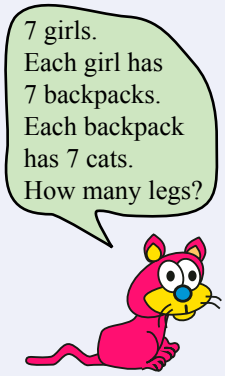
Algebra

- ★ Introduce the concept of variables.
- ★ Move fluently between algebraic and word representations.
- ★ Create algebraic expressions and perform substitutions.
- ★ Identify order of operations.
- ★ Apply the commutative and associative laws to algebraic terms and expressions.



A TASK

You, a member of the Chamber of Commerce, are presenting a short persuasive speech to a group of teachers. The Chamber of Commerce wants you to convince the teachers that mental computation should be a part of every mathematics lesson.

- Mental computation in the day of a student?
- Mental computation in the day of a business?
- What strategies are used to do mental computation?
- Mental estimation versus exact mental computation?

A LITTLE BIT OF HISTORY

Alexander Aitken (1895-1967), from New Zealand, was recognised as the greatest mathematician of his era.
Aitken was also known for his awesome mental computations:

- He could recite Pi to 707 decimal places.
- Mentally multiply two nine digit numbers in 30 seconds.
- Change fractions to 26 decimal places in five seconds.

For some years from about 15, without telling anyone, I practised mental calculation gradually until what had been difficult at first became easier and easier.

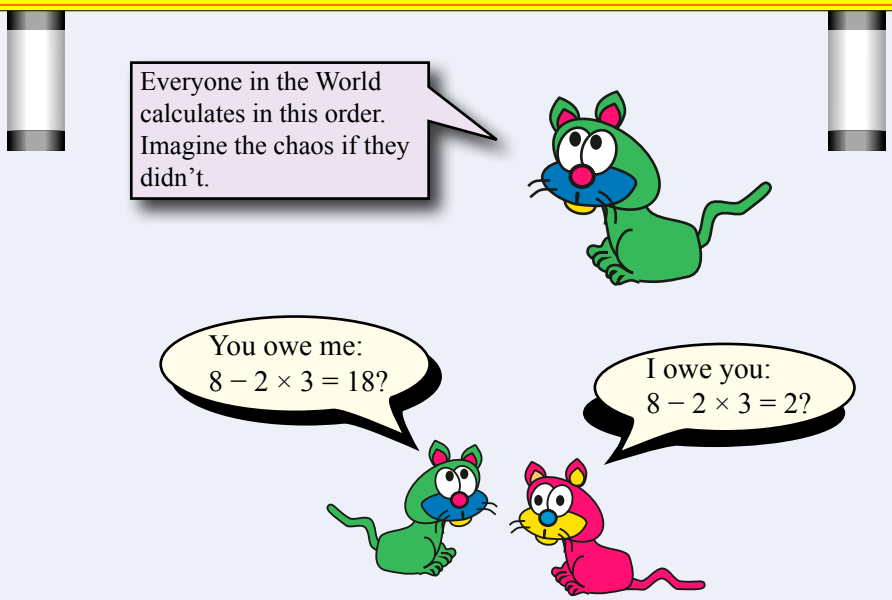
Order of Operations

Order of Operations:

1 Work the brackets first.

2 Work from left to right and do all × and ÷ as you come across them.

3 Work from left to right and do all + and − as you come across them.



Exercise 7.1

Find the value of each of the following:

$(8 - 5) \times 3$ $= 3 \times 3$ {brackets} $= 9$ {× and ÷ }	$5 \times 6 - (4 + 2) \div 3 + 2$ $= 5 \times 6 - 6 \div 3 + 2$ {brackets} $= 30 - 2 + 2$ {× and ÷ } $= 30$ {+ and − }

