Learning Recovery

Maths – KS3

WRITE ANSWERS ON LINED PAPER

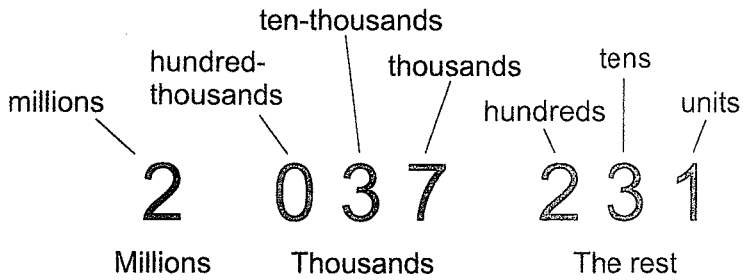
DO NOT WRITE IN THE BOOK

Section 1 — Numbers and Arithmetic

1.1 Place Value and Ordering Numbers

Place Value

You can split numbers up into columns.
The digit in each column tells you how many of each thing you have:



Big numbers are written with their numbers in groups of three, where each group shows millions, thousands, etc. This makes large numbers easier to read.

Example 1 **Write down the value, in words and as a number, of each digit in 2 730 491.**

Write down how many you have in each column.

Then write each digit...	...in words...	...and as a number.
1 unit	one	1
9 tens	ninety	90
4 hundreds	four hundred	400
0 thousands	zero	0
3 ten-thousands	thirty thousand	30 000
7 hundred-thousands	seven hundred thousand	700 000
2 millions	two million	2 000 000

Exercise 1

1 For each of the following numbers, write down in numbers the value of the digit in:

i) the tens column **ii)** the thousands column **iii)** the hundred-thousands column

a) 1 283 458	**b)** 2 432 042	**c)** 7 263 982	**d)** 8 008 761
e) 9 920 675	**f)** 6 309 183	**g)** 3 792 023	**h)** 4 802 811
i) 7 865 201	**j)** 9 210 399	**k)** 1 621 307	**l)** 5 759 034

2 Write down the value of the underlined digit in the following numbers:

i) as a number	ii) in words		
a) 5 2<u>3</u>1 099	**b)** <u>8</u> 279 708	**c)** 3 954 <u>0</u>28	**d)** 5 112 3<u>8</u>2
e) 7 44<u>3</u> 028	**f)** 4 00<u>8</u> 271	**g)** 1 <u>4</u>95 221	**h)** 2 1<u>9</u>2 110
i) 6 926 77<u>3</u>	**j)** 3 302 <u>2</u>89	**k)** <u>6</u> 828 362	**l)** 8 3<u>5</u>2 447

3 Write down, in numbers, the value of each digit in the following numbers.

a) 203	**b)** 810	**c)** 3921	**d)** 1987
e) 63 291	**f)** 80 373	**g)** 797 634	**h)** 28 977
i) 921 337	**j)** 818 752	**k)** 2 871 354	**l)** 7 620 931

Example 2 **Write the amount £4829309 in words.**

1. First, split the number up into groups of three.
   Start on the right-hand side
   of the number and move left,
   putting a space every three numbers. £4 829 309
2. Then read each group from left to right. £ 4 million, 829 thousand, 309
3. Write the number out fully in words. **Four million, eight hundred and twenty nine thousand, three hundred and nine pounds.**

Exercise 2

1 Write each of these numbers in words.

a) 15298	**b)** 40291	**c)** 82179	**d)** 74331
e) 23005	**f)** 25221	**g)** 10281	**h)** 55501

2 Write each of these numbers in words.

a) 452123	**b)** 605128	**c)** 391407	**d)** 515398
e) 933148	**f)** 295341	**g)** 709382	**h)** 351922
i) 121445	**j)** 678144	**k)** 366121	**l)** 892153

3 Write each of these numbers in words.

a) 1163720	**b)** 2810278	**c)** 6201827	**d)** 7277260
e) 6271029	**f)** 4482910	**g)** 1009275	**h)** 5997165
i) 1321992	**j)** 7392014	**k)** 9371720	**l)** 5009801
m) 8109200	**n)** 6211315	**o)** 8900003	**p)** 1628102

4 Write each of these values in numbers.

a) Twelve thousand, three hundred and ninety-seven.

b) Eight hundred and seventy-four thousand, two hundred and nine.

c) Six million, one hundred and sixty-three thousand, five hundred and eleven.

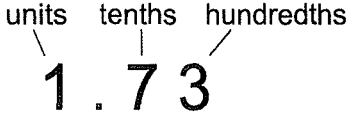
d) Four million, seven hundred and thirteen thousand and nine.

5 Harriet is filling out a cheque for £9703109. What is this amount in words?

6 Benjamin is writing a cheque for £88600531. What is this amount in words?

Investigate — Place Value in Decimals

As with whole numbers, decimal numbers can be split up into columns called decimal places:



a) Look at the number. The first two decimal columns are labelled. Use what you know about the names of the columns in whole numbers to label the column that would come next.

b) Think about the number 1.7324. What would you call the column that the 4 is in?

c) Write out a number with 5 decimal places and label each column.

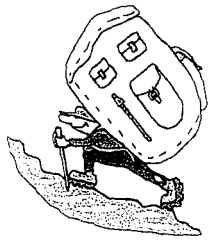
d) How many decimal places would a number with a digit in the 'millionths' column have? Write out a number with a 'millionths' column.

e) What is the value of the 3 in the number 0.0000003 in words?

f) Write out some more decimal numbers. Find the value of each digit in each one.

Ordering Numbers

Example 3



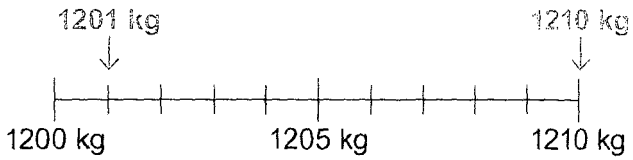
a) Which amount is larger, 1201 kg or 1210 kg?

Compare the digits in each number column by column, moving left to right, until one has a larger digit than the other.

1. Start by comparing the number in the thousands column: 1201 and 1210 both have 1 thousand
2. Compare the digits in the hundreds column: 1201 and 1210 both have 2 hundreds
3. Compare the digits in the tens column: 1201 has a 0 in this column. 1210 has a 1 in this column, so is larger.
4. You can use the < or > signs to show which number is bigger. The wide end of the symbol goes next to the larger number: 1201 kg < 1210 kg

b) Put the two masses onto the number line shown.

1. Work out what each dash on the number line represents. There are **10** spaces between 1200 kg and 1210 kg. So each dash represents: (1210 – 1200) ÷ **10** = 10 kg ÷ **10** = 1 kg
2. Write the masses on the number line in the correct places.



Exercise 3

1 Use the < and > symbols to show which amount in each pair is larger.

a) 16 kg , 61 kg **b)** 94 s, 98 s **c)** 54 g, 45 g **d)** 91 ms, 97 ms

e) 186 ml, 168 ml **f)** 212 cm, 218 cm **g)** 336 g, 332 g **h)** 721 m, 712 m

2 Use the < and > symbols to show which amount in each pair is larger.

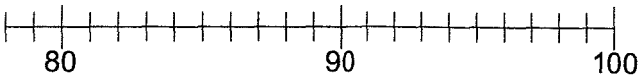
a) 1665 m, 1766 m **b)** 1108 kg, 1208 kg **c)** 1302 m, 1392 m **d)** 9302 ml, 9120 ml

e) 6251 s, 6250 s **f)** 8006 ml, 8010 ml **g)** 1312 g, 1310 g **h)** 2221 kg, 2220 kg

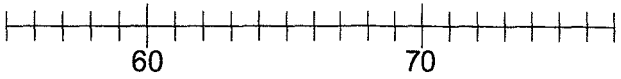
i) 8910 m, 8911 m **j)** 5200 s, 5201 s **k)** 7721 kg, 7228 kg **l)** 2188 m, 2186 m

3 Write each set of numbers on a copy of the number line shown.

a) 98, 97, 79

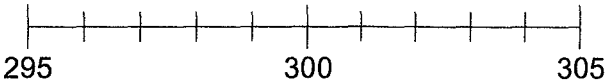


b) 75, 55, 77

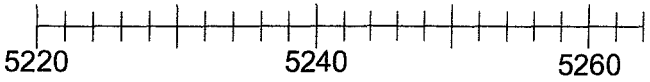


c) 192, 198, 182

d) 298, 303, 301



e) 5262, 5226, 5254



Example 4 **Put the following numbers in order from smallest to largest: 68, 128, 487, 26, 1921, 1829, 287, 3**

