

Work on practising some strands

Data and stats

- 1 Define the statistical term 'sample'.
- 2 Would a census or a sample be used to investigate the number of people who use a particular brand of toothpaste? Why?
- 3 Describe the sample you would use if you wanted to gather support for improved skateboard facilities at your local park.
- 4 For the scores 11, 14, 15, 19, 19, 21, find the:
a mean **b** mode **c** median **d** range.

- 5 For the scores in this stem-and-leaf plot, find the:
a mean **b** mode
c median **d** range.

Stem	Leaf
2	7 8 8
3	0 0 1 2 3 4 5 6 6
4	1 2 4 4 4 6 8
5	3 5 7 8
6	2 3

- 6 The back-to-back stem-and-leaf plot compares the marks gained by classes A and B in their half-yearly Mathematics exam.
a Find the mean, mode, median and range for each class.
b Which class performed better? Explain your answer.

Class A	Stem	Class B
Leaf		Leaf
2 1	2	8 8
6 4 2 1	3	0 3 5 6
6 5 3 1 0	4	0 2 6 6 8
1 1 0	5	3 6 9
	6	7

- 7 From a school of 800 students, a random sample of 50 students was selected. There were 13 left-handed students in the sample.
a What fraction of the sample was left-handed?
b Estimate how many students at the school were left-handed.

- 1 Write the outlier in each data set.
a 0, 71, 72, 72, 75

- b** 23, 24, 25, 25, 27, 28, 89

2 Consider the three data sets given.

A 8, 10, 11, 11, 13, 96

B 7, 7, 8, 9, 11, 12

C 4, 7, 8, 9, 9, 9, 9

In which data set(s) is the following measure *not* a central value?

a mean

b mode

c median

3 The sexes of 5 students chosen at random from Year 9 are female, male, male, female, male. For this data, find, where possible, the:

a mean

b mode

c median.

4 a The weights, in kilograms, of seven 1-year-old horses of the same breed were 420, 420, 430, 440, 460, 470, 650. For these weights, find the:

i mean

ii mode

iii median.

b Which measure would be the most appropriate to represent the weight of 1-year-old horses of this breed?

5 Five samples of 20 students were chosen from all students in a school. The students were asked to state the number of text messages they had sent the day before. The mean number of texts per day for each sample is shown in the table. Using the information given, what is the best estimate of the mean number of texts sent per day by students of this school? Give the answer to the nearest whole number.

Sample number	1	2	3	4	5
Mean number of texts	15.2	6.8	9.4	12.8	11.6

- 1** The table below shows the monthly and annual rainfall for Sydney (Observatory Hill) from 2002 to 2011. Measurements are to the nearest millimetre.

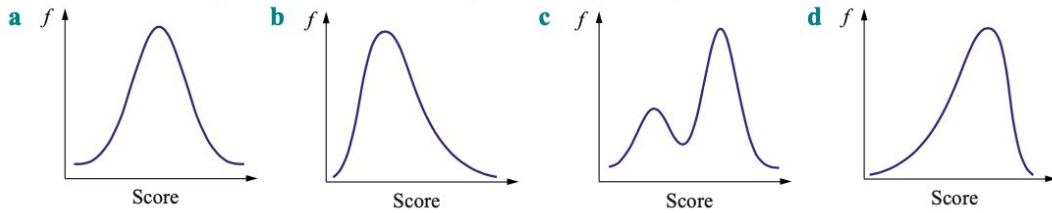
Rainfall for Sydney (mm)

Year	J	F	M	A	M	J	J	A	S	O	N	D	Annual
2002	98	348	45	68	93	28	24	20	22	6	32	75	860
2003	14	59	132	192	349	76	58	43	6	103	109	60	1200
2004	51	129	101	33	8	39	44	153	60	234	67	76	995
2005	68	125	154	33	48	79	63	2	51	43	125	25	816
2006	121	51	40	10	40	177	140	86	192	17	45	74	994
2007	45	108	65	180	10	511	67	152	41	27	170	123	1499
2008	57	258	63	147	3	127	90	44	99	67	73	54	1083
2009	25	128	61	153	126	130	53	6	16	180	13	67	956
2010	36	239	51	30	168	147	115	27	42	85	130	83	1154
2011	54	18	192	206	136	94	282	52	72	37	148	78	1369

- a** In this time period, in which year was the annual rainfall:
- i** highest? **ii** lowest?
- b** How much rain fell in:
- i** July 2006? **ii** June 2007?
- iii** October 2011?
- c** Which month had the highest rainfall in:
- i** 2006? **ii** 2011?
- d** Which month had the lowest rainfall in:
- i** 2005? **ii** 2008?
- e** Which year had the wettest:
- i** February? **ii** June?
- iii** October?
- f** Which year had the driest:
- i** January? **ii** June?
- iii** December?