1 $8 - 2 \times 3$

2 $6 \times 5 - 4$

3 $5 + 5 \times 2$

4 $18 - 6 \div 2$

5 $20 - 10 \div 2$

6 $25 + 6 \times 2$

7 $8 \div 2 - 3$

8 $9 \div 3 \times 2 + 1$

9 $3 \times 2 - 2 \times 2$

10 $12 \div 4 + 2 \times 3$

11 $30 - 6 \times 4 \div 8$

12 $(12 + 2) \times 2 + 3$

13 $16 \div (3 + 1) - 2$

14 $2 \times 3 + 8 \div 2 + 1$

15 $18 \div 3 \times 2 + 5$

16 $5 \times 6 - (4 + 2)$

17 $4 \times 3 \div (2 + 1)$

18 $7 + 12 \div (2 + 4)$

19 $5 \times (5 - 3) + 4$

20 $(6 + 2) \div 4 \times 3$

Order of Operations:
1 ( ) brackets first.
2 × and ÷ from left to right.
3 + and − from left to right.

Exercise 7.2
Find the value of each of the following:

$9 - (5 - 3) \times 3$
$= 9 - 2 \times 3$
$= 9 - 6$
$= 3$

$35 - (6 \times 2 - 5) + 8 \times 2$
$= 35 - (12 - 5) + 8 \times 2$
$= 35 - 7 + 8 \times 2$
$= 35 - 7 + 16$
$= 28 + 16$
$= 44$

1 $15 - 2 \times 5$
2 $10 \div 2 - 4$
3 $6 + (5 \times 2)$
4 $(18 \div 6) - 2$
5 $(20 - 10) \div 2$
6 $5 - (1 + 2)$
7 $8 \div 4 - 1$
8 $16 - 4 \times (2 + 1)$
9 $15 \div 3 - 2 \times 2$
10 $12 \div (4 + 2) \times 2$
11 $11 - 2 \times (6 \div 2)$
12 $(3 + 2) \times 3 + 1$
13 $9 \div 3 - (4 - 2)$
14 $4 \times (3 + 2) \div 2 + 1$
15 $35 - (6 \times 2 - 5) + 8 \times 2$
16 $(3 + 2) \times 4 + 10 \div (8 - 3)$
17 $20 \div (3 \times 2 - 1) + 5 \times (7 - 4)$
18 $(8 - 4 \times 1) \div (8 \div (3 + 1))$
19 $13 \times 2 - 15 \div (8 - 5) + 4 \times 2$
20 $12 + 3 \times 2 - 15 \div 3 - 8$
21 $(12 - 4 \times 2) \times 5 - 6 \times 3 \div 9$
22 $3 + 6 \div (5 - 2) \times 2 + 10$

Calculators calculate in this order.

Use a calculator to check your answers (Enter the whole problem in one go.)

In mathematics, brackets and parentheses are the same thing.

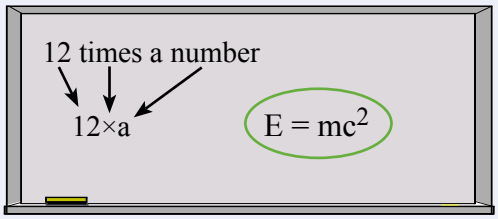
Examples of brackets are:
(5 + 2), [5 + 2], {5 + 2}

Algebraic Expressions

Algebra is used to solve millions and millions of problems every day.

Algebraic Expressions:
When letters of the alphabet are used to represent numbers.

12a and 12×a are the same thing.
x÷3 and $\frac{x}{3}$ are the same thing.



Use any letter of the alphabet to represent the number. x is a popular letter to use.

Exercise 7.3
Write an algebraic expression for each of the following:

A number plus 5	Two less than a number	The next consecutive number
a + 5	b − 2	x + 1

1 A number plus 4
2 A number minus 9
3 6 is added to a number
4 A number is decreased by 7
5 The number is increased by 13
6 Subtract 12 from a number
7 The sum of a number and 23
8 Five less than the number
9 The next consecutive number
10 Decrease a number by 85

A number times 3	A number divided by 12	Three-fifths of a number
3×x	b ÷ 12	$\frac{3}{5}\times x$

11 Double a number
12 A number divided by 11
13 Triple a number
14 Half of a number
15 Multiply a number by 25
16 A quarter of a number
17 The product of a number and 87
18 Two-thirds of a number
19 Seven times a number
20 Three-quarters of a number

The sum of a and b	The product of a and b	Double x minus three times y
a + b	a×b	2×x − 3×y

21 The sum of b and a
22 The product of b and a
23 a plus b
24 b plus a
25 a times b
26 b times a
27 a is increased by b
28 a is multiplied by b
29 Triple a and add c
30 Quadruple x and subtract m

Substitution

When using substitution in algebra, a variable such as x or y is replaced with its value.

