
9.	$12 \times 8 = j$	10.	$k \div 11 = 11$	11.	$84 \div l = 12$	12.	$150 \div m = 30$
13.	$15 \times n = 45$	14.	$63 \div 9 = o$	15.	$p \div 12 = 6$	16.	$60 \times 8 = q$
17.	$r \times 25 = 200$	18.	$60 \div s = 15$	19.	$105 \div 5 = t$	20.	$u \times 30 = 360$

Writing and solving equations:

Consider this problem.

Mary buys 6 new books for the school library. If each book costs the same price and the total cost was \$30.00, how much did each book cost?

Write this information as an equation, then solve it.

Answer: $6 \times x = \$30.00$, where **'x'** equals the cost of one book.
$x = \$5.00$, as $6 \times \$5.00 = \$30.00$.

or it could be written as $\$30.00 \div 6 = x$, where **'x'** equals the cost of one book.
$x = \$5.00$, as $\$30.00 \div 6 = \$5.00$.

Task 24

Write an **equation** for each of these word problems, then work out the answer.

1. David has been running for 72 minutes around a park.
How many laps of the park has he done, if each lap takes 6 minutes?

2. A chocolate bar is to be divided up equally among 6 pupils. If there are 54 squares of chocolate in the bar, how many squares does each pupil get?

3. 27 pupils are going on the school camp.
If each pupil has to pay \$30.00, what is the total cost of the trip?

4. Make up **5** of your own word problems, similar to those above, that can be written as equations. Give your questions to a classmate to solve.

Using a formula:

A formula is like a rule and can be used to work things out.

Example: Chocolate bars cost $1.00 each. A formula can be written, that can be used to work out the total cost of any number of chocolate bars bought.

Total cost of chocolate bars = $1.00 × Number of chocolate bars bought

This can be written as letters rather than in words.

Let **C** = 'cost of chocolate bars' and **N** = 'number of chocolate bars bought'

A simple formula can be written, **C = $1.00 × N**

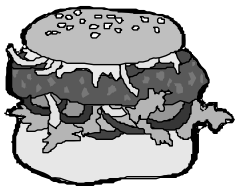
Use this formula to find the cost of 25 chocolate bars.

Answer: Replace the N with 25. C = $1.00 × 25 [Note: Working goes down the page, not across.]
C = $25.00

Task 25

Use each formula given to work out these problems.

The cost of hamburgers (H) is given by the formula,



H = $2.50 × N where N is the number of hamburgers bought.

1. How much would it cost to buy 3 hamburgers?
2. How much would it cost to buy 9 hamburgers?
3. If Michael spent $12.50 on hamburgers, how many hamburgers did he buy?

The cost of ice-creams (C) is given by the formula,

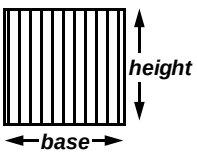
C = $0.80 × S where S is the number of scoops.

4. How much would a two scoop ice-cream cost?
5. How much would a three scoop ice-cream cost?
6. How much would it cost to buy 3 two scoop ice-creams?

The cost of going to the movies (M) is given by the formula,

M = $6.50 × P where P is the number of people who buy tickets.

7. How much would it cost for 12 people to go to the movies?
8. How much would it cost for 25 people to go to the movies?
9. If $65.00 was spent on tickets, how many people went to the movies?

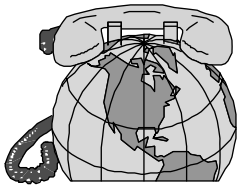


The area (A) of a rectangle is given by the formula,

A = B × H where B is the base and H is the height.

10. What is the area of a rectangle if the base is 10cm and the height is 8cm?
11. What is the area of a rectangle if the base is 20cm and the height is 9cm?

The cost (C) of time on the Internet is given by the formula,



C = $2.50 × H where H is time in hours.

12. How much would it cost if you were on the Internet for $5\frac{1}{2}$ hours?

'In-class' Worksheet

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.

Worksheet 1

Introduction:

The topic of algebra is often considered difficult, but it is not as bad as it sounds. Algebra is concerned with creating patterns and sequences, finding relationships and drawing graphs, solving equations and using formulae. Many of the problems pupils already do are in fact solved using algebra skills without them realising it.

Worksheet 1, **Task 1** is concerned with the revision and correct use of the signs '=', '<', and '>'.

Task 2 is to encourage pupils to think about different ways that we can write numbers. There will be an infinite number of answers for these questions and this leads on to **Task 3**.

Task 3 is concerned with what the words 'finite' and 'infinite' mean.

There are no model answers for **Task 2**.

Task 1

1.	$12 < 16$	2.	$17 > 16$	3.	$21 = 21$	4.	$86 < 89$
5.	$27.6 < 27.7$	6.	$0.4 < 0.8$	7.	$45.36 < 45.41$	8.	$92.78 > 92.75$
9.	$9 + 7 = 8 + 8$	10.	$7 \times 4 < 36 - 5$	11.	$48 \div 4 > 23 - 14$	12.	$16 + 15 < 4 \times 8$

Task 3

Possible finite things

- Number of pupils in your class.
- Number of people in New Zealand
- How much food you can eat at one time, etc.

Possible infinite things

- The counting numbers
- The different ways you can write the number 8
- Time ? etc.

Worksheet 2

Continuing and describing shape patterns:
When shapes are drawn and you can see a pattern occurring, a sequence of shapes has been created. After working out how the diagram pattern was created, the sequence of diagrams can be continued.

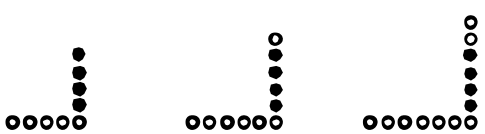
Task 4 is designed to give practice at continuing diagram patterns, then describing in words how the pattern was created.

