A Complete Guide to ...

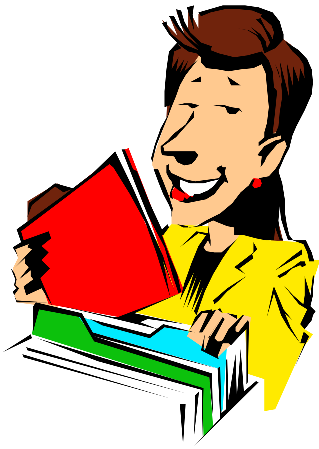
Algebra

Utilising the objectives as written in

MATHEMATICS in the New Zealand CURRICULUM

for

Level 4



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
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L4MA

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Author:
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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 Algebra

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

Mathematics in the New Zealand Curriculum for Level 4.

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 4

Resource Code: L4MN

A Complete Guide to Measurement

written utilising the objectives as stated in

Mathematics in the New Zealand Curriculum for Level 4.

Resource Code: L4MM

A Complete Guide to Geometry

written utilising the objectives as stated in

Mathematics in the New Zealand Curriculum for Level 4.

Resource Code: L4MG

*A Complete Guide to Algebra

written utilising the objectives as stated in

Mathematics in the New Zealand Curriculum for Level 4.

Resource Code: L4MA

A Complete Guide to Statistics

written utilising the objectives as stated in

Mathematics in the New Zealand Curriculum for Level 4.

Resource Code: L4MSt

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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.

Section	
1	**List of Algebra Objectives:** **Table of 'In-class' Worksheets / Objectives covered**
2	**Table of Contents:** **'In-class' Worksheets**
3	**'In-class' Worksheets Masters**
4	**Teaching Notes / Answers for 'In-class' Worksheets**
5	**Table of Contents:** **Homework / Assessment Worksheets**
6	**Homework / Assessment Worksheets Masters**
7	**Answers for Homework / Assessment Worksheets**
8	**Worksheet tracking sheets for teachers to record pupil names / worksheets covered**

❶

Algebra

The following are the objectives for **Algebra**, **Level 4**, as written in the
MATHEMATICS *in the New Zealand Curriculum* document, first published 1992. ***[Refer Page 142]***

Exploring patterns and relationships

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

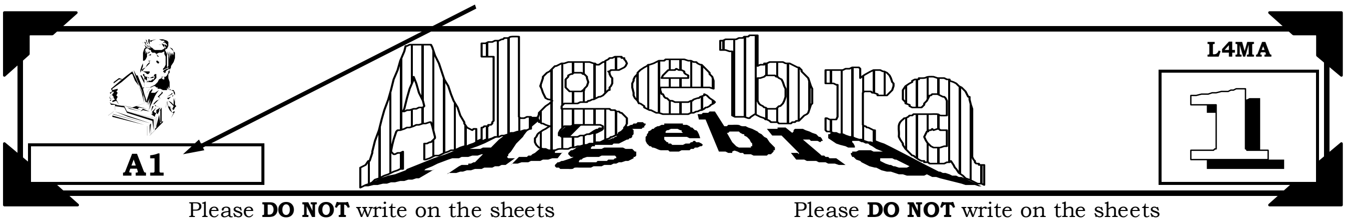
- **A1** find a rule to describe any member of a number sequence and express it in words;
- **A2** use a rule to make predictions;
- **A3** sketch and interpret graphs on whole number grids which represent simple everyday situations.

Exploring equations and expressions

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

- **A4** find and justify a word formula which represents a given practical situation;
- **A5** solve simple linear equations such as 2☐ + 4 = 16.

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.



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 4**.

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;
- **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 4**. ***[Refer to pages 23 - 29 of the Curriculum document]***

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

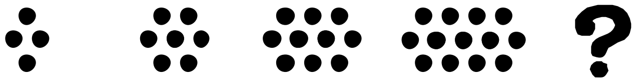
See the opposite page for details of each objective.

	Algebra Objectives					Mathematical Processes Objectives												
Worksheet Number	A 1	A 2	A 3	A 4	A 5	MP 1	MP 2	MP 3	MP 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					✖	✖		✖	✖			✖				✖		

Table of Contents for the 'In-class' Worksheet Masters for Algebra, Level 4

Creating and describing shape patterns:

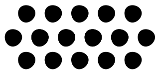
When a series of shapes forms a pattern it is sometimes called a **sequence**.
Example: The first four shapes of a pattern are drawn below.



1st shape *2nd shape* *3rd shape* *4th shape* *5th shape*

How many dots are there in each shape?
What would the 5th shape look like?
How many dots in the 10th shape?

Answers: 4, 7, 10 and 13 dots. This is the beginning of a **number sequence**.
The 5th shape looks like ...



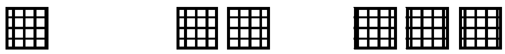
There are 31 dots in the 10th shape.

Can you describe in words how each new shape has been created?
"Start with four circles and add three circles to each new shape."

Task 1

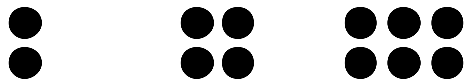
Below are diagrams of the first three shapes of six patterns.
Draw the **next three shapes** for each pattern.

1.



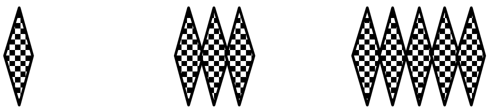
1st shape *2nd shape* *3rd shape*

2.



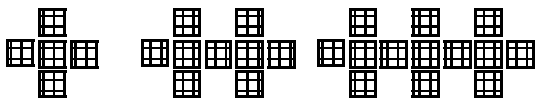
1st shape *2nd shape* *3rd shape*

3.



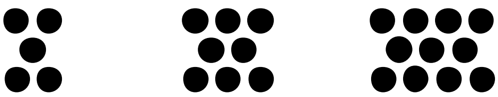
1st shape *2nd shape* *3rd shape*

4.



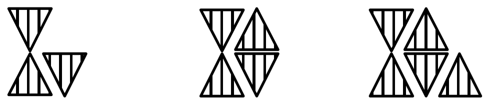
1st shape *2nd shape* *3rd shape*

5.



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

6.



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

7. **Count** the number of squares, circles, diamonds or triangles that are in each shape diagram for each shape pattern drawn above, plus the three additional diagrams you have drawn.
   Example: Question 1 numbers would be 1, 2, 3, 4, 5 and 6.
   As you write these numbers, you are creating **number sequences** that could go on forever.
8. **Describe** in words how each sequence in Questions 1, 2, 3, 4, 5 and 6 have been created.
   Looking at the number sequences you created in Question 7 may help.
9. **Using** your **word rules**, **work out** the number of squares, circles, diamonds or triangles that would be in the **8th** and **10th shapes** of each pattern in Questions 1, 2, 3, 4, 5 and 6.

Task 2

1. **Create** the **first three shapes** of four shape patterns of your own, like the questions above.
2. **Exchange** patterns with a classmate and work out the next three shapes of his / her pattern.
3. **Describe** in words how each pattern has been created.

Please **DO NOT** write on the sheets

Continuing a number sequence and finding the rule:

When a series of numbers forms a pattern it is called a **sequence**. A sequence can be an **infinite list** of numbers. The sequence of numbers can be created by **adding** or **subtracting** the same number to or from the previous number.
The numbers in a sequence can also be called **terms**.

Example: 1, 3, 5, 7, 9, 11, . . . These numbers form the sequence called **odd numbers**.

The 1st term is 1, the 2nd term is 3, the 3rd term is 5, the 4th term is 7, the 5th term is 9 etc.

What is the rule for this sequence? Answer: '***Add 2'*** to each new number or term.

Task 3

Look at each number sequence below and **find** the **missing numbers** that would replace each ☐.
Describe in words, **the rule** for each sequence.

1. 2, 4, ☐, 8, ☐, 12, 14, ☐, . . .
2. 6, ☐, 18, 24, ☐, ☐, 42, 48, . . .
3. 5, ☐, 15, 20, ☐, ☐, 35, 40, . . .
4. 9, 18, ☐, 36, ☐, 54, ☐, 72, . . .
5. 11, 22, ☐, 44, ☐, 66, ☐, 88, . . .
6. 3, ☐, ☐, 12, 15, ☐, 21, 24, . . .
7. 7, ☐, ☐, 28, 35, ☐, 49, 56, . . .
8. 10, 20, ☐, ☐, 50, 60, ☐, 80, 90, . . .
9. 4, 8, ☐, ☐, 20, 24, ☐, 32, 36, . . .
10. 8, ☐, 24, 32, ☐, ☐, 56, 64, . . .

Look at each number sequence below and **find** the **missing numbers** that would replace each ☐.
Describe in words, **the rule** for each sequence.

11. 48, 44, ☐, 36, ☐, 28, 24, ☐, . . .
12. 100, ☐, 80, 70, ☐, ☐, 40, 30, . . .
13. 60, ☐, 50, 45, ☐, ☐, 30, 25, . . .
14. 84, 77, ☐, 63, ☐, 49, ☐, 35, . . .
15. 36, 33, ☐, 27, ☐, 21, ☐, 15, . . .
16. 108, ☐, ☐, 81, 72, ☐, 54, 45, . . .

Find the **rule** for these number sequences.
Use your rule to work out the **next 3 numbers** for each sequence.

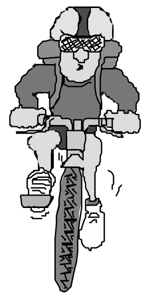
17. 5, 9, 13, 17, 21, . . .
18. 37, 34, 31, 28, 25, . . .
19. 13, 23, 33, 43, 53, . . .
20. 2, 9, 16, 23, 30, . . .
21. 72, 63, 54, 45, 36, . . .
22. 7, 13, 19, 25, 31, 37, . . .
23. 4, 16, 28, 40, 52, 64, . . .
24. 61, 54, 47, 40, 33, . . .
25. 121, 221, 321, 421, 521, . . .
26. 162, 142, 122, 102, 82, . . .

Task 4

1. **Create** the **first three numbers** of four number sequences of your own, like the questions above.
2. **Exchange** sequences with a classmate and work out the next three numbers of his / her sequence.
3. **Describe** in words how each number sequence has been created.

Word problems involving number sequences:

Example: Sally goes for a bike ride every Saturday, without fail.
This sequence of numbers shows how far each ride was, for the first 5 rides.



7km, 9km, 11km, 13km, 15km

What can you say about Sally's bike rides?

Answer: Sally **added 2 kilometres** to her ride each week.

If she continued this sequence, how far would the next 3 rides be?

Answer: 17km, 19km and 21km.

Task 5

Paul bought a small pot plant that was 8cm high. Every 3 days he measured how high the pot plant had grown. This sequence of numbers shows the height of the pot plant, after it was measured 3 times.

8cm, 11cm, 14cm, 17cm

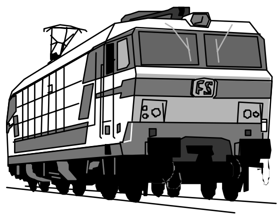
1. How much did the pot plant grow every three days?
2. How many days is it since Paul started measuring the plant?
3. If the pot plant continues to grow at the same rate, work out the next three heights.
4. What will the height be after 24 days if it grows at the same rate?

On this calendar, John has circled the days he must deliver a local newspaper in his neighbourhood.

5. Create a number sequence by listing these dates.
6. How often does he deliver these newspapers?
7. Work out the next 2 days he must deliver papers.

Sun	Mon	Tue	Wed	Thu	Fri	Sat
			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
26	27	29	30	31		

Mr Moore is travelling home by train, a distance of 350km. Every hour, a sign in the train tells the passengers how much further they have to go. This sequence of numbers shows the distance left to travel.

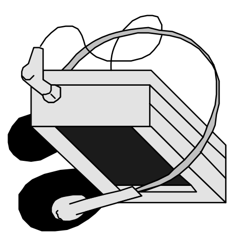


350km, 300km, 250km, 200km

8. How far does the train travel every hour?
9. Work out the next three numbers in this sequence.
10. How many hours does this train journey of 350km take altogether?

Jamie is saving his pocket money each week so that he can buy himself a new walkman.
This sequence of numbers shows how much Jamie has saved so far.

$7, $14, $21, $28, $35



11. How much does Jamie save each week?
12. Work out the next 3 numbers in this sequence.
13. If the walkman costs $70, for how many weeks will Jamie have to save his pocket money before he can buy the walkman?

 Please **DO NOT** write on the sheets

Continuing more number sequences and finding rules:

A sequence of numbers can also be created by **multiplying** or **dividing** each new number or term by the same number. A number sequence created this way can also go on forever.

Example: 2, 4, 8, 16, 32, 64, . . .

1st term is	1 × 2 = 2	2nd term is	2 × 2 = 4	
3rd term is	4 × 2 = 8	4th term is	8 × 2 = 16	
5th term is	16 × 2 = 32	6th term is	32 × 2 = 64	etc.

What is the rule for this sequence? Answer: ***'Multiply by 2'***, each new number or term.

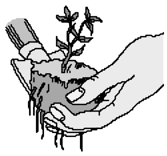
Task 6

Look at each number sequence below and **find** the **missing numbers** that would replace each ☐.
Describe in words, **the rule** for each sequence.

1. 3, 6, ☐, 24, ☐, 96, 192, ☐, . . .
2. 1, 5, ☐, 125, 625, ☐, ☐, 78125, . . .
3. 2, 6, ☐, 54, 162, ☐, ☐, 4374, . . .
4. 4, 8, ☐, 32, ☐, 128, ☐, 512, . . .
5. 3, 12, ☐, 192, ☐, 3072, ☐, 49152, . . .
6. 20000, 10000, ☐, 2500, ☐, ☐, 312.5, . . .
7. 1, 7, ☐, ☐, 2401, ☐, 117649, . . .
8. 6, 18, ☐, ☐, 486, 1458, ☐, 13122, . . .
9. 4800, 2400, ☐, ☐, 300, 150, ☐, 37.5, . . .
10. 2, ☐, 50, 250, ☐, ☐, 31250, . . .

Find the **rule** for these number sequences listed below.
Use your rule to work out the **next 3 numbers** for each sequence.

11. 2, 4, 8, . . .
12. 7, 14, 28, . . .
13. 2, 10, 50, . . .
14. 3, 12, 48, . . .
15. 4, 12, 36, . . .
16. 6, 30, 150, . . .
17. 1 ,9, 81, . . .
18. 5, 35, 245, . . .
19. 10, 100, 1000, . . .
20. 8, 16, 32, . . .
21. A bean plant grows twice as tall each week. If the bean plant was 3cm tall after one week, list the heights the bean plant will be at the end of each of the next 5 weeks.



Mr Jones is raising money for child cancer research. This sequence of numbers shows the amount of money raised each month, for the first three months.

$240, $720 and $2160

22. Find the rule for this number sequence, then work out what the next three money totals might be.

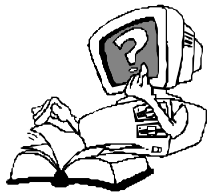
Task 7

1. **Create** the **first three numbers** of four number sequences of your own, like the questions above.
2. **Exchange** sequences with a classmate and work out the next three numbers of his / her sequences.
3. **Describe** in words how each number sequence has been created.

Please **DO NOT** write on the sheets

Special number sequences:

Task 8



These diagrams show the first three **triangular numbers**. By counting the dots, a number sequence can be created for each.

1. **Look** at the pattern of dots, then **draw** the 4th diagram for the triangular numbers.

	1st diagram	*2nd diagram*	*3rd diagram*	*4th diagram*
Triangular numbers				?

2. **Count** the dots in each diagram and **write** the first four numbers for this sequence.

3. **Look** at the difference between the numbers of this sequence and then try to **work out** the **next** triangular number.

In this table are drawn the first three diagrams for the **square**, **pentagonal** and **hexagonal** numbers.

For the square, pentagonal and hexagonal numbers ...

4. **Draw** the 4th diagram.
5. **Count** the dots in each diagram and **write** the first four numbers for each sequence.
6. **Work out** the 5th number for each sequence.

	1st diagram	*2nd diagram*	*3rd diagram*	*4th diagram*
Square numbers				?
Pentagonal numbers				?
Hexagonal numbers				?