Exercise 7.4

Find the value of $x + 5$ if $x = 4$	Find the value of $2b - 1$ if $b = 3$
$x + 5 = 4 + 5$ $= 9$	$2b - 1 = 2 \times 3 - 1$ $= 6 - 1$ $= 5$

1 Find the value of each of the following algebraic expressions given that $x = 4$ and $y = 9$.

a) $3x$ **b)** $2y$ **c)** $x + 5$

d) $y - 5$ **e)** $x \div 2$ **f)** $\frac{y}{3}$

g) $x + y$ **h)** $y - x$ **i)** xy

j) $3x + 5$ **k)** $4x - y$ **l)** $2y + 10$

2 If $x = 10$, what is the value of $7x + 3$?

3 $y = 8 - 3x$, what is the value of y when $x = 1.5$?

The area A, of a rectangle of length l, and breadth w, is given by the algebraic formula: $A = lb$.

Find the area of the rectangle if length = 12 m and breadth = 5 m

$$A = lw$$
$$= 12 \text{ m} \times 5 \text{ m}$$
$$= 60 \text{ m}^2$$

4 The area, A, of a rectangle of length, l, and breadth, b, is given by the algebraic formula: $A = lb$. Find the area of each of the following rectangles:

a) length = 6 cm and breadth = 5 cm.

b) length = 15 m and breadth = 6 m.

5 The weight that a pack mule can carry may be estimated from the formula: $P = 0.2W$, where W is the weight of the mule in kg. Estimate the pack weight that the following mules can carry:

a) Weight = 400 kg.

b) Weight = 450 kg.

6 The weight of a pig can be estimated from the formula: $w = 69g^2L$, where g is the girth measurement and L is the length of the pig. Estimate the weight of the following pigs:

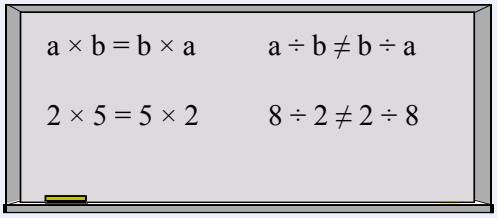
a) Girth 1.3 m, length = 1.0 m.

b) Girth 1.1 m, length = 0.9 m.

Commutative Laws

Commutative
An operation is commutative if changing the order of the operands does not change the result.

Addition is commutative because:
a + b = b + a
Example: 3 + 5 = 5 + 3



Exercise 7.5
Calculate each of the following and decide if the operation is commutative:

7 + 3 and 3 + 7	6 − 4 and 4 − 6	8 × 2 and 2 × 8
7 + 3 = 10 3 + 7 = 10 + is commutative	6 − 4 = 2 4 − 6 = -2 − is not commutative	8 × 2 = 16 2 × 8 = 16 × is commutative

1 5 + 4 and 4 + 5	**2** 8 + 6 and 6 + 8	**3** 15 + 23 and 23 + 15
4 0 + 2 and 2 + 0	**5** 3 + 1 and 1 + 3	**6** 89 + 61 and 61 + 89
7 5 − 4 and 4 − 5	**8** 8 − 6 and 6 − 8	**9** 15 − 23 and 23 − 15
10 0 − 2 and 2 − 0	**11** 3 − 1 and 1 − 3	**12** 89 − 61 and 61 − 89
13 5 × 4 and 4 × 5	**14** 8 × 6 and 6 × 8	**15** 15 × 23 and 23 × 15
16 0 × 2 and 2 × 0	**17** 3 × 1 and 1 × 3	**18** 89 × 61 and 61 × 89
19 5 ÷ 4 and 4 ÷ 5	**20** 8 ÷ 6 and 6 ÷ 8	**21** 15 ÷ 23 and 23 ÷ 15
22 0 ÷ 2 and 2 ÷ 0	**23** 3 ÷ 1 and 1 ÷ 3	**24** 89 ÷ 61 and 61 ÷ 89