Task 4

1.

4th shape *5th shape* *6th shape*

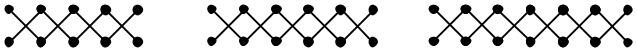
2.



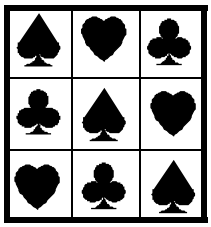
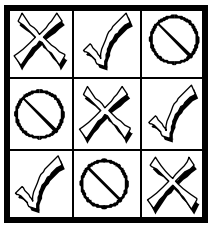
4th shape *5th shape* *6th shape*

3. 

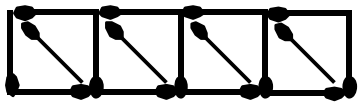
4th shape *5th shape* *6th shape*

4. 

4th shape *5th shape* *6th shape*

5. Question 1: The pattern was created by turning the arrows upside down for each new diagram.
   Question 2: Each new diagram had one circle added to end of each arm.
   Question 3; Each new diagram had a rectangle with an oval inside and a diagonal line across, added to each new diagram.
   Question 4: Each new diagram had two circles and two lines added, in the same pattern.
6. -
7. 
8. 

The pattern in these boxes was created by placing the three shapes in each row and column so that there was a different shape in each row and column.

9. 
10. 8 triangles
11. 17 matches

Worksheet 3

Continuing and describing number patterns:

When a series of numbers form a pattern it is called a sequence. Each number in the sequence is called a term. For number sequences involving addition or subtraction, there is a repeating pattern whereby each new term in the sequences is increased or decreased by the same number. Other sequences can be created by multiplying each new term by a common number.

Task 5 is designed to give practice at finding what the repeated addition or subtraction pattern is, describing each pattern in words, then continuing the sequence.

Task 6 is designed to give practice at finding what the repeated multiplication pattern is, describing each pattern in words, then continuing the sequence.

Task 5

1. 3, 5, 7
2. 4, 7, 10
3. 25, 23, 21
4. 25, 22, 19
5. Question 1: Add 2 to each new term. Next 5 terms: 9, 11, 13, 15, 17
   Question 2: Add 3 to each new term. Next 5 terms: 13, 16, 19, 22, 25
   Question 3: Subtract 2 from each new term Next 5 terms: 19, 17, 15, 13, 11
   Question 4: Subtract 3 from each new term. Next 5 terms: 16, 13, 10, 7, 4
6. 23, 29, 35, 41, 47: add 6
7. 48, 43, 38, 33, 28: subtract 5
8. 47, 58, 69, 80, 91: add 11
9. 34, 43, 52, 61, 70: add 9
10. 3.5, 4.0, 4.5, 5.0, 5.5: add 0.5
11. 22.5, 21.8, 21.1, 20.4, 19.7: subtract 0.7
12. 3rd July, 10th July, 17th July, 24th July, 31st July, 7th August, 14th August

Task 6

1. 108, 324, 972, 2916, 8748: multiply by 3
2. 125, 625, 3125, 15625, 78125: multiply by 5
3. 648, 3888, 23328, 139968, 839808: multiply by 6
4. 14cm, 28cm, 56cm, 112cm, 224cm

Worksheet 4

Special number patterns:

Not all number sequences are created by adding, subtracting or multiplying a constant number. Some rules for sequences are more complicated, as shown by the triangular, square, pentagonal and hexagonal number.

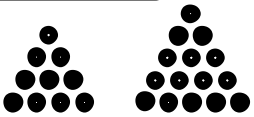
Task 7 is designed to give practice at creating special number sequences.

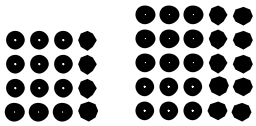
Creating patterns given a rule:

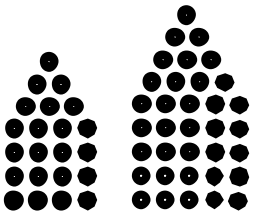
Number sequences can also be created where a written rule is given. A rule can also be in the form of a formula and these will be covered later. The rule can be as simple as adding, subtracting or multiplying each new term by a constant number, or a combination of these operations. At this level, rules will be kept simple.

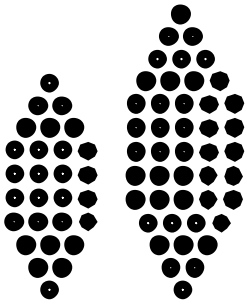
Task 8 is designed to give practice at creating number sequences, given a written rule.

Task 7

1. 
10 15

2. 
16 25

3. 
22 35

4. 
28 45

5. 21, 36, 51, 66

Task 8

1. 5, 10, 20, 40, 80
2. 4, 17, 30, 43, 56
3. 100, 83, 66, 49, 32
4. -
5. 4 × 7 = 28 chairs
6. 32 pupils, therefore 32 chairs and 8 desks

Worksheet 5

Using a rule to create a number sequence:

Input / output diagrams can be used to create number sequences, given a rule. This is an alternative to stating the rule in words. Some rules involve two steps, to be completed in the order as written.

Task 9 is designed to give practice using input / output diagrams.

Task 10 is designed to let pupils create there own input / output diagrams, exchange these with classmates. This will give pupils a better understanding of how to create and use rules.

Task 9

1. 8, 10, 12, 14
2. 0, 1, 2, 3
3. 5, 8, 11, 14
4. 6, 7, 8, 9
5. 32
6. 15
7. 40
8. 3

Worksheet 6

Finding a rule given the input/ output numbers:

The rules for these input / output diagrams can be worked out by a trial and error method. Some rules will be obvious as they involve only adding or subtracting. These are 'one' step rules. 'Two' step rules may involve multiplying, followed by adding or subtracting and are not always easy to work out. To test if a rule is correct, apply the rule to each input number. If the rule is correct, the output numbers listed should be the answers obtained.