- 2 State whether the shape of each distribution is symmetrical, positively skewed, negatively skewed or bimodal.



- 3 The numbers of goals per match scored by two soccer teams are shown in the tables below.

Team A

Number of goals	Number of matches
0	6
1	8
2	4
3	0
4	2

Team B

Number of goals	Number of matches
0	3
1	5
2	6
3	4
4	2

- a Display this information in:
- a back-to-back histogram
 - a parallel dot plot.
- b Comment on the shape of each distribution.
- c Compare the mean, median and range for these two distributions.
- d Which team do you think performed better?

Ratio and Rates

- Express the ratio 25 min : $1\frac{1}{4}$ h in simplest form.
- Which of the following is equivalent to 3 : 5?

A 21 : 36

B 45 : 75
- Find x if $\frac{4}{x} = \frac{7}{5}$.
- Simplify the following ratios.

a 25 cm : 0.6 m

b 360 m : 0.5 km

- 5** The ratio of teachers to students is 2 : 11. Calculate the number of students if there are 10 teachers.
- 6** A scalene triangle has side lengths in the ratio 2 : 5 : 4.
a If the shortest side is 12.4 cm, find the lengths of the other two sides.
b Calculate the perimeter of the triangle.
- 7** Ian jogs 3.5 km in 20 minutes. Express this as a rate of km/min.
- 8** Which is the better buy, A or B?
A 1.2 L of Fizz Whiz Cola at \$1.05 **B** 2.5 L of Fizz Whiz Cola at \$2.20
- 9** The scale of a model aeroplane is 1 : 120. If the wingspan of the model is 17 cm, calculate the actual wingspan of the real aeroplane.
- 10** The actual height of a building is 825 m. If a model of the building is constructed using a scale of 1 : 1500, calculate the height of the model.

Index laws

- 1** Write the following in index form.
a $7 \times 7 \times 7 \times 7 \times 7$ **b** $9 \times 9 \times 9 \times 9 \times 9 \times 9 \times 9$
c $2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2$ **d** $10 \times 10 \times 10$
- 2** Write the base and index of each number.
a 3^8 **b** 5^2 **c** 8^4 **d** 6^0
- 3** Write the following in expanded form.
a 6^4 **b** 7^3 **c** 6^2 **d** 5^7
- 4** Evaluate:
a 2^9 **b** 3^6 **c** 5^4 **d** 7^3
- 5** Simplify, leaving your answers in index form.
a $3^{10} \times 3^3$ **b** $(7^2)^6$ **c** $4^{10} \div 4^5$ **d** $6^{12} \div 6$ **e** $(2^5)^4 \times 2^{10}$
- 6** Determine whether these calculations are true or false.
a $4^5 \times 2^6 = 8^{11}$ **b** $5^7 \div 5^3 = 1^4$ **c** $4^7 \times 3^4 = 12^{11}$ **d** $15^8 \div 3^2 = 5^6$
- 7** Evaluate:
a 6^2 **b** 6^1 **c** 6^0 **d** $(7^2)^0$
- 8** Simplify:
a $a \times a \times a$ **b** $6 \times r \times r \times r \times r \times r$ **c** $x \times x \times y \times y \times y \times y$
- 9** Expand:
a t^2 **b** $5a^4$ **c** p^6 **d** $15e^5$
- 10** If $a = 3$, evaluate:
a a^2 **b** $4a^2$ **c** $(4a)^2$ **d** $4a^0$