Addition is commutative
a + b = b + a

Subtraction is **not** commutative
a − b ≠ b − a

Multiplication is commutative
a × b = b × a

Division is **not** commutative
a ÷ b ≠ b ÷ a

Associative Laws

Associative
An operation is associative if changing the grouping of the operands does not change the result.

Addition is associative because:
(a + b) + c = a + (b + c)
Example: (3 + 2) + 5 = 3 + (2 + 5)

(a × b) × c = a × (b × c)

(4 × 3) × 1 = 4 × (3 × 1)

Exercise 7.6
Calculate each of the following and decide if the operation is associative:

(5 + 3) + 4 and 5 + (3 + 4)	(7 − 6) − 4 and 7 − (6 − 4)
(5 + 3) + 4 = 8 + 4 = 12 5 + (3 + 4) = 5 + 7 = 12 + is associative	(7 − 6) − 4 = 1 − 4 = −3 7 − (6 − 4) = 7 − 2 = 5 − is not associative

0 ÷ a = 0
a ÷ 0 = undefined
0 × a = 0
a × 0 = 0

1 (2 + 7) + 5 and 2 + (7 + 5)
2 (4 + 6) + 13 and 4 + (6 + 13)
3 (9 + 0) + 1 and 9 + (0 + 1)
4 (26 + 2) + 98 and 26 + (2 + 98)

5 (2 − 7) − 5 and 2 − (7 − 5)
6 (2 − 7) − 5 and 2 − (7 − 5)
7 (9 − 0) − 1 and 9 − (0 − 1)
8 (26 − 2) − 98 and 26 − (2 − 98)

9 (2 × 7) × 5 and 2 × (7 × 5)
10 (4 × 6) × 13 and 4 × (6 × 13)
11 (9 × 0) × 1 and 9 × (0 × 1)
12 (26 × 2) × 98 and 26 × (2 × 98)

13 (2 ÷ 7) ÷ 5 and 2 ÷ (7 ÷ 5)
14 (4 ÷ 6) ÷ 13 and 4 ÷ (6 ÷ 13)
16 (9 ÷ 0) ÷ 1 and 9 ÷ (0 ÷ 1)
16 (26 ÷ 2) ÷ 98 and 26 ÷ (2 ÷ 98)

Addition is associative
(a + b) + c = a + (b + c)

Subtraction is **not** associative
(a − b) − c ≠ a − (b − c)

Multiplication is associative
(a × b) × c = a × (b × c)

Division is **not** associative
(a ÷ b) ÷ c ≠ a ÷ (b ÷ c)

Exercise 7.7

a) Write an algebraic expression for each of the following pairs:
b) Find the value of each algebraic expression using x= 2, y = 5.
c) Comment on the values obtained.

x plus y	**and**	y plus x	triple x minus y	**and**	y minus triple x
$x + y$		$y + x$	$3x - y$		$y - 2x$
$2 + 5$		$5 + 2$	$3\times2 - 5$		$5 - 3\times2$
$= 7$		$= 7$	$= 1$		$= ^-1$
x+y and y+x is commutative.			3x−y and y−3x is not commutative.		

1 y plus seven **and** seven plus y.
2 The sum of x and 13 **and** the sum of 13 and x.
3 Nine plus triple x **and** triple x plus nine.
4 Two more than y **and** y more than two.
5 The difference between x and y **and** the difference between y and x.
6 Double y minus five **and** five minus double y.
7 The product of nine and x **and** the product of x and y.
8 Triple x times twelve **and** twelve times triple x.
9 y divided by two **and** two divided by y.
10 Quadruple y divided by two **and** two divided by quadruple y.

