A Complete Guide to ...

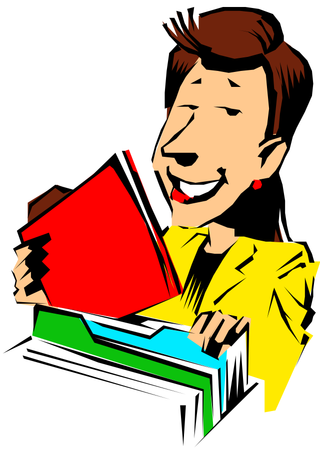
Algebra

Utilising the objectives as written in

MATHEMATICS in the New Zealand CURRICULUM

for

Level 5



This resource contains:

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

These resources are supplied as PHOTOCOPY MASTERS

Author: A. W. Stark

AWS Publications Ltd
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L5MA

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Author:
A. W. Stark

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First Published March 1998

Formatting and publishing by
Andrew Stark

Formerly trading as: AWS Teacher Resources

NOW trading as: AWS Publications Ltd

P O Box 21304
Edgeware
CHRISTCHURCH 8143
NEW ZEALAND

☎ +64 3 379 0516 or 🖷 +64 3 379 0619

Note from the author:

This resource ...

*A Complete Guide to Algebra

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

Mathematics in the New Zealand Curriculum for Level 5.

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

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

Resources in this series:

A Complete Guide to Number

written utilising the objectives as stated in

Mathematics in the New Zealand Curriculum for Level 5

Resource Code: L5MN

A Complete Guide to Measurement

written utilising the objectives as stated in

Mathematics in the New Zealand Curriculum for Level 5.

Resource Code: L5MM

A Complete Guide to Geometry

written utilising the objectives as stated in

Mathematics in the New Zealand Curriculum for Level 5.

Resource Code: L5MG

*A Complete Guide to Algebra

written utilising the objectives as stated in

Mathematics in the New Zealand Curriculum for Level 5.

Resource Code: L5MA

A Complete Guide to Statistics

written utilising the objectives as stated in

Mathematics in the New Zealand Curriculum for Level 5.

Resource Code: L5MS

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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**

Algebra

The following are the objectives for **Algebra**, **Level 5**, as written in the
MATHEMATICS *in the New Zealand Curriculum* document, first published 1992. ***[REFER PAGE 148]***

Exploring patterns and relationships

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

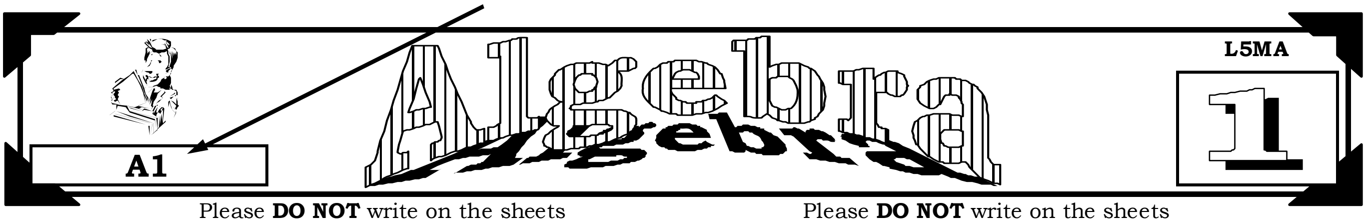
- **A1** generate patterns from a structured situation, find a rule for the general term, and express it in words and symbols;
- **A2** generate a pattern from a rule;
- **A3** sketch and interpret graphs which represent everyday situations;
- **A4** graph linear rules and interpret the slope and intercepts on an integer co-ordinate system.

Exploring equations and expressions

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

- **A5** evaluate linear expressions by substituation;
- **A6** solve linear equations;
- **A7** combine like terms in algebraic expressions;
- **A8** simplify algebraic fractions;
- **A9** factorise and expand algebraic expressions;
- **A10** use equations to represent practical situations.

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 5**.

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

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

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

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

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

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

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

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

See the opposite page for details of each objective.

	Algebra Objectives										Mathematical Processes Objectives													
	A 1	A 2	A 3	A 4	A 5	A 6	A 7	A 8	A 9	A 10	MP 1	MP 2	MP 3	MP 4	MP 6	MP 8	MP 9	MP 10	MP 11	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						✖	✖			✖			✖				✖					✖		
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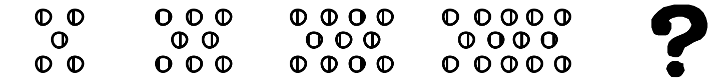
20										✖			✖				✖				✖	✖		
21										✖			✖				✖				✖	✖		

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

Generating and describing patterns:

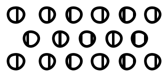
Below are the first four diagrams of a pattern, created by adding a constant number of dots to each new diagram. A **number sequence** can be created by adding, then listing the number of dots in each diagram.



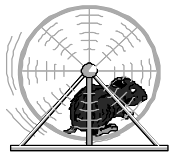
1st diagram 2nd diagram 3rd diagram 4th diagram 5th diagram

The first 4 numbers or **terms** of this **sequence** are 5, 8, 11 and 14.

Draw the 5th diagram for this pattern.

Answer: 

5th diagram

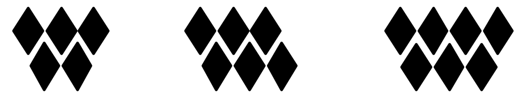


What are the 5th and 10th numbers or terms of this sequence?
Answers: 17 and 32

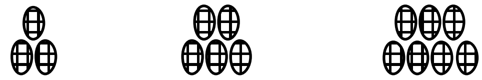
Can you describe in words how each new diagram has been created?
"Start with five dots and add three dots to each new diagram."

Task 1

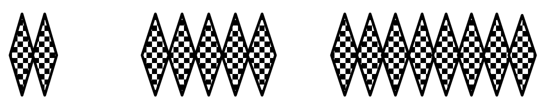
Below are diagrams of the first three diagrams of six patterns.
Draw the **next two diagrams** for each pattern.

1. 

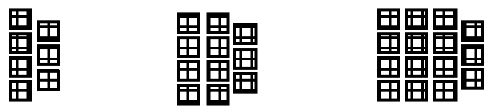
1st diagram 2nd diagram 3rd diagram

2. 

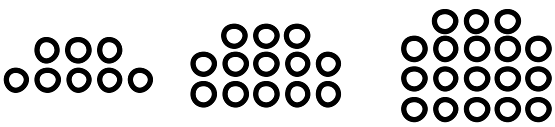
1st diagram 2nd diagram 3rd diagram

3. 

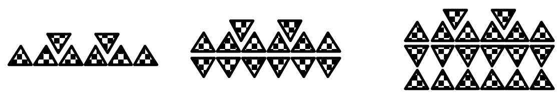
1st diagram 2nd diagram 3rd diagram

4. 

1st diagram 2nd diagram 3rd diagram

5. 

1st diagram 2nd diagram 3rd diagram

6. 

1st diagram 2nd diagram 3rd diagram

7. **Count** the number of shapes that are in each diagram for each pattern drawn above, plus the two additional diagrams you have drawn.
   Example: Question 1 numbers would be 5, 6, 7, 8, and 9.
   As you write these numbers, you are creating **number sequences** that can 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 shapes that would be in the **8th**, **10th** and **20th diagrams** 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: 2, 4, 6, 8, 10, 12, . . . These numbers form the sequence called **even numbers**.

The 1st term is 2, the 2nd term is 4, the 3rd term is 6, the 4th term is 8, the 5th term is 10 etc.

Describe how this sequence was created. Answer: ***'Start with 2, then 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. 5, □, 15, 20, □, □, 35, 40, . . .
3. 7, □, 21, 28, □, □, 49, 56, . . .
4. 2, 8, □, 20, □, 32, □, 44, . . .
5. 3, 14, □, 36, □, 58, □, 80, . . .
6. 1, □, □, 25, 33, □, 49, 57, . . .
7. 5, □, □, 32, 41, □, 59, 68, . . .
8. 7, 13, □, □, 31, 37, □, 49, 55, . . .
9. -5, -2, □, □, 7, 10, □, 16, □, . . .
10. -9, □, 7, □, 23, □, □, 47, 55, . . .

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

11. 51, 45, □, 33, □, 21, 15, □, . . .
12. 102, □, 84, 75, □, □, 48, 39, . . .
13. 71, □, 55, 47, □, □, 23, 15, . . .
14. 85, 80, □, 70, □, 60, □, 50, . . .
15. 107, 95, □, 71, □, 47, □, 23, . . .
16. 104, □, □, 77, 68, □, 50, 41, . . .
17. 121, □, □, 82, 69, □, 43, 30, . . .
18. 81, □, 53, 39, □, □, -3, -17, . . .
19. 34, □, 20, 13, □, □, -8, -15, . . .
20. 47, □, 23, □, □, -13, □, -37, -49. . .

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

21. 3, 10, 17, 24, 31, . . .
22. 37, 31, 25, 19, 13, . . .
23. 1, 10, 19, 28, 37, . . .
24. 41, 33, 25, 17, 9, . . .
25. -5, -1, 3, 7, 11, . . .
26. -21, -16, -11, -6, -1, 4, . . .
27. 31, 17, 3, -11, -25, -39, . . .
28. 3, 16, 29, 42, 55, . . .
29. -32, -19, -6, 7, 20, ...
30. 8, 45, 82, 119, 156, . . .
31. 63, 36, 9, -18, -45, . . .
32. -72, -43, -14, 15, 44, . . .
33. 13, 20.5, 28, 35.5, 43, . . .
34. 43, 31.75, 20.5, 9.25, 2, . . .

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.

Please **DO NOT** write on the sheets

More number sequences:

Using this word rule ***'Start with 3, add 2 to each new number'***, the first 7 numbers or terms of the sequence are … 3, 5, 7, 9, 11, 13, and 15.
But what would be the 100th or 500th term in this sequence?

To work this out, a rule written in symbols to describe the 'general term' for the sequence can be found.

The rule describes the relation between the sequence order and the sequence number or term. Let 'n' = sequence order. See diagram opposite.

Example: n = 1 (1st term), n = 2 (2nd term), n = 3 (3rd term) etc.

The rule for this sequence is … **General term = 2n + 1**

Using the rule the 100th term would be … 2 × 100 + 1 = 201
and the 500th term would be … 2 × 500 + 1 = 1001

Sequence order		Sequence terms
n = 1	→	3
n = 2	→	5
n = 3	→	7
n = 4	→	9
n = 5	→	11
n = 6	→	13
n = 7	→	15
General term	→	**Rule = 2n + 1**

Task 5

Look at each number sequence below and **find** the **missing numbers** that would replace each □.
Describe the **rule** for the general term for each sequence. Let n = sequence order.
Example: For Question 1, General term = 2*n*

1.

Sequence order		Sequence terms
1st term	→	2
2nd term	→	4
3rd term	→	□
4th term	→	8
5th term	→	□
6th term	→	12
7th term	→	□
general term	→	Rule?

2.

Sequence order		Sequence terms
1st term	→	5
2nd term	→	□
3rd term	→	9
4th term	→	11
5th term	→	□
6th term	→	15
7th term	→	□
general term	→	Rule?

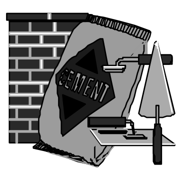
3.

Sequence order		Sequence terms
1st term	→	2
2nd term	→	5
3rd term	→	□
4th term	→	□
5th term	→	14
6th term	→	17
7th term	→	□
general term	→	Rule?

4. 6, 11, □, 21, □, 31, 36, □, . . .
5. 4, □, 10, 13, □, □, 22, 25, . . .
6. 1, □, 9, 13, □, □, 25, 29, . . .
7. -3, -1, □, 3, □, 7, □, 11, . . .
8. 1, 4, □, 10, □, 16, □, 22, . . .
9. 3, □, □, 12, 15, □, 21, 24, . . .
10. -7, □, □, -1, 1, □, 5, 7, . . .
11. 13, 23, □, □, 53, 63, □, 83, 93, . . .
12. 10, □, □, 28, 34, □, 46, 52, . . .
13. -6, □, 0, 3, □, □, 12, 15, . . .

A one metre high fence is to be built using bricks. This table shows a number sequence that represents the number of bricks needed for fences of different lengths.

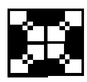
Length of fence	Number of bricks
1m	24
2m	48
3m	72
4m	96
5m	120



14. Find a rule to describe the general term for this sequence.
15. Use your rule to work out the number of bricks needed for a fence that is 15m long, 23m long and 42m long.
16. How long are fences that used 192 bricks, 300 bricks and 150 bricks?

Area of floor	Number of tiles
1m^2	16
2m^2	26
3m^2	36
4m^2	46
5m^2	56

A floor design is to be created using different shaped tiles. This table shows a number sequence that represents the number of tiles needed to cover various floor areas.



17. Find a rule to describe the general term for this sequence.
18. Use your rule to work out the number of tiles needed to cover 12m^2, 20m^2 and 50m^2.
19. What area of floor requires 76 tiles, 116 tiles and 206 tiles?

Please **DO NOT** write on the sheets

Using a rule to create a number sequence:

Given a rule written in symbols, 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:

Sequence order	Rule	Sequence numbers
1	**2n + 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 6

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

Sequence order	Rule	Sequence terms
1	**4n + 9**	?
2		?
3		?
4		?

2. Use the same rule, ***'n multiplied by 3, plus 9'***, to find the ...
   12th term,
   30th term,
   and the **65th** term of this sequence.

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

Sequence order	Rule	Sequence terms
1	**5n - 8**	?
2		?
3		?
4		?

4. Use the same rule, ***''n multiplied by 5, subtract 8'***, to find the ...
   15th term,
   40th term,
   and the **72nd** term of this sequence.

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

Sequence order	Rule	Sequence terms
1	**10 + 3n**	?
2		?
3		?
4		?

6. Use the same rule, ***''10 plus n multiplied by 3'***, to find the ...
   12th term,
   50th term,
   and the **80th** term of this sequence.

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

Sequence order	Rule	Sequence terms
1	**12 - 4n**	?
2		?
3		?
4		?

8. Use the same rule, ***''12 minus n multiplied by 4'***, to find the ...
   12th term,
   50th term,
   and the **80th** term of this sequence.

Task 7

1. **Using a rule** of your own, create the **first five 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. **Find** the rule in symbols that describes the general term for each number sequence that has been created.

 Please **DO NOT** write on the sheets

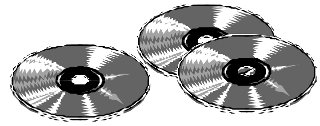
Practical problems involving rules:

Andrew buys C.D.'s by mail-order. Each C.D. costs $24.95 and there is a postage charge of $6.95.

A rule for the cost of buying C.D.'s would be ***'Number of C.D.'s multiplied by $24.95, plus $6.95'***.

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

Answer: 3 × $24.95 + $6.95 = **$81.80**



If Andrew spent $131.70 on C.D.'s, how many C.D.'s did he buy?

Answer: 131.70 - $6.95 (postage) = $124.75, then $124.75 ÷ $24.95 (cost of 1 C.D.)= 5 C.D.'s.

Task 8

Paul often buys books through a book club at his school.
All the books cost $6.50 each and with each order, $4.95 postage is charged.

1. **Use** the **rule** to work out the cost of buying 3, 7, 12 or 25 books.
2. If Paul spent $63.45 on books, how many books did he buy?

Number of books	Rule	Cost
3	**$6.50 per book, plus $4.95 postage**	?
7		?
12		?
25		?

Soccer balls can be bought for $11.50 each from a mail order company.
Postage of $8.95 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, 9, 15 and 21 soccer balls.
4. If Jane spent $146.95 on soccer balls, how many soccer balls did she buy?

Number of soccer balls	Rule	Cost
3	**$11.50 per soccer ball, plus $8.95 postage**	?
9		?
15		?
21		?

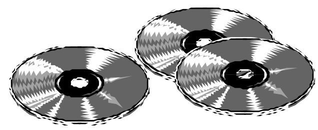
Andrew makes an overseas toll call that costs $1.60 per minute and uses an operator when he makes the call. Using an operator means there is an additional charge of $2.50 per call.

5. **Use** the **rule** to work out the cost of making telephone calls 9, 12.5, 19 and 27.5 minutes in length.
6. Andrew used the operator to make a telephone call. If the call cost $25.70, for how long did he talk on the telephone?

Time in minutes	Rule	Cost
9	**$1.60 per minute, plus $2.50 charge**	?
12.5		?
19		?
27.5		?

Pauline buys CD's that cost $17.95 each from a mail order company. If she orders more than 3 CD's, she receives a discount of $10.00 per order.

7. **Create** a rule that can be used to work out the cost of buying 3 or more CD's.
8. **Use** your rule to **calculate** the cost of buying 5, 9, 12 and 15 CD's.
9. If Pauline spent $97.70 on CD's, how many CD's did she buy?



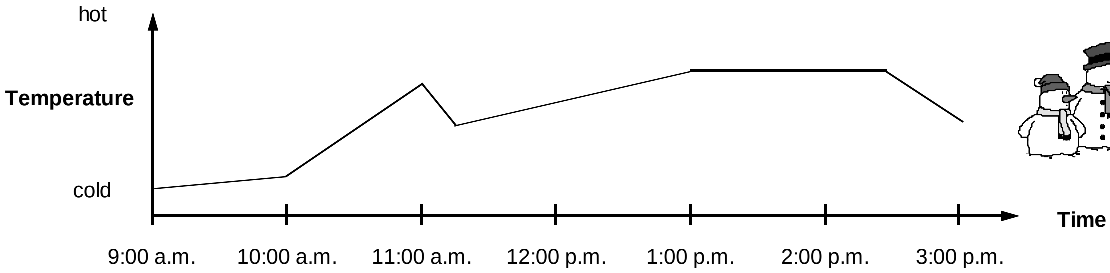
Task 9

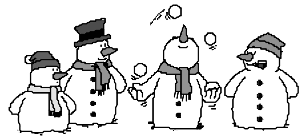
1. **Create** three diagrams, similar to those above, with a rule. You have to be able to work out your own answers using your rules.
2. **Exchange** diagrams with a classmate and work out his / her problems, then **compare** your answers.

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.

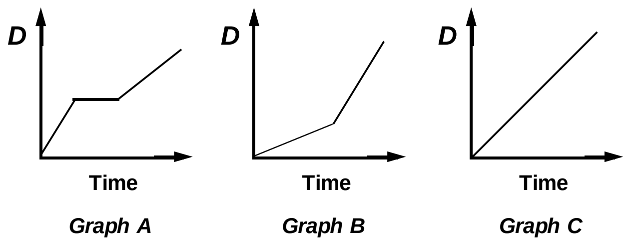
A door or windows may have been opened, letting out the heat, causing the air temperature to drop.

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

Task 10

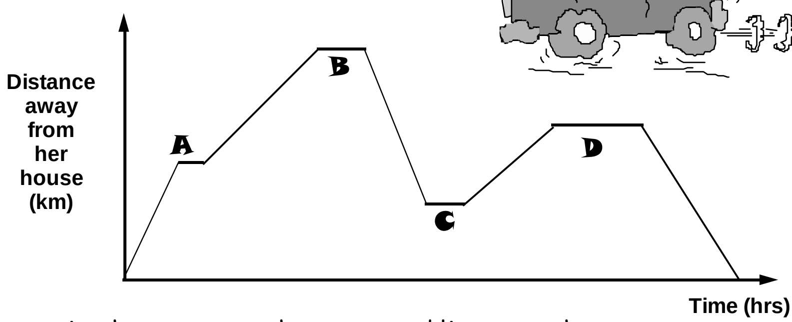
Which of these stories belongs to which graph?
For each graph, the **D** = distance.

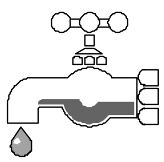
1. Rob ran at a steady pace across the park.
2. Susan walked slowly up hill and ran fast down hill.
3. Jan ran to the gate and waited for the postman, then walked to the shop.



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.

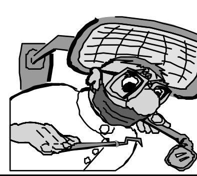
7. **Draw** a graph to show the depth of water in the bath.
   Discuss your graph with a classmate.

Over a 6 hour period, John has been very unwell. He recorded his body temperature every half hour.

8. **Draw** a graph to show John's temperature over this 6 hour period.
   Discuss your graph with a classmate.

Task 11

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.



Algebra

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Ordered pairs:

Mapping diagrams can be used to show a relationship between numbers. From a mapping diagram, **ordered pairs** can be created by writing the numbers that are at each end of the arrow as a pair, inside brackets. The order in which the numbers are written is important. That is why they are called **ordered pairs**.

Example:

1 →	-1
2 →	0
3 →	1
4 →	2
5 →	3
6 →	4

The **ordered pairs** for this relation are (1,-1), (2,0), (3,1), (4,2), (5,3) and (6,4).

The relation for these ordered pairs is ***'is 2 more than'***.

Task 12

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

1.

1 →	3
2 →	4
3 →	5
4 →	6
5 →	7
6 →	8

2.

1 →	-3
2 →	-2
3 →	-1
4 →	0
5 →	1
6 →	2

3.

1 →	2
2 →	4
3 →	6
4 →	8
5 →	10
6 →	12

4.

1 →	6
2 →	7
3 →	8
4 →	9
5 →	10
6 →	11

5.

2 →	1
4 →	2
6 →	3
8 →	4
10 →	5
12 →	6

6.

1 →	-6
2 →	-5
3 →	-4
4 →	-3
5 →	-2
6 →	-1

7. **State** the **relation** between the numbers in each list of ordered pairs in questions 1 to 6.

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 8 more than 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 4 times the first number'***, **copy** and **complete** these ordered pairs.

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

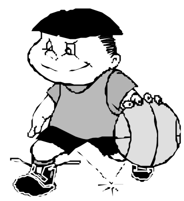
    (1,), (2,), (3,), (4,), (5,), (6,)

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

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

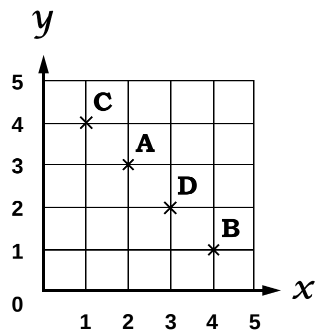
    (1,), (2,), (3,), (4,), (5,), (6,)

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



Plotting 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?