Number sequence challenge:

Task 9

In this grid there are **5 number sequences**. Each sequence is made up of 5 numbers.

4	1	3	6	12	24	48
7	5	11	18	27	13	2
12	9	10	9	17	21	7
32	6	17	15	28	10	12
24	2	13	23	20	3	17
6	11	3	7	17	25	22
9	10	19	2	13	6	29
2	6	18	54	162	193	36

1. **Find** and **write out** each sequence and **describe** how each sequence was created.

2. **Make up** your own grid with 5 hidden number sequences. Have a classmate try to **find** your sequences and **describe** how they were created.

Using a rule to create a number sequence:

Given a rule written in words, a number sequence can be created. Some rules can involve more than one operation (+, −, × or ÷). Remember that the numbers of a sequence can be called **terms**.

Example:

Term numbers	Rule	Sequence numbers
1	**Multiply by 2, then add 5**	7
2		9
3		11
4		13

The first four numbers or terms of this sequence are

7, 9, 11 & 13

What would the 20th term of this sequence be?

Answer: 20 ***'multiplied by 2, then add 5'*** = 45
(20 × 2 = 40, 40 + 5 = 45)
The 20th term of this sequence is 45.

Task 10

1. **Use** the **rule** to **find** the **first 4 terms** of this number sequence.

Term numbers	Rule	Sequence numbers
1	**Multiply by 3, then add 2**	?
2		?
3		?
4		?

2. Use the same rule, ***'multiply by 3, than add 2'***, to find the ...
10th term,
20th term,
and the **50th** term of this sequence.

3. **Use** the **rule** to **find** the **first 4 terms** of this number sequence.

Term numbers	Rule	Sequence numbers
1	**Multiply by 5, subtract 4**	?
2		?
3		?
4		?

4. Use the same rule, ***'multiply by 5, subtract 4'***, to find the ...
10th term,
20th term,
and the **50th** term of this sequence.

5. **Use** the **rule** to **find** the **first 4 terms** of this number sequence.

Term numbers	Rule	Sequence numbers
1	**Add 4, then multiply by 2**	?
2		?
3		?
4		?

6. Use the same rule, ***'Add 4, then multiply by 2'***, to find the ...
10th term,
20th term,
and the **50th** term of this sequence.

7. **Use** the **rule** to **find** the **2nd**, **4th**, **6th** and **8th terms** of this number sequence.

Term numbers	Rule	Sequence numbers
2	**Divide by 2, then add 7**	?
4		?
6		?
8		?

8. Use the same rule, ***''Divide by 2, then add 7'***, to find the ...
10th term,
20th term,
and the **50th** term of this sequence.

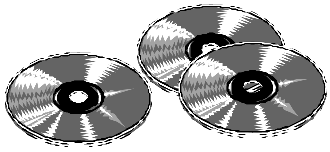
Practical problems involving rules:

Richard buys C.D.'s by mail-order. Each C.D. costs $10.00 and there is a postage charge of $4.00.

A rule for the cost of buying C.D.'s would be ***'Number of C.D.'s multiplied by $10.00, plus $4.00'***.

What would it cost to buy 3 C.D.'s?

Answer: 3 × $10.00 + $4.00 = **$34.00**



If Richard spent $54.00 on C.D.'s, how many C.D.'s did he buy?

Answer: $54.00 - $4.00 (postage) = $50.00, then $50.00 ÷ $10.00 (cost of 1 C.D.)= 5 C.D.'s.

Task 11

Paul often buys books through a book club at his school.
All the books cost $5.00 each and with each order, $6.00 postage is charged.

1. **Use** the **rule** to work out the cost of buying 2, 5, 10 or 20 books.
2. If Paul spent $41.00 on books, how many books did he buy?

Number of books	*Rule*	*Cost*
2	**$5.00 per book, plus $6.00 postage**	?
5		?
10		?
20		?

Soccer balls can be bought for $12.00 each from a mail order company.
Postage of $9.00 is charged for each order, no matter how many soccer balls are purchased.

3. **Use** the **rule** to work out the cost of buying 3, 7, 10 and 20 soccer balls.
4. If Jane spent $57.00 on soccer balls, how many soccer balls did she buy?

Number of soccer balls	*Rule*	*Cost*
3	**$12.00 per soccer ball, plus $9.00 postage**	?
7		?
10		?
20		?

Andrew makes an overseas toll call that costs $1.50 per minute and uses an operator when he makes the call. Using an operator means there is an additional charge of $2.50 per call.

5. **Use** the **rule** to work out the cost of making telephone calls 4, 8, 12 and 20 minutes in length.
6. Andrew used the operator to make a telephone call. If the call cost $17.50, for how long did he talk on the telephone?

Time in minutes	*Rule*	*Cost*
4	**$1.50 per minute, plus $2.50 charge**	?
8		?
12		?
20		?

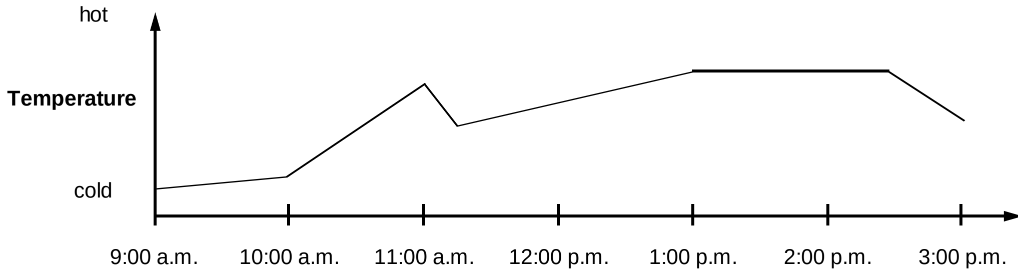
Task 12

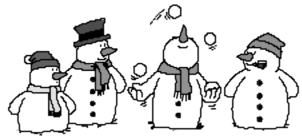
1. **Create** three diagrams, similar to those above, with a rule. You have to be able to work out your own answers using your rules.

2. **Exchange** diagrams with a classmate and work out his / her rules, then **compare** your answers.

Graphs of real-life situations:

There are many **'things'** that are related in some way. Drawing a **graph** is one way to show a relationship.
Example: The air temperature in Room 10 was noted during one school day, during the winter.





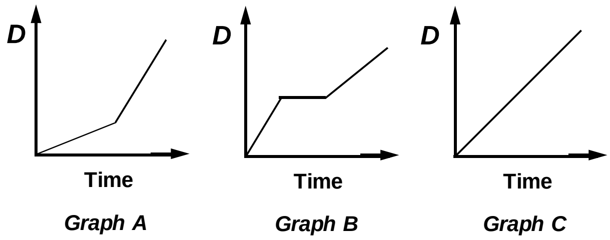
What relationship does this graph show? What could have caused the dip in the graph at 11:00 a.m.?

Answers: Air temperature in Room 10 for one day from 9:00a.m. to 3:00p.m.
A door or windows may have been opened, letting out the heat, causing the air temperature to drop.

What else can you say about the air temperature in Room 10 during that day? **Discuss**.

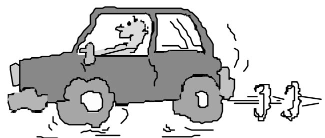
Task 13

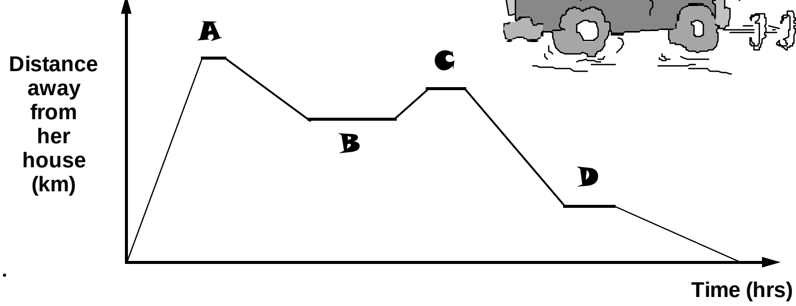
Which of these stories belongs to which graph?
For each graph, the **D** = distance.



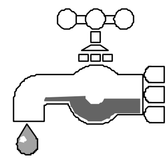
1. John ran at a steady pace across the park.
2. Mary walked slowly up hill and ran fast down hill.
3. Kim ran to the gate and waited for the postman, then walked to the shop.

This graph shows how far Mrs Robinson was away from her house as she went shopping and visited a friend's place for lunch.





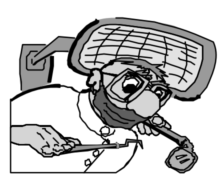
4. At which point on the graph was Mrs Robinson furtherest away from her house?
5. At which point on the graph did she stop for the longest time?
6. **Write** a story for this graph. **Discuss** your story with a classmate.



Shane runs water for a bath. He gets in, then runs more hot water and listens to the radio while sitting in the bath. He gets out and then empties the bath.

7. **Draw** a graph to show the depth of water in the bath. **Discuss** your graph with a classmate.

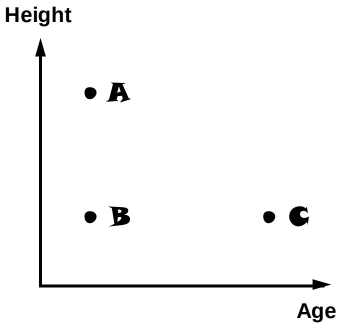
Task 14



1. **Create** 2 or 3 graphs of real-life situations. Remember to state what relationship your graph shows by labelling each axis of your graph.
2. **Write** a story about the information displayed by your graph.

Interpreting graphs showing relationships:

This graph shows the relationship between height and age of four people.

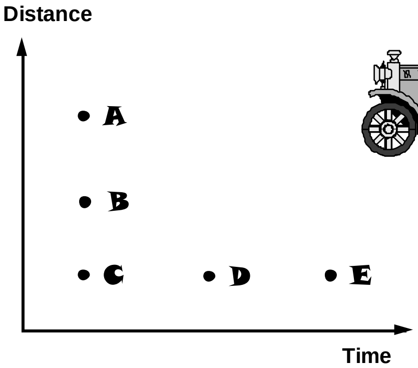


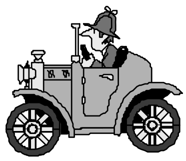
Which two points indicate the same age?

Which two points indicate the same height?

Answers: Points A and B indicate the same age.
Points B and C indicate the same height.

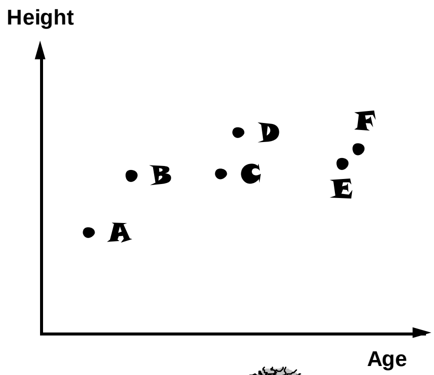
Task 15





1. Sam, Linda and Richard all live the same distance from their school. Which letters on this graph could represent these three pupils?
2. Why do you think Sam, Linda and Richard do not take the same time to travel to school?
3. Which letter represents Richard, if he walks to school?
4. David walks to school, Karen arrives by car and Bruce rides his bike to school. Which three letters would represent David, Karen and Bruce if they all take the same time to get to school?

The graph below shows the Johnston family, spanning three generations, but who is who?

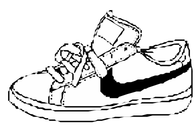


5. Grandad Johnstone is younger and slightly shorter than his wife. Which letter represents Grandad Johnston?
6. If Mr Johnston is taller than Mrs Johnston, which letter could represent Mr Johnston?
7. How many children do you think Mr and Mrs Johnston have and which letters represent them?
8. Which letter represents Mrs Johnston?
9. If their son is as tall as Mrs Johnston, which letter represents him?

10. Ken, Peter and James are all brothers. Peter is the tallest, but James is the oldest. Ken is younger than Peter and not as tall as James. **Draw** a graph to show the **relationship** between the **heights** and **ages** of the brothers.

Task 16

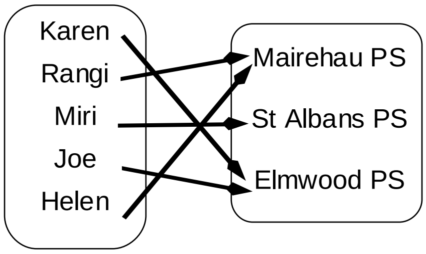
Create four **relationship graphs** of your own. Remember to **label** each **axis** of your graph.
Suggestions: 'age and height of 5 pupils',
'shoe size and height of 5 pupils',
'size and weight of 6 objects',
'cost and weight of 6 chocolate bars', . . .
Have a classmate **interpret** each relationship graph.



Understanding mapping diagrams:

There are many ways a graph can be drawn to show a relationship.
Example: In this graph, the arrows show 'things' that are related.

This type of graph is called a **mapping diagram**.
This mapping diagram shows the relation **'the school they go to'**.
The arrows usually point from left to right.



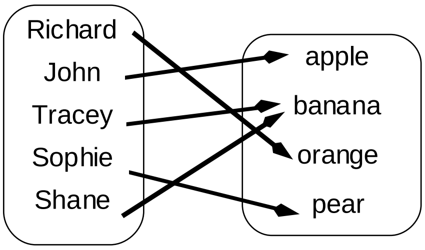
What school does Miri go to and who goes to Elmwood Primary School?

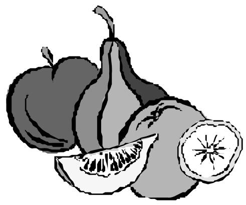
Answer: Miri goes to St Albans PS and Karen and Joe go to Elmwood PS.

Task 17

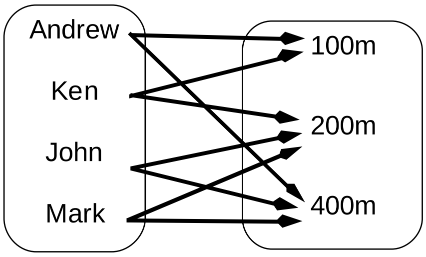
This mapping diagram shows which fruit four pupils had in their school lunches.

1. What fruits did the pupils have for their lunches?
2. Who had an apple?
3. What fruit did Richard have?
4. How many pupils had a banana?

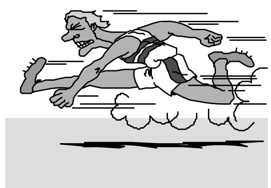




This mapping diagram shows the events that four boys entered in the athletic sports.

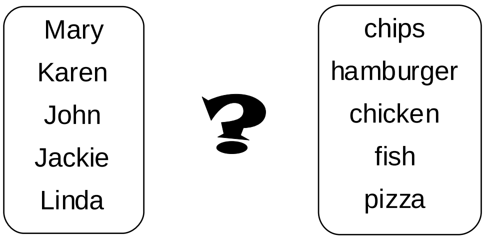


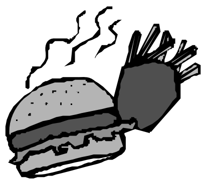
5. Who ran in the 200m race?
6. What races did Andrew run in?
7. What races did Mark run in?
8. Who ran in the 400m race?



Five friends buy take-aways for lunch. Mary buys a hamburger and chips, Karen buys fish and chips, John buys a hamburger and chicken, Jackie buys pizza and Linda buys chicken and chips.

9. **Copy** and **complete** this mapping diagram to show the relation **'what take-aways they had for lunch'**.



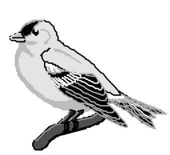


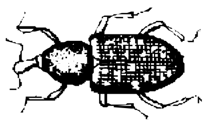
Four friends went to the movies. As part of the clothes they chose to wear, Dianne wore a skirt, Frank and Jacob wore jeans and Rebecca wore shorts.

10. **Draw** a mapping diagram for the relation **'what they wore'**.

Task 18

Create four **mapping diagrams** of your own. Remember to **name** the **relation** that you are drawing.
Suggestions: 'is older than',
'is taller than',
'has more legs than',
'is in the same class as', . . .