1 Write each in index form.

a $2 \times 2 \times 2 \times 2 \times 2$

b $5 \times 5 \times 5 \times 5 \times 5$

2 Write the base of each number.

a 9^7

b 5^{11}

3 Write each number in expanded form.

a 5^3

b 6^7

4 Use a calculator to evaluate each number.

a 2^9

b 6^5

5 State whether the following are true or false.

a $3^4 \times 2^7 = 6^{11}$

b $8^{10} \div 4^2 = 2^5$

6 Simplify each of the following, leaving the answer in index form.

a $5^{12} \times 5^{16}$

b $(4^5)^2$

c $2^8 \div 2^5$

d $7^6 \times 7$

e $5^6 \times 5^3 \div 5^9$

7 Write the meaning of:

a 2^{-6}

b $5^{\frac{1}{2}}$

c $11^{\frac{1}{3}}$

8 Evaluate:

a 5^{-2}

b $16^{\frac{1}{2}}$

c $8^{\frac{1}{3}}$

d 17^0

9 Simplify:

a $y^{10} \times y^5$

b $k^{11} \div k^6$

c $(p^7)^3$

d $\frac{f^7 \times f^7}{f^3 \times f^5}$

e $(5m^4)^2$

f $3a^5b^3 \times 2ab^7$

10 Evaluate:

a v^0

b $6v^0$

c $(6v)^0$

d $6v^0 + 1$

11 Write the meaning of:

a $x^{\frac{1}{2}}$

b $5x^{\frac{1}{2}}$

c $(5x)^{\frac{1}{2}}$

d $x^{\frac{1}{3}}$

e $5x^{\frac{1}{3}}$

12 Write the meaning of:

a z^{-3}

b $3z^{-3}$

c $(3z)^{-3}$

13 Simplify:

a $y^{-3} \times y^7$

b $e^6 \div e^{-3}$

c $(n^{-4})^4$

d $6b^{-2} \times 3b^8$

e $4k^{-5} \div 2k^{-5}$

14 State whether the following are true or false.

a $4q^0 = 4$

b $a^6 \div a^8 = a^2$

c $6m^5 \div 2m^5 = 3m$

d $5b^{-2} = \frac{5}{b^2}$

e $4q^{\frac{1}{2}} = 2\sqrt{q}$

15 Expand:

a $6(2v - 4w)$

b $a^3(2a^2 + 3a)$

c $-3(5x + 2)$

16 Expand and simplify:

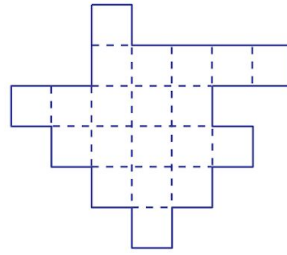
a $6(m - 2) + 5(2m + 5)$

b $4(3a - b) - (2a - b)$

Fractions Decimals and percentages

1 Shade $\frac{7}{10}$ of this diagram.

2 In a class of 20 students, $\frac{1}{4}$ play soccer, $\frac{1}{5}$ play netball and the remainder play football. What fraction of the class plays football?



4 a Complete: $\frac{155}{\square} = \frac{31}{20}$

b Simplify $\frac{175}{240}$.

5 Arrange in descending order: $\frac{4}{5}, \frac{8}{15}, \frac{2}{3}$

6 a State the reciprocal of $2\frac{2}{3}$.

b Calculate $\frac{3}{8}$ of 592 kg.

7 Liam earns \$600 per week. He banks $\frac{1}{5}$, spends $\frac{2}{3}$ on rent and food, and keeps the remaining money for personal use.

a How much does Liam bank each week?

b How much does he spend weekly on rent and food?

c What fraction of Liam's weekly wage is for personal use?

d How much is kept for personal use?

8 State the value of 2 in 4.0203.

9 Express $8 + \frac{3}{10} + \frac{7}{1000}$ as a decimal.

10 a Write 4.2 as a mixed numeral.

b Write $3\frac{3}{8}$ as a decimal.

11 Express $\frac{1}{6}$ as a decimal correct to 2 decimal places.

12 a Round 3.854 44 to the nearest hundredth.

b Round 3.5217 to the nearest whole number.