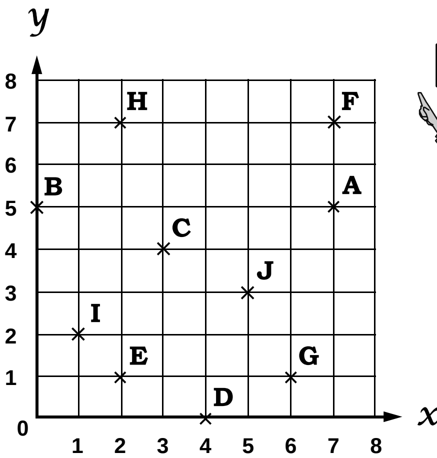
Answer: Count 2 along the x-axis to the right and count 3 up the y-axis.
Where the lines cross is Point A.

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 13

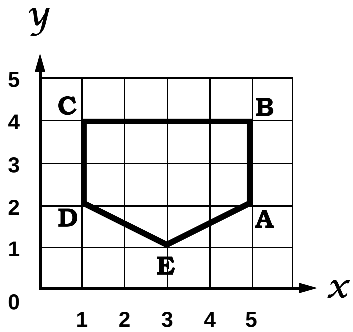
1. **Write** the co-ordinates for the 10 points that are marked on this graph. Remember the order (x,y).



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

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

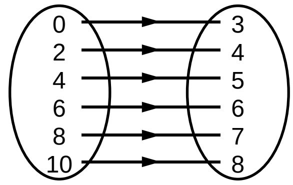


4. On a graph, **plot** these points, joining them with straight lines as you go.
(1, 4), (2, 1), (6, 1), (7, 4), (4, 6), (1, 4)

5. What shape did this create?

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

6.



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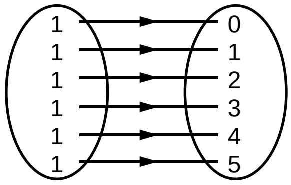

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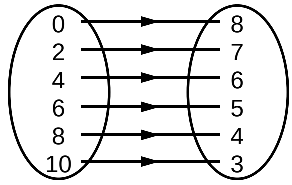

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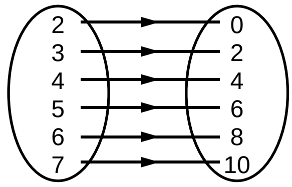

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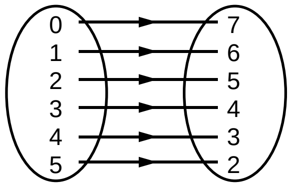

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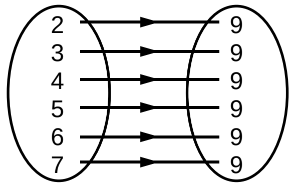

12. **Draw** a graph with numbers from 1 to 10 on the x-axis and from 1 to 10 on the y-axis,
On your graph, **draw** each set of co-ordinates from questions 6 to 11, joining the points in order.

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

Algebra

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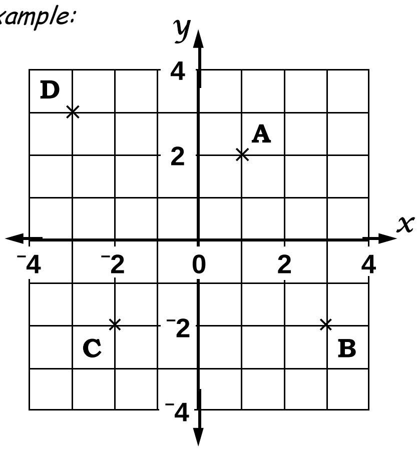
Extending co-ordinate graphs:

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**.

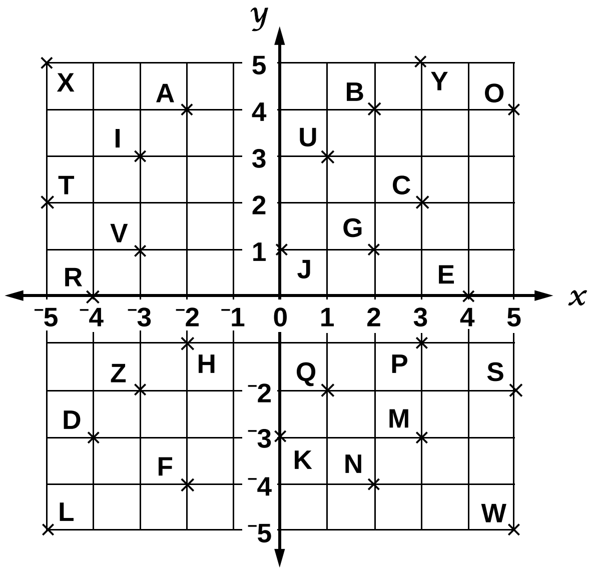
What are the co-ordinates for the points A, B C and D marked on this graph?

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

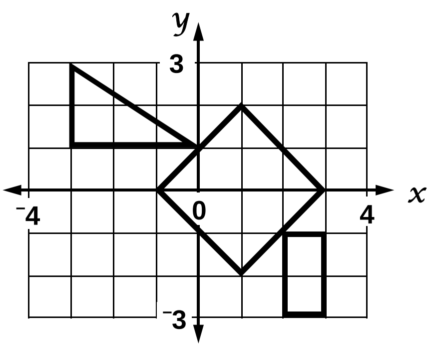
Task 14

1. **Plotted** on this graph are the letters of the alphabet.
   Example: A = (-2, 4), B = (2, 4), ... etc.
   Write the co-ordinates for all the letters plotted.
2. If you joined the points A, P, N, V and back to A what shape have you drawn?
3. If you joined the points D, H, K, F and D, what shape have you drawn?
4. Using the co-ordinates, Peter wrote a coded message. What does his message say?

   (-2, 4), (-5, -5), (2, 1), (4, 0), (2, 4), (-4, 0), (-2, 4), /
   (-3, 3), (5, -2) / (2, 1), (-4, 0), (4, 0), (-2, 4), (-5, 2) /
   (-2, -4), (1, 3), (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 15

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

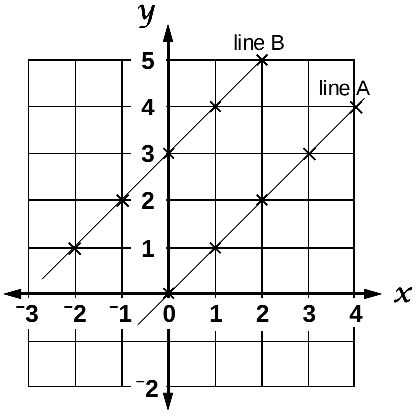
Create a picture on your graph, made up of straight lines.

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 / her see your picture until he /she has completed the picture.

 Please **DO NOT** write on the sheets

Ordered pairs and Linear graphs:



When a set of co-ordinates or ordered pairs is plotted and forms a straight line when joined, it is called a **linear graph**.

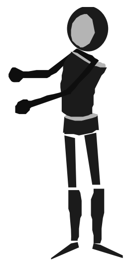
Example: (0, 0), (1, 1), (2, 2), (3, 3), (4, 4) form a straight line when graphed (line A on graph).

Given a rule or relation, ordered pairs for **linear graphs** can be created by substituting values of x into the rule to find a y value for each ordered pair.

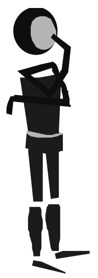
Example: From the rule $y = x + 3$, the following ordered pairs can be found (-2, 1), (-1, 2), (0, 3), (1, 4), (2, 5) (line B on graph)

Task 16

Copy and complete each set of ordered pairs for the given rule or relation.



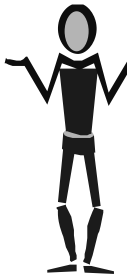
1. $y = x + 2$ (-3, -1), (-2,), (-1,), (0,), (1,), (2,), (3, 5)
2. $y = x$ (-3, -3), (-2,), (-1,), (0,), (1,), (2,), (3, 3)
3. $y = x - 1$ (-3, -4), (-2,), (-1,), (0,), (1,), (2,), (3, 2)
4. On one graph, plot each set of ordered pairs above, joining to create three straight lines.
5 What do you notice about these three lines?
6. If the line $y = x + 2$ cuts the y-axis at +2, where do the lines $y = x$ and $y = x - 1$ cut the y axis?



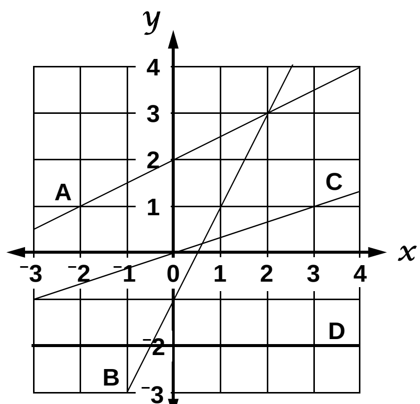
Copy and complete each set of ordered pairs for the given rule or relation.

7. $y = 2x - 2$ (-3, -8), (-2,), (-1,), (0,), (1,), (2,), (3, 4)
8. $y = 2x + 3$ (-3, -3), (-2,), (-1,), (0,), (1,), (2,), (3, 9)
9. $y = 2x$ (-3, -6), (-2,), (-1,), (0,), (1,), (2,), (3, 6)
10. On one graph, plot each set of ordered pairs above, joining to create three straight lines.
11 What do you notice about these three lines?
12. If the line $y = 2x - 2$ cuts the y-axis at -2, where do the lines $y = 2x + 3$ and $y = 2x$ cut the y axis?

Copy and complete each set of ordered pairs for the given rule or relation.

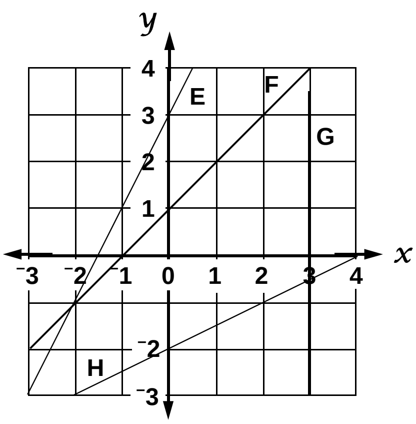


13. $y = \frac{1}{2}$ (-6, -3), (-4,), (-2,), (0,), (2,), (4,), (6, 3)
14. $y = \frac{1}{2}x + 3$ (-6, 0), (-4,), (-2,), (0,), (2,), (4,), (6, 6)
15. $y = \frac{1}{2}x - 2$ (-6, -5), (-4,), (-2,), (0,), (2,), (4,), (6, 1)
16. On one graph, plot each set of ordered pairs above, joining to create three straight lines.
17. What do you notice about these three lines?
18. If the line $y = \frac{1}{2}x$ cuts the y-axis at 0, where do the lines $y = \frac{1}{2}x + 3$ and $y = \frac{1}{2}x - 2$ cut the y axis?



Match each straight line graph drawn with one of the rules listed in the below.

19. $y = \frac{1}{2}x - 2$
20. $x = 3$
21. $y = 2x + 3$
22. $y = \frac{1}{2}x + 2$
23. $y = \frac{1}{3}x$
24. $y = 2x - 1$
25. $y = -2$
26. $y = x + 1$



Linear graph equations / y = mx + c:

In **Task 16**, all rules for the straight lines drawn were written in the form ... $\mathbf{y = mx + c}$

Example: Compare lines $y = 2x + 2$, $y = 2x + 3$ and $y = 2x - 4$ What can you say about these three lines?

Answer: These three lines are all parallel, therefore they have the same **slope** or **gradient**, but each line cuts the y-axis at a different point.

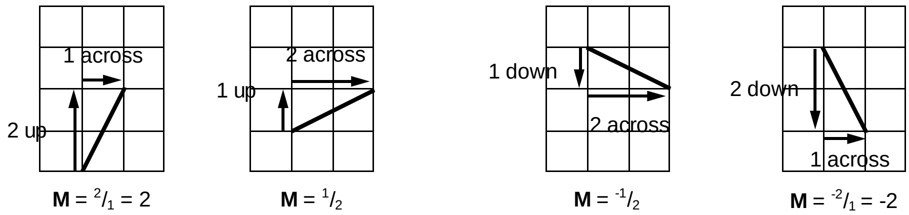
Example: Compare lines $y = \frac{1}{2}x + 3$, $y = 2x + 3$ and $y = x + 3$ What can you say about these three lines?

Answer: While these lines have different gradients, all lines cut the y-axis at the same point (0, 3). This point is known as the **y-intercept**.

The general rule / equation for a straight line is ... $\boxed{y = mx + c}$ where, $\mathbf{m}$ = **gradient** and $\mathbf{c}$ = **y-intercept**

The **gradient (m)** of a line is a measure of its slope. A gradient has two directions ... up (down) and across.

Example: A slope can be positive (up / across) or negative (down / across)



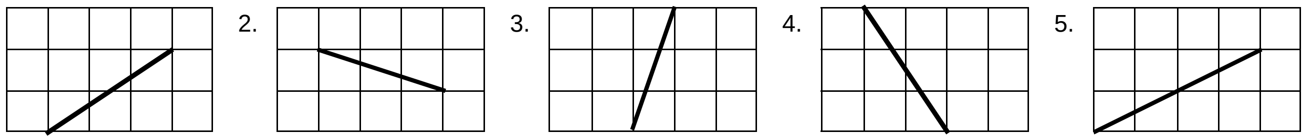
A **horizontal** line has a slope of zero.

A **vertical** line has an undefined slope

Task 17

Find the gradients /slopes of the following lines.

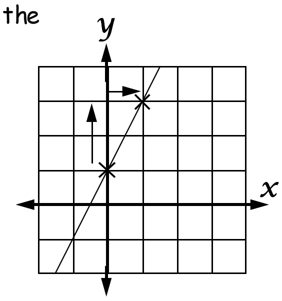
1. 2. 3. 4. 5.



For each linear graph rule (equation) below state the gradient and the y-intercept.

6.	$y = 4x - 2$	7.	$y = x + 5$	8.	$y = -3x + 5$	9.	$y = \frac{2}{3}x - 2$	10.	$y = -\frac{4}{5}x + 1$
11.	$y = -2x - 4$	12.	$y = \frac{4}{3}x + 3$	13.	$y = 5x$	14.	$y = -4x + 5$	15.	$y = \frac{1}{2}x - 7$
16.	$y = \frac{3}{2}x + 3$	17.	$y = -5x + 1$	18.	$y = \frac{2}{3}x - 1$	19.	$y = x - 5$	20.	$y = -2x + 5$

Sketch the graphs of the following straight lines given the **gradient** and the **y-intercept point** using the following steps.



Example: gradient = 2, y-intercept = +1

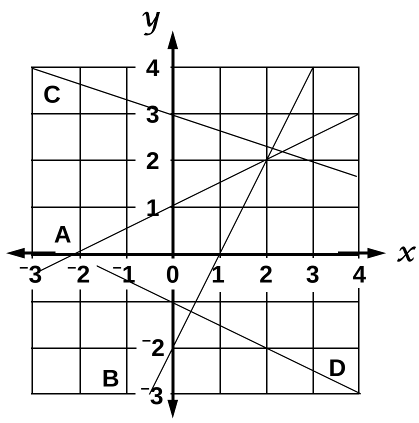
Step 1: **Mark** the y-intercept point.

Step 2: **Count** off the gradient from the y-intercept point and mark this point.

Step 3: **Join** the two points and extend the line.

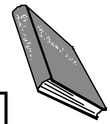
21. gradient = 2, y-intercept = -3
22. gradient = -1, y-intercept = +6
23. gradient = $-\frac{2}{3}$, y-intercept = +2
24. gradient = $\frac{3}{2}$, y-intercept = -1
25. gradient = $\frac{4}{3}$, y-intercept = +1
26. gradient = $\frac{1}{2}$, y-intercept = -2
27. gradient = -3, y-intercept = 0
28. gradient = 0, y-intercept = 4
29. Write the equation of each line in questions 21 to 28.

30. Write equations for the lines A to D drawn on these graphs.



Graphing real-life relationships:

A shop sells books for $1.50 each.
This table shows the cost of buying 0, 1, 2 and 4 books.

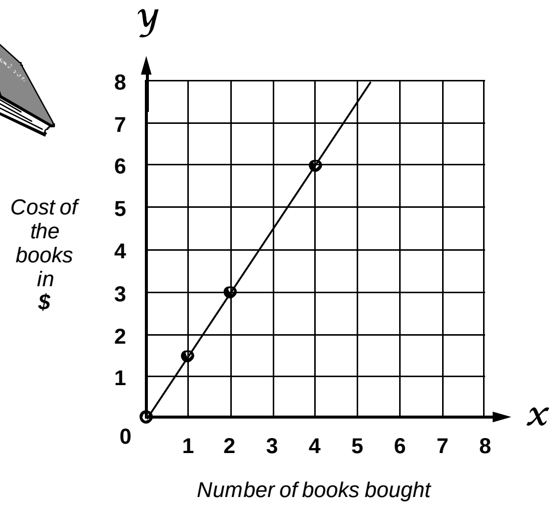


Number of Books	0	1	2	3	4	5
Price (in dollars)	0	1.50	3.00	?	6.00	?

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

(0, 0), **(1, 1.5)**, **(2, 3)** and **(4, 6)**

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

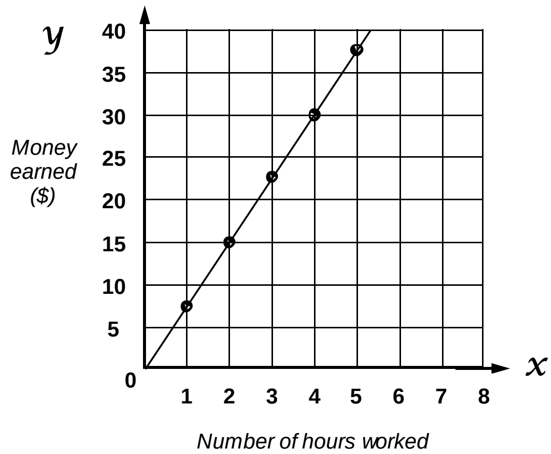


Looking at the graph, work out how much it would cost to buy 3 and 5 books.

Answer: The cost would be $4.50 and $7.50.

Task 18

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



1. How much did Jackie earn when she worked 2 hours?
2. How much did Jackie earn in 4 hours of work?
3. What is the hourly rate for Jackie's job?
4. If Jackie earned $37.50, how many hours did she work?
5. If Jackie earned $67.50, how many hours did she work?
6. **List** the points on this graph as **ordered pairs**.
7. **Write** an **equation** for this relationship, where W = total wages and h = hours worked.

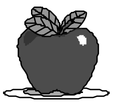
A shop sells packets of jelly beans for 25 cents each.

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

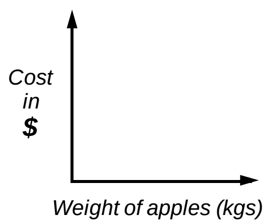
Number of packets	0	1	2	3	4	5	9	10	15
Cost (cents)	0	25	50	?	?	?	?	?	?

11. Use your graph to work out the cost of buying 6, 11 and 14 packets of jelly beans.
12. Write an equation for this relationship, where C = total cost and n = number of jelly bean packets.

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

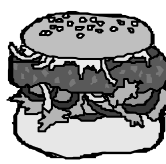


Weight of apples (kgs)	0	1	2	5	8	12	15	20
Cost ($)	0	0.60	1.20	3.00	4.80	7.20	9.00	12.00



13. Write the numbers in this table as co-ordinates.
14. **Plot** these **co-ordinates** on a graph, joining the points with a straight line.
15. Use your graph to work out the cost of buying 7kgs, 13kgs and 18kgs of apples.
16. **Write** an **equation** for this relationship, where C = total cost and k = weight of apples.

Task 19



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**.

 Please **DO NOT** write on the sheets

Algebraic expressions and substitution:

In algebra, letters are used to stand for numbers If the letters are replaced by numbers, the **BEDMAS** rules apply. This process is called **substitution**.

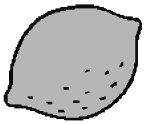
Example: If $a = 4$, $b = 5$ & $c = {}^-3$ find the values of $a + b$, bc, ac^2 and $b(a + c)$

Answers: $4 + 5 = 9$, $5 \times {}^-3 = {}^-15$, $4 \times {}^-3^2 = 4 \times 9 = 36$, $5(4 + {}^-3) = 5 \times 1 = 5$

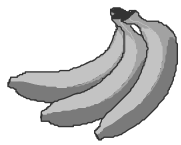
Task 20

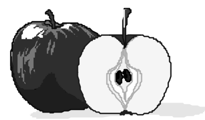
Given that $a = 5$, $b = -4$, $c = 10$ and $d = -7$ find the value of each algebraic expression using substitution. Remember the BEDMAS rules apply.

1.	$4a + 7$	2.	$3c - 4$	3.	$2b + 10$	4.	$5d + 12$	5.	$3a + b$
6.	$a + b + c + d$	7.	ab	8.	abc	9.	$abcd$	10.	$7bd$
11.	a^2c	12.	b^2d	13.	$5bc^2$	14.	$cd^2 + ab$	15.	$3c^2 - 5ab$
16.	$2a(c + d)$	17.	$5c + a(b + c)$	18.	$d^2 - 4ab$	19.	$c + b(2c + d)$	20.	$a(b + d)^2 + c$


lemons
40 cents each


strawberries
10 cents each


bananas
30 cents each


apples
25 cents each


grapes
$1.00 a bunch

For the above information, let lemons = L, strawberries = S, bananas = B, apples = A and grapes = G.

Calculate the cost of the following, giving your answers in dollars ...

21.	5L + 7S	22.	5B + 4A	23.	3G + 10S	24.	5L + 4A	25.	20S + 3G
26.	5L + 4A + 3B	27.	20S + 3G + 2B	28.	7A + 5L + 9B	29.	6B + 14A + 7S	30.	4G + 9B + 15A

Formulae and substitution:

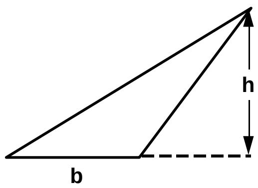
A formula is a general rule or relation, written as an algebraic equation. There are formulae for calculating areas, volumes, perimeters, interest, speed, conversions etc.

Example: **Area of a rectangle** = **base × height** If base = 5.2cm and height = 7.3cm, what is the area?

Answers: $37.96cm^2$

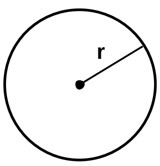
Task 21

Answer the following by substituting into the given formula.



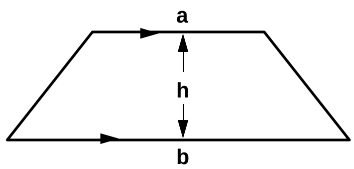
The formula for the area of a triangle is ... $\boxed{A = \tfrac{1}{2}bh}$

1. If b = 24.6cm & h = 17.4cm, what is the area of the triangle?
2. If b = 48.3cm & h = 64.8cm, what is the area of the triangle?