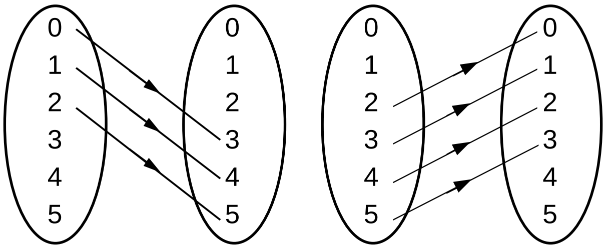


Have a classmate **interpret** each **mapping diagram**.

Mapping diagrams involving numbers:

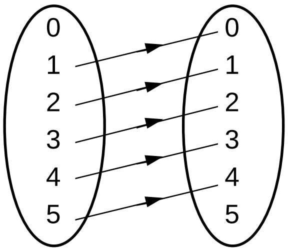
Mapping diagrams can be used to show a relationship between numbers.

Example: The first two diagrams show the relations ***'is 3 less than'*** and ***'is 2 more than'***.



What relation does this mapping diagram show?

Answer: '***is 1 more than***'

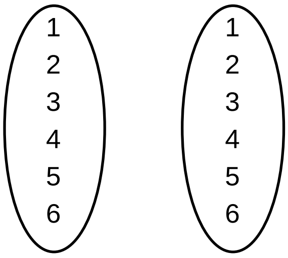


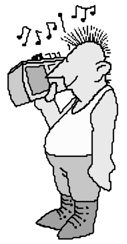
Remember the arrows point from left to right.

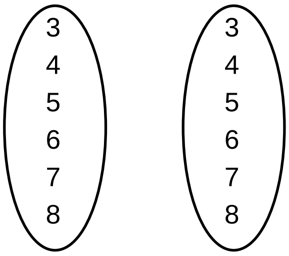
Task 19

Make **2 copies** of this mapping diagram.

1. On one diagram show the relation ***'is half'***.
2. On the other diagram show the relation ***'is double'***.





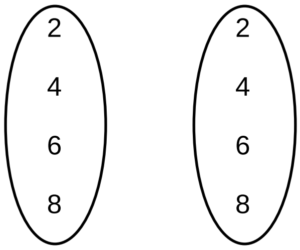


Make **2 copies** of this mapping diagram.

3. On one diagram show the relation ***'is 3 more than'***.
4. On the other diagram show the relation ***'is 2 less than'***.

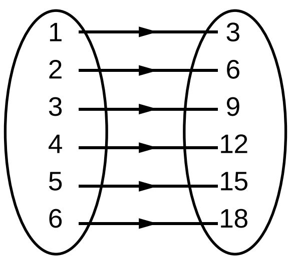
Make **2 copies** of this mapping diagram.

5. On one diagram show the relation ***'is a factor of'***.
6. On the other diagram show the relation ***'is a multiple of'***.

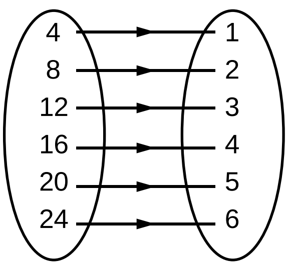


Look at each mapping diagram below and state the relationship between the numbers.

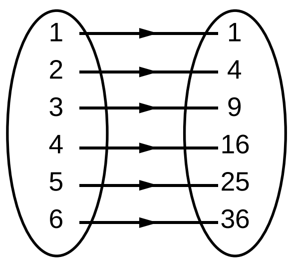
7.



8.



9.



Task 20

Create four **number mapping diagrams** of your own, with at least 6 numbers on each side, similar to questions 7, 8 and 9.

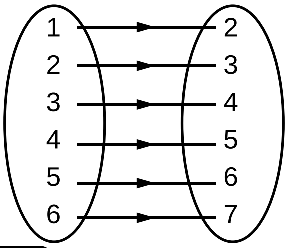
Have a classmate try to work out the relationship between the numbers of each diagram. Remember the arrows point from left to right.

 Please **DO NOT** write on the sheets

Ordered pairs:

From a mapping diagram, **ordered pairs** can be created by writing the numbers (or words) that are at each end of the arrow as a pair, inside brackets. The order in which the numbers (or words) are written is important. That is why they are called **ordered pairs**.

Example:



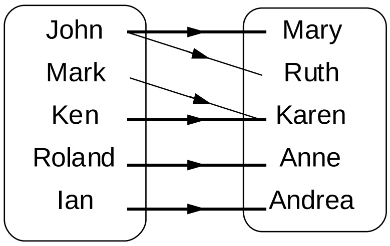
The **ordered pairs** for this relation are (1,2), (2,3), (3,4), (4,5), (5,6) and (6,7).

The relation for these ordered pairs is ***'is 1 less than'***.

Task 21

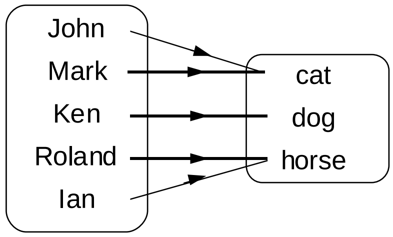
List the **ordered pairs** containing words that are shown by these mapping diagrams.

1.



'is the brother of'

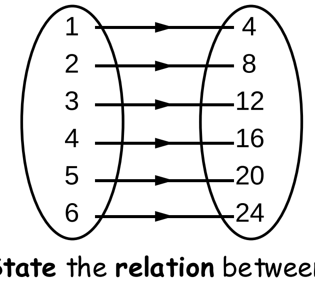
2.



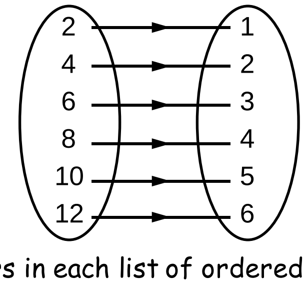
'has a pet'

List the **ordered pairs** that are shown by these mapping diagrams.

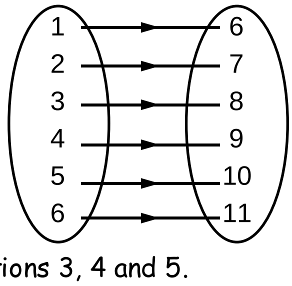
3.



4.



5.



6. **State** the **relation** between the numbers in each list of ordered pairs in questions 3, 4 and 5.

7. The first number of each ordered pair is written in these brackets.

   (1,   ), (2,   ), (3,   ), (4,   ), (5,   ), (6,   )

   If the relation between the numbers is ***'the second number is 10 more than the first number'***, **copy** and **complete** these ordered pairs.

8. The first number of each ordered pair is written in these brackets.

   (1,   ), (2,   ), (3,   ), (4,   ), (5,   ), (6,   )

   If the relation between the numbers is ***'the second number is 3 times the first number'***, **copy** and **complete** these ordered pairs.

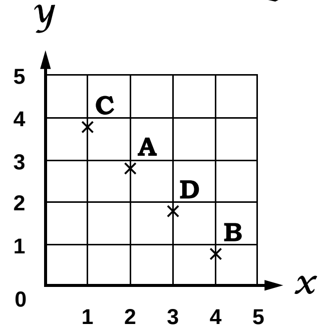
9. The first number of each ordered pair is written in these brackets.

   (1,   ), (2,   ), (3,   ), (4,   ), (5,   ), (6,   )

   If the relation between the numbers is ***'the second number is half the first number'***, **copy** and **complete** these ordered pairs.

Graphing ordered pairs / co-ordinates:

Co-ordinates are the ordered pairs that locate points on a graph called a **Cartesian graph**.
The ***x*-axis** is the **horizontal axis**. The ***y*-axis** is the **vertical axis**.
Example: Point **A** = (2, 3) and is shown on the graph.



What do the numbers 2 and 3 in the brackets mean?

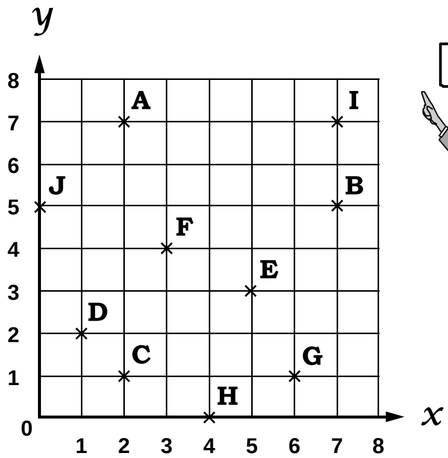
Answer: Count 2 along the x-axis to the right and count 3 up the y-axis. Where the lines cross is Point A.

What are the co-ordinates for Points B, C and D?

Answer: B = (4, 1), C = (1,4) and D = (3, 2). Remember the **order MUST be** (x-axis number, y-axis number), inside the brackets.

Task 22

1. **Write** the co-ordinates for the 10 points that are marked on this graph.

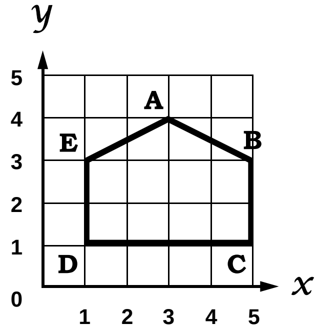


2. **Draw** your own graph with numbers from 1 to 8 on the x-axis and from 1 to 8 on the y-axis. **Mark** these points on your graph.

A = (3, 5)	B = (1, 3)
C = (7, 2)	D = (4, 8)
E = (6, 5)	F = (8, 1)
G = (2, 7)	H = (7, 0)
I = (0, 6)	J = (0, 0)

3. The instructions to draw this shape could start with (1, 1), then join to ...

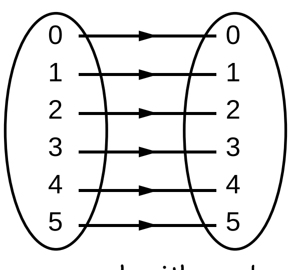
   Complete these instructions.

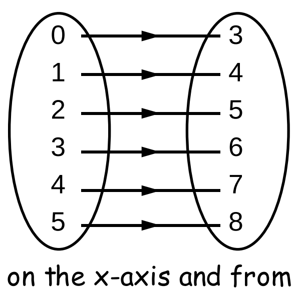


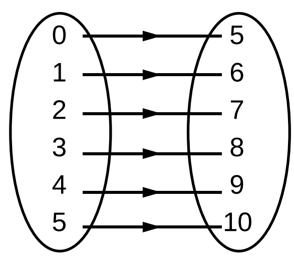
4. On a graph, **plot** these points, joining them with straight lines as you go.
   (2, 1), (1, 3), (3, 5), (5, 3), (4, 1), (2, 1)

5. What shape did this create?

For each mapping diagram below, **write** the ordered pairs or **co-ordinates** they represent.

6. 

7. 

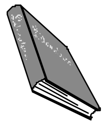
8. 

9. **Draw** a graph with numbers from 1 to 10 on the x-axis and from 1 to 10 on the y-axis, On your graph, **draw** each set of co-ordinates from questions 6, 7 and 8.

10. What do you notice about the points of each set of co-ordinates you have drawn?

Graphing real-life relationships:

A shop sells books for $2.00 each.
This table shows the cost of buying 0, 1, 2 and 4 books.

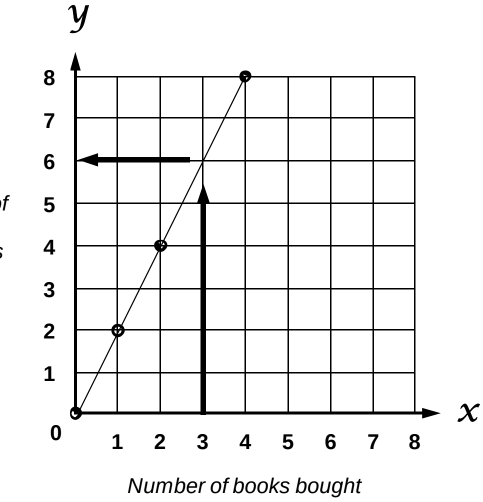


Number of Books	0	1	2	4
Price (in dollars)	0	2	4	8

From this table, **ordered pairs** or **co-ordinates** can be **written** ...

(0, 0), (1, 2), (2, 4) and **(4, 8)**

and then **graphed**, joining the points with a straight line.

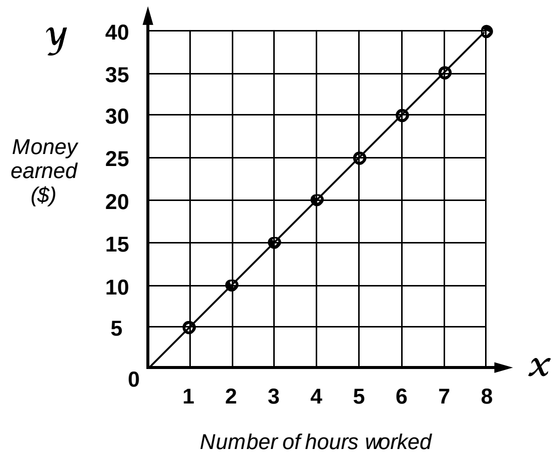


Looking at the graph, can you work out how much it would cost to buy 3 books?

Answer: Yes, the cost would be $6.00. (See arrows on graph)

Task 23

This graph shows the relationship between the number of hours Sally can work and the money she will earn.



1. How much did Sally earn when she worked 1 hour?
2. How much did Sally earn in 5 hours of work?
3. If Sally earned $15.00, how many hours did she work?
4. If Sally earned $40.00, how many hours did she work?
5. **List** the points on this graph as **ordered pairs**.

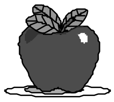
A shop sells packets of jelly beans for 20 cents each.

6. **Copy** and **complete** this table.
7. **Write** the numbers as ordered pairs.
8. **Plot** these ordered pairs on a graph, **joining** the points with a **straight line**.

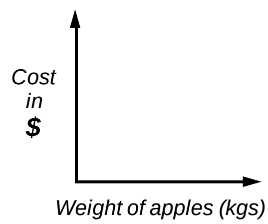
Number of packets	0	1	2	3	5	8	10
Price (cents)	0	20	40	?	?	?	?

9. Use your graph to work out the cost of buying 4, 7 and 9 packets of jelly beans.

The cost of buying apples, priced per kilogram, is shown in this table.



Weight of apples (kgs)	0	1	2	4	7	9	10
Cost ($)	0	0.50	1.00	2.00	3.50	4.50	5.00



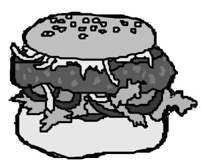
10. **Write** the numbers in this table as **co-ordinates**.
11. **Plot** these co-ordinates on a graph, **joining** the points with a **straight line**.
12. Use your graph to work out the cost of buying 3kgs, 5kgs and 8kgs of apples.

Task 24

Create two **real-life graphs** of your own. Remember to **draw** a **scale** and **label** each axis and **name** the **relationship** that you are drawing.

Suggestions: 'the cost of buying hamburgers / number of hamburgers bought',
'the weight of jelly beans / number of jelly beans', . . .

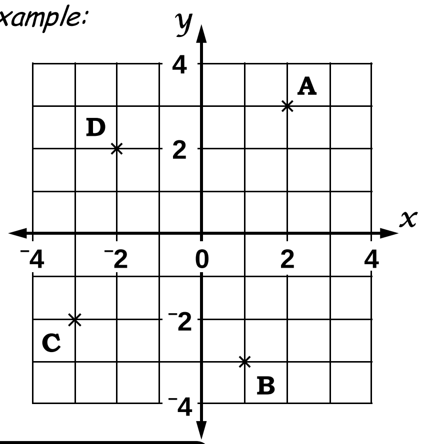
Have a classmate **interpret** each **real-life graph**.



Extending co-ordinate graphs:

Simple co-ordinate graphs can be extended to include negative numbers.

Example:

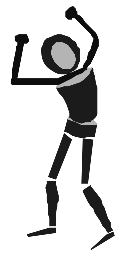


The point where the x-axis and y-axis cross is called the **origin**.
The origin has the co-ordinates (0, 0).
Remember the order of the co-ordinates is still across (left / right) first, followed by up or down.