Task 11 is designed to give practice finding the rules given the input / output numbers.

Task 12 is designed to let pupils create their own input / output numbers using their own rules. Pupils exchange diagrams with the input / output numbers listed, but the rules are missing.

Task 11

1. Rule: Add 6
2. Rule: Subtract 2
3. Rule: Subtract 11
4. Rule: Add 9
5. Rule: Multiply by 4, then add 1
6. Rule: Multipy by 2, then subtract 3

Worksheet 7

Practical problems involving rules:

The questions on this worksheet utilise rules to work out practical everyday problems. In everyday life, many problems can be worked out using algebraic skills and most times, pupils would do this without realising that algebra was involved. *Example:* Going shopping.

Task 13 is designed to give practice at using rules to solve practical everyday problems.

Task 13

1. 1 hamburger: $2.95 — 1 scoop of chips: $1.20
   2 hamburgers: $5.90 — 2 scoops of chips: $2.40
   3 hamburgers: $8.85 — 3 scoops of chips: $3.60
   4 hamburgers: $11.80 — 4 scoops of chips: $4.80
2. $8.85 + $2.40 = $11.25
3. $7.20 ÷ $1.20 = 6 scoops
4. $29.50 ÷ $2.95 = 10 hamburgers
5. $14.75 + $7.20 = $21.95
6. 1 CD: $15.00 — 2 CD's: $25.00 — 3 CD's: $35.00 — 4 CD's: $45.00
7. 12 CD's: $125.00
8. $65.00 less postage divided by CD cost = 6 CD's
9. 50 people: 106 sausages — 75 people: 156 sausages
   100 people: 206 sausages — 140 people: 286 sausages
10. 206 sausages × 50 cents = $103.00
11. 126 × $1.20 = $151.20
12. 25 people

Worksheet 8

Relationship graphs:

Algebra is involved with sequences etc. where there is a relationship between each term in the sequence or the diagram in a pattern. For many situations where there is a 'connection', a relationship graph can be drawn. This worksheets introduces the idea of relationship graphs. This will lead on to relationship graphs that involve numbers.

Task 14 is designed to give practice at understanding relationship graphs.

Task 15 is designed to give practice at drawing relationship graphs.

Task 14

1. -
2. John and Richard
3. John married Joanne, their children are Andrew, James and Kaye
4. Jan is George's grand daughter or George is Jan's grand father
5. Jan and Donald are brother and sister
6. James and Donald are cousins
7. Richard is Kaye's uncle or Kaye is Richard's niece
8. How Kerry felt about each question in a test
9. He thought it was very hard
10. He thought they were very easy
11. question 2: easy, question 4: ok, question 7: hard

Worksheet 9

Map grids:

Map grids are used to help locate places, therefore there is a relationship between the map grid reference and the place. So that we all locate the same place, the grid system was created. In the example in worksheet 9, the order in which the references are listed is the same as the order used when listing 'ordered pairs' on a mathematical graph. That is, across first followed by up. This has been done to make it easier when mathematical graphs are looked at in the next worksheet. Grid references refer to a 'box' on the map etc, within which the street, city etc can be located. It does not pin-point the exact spot, but gives a general area.

Task 16 is designed to give practice at using map grids.

Task 17 is designed to give pupils practice at drawing and using map grids.

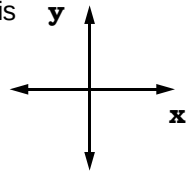
Task 16

1. bed, soft chair, desk, telephone
2. (C,4) & (B,1)
3. Mathematics is great fun
4. -

Worksheet 10

Map grid references / mathematical graphs:

The mathematical graphs (Cartesian graphs) in this worksheet only have the postive numbers. These graphs are used to show relationships between a pair of numbers, called an 'ordered pair'. The axes are labelled. The vertical axis is labelled 'y' and horizontal axis is labelled 'x'. The order the numbers in the ordered pair are listed, is most important. It is always across left / right, followed by up / down. Again this is done so that the same position on the graph can be located by everyone. At this level, only positive numbers are used, therefore numbers refer to (right, up).



Task 18 is designed to give practice at using mathematical graphs.

Task 18

1. A = (1,1), B = (4,2), C = (3,4), D = (2,2), E = (1,5)
2. -
3. Do you know all your basic number facts?
4. -
5. B = (2 ,$2.00), C = (3, $3.00), D = (4,$4.00), E = (5,$5.00)
6. Rule: Cost of chocolate bars is $1.00 multiplied by the number of bars bought
7. 12 × $1.00 = $12.00
8. 16 chocolate bars

Worksheet 11

'Guess the number' games:

Guess the number game is an introduction to equations. The ability to work these out in a logical way will be of benefit, as equations can be solved the same way. Trial and error is a good method and may be the most common at this level.
A mathematical way to work out the number is as follows. This will also apply to solving equations.

Example: *Think of a number.*
I add 13. *This could be written as an equation* $x + 13 = 25$
The result is 25
What is the number?

Addition and subtraction are opposite operations, as are multiplication and division. To solve, start with the 'result'. Then use the opposite operation to that listed. If it said add, then subtract.
In the example above that means, 25 minus 13. Therefore, 12 is the number. This can be checked by going through the problem using this number.

Task 19 is designed to give practice at problem solving in a fun way.