The formula for the circumference of a circle is ... $\boxed{C = 2\pi r}$

3. If r = 20.8cm what is the circumference of the circle? (Use $\pi = 3.14$)
4. If r = 13.25m what is the circumference of the circle? (Use $\pi = 3.14$)



The formula for the area of a trapezium is ... $\boxed{A = \tfrac{1}{2}(a + b)h}$

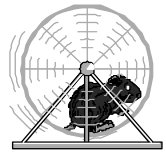
5. If a = 12.7cm, b = 20.9cm & h = 8.4cm, what is the area of the trapezium?
6. If a = 15.3cm, b = 24.6cm & h = 14.7cm, what is the area of the trapezium?

Please **DO NOT** write on the sheets

Collecting and simplifying 'like' terms:

An **algebraic term** is made up of a coefficient (number), variables (letters) and exponents (powers).
Example: $6y^2$ 6 = coefficient, y = variable and 2 = exponent

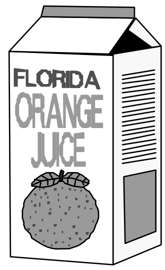
Like terms have the same variable and exponent.
Example: 4b, 10b and -7b are like terms 5b, 8, and $3b^2$ are unlike terms



An **algebraic expression** is a group of algebra terms.
Example: 2x + 8, xy + 9, 4y + 3x, $4z - z^2$ and 9 + 4a - 5c, etc. are all **algebraic expressions**.

Algebraic expressions can be simplified by **collecting** the **like terms**.
Example: 5x + 4x = 9x, 6a + 7 - 5b = b + 7

Task 22



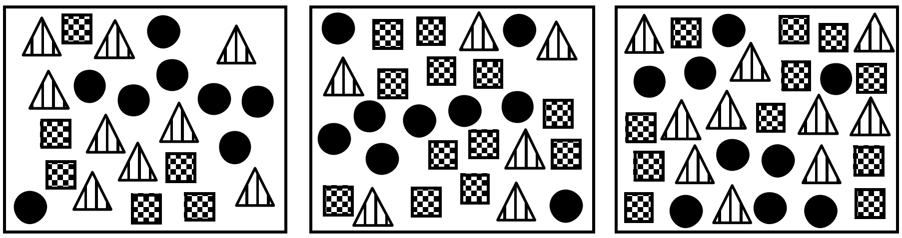
	M	T	W	T	F
Chocolate Milk	5	6	7	3	9
Fruit Juice	4	7	4	7	8
Coke	12	11	15	9	13
Lemonade	8	9	7	10	7

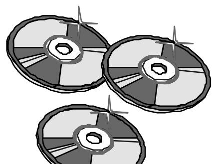
A local shop recorded the number of each type of drink sold each day for one week, as shown in this table.

1. What is the total number of each type of drink sold during the week?

A collection of mathematical shapes is sorted into three boxes as shown in the diagrams.

2. How many of each shape is in each box?
3. What is the total number of each shape?





4. Peter has 25 tapes and 14 C.D.s. If he exchanged 7 tapes for 3 C.D.s, how many tapes and C.D.s does he now have?
5. Miri has 9 video tapes, 31 C.D.s and 17 cassette tapes. If she buys 3 video tapes, 5 cassette tapes and sells 19 C.D.s, how many of each does she now have?

Simplify these algebraic expressions by collecting like terms.

6.	5a + 6a	7.	7b + 12b	8.	9c - 7c	9.	12d - d
10.	8e + 5e - 7e	11.	10f - 6f + 9f	12.	6g - 15g	13.	15h - 9h + 12h
14.	3a + 5a + 9b	15.	5d + 9 - 4f	16.	12g - 7g + 9h	17.	7h + 5j + h
18.	8k - 4j + 5k + 9j	19.	12m - 8 - 7n + 9	20.	10p + 9q - 14q + 9p	21.	14s - 12r - 11s + 10r
22.	6a - 7d + 2c + 8b	23.	9h - 14h + 8k + 9k	24.	15g + 11j + 5g - 12j	25.	12b - 2a + 9a + 8b
26.	y - 8z - 5y + 15z	27.	12d + 9e + 7d - 13e	28.	18 + 12p - 24 + 7p	29.	12y - 8z - 7y + 14z

Simplify these harder algebraic expressions by collecting like terms.

30.	$7a^2 + 5a + a^2$	31.	12cd - 4c + 9d	32.	$12c^2 - 7c + 10c$	33.	$13d + 5d^2 - 9d^2$
34.	$9e - 9e^2 - 12e + 5e^2$	35.	$10f^2 - 6f + 8f - f^2$	36.	$9g + 6g^2 - 15g^2 + 8$	37.	$13h^2 - 9h^2 + h - 8h$
38.	7ab - 11ab + 9b - 7a	39.	15xy + 9x - 4y + 8xy	40.	$10g^2 - 7gh + 9h^2 + 5gh$	41.	$7s^2 + 8r - 9r^2 - 11s^2$

Solving equations using opposite operations:

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. Note: Not all answers will be whole numbers.

Example:

$$\begin{aligned} y + 18 &= 29 \\ y + 18 \mathbf{- 18} &= 29 \mathbf{- 18} \\ y &= 11 \end{aligned}$$

$$\begin{aligned} g - 12 &= 13 \\ g - 12 \mathbf{+ 12} &= 13 \mathbf{+ 12} \\ g &= 25 \end{aligned}$$

$$\begin{aligned} 5k + 9 &= 23 \\ 5k + 9 \mathbf{- 9} &= 23 \mathbf{- 9} \\ 5k &= 14 \\ \frac{5k}{\mathbf{5}} &= \frac{14}{\mathbf{5}} \\ k &= 2\tfrac{4}{5} \end{aligned}$$

$$\begin{aligned} 3d - 7 &= 19 \\ 3d - 7 \mathbf{+ 7} &= 19 \mathbf{+ 7} \\ 3d &= 26 \\ \frac{3d}{\mathbf{3}} &= \frac{26}{\mathbf{3}} \\ d &= 8\tfrac{2}{3} \end{aligned}$$

Task 23

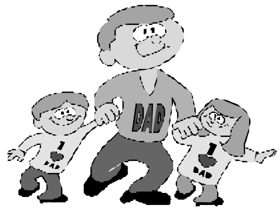
Solve these equations using opposite operations and show your working. Simplify your answers.

1.	a + 25 = 41	2.	17 + b = 31	3.	c – 9 = 24	4.	29 – d = 12	5.	e + 27 = 19
6.	5f = 31	7.	6g = 22	8.	3h = 34	9.	9i = 37	10.	9j = 84
11.	12k = 43	12.	7m = 31	13.	14n = 63	14.	16p = 71	15.	14q = 85
16.	2r + 29 = 81	17.	4s + 34 = 53	18.	27 + 3t = 89	19.	6u – 39 = 14	20.	7v – 24 = 41
21.	3w – 12 = 16	22.	4x + 15 = 8	23.	8y – 23 = 34	24.	9z + 17 = 9	25.	6a – 15 = 23
26.	8b + 17 = 45	27.	3c – 51 = -47	28.	7d + 17 = 42	29.	5e – 61 = -18	30.	9f + 41 = 25

Solve these equations involving decimals, rounding your answers to 2 d.p. Show your working.

31.	1.3g – 4.5 = 7.9	32.	3.6h + 4.8 = 9.3	33.	4.2j – 8.6 = 0.4	34.	3.7k – 7.6 = 1.4	35.	2.3m + 7.6 = 14
36.	4.2n – 7.9 = 5.2	37.	0.9p + 4.7 = 9.8	38.	6.7q + 9.4 = 3.1	39.	5.7r – 9.4 = 0.3	40.	9.4s + 11.2 = 2.7

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



41. If Jordan triples his age and adds 17, he is the same age as his father. If his father is 53 years old, how old is Jordan?

42. If James multiples his age by 6, then subtracts 23 he is the same age as his father. If his father is 43 years old, how old is James?

43. David likes playing cricket. This week he scored 21 less than twice as many runs as last week. If he scored 47 runs this week, how many runs did David score last week?

44. Sam likes playing cricket. Last week he scored 17 more than three times as many runs as this week. If he scored 47 runs last week, how many runs did Sam score this week?

45. Mr Duncan is driving between two cities that are 543km apart. He has 354km left to travel and has already been driving for 2 hours. What was the average speed he travelled at during the first two hours?

46. Kevin ran 6 laps around a local park at an even pace. During the run he stopped for a total of 17 minutes to talk to a friend. If the total time, including his stop, was 1 hr 45 min 30 sec for the run, how long does it take Kevin to complete each lap?

47. Mr Davidson is buying a car worth $11995. He pays a deposit of $1500 and will pay equal amounts for the next 12 months until the car is paid off. How much will these monthly payments be?

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

Expanding and factorising expressions:

Removing the brackets from an expression is called **expanding** the expression.
Each term inside the bracket is multiplied by the term outside the bracket.

Example: 2(a + 4) = **2** × a + **2** × 4 = 2a + 8 7(3b - 5) = **7** × 3b - **7** × 5 = 21b - 35

5b + 3(4b - 7) = 5b + **3** × 4b - **3** × 7 = 5b + 12b - 21 = 17b - 21 (Simplify by collecting 'like' terms)

Factorising an expression is the reverse of expanding. It involves the placing of brackets into an expression.

Example: 12a + 24 = **12** × a + **12** × 2 = 12(a + 2) 12 is a factor of 12a and 24
15w + 20 = **5** × 3w + **5** × 4 = 5(3w + 4) 5 is a factor of 15w and 20

Note: Not all expressions can be factorised. *Example:* 7d + 15

Task 24

Expand the following expressions.

1. 2(a + 3)	2. 5(7 + b)	3. 3(c – 9)	4. 8(d – 3)	5. 5(e + 7)
6. 9(f - 8)	7. 6(g + 5)	8. 3(h + 6)	9. 11(i + 6)	10. 9(j - 3)
11. 12(k + 3)	12. 7(m - 8)	13. 14(n + 5)	14. 12(p - 3)	15. 4(2q - 4)
16. 2(r + 21)	17. 4(s + 10)	18. 2(8 + 3t)	19. 7(u – 9)	20. 6(v – 12)
21. 3(3w – 12)	22. 3(5x + 16)	23. 7(4y – 6)	24. 8(3z + 7)	25. 9(3a – 13)
26. 8(2b + 2a)	27. 3(5c – 8d)	28. 8(3d + 5e)	29. 5(4e – 8f)	30. 8(3f + 11g)

Expand the following expressions, then simplify by collecting like terms.

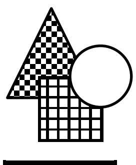
31. 2(a + 3) - 12	32. 14b + 5(7 + b)	33. 5(c – 9) - 6c	34. 15 + 7(d – 3)
35. 4f + 6(f - 8)	36. 6(g + 5) + 6h	37. 24 + 6(h + 6)	38. 11(i + 5) - 42
39. 11(k + 5) + 6k	40. 15 + 7(m - 8)	41. 12(n + 5) + 6n	42. 4p + 12(p - 3)
43. 8(a + 9) + 2(a + 3)	44. 5(b - 4) + 7(b + 6)	45. 7(c + 11) + 4(c - 5)	46. 6(d + 7) + 9(d + 6)
47. 7(e - 7) + 5(e + 4)	48. 6(f + 9) + 2(3f - 3)	49. 8(g - 12) - 2(g + 3)	50. 4(6h + 6) - 5(7h - 7)

Factorise the following expressions.

51. 2a + 10	52. 5b + 25	53. 3c – 24	54. 8d – 32	55. 5e + 40
56. 9f - 54	57. 6g + 42	58. 3h + 27	59. 11i + 55	60. 9j - 72
61. 12k + 48	62. 7m - 56	63. 14n + 28	64. 12p - 108	65. 4q - 32
66. 4r + 18	67. 6s + 15	68. 16 + 6t	69. 10u – 45	70. 8v – 36
71. 9w – 24	72. 8x + 8	73. 14y – 35	74. 15z + 36	75. 16a – 56
76. 4a + 8b - 24	77. 15c – 10d + 40	78. 24e - 32 + 48f	79. 20g - 10h - 30	80. 40 - 8i + 16j

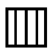
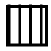
Fourteen people ordered the same lunch of an apple (A), 4 sandwiches (S), 2 meusli bars (M) and an orange drink (O).

81. Copy and complete this algebra expression. ………… (……… A + ……… S + ……… M + ……… O)
82. Expand your expression above to work out the combined lunch order.



A school purchased 36 triangle, 48 square and 24 circle shapes that are to be divided into 6 equal groups.

83. Copy and complete the algebra expression that shows how this could be done.

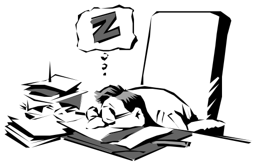
…………  + …………  + …………  = ………… (…………  + …………  + ………… )

Equations involving brackets:

When solving equations involving brackets, expanding the brackets is an extra step that is usually done first..

Example:

$$\begin{aligned} 5(a+4) &= 37 \\ 5a+20 &= 37 \\ 5a+20\mathbf{-20} &= 37\mathbf{-20} \\ 5a &\quad 17 \\ \frac{5a}{5} &= \frac{17}{5} \\ a &= 3^2/_5 \end{aligned}$$



$$\begin{aligned} 7(b-4) &= 11 \\ 7b-28 &= 11 \\ 7b-28\mathbf{+28} &= 11\mathbf{+28} \\ 7b &\quad 39 \\ \frac{7b}{7} &= \frac{39}{7} \\ b &= 5^4/_7 \end{aligned}$$

Task 25

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

1. $4(a + 7) = 41$
2. $5(4 + b) = 19$
3. $3(c - 7) = 29$
4. $6(d - 3) = 25$
5. $6(e + 7) = 19$
6. $5(f - 6) = 17$
7. $6(g + 7) = 22$
8. $3(h + 3) = 34$
9. $9(i + 6) = 37$
10. $8(j - 3) = 81$
11. $12(k + 4) = 15$
12. $7(m - 3) = 15$
13. $14(n + 3) = 63$
14. $11(p - 3) = 64$
15. $4(2q - 4) = 85$
16. $2(r + 23) = 81$
17. $4(s + 9) = 15$
18. $2(9 + 3t) = 89$
19. $6(u - 9) = 14$
20. $7(v - 12) = 41$

Solve these equations involving decimals, rounding your answers to 2 d.p. Show your working.

21. $1.3(g - 3) = 32.9$
22. $3.6(h + 4) = 19.3$
23. $4.2(j - 7) = 57.4$
24. $3.7(k - 6) = 35.4$
25. $4.2(n - 2) = 12.2$
26. $0.9(p + 6) = 9.8$
27. $6.7(q + 10) = 23.1$
28. $5.7(r - 9) = 14.9$

Equations involving the 'unknown' on both sides:

In some equations, the 'unknown' is on both sides of the equals sign. The first step is to move the unknown or variable to one side, then the equation can be worked out as before.

Example:

$$\begin{aligned} 5k+9 &= 3k+25 \\ 5k\mathbf{-3k}+9 &= 3k\mathbf{-3k}+25 \\ 2k+9\mathbf{-9} &= 25\mathbf{-9} \\ \frac{2k}{\mathbf{2}} &= \frac{16}{\mathbf{2}} \\ k &= 8 \end{aligned}$$

Task 26

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

1. $4a + 7 = 3a + 24$
2. $7 + 5b = 2b - 11$
3. $3c - 11 = 7c + 19$
4. $9d - 3 = 2d + 14$
5. $6e + 7 = 11e - 9$
6. $5f - 6 = 8f - 17$
7. $9g + 7 = 5g - 21$
8. $4h + 9 = 9h + 15$
9. $7i + 7 = 5i + 24$
10. $8j - 9 = 12j + 8$
11. $9k - 4 = 7k + 15$
12. $7m - 3 = 3m + 22$
13. $14n + 3 = 8n + 14$
14. $11p - 3 = 9p + 19$
15. $14q - 5 = 6q + 21$
16. $8r - 11 = 72 - 5r$
17. $4s + 8 = 12s - 15$
18. $12 + 3t = 9t - 5$
19. $6u - 9 = 4u + 18$
20. $7v - 12 = 9v + 17$

Equations involving fractions:

To solve equations involving fractions, remove the fraction part of the equation first as shown in the example, then solve the equation using the steps already practised.

Example:

$$\frac{3k+7}{4} = 9$$

$$\frac{3k+7}{4}\mathbf{\times 4} = 9\mathbf{\times 4}$$

$$3k+7 = 36$$

(solve the equation as before)

Task 27

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

1. $\frac{3a+7}{4} = 9$
2. $\frac{2b-12}{5} = 1$
3. $\frac{5c+14}{3} = 9$
4. $\frac{7d+10}{6} = -9$
5. $\frac{6e-9}{7} = 4$
6. $\frac{5f-14}{3} = 8$
7. $\frac{12h+14}{5} = 11$
8. $\frac{8i-23}{4} = -7$
9. $\frac{9k+42}{2} = 8$
10. $\frac{5m+6}{7} = -11$
11. $\frac{2(n-7)}{4} = 9$
12. $\frac{3(r+7)}{5} = 12$
13. $\frac{4(s-11)}{7} = 9$
14. $\frac{4(5v-6)}{5} = 12$
15. $\frac{7(2v+6)}{8} = 3$

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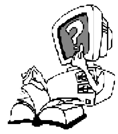
Working with exponents:



An **algebraic term** is made up of a coefficient (numbers), variables (letters) and exponents (powers, indices).
Example: $5y^3$ 5 = coefficient, y = variable and 3 = exponent

But what does $5y^3$ actually mean? $5y^3$ is a shorthand way of writing $5 \times y \times y \times y$

Task 28

Write these algebraic terms in expanded form.

1.	a^2	2.	b^5	3.	$4c^3$	4.	$3e^6$	5.	$5f^4$
6.	g^2h^3	7.	$-6m^4n^6$	8.	$\frac{1}{2}p^5q$	9.	$0.5r^3s^4$	10.	$8u^3v^2w^5$

Simplify these terms by writing them in index form. (In these questions the '×' is a multiplication sign.)

11.	$a \times a \times a \times a$	12.	$b \times b \times b \times b \times b$	13.	$5 \times c \times c \times c \times c$	14.	$9 \times d \times d \times d \times d \times d$
15.	$e \times e \times e \times e \times f \times f$	16.	$6 \times g \times g \times h \times h \times h$	17.	$2 \times j \times j \times 6 \times k \times k \times k$	18.	$\frac{1}{2} \times m \times m \times 8 \times n \times n$
19.	$a \times a \times a \times b \times b \times b \times c \times c \times c \times c$	20.	$8 \times d \times d \times d \times 3 \times e \times e \times e \times e \times e \times e \times e$	21.	$\frac{1}{2} \times f \times f \times 12 \times g \times g \times g \times h \times h \times h \times h$	22.	$24 \times r \times r \times r \times r \times \frac{1}{4} \times s \times s \times t \times t \times t$
23.	$15 \times f \times f \times f \times f \times 0.5 \times g \times g \times g \times h$	24.	$16 \times r \times r \times r \times r \times r \times s \times s \times \frac{1}{4} \times t \times t$	25.	$0.75 \times a \times a \times a \times b \times b \times 15 \times c \times c \times c \times c$	26.	$3 \times p \times p \times p \times p \times 4 \times q \times q \times q \times 6 \times r \times r$

Multiplying exponents / indices:

If a^2 means $a \times a$ and a^3 means $a \times a \times a$, therefore $a^2 \times a^3 = (a \times a) \times (a \times a \times a) = a^{2+3} = a^5$

From this example, an **indice rule** for **multiplying exponents** can be created ... $\boxed{a^x + a^y = a^{x+y}}$

This rule says ...*'When multiplying numbers or variables with indices, ADD the indices together.'*

Examples: $d^8 \times d^3 = = d^{8+3}= d^{11}$ $4c^3 \times 5c^7 = 4 \times 5 \times c^{3+7} = 20c^{10}$ $\frac{1}{2}e^7 \times 12e = \frac{1}{2} \times 12 \times e^{7+1} = 6e^{7+1} = 6e^8$

Two other rules also need to be remembered ... $\boxed{a = a^1}$ and $\boxed{a^0 = 1,\ a \neq 0}$

Task 29

Use the indice rules above to simplify these algebraic terms.

1.	$a^8 \times a^3$	2.	$b^4 \times b^7$	3.	$c^5 \times c^5$	4.	$d^6 \times d^5$	5.	$e^9 \times e$
6.	$4f^2 \times f^3$	7.	$g^5 \times 6g^6$	8.	$\frac{1}{2}h \times 12h^7$	9.	$6j^7 \times 9j^5$	10.	$16k^8 \times \frac{1}{4}k^3$
11.	$0.5m^4 \times 17m^3$	12.	$7n^2 \times 6n^{13}$	13.	$20p^6 \times \frac{1}{2}p^7$	14.	$3q^4 \times 12q^7$	15.	$24r \times 0.25r^9$
16.	$12s^4 \times 2s^7$	17.	$0.6u^5 \times 20u^8$	18.	$15v^7 \times 3v^6$	19.	$\frac{3}{4}w^2 \times 16w^9$	20.	$8x^4 \times 4x^9$
21.	$0.4y^6 \times 30y^2$	22.	$14z^{11} \times 2z^3$	23.	$3a^8 \times 20a^6$	24.	$20b^5 \times \frac{1}{4}b^5$	25.	$32c^9 \times 0.5c^7$
26.	$6d^7 \times 2.5d^4$	27.	$\frac{3}{4}e^2 \times 12e^{13}$	28.	$8f^7 \times 9f$	29.	$7g^5 \times 5g^9$	30.	$3h^4 \times 14h^7$

Use the indice rules above to simplify these more difficult algebraic terms.