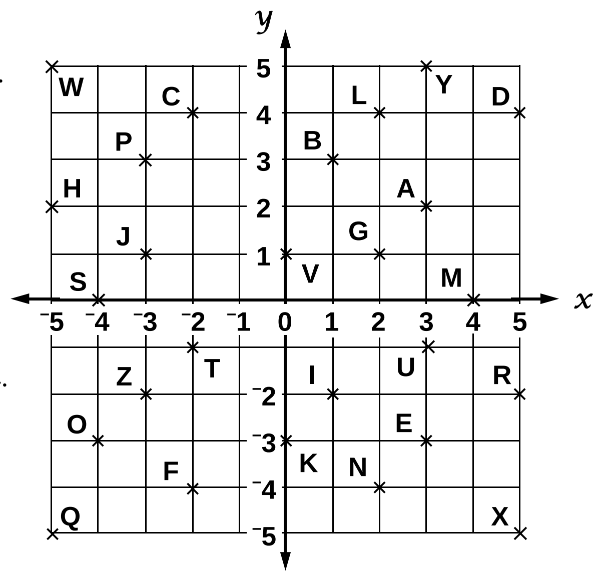
The **x-axis** has been **extended** to the **left**.
The **y-axis** is **extended downwards**.

What are the co-ordinates for the points A, B C and D marked on this graph?

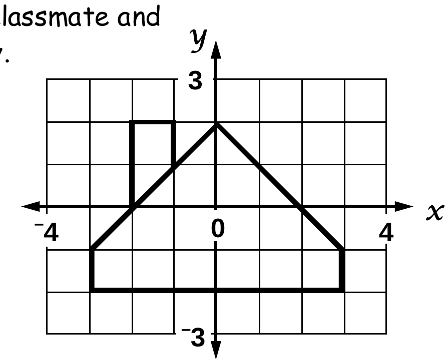
Answers: A = (2, 3), B = (1, -3), C = (-3, -2) and D = (-2, 2)



Task 25



1. **Plotted** on this graph are the letters of the alphabet. *Example:* A = (3, 2), B = (1, 3), ... etc.
   Write the co-ordinates for all the letters plotted.
2. If you joined the points P, B, I, Z and back to P what shape have you drawn?
3. If you joined the points F, L, R and F, what shape have you drawn?
4. Using the co-ordinates, Peter wrote a coded message. What does his message say?
   (4, 0), (3, 2), (-2, -1), (-5, 2), (3, -3), (4, 0), (3, 2), (-2, -1), (1, -2), (-2, 4), (-4, 0) / (1, -2), (-4, 0) / (-2, -4), (3, -1), (2, –4).
5. **Write** your own coded message to a classmate and have your classmate write you a reply.
6. **Write** the instructions needed so that someone could redraw this diagram without seeing it first.



Task 26

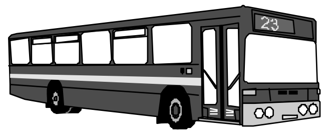
Draw a graph that goes from -5 to 5 on the x-axis and from -5 to 5 on the y-axis.

Create a picture on your graph, made up of straight lines.

List the **co-ordinates** for your picture.

Have a **classmate** try to **draw** your picture, using your list of co-ordinates.
Remember not to let him / she see your picture until he /she has completed the picture.

Using a formula to solve practical problems:



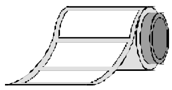
A **formula** is like a rule and can be used to work things out.

Example: Room 10 are going by bus on a school trip. Each pupil must pay $2.00 for a bus ticket. **Write** a **formula** that could be used to work out the total cost of bus tickets.

Total cost of the bus tickets = $2.00 × Number of pupils who buy tickets

This can be shortened by using mathematical symbols, numbers and letters as follows.

C = $2.00 × N where **C** = total cost of bus tickets, **N** =number of pupils who buy tickets.



Use the formula to find the cost of buying 10, 17 and 25 bus tickets.

Answer: *C* = $2.00 × 10 = $20.00, *C* = $2.00 × 17 = $34.00 and *C* = $2.00 × 25 = $50.00

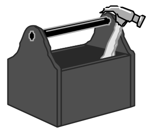
Task 27

Use each formula given to work out these problems.

The cost of buying new soccer balls (S) is find by using the formula ...

S = $9.00 × N where N is the number of soccer balls bought.

1. Find the cost of buying 10, 15 or 20 new soccer balls.
2. If Mr Moore spent $63.00 on soccer balls, how many did he buy?



The number of bricks needed to build a fence (B) is given by the formula,

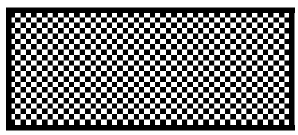
B = 25 × L where L is the length of the fence in metres.

3. How many bricks would be needed to build a fence that is 8m, 15m or 25m long?
4. How long is the fence that has been made with 250 bricks?

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

A = b × h where b = base and h = height.

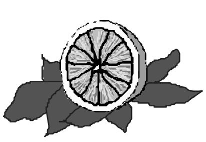
height



base

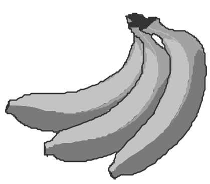
5. What is the area of a rectangle that has a base of 10cm and a height of 6cm?
6. What is the area of a square that has sides of 7 cm?
7. What is the base of a rectangle that has an area of 24cm^2 and a height of 4cm?
8. What is the height of a rectangle that has an area of 30cm^2 and a base of 5cm?

The cost (C) of buying some oranges (O) and bananas (B) is given by the formula,

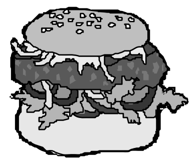


C =$0.90 × O + $0.65 × B where O = number of oranges bought and B = number of bananas bought.

9. What does it cost to buy one orange?
10. What does it cost to buy one banana?
11. What would it cost to buy 3 oranges and 2 bananas?
12. What would it cost to buy 5 oranges and 6 bananas?



Creating and using a formula to solve practical problems:

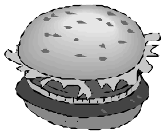


Example: Jacqui has been sent to the shop to buy hamburgers for seven people.
The cost of a hamburger is \$2.75. A **formula** can be written to work out the cost.

Total cost of the hamburgers = \$2.75 × Number of hamburgers purchased

This can be shortened by using mathematical symbols, numbers and letters as follows.

$\boxed{C = \$2.75 \times N}$ where **C** = total cost of the hamburgers, **N** =number of hamburgers purchased.

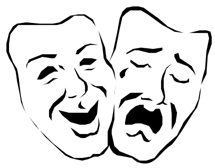


Use the formula to work out the cost of buying 7, 12 and 15 hamburgers.

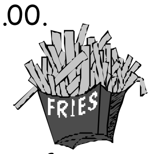
Answer: $C = \$2.75 \times 7 = \$19.25$, $C = \$2.75 \times 12 = \$33.00$ and $C = \$2.75 \times 15 = \$41.25$

Task 28

1. The cost of a telephone call is \$2.50 per minute.
   Use this information to **write** a **formula**.
   Let C = total cost of the call (\$) and T = time spent talking (minutes).
2. **Use** your **formula** to work out the cost of telephone calls that lasted 4 minutes, 10 minutes and 25 minutes.



3. The cost of a movie ticket is \$6.50 for children under 15.
   Use this information to **write** a **formula**.
   Let C = total cost of tickets (\$) and N = number of children going to the movies.
4. **Use** your **formula** to work out the cost of movie tickets if 7 children, 11 children or 20 children went to the movies.
5. If pupils in Room 8 spent \$65.00 on movie tickets, how many pupils went to the movies?



6. At the local fish and chip shop, a piece of fish costs \$1.20 and a scoop of chips costs \$1.00.
   Use this information to **write** a **formula**. Let C = total cost of buying fish and chips (\$) and F = number of pieces of fish bought and S = number of scoops of chips bought.
7. **Use** your **formula** to work out the cost of buying these three fish and chip orders, 2 pieces of fish and 3 scoops of chips, 4 pieces of fish and 3 scoops of chips and 9 pieces of fish and 5 scoops of chips.

8. The 'Read For Life' company sends out books by mail order that cost \$5.00 each. With each order there is a postage charge of \$6.00, no matter how many books are sent. Use this information to **write** a **formula**.
   Let C = total cost of books bought (\$) and N = number of books bought.
9. **Use** your **formula** to work out the cost of buying 4 books, 9 books and 13 books by mail order.
10. If Richard spent \$36.00 on books bought from the 'Read For Life' company, how many books did he buy?

Task 29

Create three word questions of **real-life problems** involving the buying of something, similar to the questions above.

Have a classmate **write** a **formula** from the information from your information.

Using this formula work out the cost of buying 3, 7, 12 and 20 of the items in your questions.

Please **DO NOT** write on the sheets

'Guess the number' game:

Consider these problems ...

> *Think of a number.*
> *I add 14.*
> *The result is 31.*
> *What is the number?*

> *Think of a number.*
> *I multiply by 3, add 5.*
> *The result is 17.*
> *What is the number?*

One way to work out these problems is by **'trial and error'**.

Example: Try 15	**15** + 14 = 29	Does not equal 31
Try 18	**18** + 14 = 32	Does not equal 31
Try 17	**17** + 14 = 31	Correct answer, **17** was the number.

Example: Try 3	**3** × 3 + 5 = 14	Does not equal 17
Try 5	**5** × 3 + 5 = 20	Does not equal 17
Try 4	**4** × 3 + 5 = 17	Correct answer, **4** was the number.

Discuss other methods you can use to work out these problems.

Task 30

Use a 'trial and error' method, or a method of your own, to work out these numbers.

1. *Think of a number. I add 10. The result is 26. What is the number?*
2. *Think of a number. I multiply by 9 The result is 72. What is the number?*
3. *Think of a number. I subtract 13. The result is 18. What is the number?*
4. *Think of a number. I divide by 7. The result is 9. What is the number?*
5. *Think of a number. I multiply by 4, add 10. The result is 34. What is the number?*
6. *Think of a number. I divide by 3, add 7. The result is 13. What is the number?*
7. *Think of a number. I multiply by 5, subtract 9. The result is 26. What is the number?*
8. *Think of a number. I add 3, multiply by 4. The result is 48. What is the number?*
9. *Think of a number. I add 7, divide by 3. The result is 10. What is the number?*
10. *Think of a number. I multiply by 8, subtract 9. The result is 47. What is the number?*
11. *Think of a number. I multiply by 7, add 17. The result is 66. What is the number?*
12. *Think of a number. I add 14, divide by 3. The result is 13. What is the number?*
13. *Think of a number. I multiply by 12, subtract 19. The result is 29. What is the number?*

Task 31

Create 5 'Guess the number' problems of your own, following these steps.

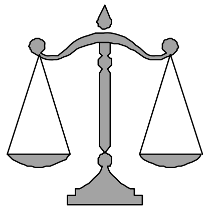
Step 1: Choose a number less than 20.
Step 2: Multiply by a number less than 12.
Step 3: Add or subtract a number less than 50. The result is ... ?
Step 4: Write your problem in words as above.

Exchange your problems with a classmate to work out or solve. For an extra challenge, make up problems that involve dividing instead of multiplying.

Please **DO NOT** write on the sheets

Solving equations:

A number sentence containing numbers, a letter and mathematical signs is called an **equation**.
An **equation** must have an **equals sign**.
Example: $y + 5 = 12$, $p - 6 = 14$, $8k = 32$, $2h + 6 = 18$ (2h means $2 \times h$)



To **solve** an equation means to work out the number that would replace the letter or shape, so that both sides equal each other. Equations can be worked by 'trial and error' or some other more formal way.

All answers should be written as y = ? or p = ? or k = ? ... and not just a number on its own.

Task 32

Solve these equations involving addition or subtraction.

1. $a + 14 = 27$	2. $11 + b = 27$	3. $c - 8 = 13$	4. $26 - d = 12$
5. $15 + e = 31$	6. $f - 16 = 13$	7. $37 - g = 19$	8. $h + 21 = 37$
9. $i - 19 = 43$	10. $47 - j = 31$	11. $k + 24 = 63$	12. $34 + m = 71$
13. $47 - n = 19$	14. $p + 29 = 81$	15. $43 + q = 89$	16. $r - 39 = 14$

Solve these equations involving multiplying or dividing.

17. $6a = 24$	18. $b \div 5 = 9$	19. $9c = 81$	20. $32 \div d = 4$
21. $e \div 4 = 12$	22. $12f = 48$	23. $54 \div g = 6$	24. $11h = 99$
25. $14i = 42$	26. $36 \div j = 4$	27. $9k = 108$	28. $m \div 7 = 8$
29. $63 \div n = 9$	30. $20p = 160$	31. $12q = 96$	32. $15r = 75$

Solve these equations involving a combination of operations. **Show your working**.

Examples:

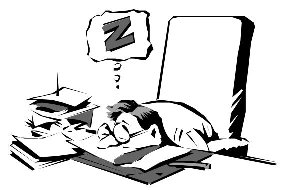
$$\begin{aligned} 6a + 5 &= 23 \\ 6a &= 23 - 5 \\ 6a &= 18 \\ a &= 18 \div 6 \\ a &= 3 \end{aligned} \qquad \begin{aligned} 4b - 7 &= 33 \\ 4b &= 33 + 7 \\ 4b &= 40 \\ b &= 40 \div 4 \\ b &= 10 \end{aligned}$$

33. $3a + 10 = 37$	34. $5b - 10 = 15$	35. $4c + 7 = 35$
36. $6d - 13 = 23$	37. $8e + 9 = 33$	38. $6f - 17 = 13$
39. $9g + 11 = 65$	40. $11h - 14 = 52$	41. $9i + 17 = 62$
42. $12j - 21 = 51$	43. $20k + 32 = 92$	44. $15m - 21 = 39$

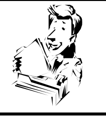
Solve these equations involving a combination of operations and brackets. **Show your working**.

Examples:

$$\begin{aligned} 2(a + 5) &= 28 \\ 2a + 10 &= 28 \\ 2a &= 28 - 10 \\ 2a &= 18 \\ a &= 18 \div 2 \\ a &= 9 \end{aligned} \qquad \begin{aligned} 3(b - 4) &= 9 \\ 3b - 12 &= 9 \\ 3b &= 9 + 12 \\ 3b &= 21 \\ b &= 21 \div 3 \\ b &= 7 \end{aligned}$$



45. $3(a + 5) = 36$	46. $2(b - 9) = 12$	47. $4(c + 5) = 44$
48. $4(d - 8) = 16$	49. $5(e + 6) = 40$	50. $6(f - 3) = 24$
51. $7(g + 3) = 35$	52. $8(h - 2) = 40$	53. $9(i + 3) = 63$



Algebra

Please **DO NOT** write on the sheets

Writing and solving equations for practical problems:

Example: If you double Nigel's age and then add 5 it totals 17. How old is Nigel?
Write an equation to show this information, then solve your equation.

Answer: Let **n** = Nigel's age.

$$2n + 5 = 17$$
$$2n = 17 - 5$$
$$2n = 12$$
$$n = 12 \div 2$$
$$n = 6$$

Nigel is 6 years old.

Task 33

Write an **equation** for each word problem, then **work out** the **answer**.

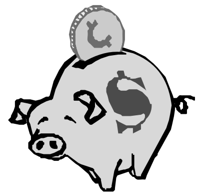
1. If Jordan doubles his age and adds 15 years, he is the same age as his father. If his father is 27 years old, how old is Jordan?

2. Four times James's age, plus eight years is the same as his father's age. If James's father is 32, how old is James?

3. David likes playing cricket. This week he scored six more than twice as many runs as last week. If he scored 52 runs this week, how many runs did David score last week?

4. Jackie's mother is five times Jackie's age, plus nine years. If Jackie's mother is 49 years old, how old is Jackie?

5. Mary had $25 in her piggy bank. For the past eight weeks, Mary has been saving all her pocket money and she now has $73.00 altogether. How much pocket money does she get each week?



6. Ken bought 9 C.D.'s that were all the same price. If he had $100.00, but now has only $37.00 left, what is the cost of each C.D.?

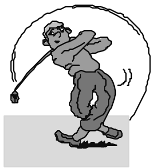
7. Mr Duncan is driving between two cities that are 278km apart. He has 128km left to travel and has already been driving for 2 hours. What was the average speed he travelled at during the first two hours?

