

Student Name

Mathematics Stage 5 Core

NUMBERS OF ANY MAGNITUDE

Book 3 Estimate and round numbers to a
specified degree of accuracy

Version: 260207

Report mistakes & suggest improvements:
<https://MrDingMaths.com>

CONTENTS

Overview	2
Significant Figures.....	3
Check Your Understanding	9

OVERVIEW

SYLLABUS CONTENT

MA5-MAG-C-01 solves measurement problems by using scientific notation to represent numbers and rounding to a given number of significant figures

Estimate and round numbers to a specified degree of accuracy

- Apply the language of estimation appropriately, including the terms *rounding*, *approximate* and *level of accuracy*
- Round numbers to a specified number of significant figures
- Examine the effect that truncating or rounding during calculations has on the accuracy of the results

REVIEW OF PRIOR KNOWLEDGE

1 Round these numbers.

a 738
nearest 10

b 9115
nearest 10

c 48 799
nearest 100

d 995
Nearest 100

e 9.871
nearest tenth

f 14.2129
nearest hundredth

g 9.8742
to 2 d.p.

a 509.493
to 1 d.p.

h 49.089
nearest whole

SIGNIFICANT FIGURES

- **Significant figures** are meaningful digits in a number.
- It's impossible to cut a piece of timber to a length of 1.333 333... m.
- The digits after a certain figure, or digit, are meaningless.
- **Rules for significant figures:**
 1. The first significant figure is the first non-zero digit (reading from left to right).
 2. All non-zero digits are significant.
 3. Zeros between non-zero digits are significant.
 4. Zeros on the end of a decimal are significant.
 5. Zeros on the end of a whole number *may* be significant.
Treat them as significant until we learn scientific notation.

1st non zero digit from left.
So 7 is the 1st significant figure

↓

0.0075836

↑ ↑

2nd significant figure 3rd significant figure

Example Identify the number of significant figures.

Determine how many significant figures in each number.			
a 456	i 0.04	q 1.45006	y 4.00067
3	1	6	6
b 450	j 0.004	r 450067	z 0.00067
3	1	6	2
c 406	k 0.00456	s 45067	aa 0.0067
3	3	5	2
d 400	l 0.456	t 4506.7	bb 6.0007
3	3	5	5
e 40	m 0.406	u 450.67	cc 0.6007
2	3	5	4
f 4	n 0.450	v 45.067	dd 0.0607
1	3	5	3
g 0.4	o 0.4500	w 45.0067	ee 1.06070
1	4	6	6
h 0.40	p 0.45006	x 4.50067	ff 1.060700
2	5	6	7

ROUNDING TO A SIGNIFICANT FIGURE

- To round to n significant figures:
 1. Identify the n th significant figure.
 2. Determine the place value of this digit.
 3. Round to this place value.

Example Round numbers to a specific number of significant figures.

Round 56718 to one significant figure. 1. The first significant figure is digit 5, 2. representing ten thousand. 3. We round to the nearest ten thousand. $56718 \approx 60000$ (1 s.f.)	Round 0.0068463 to two significant figures. 1. The 2nd significant figure is digit 8, 2. the 4th decimal place. 3. We round to the 4th decimal place. $0.0068463 \approx 0.0068$ (2 s.f.)
--	---

Round these numbers to the required significant figures.

a 428.3 (1 s.f.) 1 st significant figure: Round to nearest 428.3 $\approx$ (1 s.f.) 400	b 629.51 (3 s.f.) 3 rd significant figure: Round to nearest 629.51 $\approx$ (3 s.f.) 630	c 6103 (2 s.f.) 2 nd significant figure: Round to nearest 6103 $\approx$ (2 s.f.) 6100
d 0.005072 (2 s.f.) 0.0031	e 0.03926 (3 s.f.) 0.0393	f 0.56201 (2 s.f.) 0.56

Key ideas

1. For numbers based on measurements. Not all digits have meaning, due to the limits of
2. Only digits with meaning are written. These digits are called figures.

1 Decide how many significant figures are in these quantities.

a 1.234	b 0.001
4	1
c 1.2	d 0.012
2	2
e 1002	f 1.023
4	4
g 3.07	h 0.200
3	3

2 Complete the following to round 28.470 58 to the given level of accuracy.

a 1 s.f.	b 2 s.f.	c 3 s.f.
1 st significant figure: 2	2 nd significant figure:	3 rd significant figure:
Round to nearest ten	Round to nearest	Round to nearest
28.470 58 $\approx$ (1 s.f.)	28.470 58 $\approx$ (2 s.f.)	28.470 58 $\approx$ (3 s.f.)
30	28	28.5

3 Complete the following to round 0.037 09 to the given level of accuracy.

a 1 s.f.	b 2 s.f.	c 3 s.f.
1 st significant figure:	2 nd significant figure:	3 rd significant figure:
Round to nearest	Round to nearest	Round to nearest
0.037 09 $\approx$ (1 s.f.)	0.037 09 $\approx$ (2 s.f.)	0.037 09 $\approx$ (3 s.f.)
0.04	0.037	0.0371

4 Seb rounds 7382 to 1 significant figure. He says:



The answer is 7000. It was the same as rounding to the nearest 1000.