31.	$a^4 \times ab^5$	32.	$c^5d^3 \times c^2$	33.	$e^3f \times e^5f$	34.	$g^4h^2 \times g^3h^7$	35.	$j^5k \times j^7k^4$
36.	$r^4 \times r \times r^3$	37.	$s \times s^2 \times s^5$	38.	$v^3 \times v^2 \times v^4$	39.	$w^5 \times w^6 \times w^2$	40.	$y^4 \times y^5 \times y^3$
41.	$2m^2 \times 3m^4 \times m$	42.	$\frac{1}{2}n^3 \times 6n \times n^7$	43.	$p^2 \times 4p^4 \times 3p^5$	44.	$4q^2 \times \frac{1}{4}q^6 \times 5q$	45.	$3r^3 \times 4r \times 3r^3$
46.	$5ab^2 \times 4a^3b^3$	47.	$2a^5b \times 7ab^7$	48.	$\frac{1}{2}a^7b^2 \times 8a^2b^5$	49.	$5a^2b^4 \times 6a^7b^2$	50.	$0.5ab^8 \times 10a^2b^2$
51.	$ab^3c^4 \times a^4bc^3$	52.	$a^3b^5c \times ab^7c^2$	53.	$3b^5c^3 \times 3a^2c$	54.	$3a^4c^7 \times 8b^2c$	55.	$7ab^2c \times 4a^7bc^6$

Dividing exponents / indices:

If a^5 means $a \times a \times a \times a \times a$ and a^2 means $a \times a$, therefore $a^5 \div a^2 = \dfrac{a \times a \times a \times \cancel{a} \times \cancel{a}}{\cancel{a} \times \cancel{a}} = a \times a \times a = a^3$

From this example, an **indice rule** for **dividing exponents** can be created ...

$$\boxed{\frac{a^x}{a^y} = a^{x-y}}$$

This rule says ...*'When dividing numbers or variables with indices, SUBTRACT the indices.'*

Examples: $d^8 \div d^3 = = d^{8-3} = d^5$ $\quad 20c^7 \div 5c = 4c^{7-1} = 4c^6$ $\quad 24e^{11} \div 12e^5 = 2e^{11-5} = 2e^6$

Using the rule above, consider this example ...

Example: If $a^3 \div a^5 = a^{3-5} = a^{-2}$ and $a^3 \div a^5 = \dfrac{\cancel{a} \times \cancel{a} \times \cancel{a}}{a \times a \times \cancel{a} \times \cancel{a} \times \cancel{a}} = \dfrac{1}{a \times a} = \dfrac{1}{a^2}$ therefore $\mathbf{a^{-2}} = \dfrac{\mathbf{1}}{\mathbf{a^2}}$

From this example, an **indice rule** for **negative exponents** can be created ...

$$\boxed{a^{-x} = \frac{1}{a^x}, \quad a \neq 0}$$

Task 30

Use the indice rules above to simplify these algebraic terms.

1. $\dfrac{a \times a \times a \times a \times a}{a \times a \times a}$	2. $\dfrac{b \times b \times b \times b \times b}{b \times b}$	3. $\dfrac{c \times c \times c \times c \times c}{c \times c \times c \times c \times c}$	4. $\dfrac{d \times d \times d \times d \times d \times d}{d \times d \times d \times d \times d}$	5. $\dfrac{e \times e \times e}{e \times e \times e \times e \times e \times e \times e}$
6. $\dfrac{f^7}{f^2}$	7. $\dfrac{g^9}{g^3}$	8. $\dfrac{h^{10}}{h^5}$	9. $\dfrac{k^{11}}{k^7}$	10. $\dfrac{m^3}{m^7}$
11. $\dfrac{10a^6}{2a^4}$	12. $\dfrac{16b^7}{4a^3}$	13. $\dfrac{5c^4}{20c^2}$	14. $\dfrac{8d^4}{8d^4}$	15. $\dfrac{15e^9}{5e^8}$
16. $\dfrac{18f^4g^7}{9f^4g^6}$	17. $\dfrac{24r^{11}s^6}{4r^7s^3}$	18. $\dfrac{32p^6q^7}{16p^9q^2}$	19. $\dfrac{12a^{11}b^7c^8}{8a^9b^4c^5}$	20. $\dfrac{3e^5f^2g^{12}}{18ef^4g^7}$

Two exponents / indices:

If $(a^3)^2 = a^{3 \times 2} = a^6$, because $(a^3)^2 = a^3 \times a^3 = (a \times a \times a) \times (a \times a \times a) = a^6$

From this example, an **indice rule** for **two exponents** can be created ...

$$\boxed{(a^x)^y = a^{x \times y}}$$

This rule says ...*'When raising a number or variable with an index to another index, MULTIPLY the indices.'*

Examples: $(a^4)^3 = a^{4 \times 3} = a^{12}$ $\quad (4d^3)^2 = 4^2 \times d^{3 \times 2} = 16d^6$ $\quad (5c^4d^6)^3 = 5^3 \times c^{4 \times 3} \times d^{6 \times 3} = 125c^{12}d^{18}$

$7(g^3)^4 = 7 \times g^{3 \times 4} = 7g^{12}$ $\quad 5e(2e^3)^4 = 5e \times 2^4 \times e^{3 \times 4} = 5e \times 16 \times e^{12} = 80e^{13}$

Task 31

Use the indice rules above to simplify these algebraic terms.

1. $(a^5)^4$	2. $(b^3)^6$	3. $(c^7)^2$	4. $(d^4)^5$	5. $(e^9)^3$
6. $(4f^5)^2$	7. $(5g^6)^3$	8. $(8h^6)^2$	9. $(9k^4)^3$	10. $(10m^5)^3$
11. $(a^2b^7)^3$	12. $(c^4d)^3$	13. $(e^7f^2)^5$	14. $(g^7h^5)^4$	15. $(m^7n^3)^5$
16. $(4r^8s^2)^3$	17. $(6u^5v^6)^2$	18. $(10jk^5)^3$	19. $(2m^3n^4)^5$	20. $(3h^3j^8)^4$
21. $8(s^5)^3$	22. $4(b^3)^5$	23. $6d(d^3)^4$	24. $5h(h^5)^4$	25. $9a^2(a^4)^3$
26. $5d(d^2e^4)^6$	27. $9f^2(f^4g^5)^2$	28. $5ab(a^7b^4)^2$	29. $(12a^8b^4c^7)^2$	30. $(5a^6bc^5d^7)^3$

Please **DO NOT** write on the sheets

Writing and solving equations for practical problems:

Example: If you double Stewart's age and then add 12 it totals 31. How old is Nigel?
Write an equation to show this information, then solve your equation.

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

$$\begin{aligned} 2\mathbf{n} + 12 &= 31 \\ 2\mathbf{n} &= 31 - 12 \\ 2\mathbf{n} &= 19 \\ \mathbf{n} &= 19 \div 2 \\ \mathbf{n} &= 9\tfrac{1}{2} \end{aligned}$$

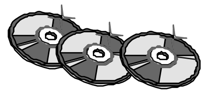
Stewart is $9\frac{1}{2}$ years old.

Task 32

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

1. If Amy multiplies her age by 5 and adds 11, she is the same age as her mother. If her mother is 41 years old, how old is Amy?
2. Seven times Brett's age, minus 62 is the same as his father's age. If Brett's father is 43, how old is Brett?

3. Mary had $55 in her bank account. For the past twelve weeks, Mary has been saving all her pocket money and she now has $157.00 altogether. How much pocket money does she get each week?
4. Rangi had $72 in his bank account. For the past twenty weeks, Rangi has been saving half his pocket money and he now has $162.00 in his bank account. How much pocket money does he get each week?

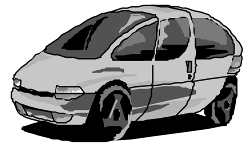


5. Jackie bought 7 C.D.'s that were all the same price. If she had $150.00, but now has only $24.35 left, what is the cost of each C.D.?

6. Mr Moore is driving between two cities that are 512km apart. He has 225.2km left to travel and has already been driving for 3 hours. What was the average speed he travelled at during the first three hours?

7. Gail has $96.00 in her bank account. She buys some books that cost $6.50 each and has $50.50 left in her bank account. How many $6.50 books did she buy?

8. Kevin ran 7 laps around a local park at an even pace. During the run he stopped for a total of 21 minutes to talk to a friend. If the total time, including his stop, was 2 hours 23 minutes 30 seconds for the run, how long does it take Kevin to complete each lap?



9. Mr Davidson is buying a car worth $14590. He pays a deposit of $1450 and will pay equal amounts for the next 8 months until the car is paid off. How much will these monthly payments be?

10. A school group of 25 is travelling to a sports tournament by train. They have fund-raised $500.00 and after paying for the train tickets there is $156.25 left over. What is the cost of one train ticket?

Task 33

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.

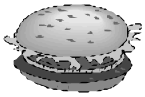
Please **DO NOT** write on the sheets

Creating and using a formula to solve practical problems:

Example: Jacqui has been sent to the shop to buy hamburgers and chips for some people. The cost of a hamburger (H) is $2.75 and the cost of chips (C) is $1.50. A **formula** can be written to work out the total cost (T).

$$T = \$2.75H + \$1.50C$$

where **T** = total cost, **H** = number of hamburgers purchased, ***C*** = number of chips purchased.



Use the formula to work out the cost of buying 5 hamburgers and 8 chips.

Answer: T = $2.75 × 5 + $1.50 × 8 = $13.75 + $12.00 = $25.75

Task 34

1. The telephone cost $25.00 / month plus 20 cent / local call.
   Use this information to **write** a **formula** for a monthly bill.
   Let M = total monthly cost ($) and N = number of local calls made.
2. **Use** your **formula** to work out the monthly bill if 147 local calls were made.
3. If the telephone bill was $55.80, how many local calls were made?

4. The cost of a movie ticket is $6.50 for children under 15 and $10.00 for adults.
   Use this information to **write** a **formula**.
   Let T = total cost of tickets ($) and *C* = number of children going to the movies and A = number of adults going to the movies.
5. **Use** your **formula** to work out the cost of movie tickets if 7 children and 3 adults went to the movies.
6. Movie tickets cost $88.50. If 3 adults went to the movies, how many children went to the movies?

7. 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.
8. **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.
9. A fish and chip order cost $10.80. If the order included 4 fish, how many scoops of chips came with this order?

The 'Read For Life' company sends out books by mail order that cost $9.50 each.
With each order there is a postage charge of $6.95, no matter how many books are sent.

The **formula** … $C = \$9.50N + \$6.95$ is used to work out the cost of an order.

where *C* = total cost of books bought ($) and N = number of books bought.

10. **Rearrange** this **formula** to make **N** the subject of the formula.
11. Use your rearranged formula to work out the number of books sold for three orders that cost $54.45, $111.45 and $196.95.

Task 35

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 within your question.

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

‘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. Linear graphs and the co-ordinate system is explored and 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.

Creating and describing patterns:
Continuing a number sequence and finding the rule:
More number sequences:
Using a rule to create number sequences:
Practical problems involving rules:

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. Pupils are to describe how each sequence has been created and use their rule to find the missing numbers or continue a sequence.

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 introduced to finding the ‘general term’ for a sequence, written as an algebraic expression rather than expressed in words. The rule for the ‘general term’ links the sequence order with the value of any sequence term.

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 ***3n + 5***, the 20th term would be ‘**20** × 3 + 5 = **65**.
This would be written as the ordered pair (20, 65).

Practical problems are included to illustrate how rules can be used.

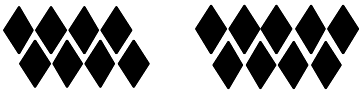
In **Task 6** pupils are to continue number sequences and find various terms given the rule for the general term to describe the sequence.

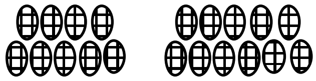
In **Task 7** pupils are to create their own rules for the general term for four number sequences. Pupils exchange sequences with classmates, who are to find the next three numbers and describe the rule for the general term for each sequence as an algebraic expression.

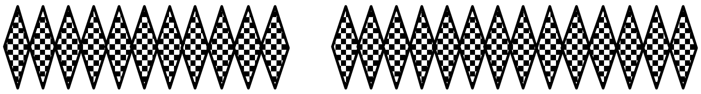
In **Task 8** pupils are to investigate practical problems involving rules.

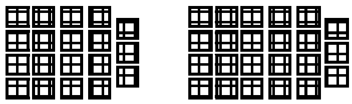
In **Task 9** pupils are to create practical problems similar to those created in Task 8 above that can be exchanged with classmates.

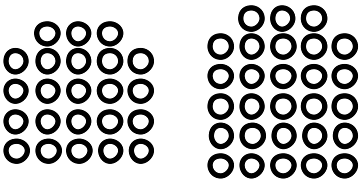
Task 1

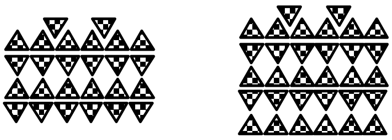
1. 

2. 

3. 

4. 

5. 

6. 

7. Q1: 5, 6, 7, 8, 9, ... Q2: 3, 5, 7, 9, 11, ... Q3: 2, 5, 8, 11, 14, ... Q4: 7, 11, 15, 19, 23,...
Q5: 8, 13, 18, 23, 28, ... Q6: 8, 14, 20, 26, 32, ...
8. Q1: Start with 5 diamonds then add 1 diamond to each new diagram Q2: Start with 3 ovals than add 2 ovals to each new diagram Q3: Start with 2 diamonds then add 3 diamonds to each new diagram Q4: Start with 7 squares than add 4 squares to each new diagram Q5: Start with 8 circles then add 5 circles to each new diagram Q6: Start with 8 triangles then add 6 triangles to each new diagram 9. Q1: 12, 14, 24 Q2: 17, 21, 41 Q3: 23, 29, 59 Q4: 35, 43, 83 Q5: 43, 53, 103 Q6: 50, 62, 122

Task 3

1. 6, 10, 16, add 2 2. 10, 25, 30, add 5 3. 14, 35, 42, add 7 4. 14, 26, 38, add 6 5. 25, 47, 69, add 11 6. 9, 17, 41, add 8 7. 14, 23, 50, add 9 8. 19, 25, 43, add 6 9. 1, 4, 13, 19, add 3 10. -1, 15, 31, 39, add 8 11. 39, 27, 9, subtract 6 12. 93, 66, 57, subtract 9 13. 63, 39, 31, subtract 8 14. 75, 65, 55, subtract 5 15. 83, 59, 35, subtract 12 16. 95, 86, 59, subtract 9 17. 108, 95, 56, subtract 13
18. 67, 25, 11, subtract 14 19. 27, 6, -1, subtract 7 20. 35, 11, -1, -25, subtract 12
21. add 7, 38, 45, 52 22. subtract 6, 7, 1, -5 23. add 9, 46, 55, 64 24. subtract 8, 1, -7, -15 25. add 4, 15, 19, 23 26. add 5, 9, 14, 19 27. subtract 14, -53, -67, -81 28. add 13, 68, 81, 94 29. add 13, 33, 46, 59 30. add 37, 193, 230, 267 31. subtract 27, -72, -99, -126 32. add 29, 73, 102, 131 33. add 7.5, 50.5, 58. 65.5 34. subtract 11.25, -13.25, -24.5, -35.75

Task 5

1. 6, 10, 14, general term = 2n 2. 7, 13, 17, general term = 2n + 3 3. 8, 11, 20, general term = 3n - 1
4. 16, 26, 41, general term = 5n + 1 5. 7, 16, 19, general term = 3n + 1 6. 5, 17, 21, general term = 4n - 3
7. 1, 5, 9, general term = 2n - 5 8. 7, 13, 19, general term = 3n - 2 9. 6, 9, 18, general term = 3n
10. -5, -3, 3, general term = 2n - 9 11. 33, 43, 73, general term = 10n + 3 12. 16, 22, 40, general term = 6n + 4
13. -3, 6, 9, general term = 3n - 9 14. 24m 15. 15m = 360 bricks, 23m = 552 bricks, 42m = 1008 bricks
16. 192 bricks = 8m, 300 bricks = 12.5m, 150 bricks = 6.25m 17. 10x + 6 18. 12m^2 = 126 tiles, 20m^2 = 206 tiles, 50m^2 = 506 tiles 19. 76 tiles = 7m^2, 116 tiles = 11m^2, 206 tiles = 20m^2

Task 6

1. 13, 17, 21, 25 2. 57, 129, 269 3. -3, 2, 7, 12 4. 67, 192, 352 5. 13, 16, 19, 22 6. 46, 160, 250
7. 8, 4, 0, -4 8. -36, -188, -308

Task 8

1. $24.45, $50.45, $82.92, $167.45 2. $63.45 - $4.95 = $58.50, $58.50 ÷ $6.50 = 9 books
3. $43.45, $112.45, $181.45, $250.45 4. $146.95 - $8.95 = $138.00, $138.00 ÷ $11.50 = 12 soccer balls
5. $16.90, $22.50, $32.90, $46.50 6. $25.70 - $2.50 = $23.20, $23.20 ÷ $1.60 = 14.5 minutes 7. Cost of buying CD's = no. of CD's x $17.95 - $10 8. $79.75, $151.55, $205.40, $259.25
9. $97.70 + $10.00 = $107.70, $107.70 ÷ 17.95 = 6 CD's

Worksheet 6

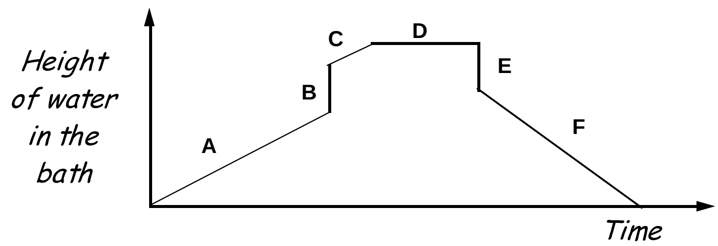
Graphs of real-life situations:

In **Task 10** pupils are to interpret graphs of real-life situations, creating a story that represents the information displayed by the graph. Pupils are to create graphs for a given situations and discuss his / her graph with a classmates.

In **Task 11** pupils are to create graphs for various real-life situations, writing a story to explain the his / her graph.

Task 10

1. graph C 2. graph B 3. graph A 4. point B 5. point D
6. -
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

Worksheets 7 to 9

Ordered pairs:
Graphing ordered pairs / co-ordinates:
Extending co ordinate graphs:

In **Task 12** pupils are to interpret mapping diagrams to create a list of ordered pairs or co-ordinates. Given the first number of an ordered pair, plus the relation between the first and second numbers, pupils are to complete the ordered pairs.

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 13** pupils are to list the co-ordinates for points plotted on a Cartesian graph and graph co-ordinates points given. From mapping diagrams, pupils are to list ordered pairs and plot them on a graph.

In **Task 14** 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 15** 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.

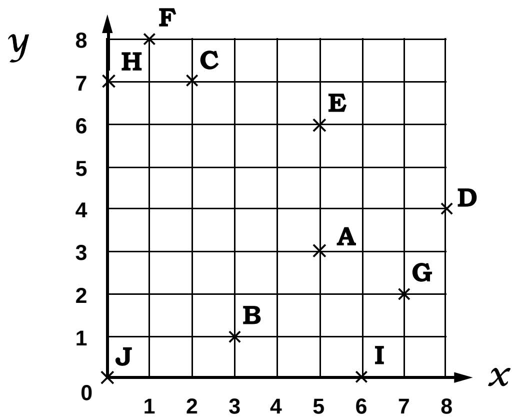
Task 12

1. (1, 3), (2, 4), (3, 5), (4, 6), (5, 7), (6, 8) 2. (1, -3), (2, -2), (3, -1), (4, 0), (5, 1), (6, 2)
3. (1, 2), (2, 4), (3, 6), (4, 8), (5, 10), (6, 12) 4. (1, 6), (2, 7), (3, 8), (4, 9), (5, 10), (6, 11)
5. (2, 1), (4, 2), (6, 3), (8, 4), (10, 5), (12, 6) 6. (1, -6), (2, -5), (3, -4), (4, -3), (5, -2), (6, -1)
7. Q1 'is 2 less than' Q2: 'is 4 more than' Q3: 'is half of' Q4: 'is 5 less than' Q5: 'is twice'
Q6: 'is 7 more than' 8. (1, 9), (2, 10), (3, 11), (4, 12), (5, 13), (6, 14) 9. (1, 4), (2, 8), (3, 12), (4, 16), (5, 20), (6, 24)
10. (1, 4), (2, 6), (3, 8), (4, 10), (5, 12), (6, 14) 11. (1, 1), (2, 4), (3, 7), (4, 10), (5, 13), (6, 16)

Task 13

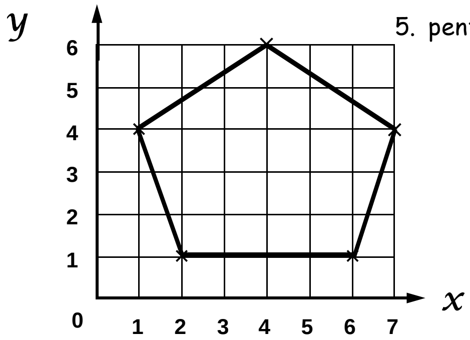
1. A = (7, 5), B = (0, 5), C = (3, 4), D = (4, 0), E = (2, 1), F = (7, 7), G = (6, 1), H = (2, 7), I = (1, 2), J = (5, 3)

2.



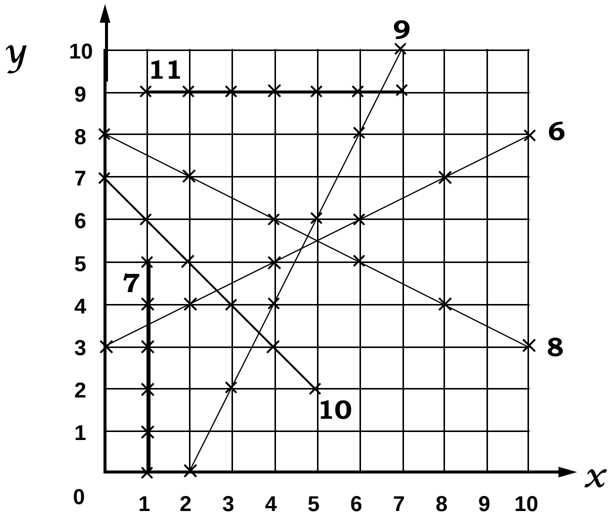
3. (1, 1), (5, 1), (5, 3), (3, 4), (1,3) and (1, 1)

4.