1. Sort the numbers into groups based on how many digits they have.

1 digit	2 digits	3 digits	4 digits
3	68	128	1921
	26	487	1829
		287	

2. Then put each group in order by comparing the digits in the columns, going from left to right.

Increasing size →

↓			
3	26	128	1829
	68	287	1921
		487	

3. Write out the full list in order.

3, 26, 68, 128, 287, 487, 1829, 1921

4 Write these sets of numbers in order from smallest to largest.

a) 61, 67, 76, 62, 55, 70

b) 42, 44, 60, 4, 58, 56

c) 52, 25, 5, 22, 2, 50

d) 112, 132, 110, 100, 111, 131

e) 162, 182, 172, 77, 180, 167

f) 77, 176, 171, 172, 161, 69

5 Write these sets of numbers in order from smallest to largest.

a) 7161, 7511, 620, 51, 665, 621, 49, 734

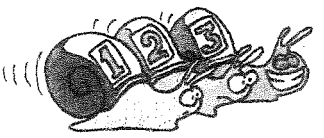
b) 182, 889, 1882, 18, 84, 1880, 8, 6

c) 6, 90, 68, 1921, 6621, 6667, 9, 66

d) 163, 3, 1921, 662, 31, 1633, 166, 168

1.2 Addition and Subtraction

Adding Whole Numbers



Example 1 **Work out 1129 + 238.**

1. Write out one number above the other, making sure the units columns line up.

$$\begin{array}{r} 1\,1\,2\,9 \\ +\ \ 2\,3\,8 \\ \hline \end{array}$$

2. Add the columns from right to left. Start with the units. $9 + 8 = 17$ Carry the '1' into the tens column.

$$\begin{array}{r} 1\,1\,2\,9 \\ +\ \ 2\,3\,8 \\ \hline \ \ \ \ {}_{1}7 \end{array}$$

3. Now add up the tens column, including the 1 carried over. $2 + 3 + 1 = 6$

$$\begin{array}{r} 1\,1\,2\,9 \\ +\ \ 2\,3\,8 \\ \hline \ \ \ 6_{1}7 \end{array}$$

4. Do the same with the hundreds column. $1 + 2 = 3$

$$\begin{array}{r} 1\,1\,2\,9 \\ +\ \ 2\,3\,8 \\ \hline \ \ 3\,6_{1}7 \end{array}$$

5. When you get to the thousands column, there's no adding to do — so write the number straight into the answer.

$$\begin{array}{r} 1\,1\,2\,9 \\ +\ \ 2\,3\,8 \\ \hline 1\,3\,6_{1}7 \end{array}$$

Exercise 1

Don't use a calculator for this exercise.

1 Complete the following additions.

a) $\begin{array}{r} 3\,3 \\ +\ 2\,2 \\ \hline \end{array}$ **b)** $\begin{array}{r} 1\,1 \\ +\ 6\,9 \\ \hline \end{array}$ **c)** $\begin{array}{r} 3\,8 \\ +\ 2\,7 \\ \hline \end{array}$ **d)** $\begin{array}{r} 4\,5 \\ +\ 8\,3 \\ \hline \end{array}$

e) $\begin{array}{r} 7\,4 \\ +\ 5\,5 \\ \hline \end{array}$ **f)** $\begin{array}{r} 9\,7 \\ +\ 5\,8 \\ \hline \end{array}$ **g)** $\begin{array}{r} 2\,1\,1 \\ +\ \ 4\,7 \\ \hline \end{array}$ **h)** $\begin{array}{r} 8\,9\,3 \\ +\ \ 2\,8 \\ \hline \end{array}$

i) $\begin{array}{r} 4\,7\,6 \\ +\ \ 8\,2 \\ \hline \end{array}$ **j)** $\begin{array}{r} 6\,6\,5 \\ +\ \ 4\,4 \\ \hline \end{array}$ **k)** $\begin{array}{r} 9\,7\,2 \\ +\ \ 6\,3 \\ \hline \end{array}$ **l)** $\begin{array}{r} 7\,7\,9 \\ +\ \ 8\,6 \\ \hline \end{array}$

2 Complete the following additions.

a) $\begin{array}{r} 1\,8\,3 \\ +\ 4\,5\,2 \\ \hline \end{array}$ **b)** $\begin{array}{r} 5\,4\,1 \\ +\ 3\,6\,7 \\ \hline \end{array}$ **c)** $\begin{array}{r} 3\,6\,7 \\ +\ 4\,2\,7 \\ \hline \end{array}$ **d)** $\begin{array}{r} 2\,7\,8 \\ +\ 1\,9\,9 \\ \hline \end{array}$

e) $\begin{array}{r} 6\,0\,6 \\ +\ 3\,8\,8 \\ \hline \end{array}$ **f)** $\begin{array}{r} 7\,1\,3 \\ +\ 9\,2\,5 \\ \hline \end{array}$ **g)** $\begin{array}{r} 2\,2\,8 \\ +\ 8\,7\,4 \\ \hline \end{array}$ **h)** $\begin{array}{r} 7\,9\,2 \\ +\ 2\,1\,7 \\ \hline \end{array}$

3 Complete the following additions.

a) 9012 + 146

b) 6702 + 237

c) 8353 + 308

d) 6721 + 449

e) 7992 + 641

f) 8843 + 254

g) 5012 + 4146

h) 6702 + 2237

i) 8353 + 1308

j) 6721 + 5449

k) 9952 + 1641

l) 8843 + 3254

4 Work out the answers to these additions.

a) 12 + 928

b) 821 + 72

c) 726 + 28

d) 88 + 212

e) 662 + 928

f) 905 + 929

g) 739 + 115

h) 812 + 426

i) 2710 + 821

j) 7271 + 829

k) 6652 + 981

l) 8210 + 280

m) 3327 + 6202

n) 8202 + 6021

o) 2599 + 7917

p) 9200 + 2863

5 In the morning, 261 people walk through a park. In the afternoon, 769 more people walk through the same park. How many people walk through the park in total?

6 In one day, a theme park sells 3201 day passes and 152 annual passes. How many passes does the theme park sell in total?

7 Harriet buys a car for £7231 and spends £1621 servicing it. How much does she spend on her car in total?

8 Complete the following addition questions.

a) 612 + 127 + 82

b) 712 + 21 + 941

c) 883 + 219 + 211

d) 223 + 271 + 991

e) 818 + 1821 + 993

f) 834 + 348 + 1492

g) 1821 + 211 + 2611

h) 7417 + 1411 + 471

Investigate — Jam + Bun

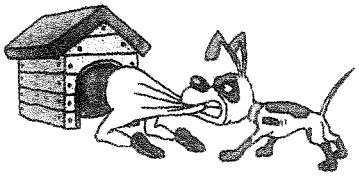
Each of the letters in the words 'JAM' and 'BUN' stand for a different digit from 1 to 6 so that...

```
  J A M
+ B U N
-------
  7 7 7
```

a) Can you work out what each of the letters could stand for?

b) Try making your own addition puzzles and get someone else to try them out.

Subtracting Whole Numbers



Example 2 **Work out 759 – 378.**

1. Write the first number above the second number with the units columns lined up.

$$\begin{array}{r} 759 \\ -\,378 \\ \hline \end{array}$$

2. Starting with the units column, take the bottom number away from the top number. $9 - 8 = 1$

$$\begin{array}{r} 759 \\ -\,378 \\ \hline 1 \end{array}$$

3. The top number in the next column is smaller than the bottom number, so 'borrow ten' from the next column along. This makes the '5' in the tens column into '15', and changes the '7' in the hundreds column into a '6'. $15 - 7 = 8$

$$\begin{array}{r} 6\,\overset{1}{\not 7}\,59 \\ -\,378 \\ \hline 81 \end{array}$$

4. Now do the subtraction in the tens column.

5. Finally do the subtraction in the last column using the '6' as the top number. $6 - 3 = 3$

$$\begin{array}{r} 6\,\overset{1}{\not 7}\,59 \\ -\,378 \\ \hline 381 \end{array}$$

Exercise 2

Don't use a calculator for this exercise.

1 Complete the following subtractions.

a) $\begin{array}{r} 75 \\ -\,14 \\ \hline \end{array}$ **b)** $\begin{array}{r} 82 \\ -\,51 \\ \hline \end{array}$ **c)** $\begin{array}{r} 83 \\ -\,72 \\ \hline \end{array}$ **d)** $\begin{array}{r} 64 \\ -\,51 \\ \hline \end{array}$

e) $\begin{array}{r} 502 \\ -\,51 \\ \hline \end{array}$ **f)** $\begin{array}{r} 631 \\ -\,81 \\ \hline \end{array}$ **g)** $\begin{array}{r} 908 \\ -\,56 \\ \hline \end{array}$ **h)** $\begin{array}{r} 839 \\ -\,77 \\ \hline \end{array}$

2 Complete the following subtractions.

a) $\begin{array}{r} 999 \\ -\,831 \\ \hline \end{array}$ **b)** $\begin{array}{r} 679 \\ -\,567 \\ \hline \end{array}$ **c)** $\begin{array}{r} 484 \\ -\,326 \\ \hline \end{array}$ **d)** $\begin{array}{r} 632 \\ -\,517 \\ \hline \end{array}$

e) $\begin{array}{r} 751 \\ -\,681 \\ \hline \end{array}$ **f)** $\begin{array}{r} 691 \\ -\,470 \\ \hline \end{array}$ **g)** $\begin{array}{r} 6932 \\ -\,821 \\ \hline \end{array}$ **h)** $\begin{array}{r} 5712 \\ -\,632 \\ \hline \end{array}$

i) $\begin{array}{r} 7659 \\ -\,168 \\ \hline \end{array}$ **j)** $\begin{array}{r} 4188 \\ -\,467 \\ \hline \end{array}$ **k)** $\begin{array}{r} 6958 \\ -\,671 \\ \hline \end{array}$ **l)** $\begin{array}{r} 8942 \\ -\,754 \\ \hline \end{array}$

3 Work out the answers to these subtractions.

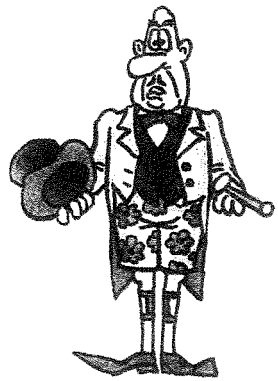
a) 51 – 42	**b)** 31 – 28	**c)** 94 – 38	**d)** 66 – 49
e) 462 – 81	**f)** 539 – 83	**g)** 381 – 73	**h)** 655 – 74
i) 990 – 421	**j)** 639 – 541	**k)** 887 – 692	**l)** 483 – 199
m) 3887 – 650	**n)** 1607 – 531	**o)** 4995 – 886	**p)** 5280 – 666
q) 7291 – 371	**r)** 2917 – 248	**s)** 8323 – 601	**t)** 6318 – 237

4 **a)** Find the difference between 92 and 38.

b) What is 209 subtracted from 381?

c) Take 592 away from 1497.

d) How much less is 621 than 8712?