13 Simplify the following.

a $12.6 - 11.8 + 3.84$

b $15.5 \div 0.05 + 22.4$

c $16.2 \div 2 + 5.7 - 1.9$

14 Simplify the following.

a $(2.1 + 3) \times (11.9 - 5.9)$

b $(10.3 - 8.7) + (0.4 \times 9)$

15 a Ahmed earns \$4.60 per hour. How much does he earn if he works for $10\frac{1}{2}$ hours?

b Sylvanna won \$1 216 320 in a lottery. She decided to share it equally between eight people. How much did each person receive?

16 Shade 75% of this diagram.



17 Write 48 out of 100 as a percentage.

18 a Convert 37% to a fraction.

b Convert 57% to a decimal.

19 Express the following as percentages.

a 3.8

b $\frac{5}{8}$

20 Convert to percentages and arrange in ascending order: $\frac{4}{5}, 70\%, 0.65$

21 Convert:

a $\frac{27}{100}$ to a percentage

b 15% to a simplified fraction

c 425% to a decimal.

22 a Calculate 15% of \$360.

b Find 25% of 48 m.

23 Express 13 kg as a percentage of 52 kg.

24 a Increase 100 by 30%.

b Decrease 320 by 25%.

Number

- 1** Write the following numbers in scientific notation.
- a** 23 000 000 000 **b** 0.000 052
- 2** Write the following as ordinary numbers.
- a** 9.8×10^7 **b** 3.7×10^{-9}
- 3** Explain why $4 \times 10^5 \neq 4^5$.
- 4** Use your calculator to evaluate the following, leaving the answer in scientific notation.
- a** $(3.4 \times 10^4) \times (4.8 \times 10^9)$ **b** $(5.6 \times 10^{10}) \div (3.5 \times 10^5)$
c $(4 \times 10^9)^5$ **d** $\sqrt{2.25 \times 10^{16}}$
- 5** Write the following numbers in order from smallest to largest.
 3.8×10^{15} , 4.6×10^{13} , 7.7×10^{-16} , 3.1×10^{-12}
- 6** Write the value of the digit 7 in each of the following numbers.
- a** 753.6 **b** 1407.2 **c** 76.45 **d** 7564
- 7** Round:
- a** 3470 to the nearest hundred **b** 7956 to the nearest ten
c 37.5 to the nearest whole number **d** 69 900 to the nearest thousand.
- 8** Round 7.2681 to:
- a** 1 decimal place **b** 2 decimal places **c** 3 decimal places.
- 9** Round:
- a** 4.288 correct to 2 decimal places **b** 39.97 correct to 1 decimal place.
- 10** A number was rounded to the nearest 10 and the answer was 50.
- a** What is the smallest the number could have been?
b What is the largest the number could have been? Discuss.
c Write a mathematical statement that shows the range of possible numbers.
- 11** Write the first significant figure in each of the following numbers.
- a** 160 **b** 3.201 **c** 0.006 51
- 12** Round 67.30591 to the following number of significant figures.
- a** 1 **b** 2 **c** 3 **d** 4 **e** 5
- 13** How many significant figures are there in each of the following numbers?
- a** 957 **b** 0.03 **c** 7.500 **d** 0.0035 **e** 142 000
- 14** Explain the difference between measurements of 4.65 m and 4.650 m.
- 15** How many nanowatts in 3.6 milliwatts?
- 16** Convert 43 000 metres to:
- a** kilometres **b** megametres.
- 17** The time taken for a student to complete a task in an aptitude test was measured to be 21 s.
- a** Find the limit of reading of the measuring instrument used.
b Determine the greatest possible error in the measurement.
c What are the limits of accuracy of the measurement?
d Write a mathematical statement that shows the range of values within which the true time lies.