5. pentagon

6. (0, 3), (2, 4), (4, 5), (6, 6), (8, 7), (10, 8)
7. (1, 0), (1, 1), (1, 2), (1, 3), (1, 4), (1, 5)
8. (0, 8), (2, 7), (4, 6), (6, 5), (8, 4), (10, 3)
9. (2, 0), (3, 2), (4, 4), (5, 6), (6, 8), (7, 10)
10. (0, 7), (1, 6), (2, 5), (3, 4), (4, 3), (5, 2)
11. (2, 9), (3, 9), (4, 9), (5, 9), (6, 9), (7, 9)



13. They are all straight lines

Task 14

1. A = (-2, 4), B = (2, 4), C = (3, 2), D = (-4, -3), E = (4, 0), F = (-2, -4), G = (2, 1), H = (-2, -1), I = (-3, 3), J = (0, 1), K = (0, -3), L = (-5, -5), M = (3, -3), N = (2, -4), O = (5, 4), P = (3, -1), Q = (1, -2), R = (-4, 0), S = (5, -2), T = (-5, 2), U = (1, 3), V = (-3, 1), W = (5, -5), X = (-5, 5), Y = (3, 5), Z = (-3, -2), 2. parallelogram 3. quadrilateral
4. Algebra is great fun
6. Plot and join the points (-1, 0), (1, 2), (3, 0), (1, -2), (-1, 0)
   Plot and join the points (2, -1), (3, -1), (3, -3), (2, -3), (2, -1).
   Plot and join the points (0, 1), (-3, 3), (-3, 1), (0, 1)

Ordered pairs and Linear graphs:
Linear graph equations / y = mx + c:
Graphing real-life relationships:

In **Task 16** pupils are to complete a set of ordered pairs, given a rule in the form **y = mx + c**. The ordered pairs are then graphed in sets of three. Comparing each set of three graphs introduces the idea that graphs with the same slope are parallel.

From the general equation, **y = mx + c**, m = slope / gradient.

Example: y = 2x, y = 2x + 5, y = 2x - 4 all have the same slope as **m** = 2 for all equations.

Pupils are also introduced to the idea that not only can you determine the slope / gradient of a line form its equation, but you can also note where the line cuts the y-axis.

From the general equation, **y = mx + c**, c = y-axis intercept.

Example: y = 2x has a y-intercept = 0, y = 2x + 5 has a y-intercept = +5, y = 2x - 4 has a y-intercept = -4

To reinforce these ideas, pupils are to match graphs drawn with linear equations.

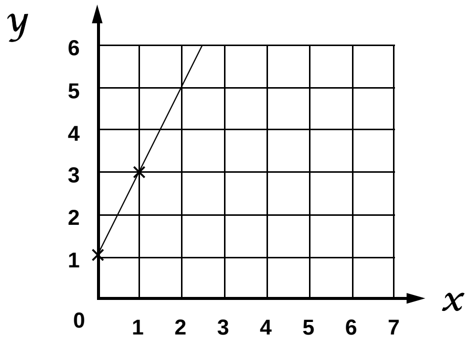
In **Task 17** pupils are to determine the slope / gradient of various lines by counting squares. Given linear equations, pupils are to state the slope / gradient and y-axis intercept points. Pupils are to draw linear graphs given the gradient and y-intercept following these steps.

Example: y = 2x +1, where gradient = 2, y-intercept = +1

Step 1: Mark the y-intercept point.

Step 2: Count off the gradient from the y-intercept point, mark this new point.

Step 3: Join the two points and extend the line.



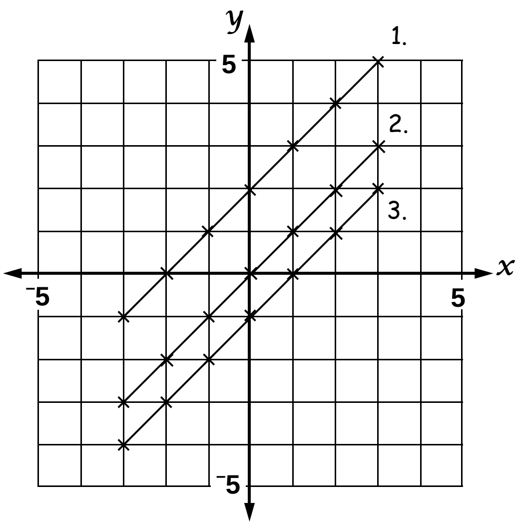
Pupils are to write equations in the form y = mx + c, given diagrams of various graphs.

In **Task 18** pupils are to interpret information displayed in graphs representing real-life situations, complete ordered pairs and graph the results.

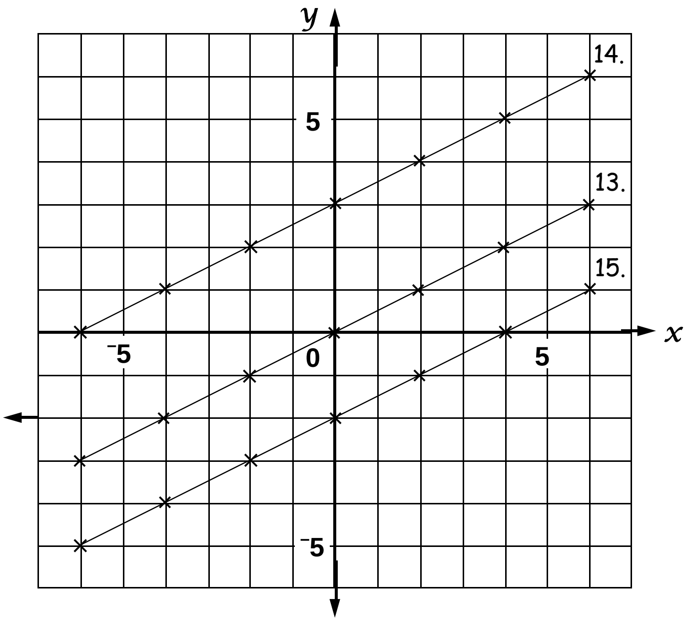
In **Task 19** pupils are to create graphs of real-life situations.

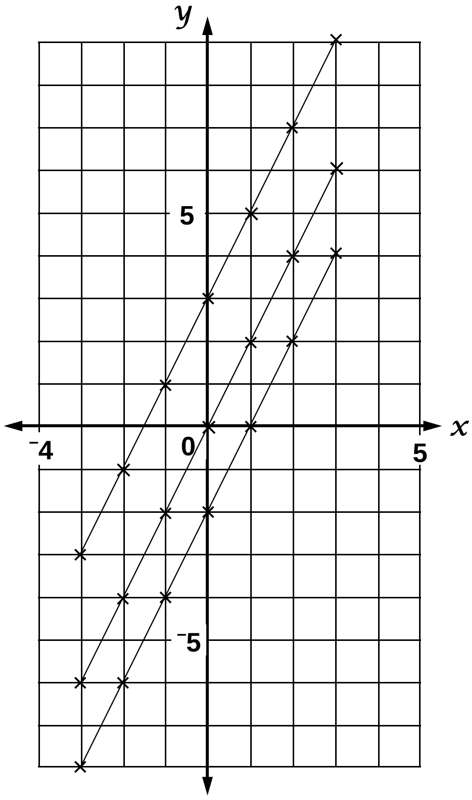
Task 16

1. (-3, -1), (-2, 0), (-1, 1), (0, 2), (1, 3), (2, 4), (3, 5) 2. (-3, -3), (-2, -2), (-1, -1), (0, 0), (1, 1), (2, 2), (3, 3)
3. (-3, -4), (-2, -3), (-1, -2), (0, -1), (1, 0), (2, 1), (3, 2) 4. See graph below
5. All lines are parallel therefore have the same slope / gradient 6. Cuts the y axis at 0 and -1



7. (-3, -8), (-2, -6), (-1, -4), (0, -2), (1, 0), (2, 2), (3, 4)
8. (-3, -3), (-2, -1), (-1, 1), (0, 3), (1, 5), (2, 7), (3, 9)
9. (-3, -6), (-2, -4), (-1, -2), (0, 0), (1, 2), (2, 4), (3, 6)
10. See graph opposite right
11. All lines are parallel therefore have the same slope / gradient
12. Cuts the y axis at 3 and 0

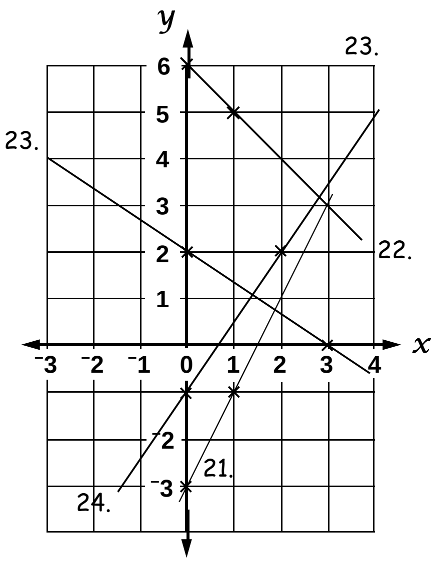


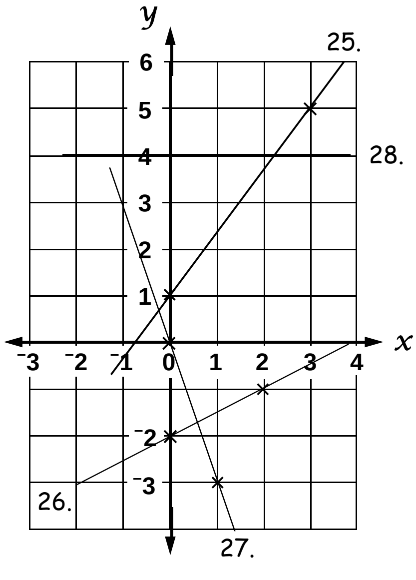


11. All lines are parallel therefore have the same slope / gradient 12. Cuts the y axis at 3 and 0
13. (-6, -3), (-4, -2), (-2, -1), (0, 0), (2, 1), (4, 2), (6, 3) 14. (-6, 0), (-4, 1), (-2, 2), (0, 3), (2, 4), (4, 5), (6, 6)
15. (-6, -5), (-4, -4), (-2, -3), (0, -2), (2, -1), (4, 0), (6, 1) 16. See graph above
17. All lines are parallel therefore have the same slope / gradient 18. Cuts the y axis at 3 and -2
19. H 20. G 21. E 22. A 23. C 24. B 25. D 26. F

Task 17

1. 2 up / 3 across ⇒ $m = {}^{2}/_{3}$ 2. 1 down / 3 across ⇒ $m = -{}^{1}/_{3}$
3. 3 up / 1 across ⇒ $m = {}^{3}/_{1} = 3$ 4. 3 down / 2 across ⇒ $m = -{}^{3}/_{2}$
5. 2 up / 4 across ⇒ $m = {}^{2}/_{4} = {}^{2}/_{4}$ 6. m = 4, c = -2 7. m = 1, c = +5
8. m = -3, c = +5 9. $m = {}^{2}/_{3}$, c = -2 10. $-{}^{4}/_{5}$, c = +1 11. m = -2, c = -4
12. $m = {}^{4}/_{3}$, c = +3 13. m = 5, c = 0 14. m = -4, c = +5
15. $m = {}^{1}/_{2}$, c = -7 16. $m = {}^{3}/_{2}$, c = +3 17. m = -5, c = +1
18. $m = {}^{2}/_{3}$, c = -1 19. m = 1, c = -5 20. m = -2, c = +5





29. Q21: $y = 2x - 3$,
Q22: $y = -x + 6$,
Q23: $y = {}^{-2}/_{3}x + 2$,
Q24: $y = {}^{3}/_{2}x - 1$,
Q25: $y = {}^{4}/_{3}x + 1$,
Q26: $y = {}^{1}/_{2}x - 2$
Q27: $y = -3x$
Q28: $y = 4$

30. A $y = {}^{1}/_{2}x + 1$
B $y = 2x - 2$
C $y = -{}^{1}/_{3}x + 3$
D $y = -{}^{1}/_{2}x - 1$

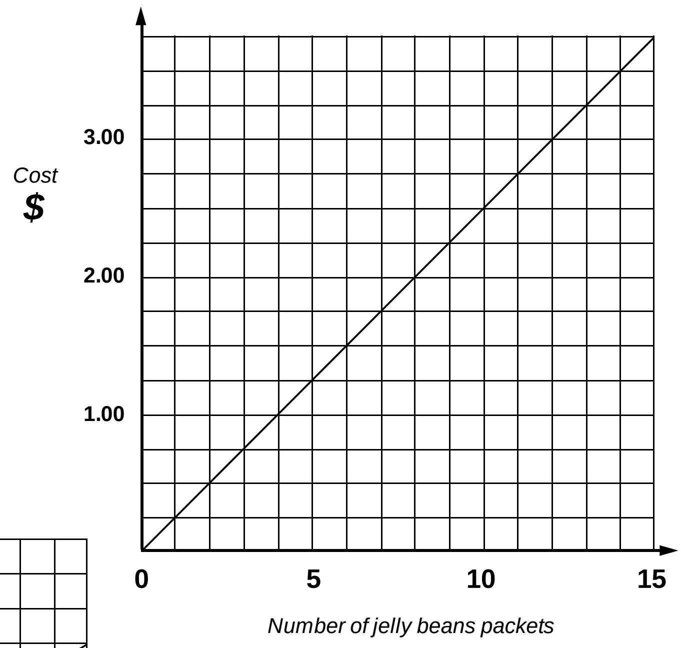
Task 18

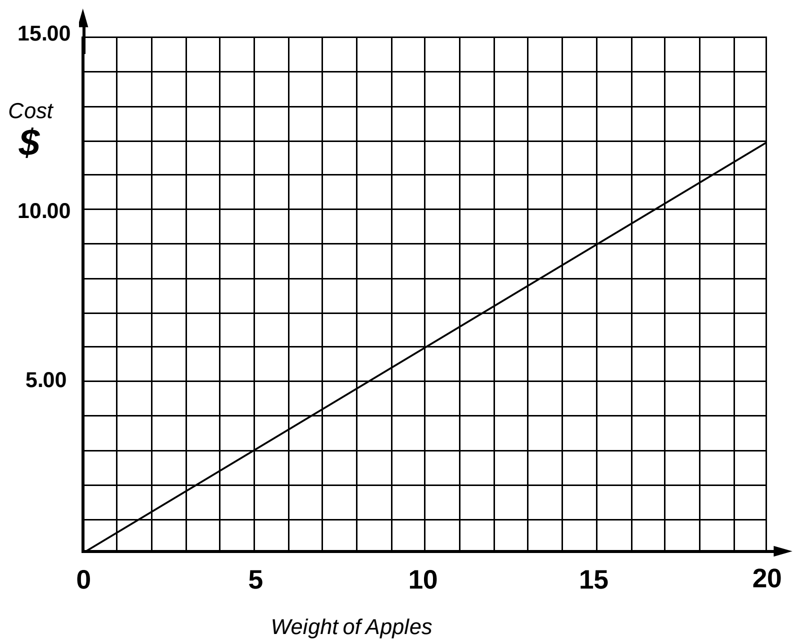
1. $15 2. $30 3. $7.50 4. 5 hours 5. 9 hours
6. (0, 0), (1, 7.5), (2, 15), (3, 22.5), (4, 30), (5, 37.5)
7. W = 7.5h 8.

Number of packets	0	1	2	3	4	5	9	10	15
Price (cents)	0	25	50	75	100	125	225	250	375

9. (0, 0), (1, 25), (2, 50), (3, 72), (4, 100), (5, 125), (9, 225), (10, 250), (15, 375) 10. see graph opposite
11. $1.50, $2.75, 3.50 12. *C* = 0.25n

13. (0, 0), (1, 0.60), (2, 1.20), (5, 3.00), (8, 4.80), (12, 7.50), (15, 9.00), (20, 12.00) 14. see graph below





15. $4.20, $$7.80, $10.80
16.*C* = 0.6k

Worksheets 13 & 14

Algebraic expressions and substitution:
Formulae and substitution:
Collecting and simplifying 'like' terms:

In **Task 20** pupils are to evaluate algebraic expressions by substituting known values into various expressions. Remind pupils to apply the BEDMAS rules, when necessary.

In **Task 21** pupils are to work with formulae. 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 22** pupils are introduced to 'like' terms. Algebraic expressions are to be simplify by collecting like terms.

Task 20

1. 27 2. 26 3. 2 4. -23 5. 11 6. 4 7. -20 8. -200 9. 1400 10. 196 11. 250 12. -112
13. -2000 14. 470 15. 400 16. 30 17. 80 18. 129 19. -42 20. 615 21. $2.70 22. $2.50
23. $4.00 24. $3.00 25. $5.00 26. $3.90 27. $5.60 28. $6.45 29. $6.00 30. $10.45

Task 21

1. $214.02cm^2$ 2. $1564.92cm^2$ 3. 130.624cm 4. 83.21m 5. $141.12cm^2$ 6. $293.265cm^2$

Task 22

1. 30 chocolate milk, 30 fruit juice, 60 coke, 41 lemonade 2. 1st box: 9 triangles, 6 squares, 8 circles, 2nd box: 6 triangles, 12 squares, 9 circles, 3rd box: 10 triangles, 11 squares, 9 circles 3. 25 triangles, 29 squares, 26 circles 4. 18 tapes and 17 C.D.'s 5. 12 video tapes, 12 C.D.'s and 22 cassette tapes
6. 11a 7. 19b 8. 2c 9. 11d 10. 6e 11. 13f 12. -9g 13. 18h 14. 8a + 9b 15. 5d + 9 - 4f
16. 5g + 9h 17. 8h + 5j 18. 13k + 5j 19. 12m - 7n + 1 20. 19p - 5q 21. 3s - 2r 22. 6a - 7d + 2c + 8b
23. -5h + 17k 24. 20g - j 25. 7a + 20b 26. -4y + 7z 27. 19d - 4e 28. 19p - 6 29. 5y + 6z
30. $8a^2 + 5a$ 31. 12cd - 4c + 9d 32. $12c^2 + 3c$ 33. $13d - 4d^2$ 34. $-3e - 4e^2$ 35. $9f^2 + 2f$ 36. $9g - 9g^2 + 8$
37. $4h^2 - 7h$ 38. -4ab - 7a + 9b 39. 23xy + 9x - 4y 40. $10g^2 - 2gh + 9h^2$ 41. $8r - 9r^2 - 4s^2$

Worksheet 15

Solving equations using opposite operations:

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

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

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

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

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

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

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.

Task 23

1. a = 16 2. b = 14 3. c = 33 4. d = 17 5. e = -8 6. f = $6\frac{1}{5}$ 7. g = $3\frac{2}{3}$ 8. h = $11\frac{1}{3}$ 9. i = $4\frac{1}{9}$
10. j = $9\frac{1}{3}$ 11. k = $3\frac{7}{12}$ 12. m = $4\frac{3}{7}$ 13. n = $4\frac{1}{2}$ 14. p = $4\frac{7}{16}$ 15. q = $6\frac{1}{14}$ 16. r = 26 17. s = $4\frac{3}{4}$
18. t = $20\frac{2}{3}$ 19. u = $8\frac{5}{6}$ 20. v = $9\frac{2}{7}$ 21. w = $9\frac{1}{3}$ 22. x = $-1\frac{3}{4}$ 23. y = $7\frac{1}{8}$ 24. z = $-\frac{8}{9}$ 25. a = $6\frac{1}{3}$
26 b = $3\frac{1}{2}$ 27. c = $1\frac{1}{3}$ 28. d = $3\frac{4}{7}$ 29. e = $8\frac{3}{5}$ 30. f = $-1\frac{7}{9}$ 31. g = 9.54 32. h = 1.25
33. j = 2.14 34. k = 2.43 35. m = 2.78 36. n = 3.12 37. p = 5.67 38. q = -0.94 39. r = 1.70
40. s = -0.90 41. 3x + 17 = 53 , x = 12 years 42. 6x - 23 = 43, x = 11 years 43. 2x -21 = 47, x = 34 runs
44. 3x +17 = 47, x = 10 runs 45. 2x + 354km = 543km, Average speed = 94.5km/hour
46. 6x - 17min = 1hr 45min 30sec, Average lap time = 14 min 45 sec
47. 12x - $1500 = $11995Monthly payment = $874.58

Worksheet 16

Expanding and factorising expressions:

In **Task 24** pupils are introduced to two new algebra processes: **expanding** and **factorising**.

Expanding involves removing brackets from an expression (or equation) by multiplying each term inside the bracket by the term outside the brackets. Expanded expression may be able to be simplified by collecting like terms.

Factorising an expression is the reverse of expanding as it involves finding common factors and the placing of brackets in an expression. Both skills are important and will be needed when solving more complicated equations in later worksheets.

Task 24

1. 2a + 6 2. 35 + 5b 3. 3c - 27 4. 8d - 24 5. 5e + 35 6. 9f - 72 7. 6g + 30 8. 3h + 18
9. 11i + 66 10. 9j - 27 11. 12k + 36 12. 7m - 56 13. 14n + 70 14. 12p - 36 15. 8q - 16
16. 2r + 42 17. 4s + 40 18. 16 + 6t 19. 7u - 63 20. 6v - 72 21. 3w - 36 22. 3x + 48
23. 7y - 42 24. 24z + 56 25. 9a - 117 26. 16b + 16a 27. 15c - 24d 28. 24d + 40e
29. 20e - 40f 30. 24f + 88g 31. 2a + 6 - 12 = 2a - 6 32. 14b + 35 + 5b = 19b + 35
33. 5c - 45 - 6c = -c - 45 34. 15 + 7d - 21 = -6 + 7d 35. 4f + 6f - 48 = 10f - 48 36. 6g + 30 + 6h
37. 24 + 6h + 36 = 60 + 6h 38. 11i + 55 - 42 = 11i + 13 39. 11k + 55 + 6k = 17k + 55
40. 15 + 7m - 56 = -41 + 7m 41. 12n + 60 + 6n = 18n + 60 42. 4p + 12p - 36 = 16p - 36
43. 8a + 72 + 2a + 6 = 10a + 78 44. 5b - 20 + 7b + 42 = 12b + 22 45. 7c + 77 + 4c - 20 = 11c + 57
46. 6d + 42 + 9d + 54 = 15d + 96 47. 7e - 49 + 5e + 20 = 12e - 29 48. 6f + 54 + 6f - 6 = 12f + 48
49. 8g - 96 - 2g - 6 = 6g - 102 50. 24h + 24 - 35h + 35 = -11h + 59 51. 2(a + 5) 52. 5(b + 5)
53. 3(c - 8) 54. 8(d - 4) 55. 5(e + 8) 56. 9(f - 6) 57. 6(g + 7) 58. 3(h + 9) 59. 11(i + 5)
60. 9(j - 8) 61. 12(k + 4) 62. 7(m - 8) 63. 14(n + 2) 64. 12(p - q) 65. 4(q - 8) 66. 2(2r + 9)
67. 3(2s + 5) 68. 2(8 + 3t) 69. 5(2u - 9) 70. 4(2v - 9) 71. 3(3w - 8) 72. 8(x + 1)
73. 7(2y -5) 74. 3(5z + 12) 75. 8(2a - 7) 76. 4(a + 2b - 6) 77. 5(3c - 2d + 8)
78. 8(3e - 4 + 6e) = 8(3e - 4 + 6f) 79. 10(2g - h - 3) 80. 8(5 - i + 2j) 81. 14(A + 4S + 2M + O)
82. 14 apples, 56 sandwiches, 28 muesli bars, 14 orange drinks

83. 36 + 48 + 24 = 6 (6 + 8 + 4)

Worksheet 17

Equations involving brackets:
Equations involving the 'unknown' on both sides:
Equations involving fractions:

In **Tasks 24 to 27** pupils are to solve equations of varying difficulty as brackets, 'unknowns' on both sides and fractions are introduced. The use of opposite operations and expanding skills are to be used when solving these equations.