5 866 people are on a train. At a station, 79 people get off.
How many people are left on the train?

6 A cinema has 207 seats. 162 seats are reserved.
How many seats in the cinema are not reserved?

7 A jug contains 2632 ml of water. 881 ml of water is poured out of the jug.
How much water is left in the jug?

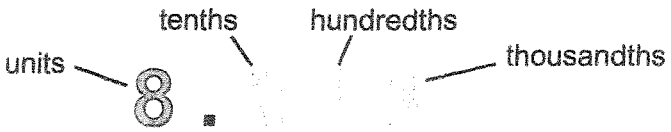
8 In a sale, a car has a discount of £529.
The original price of the car was £7660.
What is the price of the car in the sale?

9 Penny is trying to raise £8250 for charity. So far, she has raised £442.
How much more does Penny need to reach her target?

10 6429 people went to a concert on Friday.
Only 841 people went to the same concert on Sunday.
How many more people went to the concert on Friday than on Sunday?

Adding Decimals

Decimal numbers can be split up into columns, just like whole numbers.
The columns after the decimal point are called decimal places.



To add or subtract decimals you have to line up the decimal places, just as you would with whole numbers.

Example 3 **Work out 1.281 + 2.23.**

1. First write one number above the other, making sure that the decimal points line up.

$$\begin{array}{r} 1.281 \\ +\ 2.23 \end{array}$$

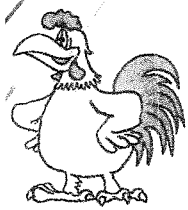
2. Add up the columns from right to left, just as you would when adding whole numbers.

   There isn't a digit in the first column for the bottom number — so add in a 0.

$$\begin{array}{r} 1.281 \\ +\ 2.230 \\ \hline 3.511 \end{array}$$

3. Include a decimal point in your answer. It must line up with the decimal points in the question.

$$3.511$$



Exercise 3

Don't use a calculator for this exercise.

1 Complete the following additions.

a) $\begin{array}{r} 3.1 \\ +\ 3.6 \end{array}$ **b)** $\begin{array}{r} 5.6 \\ +\ 4.3 \end{array}$ **c)** $\begin{array}{r} 3.8 \\ +\ 2.4 \end{array}$ **d)** $\begin{array}{r} 0.7 \\ +\ 4.8 \end{array}$ **e)** $\begin{array}{r} 2.8 \\ +\ 4.3 \end{array}$

f) $\begin{array}{r} 5.62 \\ +\ 4.3 \end{array}$ **g)** $\begin{array}{r} 4.34 \\ +\ 6.6 \end{array}$ **h)** $\begin{array}{r} 4.57 \\ +\ 7.6 \end{array}$ **i)** $\begin{array}{r} 8.59 \\ +\ 0.6 \end{array}$ **j)** $\begin{array}{r} 9.08 \\ +\ 3.9 \end{array}$

2 Complete the following additions.

a) $\begin{array}{r} 7.35 \\ +\ 4.22 \end{array}$ **b)** $\begin{array}{r} 5.64 \\ +\ 2.92 \end{array}$ **c)** $\begin{array}{r} 6.28 \\ +\ 7.96 \end{array}$ **d)** $\begin{array}{r} 0.78 \\ +\ 0.54 \end{array}$

e) $\begin{array}{r} 7.634 \\ +\ 5.76 \end{array}$ **f)** $\begin{array}{r} 9.709 \\ +\ 3.95 \end{array}$ **g)** $\begin{array}{r} 6.346 \\ +\ 0.74 \end{array}$ **h)** $\begin{array}{r} 5.096 \\ +\ 7.38 \end{array}$

3 Work out the following additions.

a) $8.535 + 1.462$ **b)** $7.656 + 3.328$ **c)** $4.839 + 6.395$ **d)** $5.547 + 6.458$ **e)** $8.691 + 4.028$

4 Work out the following calculations.

a) 7.38 + 2.28 **b)** 0.28 + 8.39 **c)** 7.82 + 1.03 **d)** 3.23 + 9.93

e) 8.23 + 2.09 **f)** 9.38 + 5.69 **g)** 8.85 + 9.58 **h)** 7.45 + 4.57

i) 5.321 + 9.057 **j)** 8.481 + 2.381 **k)** 3.048 + 4.831 **l)** 3.571 + 4.699

5 **a)** Add together 3.281 and 5.908.

b) What is the sum of 29.3 and 21.8?

c) What is the total of 8.39 and 12.83?

6 Peter buys a chocolate bar for £0.82 and a bag of sweets for £1.93.
How much does Peter spend altogether?

7 Jack spends £30.27 on a jumper and £17.80 on a pair of trousers.
How much does Jack spend in total?

8 Antonia runs 10.88 km on Saturday and 18.28 km on Sunday.
In total, how many kilometres does Antonia run at the weekend?

9 Use the menu to work out the price of the following groups of items.

a) Fish and chips.

b) Fish and mushy peas.

c) Fish, chicken and chips.

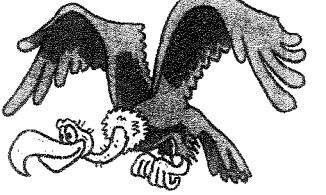
d) Mushy peas, beans and fish.

e) A fizzy drink, beans and chicken.

f) Chicken, beans and mushy peas.

Menu	
Fish	£5.92
Chips	£1.20
Mushy peas	£0.99
Beans	£0.39
Chicken	£4.89
Fizzy drinks (each)	£1.58

Subtracting Decimals



Example 4 **Work out 12.04 – 8.57.**

1. Write the first number above the second.
   Make sure the decimal points are lined up.

```
 12.04
- 8.57
```

2. Starting with the right-hand column, take the bottom number away from the top number.

   4 is smaller than 7, so you need to borrow ten from the next column to the left. This column contains a zero, which means there are no tens in this column to borrow.

   Go another column to the left until you find a non-zero value. Borrow ten from this column for the column containing a 0.

```
   1 10
 12.04
- 8.57
```

3. The column now has a non-zero value. You can borrow ten as usual.

```
    9
   1 10
 12.04
- 8.57
```

4. Continue with the subtraction, just as you would with whole numbers. Include the decimal point in your answer. It must line up with the decimal points in the question.

```
    9
 0 1 10
 12.04
- 8.57
 03.47
```

Exercise 4

Don't use a calculator for this exercise.

1 Work out the answers to these subtractions.

a) 3.9 − 1.2	b) 9.2 − 5.1	c) 6.7 − 0.8	d) 8.3 − 4.5
e) 5.8 − 3.9	f) 6.34 − 5.2	g) 7.78 − 5.8	h) 8.21 − 0.7
i) 8.4 − 0.21	j) 5.8 − 1.58	k) 7.93 − 5.31	l) 4.57 − 3.91
m) 7.84 − 6.09	n) 8.24 − 6.83	o) 4.01 − 0.72	p) 17.95 − 5.71
q) 30.18 − 4.39	r) 42.03 − 4.71	s) 25.11 − 4.05	t) 10.06 − 5.37

2 Work out the answers to these subtractions.

a) $\begin{array}{r} 7.452 \\ -\ 4.87 \\ \hline \end{array}$ **b)** $\begin{array}{r} 9.621 \\ -\ 7.25 \\ \hline \end{array}$ **c)** $\begin{array}{r} 8.439 \\ -\ 3.28 \\ \hline \end{array}$ **d)** $\begin{array}{r} 6.647 \\ -\ 5.39 \\ \hline \end{array}$

e) $\begin{array}{r} 8.45 \\ -\ 6.221 \\ \hline \end{array}$ **f)** $\begin{array}{r} 5.69 \\ -\ 0.768 \\ \hline \end{array}$ **g)** $\begin{array}{r} 8.45 \\ -\ 6.521 \\ \hline \end{array}$ **h)** $\begin{array}{r} 3.98 \\ -\ 1.972 \\ \hline \end{array}$

i) $\begin{array}{r} 4.786 \\ -\ 0.575 \\ \hline \end{array}$ **j)** $\begin{array}{r} 8.011 \\ -\ 6.922 \\ \hline \end{array}$ **k)** $\begin{array}{r} 7.025 \\ -\ 3.831 \\ \hline \end{array}$ **l)** $\begin{array}{r} 8.781 \\ -\ 6.966 \\ \hline \end{array}$

3 Work out the following subtractions.

a) 1.8 – 0.7 **b)** 2.5 – 1.7 **c)** 6.1 – 2.8 **d)** 8.1 – 6.7

e) 17.3 – 2.6 **f)** 92.8 – 6.2 **g)** 72.2 – 8.1 **h)** 17.6 – 2.9

i) 5.92 – 4.87 **j)** 1.18 – 0.88 **k)** 7.36 – 4.59 **l)** 9.67 – 5.88

m) 87.38 – 3.64 **n)** 92.87 – 5.66 **o)** 44.62 – 28.57 **p)** 57.62 – 18.19

q) 8.951 – 6.681 **r)** 7.393 – 5.279 **s)** 7.565 – 4.956 **t)** 7.532 – 4.617

4 **a)** Take 5.82 away from 12.391.

b) Subtract 8.281 from 9.507.

c) What is the difference between 66.37 and 27.09?

d) How much larger is 21.271 than 15.18?