8. Gail has $78.00 in her bank account. She has to leave $50.00 in the bank account, but would like to buy some books that cost $4.00 each with the rest of the money. How many $4.00 books can she buy?

9. Kevin ran 5 laps around a local park at an even pace. During the run he stopped for a total of 12 minutes to talk to a friend. If the total time, including his stop, was 1 hour 22 minutes for the run, how long does it take Kevin to complete each lap?

10. Mr Davidson is buying a car worth $10200. He pays a deposit of $1500 and will pay equal amounts for the next 6 months until the car is paid off. How much will these monthly payments be?

Task 34



Create five **word problems** of your own, similar to the questions above, that can be written as equations.

Exchange your word questions with a classmate to be solved. **Compare** equations and answers.

'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.

Introduction:

The topic of Algebra is concerned with finding a rule to describe a number sequence and using the rule to find any member of this sequence. For these sequences, the rules can be used to make predictions or continue the sequence. Through the use of various graphs, relations between numbers and everyday situations can be displayed and interpreted. The ability to find and justify a word formula, to write and solve an equation, will illustrate that many everyday tasks we take for granted can be solved using algebra skills. Developing these skills will enhance pupil's problem solving skills.

Worksheets 1 to 5

Creating and describing shape patterns:
Continuing a number sequence and finding the rule:
Word problems involving number sequences:
Continuing more number sequences and finding rules:
Special number sequences:

In **Task 1** pupils are to continue a sequence of diagrams, find a word rule to describe how the sequence has been created and use this rule to continue the sequence. By counting and listing the number of shapes in each diagram, a number sequence can be created.

In **Task 2** pupils are to create their own diagram sequences. Pupils exchange sequences with classmates, who draw the next three diagrams and work out a rule to describe each sequence.

In **Task 3** pupils are to find missing numbers in simple number sequences that involve adding or subtracting a constant number from consecutive terms. Questions 1 to 10 of this task involve lists of the multiples. Pupils are to describe how each sequence has been created and use their rule to find the next three numbers.

In **Task 4** pupils are to create their own number sequences. Pupils exchange sequences with classmates, who are to find the next three numbers and describe each sequence in words.

In **Task 5** pupils are to create and use number sequences generated from data contained within word problems, to answer various questions and make predictions.

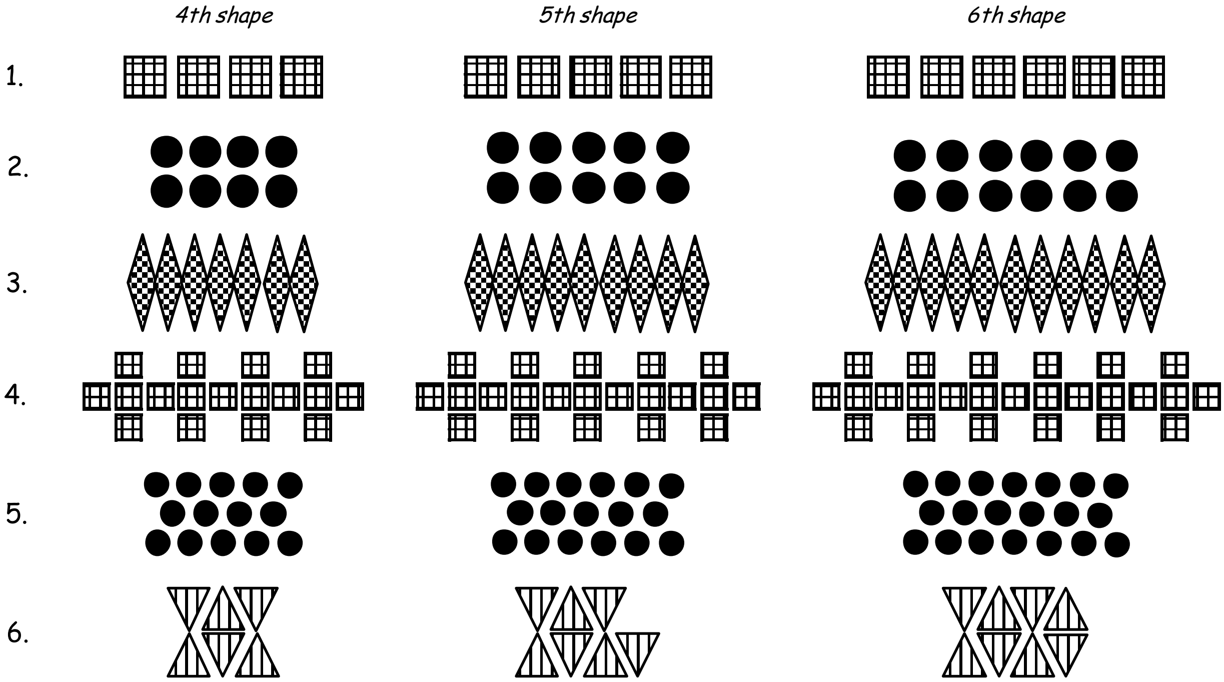
In **Task 6** pupils continue and describe number sequences that have been created by multiplying or dividing consecutive terms by a constant number.

In **Task 7** pupils are to create their own number sequences. Pupils exchange sequences with classmates, who are to find the next three numbers and describe each sequence in words.

In **Task 8** pupils are to investigate special number sequences.

In **Task 9** pupils are to locate sequences hidden within a grid and to create their own grid to exchange with classmates. Sequences are placed in vertical, horizontal and diagonal positions within the grid.

Task 1



7. Q1: 1, 2, 3, 4, 5, 6, … Q2: 2, 4, 6, 8, 10, 12, … Q3: 1, 3, 5, 7, 9, 11, … Q4: 5, 9, 13, 17, 21, 25, …
Q5: 5, 8, 11, 14, 17, 20, … Q6: 3, 4, 5, 6, 7, 8, …
8. Q1: add 1 square Q2: add 2 circles Q3: add 2 diamonds Q4: add 4 squares
Q5: add 3 circles Q6: add 1 triangle
9. Q1: 8, … , 10 Q2: 16, …, 20 Q3: 15, …, 19 Q4: 33, …, 41 Q5: 26, …, 32 Q6: 10, …, 12

Task 3

1. 6, 10, 16, add 2 2. 12, 30, 36, add 6 3. 10, 25, 30, add 5 4. 27, 45, 63, add 9
5. 33, 55, 77, add 11 6. 6, 9, 18, add 3 7. 14, 21, 42, add 7 8. 30, 40, 70, add 10
9. 12, 16, 28, add 4 10. 16, 40, 48, 11. 40, 32, 20, subtract 4 12. 90, 60, 50, subtract 10
13. 55, 40, 35, subtract 5 14. 70, 56, 42, subtract 7 15. 30, 24, 18, subtract 3
16. 99, 90, 63, subtract 9 17. add 4, 25, 29, 33 18. subtract 3, 22, 19, 16
19. add 10, 63, 73, 83 20. add 7, 37, 44, 51 21. subtract 9, 27, 18, 9 22. add 6, 43, 49, 55
23. add 12, 76, 88, 100 24. subtract 7, 26, 19, 12 25. add 100, 621, 721, 821
26. subtract 20, 62, 42, 22

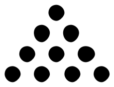
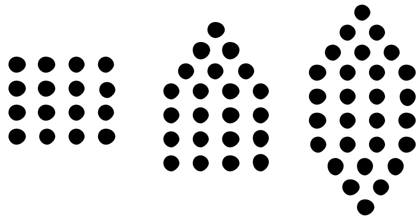
Task 5

1. 3cm 2. 9 days 3. 20cm, 23cm, 26cm 4. 32cm 5. 2, 7, 12, 17 6. every 5 days
7. 22nd & 27th 8. 50km 9. 150km, 100km, 50km 10. 7 hours 11. $7 12. $42, $49, $56
13. 10 weeks

Task 6

1. 12, 48, 384, multiply by 2 2. 25, 3125, 15625, multiply by 5 3. 18, 486, 1458, multiply by 3
4. 16, 64, 256, multiply by 2 5. 48, 768, 12288, multiply by 4 6. 5000, 1250, 625, divide by 2
7. 49, 343, 16807, multiply by 7 8. 54, 162, 4374, multiply by 3 9. 1200, 600, 75, divide by 2
10. 10, 1250, 6250, multiply by 5 11. multiply by 2, 16, 32, 64 12. mulitiply by 2, 56, 112, 224
13. multiply by 5, 250, 1250, 6250 14. multiply by 4, 192, 768, 3072
15. multiply by 3, 108, 324, 972 16. multiply by 5, 750, 3750, 18750
17. multiply by 9, 729, 6561, 59049 18. multiply by 7, 1715, 12005, 84035
19. multiply by 10, 10000, 100000, 1000000 20. multiply by 2, 64, 128, 256
21. 6cm, 12cm, 24cm, 48cm, 96cm 22. multiply by 3, $6480, $19440, $58320

Task 8

1.  2. 1, 3, 6, 10 3. 15 4. 

5. 1, 4, 9, 16
   1, 5, 12, 22
   1, 6, 15, 28
6. 25, 35, 45

Task 9

4	1	~~3~~	~~6~~	~~12~~	~~24~~	~~48~~
7	~~5~~	11	18	27	13	~~2~~
12	9	~~10~~	9	~~17~~	21	~~7~~
32	6	17	~~15~~	28	10	~~12~~
24	2	~~13~~	23	~~20~~	3	~~17~~
6	~~11~~	3	7	17	~~25~~	~~22~~
~~9~~	10	19	2	13	6	29
~~2~~	~~6~~	~~18~~	~~54~~	~~162~~	193	36

3, 6, 12, 24, 48, multiply by 2
5, 10, 15, 20, 25, add 5
2, 7, 12, 17, 22, add 5
9, 11, 13, 15, 17, add 2
2, 6, 18, 54, 162, multiply by 3

Worksheets 6 & 7

Using a rule to create a number sequence:
Practical problems involving rules:

Each number in a number sequence is called a **term**.
Example: For the sequence of odd numbers 1, 3, 5, 7, 9, 11, etc
1st term = 1, 2nd term = 3, 3rd term = 5, etc.

As an extension activity, the term numbers and sequence numbers can be represented as ordered pairs.
Example: (1, 1), (2, 3), (3, 5), (4, 7) etc. The first number of the ordered pair is the 'term number' and the second number is the sequence number.

When a rule is used to create a sequence of numbers, any number of the sequence can be calculated by substituting the 'term number' into the rule.
Example: If the rule was ***'multiply by 3 , then add 5'***, the 20th term would be '**20** × 3 + 5 = **65**.
This would be written as the ordered pair (20, 65).

In **Task 10** pupils are to calculate various terms of several number sequences, using the rules stated.

In **Task 11** pupils are to use 'rules' that will create number sequences, for practical situations. This task will illustrate to pupils, that many of the daily calculations we do can be solved by using algebra skills.

In **Task 12** pupils are to work out the rules for practical problems. The problems are to be exchanged with classmates, to be solved and answers compared.

Task 10

1. 5, 8, 11, 14 2. 32, 62, 152 3. 1, 6, 11, 16 4. 46, 96, 246 5. 10, 12, 14, 16 6. 28, 48, 108
7. 8, 9, 10, 11 8. 12, 17, 32

Task 11

1. \$16, \$31, \$56, \$106 2. \$41 – \$6 = \$35, \$35 ÷ 5 = 7 books
3. \$45, \$93, \$129, \$249 4. \$57 - \$9 = \$48, \$48 ÷ \$12 = 4 soccer balls
5. \$8.50, \$14.50, \$20.50, \$32.50 6. \$17.50 - \$2.50 = \$15, \$15 ÷ \$1.50 = 10 minutes

Worksheets 8 & 9

Graphs of real-life situations:
Interpreting graphs showing relationships:

Illustrating a relation or relationship can be done by drawing a graph.

In **Task 13** pupils are to interpret real-life situations illustrated by line graphs and answer questions or write a story about what the graphs represent. The labels on each axis can be used to define the relationship. Pupils are to draw a graph, given a real-life situation.

In **Task 14** pupils are to create graphs for real-life situations, then write a stories about the information displayed in their graphs.

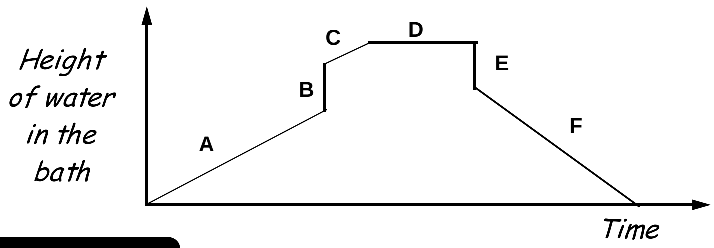
In **Task 15** pupils are to interpret information displayed in relationship graphs drawn using points / dots rather than lines, as in Task 13.

In **Task 16** pupils are to create their own point / dot relationship graphs, to illustrate relationships. Graphs are exchanged with classmates, to be interpreted.

Task 13

1. graph C 2. graph A 3. graph B 4. point A 5. point B
6. Key features to note on this graph, that should be mentioned in a story are ....
   - Points A, B, C and D indicate that Mrs Robinson has stopped as the distance she is from her house is not changing.

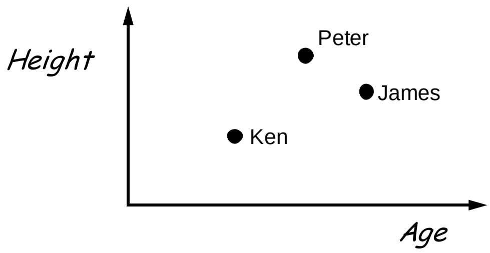
   Point A is the furthest point from her house. She moves closer to home as she moves to point B, but is further away from home at point C and closer to home at point D.
7.



A = running water for the bath
B = person getting into bath, water level goes up
C = adding more water
D = sitting listening to the radio
E = getting out of bath, water level goes down
F = emptying bath water

Task 15

1. points C, D and E
2. Because of the different ways they travel to school. *Example:* walking, biking, by car or bus etc.
3. E 4. David = point C, Karen = point A, Bruce = point B
5. point E 6. point D 7. two children, points A and B 8. point C 9. point B
10.



Worksheets 10 & 11

Understanding mapping diagrams:
Mapping diagrams involving numbers:

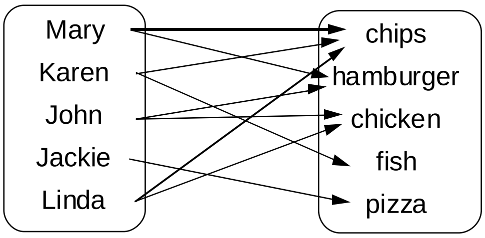
On mapping diagrams, arrows connect the things that are related. The arrows point from left to right.

In **Task 17** pupils are to interpret mapping diagrams for relations that have been stated and answer appropriate questions. Pupils are to draw a mapping diagram, given the relative information and relationship.

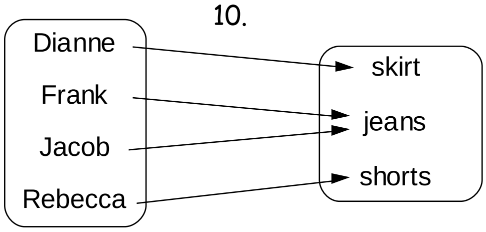
In **Task 18** pupils are to create their own mapping diagrams and have a classmate interpret the information displayed and try to name the relation.

Task 17

1. apples, bananas, oranges & pears 2. John 3. orange 4. 2 pupils 5. Ken, John & Mark
6. 100m & 400m 7. 200m & 400m 8. Andrew, John & Mark
9.

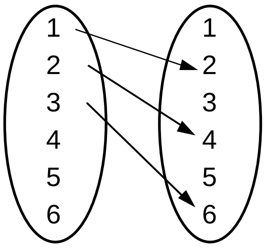


10.

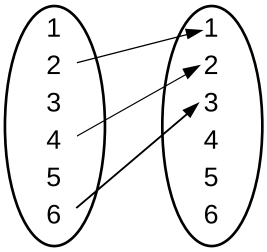


Task 19

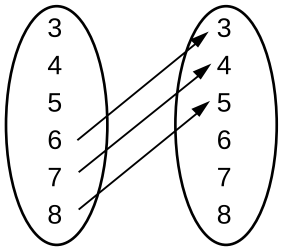
1.