Task 25

1. $a = 3^{1}/_{4}$ 2. $b = -^{1}/_{5}$ 3. $c = 16^{2}/_{3}$ 4. $d = 7^{1}/_{6}$ 5. $e = -3^{5}/_{6}$ 6. $f = 9^{2}/_{5}$ 7. $g = -3^{1}/_{3}$ 8. $h = 8^{1}/_{3}$
9. $i = -1^{8}/_{9}$ 10. $j = 13^{1}/_{8}$ 11. $k = -2^{3}/_{4}$ 12. $m = 5^{1}/_{7}$ 13. $n = 1^{1}/_{2}$ 14. $p = 8^{9}/_{11}$ 15. $q = 12^{5}/_{8}$ 16. $r = 17^{1}/_{2}$
17. $s = -5^{1}/_{4}$ 18. $t = 11^{5}/_{6}$ 19. $u = 11^{1}/_{3}$ 20. $v = 17^{6}/_{7}$ 21. $g = 28.31$ 22. $h = 1.36$ 23. $j = 20.67$
24. $k = 15.57$ 25. $n = 4.90$ 26. $p = 4.89$ 27. $q = -6.55$ 28. $r = 11.61$

Task 26

1. $a = 17$ 2. $b = -6$ 3. $c = -7^{1}/_{2}$ 4. $d = 2^{3}/_{7}$ 5. $e = 3^{1}/_{5}$ 6. $f = 3^{2}/_{3}$ 7. $g = -7$ 8. $h = -1^{1}/_{5}$ 9. $i = 8^{1}/_{2}$
10. $j = -4^{1}/_{4}$ 11. $k = 9^{1}/_{2}$ 12. $m = 6^{1}/_{4}$ 13. $n = 1^{5}/_{6}$ 14. $p = 7^{1}/_{3}$ 15. $q = 3^{1}/_{4}$ 16. $r = 6^{5}/_{13}$ 17. $s = 2^{7}/_{8}$
18. $t = 2^{5}/_{6}$ 19. $u = 13^{1}/_{2}$ 20. $v = -14^{1}/_{2}$

Task 27

1. $a = 9^{2}/_{3}$ 2. $b = 8^{1}/_{2}$ 3. $c = 2^{3}/_{5}$ 4. $d = -9^{1}/_{7}$ 5. $e = 6^{1}/_{6}$ 6. $f = 7^{3}/_{5}$ 7. $h = 3^{5}/_{12}$ 8. $i = -^{5}/_{8}$
9. $k = -2^{8}/_{9}$ 10. $m = -16^{3}/_{5}$ 11. $n = 25$ 12. $r = 13$ 13. $s = 26^{3}/_{4}$ 14. $v = 4^{1}/_{5}$ 15. $v = -1^{2}/_{7}$

Worksheets 18 & 19

Working with exponents:
Multiplying exponents / indices:
Dividing exponents / indices:
Two exponents / indices:

In **Task 28** pupils are introduced algebraic term involving exponents (index, indices, powers) by either expanding or simplifying expressions.

In **Task 29** pupils are introduced indices rule for multiplying exponents as outlined in the examples on the worksheet 18. Utilising this rule, pupils are to simplify algebraic terms involving indices.

In **Task 30** pupils are introduced indices rule for dividing exponents as outlined in the examples on the worksheet 19. Utilising this rule, pupils are to simplify algebraic terms involving indices.

In **Task 31** pupils are introduced indices rule for working with two exponents as outlined in the examples on the worksheet. Utilising this rule, pupils are to simplify algebraic terms involving indices.

Task 28

1. $a \times a$ 2. $b \times b \times b \times b \times b$ 3. $4 \times c \times c \times c$ 4. $3 \times e \times e \times e \times e \times e \times e$ 5. $5 \times f \times f \times f \times f$
6. $g \times g \times h \times h \times h$ 7. $-6 \times m \times m \times m \times m \times n \times n \times n \times n \times n$ 8. $^{1}/_{2} \times p \times p \times p \times p \times p \times q$
9. $0.5 \times r \times r \times r \times s \times s \times s \times s$ 10. $8 \times u \times u \times u \times v \times v \times w \times w \times w \times w \times w$ 11. a^4 12. b^5 13. $5c^4$ 14. $9d^5$
15. e^4f^2 16. $6g^2h^3$ 17. $12j^2k^3$ 18. $4m^2n^2$ 19. $a^3b^3c^4$ 20. $24d^3e^7$ 21. $6f^2g^3h^4$ 22. $6r^3s^2t^3$
23. $7.5f^4g^3h$ 24. $4r^5s^2t^2$ 25. $11.25a^3b^2c^4$ 26. $72p^4q^3r^2$

Task 29

1. a^{11} 2. b^{11} 3. c^{10} 4. d^{11} 5. e^{10} 6. $4f^5$ 7. $6g^{11}$ 8. $6h^8$ 9. $54j^{12}$ 10. $4k^{11}$ 11. $8.5m^7$ 12. $42n^{15}$
13. $10p^{13}$ 14. $36q^{11}$ 15. $6r^{10}$ 16. $24s^{11}$ 17. $12u^{13}$ 18. $45v^{13}$ 19. $12w^{11}$ 20. $32x^{13}$ 21. $12y^8$ 22. $28z^{14}$
23. $60a^{14}$ 24. $5b^{10}$ 25. $16c^{16}$ 26. $15d^{11}$ 27. $9e^{15}$ 28. 7^2f^8 29. $35g^{14}$ 30. $42h^{11}$ 31. a^5b^5
32. c^7d^3 33. e^8f^2 34. g^7h^9 35. $j^{12}k^5$ 36. r^8 37. s^8 38. v^9 39. w^{13} 40. y^{12} 41. $6m^7$ 42. $3n^{11}$
43. $12p^{11}$ 44. $5q^9$ 45. $36r^7$ 46. $20a^4b^5$ 47. $14a^6b^8$ 48. $4a^9b^7$ 49. $30a^9b^6$ 50. $5a^3b^{10}$ 51. $a^5b^4c^7$
52. $a^4b^{12}c^3$ 53. $9a^2b^5c^4$ 54. $24a^4b^2c^8$ 55. $28a^8b^3c^7$

Task 30

1. a^2 2. b^3 3. 1 4. d 5. e^{-3} 6. f^5 7. g^6 8. h^5 9. k^4 10. m^{-4} 11. $5a^2$ 12. $4a^{-3}b^7$ 13. $\frac{1}{4}c^2$
14. 1 15. $3e$ 16. $2g$ 17. $6r^4s^3$ 18. $2p^{-3}q^5$ 19. $1.5a^2b^3c^3$ 20. $^{1}/_{6}e^4f^{-2}g^5$

Task 31

1. a^{20} 2. b^{18} 3. c^{14} 4. d^{20} 5. e^{27} 6. $16f^{10}$ 7. $125g^{18}$ 8. $64h^{12}$ 9. $243k^{12}$ 10. $1000m^{15}$ 11. a^6b^{21} 12. $c^{12}d^3$ 13. $e^{35}f^{10}$ 14. $g^{28}h^{20}$ 15. $m^{35}n^{15}$ 16. $64r^{24}s^6$ 17. $36u^{10}x^{12}$ 18. $1000j^3k^{15}$ 19. $32m^{15}n^{20}$ 20. $81h^{12}j^{32}$ 21. $8s^{15}$ 22. $4b^{15}$ 23. $6d^{13}$ 24. $5h^{21}$ 25. $9a^{14}$ 26. $5d^{13}e^{24}$ 27. $9f^{10}g^{10}$ 28. $5a^{15}b^9$ 29. $144a^{16}b^8c^{14}$ 30. $125a^{18}b^3c^{15}d^{21}$

Worksheets 20 & 21

Writing and solving equations for practical problems:
Creating and using a formula to solve practical problems::

In **Task 32** pupils are to write, then solve equations for information contained within word problems.

In **Task 33** pupils are to created word problems containing information that can be represented as equations. The word problems are to be exchanged with a classmate for him / her to work out.

In **Task 34** pupils are to create a formula from information contained within a word problem, then use the formula to work out various problems.

In **Task 35** pupils are to created word problems containing information that can be represented as formula. The word problems are to be exchanged with a classmate for him / her to work out.

Task 32

1. 5x +11 = 41, 5x = 30, x = 6 years
2. 7x -62 = 43, 7x = 105, x = 15 years
3. 12x +55 = 157, 12x = 102, x = $8.50 / week
4. 10x + 72 = 162, 10x = 90, x = $9.00 / week
5. 7x + 24.35 = 150, 7x = 125.65, x = $17.95 / CD
6. 3x + 225.2 = 512, 3x = 286.8, x = 95.6km/hour
7. 6.5x + 50.5 = 96, 6.5x = 45.5, x = 7 books
8. 7x - 21 = 2hrs 23mins 30sec, 7x = 143mins 30 secs - 21 mins, 7x = 122 mins 30 secs, x = 17 mins 30 secs / lap
9. 8x + 1450 = 14590, 8x = 13140, x = $1642.50 / month
10. 25x + 156.25 = 500, 25x = 343.75, x = $13.75 / ticket

Task 34

1. m = $25 + 0.2n 2. m = 25 + 0.2 x 147, m = $54.40 3. No. of local calls = 30.8 ÷ 0.2, No. of local calls = 154
4. T = 6.5C - 10A 5. Cost of tickets = 6.5.x.7 + 10 x 3, Cost of tickets = $75.50 6. 6.5x + 30 = 88.50, 6.5x = 58.50, x = 9 children 7. C = 1.20F + 1.00C 8. a = $5.40, b = $7.80, c = $15.80 9. 6 scoops of chips
10. C = $9.50N + $6.95, 9.50N = C - $6.95, N = (C - 6.95) ÷ 9.50 11. 5 books, 11 books, 20 books

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

Algebra

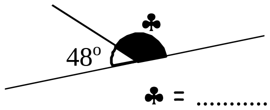
L5MA

A1 **Homework / Assessment Worksheet** **1**

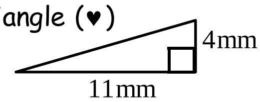
Name: **Class:** **Complete by:**

A: 10 Quick Questions

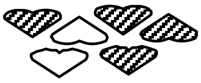
1. $56 \div 8 - {}^{-}9 =$ ....
2. List the first four multiples of 16
   ....
3. Find the missing angle (♣)



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



   ♥ = ...
5. Find 10% of 680kg
   ....
6. Round off 8.163 to 1 d.p.
   ....
7. Evaluate
   $^{2}/_{3} + {}^{4}/_{5} =$ ....
8. Convert 22:09 from 24 hr time to a.m. or p.m. time
   ....
9. What fraction is shaded?



   ....
10. $0.52 \times 4.9 + 9 =$ ....

B: Finding number patterns

Find the next three numbers in each number pattern,

1. 2, 4, 8, ...
2. 60, 30, 15, ...
3. 5, 12, 19, ...
4. 13, 10, 7, ...
5. 7, 2, -3, ...
6. 6, -12, 24, ...

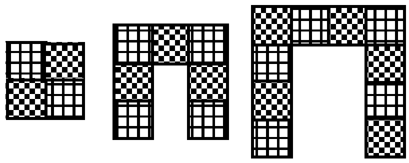
and **describe** in words how each pattern above was generated.

7. No. 1 ....
8. No. 2 ....
9. No. 3 ....
10. No. 4 ....
11. No. 5 ....
12. No. 6 ....

C: Classroom desk patterns

A teacher wishes to arrange her classroom desks, using one of the patterns below. **Draw** the next two desk patterns.

pattern 1 pattern 2 pattern 3 pattern 4 pattern 5



1. Complete this table.

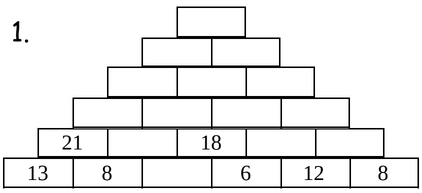
Pattern number	1	2	3	4	5	10
Number of desks in each row	2	3	4			
Total number of desks needed	4	7				

2. **Study** the numbers in the above table and see if you can work out the **relationship** between the **number of desks in each row**, with the **number of desks needed** to make each pattern. (either answer in words or as a mathematical rule)
   ....
3. If the teacher has 19 desks, what will be the length of each row, if the teacher uses the pattern above? ....
4. If the teacher has 24 desks, what will be the length of each row, if the teacher uses the pattern above and how many desks will be left over? ....
5. How many desks are needed to make the 'pattern 14' arrangement of desks? ....
6. What would be the best pattern to use, if the teacher had 34 desks (no desks to be left over)? ....

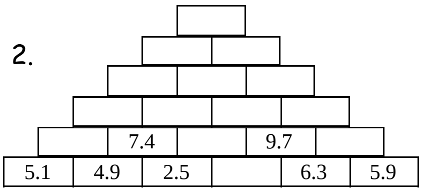
D: What is the number at the top?

Calculate the number at the top of each number pyramid.

1.



2.



AWS

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

Please sign:
Parent / Caregiver
....

L5MA

Algebra

Homework / Assessment Worksheet

A2

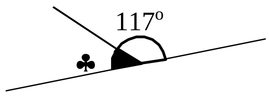
2

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

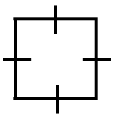
A: 10 Quick Questions

1. $9^2 \div 3 + {}^-8 =$ ....
2. List the first four multiples of 13

   ....
3. Find the missing angle (♣)



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



   ♥ = ...
5. Find 20% of 53.5 km

   ....
6. Round off 0.6349 to 2 d.p.

   ....
7. Evaluate

   $^7/_8 - {}^3/_4 =$ ....
8. Convert 19:26 from 24hr time to a.m. or p.m. time

   ....
9. What % is shaded ?

   ....
10. $1.68 \times 0.7 - 4.9 =$ ....

B: Generate the number patterns from the rules

Find the first 5 numbers in each pattern given by the word rules.

1. Start with 2, add 5 to each new number ....
2. Start with 11, subtract 6 from each number ....
3. Start with 3, double each new number ....
4. Start with 36, halve each number ....
5. Start with 2, triple each number and then subtract 5

   ....

Replace 'n' with the numbers 1 to 5 in each rule, to find the first 5 numbers of each pattern, (the first number has been done).

6. rule = 3n ⇒ 3, ...
7. rule = 4n + 3 ⇒ 7, ...
8. rule = 5n – 1 ⇒ 4, ...
9. rule = ½n + 3 ⇒ 3½, ...
10. rule = 7 + n ⇒ 8, ...

C: Word problems

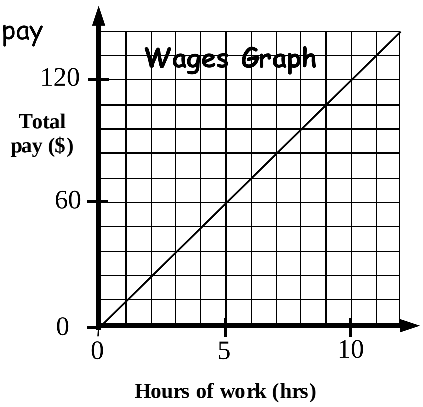
Paula works for a shop and is paid $6.40 per hour, **plus** $1.30 per day travelling money. Calculate her daily pay if she worked ...

1. 5 hrs .... 2. 6 hrs ....
3. 7 hrs .... 4. 8 hrs ....
5. 9 hrs .... 6. 10 hrs ....

Young children are to be given medicine (mls) using the following rule. *Half their age, plus 2mL.* Calculate the dose each child would get if the ages were ...

7. 6 yrs .... 8. 7 yrs ....
9. 10 yrs .... 10. 13 yrs ....
11. How old is a child who is given 6.5mL of medicine? ....
12. How old is a child who is given 10.5mL of medicine? ....

The graph opposite shows the total pay for the hours worked. Use the graph to work out the pay for the following hours of work.



13. 4 hrs ....
14. 5 hrs ....
15. 6 hrs ....
16. 7 hrs ....

Use the pattern above to work out the pay you would earn in 25 hours.

17. ....

How many hours did Karen work if she was paid ...

18. $48.00 .... 19. $96.00 ....
20. $78.00 .... 21. $126.00 ....
22. $81.00 .... 23. $147.00 ....

D: Find out about Pascal's number triangle

The first four rows have been listed. How is the number pattern created ?

1
1 1
1 2 1
1 3 3 1

1. ....

   ....
2. What are the next 3 rows of numbers?

   ....

   ....

   ....

Comments: ....

....

....

Please sign:
Parent / Caregiver

AWS

Algebra 3

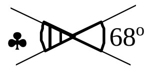
A3

Homework / Assessment Worksheet

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

A: 10 Quick Questions

1. $5^2 \times 7 + {}^{-}17 =$ ....
2. List the factors of 44 ....
3. Find the missing angle (♣)

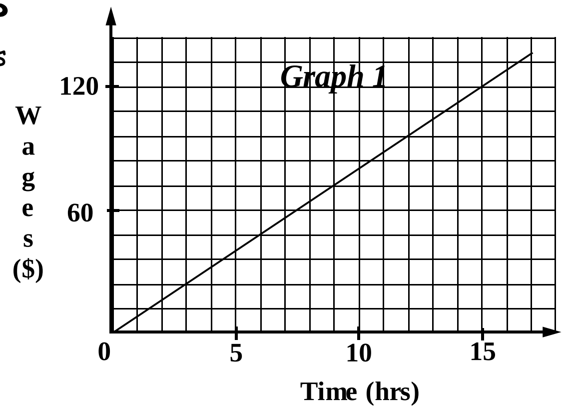


♣ = ...

4. Divide $48.00 in a ratio of 1 : 7 ....
5. How many grams in 3.25kg ? ....
6. Round off 31.964 to 1 d.p. ....
7. $60.00 - 4 × $7.60 = ...
8. Convert 0.684km to metres ....
9. How many in a baker's dozen? ....
10. 20.4 ÷ 0.4 + 6.7 = ...

B: Wages $ / hr ?

Graph 1 shows the wages ($) that Paul could earn over a given period of time (hrs). How many hours would Paul have to work to earn ...



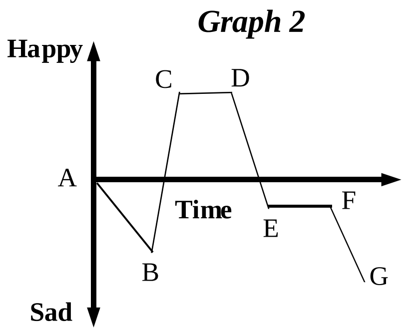
1. $16.00 ....
2. $48.00 ....
3. $72.00 ....
4. $96.00 ....
5. $112.00 ....

How much would Paul earn if he worked for the following hours ?

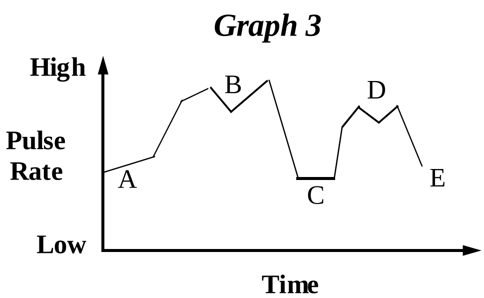
6. 5 hours ....
7. 11 hours ....
8. 14.5 hours ....
9. 20.5 hours ....
10. 7.25 hours ....
11. 9.75 hours ....
12. Can you **describe in words** or come up with a **rule** that could be used to work out how much Paul would earn, no matter how many hours he worked ? ....

C: What do the graphs mean ?

Graph 2 shows the mood of Hoani as he was watching a movie on T.V. Study the graph, then describe the changes in Hoani's mood during the movie, between the points listed below,



1. A to B ....
2. B to C..
3. C to D ....
4. D to G ....
5. Did Hoani enjoy the movie ? Give a reason why. ....



Graph 3 shows the pulse rate of Marie, who is playing soccer.

6. What has happened to Marie's pulse rate from A to B? ....
7. Why do you think the pulse rate changed between A and B? ....
8. If C is half time, how can you tell ? ....
9. Did Marie run harder in the 1st or 2nd half ? ....
10. If Marie did 10 sprints, walking between each one, show on this graph what you think would happen to her pulse rate.

Comments: ....

Please sign: Parent / Caregiver ....

L5MA

Algebra

A4

Homework / Assessment Worksheet

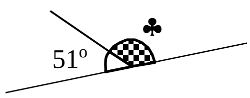
4

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

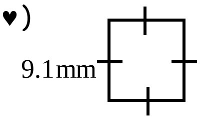
A: 10 Quick Questions

1. $12^2 \div 24 + {}^-7 =$ ....
2. List the first four multiples of 19

   ....
3. Find the missing angle (♣)



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



   = ...
5. Find 0.25 of 132.4km

   ....
6. Round off 2.0342 to 3 d.p.

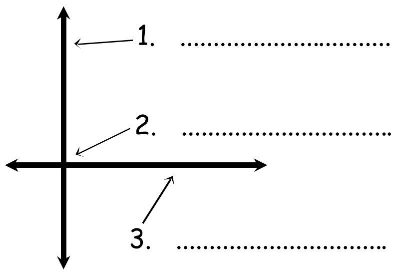
   ....
7. Evaluate

   $^5/_6 - {}^3/_5 =$ ....
8. Convert 8.042km to metres ....
9. What % is shaded?

   ....
10. $2.14 \times 0.6 - 5.7 =$ ....

B: Label the diagram

Use the words below to label this diagram of a set of axes.



x - axis	y - axis	origin

C: Co-ordinates

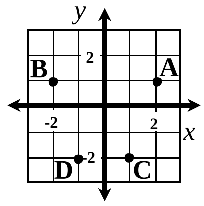
The co-ordinates of a point are a pair of numbers. Written as (x, y), they represent an ordered pair. Study the diagram, then write the ordered pairs for,

A = (.......,........)

B = (.......,........)