5 Peter buys a toy which costs £2.89. How much change would Peter get from £5.00?

6 John is travelling from Beanton to Bakesford. In total, his journey is 98.27 km. In one day, John travels 39.18 km. How far does John have left to travel in kilometres?

7 Laurence has £50.66 in his bank account. He spends £21.48 of this in the greengrocers. How much will Laurence have left in his bank account?

8 Eliza buys a new dress for £82.20. How much change would Eliza get from £100?

1.3 Multiplication and Division

Multiplying by 10, 100 and 1000

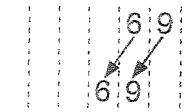
When a number is multiplied by 10, 100, 1000, etc., each digit in the number moves left:

× 10	each digit moves one place to the left.
× 100	each digit moves two places to the left.
× 1000	each digit moves three places to the left.

Example 1

a) Multiply 69 by 10.

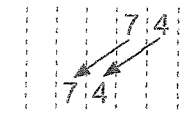
1. To multiply by **10**, move each digit **one** place to the **left**.



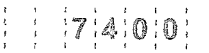
2. Fill up the empty space with a **zero**.

b) Multiply 74 by 100.

1. To multiply by **100**, move each digit **two** places to the **left**.

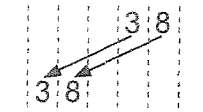


2. Fill up the empty spaces with **zeros**.

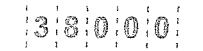


c) Multiply 38 by 1000.

1. To multiply by **1000**, move each digit **three** places to the **left**.



2. Fill up the empty spaces with **zeros**.

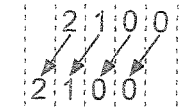


Example 2 **Calculate 700 × 30.**

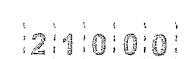
1. 30 is the same as 3 × 10, so start by working out 700 × 3.

700 × 3 = 2100

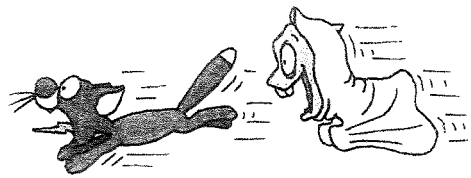
2. Then multiply your answer by 10 to find 700 × 30. To do this move the digits one place to the left.



Then fill the empty space with a zero.



Exercise 1



Don't use a calculator for this exercise.

1 Work out:

a) 6 × 10	**b)** 4 × 10	**c)** 9 × 10	**d)** 71 × 10	**e)** 63 × 10
f) 50 × 10	**g)** 269 × 10	**h)** 480 × 10	**i)** 227 × 10	**j)** 313 × 10

2 Work out:

a) 5 × 100	**b)** 9 × 100	**c)** 1 × 100	**d)** 3 × 100
e) 31 × 100	**f)** 88 × 100	**g)** 45 × 100	**h)** 16 × 100
i) 780 × 100	**j)** 289 × 100	**k)** 621 × 100	**l)** 886 × 100

3 Work out:

a) 8 × 1000	**b)** 3 × 1000	**c)** 7 × 1000	**d)** 9 × 1000
e) 63 × 1000	**f)** 90 × 1000	**g)** 21 × 1000	**h)** 52 × 1000
i) 341 × 1000	**j)** 400 × 1000	**k)** 942 × 1000	**l)** 186 × 1000

4 Work out:

a) 6 × 100	**b)** 82 × 10	**c)** 681 × 10	**d)** 712 × 100
e) 2 × 10	**f)** 821 × 1000	**g)** 71 × 1000	**h)** 900 × 100

5 Work out:

a) 80 × 20	**b)** 30 × 60	**c)** 50 × 70	**d)** 400 × 30
e) 20 × 200	**f)** 500 × 60	**g)** 600 × 400	**h)** 500 × 500
i) 300 × 200	**j)** 400 × 200	**k)** 700 × 6000	**l)** 400 × 4000
m) 5000 × 400	**n)** 7000 × 6000	**o)** 9000 × 2000	**p)** 8000 × 3000

6 Work out the missing number in the following multiplications.

a) ..... × 100 = 5000	**b)** 62 × ..... = 620	**c)** 74 × ..... = 74 000
d) 18 × ..... = 1800	**e)** ..... × 300 = 15 000	**f)** 60 × ..... = 36 000
g) ..... × 900 = 18 000	**h)** ..... × 70 = 28 000	**i)** 80 × ..... = 7200

Dividing by 10, 100 and 1000

When a number is divided by 10, 100, 1000, etc., each digit in the number moves right:

÷ 10	each digit moves one place to the right.
÷ 100	each digit moves two places to the right.
÷ 1000	each digit moves three places to the right.

Example 3 **Divide 2400 by:**

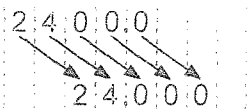
a) 10

1. 2400 is the same as 2400.0.
2. To divide by **10**, move the each digit **one** place to the **right**. Leave the decimal point where it is.

3. Remove any zeros after the decimal point.

b) 100

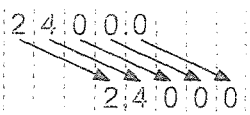
1. To divide by **100**, move the each digit **two** places to the **right**. Leave the decimal point where it is.



2. Remove any zeros after the decimal point.

c) 1000

1. To divide by **1000**, move the each digit **three** places to the **right**. Leave the decimal point where it is.



2. Remove any zeros after the decimal point.

Exercise 2

Don't use a calculator for this exercise.

1 Work out:

a) 40 ÷ 10	**b)** 50 ÷ 10	**c)** 20 ÷ 10	**d)** 70 ÷ 10	**e)** 90 ÷ 10
f) 500 ÷ 10	**g)** 280 ÷ 10	**h)** 690 ÷ 10	**i)** 430 ÷ 10	**j)** 370 ÷ 10
k) 5700 ÷ 10	**l)** 4000 ÷ 10	**m)** 4350 ÷ 10	**n)** 31 800 ÷ 10	**o)** 83 070 ÷ 10

2 Work out:

a) 400 ÷ 100	**b)** 500 ÷ 100	**c)** 800 ÷ 100	**d)** 900 ÷ 100
e) 700 ÷ 100	**f)** 8200 ÷ 100	**g)** 7700 ÷ 100	**h)** 1000 ÷ 100
i) 6700 ÷ 100	**j)** 3900 ÷ 100	**k)** 57 000 ÷ 100	**l)** 46 500 ÷ 100

3 Work out:

a) 9000 ÷ 1000	**b)** 3000 ÷ 1000	**c)** 5000 ÷ 1000	**d)** 7000 ÷ 1000
e) 16 000 ÷ 1000	**f)** 82 000 ÷ 1000	**g)** 10 000 ÷ 1000	**h)** 55 000 ÷ 1000
i) 657 000 ÷ 1000	**j)** 490 000 ÷ 1000	**k)** 200 000 ÷ 1000	**l)** 312 000 ÷ 1000

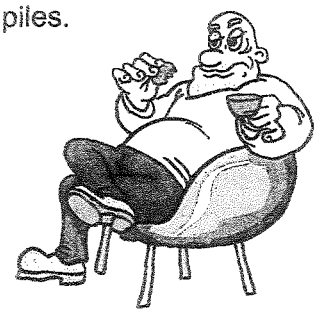
4 Work out:

a) 45 ÷ 10	**b)** 52 ÷ 10	**c)** 28 ÷ 10	**d)** 715 ÷ 10
e) 523 ÷ 10	**f)** 309 ÷ 10	**g)** 8182 ÷ 10	**h)** 4344 ÷ 10
i) 490 ÷ 100	**j)** 580 ÷ 100	**k)** 230 ÷ 100	**l)** 870 ÷ 100
m) 5720 ÷ 100	**n)** 4320 ÷ 100	**o)** 95 310 ÷ 100	**p)** 76 170 ÷ 100
q) 4300 ÷ 1000	**r)** 5900 ÷ 1000	**s)** 23 100 ÷ 1000	**t)** 79 600 ÷ 1000
u) 59 800 ÷ 1000	**v)** 276 400 ÷ 1000	**w)** 248 700 ÷ 1000	**x)** 404 500 ÷ 1000

5 Complete the following divisions.

a) 42 ÷ 100	**b)** 58 ÷ 100	**c)** 273 ÷ 100	**d)** 734 ÷ 100
e) 5331 ÷ 100	**f)** 2892 ÷ 100	**g)** 7430 ÷ 1000	**h)** 1090 ÷ 1000
i) 40 320 ÷ 1000	**j)** 87 250 ÷ 1000	**k)** 254 980 ÷ 1000	**l)** 742 210 ÷ 1000

6 Carla has 6750 g of sweets. She divides the sweets into 10 equal piles.
How many grams of sweets are in each pile?



7 Gloria has 57 litres of lemonade.
She shares the lemonade out into 100 glasses.
How many litres of lemonade are in each glass?