- 1** Dan earns \$423.76 per week. How much does he earn per:
a fortnight? **b** year? **c** month?
- 2** Convert a salary of \$54 700 p.a. to the equivalent salary per:
a week **b** fortnight **c** month.
- 3** Olivia works a 36-hour week and is paid \$25.40 per hour. How much does she earn for a week in which she works an additional 6 hours at time-and-a-half and 2 hours at double time?
- 4** Terry earns \$710 per week. He is entitled to 4 weeks annual leave and receives an additional holiday loading of 17.5%. Calculate his total pay for this holiday period.
- 5** Joanne sews buttons on shirts in a clothing factory. She is paid \$0.33 per shirt. Calculate her income for a week in which she completed the following number of shirts: Monday 172, Tuesday 189, Wednesday 203, Thursday 194 and Friday 188.
- 6** Benita sells printers. She is paid a retainer of \$180 per week plus a commission of 1.5% of sales. How much does she earn in a week in which her sales are \$33 240?
- 7** Dennis works as a casual in a coffee shop. He gets paid \$19.40 for any hours worked from Monday to Friday, \$24.27 per hour for Saturdays and \$25.36 for Sundays. Calculate how much he earns for a week in which he works 10 hours between Monday and Friday, 4 hours on Saturday and 6 hours on Sunday.
- 8** John's gross weekly income is \$752 per week. The deductions from his salary each week are tax \$126, superannuation \$36.78, health insurance \$41.20 and savings \$50. Calculate his take-home pay each week.
- 9** Calculate the simple interest on \$15 000 if it is invested at 6% p.a. for:
a 3 years **b** 15 months.
- 10** An electrical goods store offers a discount of 14% for cash purchases. Find the cash price of a toaster marked at \$67.
- 11** List the advantages and disadvantages of using a credit card to purchase goods.
- 12** An outdoor furniture setting costing \$1788 can be bought on terms for \$300 deposit and 24 monthly instalments of \$90.04.
a Calculate the cost of buying the furniture on terms.
b How much interest is paid?
- 13** A washing machine costing \$1598 can be bought on the following terms: deposit \$200, the balance to be repaid over 2 years by 24 equal monthly repayments. Simple interest is charged on the balance at 15% p.a. Calculate:
a the balance owing
b the interest charged on the balance owing
c the monthly repayment.

Algebra

- 1** Simplify:
- a** $9x + 5x$ **b** $7y - y$ **c** $3a^2 + 4a^2$ **d** $9ac - 3ca$
- 2** Simplify:
- a** $5 \times 12n$ **b** $-5 \times 2a$ **c** $8m \times 3$ **d** $-5p \times -7$
- 3** Simplify:
- a** $10a \div 2$ **b** $12m \div -3$ **c** $\frac{abc}{a}$ **d** $\frac{12m}{3}$
- 4** Simplify:
- a** $4wx + 2y - 5xw - 5y$ **b** $6m + 2m - 8m$
- 5** Simplify:
- a** $\frac{4a}{7} + \frac{a}{7}$ **b** $\frac{a}{3} - \frac{a}{5}$ **c** $\frac{q}{5} \times q$ **d** $6p \div 2p$
- 6** Expand:
- a** $a(a - n)$ **b** $mn(2n - 5)$ **c** $4p(3p + 2)$ **d** $-2p(4y - 2w)$
- 7** Expand and simplify:
- a** $3(5a + 3) - 4(8 - 4a)$ **b** $3x(y - 4) + 4y(5x - 2)$
- 8** Factorise:
- a** $mn^2 + mn$ **b** $pq - aq$ **c** $4p - 12d$ **d** $25f - 15$
- 9** Factorise each by taking out a negative factor.
- a** $-3k + 9$ **b** $-4p - 12d$
- 10** Define the following terms.
- a** pronumeral **b** coefficient
- 11** If $Q = 7$ and $p = -4$, evaluate:
- a** $4Q + p$ **b** $\frac{Qp}{8}$ **c** $6p - 5Q$ **d** $3(Q - p) + 7p - 8Q$
- 12** Write an algebraic expression for each.
- a** The product of six and d plus twenty-three
- b** The difference between x and seven multiplied by three and the result divided by eight