Task 19

1. 17 (27 – 10 = 17)
2. 23 (14 + 9 = 23)
3. 25 (8 + 17 = 25)
4. 8 (56 ÷ 7 = 8)
5. 54 (9 × 6 = 54)
6. 9 (108 ÷ 12 = 9)
7. 3 (13 – 4 = 9, 9 ÷ 3 = 3)
8. 16 (13 – 5 = 8, 8 × 2 = 16)
9. 9 (13 + 5 = 18, 18 ÷ 2 = 9)
10. 24 (3 + 5 = 8, 8 × 3 = 24)
11. -

Worksheet 12

Introduction to equations:

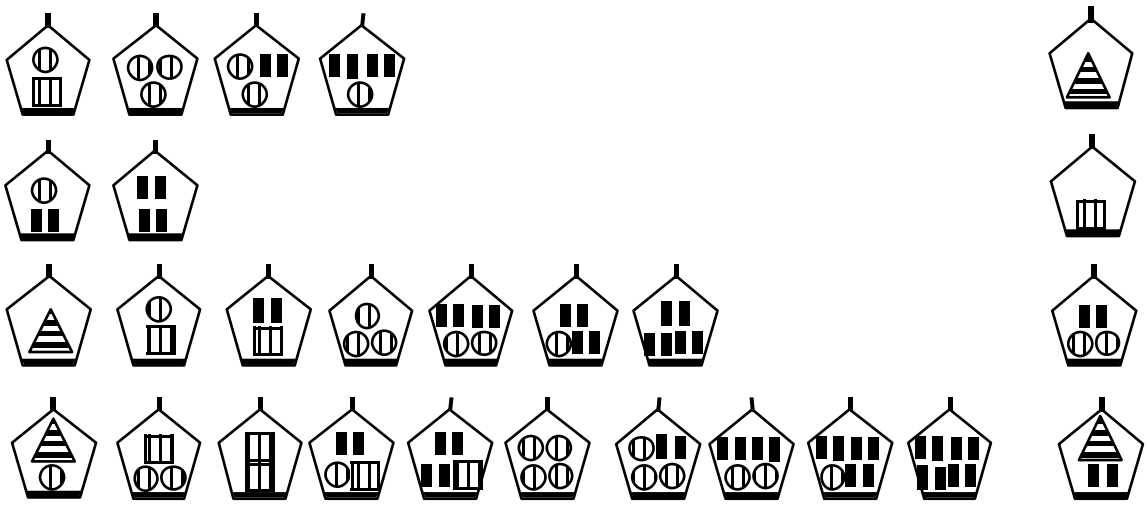
An equation is a group of numbers, mathematical signs, variables (letter), plus an equals sign. Equations are like a set of old fashioned weighing scales where weights were used. When the scales were 'balanced', there was the same weight on both sides. The aim of solving equations is to find the 'missing' number or object that would 'balance, both sides. This can be done by taking off or adding the same to each side, until you come up with the answer. 'To solve' means to find the missing number.

Task 20 is designed to give practice at balancing scales using objects, then numbers and writing equations from the information displayed. Note: 6 + ☒ = 14 is the same as ☒ + 6 = 14.

Task 20

possible left side of scales *right side of scales*

1.
2.
3.
4.



5. 6 + ☒ = 14, 14 – ☒ = 6, ☒ = 8
6. 13 + ☒ = 21, 21 – ☒ = 13, ☒ = 8
7. 34 + ☒ = 57, 57 – ☒ = 34, ☒ = 23
8. 47 + ☒ = 76, 76 – ☒ = 47, ☒ = 29

Worksheet 13 & 14

Solving equations:

Solving equations can be done in several ways. Introducing equations through balancing scales is designed to reinforce the idea that information on both sides of the equal sign MUST balance. The aim is to find the value of the number which is being represented by a letter or shape.

One method of solving is 'trial and error'. Pupils replace or substitute a number for the letter, then work out that side of the equation.

A more formal method is to perform 'opposite operations'. Addition and subtraction are opposite operations, as are multiplication and division.

Example: x + 25 = 52. This equation is saying, *"a number plus 25 equals 52"*. This can be turned around to read, *"a number equals 52 minus 25"*. This would be written as x = 52 – 25. This method will work for most equations that involve addition, subtraction and multiplication.

Solving equations continued:

Example: y × 5 = 30. This equation is saying, *"a number multiplied by 5 equals 30"*. This can be turned around to read, *"a number equals 30 divided by 5"*. This would be written as y = 30 ÷ 5.

Equations involving division, where the unknown or letter is being divided by a number, will work this way.

Example: x ÷ 6 = 4. This equation is saying, "*A number divided by 6 equals 4*". This can be turned around to read *"a number equals 6 multiplied by 4"*. This would be written as x = 6 × 4.

However, if a number is being divided by a letter, or has a number subtracted from it, then the method of using opposite operations does not work.

Example: 24 ÷ y = 3. This equation is saying *"24 divided by a number equals 3"*. In this case, it can be rewritten to read "a number equals 24 divided by 3". This would be rewritten as x = 24÷ 3.

Example: 15 – y = 8. This equation is saying *"15 minus a number equals 8"*. In this case, it can be rewritten to read "a number equals 15 minus 8". This would be rewritten as y = 15 – 8.

As all of these equations only involve one step, showing working may not be necessary. However if working is shown, it is better to work down the page, with equal signs in line, rather than across the page. Developing good setting out habits will be most benefical when pupils learn to solve more complicated equations in later years.

Tasks 21 & 23 are designed to give practice at solving equations.

Tasks 22 & 24 are designed to give practice at writing equations given a word problem, then solving the equation created.