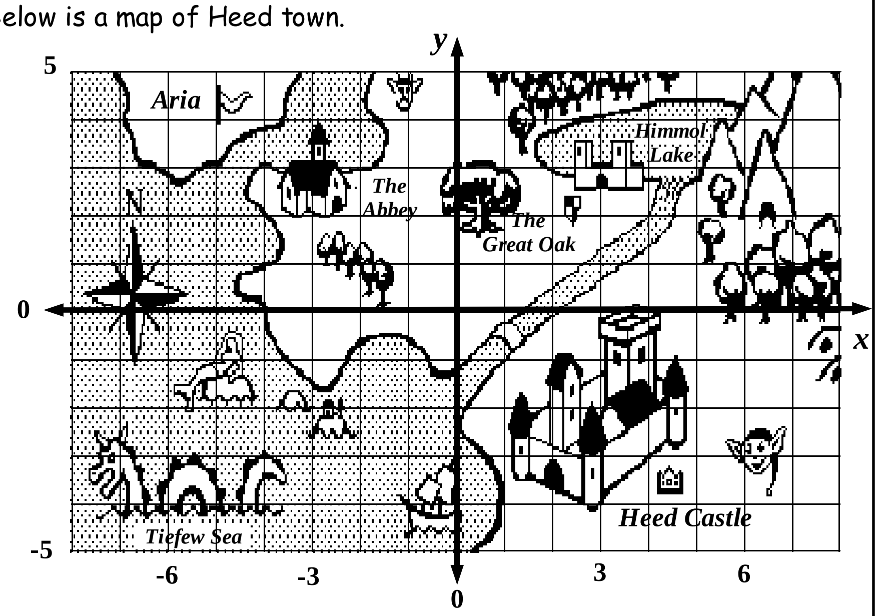
C = (.......,........)

D = (.......,........)



D: Where is that point?

Below is a map of Heed town.



Mark on the diagram the following points ...

1. (5, 1) Label it A
2. (6, -2) Label it B
3. (-5, 3) Label it C
4. (7,-4) Label it D
5. (-1,-3) Label it E
6. (-3, 1) Label it F

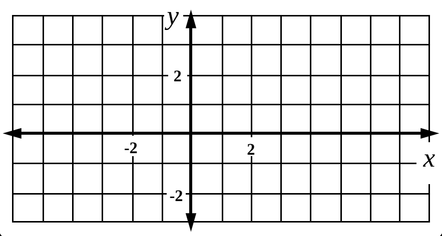
What are the co-ordinates for the following points on the map?

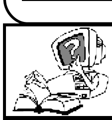
7. The castle by Himmol Lake. (.......,........)
8. The roof of the Abbey. (.......,........)
9. The sea monster's head. (.......,........)
10. Main door in Heed Castle. (.......,........)
11. The mermaid on a rock. (.......,........)
12. The biggest single tree. (.......,........)
13. The sailing ship (.......,........)
14. The bridge over the river (.......,........)

E: Plotting points

A = (-3,3), B = (1,3), C = (6,-2), D = (-5,-2) & E = (-3,3)

1. **Plot**, then **join** the points A, B, C, D and E with straight lines, in that order.
2. What shape have you drawn? ....





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AWS

L5MA

Algebra

A4

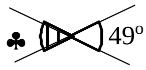
Homework / Assessment Worksheet

5

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

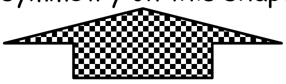
A: Quick Questions

1. Find 20% of \$75.00 ....
2. 12 × \$0.87 = ...
3. Find the missing angle (♣)



♣ = ...

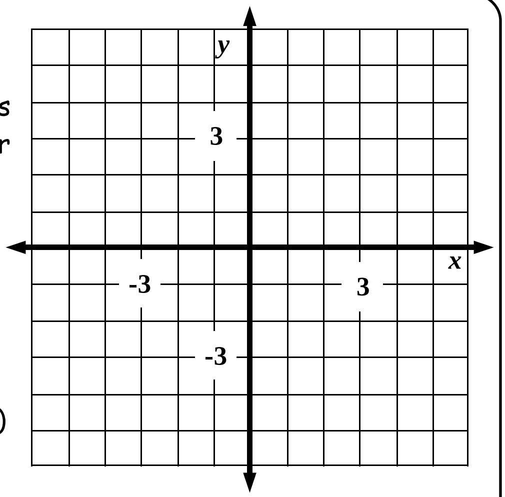
4. Convert 45% to a fraction (simplify) ....
5. Write 860000 in standard form ....
6. Round off 5930 to 2 s.f. ....
7. Draw in the lines of symmetry on this shape



8. Find the next 3 numbers 5, 11, 17, ..., ..., ...
9. Express 15 as a % of 60 ....
10. Solve $7x + 9 = 23$ x = ...

B: Plotting integer points

Plot, then **join** these (x,y) points with **straight lines**, in the order given. Label each line with the letter given.



1. (-3,-2),(-1,0),(1,2),(3,4) Label A
2. (-2,4),(0,3),(2,2),(4,1) Label B
3. (-3,-3),(-1,-3),(1,-3),(3,-3) Label C
4.

x	-2	0	2	4
y	-2	0	2	4

Label D

5.

x	5	5	5	5
y	4	2	0	-2

Label E

6. Which straight line is vertical ? ....
7. Which straight line is horizontal ? ....
8. Try to find the rule for the line in question 1, (write it in the form $y = 3x + 2$) y = ...

C: Completing sets of ordered pairs

Use each rule given to find the y co-ordinate of each ordered pair. The first ordered pair for each rule has been done for you.

1. $y = 4x$
(1,4), (2,   ), (3,   ), (4,   )
2. $y = x + 7$
(1,8), (2,   ), (3,   ), (4,   )
3. $y = 2x - 3$
(1,-1), (2,   ), (3,   ), (4,   )
4. $y = \frac{1}{2}x + 3$
(2,4), (4,   ), (6,   ), (8,   )
5. $y = \frac{1}{4}x - 5$
(4,-4), (8,   ), (12,   ), (16,   )
6. $y = \frac{1}{4}x + 4$
(4,5), (8,   ), (12,   ), (16,   )

D: Word problem

The *"Phone Home"* telephone company charges (\$) toll call users, using the following formula,

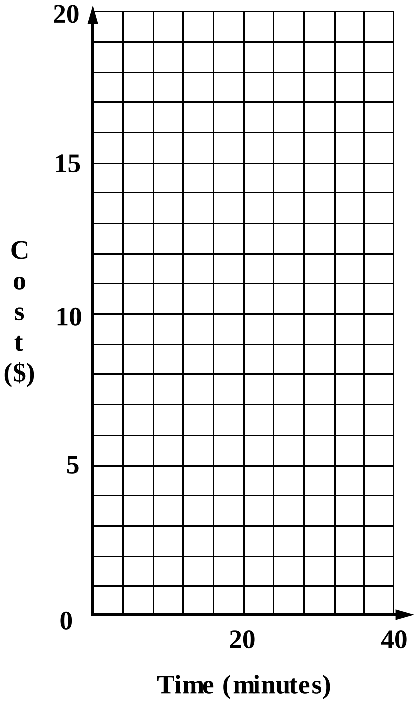
Cost (\$) = \$2.00 + \$0.50 × T

where \$2.00 is a charge for using the operator and T = length of toll call (min).

1. Use the formula above to complete the table

Time (min)	0	8	20	28	36
Cost (\$)					

2. Graph the points and join with a straight line.
3. Use the graph to find the cost of telephone calls lasting, 4 min .... & 24 min ....
4. Use the graph to find how long calls were if they cost ...
\$8.00 ....
\$14.00 ....
\$18.00 ....



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AWS

L5MA

Algebra

A5 / A10

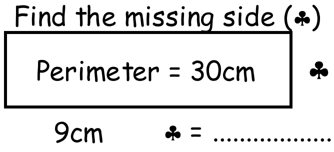
Homework / Assessment Worksheet

6

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

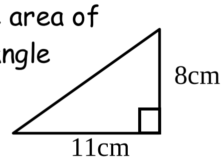
A: 10 Quick Questions

1. Find 60% of $75 ....
2. List the factors of 23 ....
3. Find the missing side (♣)



♣ = ...

4. Find the area of this triangle (♥)



A = ½bh

♥ = ...

5. Convert 0.64 to a fraction (simplify) ....
6. 42 - 5 × 9 = ...
7. ⁻7 + 9 – ⁻4 = ...
8. How many sides does a nonagon have? ....
9. 5795m = ...km
10. 0.51 × 4.2 + 6.7 = ...

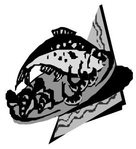
B: Substitution

Given that ***a* = 3, *b* = 6, *c* = ⁻2** and ***d* = ⁻5** find the value of each expression using substitution (use BEDMAS).

1. 2a + 5 = ...
2. 5b – 4 = ...
3. 3c + 8= ....
4. 2d + 7 = ...
5. 12 – 5a = ...
6. ab = ...
7. bc = ...
8. cd = ...
9. d^2 = ...
10. a^2c = ...
11. ab^2 = ...
12. $(ab)^2$ = ...
13. abcd = ...
14. a + b – c = ...
15. 3b – 4d = ...
16. c(5a + b) = ...

C: Using formulae / substitution

Answer the following by substituting into the given formulae.

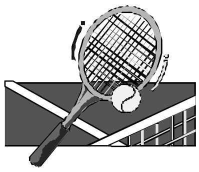


The Jones family are going to have fish & chips for dinner. The **Cost ($) = 1.15F + 0.90C**, where F = numbers of fish bought and C = number of scoops of chips.

1. Find the cost of their dinner if they buy 7 fish and 3 scoops. **Cost =** ....

The cost of C.D.'s and tapes is worked out using the formula **Cost ($) = 27CD + 18T**,

2. If 8 C.D.s and 11 tapes are purchased, what is the cost? **Cost =** ....

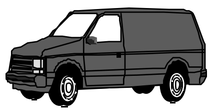


During the tennis season points for games played were worked out using the formula

Total Points = 5W + 2D

where W = games won, D = games drawn.

3. Find the points scored by Jimmy who won 12, drew 3 and lost 5 games during the season. **Total Points =** ....



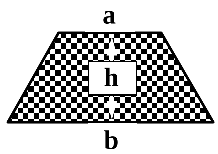
A rental van is rented out using the formula

Cost of Rental ($) = 60D + 0.50K

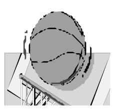
where D = number of days, K = kilometres driven

4. If the van travels 720 km in 1 week, what has it cost to rent ? (Petrol not included) **Cost =** ....
5. If the van rental cost $960 and it travelled 840 km, how long was it rented for ? **Days Rented =** ....

A wooden deck is built in the shape of a trapezium. The area of a trapezium is worked out using the formula **Area = ½(a + b)h**, where a & b = lengths of the parallel sides and h = gap between the sides.

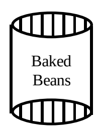


6. If the two parallel sides are 9m and 13m long and distance between them is 6.5m, what is the area of the deck? **Deck Area =** ....



7. The surface area (S.A.) of a ball or sphere is worked out using the formula **S.A. = 4πr²**. If the ball has a radius (r) = 7 cm and π = 3.1, find **S.A.** **Surface Area =** ....

8. A can of 'Baked Beans' is 10cm high (h), with a radius (r) of 3.8cm, and a can of 'Tuna Fish' is 7cm high with a radius of 6cm. Using the formula **V = πr²h**, find the volume (V) of each tin, using π = 3.1 .(answers 2 d.p.) **Baked Beans V =** .... **Tuna Fish V =** ....



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AWS

L5MA

Algebra

A7

7

Homework / Assessment Worksheet

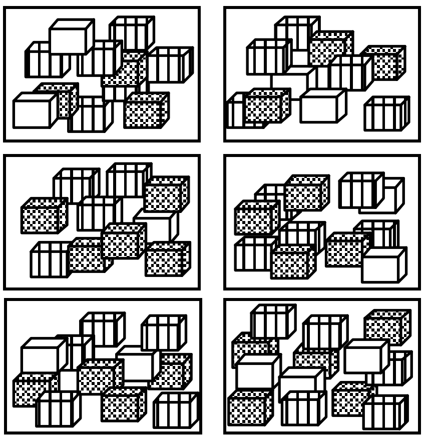
Name: **Class:** **Complete by:**

A: 10 Quick Questions

1. $72 \div 6 + {}^-8 =$ ....
2. Find $^2/_3$ of \$36 ....
3. What do the interior angles of a 6 sided figure add up to? ....
4. Write 5.2×10^4 as an ordinary number ....
5. Convert 0.82 to a fraction (simplify) ....
6. $52 - 9 \times 6 =$ ....
7. ${}^-8 + 5 - {}^-6 =$ ....
8. How many years in a century? ....
9. Convert 9420mm to metres ....
10. Round off 3.528 to 2 s.f. ....

B: How many in each ?

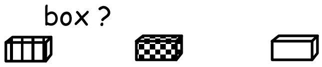
These six boxes contain three different coloured Mega Bloks. Each box should have the **same** number of **each colour**.



1. How many are there of each colour altogether ?

....

2. How many of each colour should there be in each box ?



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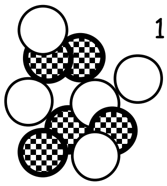
C: Collecting 'like' terms

Add or subtract these 'like' terms.



1. Mary had 18 red and 25 blue marbles. Peter had 31 red and 17 blue marbles. How many of each colour do they have altogether ?

   .... red + ... blue

2. Peter had 23 records and 18 tapes. He went to a record shop and traded in 11 records for 9 new tapes. How many of each does Peter have now ?

   .... records + ...tapes

D: Simplify

Simplify by collecting like terms.

1. $5k + 12k =$ ....
2. $19w - 14w =$ ....
3. $9r + 5t =$ ....
4. $5p - 8p =$ ....
5. $4x^2 + 7x =$ ....
6. $12j + j =$ ....
7. $7f - 10f =$ ....
8. $6h + 9h - 11h =$ ....
9. $14f - 5f - f =$ ....
10. $13g - 7g + 4g =$ ....
11. $4a + 9b - 5b =$ ....
12. $3c - 6d + 5d =$ ....
13. $3g + 4e - 7f =$ ....
14. $8k + 5k - 4g =$ ....
15. $3h + 6h - 7h =$ ....
16. $8k - 14k + 5k =$ ....
17. $15d + 3g + 6d =$ ....
18. $4y + 6x + 5y + 7x =$

    ....
19. $15r - 9r + 7s + 4s =$

    ....
20. $7x^2 + 4x + 2x^2 - 6x =$

    ....
21. $8h - 7g + 3f + 8 =$

    ....
22. $5h - 8g + 5h + 2g =$

    ....
23. $7x - 6x + 4y + 6y =$

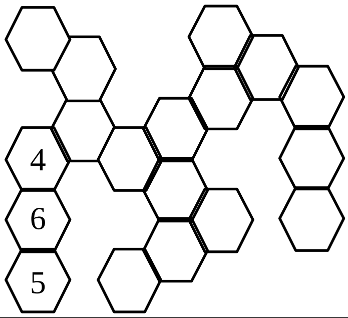
    ....
24. $12r + 6s - 9s + 3r =$

    ....

F: Number Puzzle

Place the numbers in the grid below.

48, 54, 59, 98, 315, 404, ~~465~~, 530, 593, 1549, 8134.



E: Simplify

Collect the like terms by adding or subtracting.

1. $2ab + 5ab + 9cd + 3cd =$

   ....
2. $8xy + 5x + 6y + xy =$

   ....
3. $8xy + 6y - 4y - 10xy =$

   ....
4. $15x^2 - 8x - 5x^2 + 6x =$

   ....
5. $12x^2 + 3x + 7xy + y =$

   ....
6. $13x - 7x + 5xy + xy =$

   ....
7. $7x^2 + 6x^2 - 4y + 9y =$

   ....
8. $8x - 4x + 7xy - 3y^2 =$

   ....

Comments: ....

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AWS

L5MA

Algebra

A6 / A10

Homework / Assessment Worksheet

8

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

A: 10 Quick Questions

1. $63 \div 7 + {}^-8$ = ...
2. Find $^2/_5$ of $40 ....
3. Find the next 3 numbers in the pattern 11, 7, 3, $^-1$, ...
4. Write 3.6×10^{-2} as an ordinary number ....
5. Convert 45% to a fraction (simplify) ....
6. $45 - 7 \times 8$ = ...
7. ${}^-8 + 4 - {}^-6$ = ...
8. How many years in a decade? ....
9. Convert 6256mL to litres ....
10. Round off 0.619 to 2 d.p. ....

B: Algebra expressions

Using ***x*** to represent the number, **write expressions** for the following.

Example: the number plus three would be written as $x + 3$.

1. eight plus the number ....
2. the number minus ten ....
3. twice the number ....
4. the number times five plus seven ....
5. fourteen minus the number ....
6. the sum of the number and sixteen ....
7. the product of the number and sixteen ....
8. the product of the number and six, plus eleven ....

C: Algebra equations

Algebra expressions become **equations** if there is an **equals sign**.

Using ***x*** to represent the number, **write equations** for the following,

Example: the number added to 15 equals 21, written as $x + 15 = 21$

(DO NOT NEED TO SOLVE)

1. the number added to 6 equals 17 ....
2. the number minus 13 equals 8 ....
3. twice the number plus 5 equals 18 ....
4. half the number equals 13 ....
5. product of the number and 9 equals 54 ....

D: Solving equations

Solve these equations. The answers will all be whole numbers.

1. $5x = 20$ x = ...
2. $6y = 24$ y = ...
3. $7z = 35$ z = ...
4. $\frac{1}{2}b = 14$ b = ...
5. $x + 9 = 23$ x = ...
6. $x - 17 = 31$ x = ...
7. $2y + 3 = 15$ y = ...
8. $3t - 9 = 27$ t = ...
9. $5x + 17 = 42$ x = ...
10. $\frac{1}{2}x + 6 = 24$ x = ...

E: Harder equations

The answers for these equations withnot be whole numbers.

1. $9x = 19$ **(Show working)** .... x = ...
2. $3z - 7 = 28$ .... z = ...
3. $2g + 8 = 31$ .... g = ...
4. $6y + 12 = 41$ .... y = ...
5. $5w - 41 = 16$ .... w = ...

F: Word problems

Write algebra equations for each question, then **solve**.

1. Mr. West had $100. He took 5 people to lunch and they all had the same meal. After the meal he had $13.50 left . What did each meal cost? Let **p** = cost of one meal.

Equation: .... **p** + ... = ... **Cost of Meal =** ....

2. Rebecca saved most of her weekly pocket money (**m**) for 8 weeks. At the end of 8 weeks she had $50.00 left, having spent $10.00 on a book. How much pocket money did she receive each week?

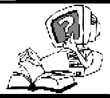
Equation: .... **m** –........ = ... **Pocket Money =** ....

3. Rangi gave half his money (**m**) to Johnny. Johnny had $38 and now has $60. How much money did Rangi have?

Equation: .... **m** + ... = ... **Rangi's Money =** ....

4. James gave a quarter of his money (**m**) to Abbey. Abbey had $14 and now has $26. How much money did James have?

Equation: .... **m** + ... = ... **James's Money** ....



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AWS

L5MA

Algebra

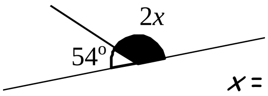
Homework / Assessment Worksheet

A9 | 9

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

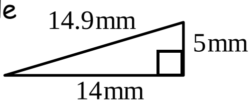
A: 10 Quick Questions

1. $36 \div 6 - {}^{-}9 =$ ....
2. List the first four multiples of 2.5 ....
3. Find the missing angle x



$x =$ ....

4. Find the perimeter of this triangle



....

5. Find 90% of 270kg ....
6. Round off 3.128 to 2 d.p. ....
7. How many sides does a pentagon have? ....
8. Convert 17:47 from 24 hr time to a.m. or p.m. time ....
9. Divide \$49 in a ratio of 2 : 5 ....
10. $5.4 \times 0.14 + 9 =$ ....

B: Word problems

1. 6 people each have a lunch of 2 apples (A), 4 sandwiches (S) and a drink of orange juice (O). This could be written as an algebra expression $6(2A + 4S + O)$. Use this expression to work out the combined lunch order. .... A + ... S + ... O
2. A school bought 42 triangle, 28 square and 56 circle shapes, which are to be divided into 7 equal groups. Fill in the spaces below to show how this could be done, using algebra.

.... △ + ... ▯ + ... ◯ = 7 (....... △ + ... ▯ + ... ◯)

C: Expanding brackets

Choose from the list below, to help expand these brackets.

1. $4(x + 6)$ = ...
2. $3(x - 5)$ = ...
3. $8(x + 4)$ = ...
4. $4(x - 6)$ = ...
5. $6(3x + 5)$ = ...
6. $7(5x - 8)$ = ...
7. $8(2x + 7)$ = ...
8. $x(x + 6)$ = ...
9. $x(4x + 5)$ = ...
10. $2x(x - 8)$ = ...

Answers (not in order)
$16x + 56$, $8x + 32$, $x^2 + 6x$, $18x + 30$, $3x - 15$, $4x^2 + 5x$, $4x + 24$, $4x - 24$, $35x - 56$, $2x^2 - 16x$

D: Factorising

Use the list below to factorise (insert brackets) these expressions.

1. $3x + 12$ = ...
2. $6x + 24$ = ...
3. $9x - 15$ = ...
4. $21x + 35$ = ...
5. $5x^2 + 15x$ = ...
6. $6x - 30$ = ...
7. $21x^2 - 6x$ = ...
8. $36x - 48$ = ...
9. $5x^2 + 30$ = ...
10. $8x^2 - 40x$ = ...

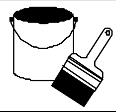
Answers (not in order)
$8x(x - 5)$, $3(3x - 5)$, $7(3x + 5)$, $3(x + 4)$, $6(x + 4)$, $6(x - 5)$, $12(3x - 4)$, $5x(x + 3)$, $3x(7x - 2)$, $5(x^2 + 6)$

E: Expand and simplify

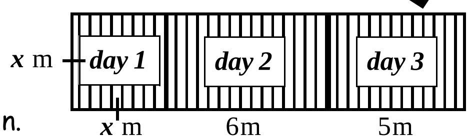
Expand, then simplify by collecting the 'like' terms

1. $2(x + 7) + 3(x + 6)$
 = ...
 = ...
2. $5(a + 3) + 7(a + 4)$
 = ...
 = ...
3. $3(k + 7) + 2(k - 5)$
 = ...
 = ...
4. $5(h - 5) + 7(h + 8)$
 = ...
 = ...
5. $7(x - 4) + 4(x - 9)$
 = ...
 = ...

F: Word problems



The diagram shows a wall that Rangi is painting. On *Day 1* he painted a square area, with sides x metres long. On *Day 2* he painted a 6m section and on *Day 3* a 5m section.



1. Write an expression for the area of the wall painted on each day. ***Day 1*** .... ***Day 2*** .... ***Day 3*** ....
2. Write an expression for the ***Total Area*** to be painted.
 Total Area = ...
3. Factorise your expression for the Total Area.
 .... (............... + ...)
4. If $x = 2.4$ metres, what area of the wall did Rangi paint each day? ***Day 1*** .... ***Day 2*** .... ***Day 3*** ....
5. What is the total area of the wall? ....