Written Multiplication

Example 4 **Calculate 314 × 23 using the grid method.**

1. Split the numbers up into columns and write them around a grid.

	300	10	4
20			
3			

2. Multiply each separate part together in the grid.

	300	10	4
20	300 × 20 = 6000	10 × 20 = 200	4 × 20 = 80
3	300 × 3 = 900	3 × 10 = 30	4 × 3 = 12

3. Add together the numbers in the grid.

$$\begin{array}{r} 6000 \\ 900 \\ 200 \\ 30 \\ 80 \\ +\quad 12 \\ \hline 7_{1}2_{1}22 \end{array}$$

Example 5 **Calculate 398 × 53 using the column method.**

1. Write one number above the other and make sure the columns line up. It's best to put the bigger number on the top.

$$\begin{array}{r} 398 \\ \times\quad 53 \\ \hline \end{array}$$

2. Start by working out 398 × 3. Multiply each digit in 398 by 3, working from right to left. If the answer is 10 or more, carry the tens digit. E.g. 3 × 8 = 24, so write the 4 in the units column and carry the 2. Then 3 × 9 = 27, plus the carried 2 gives 29.

$$\begin{array}{r} 398 \\ \times\quad 53 \\ \hline 1\,1_{2}9_{2}4 \end{array}$$

3. Work out 398 × 50 on the next row. You can do this by putting a 0 in the right-hand column and multiplying each digit in 398 by 5. Work from right to left.

$$\begin{array}{r} 398 \\ \times\quad 53 \\ \hline 1\,1_{2}9_{2}4 \\ 1_{1}9_{4}9_{4}00 \end{array}$$

4. Add the two rows together to get your final answer.

$$\begin{array}{r} 398 \\ \times\quad 53 \\ \hline 1\,1_{2}9_{2}4 \\ +\ 1_{1}9_{4}9_{4}00 \\ \hline 2_{1}1_{1}094 \end{array}$$

Exercise 3

Don't use a calculator for this exercise.

1 Copy and complete the grid to work out 72 × 8.

	70	2
8	70 × 8 = ...	2 × 8 = ...

2 Copy and complete the grid to work out 826 × 9.

	800	20	6
9	800 × ..... = ...	..... × 9 = ...	6 × ..... = ...

3 Copy and complete the grid to work out 731 × 38.

	700	30	1
30	700 × ..... = ...	..... × 30 = ...	1 × ..... = ...
8	..... × ..... = ...	..... × ..... = ...	..... × ..... = ...

4 Use the grid method to work out the following multiplications:

a) 56 × 5 **b)** 47 × 8 **c)** 6 × 59 **d)** 14 × 32 **e)** 91 × 53

f) 72 × 45 **g)** 27 × 389 **h)** 391 × 92 **i)** 192 × 11 **j)** 802 × 48

5 Work out the answers to the following multiplications.

a) 26 × 8 **b)** 83 × 5 **c)** 7 × 65 **d)** 92 × 6 **e)** 4 × 34

f) 57 × 3 **g)** 9 × 68 **h)** 23 × 8 **i)** 7 × 88 **j)** 5 × 56

6 Work out the answers to the following multiplications.

a) 84 × 33 **b)** 24 × 23 **c)** 43 × 64 **d)** 17 × 32 **e)** 83 × 27

f) 32 × 87 **g)** 49 × 76 **h)** 72 × 86 **i)** 23 × 99 **j)** 31 × 55

7 Work out the answers to the following multiplications.

a) 46 × 427 **b)** 233 × 41 **c)** 58 × 943 **d)** 371 × 93 **e)** 893 × 23

f) 853 × 38 **g)** 99 × 192 **h)** 237 × 14 **i)** 103 × 92 **j)** 281 × 79

Written Division

Example 6 **Calculate 443 ÷ 6.**

1. Set the division out with the number you're dividing inside a 'box', and the number you're dividing it by outside the box.
2. Start by working out how many times 6 will go into 4.
   The answer is 0 as 6 is bigger than 4.
   So write a 0 above the box, over the first 4.
3. Since 6 didn't go into 4, now look at the first **two** numbers in the box.
   Work out how many times 6 goes into 44.
   6 goes into 44 seven times with a remainder of 2.
   So write a 7 above the box (over the second 4), and carry the 2 over to the next column.
4. Now look at the last number, with the 2 carried over.
   Work out how many times 6 goes into 23.
   6 goes into 23 three times with a remainder of 5.
   So write a 3 above the box, over the last column, and write the final remainder.
5. Your answer is the number on top of the box, plus the remainder from the last part of the division.

Exercise 4

Don't use a calculator for this exercise.

1 Work out the answers to these divisions.

a) $6\overline{)84}$ b) $4\overline{)92}$ c) $5\overline{)75}$ d) $7\overline{)91}$ e) $3\overline{)78}$

f) $2\overline{)96}$ g) $6\overline{)54}$ h) $7\overline{)84}$ i) $3\overline{)87}$ j) $5\overline{)90}$

2 Work out these divisions. Give your answers as whole numbers with remainders.

a) $4\overline{)97}$ b) $3\overline{)59}$ c) $6\overline{)93}$ d) $2\overline{)87}$ e) $9\overline{)55}$

f) $7\overline{)93}$ g) $4\overline{)91}$ h) $5\overline{)69}$ i) $8\overline{)99}$ j) $4\overline{)86}$

k) $7\overline{)95}$ l) $3\overline{)89}$ m) $6\overline{)81}$ n) $7\overline{)88}$ o) $2\overline{)45}$

Example 7 **Calculate 7632 ÷ 36.**

1. Start by working out how many times 36 goes into 7.
   The answer is 0 as 36 is bigger than 7.
   So write a 0 above the box, over the 7.

$$\begin{array}{r} 0 \\ 36\overline{)7\ 6\ 3\ 2} \end{array}$$

2. Since 36 didn't go into 7, now look at the first two numbers in the box.

   Work out how many times 36 goes into 76.
   36 goes into 76 twice with a remainder of 4.

$$36 \times 2 = 72$$
$$76 - 72 = 4$$

   So write a 2 above the box, over the 7, and carry the 4 over to the next column.

$$\begin{array}{r} 0\ 2 \\ 36\overline{)7\ 6^{4}3\ 2} \end{array}$$

3. Now look at the next column, with the 4 carried over.

   Work out how many times 36 goes into 43.
   36 goes into 43 once with a remainder of 7.

$$36 \times 1 = 36$$
$$43 - 36 = 7$$

   So write a 1 above the box, over the 3, and carry the 7 over to the next column.

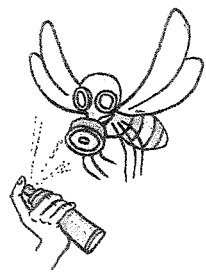
$$\begin{array}{r} 0\ 2\ 1 \\ 36\overline{)7\ 6^{4}3^{7}2} \end{array}$$

4. Now look at the last column, with the 7 carried over.

   Work out how many times 36 goes into 72.
   36 goes into 72 twice with no remainder.

$$36 \times 2 = 72$$

   So write a 2 above the box.
   Your answer is the number above the box.



$$\begin{array}{r} 0\ 2\ 1\ 2 \\ 36\overline{)7\ 6^{4}3^{7}2} \end{array}$$

3 Work out the answers to these divisions.

a) $8\overline{)7\ 6\ 8}$ **b)** $4\overline{)2\ 5\ 2}$ **c)** $3\overline{)3\ 4\ 2}$ **d)** $4\overline{)9\ 2\ 4}$

e) $5\overline{)4\ 4\ 5}$ **f)** $7\overline{)3\ 5\ 7}$ **g)** $18\overline{)5\ 7\ 6}$ **h)** $22\overline{)7\ 0\ 4}$

i) $15\overline{)9\ 1\ 5}$ **j)** $18\overline{)4\ 3\ 2}$ **k)** $41\overline{)8\ 6\ 1}$ **l)** $38\overline{)4\ 5\ 6}$

4 Work out these divisions. Give your answers as whole numbers with remainders.

a) $5\overline{)2\ 7\ 4}$ **b)** $6\overline{)9\ 3\ 1}$ **c)** $4\overline{)7\ 2\ 3}$ **d)** $8\overline{)3\ 2\ 9}$

e) $7\overline{)9\ 2\ 2}$ **f)** $9\overline{)4\ 3\ 8}$ **g)** $13\overline{)5\ 2\ 5}$ **h)** $21\overline{)2\ 7\ 7}$

i) $14\overline{)8\ 8\ 3}$ **j)** $41\overline{)9\ 1\ 4}$ **k)** $25\overline{)5\ 7\ 7}$ **l)** $16\overline{)7\ 3\ 9}$