Task 21

1.	a = 14	2.	b = 14	3.	c = 5	4.	d = 32	5.	f = 25	6.	g = 9
7.	h = 26	8.	i = 0	9.	j = 68	10.	k = 21	11.	l = 18	12.	m = 32
13.	n = 16	14.	o = 34	15.	p = 67	16.	q = 151	17.	r = 5718.	s = 65	
19.	t = 46	20.	u = 68								

Task 22

1. Let x = the number of pupils in the second class. x + 29 = 54 or x = 54 – 29, x = 25 pupils
2. Let y = the number of minutes left in the meeting. y + 34 = 75 or y = 75 – 34, y = 41 minutes
3. Let w = the number of cards Kerry has left. w + 18 = 52 or w = 52 – 18, w = 34 cards
4. -

Task 23

1.	a = 9	2.	b = 8	3.	c = 8	4.	d = 45	5.	f = 12	6.	g = 6
7.	h = 72	8.	i = 11	9.	j = 96	10.	k = 11	11.	l = 7	12.	m = 5
13.	n = 3	14.	o = 7	15.	p = 72	16.	q = 480	17.	r = 8	18.	s = 4
19.	t = 21	20.	u = 12								

Task 24

1. Let z = the number of laps David has run. z = 72 ÷ 6 or z × 6 = 72, z = 12 laps
2. Let y = the number of chocolate squares each pupil gets. y = 54 ÷ 6 or y × 6 = 54, y = 9 squares
3. Let w = the total cost of the school camp. w = $30 × 27 or w ÷ 30 = 27, w = $810
4. -

Worksheet 15

Using formulae:

A formula is like a rule and can be used to work things out. Formulae are written like equations with letters, sometimes numbers, and an equals sign.

Example: A = bh, A = ½ bh

Formulae are worked out by replacing or substituting the letters with numbers. Many everyday situations involve calculations that could be written as formulae.

Task 25 is designed to give practice at using formulae for practical everyday problems.

Task 25

1.	$7.50	2.	$22.50	3.	5 hamburgers
4.	$1.60	5.	$2.40	6.	$4.80
7.	$78.00	8.	$162.50	9.	10 people
10.	80 cm^2	11.	180 cm^2	12.	$13.75

Table of Content for the Homework / Assessment Worksheet Masters for Algebra, Level 3

Algebra

Revision / A1

Homework / Assessment Worksheet

1

Name: **Class:** **Complete by:**

A: 10 'Quick Questions'

1. 25.6 + 13.6 = ...
2. 1000 – 672 = ...
3. 105 × 9 = ...
4. 630 ÷ 7 = ...
5. List the factors of 12
   .....
6. $3.45 × 8 = ...
7. What is the time on this clock?
   .....

8. Find 50% of $2.80
   .....
9. How many litres in 3.5kL? .....
10. What would 9 books at $1.15 each cost?
    .....

B: Mathematical signs: <, =, >

Place one of the signs that means ' is less than', is greater than' or 'is equal to' in the gaps below.

1.	45.8 ..... 45.9	2.	121.0 ..... 121.0
3.	56.3 ..... 56.2	4.	6 + 15 ..... 40 ÷ 2
5.	3 × 4 ..... 60 ÷ 4	6.	8 × 9 ..... 80 – 9
7.	56 ÷ 8 ..... 5 + 9	8.	4 × 12 ..... 8 × 6
9.	36 – 15 ..... 4 × 6	10.	1.2 × 6 ..... 5.8 + 1.6

C: Renaming numbers:

These numbers have been renamed using one of the four mathematical operations.
Match the numbers (1 to 10) with their renamed form (A to J).

1.	8	.....
2.	12	.....
3.	20	.....
4.	35	.....
5.	17	.....
6.	29	.....
7.	56	.....
8.	90	.....
9.	75	.....
10.	200	.....

A	13 + 4
B	150 – 60
C	64 ÷ 8
D	163 + 37
E	7 × 8
F	100 – 80
G	25 × 3
H	41 – 12
I	48 ÷ 4
J	5 × 7

D: Finite / Infinite

Use either finite or infinite to complete these statements.

1. The whole numbers start at 0 and go on forever. This forms an ..... list.
2. The number of children at your school is a ..... list.
3. The number of different ways you could rename the number 12 is ..... .
4. The number of grains of sand on a beach is ..... .

Name one thing that is finite.

5. .....
   .....

Name one thing that is infinite.

6. .....
   .....

E: Continuing shape patterns:

The first three shapes of each pattern have been drawn. Draw the next **two** shapes for each pattern, then **describe** how each pattern was created.

1. 

.....

2. 

.....

3. 

.....

Comments: .....

.....

.....

Please sign:
Parent / Caregiver

.....

AWS

Algebra

A2 / A3

Homework / Assessment Worksheet

2

Name: **Class:** **Complete by:**

A: 10 'Quick Questions'

1. 0.32 + 15.9 = ...
2. 500 – 246 = ...
3. 219 × 12 = ...
4. 360 ÷ 90 = ...
5. What are the first 5 multiples of 7?
   .....
6. $2.50 × 8 = ...
7. Convert 2:45 p.m. to 24 hour time
   [:]
8. Find ½ of $5.70
   .....
9. How many kilograms in 4700g? .....
10. What would 5 books at $2.25 each cost?
    .....

B: Number Sequences

Look at each number sequence to work out the pattern. **Fill in** the missing numbers, then **describe** how the sequence was created.

1. 2, 4, 6, ..., ..., ..., 14, 16, ..., ..., ...
   .....
2. 2, 4, 8, ..., ..., ..., 128, 256, ..., ..., ...
   .....
3. 100, 96, 92 ....., ..., ..., 76, 72, ..., ..., ...
   .....
4. 3, 10, 17, ..., ..., ..., 45, 52, ..., ..., ...
   .....
5. 1, 5, 25, ..., ..., ..., 15625, ...
   .....

C: Creating a sequence given a rule

Find the next **five numbers** for each sequence, given the rule.

1. Start with 7, then add 9 to each new number.
   7, ..., ..., ..., ..., ...
2. Start with 3, then multiply each new number by 4
   3, ..., ..., ..., ..., ...
3. Start with 100, then subtract 13 from each new number.
   100, ..., ..., ..., ..., ...

D: Input / output diagrams

Use the rule in the box to create part of a sequence.