Exercise 7.8

a) Find the value of each algebraic expression using x= 6, y = 3, z = 2.
b) Comment on the values obtained.

$5 + (x + 2y)$	**and**	$(5 + x) + 2y$
$5 + (6 + 2\times3)$		$(5 + 6) + 2\times3$
$= 5 + (6 + 6)$		$= 11 + 6$
$= 5 + 12$		$= 17$
$= 17$		
$5 + (x + 2y)$ and $(5 + x) + 2y$ is associative.		

1 $(x + y) + z$ **and** $x + (y + z)$
2 $(3 + x) + 4$ **and** $3 + (x + 4)$
3 $2x + (y + 8)$ **and** $(2x + y) + 8$
4 $(z + 10y) + 15$ **and** $z + (10y + 15)$
5 $(x - y) - z$ **and** $x - (y - z)$
6 $4x - (3 - 2z)$ **and** $(4x - 3) - 2z$
7 $9\times(x\times y)$ **and** $(9\times x)\times y$
8 $3x\times(2y\times z)$ **and** $(3x\times2y)\times z$
9 $x \div (y \div 1)$ **and** $x \div (y \div 1)$
10 $(5x \div 2y) \div 10$ **and** $5x \div (2y \div 10)$

What would a 1 km line of $2 coins be worth?

Mental Computation

You need to be a good mental athlete because many everyday problems are solved mentally.

Exercise 7.9

1 Spell substitution.
2 Find the value of: $20 - 10 \div 2$
3 Find the value of the expression: $5x - 2$ when $x = 3$
4 Find the value of the expression: $2(a + 5)$ when $a = 7$
5 Is $2a + 5c = 5c + 2a$ true or false?
6 Change 0.25 to a fraction.
7 Change $\frac{8}{5}$ to a mixed number.
8 Calculate: $\frac{2}{9} + \frac{3}{9}$
9 Calculate: $\frac{1}{2} \times \frac{1}{3}$
10 I buy a \$6.40 magazine with a \$10 note, how much change?

To sleep: perchance to dream: ay, there's the rub - William Shakespeare.

Exercise 7.10

1 Spell commutative.
2 Find the value of: $24 + 6 \times 2$
3 Find the value of the expression: $2x + 4$ when $x = 2$
4 Find the value of the expression: $3b + 2b$ when $b = 3$
5 Is $a + (b + c) = (a + b) + c$ true or false?
6 Change 0.5 to a fraction.
7 Change $\frac{9}{4}$ to a mixed number.
8 Calculate: $\frac{1}{3} + \frac{1}{2}$
9 Calculate: $\frac{1}{4} \times \frac{1}{3}$
10 I buy a \$8.15 magazine with a \$20 note, how much change?

Exercise 7.11

1 Spell associative.
2 Find the value of: $5 \times 4 - 3$
3 Find the value of the expression: $5x \div 2$ when $x = 4$
4 Find the value of the expression: $4(3 + x)$ when $x = 2$
5 Is $a - d = d - a$ true or false?
6 Change 0.75 to a fraction.
7 Change $\frac{10}{3}$ to a mixed number.
8 Calculate: $\frac{1}{3} + \frac{1}{4}$
9 Calculate: $\frac{2}{3} \times \frac{1}{2}$
10 I buy a \$16.30 magazine with a \$20 note, how much change?

Why shouldn't you tell secrets when there's a clock in the room?

Time will tell.

NAPLAN Questions

Double check on the calculator. Check the answer by substituting back into the question.

Exercise 7.12

1 If a = 3, what is the value of 8a?

2 If b = 4, what is the value of 3b + 5

3 y = 8 − 3x, what is the value of y when x = 2.5?

4 what is the value of  ?

If  = 2,  = 3, and  +  =  + 

5 what is the value of  ?

If  = 5,  = 2, and  +  −  =  +  + 

6 What is the value of $4x - 2x^2 + 7$ when x = 1?

7 $25 \times \Delta = 35$ What is the value of Δ?

8 The divident yield, in percent, of shares is given by the formula:

Dividend Yield = 100 × dividend ÷ share price.