Explain why rounding to 1 significant figure is not always the same as rounding to the nearest 1000. Give an example.

First significant figure is not always thousands.

For example: 81, the first significant figure is 8, which is tens.

Round each of these numbers to 1 significant figure.

a 47 381	b 4738.1	c 473.81
50 000	5000	500
d 47.381	e 4.7381	f 0.47381
50	5	0.5

5 Round the following:

a 4 170 162

Sig Figs	Rounded
1	4 000 000
2	4 200 000
3	4 170 000
4	4 170 000

b 0.003 661 2

Sig Figs	Rounded
1	0.004
2	0.003 7
3	0.003 66
4	0.003 661

c 24.8706

Sig Figs	Rounded
1	20
2	25
3	24.9
4	24.87

6 Write these numbers correct to the number of significant figures indicated.

a 1 561 231 (2 s.f.)

1 600 000

b 3677 720 (4 s.f.)

3 678 000

c 789 001 (5 s.f.)

789 000

d 3 300 000 (1 s.f.)

3 000 000

e 777 777 (3 s.f.)

778 000

f 3194 729 (5 s.f.)

3 194 700

g 0.0035 (1 s.f.)

0.004

h 0.191 785 (4 s.f.)

0.1918

i 0.001 592 (3 s.f.)

0.001 59

j 0.111 222 (5 s.f.)

0.111 22

k 0.000 0271 (1 s.f.)

0.000 03

l 0.019 832 (5 s.f.)

0.019 832

7 Most questions will ask you to round to either 2 decimal places or 3 significant figures. For each of these numbers, round to 2 decimal places and to 3 significant figures.

	2 d.p.	3 s.f.
a 17.962	17.96	18.0
b 1.4638	1.46	1.46
c 47.859	47.86	47.9
d 804.5272	804.53	805
e 500.5749	500.57	501
f 821.2749	821.27	821
g 5810.2539	5810.25	5810
h 0.02389	0.02	0.0239
i 0.01537	0.02	0.0154

8 Round to 2 sf.

a 32	e 36.8	i 0.000 003 68	m 4.900 093 68
b 320	f 3.68	j 0.000 013 68	n 490 009 368
c 328	g 0.368	k 4.000 013 68	o 4 900 093 680
d 368	h 0.0368	l 4.000 093 68	p 4 090 009 368

9 Work out each of these on your calculator. Round each answer to 2 significant figures.

a 1.89×319.175	b $\sqrt{3} \times \sqrt{2}$	c 195×4.3	d $\frac{2355 \times 978}{1.95}$
600	2.4	840	1 200 000

10 The number $5 \square 3$ is rounded to 1 significant figure. The answer is 600.
What could the original number have been?

Any digit 5 to 9

11 A number rounded to 1 significant figure is 100 000.
The same number rounded to 2 significant figures is 100 000.
The same number rounded to 3 and to 4 significant figures is also 100 000.
What could the number be?

99999 (many possible answers)

12 By rounding each number to 1 significant figure, estimate the answers to these calculations.

a 58×72	b 7.3×9.6	c 88^2	d $512 \div 4.78$
4200	70	8100	100

13 The speed of light in a vacuum is 299 792 458 m/s. Round this number to:

a 1 s.f.	b 2 s.f.	c 3 s.f.
300 000 000	300 000 000	300 000 000
d What do you notice?		

They're the same

14 2016 HSC Standard 2 Band 4

What is 208.345 correct to two significant figures?

- A. 208
- B. 210
- C. 208.34
- D. 208.35

B

15 2022 HSC Standard 1

The area (A) of a circle is given by the formula $A = \pi r^2$, where r is the radius.

What is the value of A , correct to three significant figures, if $r = 3.55$?

- A. 39.5
- B. 39.6
- C. 39.591
- D. 39.592

B

16 2014 HSC Advanced Band 3

What is the value of $\frac{\pi^2}{6}$ correct to 3 significant figures?

- A. 1.64
- B. 1.65
- C. 1.644
- D. 1.645

A

CHECK YOUR UNDERSTANDING

Significant figures

1	What is the second significant figure: 0.0427						
a	First 0	b	Second 0	c	4	d	2
2	Round 23.157 to 1 significant figure.						
a	2	b	23.2	c	23	d	20
3	Round 0.047 to 1 significant figure.						
a	0.04	b	0.0	c	0.1	d	0.05
4	Round 98.21 to 1 significant figure.						
a	90	b	100	c	9	d	98.2
5	Round 5352 to 2 significant figures.						
a	5000	b	5400	c	5300	d	53
6	Round 6.07802 to 2 significant figures.						
a	6.10	b	6.1	c	6.08	d	6.0
7	Round 5.0986 to 3 significant figures.						
a	5.10	b	5.1	c	5.099	d	5.00
8	Which of these numbers is the same when rounded to decimal places AND two significant figures?						
a	23.725	b	0.391	c	0.038	d	0.0599