Input	Rule	Output
1 →	Multiply by 4, then add 5	→ A
2 →		→ B
3 →		→ C
4 →		→ D

1. A = ... B = ...
   C = ... D = ...

Work out the **rule** that would go in this box between the **input / output numbers**.

Input	Rule	Output
18 →	?	→ 13
15 →		→ 10
12 →		→ 7
9 →		→ 4

2. .....
   .....

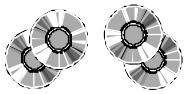
E: Practical problems involving rules

At a local supermarket, the cost of meat is worked out using the following rule, *'the cost of meat is the weight of meat in kilograms multiplied by $11.95'*.

Use this rule to work out the cost of buying ...

1. 2 kgs of meat .....
2. 4 kgs of meat .....
3. 10 kgs of meat .....
4. 25 kgs of meat .....

When buying CD's on mail-order there is a postage charge. This diagram below shows the cost of CD's, plus the postage charge. Use this rule to work out the cost of buying ...



Number of CD's	Rule	Cost
1 →	$12.00 each, plus $4.00 postage	→ ?
3 →		→ ?
7 →		→ ?
10 →		→ ?

5. 1 CD .....
6. 3 CD's .....
7. 7 CD's .....
8. 10 CD's .....
9. If Bill spent $100 on CD's, including postage, how many CD's did he buy? .....

Comments: .....
.....
.....

Please sign: Parent / Caregiver

AWS

Algebra

A4

Homework / Assessment Worksheet

3

Name: **Class:** **Complete by:**

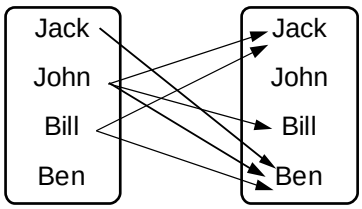
A: 10 'Quick Questions'

1. 45.6 + 8.23 = ...
2. 1000 – 753 = ...
3. 175 × 11 = ...
4. 540 ÷ 9 = ...
5. List the factors of 18
   .....
6. $3.65 × 7 = ...
7. What is the time on this clock?
   .....

8. Find 50% of $9.50
   .....
9. How many millimetres in 1.5m ? .....
10. If 7 books cost $39.20, what does one book cost?
    .....

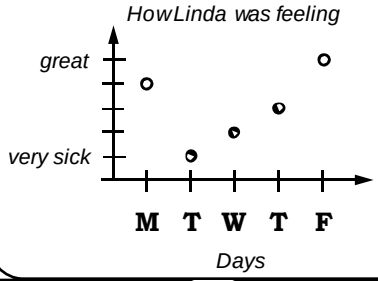
B: Relationship graphs

This is a graph showing the relationship *'is older than'*.



1. Who is Jack older than?
   .....
2. Why is there no arrow pointing away from Ben? .....
3. List the boys from oldest to youngest.
   ....., ..., ..., ...

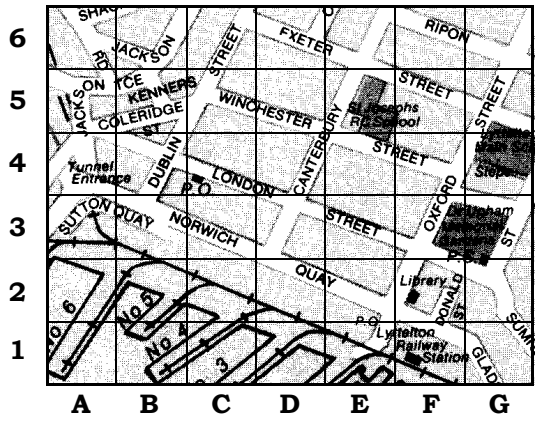
This is a graph of the relationship, *'how Linda was feeling on each of 5 days'*. Use this information to answer these questions.



4. On what day of the week was she feeling very sick?
   .....
5. On what day was she feeling great? .....
6. What word could you use to describe how she was feeling on Wednesday? .....

C: Map references

Below is part of a map of Lyttelton.

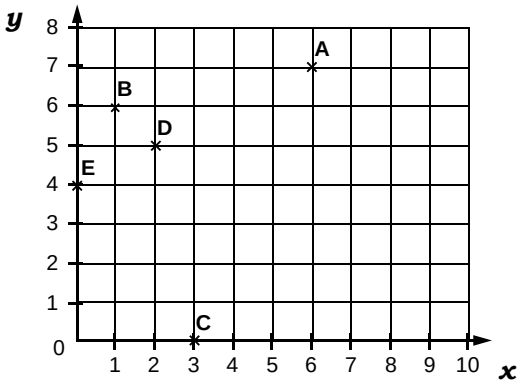


1. Name the streets that have the map references (F,6) .....
   and (C,3) .....

What are the map references for the following places?

2. The tunnel entrance (..... , ...)
3. The P.O. on London St. (..... , ...)
4. The library (..... , ...)
5. No. 5 wharf (..... , ...)
6. Lyttelton railway station (..... , ...)

D: Mathematical graphs



1. What are the two numbers that go in the brackets to describe where each of these points are on this graph?
   A = (..... , ...) B = (..... , ...)
   C = (..... , ...) D = (..... , ...)
   E = (..... , ...)
2. Draw these points on the graph, joining each point in order with a line as you go.
   (6,6), (9,4), (8,1), (4,1), (3,4), (6,6)
3. What shape have you created?
   .....

Comments: .....

.....

.....