Calculate the dividend yield of a share with a price of $25 and a dividend of $0.80

9 A rule for a pattern is multiply by three and then add two. The first three numbers of this pattern are: 5, 8, 11, ... What is the fifth number in this pattern?

10 A rule for a pattern is to add two and then multiply by four. The first three numbers of this pattern are: 16, 20, 24, ... What is the tenth number in this pattern?

11 What is the missing number?

a) $x \times$  $= y \times x$

b) $x + ($  $+$  $) = (x + y) + z$

12 A number is multiplied by itself and then 5 is added. The answer is 14. What is the number?

13 Two numbers added together equal 7. The two numbers multiplied together equal 12. What are the two numbers?

14 Two numbers added together equal 40. The two numbers multiplied together equal 175. What are the two numbers?

Competition Questions

Build maths muscle and prepare for mathematics competitions at the same time.

Order of Operations:
1 ( ) brackets first.
2 × and ÷ from left to right.
3 + and − from left to right.

Exercise 7.13

1 Evaluate each of the following:

a) $5 + 3 \times 4$

b) $20 - 12 \div 4$

c) $2 \times 6 - 4 \div 2$

d) $(12 + 2) \times 10 - 5$

e) $6 - (5 - (4 - (3 - (2 - 1))))$

2 Find the unknown in each of the following:

a)

1	2	3	4	
7	10	13	16	?

b)

1	3	5	7	
1	9	25	49	?

3 Which rule applies?

x	1	2	3	4	5
y	5	8	11	14	17

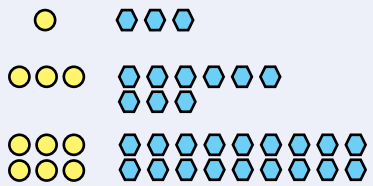
a) $y = 4x + 1$

b) $y = 3x + 4$

c) $y = 3x + 2$

d) $y = 2x + 3$

4 Which rule applies?



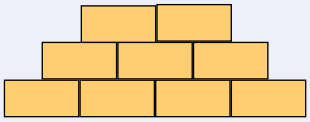
a) ⬡ = 4×○ − 1

b) ⬡ = 2×○ + 1

c) ⬡ = ○ + 2

d) ⬡ = 3×○

5 Bricks are placed in layers so that a layer has one less brick than the layer below. If there are six layers and the top layer has twelve bricks, how many bricks altogether?



6 When one-sixth of a number is subtracted from itself, the result is 45. What is the number?

7 If x and y are positive numbers, which of the following is the largest:

a) $a \times b$

b) $(a + b)^2$

c) $a^2 + b^2$

Agronomists research and apply knowledge of agricultural crops and grasses to improve agricultural production.
- Relevant school subjects are Mathematics and English.
- Courses usually involve a Universtity Bachelor degree.

Investigations

Investigation 7.1 Commutative

Commutative
An operation is commutative if changing the order of the operands does not change the result.

Addition is commutative because:
$\mathbf{a + b = b + a}$
Example: $3 + 5 = 5 + 3$

1 Brainstorm five examples of normal-life activities that are not commutative.

Putting on your shoes first and then your socks
does not give the same result as
putting on your socks first and then your shoes.

Putting on socks and shoes is not commutative.

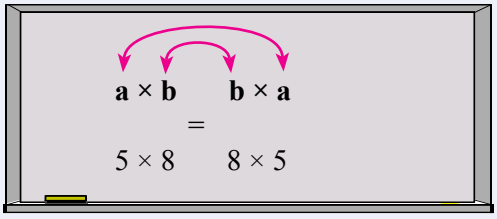
2 Brainstorm five examples of normal-life activities that are commutative.

Doing your homework first and then calling a friend
gives the same result as
calling your friend first and then doing your homework.

Investigation 7.2 Online Commutative Activities

1 Use a search phrase such as 'Commutative property of addition' to find hundreds of activities about the commutative property.
2 Try some of the activities and games.
3 Report back to your class about activities that are useful.