2.



3.



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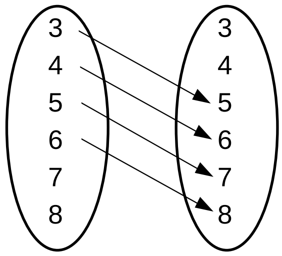

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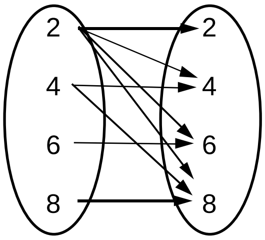
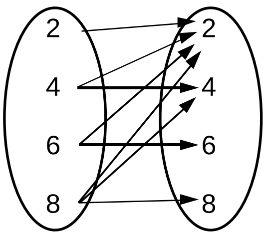


6.



7. 'is 3 times smaller than' or 'one third of'
8. 'is 4 times larger than'
9. 'is the square root of'

Task 21

1. (John, Mary), (John, Ruth), (Mark, Karen), (Ken, Karen), (Roland, Anne), (Ian, Andrea) 2. (John, cat), (Mark, cat), (Ken, dog), (Roland, horse), (Ian, horse) 3. (1, 4), (2, 8), (3, 12), (4, 16), (5, 20), (6, 24)
4. (2, 1), (4, 2), (6, 3), (8, 4), (10, 5), (12, 6) 5. (1, 6), (2, 7), (3, 8), (4, 9), (5, 10), (6, 11)
6. Q3: 'is 4 times smaller than' Q4: 'is double' Q5: 'is 5 less than'
7. (1, 11), (2, 12), (3, 13), (4, 14), (5, 15), (6, 16) 8. (1, 3), (2, 6), (3, 9), (4, 12), (5, 15), (6, 18)
9. (1, 0.5), (2, 1), (3, 1.5), (4, 2), (5, 2.5), (6, 3)

Worksheets 13 to 15

Graphing ordered pairs or co ordinates:
Graphing real-life relationships:
Extending co ordinate graphs:

Co ordinates are the ordered pairs that locate points on a graph called a **Cartesian graph**. The word 'co ordinate' is also used to describe the numbers that represent a given point on a map. The ***x*-axis** is the **horizontal axis**. The ***y*-axis** is the **vertical axis**. The point (0, 0), is where the axes meet or cross and is called the **origin**. The order of the numbers is important. The first number is always across (left or right) and the second number is always up or down. If both numbers of the ordered pair are positive, the directional movements will always be to the right first, then up. *Example:* Point **A** = (2, 3) means 2 right and 3 up.

In **Task 22** pupils are to list the coordinates for points plotted on a graph and to graph coordinate points given. From a mapping diagram, pupils are to list ordered pairs and plot them on a graph.

In **Task 23** pupils are to interpret real-life relationships displayed on graphs, created by plotting co-ordinates. Pupils are to plot coordinates, joining points with a straight line and use their graphs to work out answers or make predictions.

In **Task 24** pupils are to create their own relation graphs and a classmate is to interpret their graphs.

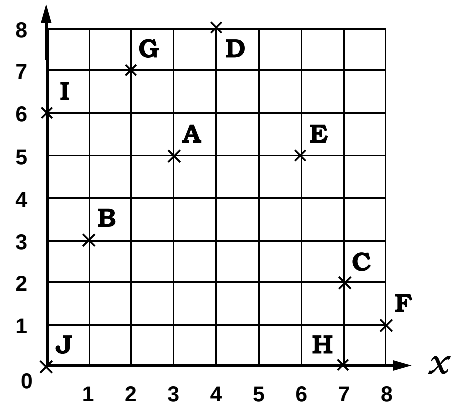
In **Task 25** pupils are to list the co-ordinates for points plotted on a graph that has been extended to include negative numbers. The directional movements have not changed. A negative first number means a horizontal movement to the left and a negative second number means a movement down.

In **Task 26** pupils are to create their own coordinate picture, list the points required to plot the picture and have a pupil redraw the picture based on the coordinates given, picture unseen.

Task 22

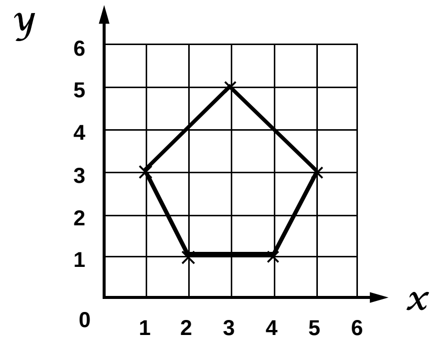
1. A = (2, 7), B = (7, 5), C = (2, 1), D = (1, 2), E = (5, 3), F = (3, 4), G = (6, 1), H = (4, 0), I = (7, 7), J = (0, 5)

2.



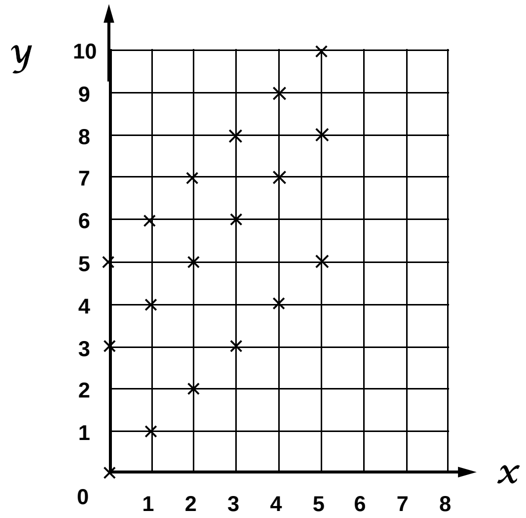
3. (1, 1), (5, 1), (5, 3), (3, 4), (1,3) and (1, 1)

4.



5. pentagon

6. (0, 0), (1, 1), (2, 2), (3, 3), (4, 4), (5, 5)
7. (0, 3), (1, 4), (2, 5), (3, 6), (4, 7), (5, 8)
8. (0, 5), (1, 6), (2, 7), (3, 8), (4, 9), (5, 10)
9. see graph
10. All three sets of points are in straight lines, which are parallel to each other.

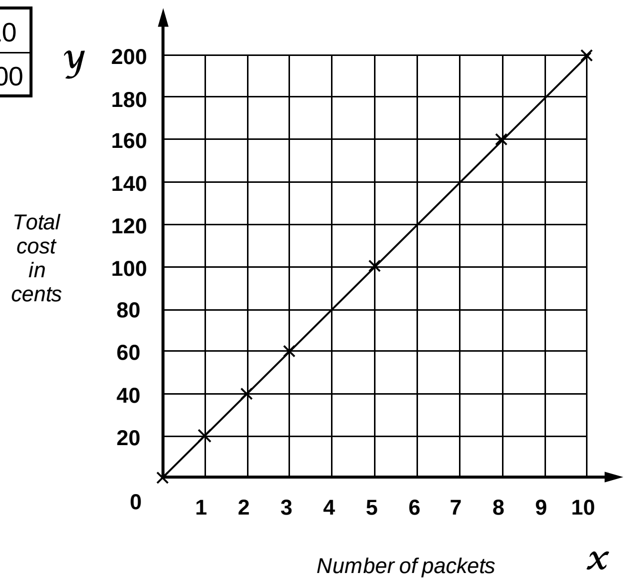


Task 23

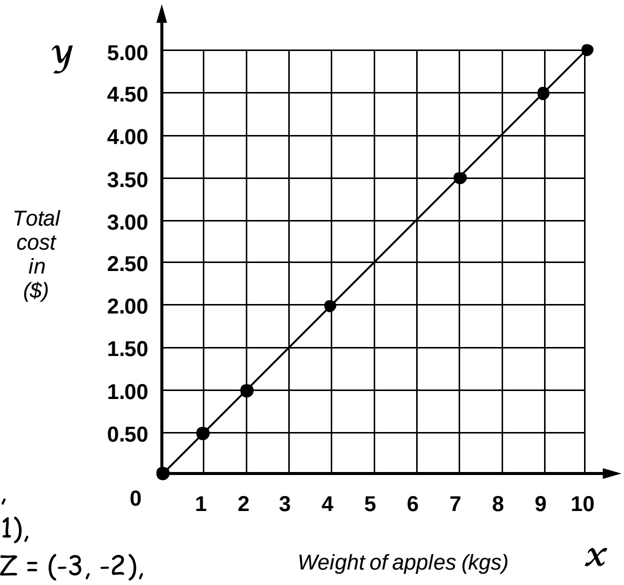
1. $5.00 2. $25 3. 3 hours 4. 8 hours
5. (1, 5), (2, 10), (3, 15), (4, 20), (5, 25), (6, 30) (7, 35), (8, 40)
6.

Number of packets	0	1	2	3	5	8	10
Price (cents)	0	20	40	60	100	160	200

7. (0, 0), (1, 20), (2, 40), (3, 60), (5, 100), (8, 160), (10, 200) 8. see graph
9. 4 packets cost 80c, 7 packets cost $1.40, 9 packets cost $1.80
10. (0, 0), (1, 0.50), (2, 1.00), (4, 2.00), (7, 3.50), (9, 4.50), (10, 5.00)



11. see graph
12. 3kgs = $1.50, 5kgs = $2.50, 8kgs = $4.00



Task 25

1. A = (3, 2), B = (1, 3), C = (-2, 4), D = (5, 4), E = (3, -3), F = (-2, -4), G = (2, 1), H = (-5, 2), I = (1, -2), J = (-3, 1), K = (0, -3), L = (2, 4), M = (4, 0), N = (2, -4), O = (-4, -3), P = (-3, 3), Q = (-5, -5), R = (5, -2), S = (-4, 0), T = (-2, -1), U = (3, -1), V = (0, 1), W = (-5, 5), X = (5, -5), Y = (3, 5), Z = (-3, -2),

2. rectangle 3. triangle 4. Mathematics is fun 5. -
6. Plot and join the points (-3, -2), (-3, -1), (0, 3), (3, -1), (3, -2) and (-3, -2).
Plot and join the plots (-2, 0), (-2, 2), (-1, 2) and (-1, 1).

Worksheets 16 & 17

Using a formula to solve a practical problem:
Creating and using a formula to solve a practical problem:

A formula is a rule that can be used to work things out. A formula is made up of letters, numbers and mathematical signs. An equals sign is always involved. The letter/s in a formula represents the 'unknown' and can take on any value (depending on the formula). Numbers are substituted into the formula to work out the answer.

In **Task 27** pupils are to use a formula to calculate answers for everyday situations that can be represented by a formula. In most cases, these calculations would be done without refering to a formula, but this task is designed to highlight to pupils how algebra skills are used often without them knowing it and to improve their problem solving skills.

In **Task 28** pupils are to interpret real-life practical problems, create a formulas and solve the problems.

In **Task 29** pupils are to create their own practical problems that can be expressed as formulae. Classmates are to create formulae to solve the problems.

Task 27

1. 10 soccer balls cost $90, 15 soccer balls cost $135, 20 soccer balls cost $180 2. 7 soccer balls
3. 8m uses 200 bricks, 15m uses 375 bricks, 25m uses 625 bricks 4. 10m
5. Area = 60 cm^2 6. 49cm^2 7. 6cm 8. 6cm 9. 90 cents 10. 65 cents
11. $0.90 × 3 + $0.65 × 2 = $2.70 + $1.30 = $4.00 12. $0.90 × 5 + $0.65 × 6 = $4.50 + $3.90 = $8.40

Task 28

1. C = $2.50T 2. 4 minute call = $10.00, 10 minute call = $25.00, 25 minute call = $62.50
3. C = $6.50N 4. 7 tickets cost $45.50, 11 tickets cost $71.50, 20 tickets cost $130.00 5. 10 pupils
6. C = $1.20F + $1.00S 7. 2 fish & 3 scoops = $5.40, 4 fish & 3 scoops = $7.80, 9 fish & 5 chips = $15.80 8. C = $5.00N + $6.00 9. 4 books cost $26, 9 books cost $51, 13 books cost $71 10. $36 - $6 = $30, $30 ÷ $5 = 6 books

'Guess the number' game:
Solving equations:
Writing and solving equations for practical problems:

An **equation** is a collection of variables (letters), numbers and mathematical signs, plus an equals sign. There **MUST** be an **equals sign**.
Example: $2x + 8 = 14$ is an equation, but $2x + 8$ is an **algebra expression**.

The aim of solving an equation is to find the number that would replace the variables (letters) so that the value or total of both sides is the same. Remember an equation is like the old-fashioned 'balancing scales'.

There are several ways to solve equations which involve going through a series of methodical steps involving opposite operations (+ / – and × / ÷) until you are left with a single variable or letter on one side of the equals sign and the answer on the other side. The steps may involve adding or subtracting the same number from each side, or multiplying or dividing each side by the same number. To check if the answer is correct, the 'answer' can be substituted back into the original equation to find out if both sides 'balance' (are same).

Solving equations using opposite operations:
Example: Solve $y + 18 = 29$, $y - 12 = 13$, $3k + 9 = 21$, $4m - 5 = 15$

$$\begin{aligned} y + 18 &= 29 \\ y + 18 \mathbf{- 18} &= 29 \mathbf{- 18} && \text{(subtract 18 from each side)} \\ y &= 11 \end{aligned}$$

$$\begin{aligned} y - 12 &= 13 \\ y - 12 \mathbf{+ 12} &= 13 \mathbf{+ 12} && \text{(add 12 to each side)} \\ y &= 25 \end{aligned}$$

$$\begin{aligned} 3k + 9 &= 21 \\ 3k + 9 - \mathbf{9} &= 21 - \mathbf{9} && \text{(subtract 9 from each side)} \\ 3k &= 12 \\ \frac{3k}{\mathbf{3}} &= \frac{12}{\mathbf{3}} && \text{(divide each side by 3)} \\ k &= 4 \end{aligned}$$

Correct setting out, while lengthy and time consuming, will assist pupils to understand solving equations better.

$$\begin{aligned} 4m - 5 &= 15 \\ 4m - 5 + \mathbf{5} &= 15 + \mathbf{5} && \text{(add 5 to each side)} \\ 4m &= 20 \\ \frac{4m}{4} &= \frac{20}{4} && \text{(divide each side by 4)} \\ m &= 5 \end{aligned}$$

In **Task 30** pupils are to develop an understanding of solving equations through a 'Guess the number' game. This will allow them to come up with various methods to solve equations that can be formalised in the next task.

In **Task 31** pupils are to make up their own 'Guess the number' problems to exchange with classmates.

In **Task 32** pupils are to solve equations using a formal method, either the method illustrated above or some other abridged version. Opposite operations will always be involved, even if the equations are solved mentally, rather than written down on paper.

In **Task 33** pupils are to write, then solve equations for practical problems.

Task 30

1\. 16 2. 8 3. 31 4. 63 5. 6 6. 18 7. 7 8. 9 9. 23 10. 7 11. 7 12. 25 13. 4

Task 32

1. a = 13   2. b = 16   3. c = 21   4. d = 14   5. e = 16   6. f = 29   7. g = 18   8. h = 16   9. i = 62
10. j = 16   11. k = 39   12. m = 37   13. n = 28   14. p = 52   15. q = 46   16. r = 53   17. a = 4
18. b = 45   19. c = 9   20. d = 8   21. e = 48   22. f = 4   23. g = 9   24. h = 9   25. i = 3
26 j = 9   27. k = 12   28. m = 56   29. n = 7   30. p = 8   31. q = 8   32. r = 5
33. 3a = 27, a = 9   34. 5b = 25, b = 5   35. 4c = 28, c = 7   36. 6d = 36, d = 6   37. 8e = 24, e = 3
38. 6f = 30, f = 5   39. 9g = 54, g = 6   40. 11h = 66, h = 6   41. 9i = 45, i = 5   42. 12j = 72, j = 6
43. 20k = 60, k = 3   44. 15m = 60, m = 4
45. 3a + 15 = 36, 3a = 21, a = 7   46. 2b – 18 = 12, 2b = 30, b = 15   47. 4c + 20 = 44, 4c = 24, c = 6
48. 4d – 32 = 16, 4d = 48, d = 12   49. 5e + 30 = 40, 5e = 10, e = 2   50. 6f – 18 = 24, 6f = 42, f = 7
51. 7g + 21 = 35, 7g = 14, g = 2   52. 8h – 16 = 40, 8h = 56, h = 7   53. 9i + 27 = 63, 9i = 36, i = 4

Task 33

In all questions 'n' is the unknown. Note: There will other ways that these equation can be written.