5 Work out the answers to these divisions.

a) $6\overline{)1518}$ **b)** $7\overline{)4557}$ **c)** $3\overline{)4638}$ **d)** $5\overline{)4755}$

e) $9\overline{)9927}$ **f)** $8\overline{)5808}$ **g)** $14\overline{)4494}$ **h)** $21\overline{)4641}$

i) $33\overline{)6996}$ **j)** $13\overline{)5473}$ **k)** $12\overline{)6492}$ **l)** $19\overline{)8018}$

6 Work out these divisions. Give your answers as whole numbers with remainders.

a) $7\overline{)1070}$ **b)** $4\overline{)7577}$ **c)** $5\overline{)4063}$ **d)** $8\overline{)7421}$

e) $13\overline{)8501}$ **f)** $18\overline{)4173}$ **g)** $11\overline{)5319}$ **h)** $13\overline{)8022}$

7 Work out the answers to these divisions.

a) 48 ÷ 3 **b)** 98 ÷ 7 **c)** 68 ÷ 2 **d)** 762 ÷ 6 **e)** 369 ÷ 9

f) 496 ÷ 8 **g)** 336 ÷ 14 **h)** 704 ÷ 22 **i)** 816 ÷ 16 **j)** 1232 ÷ 8

k) 4248 ÷ 9 **l)** 4445 ÷ 7 **m)** 7088 ÷ 16 **n)** 4494 ÷ 14 **o)** 7236 ÷ 18

8 Work out these divisions. Give your answers as whole numbers with remainders.

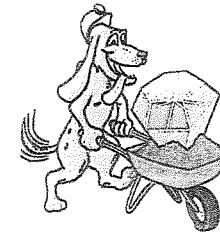
a) 65 ÷ 7 **b)** 47 ÷ 3 **c)** 74 ÷ 5 **d)** 156 ÷ 8 **e)** 267 ÷ 4

f) 355 ÷ 6 **g)** 567 ÷ 11 **h)** 578 ÷ 15 **i)** 839 ÷ 13 **j)** 2211 ÷ 9

k) 3931 ÷ 7 **l)** 4709 ÷ 5 **m)** 1880 ÷ 12 **n)** 3980 ÷ 17 **o)** 2886 ÷ 14

9 **a)** Divide 8652 by 14.

b) How many fifteens are there in 3135?

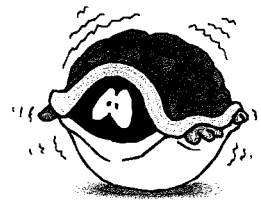


10 A weekend break for four costs £624. How much does it cost per person?

11 Peter shares 782 apples equally into 17 bags. How many apples are in each bag?

12 Bricks are being loaded onto 18 palettes so that each palette is holding the same number of bricks. If there are 4223 bricks in total, how many will be left over?

1.4 Calculations with Negative Numbers



Negative Numbers on a Number Line

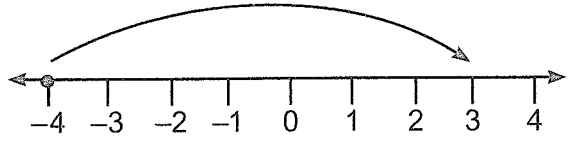
Negative numbers are numbers that are less than zero.
They're written with a minus sign in front of them.

You can use a number line to help with calculations involving negative numbers.

Example 1 **Use the number line to work out:**

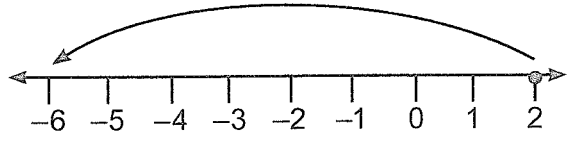
a) –4 + 7

1. Start at –4.
2. Count 7 places up (right).
3. You finish at 3, so: $-4 + 7 = 3$



b) 2 – 8

1. Start at 2.
2. Count 8 places down (left).
3. You finish at –6, so: $2 - 8 = -6$



Exercise 1

Don't use a calculator for this exercise.

1 Work out the following, using a number line if you need to.

a) –6 + 8	**b)** –5 + 9	**c)** –7 + 4	**d)** –12 + 15
e) –16 + 8	**f)** –5 + 17	**g)** –2 + 19	**h)** –11 + 9
i) –12 + 15	**j)** –2 + 18	**k)** –16 + 20	**l)** –15 + 6
m) –13 + 11	**n)** –25 + 7	**o)** –12 + 21	**p)** –18 + 19

2 Work out:

a) 3 – 9	**b)** 6 – 10	**c)** 4 – 15	**d)** 8 – 12
e) 11 – 16	**f)** 8 – 15	**g)** 9 – 34	**h)** 12 – 26
i) 11 – 19	**j)** 7 – 15	**k)** 20 – 26	**l)** 10 – 19
m) 14 – 22	**n)** 8 – 19	**o)** 12 – 18	**p)** 21 – 30

3 Work out:

a) $-8 - 4$	**b)** $-3 - 11$	**c)** $-6 - 4$	**d)** $-12 - 7$
e) $-2 - 16$	**f)** $-12 - 15$	**g)** $-21 - 10$	**h)** $-25 - 18$
i) $-6 - 23$	**j)** $-15 - 21$	**k)** $-32 - 12$	**l)** $-31 - 22$

4 **a)** What is the difference in temperature between –7 °C and 19 °C?

b) What is the difference in temperature between 35 °C and –4 °C?

c) The temperature inside a freezer is –18 °C.
The temperature in the kitchen is 24 °C.
What is the difference in temperature between the freezer and the kitchen?

d) The temperature in Walton is –2 °C. It is 31 °C warmer in Harpury.
What is the temperature in Harpury?

5 A seal jumps from a rock 3 metres above sea level, into the sea.
It dives 6 metres below the water. How far has the seal dived in total?

6 Clive goes shopping with £86 in his bank account.
He leaves the first shop and is £13 overdrawn,
i.e. he has spent £13 more than he originally had in his account.

a) How much did Clive spend in the first shop?

b) Clive goes into a second shop and spends a further £33.
By how much is Clive overdrawn now?

Investigate — Multiplying Negatives

Use a calculator to do the following multiplications:

a) A positive number × a negative number.

b) A negative number × a positive number.

c) A negative number × a negative number.

d) A negative number × a negative number × a negative number.

Do you get a positive or a negative answer for each one?
See if you can write some rules for the outcomes of **a)-d)**.
Test them out with some different numbers.

1.5 Calculators, BODMAS and Checking

BODMAS

Operations in a calculation are things like addition, subtraction, multiplication and division.

The order you do these things in is really important.

BODMAS tells you the order you should do things in a calculation:

BRACKETS	←	Work out things in **brackets** first.
OTHER	←	Then do other things like **squaring** and **powers**.
DIVISION MULTIPLICATION	←	**Divide/Multiply** groups of numbers working from left to right.
ADDITION SUBTRACTION	←	**Add/Subtract** groups of numbers working from left to right.

Example 1 **Work out $12 - 3 \times 3 + 8$.**

1. This calculation involves subtraction, multiplication and addition.

2. BODMAS tells us that the **multiplication** needs to be done first. $3 \times 3 = 9$
   $12 - 9 + 8$

3. Working from left to right, the **subtraction** needs to be done next. $12 - 9 = 3$

4. Finally, do the **addition**. $3 + 8 = \mathbf{11}$

Example 2 **Work out $7 \times (10 - 4) + 11$.**

1. This calculation involves multiplication, brackets, subtraction and addition.

2. BODMAS tells us that the things inside the **brackets** need to be done first. $(10 - 4) = 6$
   $7 \times 6 + 11$

3. The two operations left are multiplication and addition. The **multiplication** needs to be done next. $7 \times 6 = 42$

4. Finally, do the **addition**. $42 + 11 = \mathbf{53}$

Exercise 1

Don't use a calculator for this exercise.