4 Similarly, use a search phrase such as 'Commutative property of multiplication' to find hundreds of activities about the commutative property.



Investigation 7.3 Online Associative Activities

1 Use a search phrase such as 'Associative property of addition' to find hundreds of activities about the associative property.
2 Try some of the activities and games.
3 Report back to your class about activities that are useful.

4 Similarly, use a search phrase such as 'Associative property of multiplication' to find hundreds of activities about the associative property.

A Couple of Puzzles

Prime numbers have only two factors: 1 and itself.

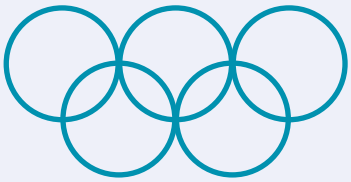
Examples: 2, 3, 5, 7, 11, 13, 17, 19

Exercise 7.14

1 I am a number between 10 and 20.
I am a prime number.
The sum of my digits is 8. Who am I?

2 I am a two digit number. If you reverse my digits and add us together, the result is 99. How many of us are there?

3 Place each of the numbers 1 to 9 in each space so that the total of the numbers in each ring is 11.



A Game

Combinations by 4

1 Make nine cards with the numbers 1 to 9 written on them.

1	2	3	4	5	6	7	8	9

2 Turn the cards face down and mix them up.

3 When it is their turn, Each player/team turns up 4 cards and then uses +, −, ×, ÷, and ( ) to make a whole number with an **upper limit of 15**. All 4 cards must be used.

1	4	5	8

5 × (8 ÷ 4 + 1) = 15

4 Player/team with largest total score after 5 turns wins.

A Sweet Trick

You race your audience. They have a calculator, you don't.

Your audience volunteers a five digit number:	**71956**
You write a five digit number:	28043
Your audience volunteers a five digit number:	**36170**
You write a five digit number:	63829
Your audience volunteers a five digit number:	**83715**
You write a five digit number:	16284

You write the 9 complement.

When someone says go
They add them up.

You write up the answer faster than they can use a calculator.

??? ???

Use the trick in Chapter 6 to help you know what the answer should be.

Technology

Technology 7.1 Calculators and Order of Operations

Order of Operations:
1 ( ) brackets first.
2 × and ÷ from left to right.
3 + and − from left to right.

Calculators calculate in this order.

Use a calculator to simplify: $4 + 15 \div (3 + 2)$

Enter [4] [+] [15] [÷] [(] [3] [+] [2] [)] [=]

To give the answer: 7

Enter the expression exactly as it is written.

Use a calculator to check the answers to the earlier exercises.

Technology 7.2 Substitution

Use a spreadsheet to check that the following expressions are equivalent:

	A	B
1	Substituting value	3
2	2x + 6	12
3	2×(x + 3)	12

Use any substituting value other than 0

Enter the first expression
=2*B1 + 6

Enter the second expression
=2*(B1 + 3)

Thus the expressions $2x + 6$ and $2(x + 3)$ are equivalent.
Are the following statements correct?

1 $2x + 6 = 2\times(x + 3)$
2 $9x + 17 = 17 + 9x$
3 $7a + 28 = 28 + 7a$
4 $12b + 36 = 6\times(2b + 6)$
5 $10x - 80 = 10(x - 8)$
6 $5a + 4a = 2a\times(5 + 2)$
7 $14y - 102 = 14(y - 8)$
8 $48y + 6y = 6y(8 + 1)$

Chapter Review 1

Exercise 7.15

1 Find the value of each of the following:

a) $12 - 3 \times 2$ **b)** $3 \times 5 - 2$

c) $5 \times 6 \div (2 + 1)$ **d)** $4 + 15 \div (3 + 2)$

e) $18 \div (3 \times 2 - 3) + 5 \times 2$ **f)** $(4 - 2 \times 1) \div (8 \div (3 + 1))$

2 Write an algebraic expression for each of the following:

a) A number plus 5 **b)** A number minus 3

c) Triple a number d) Half of a number

e) b is increased by d **f)** x is multiplied by y

g) Triple s and then add w **h)** Quadruple a and then subtract b

Use any letter of the alphabet to represent the number. x is a popular letter to use.