1. 2n + 15 = 27, 2n = 12, n = 6   Jordon is 6 years old.
2. 4n + 8 = 32, 4n = 24, n = 6   James is 6 years old.
3. 6 + 2n = 52, 2n = 46, n = 23   David scored 23 runs.
4. 5n + 9 = 49, 5n = 40, n = 8   Jackie is 8 years old.
5. 8n + 25 = 73, 8n = 48, n = 6   Mary saved $6 per week.
6. 9n + 37 = 100, 9n = 63, n = 7   Each C.D. costs $7.
7. 2n + 128 = 278, 2n = 150, n = 75km   Mr Duncan was travelling at 75km per hr.
8. 4n + 50 = 78, 4n = 28, n = 7   Gail can buy 7 $4.00 books.
9. 5n + 12 = 72, 5n = 60, n = 12 minutes   Kevin takes 12 minutes per lap.
10. 6n + 1500 = 10200 6n = 8700, n = 1450   Mr Davidson will pay $1450 per month.

Table of Contents for the Homework / Assessment Worksheet Masters for Algebra, Level 4

L4MA

Algebra

Homework / Assessment Worksheet

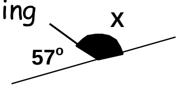
A1 | 1

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

A: 10 'Quick Questions'

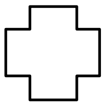
1. $5 \times 6 + 9 =$ ....
2. Calculate $\sqrt{81} =$ ....
3. Circle the factors of 8

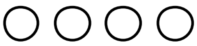
   1 2 3 4 5 6 7 8
4. Convert 50% to a fraction ....
5. Find the missing angle X

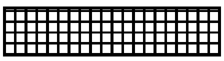
   

   X = ...
6. Find 50% of \$24.80

   ....
7. Draw in the lines of symmetry (if any)

   
8. Shade in 75% of these circles

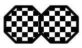
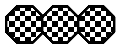
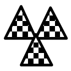
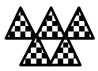
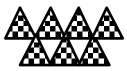
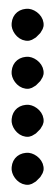
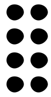
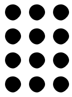
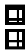
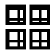
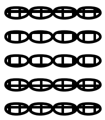
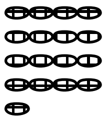
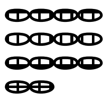
   
9. $8.6 \times 1000 =$ ....
10. Calculate the perimeter

    ....

B: Creating and describing shape patterns

1. **Study** each group of shapes below, then **draw** the 4th and 5th shapes to continue each pattern or sequence.

	1st shape	*2nd shape*	*3rd shape*	*4th shape*	*5th shape*
A					
B					
C					
D					
E					

2. **Count** the number of shapes in each sequence of diagrams. **Write** them in the space below, to create a number sequence and find the **next 2 numbers** or **terms**.

   Sequence A: ...., ..., ..., ..., ..., ..., ...

   Sequence B: ...., ..., ..., ..., ..., ..., ...

   Sequence C: ...., ..., ..., ..., ..., ..., ...

   Sequence D: ...., ..., ..., ..., ..., ..., ...

   Sequence E: ...., ..., ..., ..., ..., ..., ...
3. **Describe** how each number **sequence** was created.

   A: ....

   B: ....

   C: ....

   D: ....

   E: ....
4. Find the **10th** and **15th** terms of Sequence A. .... & ....
5. Find the **9th** and **12th** terms of Sequence B. .... & ....
6. Find the **10th** and **15th** terms of Sequence C. .... & ....
7. Find the **8th** and **10th** terms of Sequence D. .... & ....
8. Find the **8th** and **9th** terms of Sequence E. .... & ....

C: Number sequences

Fill in the **missing numbers** in these number sequences and **describe** how the sequence was created.

1. 2, 4, ..., 8, ..., 12

   ....
2. 5, 10, ..., 20, ..., 30

   ....
3. 2, 4, ..., 16, ..., 64

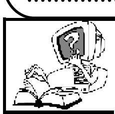
   ....
4. 3, 8, ..., 18, ..., 28

   ....
5. 1, 7, ..., 19, ..., 31

   ....
6. 2, 11, ..., 29, ..., 47

   ....
7. 80, 40, ..., 10, ...

   ....



AWS

Comments: ....

....

....

Please sign: Parent / Caregiver ....

L4MA

Algebra

A1

Homework / Assessment Worksheet

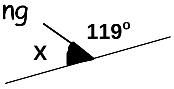
2

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

A: 10 'Quick Questions'

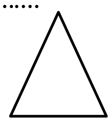
1. 24 ÷ 3 – 7 = ...
2. Calculate $\sqrt{64}$ = ...
3. Circle the factors of 9

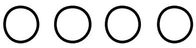
   1 2 3 4 5 6 7 8 9
4. Convert 25% to a fraction ....
5. Find the missing angle X

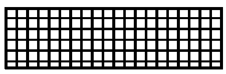
   

   X = ...
6. Find $\frac{1}{4}$ of $24.80

   ....
7. Draw in the lines of symmetry (if any)

   
8. Shade in 25% of these circles

   
9. 1.3 × 10000 = ...
10. Calculate the area

    ....

B: Continuing a sequence and finding a rule

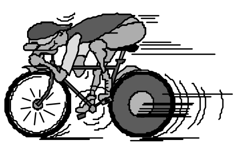
Find the 4 missing numbers for these sequences.

Describe a word **rule** for each sequence and **find** the **next three** numbers for each sequence.

1. 3, 9, 15, ..., ..., 33, 39, ..., 51, ...
   Rule: ....
   Next three numbers ...., ..., ...
2. 4, 15, 26, ..., ..., 59, 70, ..., 92, ...
   Rule: ....
   Next three numbers ...., ..., ...
3. 3, 6, 12, ..., ..., 96, 192, ..., 768, ...
   Rule: ....
   Next three numbers ...., ..., ...
4. 100, 92, 84, ..., ..., 60, 52, ..., 36, ...
   Rule: ....
   Next three numbers ...., ..., ...
5. 5, 14, 23, ..., ..., 50, 59, ..., 77, ...
   Rule: ....
   Next three numbers ...., ..., ...
6. 113, 106, 99, ..., ..., 78, 71, ..., 57, ...
   Rule: ....
   Next three numbers ...., ..., ...

C: Word problems involving sequences

Jim has bought a bicycle worth $280, but does not have to start paying for it until the end of the first month. Each month he pays off the same amount of money.



$280, $245, $210, ..., ..., ..., ..., ..., ...

1. How much does Jim pay off the cost of his bicycle each month? ....
2. **Complete** the number sequence to show how much Jim has left to pay after each monthly payment.
3. How many months did it take Jim to pay for his new bicycle? ....

Each week Jenny is saving her pocket money so that she can have some money to spend on holiday. This sequence of numbers shows what Jenny has saved so far.

$8.50, $17.00, $25.50, $34.00, ..., ..., ..., ..., ..., ...

4. How much does Jenny save each week? ....
5. **Write** in the spaces above, the next 6 weekly totals of money that Jenny will save.
6. For how many weeks must she save her money if she wants to buy some new clothes worth $59.50? ....

7. If Jenny saved only $4.25 each week, how long would it take to save $59.50? ....

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

Please sign:
Parent / Caregiver
....

AWS

Algebra

A2

Homework / Assessment Worksheet

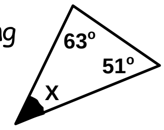
3

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

A: 10 'Quick Questions'

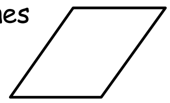
1. 5 + 4 × 9 = ...
2. Calculate √ 49 = ...
3. List the first 5 multiples of 7

   ....
4. Convert 0.5 to a fraction ....
5. Find the missing angle X
   X = ...



6. Find 20% of $24.80

   ....
7. Draw in the lines of symmetry (if any)



8. Shade in $\frac{1}{4}$ of these circles

9. 1.4 × 1000 = ...
10. If the temperature was 5°C, then drops 9°C, what is the new temperature?

    ....

B: Using a rule to create a number sequence

Use the **rule** to **find** the **first 4 terms** of this number sequence.

1.

Term numbers	*Rule*	*Sequence numbers*
1 →	**Multiply by 5, then add 7**	→ ....
2 →		→ ....
3 →		→ ....
4 →		→ ....

2. Use the same rule, *'multiply by 5, than add 7'*, to find the ...
   8th term, ...
   20th term, ...
   28th term, ...
   and the **43rd** term, ...
   of this sequence.

3.

Term numbers	*Rule*	*Sequence numbers*
1 →	**Multiply by 9, subtract 5**	→ ....
2 →		→ ....
3 →		→ ....
4 →		→ ....

4. Use the same rule, *'multiply by 9, than subtract 5'*, to find the ...
   12th term, ...
   25th term, ...
   33rd term, ...
   and the **60th** term, ...
   of this sequence.

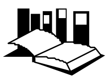
5.

Term numbers	*Rule*	*Sequence numbers*
1 →	**Add 4, then multiply by 3**	→ ....
2 →		→ ....
3 →		→ ....
4 →		→ ....

6. Use the same rule, *'add 4, then multiply by 3'*, to find the ...
   10th term, ...
   20th term, ...
   32nd term, ...
   and the **50th** term, ...
   of this sequence.

C: Practical problems involving rules

The Lucky Book Club has a sale on some books. These books cost **$4.90 each**.
A **postage** charge of **$5.00** is **added** to each order.



Rule

Number of books × $4.90, plus $5.00

1. **Use** this **rule** to **work out** the **cost** of buying ....
   3 books ....
   4 books ....
   10 books ....
   20 books ....

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

Please sign:
Parent / Caregiver
....

AWS

Algebra

L4MA

A3

Homework / Assessment Worksheet

4

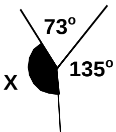
Name: **Class:** **Complete by:**

A: 10 'Quick Questions'

1. $19 - 36 \div 9$ = ...
2. Calculate 6^2 = ...
3. List the first 5 multiples of 9

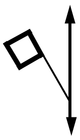
   ....
4. Convert 0.75 to a fraction ....
5. Find the missing angle X

   X = ...



6. Find 10% of $24.80

   ....
7. Complete this diagram to make it symmetrical



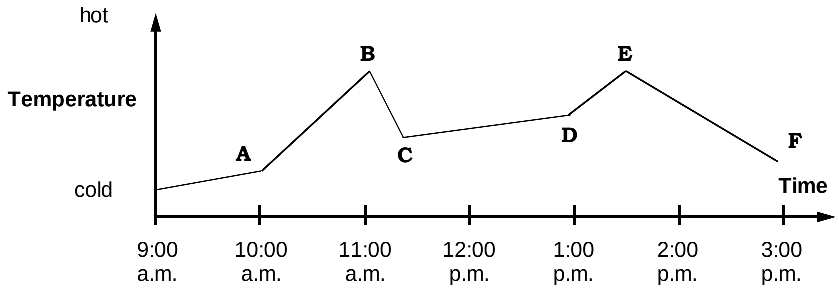
8. Estimate 98.23×2.09 by rounding first

   .... × .... = ...
9. 0.6×1000 = ...
10. If the temperature was 7°C, then drops 8°C, what is the new temperature?

    ....

B: Graph of real-life situations

This graph shows the relationship between the temperature in Room 8 and the time of the day, during one day in August.



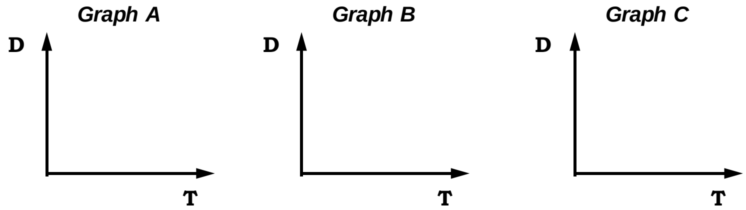
1. At what two points on the graph do you think the heaters were turned on? .... & ....

   Explain why. ....
2. Explain what temperature change occurred at 11:00 a.m. and what could have caused it. ....

   ....

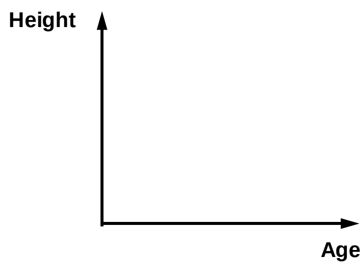
Show these three situations on the Distance (D) / Time (T) graphs.

3. Linda ran at a constant pace across a park. (Graph A)
4. Ken runs very fast and then walks to school. (Graph B)
5. Andrea walks to a tree, stops for a while, then walks back to where she started from. (Graph C)



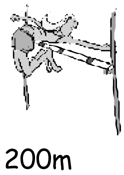
C: Drawing a relationship graph

Linda, Helen and Geoff are all members of the same family. Linda is older than Geoff but younger than Helen. Helen is shorter than Linda but taller than Geoff. **Draw dots** on the graph to show this relationship between their ages and heights.

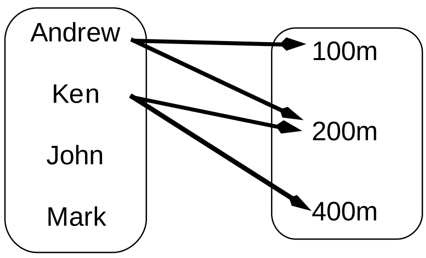


Remember to label each dot.

D: Understanding mapping diagrams



This mapping diagram shows the events that pupils competed in, on the athletics day.



1. Who ran in the 200m race?

   ....
2. What races did Andrew run in?

   ....
3. John ran in the 100m and the 400m race.

   Draw arrows on the mapping diagram to show this.
4. Mark ran in the 200m and the 400m race.

   Draw arrows on the mapping diagram to show this.

Comments: ....

....

....

Please sign: Parent / Caregiver ....

AWS

Algebra

L4MA

5

A3

Homework / Assessment Worksheet

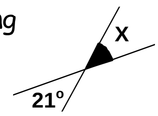
Name: **Class:** **Complete by:**

A: 10 'Quick Questions'

1. 5 + 3 × 7 + 6 = ...
2. Calculate 12^2 = ...
3. Circle the factors of 10

   1 2 3 4 5 6 8 10
4. Convert $\frac{3}{4}$ to a decimal ....
5. Find the missing angle X

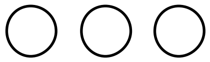
   X = ...



6. Find $\frac{1}{4}$ of \$24.80

   ....
7. Estimate 247.86 ÷ 4.95 by rounding first

   ....÷ .... = ...
8. Shade in 33.3̇ % of these circles

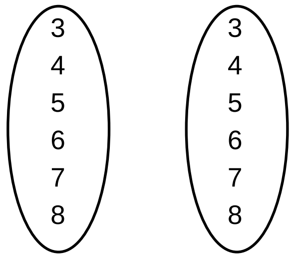


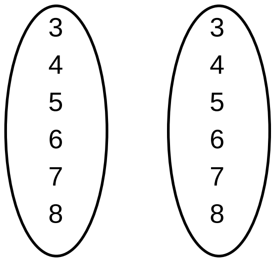
9. 5.7 ÷ 100 = ...
10. If the perimeter of a square is 28cm, how long is each side? ....

B: Mapping diagrams / ordered pairs

1. On this mapping diagram show the relation *'is 3 more than'*.
2. **List** this relation as ordered pairs.

   ....





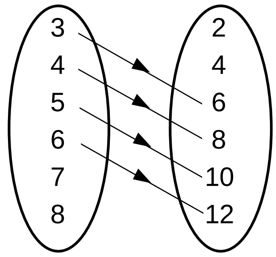
3. On this mapping diagram show the relation *'is 2 less than'*.
4. **List** this relation as ordered pairs.

   ....

5. What relation is shown on this mapping diagram?

   ....
6. **List** this relation as ordered pairs.

   ....