Please sign:
Parent / Caregiver

AWS

L3MA

Algebra

A5

Homework / Assessment Worksheet

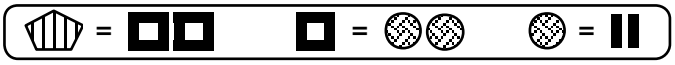
Name: **Class:** **Complete by:**

A: 10 'Quick Questions'

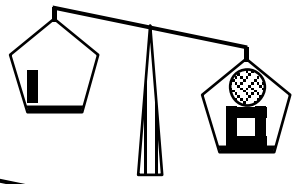
1. 1.36 + 14.8 = ...
2. 40 – 25.7 = ...
3. 359 × 11 = ...
4. 720 ÷ 60 = ...
5. What are the first 5 multiples of 9?
   .....
6. $6.45 × 6 = ...
7. Convert 6:25 a.m. to 24 hour time
   :
8. Find $\frac{1}{4}$ of $10.60
   .....
9. How many centimetres in 253mm? .....
10. What would 13 books at $0.80 each cost?
    .....

B: Balancing scales

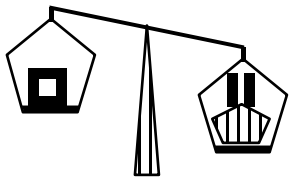
Use the information in this box to balance these scales.

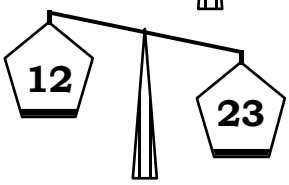


1.



2.





One equation for these scales would be 23 – 12 = *X*. **Write** a second equation for these scales, then **solve** it.

3. .....

C: Solving equations

Solve these equations.

1.	$a + 17 = 31$	a = ...	2.	$b - 17 = 31$	b = ...
3.	$56 \div 8 = c$	c = ...	4.	$12 \times 20 = d$	d = ...
5.	$e \times 15 = 75$	e = ...	6.	$f \div 12 = 8$	f = ...
7.	$52 \div g = 13$	g = ...	8.	$19 \times h = 57$	h = ...
9.	$92 + i = 127$	i = ...	10.	$67 - j = 39$	j = ...

D: Guess the number

Think of a number.
I subtract 19.
The result is 12.
What is the number?

1. .....

Think of a number.
I add 21.
The result is 47.
What is the number?

2. .....

Think of a number.
I divide by 3, then subtract 5.
The result is 3.
What is the number?

3. .....

Think of a number.
I multiply by 4, then add 9.
The result is 29.
What is the number?

4. .....

E: Solving word problems

Write an equation for each word problem, then **solve** it.

1. In Mr Stevenson's class there are 13 boys.
   If the class has 32 pupils in total, how pupils are girls?
   Equation: ..... Answer: .....

2. Mrs Grey spent $59.75 on some meat.
   If the meat cost $11.95 per kilogram, how many kilograms did she buy?

   Equation: ..... Answer: .....

3. What will it cost to buy 12 new soccer balls, if each ball costs $9.95?

   Equation: ..... Answer: .....

4. David now has $67.50 in his bank account.
   If he deposited $24.75 into his account yesterday, how much was already in the account?

   Equation: ..... Answer: .....

Comments: .....

.....

.....

Please sign:
Parent / Caregiver

AWS

Algebra

A5

Homework / Assessment Worksheet

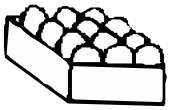
5

Name: **Class:** **Complete by:**

A: 10 'Quick Questions'

1. 4.36 + 18.2 = ...
2. 100 – 57.6 = ...
3. 115 × 11 = ...
4. 480 ÷ 40 = ...
5. List the factors of 24
   .....
6. $3.25 × 9 = ...
7. What is the time on this clock?
   
   .....
8. Find 25% of $6.40
   .....
9. How many grams in 5.6kg?
   .....
10. If 8 books cost $17.20, what does each book cost?
    .....

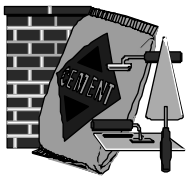
B: Using a word formula



Use the word formula to work out these problems.

The cost of buying eggs is given by the formula, *'for every dozen eggs you buy it costs $2.60'*.

1. What would it cost to buy 2 dozen eggs? $.....
2. What would it cost to buy half a dozen? $.....



The number of bricks needed to build a fence is given by the formula, *'the length of the fence in metres multiplied by 12 bricks'*.

3. How many bricks are needed to build a fence that is 20 metres long? .....
4. How long is a fence that was built with 180 bricks? .....

The cost of buying mail order books is given by the formula, *'the number of books multiplied by $5.00, plus $2.50 postage'*.

5. What would it cost to buy 7 books through mail order? .....
6. How many book were bought with $22.50? .....

C: Using a formula

Use each formula given to work out these problems.

The cost of cartons of juice (J) is given by the formula,

J = $1.65 × N, where N is the number of cartons of juice bought.

1. What would 5 cartons of juice cost?
   J = ...
2. What would 9 cartons of juice cost?
   J = ...
3. How many cartons of juice can be bought with $9.90? N = ...

In each carton of juice there is enough juice for 3 pupils. The number of cartons of juice (C) needed for a class party is given by the formula,

C = P ÷ 3, where P is the number of pupils in a class.

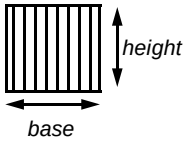
4. How many juice cartons are needed for a class of 27 pupils? C = ...
5. Jim's class needed 11 cartons of juice. How many pupils in this class? P = ...

D: More formulae

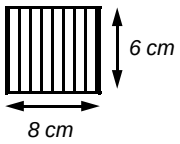
To calculate the area of a square or rectangle, use the formula,

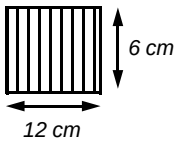
A = b × h,

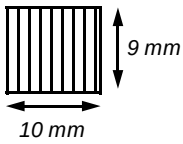
where b = base and h = height.



What is the area of these squares and rectangles?