3 Find the value of each of the following algebraic expressions given that $x = 5$ and $y = 6$.

a) $2x$ **b)** $3y$ **c)** $x + 9$

d) $y - 2$ **e)** $y \div 2$ **f)** $\frac{y}{3}$

g) $x + y$ **h)** $y - x$ **i)** xy

j) $3x + 1$ **k)** $4x - y$ **l)** $2y + 10$

4 Write an algebraic expression for each of the following pairs:
Find the value of each algebraic expression using $x = 7$, $y = 4$.
Comment on the values obtained.

a) x plus three **and** three plus x.

b) Nine plus triple x **and** triple x plus nine.

c) Five times y minus eight **and** eight minus five times y.

d) y times ten **and** ten times y.

e) x divided by four **and** four divided by x.

5 Find the value of each algebraic expression using $x = 10$, $y = 8$, $z = 3$.
Comment on the values obtained.

a) $(x + y) + z$ **and** $x + (y + z)$

b) $3x + (y + 1)$ **and** $(3x + y) + 1$

c) $(x - y) - z$ **and** $x - (y - z)$

d) $4 \times (x \times y)$ **and** $(4 \times x) \times y$

e) $x \times (5y \times z)$ **and** $(x \times 5y) \times z$

f) $x \div (y \div z)$ **and** $(x \div y) \div z$

The easy way is always mined - Murphy's Laws of Combat.

6 The power of a wind turbine, in watts, is given by the formula:
Power = 0.62avvv, where a is the circular area of the turbine blades, and v is the wind speed. What power is generated by a wind turbine with $a = 600\ m^2$, and $v = 10$ m/s?

Chapter Review 2

Exercise 7.16

1 Find the value of each of the following:

a) $20 - 2 \times 2$ **b)** $7 \times 4 - 3$

c) $2 \times 8 \div (2 + 2)$ **d)** $9 + 12 \div (4 + 2)$

e) $15 \div (3 \times 3 - 4) + 1 \times 6$ **f)** $(7 - 3 \times 1) \div (6 \div (2 + 1))$

2 Write an algebraic expression for each of the following:

a) A number plus 6 **b)** A number minus 8

c) Double a number d) Third of a number

e) h is decreased by m **f)** a is multiplied by b

g) Triple g and then minus f **h)** Quadruple a and then increase by p

Use any letter of the alphabet to represent the number. x is a popular letter to use.

3 Find the value of each of the following algebraic expressions given that x = 8 and y = 3.

a) 3x **b)** 4y **c)** x + 6

d) y − 1 **e)** x ÷ 2 **f)** $\frac{y}{3}$

g) x + y **h)** x − y **i)** xy

j) 2x + 5 **k)** x − 2y **l)** 3y + 9

4 Write an algebraic expression for each of the following pairs:
Find the value of each algebraic expression using x= 4, y = 1.
Comment on the values obtained.

a) x plus two **and** two plus x.

b) Seven plus triple x **and** triple x plus seven.

c) Nine times y minus five **and** five minus nine times y.

d) x times ten **and** ten times x.

e) x divided by four **and** four divided by x.

5 Find the value of each algebraic expression using x= 5, y = 6, z = 7.
Comment on the values obtained.

a) $(x + y) + z$ **and** $x + (y + z)$

b) $2x + (y + 3)$ **and** $(2x + y) + 3$

c) $(x - y) - z$ **and** $x - (y - z)$

d) $5 \times (x \times y)$ **and** $(5 \times x) \times y$

e) $x \times (2y \times z)$ **and** $(x \times 2y) \times z$

f) $x \div (y \div z)$ **and** $(x \div y) \div z$

Everything has beauty but not everyone sees it - Confucius.

6 The power of a 240v electrical motor, in watts, is given by the formula: Power = Vie, where V is the voltage, i is the current, and e is the efficiency of the motor. What is the power output of an electrical motor with V = 240volts, i = 3 amps and e = 0.75?