C: Co-ordinate graphs

1. Label the x-axis and the y-axis on this graph.
2. Point X has the co-ordinates (2, 1), or does it? What is wrong with these co-ordinates?

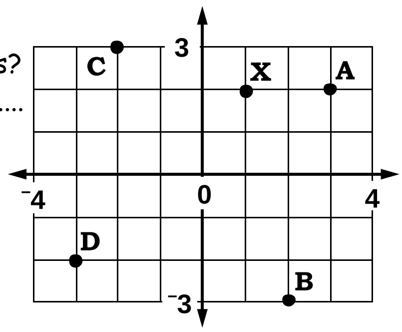
   ....
3. What are the co-ordinates for the points ...

   A = (,)

   B = (,)

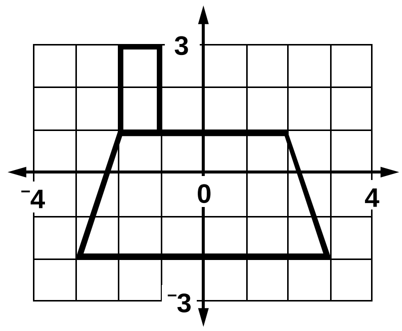
   C = (,)

   D = (,)



4. Plot these points on the graph.

   E = (-2, 1), F = (0, 2), G = (3, 0), H = (-1, -2)



5. **Write** the instructions to draw this shape on the graph.

   ....

   ....

   ....

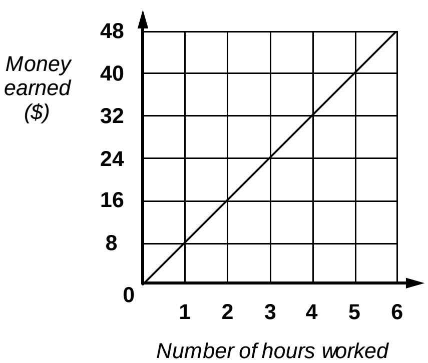
   ....

   ....

   ....

D: Real-life graphs

John has a holiday job. This graph shows how much he is paid for the hours he works.



1. How much does John earn in 2 hours? ....
2. What does the point (5, 40) mean?

   ....

   ....

AWS

Comments: ....

....

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Please sign:
Parent / Caregiver

....

Algebra

A4

Homework / Assessment Worksheet

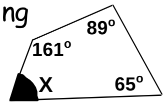
6

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

A: 10 'Quick Questions'

1. $3 + 25 \div 5 - 7$ ....
2. Calculate 10^2 = ...
3. List the first 5 multiples of 12

   ....
4. Convert $0.6\dot{6}$ to a fraction ....
5. Find the missing angle X

   X = ...
6. Find $\frac{3}{4}$ of $24.80

   ....
7. Complete this diagram to make it symmetrical

   
8. Estimate 205.39×4.89 by rounding first

   .... × .... = ...
9. Convert 2.35kg to grams

   ....
10. Find the missing numbers in this sequence.

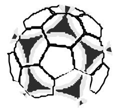
    3, 7, ..., 15, ..., ...

B: Using and creating formulae

Use the **formulae** given to work out these problems.

The cost of buying new soccer balls (S) is given by the formula,

$\boxed{S = \$9.50 \times N}$ where N is the number of soccer balls bought.



1. Find the cost of buying ...

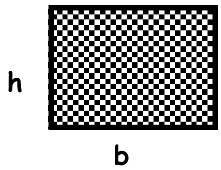
   10 ....

   15 ....

   20 .... new soccer balls.
2. If Mr Moore spent $76.00 on soccer balls, how many did he buy? ....

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

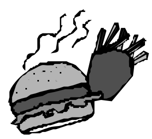
$\boxed{A = b \times h}$ where b = base and h = height.



3. Find the area of a rectangle that has a height of 8cm and a base of 12cm.

   ....
4. Find the area of a square that has sides of 10cm. ....
5. If **A** = 32cm^2 and **b** = 8cm, find the height. ....

The cost (C) of buying hamburgers (H) and chips (S) is given by the formula, $\boxed{C = \$2.90H + \$1.50S}$



where **H** = number of hamburgers bought
and **S** = number of scoops of chips bought.

6. What does it cost to buy one hamburger? ....
7. What does it cost to buy 1 scoop of chips? ....
8. Work out the cost of buying ...

   1 hamburger and 2 scoops of chips ....

   2 hamburgers and 4 scoops of chips ....

   5 hamburgers and 3 scoops of chips ....

The ***'Read For Life'*** company sells books that cost $7.50 each, by mail order. With each order there is a postage charge of $6.00, no matter how many books are bought.
Let ***C*** = total cost of books sold ($) and **N** = number of books sold.

9. **Write** a **formula** to show this information.

   ....

10. **Use** your **formula** to work out the cost of buying ...

    4 books ....

    9 books ....

    13 books .... by mail order.
11. How many books have been purchased, if the cost was $28.50? ....

C: More formulae

Joanne can buy ...
apples for 25 cents each,
oranges for 70 cents each &
bananas for 45 cents each.

1. **Write** a **formula** that could be used to work out the total cost of buying any combination of fruit.

   ....

   ....

   ....

   ....
2. Use your formula to work out the cost of buying 3 apples, 2 oranges and 4 bananas.

   ....

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

Please sign:
Parent / Caregiver
....

AWS

Algebra

L4MA

A5

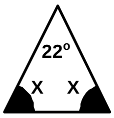
Homework / Assessment Worksheet

7

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

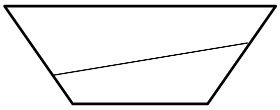
A: 10 'Quick Questions'

1. $2(5 + 3 \times 4) =$ ....
2. Calculate $15^2 =$ ....
3. List the factors of 20
   ....
4. Convert 60% to a decimal ....
5. Find the missing angle X
   X = ...



6. Find 60% of $30.00
   ....
7. If meat costs $11.95 / kg, how much would 5kg cost?
   ....
8. What % of these shapes are shaded? ....

9. $1.6 \times 10000 =$ ....
10. How many acute angles in this diagram? ....



B: 'Guess the number' game

Consider these problems.

1. *Think of a number.*
   Multiply by 5, add 9.
   The result is 59.
   What is the number?
   ....
2. *Think of a number.*
   Divide by 9, add 7.
   The result is 14.
   What is the number?
   ....

C: Solving equations

Solve these equations. **Show your working.**

1. **a** + 17 = 31	2. **b** – 17 = 23	3. 11 + **c** = 27
4. **d** – 19 = 9	5. **e** + 16 = 63	6. 7**f** = 84
7. **g** ÷ 7 = 12	8. 47 – **h** = 31	9. 47 – **i** = 31
10. 6**j** = 72	11. **k** ÷ 7 = 11	12. 4**m** = 164
13. **n** + 64 = 91	14. 12**p** = 132	15. **q** ÷ 9 = 12
16. 3**r** – 9 = 15	17. 8**s** + 11 = 43	18. 12**t** + 7 = 67
19. 7**u** + 29 = 78	20. 9**v** – 17 = 91	21. 13**w** – 37 = 54
22. 7(**y** + 4) = 91	23. 5(**z** – 7) = 45	24. 8(**a** + 6) = 104
25. 9(**b** – 8) = 18	26. 10(**c** + 3) = 120	27. 11(**d** – 6) = 44

D: Word problems

Write an **equation** for this word problem, then **work out** the **answer**.

1. David likes playing cricket. This week he scored five more than three times as many runs as last week.
   If he scored 77 runs this week, how many runs did David score last week?

Equation: ....

Working out:
....
....
....

Comments: ....

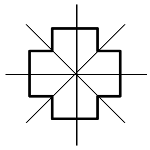
Please sign:
Parent / Caregiver

AWS

Homework / Assessment Worksheet
Answers

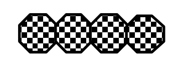
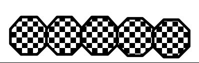
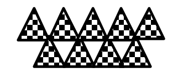
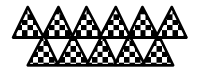
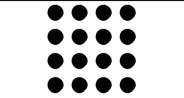
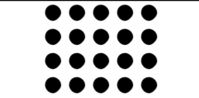
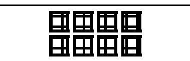
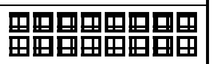
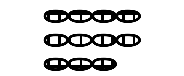
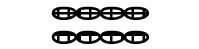
Worksheet 1

A:

1. 39 2. 9 3. 1, 2, 4, 8 4. ½ 5. 123° 6. $12.40 7.  8. ● ● ● ○
9. 8600 10. 30cm

B:

1.

	4th shape	5th shape
A		
B		
C		
D		
E		

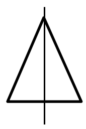
2. Sequence A: 1, 2, 3, 4, 5, 6, 7
   Sequence B: 3, 5, 7, 9, 11, 13, 15
   Sequence C: 4, 8, 12, 16, 20, 24, 28
   Sequence D: 1, 2, 4, 8, 16, 32, 64
   Sequence E: 20, 17, 14, 11, 8, 5, 2
3. A: add 1 to each new term
   B: add 2 to each new term
   C: add 4 to each new term
   D: double each new term
   E: subtract 3 from each new term
4. 10, 15 5. 19, 25 6. 40, 60 7. 128, 512 8. -1, -4

C:

1. 6, 10, add 2 2. 15, 25, add 5 3. 8, 32, multiply by 2 4. 13, 23, add 5 5. 13, 25, add 6
6. 20, 38, add 9 7. 20, 5, divide by 2

Worksheet 2

A:

1. 1 2. 8 3. 1, 3, 9 4. ¼ 5. 61° 6. $6.20 7.  8. ● ○ ○ ○
9. 13000 10. 36cm²

B:

1. 21, 27, 45, 57, add 6, 63, 69, 75 2. 37, 48, 81, 103, add 11, 114, 125, 136
3. 24, 48, 384, 1536, multiply by 2, 3072, 6144, 12288 4. 76, 68, 44, 28 subtract 8, 20, 12, 4
5. 32, 41, 68, 86, add 9, 95, 104, 113 6. 92, 85, 64, 50, subtract 7, 43, 36, 29

C:

1. $35 2. $175, $140, $105, $70, $35, $0 3. 8 months 4. $8.50 5. $42.50, $51.00, $59.50, $68.00, $76.50, $85.00, 6. 7 weeks 7. 14 weeks

Worksheet 3

A:

1. 41 2. 7 3. 7, 14, 21, 28, 35 4. ½ 5. 66° 6. $4.96 7. no lines of symmetry 8. ● ○ ○ ○
9. 1400 10. -4°C

B:

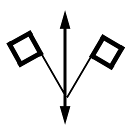
1. 12, 17, 22, 27 2. 47, 107, 147, 222 3. 4, 13, 22, 31 4. 103, 220, 292, 535 5. 15, 18, 21, 24
6. 42, 72, 108, 162

C:

1. $19.70, $24.60, $54.00, $103

Worksheet 4

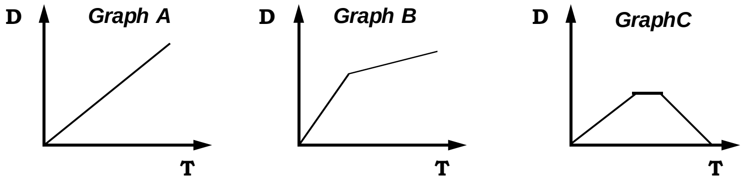
A:

1. 15 2. 36 3. 9, 18, 27, 36, 45 4. ¾ 5. 152° 6. $2.48 7. 
8. 100 × 2 = 200 9. 600 10. -1°C

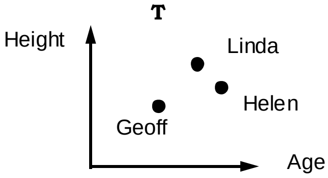
B:

1. Points A & D because that is when the temperature went up more quickly. 2. The temperature went down quickly. This could have occurred if the doors or windows in the classroom were opened and / or the were heaters turned off.

3.

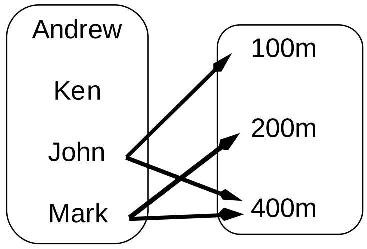


C:



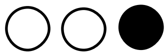
D:

1. Andrew & Ken
2. 100m & 200m   3 & 4

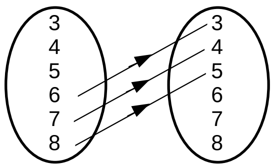
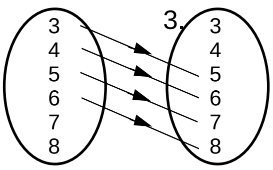


Worksheet 5

A:

1. 32   2. 144   3. 1, 2, 5, 10   4. 0.75   5. 21^o 6. \$6.20   7. 250 ÷ 5 = 50   8. 
9. 0.057   10. 7cm

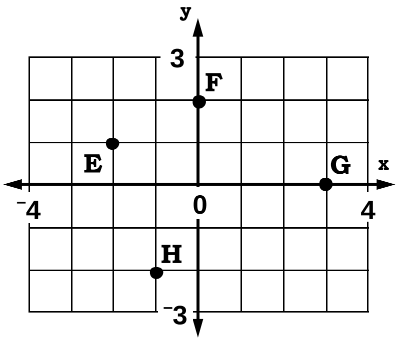
B:

1. 
3. 

2. (6, 3), (7, 4), (8, 5)   4. (3, 5), (4, 6), (5, 7), (6, 8)

5. 'is half of'   6. (3, 6), (4, 8), (5, 10), (6, 12)

C:

1. see graph   2. number order incorrect, should be (1, 2)
3. A = (3, 2), B = (2, -3), C = (-2, 3), D = (-3, -2)
4. 

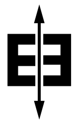
5. A possible order could be ...
   (-3, -2), (-2, 1), (2, 1), (3, -2), (-3, -2), join pts. with straight lines
   (-2, 1), (-2, 3), (-1, 3), (-1, 1), join pts. with straight lines

D:

1. \$16.00   2. John worked for 5 hours and earned \$40.00

Worksheet 6

A:

1. 1   2. 100   3. 12, 24, 36, 48, 60   4. $^2/_3$ 5. 45^o 6. \$18.60   7.    8. 200 × 5 = 1000
9. 2350g   10. 11, 19, 23

B:

1. \$95.00, \$142.50, \$190.00   2. 8 soccer balls   3. $96cm^2$ 4. $100cm^2$ 5. 4cm   6. \$2.90
7. \$1.50   8. \$5.90   9. \$11.80   10. \$19   9. C = \$7.50N + \$6.00   10. \$36, \$73.50, \$103.50   11. 3

C:

1. C = 25A + 70S + 45B, where C = total cost, A = number of apples bought, S = number of oranges bought, B = number of bananas bought, numbers are in cents
2. C = 25 × 3 + 70 × 2 + 45 × 4, C = 75 + 140 + 180, C = 395 cents or C = \$3.95

Worksheet 7

A:

1. 34   2. 225   3. 1, 2, 4, 5, 10, 20   4. 0.6   5. 79^o 6. \$18   7. \$59.75   8. ¼   9. 16000   10. 4

B:

1. 10   2. 63

C:

1. a = 14   2. b = 40   3. c = 16   4. d = 28   5. e = 47   6. f = 12   7. g = 84   8. h = 16   9. i = 34
10. j = 12   11. k = 77   12. m = 41   13. n = 27   14. p = 11   15. q = 108   16. r = 24   17. s = 32
18. t = 5   19. u = 7   20. v = 12   21. w = 7   22. y = 9   23. z = 16   24. a = 7   25. b = 10
26. c = 9   27. d = 10

D:

1. 3s + 5 = 77, when s = runs scored last week.   2. 3s + 5 - 5 = 77 - 5, 3s = 72, s = 24 runs scored

Tracking Sheet: ‘In-class’ Activity Sheets

Comments

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

Algebra

Name

Tracking Sheet: Homework / Assessment Worksheets

Comments

Worksheet	Objectives
7	A5
6	A4
5	A3
4	A3
3	A2
2	A1
1	A1

Algebra

Name