1 For each calculation, list the operations in the order they should be done.
You do not need to work out the answers.

a) $8 + 3 \times 11$ **b)** $25 \div 5 - 2$ **c)** $24 - 3 \times 4$ **d)** $18 - 6 \div 6$

e) $18 - 48 \div 8 + 3$ **f)** $10 \times 2 - 22 \div 2$ **g)** $11 \times 8 + 2 - 14$ **h)** $66 \div 6 + 2 \times 9$

2 Use BODMAS to answer these questions.

a) $4 + 1 \times 5$ **b)** $6 \div 3 + 9$ **c)** $11 \times 3 + 5$ **d)** $12 \div 6 + 15$

e) $12 + 12 \div 6$ **f)** $10 \times 8 - 7$ **g)** $12 \times 4 + 18$ **h)** $72 \div 8 + 22$

i) $90 - 7 \times 12$ **j)** $12 + 30 \div 6$ **k)** $55 \div 11 \times 4$ **l)** $12 + 81 \div 9$

3 Use BODMAS to answer these questions.

a) $6 \times (5 - 2)$ **b)** $48 \div (10 - 6)$ **c)** $11 \times (22 \div 2)$

d) $(22 - 15) \times 8$ **e)** $(12 - 6) \times 7$ **f)** $144 \div (4 \times 3)$

g) $(29 + 7) \div 3$ **h)** $(5 + 6) \times 2$ **i)** $10 \times (22 - 12)$

j) $(5 + 6) \times 3$ **k)** $5 \times (36 \div 4)$ **l)** $(50 - 41) \times 7$

m) $44 \div (2 + 2)$ **n)** $(60 - 28) \div 4$ **o)** $77 \div (30 - 23)$

4 Use BODMAS to answer these questions.

a) $8 \times (12 - 5)$ **b)** $(9 + 10) \times 2$ **c)** $108 \div 12 + 20$ **d)** $96 \div 8 - 2$

e) $(18 + 22) \div 10$ **f)** $50 - 4 \times 4$ **g)** $5 \times (8 + 7)$ **h)** $(6 + 6) \times 4$

i) $7 \times (14 - 2)$ **j)** $42 \div (2 + 4)$ **k)** $2 \times (69 \div 3)$ **l)** $11 \times (18 - 6)$

5 Use BODMAS to answer these questions.

a) $5 \times 5 - 16 \div 2$ **b)** $9 + 10 \times 2 \div 4$ **c)** $22 - 3 \times 2 + 8$ **d)** $6 \times 8 - 15 \div 3$

e) $9 \div 3 + 2 \times 9$ **f)** $31 + 4 - 6 \times 4$ **g)** $36 - 2 + 32 \div 8$ **h)** $9 \times 7 + 11 - 8$

i) $19 + 6 \times 3 - 4$ **j)** $10 + 16 \div 8 \times 5$ **k)** $60 - 6 \times 9 - 1$ **l)** $80 \div 4 - 2 \times 6$

6 Use BODMAS to answer these questions.

a) $12 \times (12 - 9) \div 9$ **b)** $(16 - 3) + 8 \div 2$ **c)** $36 \div 3 \times (11 - 5)$

d) $(3 + 32) + 6 \times 4$ **e)** $(4 + 6) \times 4 + 32$ **f)** $9 \times (16 - 6) \div 3$

g) $8 \times 9 - (12 + 24)$ **h)** $5 \times (9 + 3) - 11$ **i)** $(22 + 22) - 63 \div 9$

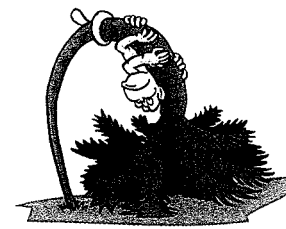
Investigate — Four 4s Make...

Can you make every whole number from 0 upwards by putting the symbols +, –, ×, ÷ or brackets between the numbers 4, 4, 4 and 4?

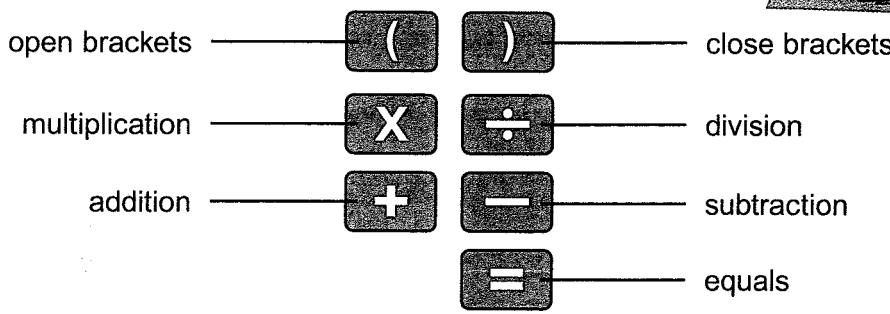
E.g. $4 \div 4 = \mathbf{1}$, $4 \div 4 + 4 \div 4 = \mathbf{2}$ etc.

You don't have to use all four numbers each time.
Remember to use what you know about the order of operations from BODMAS.

Using Calculators



When doing calculations with lots of operations, you'll need to use these buttons on your calculator:



You can tell the calculator what order to do the operations in by putting brackets into the calculation. Calculators will work out the things in brackets first.

Example 3 **Add brackets to the following calculation so it is correct when worked out on a calculator: $18 - 3 \times 5 = 75$**

1. There are two possible places for the brackets to go. $18 - (3 \times 5)$ or $(18 - 3) \times 5$

2. Enter each option in on your calculator to see which gives you the right answer. $18 - (3 \times 5) = 3$

   $\mathbf{(18 - 3) \times 5 = 75}$

Exercise 2

1 There are two places to put a pair of brackets in the following calculations. For each one, write out the calculation with the brackets in each position, and work out the answer.

a) $10 \div 2 + 3$ **b)** $3 \times 7 - 4$ **c)** $3 \times 4 + 6$ **d)** $12 \div 3 \times 2$

e) $60 + 12 \div 6$ **f)** $24 + 12 \div 6$ **g)** $10 \times 2 + 11$ **h)** $25 - 8 \times 3$

i) $7 + 2 \times 9$ **j)** $40 - 36 \div 4$ **k)** $84 \div 7 + 5$ **l)** $27 - 9 \div 9$

2 Add brackets to these calculations so they're correct.
Check your answers on a calculator.

a) $16 \div 8 \times 2 = 1$ **b)** $60 \div 5 + 5 = 6$ **c)** $8 - 6 \times 12 = 24$

d) $14 - 2 \times 6 = 72$ **e)** $6 + 3 \times 4 = 36$ **f)** $4 + 2 \times 7 = 42$

g) $88 + 55 \div 11 = 13$ **h)** $60 + 10 \div 7 = 10$ **i)** $42 + 3 \div 9 = 5$

j) $8 - 1 \times 9 = 63$ **k)** $36 \div 3 + 3 = 6$ **l)** $22 - 7 \times 2 = 30$

m) $4 \times 10 + 2 = 48$ **n)** $150 - 6 \div 12 = 12$ **o)** $50 - 2 \div 6 = 8$

3 Stacey thinks that $52 \div 2 + 2 = 13$.

a) Explain why Stacey is wrong.

b) Stacey adds brackets to her calculation and correctly gets the answer 13.
Where has Stacey put the brackets?

4 Add one pair of brackets to each of these calculations so they're correct.
Use your calculator to check each one.

a) $3 + 5 \times 6 - 2 = 23$ **b)** $8 - 2 \times 4 + 8 = 32$

c) $40 \div 8 \div 2 \times 11 = 110$ **d)** $9 + 1 - 10 - 2 = 2$

e) $9 \times 6 + 3 - 7 = 74$ **f)** $99 \div 12 - 3 + 11 = 22$

g) $15 - 12 \times 3 \times 12 = 108$ **h)** $11 - 9 + 2 \times 11 = 44$

5 Paul thinks that $3 \times 10 + 9 \div 3 = 19$.

a) Explain why Paul is wrong.

b) Add brackets to the calculation to make Paul's answer correct on a calculator.

Checking Answers

One way to check your answers is to do the opposite calculation.

Addition and **subtraction** are opposites. If you start off with a number, add any number to it and then subtract the same number from the answer, you'll end up with your original number.

Multiplying and **dividing** are opposites. If you start off with a number, multiply it by any number and then divide the answer by the same number, you'll end up with your original number.

Example 4 **What calculation could you do to check that 10 ÷ 2 = 5?**

1. First identify what sort of calculation the question is.
   This is a **division**. $10 \div 2 = 5$

2. **Multiplication** is the opposite of **division**.
   If you multiply your answer by the number you divided by, you should get the number you started with. **5 × 2 = 10**

   (You could also check that 10 ÷ 5 = 2.)

Exercise 3

1 Write a calculation you could use to check the following.

a) 19 + 8 = 27	**b)** 6 + 11 = 17	**c)** 21 – 14 = 7	**d)** 42 – 22 = 20
e) 15 – 9 = 6	**f)** 7 + 18 = 25	**g)** 24 – 15 = 9	**h)** 16 + 11 = 27
i) 22 – 17 = 5	**j)** 15 + 19 = 34	**k)** 39 – 22 = 17	**l)** 25 + 12 = 37
m) 31 – 10 = 21	**n)** 22 – 4 = 18	**o)** 28 + 14 = 42	**p)** 10 + 29 = 39

2 Write an opposite calculation for each of the following.

a) 5 × 5 = 25	**b)** 4 × 3 = 12	**c)** 42 ÷ 6 = 7	**d)** 72 ÷ 8 = 9
e) 8 × 4 = 32	**f)** 7 × 3 = 21	**g)** 5 × 10 = 50	**h)** 18 ÷ 9 = 2
i) 90 ÷ 10 = 9	**j)** 12 ÷ 6 = 2	**k)** 121 ÷ 11 = 11	**l)** 96 ÷ 8 = 12
m) 63 ÷ 9 = 7	**n)** 8 × 8 = 64	**o)** 7 × 11 = 77	**p)** 11 × 12 = 132

Calculating Tips

Here you go, your first page of lovely maths. All of the stuff on this page comes down to good old BODMAS, so remember — BODMAS, BODMAS, BODMAS, BODMAS, BODMAS...