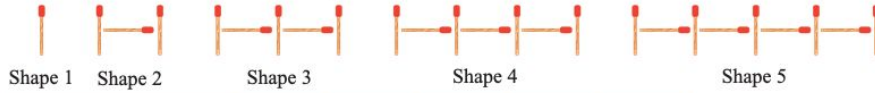
- 1** Show each step required to get from the expression $4x + 12$ back to x .
- 2** Solve the following equations.
- a** $x + 11 = 17$ **b** $x + 9 = -6$ **c** $4x = 36$ **d** $-9x = 63$
- e** $3y + 18 = 29$ **f** $5 - 4p = -47$ **g** $4d + 8 = 3d - 12$ **h** $18 + 7c = 32 - 3c$
- i** $3(m + 6) = 2(m - 1)$ **j** $8(q - 5) = -3(10 + 3q)$
- 3** Solve the following equations.
- a** $\frac{4p}{5} = 6$ **b** $\frac{3x + 12}{7} = 12$
- 4** Is the given value for the pronumeral a solution to the equation?
- a** $5d + 12 = 28$; $d = 3$ **b** $\frac{x}{5} + 7 = 24$; $x = 3\frac{2}{5}$
- 5** Write an equation and solve this problem.
The sum of a certain number and 23 is 114. What is the number?
- 6** Solve the following inequations.
- a** $x + 9 \geq -3$ **b** $\frac{m}{7} < 4$

1 Plot these points on a number plane: $A(0, -3)$, $B(-2, -3)$, $C(3, -4)$, $D(-3, 2)$, $E(2, 5)$

2 a Plot the points $A(-3, 6)$, $B(3, 6)$ and $C(3, 0)$.

b If $ABCD$ is a square, find the coordinates of point D .

3 a Use this pattern of matches to complete the table.



Shape number	1	2	3	4	5
Number of matches					

b Write a rule describing the number of matches required to make each shape.

c Using x to represent the shape number and y to represent the number of matches, write a set of coordinate points describing this information.

d Graph these points on a number plane.

e Mark in the next two points and write their coordinates.

4 Bulk 'minute steak' for barbecues is sold for \$7.50 per kilogram with a minimum purchase of 2 kg. The following table shows weight versus cost for various quantities of minute steak.

Weight (kg)	2	4	6	10	20
Cost (\$)	15	30	45	75	150

a Using x to represent the number of kilograms and y to represent the cost in dollars, write a set of coordinate points describing this information.

b Graph these points on a number plane and draw a straight line through them.

c Use the graph to find how much 16 kg of minute steak would cost.

d Use the graph to find how much minute steak could be purchased for \$90.

5 Complete the table and draw the graph of $y = 2x - 3$.

x	-2	-1	0	1	2
y		-5			1

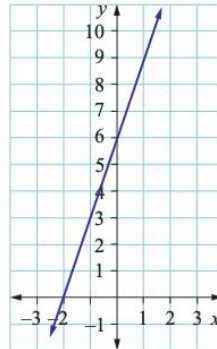
6 The graph on the right shows a straight line.

a Use the graph to complete this table of values.

x	-2	-1	0	1
y				

b Write the rule describing this straight line.

The rule is of the form $y = \square x \pm \Delta$.



1 Solve for x .

a $4 - 7x = 4$

b $\frac{x}{5} = -3$

c $\frac{x}{7} + 3 = -5$

d $\frac{3x - 2}{5} = 4$

2 If $y = \frac{3x - 5}{2}$ find:

a y when $x = \frac{1}{3}$

b x when $y = \frac{7}{2}$

3 If $y = 6 - 5(4 - x)$, find x when $y = 0$.

4 Solve:

a $-2(4x + 3) = 17$

b $7(3t + 1) = t - 4$

c $7(3p - 7) = 4(1 - p)$

d $x - 5(2x + 1) - 3 = 2$

e $\frac{4}{3} = \frac{x}{7}$

f $\frac{1}{4}(3x - 1) = -11$

g $\frac{3 - 4x}{3} = \frac{x + 5}{4}$

h $\frac{3x - 4}{3} - \frac{2 - 4x}{5} = 1$

i $\frac{x + 1}{5} + x = \frac{3 - x}{3} + 2$

5 Solve these problems.

a When 12 is added to twice a number, the answer is 10. Find the number.

b If a number is decreased by 3 then multiplied by 5, the result is 1 more than three times the number. Find the number.

6 The velocity of an object is given by $v^2 = u^2 + 2as$.

a Find v when $u = 10$, $a = -5$ and $s = 2$.

b Find u when $v = 20$, $a = 5$ and $s = 12$.

7 Solve:

a $x - 4 > 5$

b $-3x > 12$

c $4 - 3x \leq -7$

d $\frac{x}{3} + 3 \geq 0$

e $\frac{4 - 3x}{2} \geq 3$

f $6 - x \geq 5 - 4(x - 1)$