Comments: ....
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AWS

Algebra

L5MA

A8

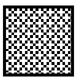
Homework / Assessment Worksheet

10

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

A: 10 Quick Questions

1. Find 40% of $85.00 ....
2. 14 × $0.93 = ...
3. What is the perimeter of a square with an area of $49m^2$? ....
4. Convert 68% to a fraction (simplify) ....
5. Write 52000 in standard form ....
6. Round off 25460 to 2 s.f. ....
7. Draw in all lines of symmetry on this shape



8. Find the next 3 numbers -6, 0, 6, ..., ..., ...
9. Express 21 as a % of 42 ....
10. Divide $36 in a ratio of 5 : 1 : 3 ....

B: Indices / Exponents / Powers ?

Indices (Index), exponents, or powers all mean the same and is the name given to the small numbers written next to other numbers or letters. *Example:* ***For $9x^3$, the 3 is the index / exponent / power.*** Fill in the gaps in the table below as you convert from index form to expanded form, or from expanded form to index form.

Expanded Form	Index Form	Expanded Form	Index Form
$k \times k \times k \times k \times k$	1.	$5 \times d \times d \times s \times s \times s$	6.
$m \times m \times m \times m \times m \times m$	2.	7.	$6hk^5$
3.	g^4	$3j \times 7j$	8.
$b \times b \times b \times b \times b \times b \times b \times b \times b \times b$	4.	$5 \times e \times e \times 4 \times h \times h \times h \times h$	9.
5.	d^4b^3	$\frac{1}{2} \times b \times 10 \times c \times c \times c \times c$	10.

C: Multiplying

Simplify, using the index rule for multiplication, (add indices).

1. $d^4 \times d^2$ = ...
2. $b^7 \times b^6$ = ...
3. $g^4 \times g$ = ...
4. $y^3 \times y^7$ = ...
5. $c^4 \times c^6$ = ...
6. $k^9 \times k^3$ = ...
7. $5d \times d^3$ = ...
8. $e^3 \times 4e^4$ = ...
9. $5p^4 \times p^2$ = ...
10. $3g \times 7g^5$ = ...
11. $5h^6 \times 3h^7$ = ...
12. $9k^2 \times 4k^5$ = ...
13. $u^3v^7 \times u^4v^2$ = ...
14. $a^5b^3 \times a^4b$ = ...
15. $3v^4u^7 \times 5vu^8$ = ...
16. $8s^3r^5 \times 3s^6r^3$ = ...
17. $5y^4v^7 \times 4y^6v^5$ = ...

D: Dividing

Simplify, using the index rule for division, (subtract indices).

1. $\dfrac{x \times x \times x \times x \times x \times x \times x}{x \times x \times x \times x \times x}$ = ...
2. $\dfrac{y \times y \times y \times y \times y \times y}{y \times y \times y \times y \times y}$ = ...
3. $\dfrac{25x}{5}$ = ...
4. $\dfrac{16d}{16d}$ = ...
5. $\dfrac{21s^3}{7s}$ = ...
6. $\dfrac{15r^6}{5r^3}$ = ...
7. $\dfrac{15r^9}{30r^4}$ = ...
8. $\dfrac{28w^8u^6}{7w^8u^2}$ = ...
9. $\dfrac{5s^2k^6}{15s^5k^4}$ = ...
10. $\dfrac{48a^{11}b^3c^6}{8a^5b^8c}$ = ...

E: Exponents

Simplify,

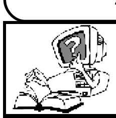
1. $(x^6)^2$ = ...
2. $(3x^4)^2$ = ...
3. $(5x^8)^3$ = ...
4. $(3a^2b^6)^4$ = ...
5. $3a(a^2)^4$ = ...

F: Mixed problems

Match each question with the simplified answers below.

1. $(2x^5)^2$ = ...
2. $(4x^2)^3$ = ...
3. $(5x^6)^3$ = ...
4. $7x^5 \times 6x^4$ = ...
5. $3x^4 \times 7x^9$ = ...
6. $\dfrac{42x^8}{7x^5}$ = ...
7. $30x^9 \div 5x^4$ = ...
8. $8x^7 \div 16x$ = ...
9. $4(3x^5)^2$ = ...
10. $2(6x^3)^2$ = ...
11. $6x(2x^2)^3$ = ...
12. $5x(3x^4)^3$ = ...

Answers (not in order)
$135x^{13}$, $6x^5$, $42x^9$, $72x^6$, $4x^{10}$, $36x^{10}$, $48x^7$, $6x^3$, $\frac{1}{2}x^6$, $64x^6$, $125x^{18}$, $21x^{13}$



Comments: ....
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AWS

Algebra

L5MA

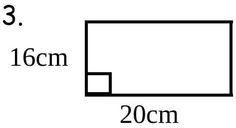
A6 / A10

Homework / Assessment Worksheet

11

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

A: 10 Quick Questions

1. 72 ÷ 8 + ⁻8 = ...
2. Find $^3/_5$ of $40 ....
3. 

Find the area ....
4. Find the missing side of a rectangle if the base is 15cm and the area 60cm^2 ....
5. Convert 6% to a fraction (simplify) ....
6. 54 - 7 × 8 = ...
7. ⁻5 + 4 – ⁻8 = ...
8. How many years in ten decades? ....
9. Convert 720cm to metres ....
10. Round off 6.859 to 1 d.p. ....

B: Equations with brackets

Solve these equations, and **show** your **working**.

1. $3(x + 4) = 36$ ....
2. $5(x - 4) = 85$ ....
3. $4(2x + 3) = 39$ ....
4. $5(2x - 6) = 33$ ....
5. $6(x + 8) = 11$ ....

C: Unknowns both sides

Solve these equations, and **show** your **working**.

1. $7x + 9 = 2x + 20$ ....
2. $8x + 12 = 3x + 44$ ....
3. $2x + 19 = 9x + 6$ ....
4. $8x - 12 = 5x + 25$ ....
5. $5x + 7 = 9x - 24$ ....

D: Equations involving fractions

Solve these equations and **show** your **working**.

1. $\dfrac{x + 8}{5} = 5$
2. $\dfrac{x - 7}{3} = 9$

....

3. $\dfrac{2x + 7}{6} = 5$
4. $\dfrac{4x - 3}{7} = 9$

....

5. $\dfrac{2(x + 7)}{3} = 14$

....

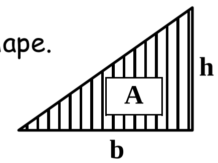
E: Rearranging formulae

Change the subject of each formula by rearranging these equations.

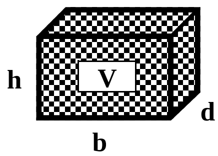
1. If $A = bh$, what does b = ... ?
2. If $A = \frac{1}{2}bh$, what does h = ... ?
3. If $A = \frac{1}{2}(a + b)h$, what does a = ... ?
4. If $A = \pi r^2$, what does r = ... ?
5. If $p = \dfrac{a + b}{c}$, what does b = ... ?

F: Word problems

1. Part of a fence is a right-angled triangular shape. Rearrange the formula. ***Area = ½ base × height*** (A = ½bh) so that h = ...



2. The area of this fence is 7.6m^2, If b =9.5m, what is the height (h) of the fence? ....
3. Barry has to design a rectangular box. Rearrange the formula (V = bhd) ***Volume = base × height × depth*** so that d = ...



4. The volume of a box is 120cm^3. If b = 5cm and h = 6cm, what is the depth (d) of this box? ....

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

Please sign:
Parent / Caregiver
....

AWS

Homework / Assessment Worksheet
Answers

Worksheet 1

A:

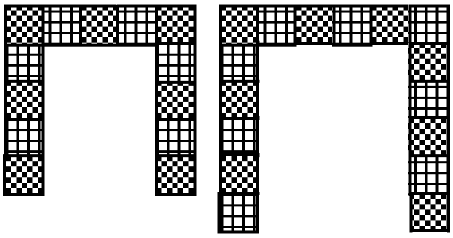
1. 16 2. 16, 32, 48, 64 3. 42^o 4. $22mm^2$ 5. 68kg 6. 8.2 7. $1^7/_{15}$ 8. 10.09 p.m. 9. $^4/_6$ or $^2/_3$
10. 11.548

B:

1. 16, 32, 64 2. 7.5, 3.75, 1.875 3. 26, 33, 40 4. 4, 1, -2 5. -8, -13, -18 6. -48, 96, -192
7. multiply each new number by 2 8. divide each new number by 2 9. add 7 to each new number
10. subtract 3 from each new number 11. subtract 5 from each new number
12. multiply each new number by -2

C:

pattern 4 pattern 5



1.

Pattern number	1	2	3	4	5	10
Number of desks in each row	2	3	4	5	6	11
Total number of desks needed	4	7	10	13	16	31

2. 3 x number of desks in each row subtract 2 or 3x – 2
3. 7 desks 4. 8 desks & 2 left over
5. 43 desks 6. pattern 11

D:

301
153 148
79 74 74
41 38 36 38
21 20 18 18 20
13 8 12 6 12 8

126.0
59.6 66.4
30.7 28.9 37.5
17.4 13.3 15.6 21.9
10.0 7.4 5.9 9.7 12.2
5.1 4.9 2.5 3.4 6.3 5.9

Worksheet 2

A:

1. 19 2. 13, 26, 39, 52 3. 63^o 4. $42.25mm^2$ 5. 10.7km 6. 0.63 7. $^1/_8$ 8. 7:26 p.m. 9. 50·%
10. -3.724

B:

1. 2, 7, 12, 17, 22 2. 11, 5, -1, -7, -13 3. 3, 6, 12, 24, 48 4. 36, 18, 9, 4.5, 2.25 5. 2, 1, -2, -11, -38
6. 3, 6, 9, 12, 15 7. 7, 11, 15, 19, 23 8. 4, 9, 14, 19, 24 9. $3^1/_2$, 4, $4^1/_2$, 5, $5^1/_2$ 10. 8, 9, 10, 11, 12

C:

1. \$33.30 2. \$39.70 3. \$46.10 4. \$52.50 5. \$58.90 6. \$65.30 7. 5mL 8. 5.5mL 9. 7mL
10. 8.5mL 11. 9yrs 12. 17yrs 13. \$48 14. \$60 15. \$72 16. \$84 17. \$300 18. 4hrs
19. 8hrs 20. 6.5hrs 21. 10.5hrs 22. 6.75hrs 23. 12.25hrs

D:

1. add the two numbers above, write the answer below, with 1 being the first and last number in each row
2.

1
1 1
1 2 1
1 3 3 1
1 4 6 4 1
1 5 10 10 5 1
1 6 15 20 15 6 1

Worksheet 3

A:

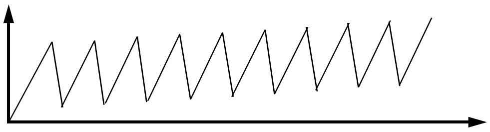
1. 158 2. 1, 2, 4, 11, 22, 44 3. 68^o 4. $6:$42 5. 3250g 6. 32.0 7. $29.60 8. 684m
9. 13 10. 57.7

B:

1. 2hrs 2. 6hrs 3. 9hrs 4. 12hrs 5. 14hrs 6. $40 7. $88 8. $116 9. $164 10. $58
11. $78 12. Total money earned (M) = 8 times the number of hours worked (H), M = 8H

C:

1. starts out neither sad nor happy then becomes sadder 2. starts sad then becomes happier 3. stayed happy 4. starts happy, becomes sad and then becomes very sad 5. Hoani may not have enjoyed the movie as he was more sad at the end of the movie than at the start 6. pulse rate went up then down slightly
7. initially running around alot, then slowed down 8. pulse rate goes down, then stayed the same for a period of time 9. first half because her pulse rate was higher
10.



Worksheet 4

A:

1. -1 2. 19, 38, 57, 76 3. 129^o 4. 36.4mm 5. 33.1km 6. 2.034 7. $^{5}/_{6} - ^{3}/_{5} = ^{7}/_{30}$ 8. 8042m
9. 60% 10. -4.416

B:

1. y - axis 2. origin 3. x - axis

C:

A = (2,1), B = (-2, 1), C = (1, -2), D = (-1, -2)

D:

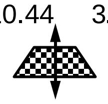
1 to 6 check graph 7. (3, 3) 8. (-3, 3) 9. (-7, -3) 10. (2, -3) 11. (-5, -1) 12. (½, 2) 13. (-½, -4)
14. (1, -½)

E:

1. check graph 2. trapezium

Worksheet 5

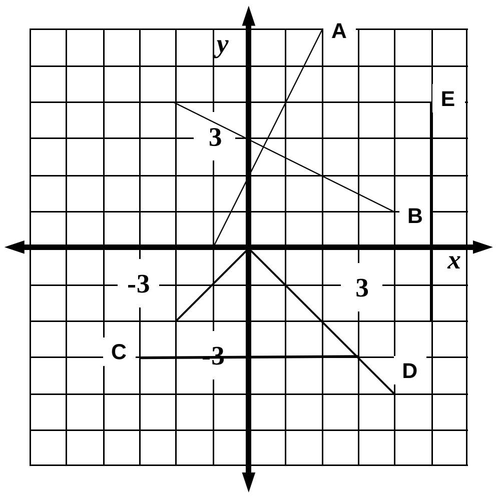
A:

1. $15 2. $10.44 3. 49^o 4. $^{45}/_{100} = ^{9}/_{20}$ 5. 8.6×10^5
6. 5900 7.  8. 23, 29, 35 9. 25% 10. x = 2

B:

1 to 5 see graph 6. line E 7. line C 8. y = 2x + 2

B:



C:

1. (1,4), (2,8), (3,12), (4,16) 2. (1,8), (2,9), (3,10), (4,11)
3. (1,-1), (2,1), (3,3), (4,5) 4. (2,4), (4,5), (6,6), (8,7)
5. (4,-4), (8,-3), (12,-2), (16,-1) 6. (4,5), (8,6), (12,7), (16,8)

D:

1.

Time (min)	0	8	20	28	36
Cost ($)	2	6	12	16	20

2. check graph 3. $4 & $14 4. 12 mins, 24 mins, 32 mins

Worksheet 6

A:

1. \$45 2. 1, 23 3. 6cm 4. $44cm^2$ 5. $^{64}/_{100}$ or $^{16}/_{25}$ 6. -3 7. 6 8. 9 sides 9. 5.795km
10. 8.842

B:

1. 11 2. 26 3. 2 4. -3 5. -3 6. 18 7. -12 8. 10 9. 25 10. -18 11. 108 12. 324
13. 180 14. 11 15. 38 16. -42

C:

1. \$10.75 2. \$414 3. 66 points 4. \$780 5. 9 days 6. $71.5m^2$ 7. $607.6cm^2$
8. $447.64cm^3$ $781.2cm^3$

Worksheet 7

A:

1. 4 2. \$24 3. 720^o 4. 52000 5. $^{82}/_{100}$ or $^{41}/_{50}$ 6. -2 7. 3 8. 100 years 9. 9.42m 10. 3.53

B:

1. 30 24 12 2. 5 4 2

C:

1. 49 red + 42 blue 2. 12 records + 27 tapes

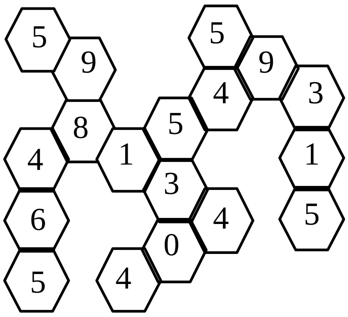
D:

1. 17k 2. 5w 3. 9r + 5t 4. -3p 5. x(4x + 7) 6. 13j 7. -3f 8. 4h 9. 8f 10. 10g 11. 4a + 4b
12. 3c - d 13. 3g + 4e - 7f 14. 13k - 4g 15. 2h 16. -k 17. 21d + 3g 18. 9y + 13x 19. 6r + 11s
20. x(9x - 2) 21. 8h - 7g + 3f + 8 22. 10h - 6g 23. x + 10y 24. 15r - 3s

E:

1. 7ab + 12cd 2. 9xy + 5x + 6y 3. -2xy + 2y 4. $10x^2 - 2x$ 5. $12x^2 + 3x + 7xy + y$ 6. 6x + 6xy
7. $13x^2 + 5y$ 8. $4x + 7xy - 3y^2$

F:



Worksheet 8

A:

1. 1 2. \$16 3. -5, -9, -13 4. 0.036 5. $^{45}/_{100}$ or $^{9}/_{20}$ 6. -11 7. 2 8. 10 years 9. 6.256L
10. 0.62

B:

1. 8 + x 2. x - 10 3. 2x 4. 5x + 7 5. 14 - x 6. x + 16 7. 16x 8. 6x + 11

C:

1. x + 6 = 17 2. x - 13 = 8 3. 2x + 5 = 18 4. $^{x}/_{2} = 13$ 5. 9x = 54

D:

1. 4 2. 4 3. 5 4. 28 5. 14 6. 48 7. 6 8. 12 9. 5 10. 36

E:

1. $2^1/_9$ 2. $11^2/_3$ 3. $11^1/_2$ 4. $4^5/_6$ 5. $11^2/_5$

F:

1. 5p + 13.50 = 100, p = \$17.30 2. 8m - 10 = 50, m = \$7.50 3. $^{m}/_{2} + 38 = 60$, m = \$44.00
4. $^{m}/_{4} + 14 = 26$, m = \$48.00

Worksheet 9

A:

1. 15 2. 2.5, 5.0, 7.5, 10.0 3. 63^{o} 4. 33.9mm 5. 243kg 6. 3.13 7. 5 8. 5:47 p.m. 9. $14:$35
10. 9.756

B:

1. 12A + 24S + 6O 2. 42 + 28 + 56 = 7(6 + 4 + 8)

C:

1. 4x + 24 2. 3x - 15 3. 8x + 32 4. 4x - 24 5. 18x + 30 6. 35x - 56 7. 16x + 56 8. $x^2 + 6x$
9. $4x^2 + 5x$ 10. $2x^2 - 16x$

D:

1. 3(x + 4) 2. 6(x + 4) 3. 3(3x - 5) 4. 7(3x + 5) 5. 5x(x + 3) 6. 6(x - 5) 7. 3x(7x - 2) 8. 12(3x - 4)
9. $5(x^2 + 6)$ 10. 8x(x - 5)

E:

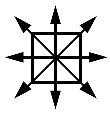
1. 2x + 14 + 3x + 18 = 5x + 32 2. 5a + 15 + 7a + 28 = 12a + 43 3. 3k + 21 + 2k - 10 = 5k + 11
4. 5h - 25 + 7h + 56 = 12h + 31 5. 7x - 28 + 4x - 36 = 11x - 64

F:

1. Day 1 = x^2 Day 2 = 6x Day 3 = 5x 2. $x^2 + 6x + 5x$ 3. x(x + 11)
4. Day 1 = $5.76m^2$ Day 2 = $14.4m^2$ Day 3 = $12m^2$ 5. $32.16m^2$

Worksheet 10

A:

1. $34 2. $13.02 3. 28m 4. $^{68}/_{100} = {}^{17}/_{25}$ 5. 5.2×10^4 6. 25000 7.  8. 12, 18, 24
9. 50% 10. $20:$4:$12

B:

1. k^5 2. m^6 3. gxgxgxg 4. b^{11} 5. axaxaxaxbxbxb 6. $5d^2s^3$ 7. 6xhxkxkxkxkxk 8. $21j^2$
9. $20e^2h^4$ 10. $5bc^4$

C:

1. a^6 2. b^{13} 3. g^5 4. y^{10} 5. c^{10} 6. k^{12} 7. $5d^4$ 8. $4e^7$ 9. $5p^6$ 10. $21g^6$ 11. $15h^{13}$
12. $36k^7$ 13. u^7v^9 14. a^9b^4 15. $15v^5u^{15}$ 16. $24s^9r^8$ 17. $20y^{10}v^{12}$

D:

1. x^x 2. y^x 3. 5x 4. 1 5. $3s^2$ 6. $3r^3$ 7. $\frac{1}{2}r^5$ 8. $4u^4$ 9. $^1/_3 s^{-3}k^2$ 10. $6a^6b^{-5}c^5$

E:

1. x^{12} 2. $9x^8$ 3. $125x^{24}$ 4. $81a^8b^{24}$ 5. $3a^9$

F:

1. $4x^{10}$ 2. $64x^6$ 3. $125x^{18}$ 4. $42x^9$ 5. $21x^{13}$ 6. $6x^3$ 7. $6x^5$ 8. $\frac{1}{2}x^6$ 9. $36x^{10}$ 10. $72x^6$
11. $48x^7$ 12. $135x^{13}$

Worksheet 11

A:

1. 1 2. $24 3. $320cm^2$ 4. 4cm 5. $^6/_{100} = {}^3/_{50}$ 6. -2 7. 7 8. 100 years 9. 7.2m
10. 6.9

B:

1. 3x + 12 = 36, 3x = 24, x = 8 2. 5x – 20 = 85, 5x = 105, x = 21 3. 8x + 12 = 39, 8x = 27, x = $3^3/_8$
4. 10x – 30 = 33, 10x = 63 x = $6^3/_{10}$ 5. 6x + 48 = 11, 6x = -37, x = $-6^1/_6$

C:

1. 5x = 11, x = $2^1/_5$ 2. 5x = 32, x = $6^2/_5$ 3. 7x = 13, x = $1^6/_7$ 4. 3x = 37, x = $12^1/_3$ 5. 4x = 31, x = $7^3/_4$

D:

1. x + 8 = 25, x = 17 2. x – 7 = 27 , x = 34 3. 2x + 7 = 30, 2x = 23, x = $11^1/_2$
4. 4x – 3 = 63, 4x = 66, x = $16^1/_2$ 5. 2x + 14 = 42, 2x = 28, x = 14

E:

1. b = $^A/_h$ 2. h = $^{2A}/_b$ 3. a = $^{2A}/_h$ – b 4. r = $\sqrt{^A/_\pi}$ 5. b = cp – a

F:

1. h = $^{2A}/_b$ 2. 1.6m 3. d = $^V/_{bh}$ 4. 4cm

Tracking Sheet: ‘In-class’ Activity Sheets

Comments

Worksheet	Objectives															
21																
20																
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Algebra

Name

Tracking Sheet: Homework / Assessment Worksheets

Comments

Worksheet	Objectives
11	A6 / A10
10	A8
9	A9
8	A6 / A10
7	A7
6	A5 / A10
5	A4
4	A4
3	A3
2	A2
1	A1

Algebra

Name