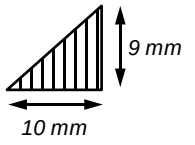
1. .....cm² 2. .....cm² 3. .....mm²

4. What is the area of a square that has sides of 9 cm? A = ... cm².

To calculate the area of a triangle, use the formula,

A = ½ × b × h,

where b = base and h = height.



5. What is the area of this triangle if the base is 12 cm and the height is 8 cm?
   A = ... cm²

Comments: .....

.....

.....

Please sign: Parent / Caregiver

AWS

Homework / Assessment Worksheet

Answers

Worksheet 1

A:

1. 39.2 2. 328 3. 945 4. 90 5. 1,2,3,4,6,12 6. $27.60 7. 10 past 10 8. $1.40 9. 3500L 10. $10.35

B:

1. < 2. = 3. > 4. > 5. < 6. > 7. < 8. = 9. < 10. <

C:

1. C 2. I 3. F 4. J 5. A 6. H 7. E 8. B 9. G 10. D

D:

1. infinite 2. finite 3. infinite 4. finite, although it would be impossible to count 5. - 6. -

E:

1.  a ¼ turn to the right each time
2.  add two circles and a rectangle
3.  add four matches, forming two more triangles

Worksheet 2

A:

1. 16.22 2. 254 3. 2628 4. 4 5. 7,14,21,28,35 6. $20.00 7. 14:45 8. $2.85 9. 4.7kg 10. $11.25

B:

1. 8, 10, 12, ... 18, 20, 22 counting in two's, even numbers, adding two to each new number
2. 16, 32, 64, ... 512, 1024, 2048 multiplying each new number by 2
3. 88, 84, 80, ... 68, 64, 60 subtracting 4 from each new number
4. 24, 31, 38, ... 59, 66, 73 adding 7 to each new number
5. 125, 625, 3125, ... 78125, multiplying each new number by 5

C:

1. 16, 25, 34, 43, 52 2. 12, 48, 192, 768, 3072 3. 87, 74, 61, 48, 35

D:

1. A = 9, B = 13, C = 17, D = 21 2. Subtract 5

E:

1. $23.90 2. $47.80 3. $119.50 4. $298.75 5. $16.00 6. $40.00 7. $88.00 8. $124.00 9. 8 CD's

Worksheet 3

A:

1. 53.83 2. 247 3. 1925 4. 60 5. 1,2,3,6,9,18 6. $25.55 7. 25 to 4 8. $4.75 9. 1500mm 10. $5.60

B:

1. Ben 2. Ben is the youngest 3. John, Bill, Jack, Ben 4. Tuesday 5. Friday 6. sick

C:

1. (F,6) = Ripon Street, (C,3) = Norwich Quay 2. (A,4) 3. (C,4) 4. (F,2) 5. (B,2) 6. (F,1)

D:

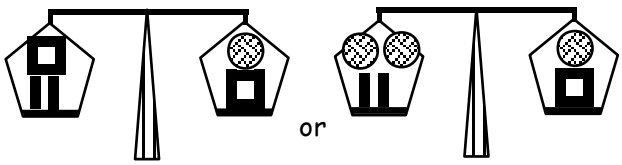
1. A = (6,7), B = (1,6), C = (3,0), D = (2,5), E = (0,4) 2. check pupil's graph 3. pentagon (5 sides)

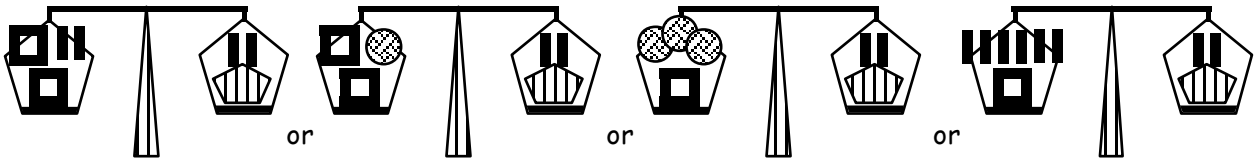
Worksheet 4

A:

1. 16.16 2. 14.3 3. 3949 4. 12 5. 9,18,27,36,45 6. $38.70 7. 06:25 8. $2.65 9. 25.3cm 10. $10.40

B:

1. 

2. 

3. $X + 12 = 23$ or $23 - X = 12$, $X = 11$

C:

1. a = 14 2. b = 48 3. c = 7 4. d = 240 5. e = 5 6. f = 96 7. g = 4 8. h = 3 9. i = 35 10. j = 28

D:

1. 31 2. 26 3. 24 4. 5

E:

1. 19 girls 2. 5 kgs of meat 3. $119.40 4. $42.75

Worksheet 5

A:

1. 22.56 2. 42.4 3. 1265 4. 12 5. 1,2,3,4,6,8,12,24 6. $29.25 7. 5 to 5 8. $1.60 9. 5600g 10. $2.15

B:

1. $5.20 2. $1.30 3. 240 bricks 4. 15 metres long 5. $37.50 6. 4 books

C:

1. $8.25 2. $14.85 3. 6 cartons 4. 9 cartons 5. 33 pupils

D:

1. 48 cm^2 2. 72 cm^2 3. 90 mm^2 4. 81 cm^2 5. 48 cm^2

Tracking Sheet: ‘In-class’ Activity Sheets

Algebra

Name

Comments

Worksheet	Objectives														
15	A5														
14	A5														
13	A5														
12	A5														
11	A5														
10	A4														
9	A4														
8	A4														
7	A2 / A5														
6	A3														
5	A2														
4	A1 / A2														
3	A1 / A2														
2	A1														
1	Revision														

Tracking Sheet: Homework / Assessment Worksheets

Algebra

Worksheet	Objectives	Name														Comments
5	A5															
4	A5															
3	A4															
2	A2 / A3															
1	A1															