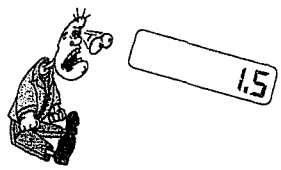
Q1 Edward uses his calculator to do this calculation: $\frac{12}{4 \times 0.5}$

a) He gets an answer of 1.5. Is this correct?

b) What has he done wrong?

c) Write down the keys he should use to get the correct answer.

d) Can you get the correct answer using another set of keystrokes?



Q2 Now Edward tries the following calculation, and gets an answer of 33.

$$\frac{140}{7+13}$$

What should he do to get the correct answer now?

Q3 Use your calculator to work these out:

(i) Writing down all the intermediate stages,
(ii) without writing down any intermediate stages.

a) $0.7 + (1.8 + 3.4) - (1.4 + 0.7)$

b) $8.2 - (4.1 + 1.6) - (0.7 - 3.7)$

c) $23.7 - 2 \times (4.3 - 1.9)$

d) $104 - 7 \times (3.2 - 11)$

e) $\frac{4.8 + 7.2}{0.2 \times 0.4}$

f) $\frac{37 - (21 - 4)}{4 \times -5}$

g) $3 \times (4 - 2 \times (0.7 \times 0.5))$

h) $\frac{2 \times 0.4^2 - 2 \times 0.2^2}{3.1 - 2.48}$

Remember:

Use BODMAS to get the order of operations right:

Brackets, Other, Division, Multiplication, Addition, Subtraction.

First → *Last*

Q4 **Challenge** — by inserting as many brackets as you like, see how many different answers you can get for the following:

$1 \times 3 + 5 - 3 \times 2 + 6 =$

Example: $((1 \times 3) + (5 - 3)) \times (2 + 6) = 40$

Ordering Numbers

Ideally, what you want to be able to do is order numbers without even thinking about it, so if you see a group of numbers you know the order of them straight away. Unfortunately it takes practice, but once it's done, it's done.

Q1 What are the largest and the smallest numbers that can be made with these sets of digits? Write each number out in words.

a) 4, 7, 9, 1

b) 3, 8, 8, 4

c) 3, 2, 4, 9

d) 5, 4, 3, 4, 8

e) 1, 2, 3, 7, 8

f) 1, 2, 3, 7, 9

Q2 What value does the digit 8 represent in each of these numbers?

a) 548.9

b) 784.2

c) 76.8

d) 4.081

e) 86560

f) 9.548

g) 7801

h) 823456

i) 18450

Q3 Put these numbers in order, from the smallest to the largest.

a) 1.54 1.71 1.98 1.3 1.89 1.5 1.62

b) 102.8 101.2 100.3 102.89 100.4 101.6 100.43

c) 4 0 -1 -10 2 5 -3

d) 7.41 7.36 7.13 7.09 7.40 7.18 7.21

Q4 Put these measurements in descending order.

a) 4.0 cm 4.1 cm 2.3 cm 3.1 cm 2 cm 3.9 cm 0.9 cm

b) 76.1 km 79.1 km 74.9 km 74.1 km 75.2 km 78.7 km 74.3 km

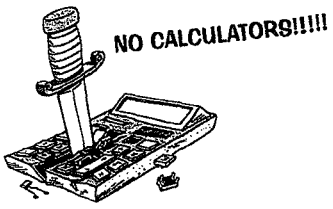
c) 0.102 m 0.219 m 0.02 m 0.009 m 0.021 m 0.012 m 0.220 m

d) 40.73 g 40.93 g 40.81 g 41.06 g 40.07 g 41.1 g 40.7 g

Don't be put off by the units — as long as you're ordering numbers with the same unit just carry on as normal.

Addition and Subtraction

You're not allowed to use calculators on this page. And that's not 'cos I've got anything against them — it's just that far, far away in the future you'll have to do some non-calculator exams. Sorry about that...



Q1 Use a pencil and paper to work out these calculations:

a) 1279 + 334

b) 4796 + 209

c) 569 – 491

d) 243 + 694 + 101

e) 3712 + 1319 + 2240

f) 7348 – 69

g) 1234 + 567 + 89

h) 9876 + 543 + 21

Q2 Calculate the following:

a) 2 – 7

b) -6 – 8

c) 0 – 9

d) 5 – -2

e) 7 – - 6

f) -8 – -2

g) -3 – -3

h) 8 – 5 – - 3

Q3 Using pencil and paper only, work out:

a) 31.8 + 42.7 + 83.8

b) 27.41 + 28.3 + 15.09

c) 2.31 + 23.1 + 231

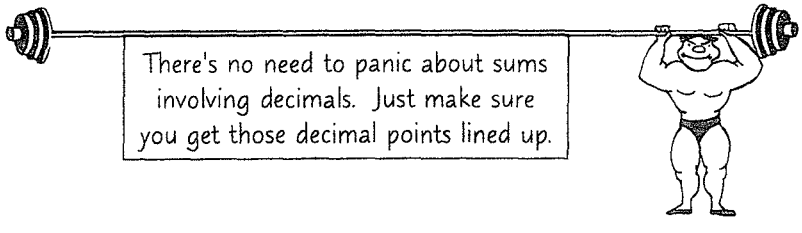
d) 1046 + 164 + 0.146

e) 27 + 36 – 42 + 0.5

f) 234 – 34.2 + 4.23

g) 67.1 + 30.23 + 11.131 – 42.22

h) 0.012 + 0.314 + 0.505



Q4 Work out these using paper and pencil only:

a) 47.0179 + 107.08 + 302.018

b) 73.179 + 8.987 + 20.117

c) 6.432 + 64.32 + 0.6432 + 643.2

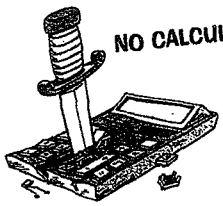
d) -0.0002 + 0.0014 + 0.00024

e) 10.9 + -7.31

f) 173.7 + -87.89

Multiplying Without a Calculator

Some of these are pretty hard considering you can't use a calculator. But if you're struggling, there's a sure-fire way to get better at this kind of question — and that's to practise until you can do them.



Q1 Carry out the following multiplications:

a) 51×10

b) 320×10

c) 14×100

d) 160×1000

e) 7.6×100

f) 5.487×10

Q2 Now work out these.

a) 43×47

b) 242×65

c) 721×341

d) 602×407

e) 34.7×2.3

f) 4.3×12.5

g) 73×-0.14

h) 57.1×-0.23

i) -4300×-1.23

j) 3.12×8.33

Q3 Work out 87×231. Then use your answer to work out the following.

a) 8.7×2.31

b) 87×23.1

c) 0.87×231

d) 870×2.31

e) 8.7×23.1

f) 870×0.231

g) 0.087×2310

h) 8.7×0.231

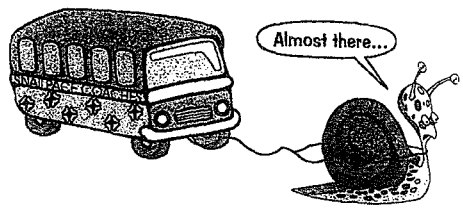
Once you've got the first multiplication sorted, you can work out the rest by carefully shifting the decimal point.

Q4 Snailpace Coach Company is running a trip to "The Anoraks" concert. They have seven 52-seater coaches and eight 12-seater minibuses.

a) How many fans can they carry to the concert?

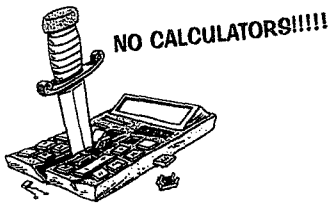
b) The coach company forks out £23 for each ticket. It also costs them £150 to run each coach and £80 per minibus. How much will the company have to pay in total to run the trip?

c) If they sell seats for the trip at £35 per ticket, how much profit will they make?



Dividing Without a Calculator

Divisions can be pretty easy when you're dividing by 10, 100 or 1000... but make sure that you know how to use short and long division for the harder ones.



Q1 Carry out the following divisions:

a) 350 ÷ 10

b) 1500 ÷ 100

c) 190,000 ÷ 1000

d) 20 ÷ 100

e) 1.6 ÷ 10

f) 410.36 ÷ 100

Q2 Work out the following, without using a calculator.

a) 357 ÷ 7

b) 744 ÷ 3

c) 676 ÷ 4

d) 276 ÷ 23

e) 231 ÷ 21

f) 437 ÷ 19

g) 8.7 ÷ 0.3

h) 48.96 ÷ 0.06

To get rid of decimals, write the division as a fraction and multiply both the top and bottom by 10 or 100.

Q3 Give these answers as a whole number plus remainder.

a) 985 ÷ 4

b) 767 ÷ 3

c) 371 ÷ 6

d) 423 ÷ 13

e) 279 ÷ 23

f) 986 ÷ 46

g) 779 ÷ 37

h) 775 ÷ 15

Q4 Cedric breeds rats. He keeps 7 rats in each cage.

How many cages will he need for 81 rats?

Q5 Daisy breeds locusts. How many 5 kg bags of food will she need to last four weeks if her locusts eat 1 kg of food a day?

Q6 Cedric suggests feeding the locusts to his rats.

If each rat eats 4 locusts a day, how long will 3416 locusts last 7 rats?

Special Types of Number

These can sound pretty complicated, but it's mainly just a matter of knowing what the words mean. Unfortunately, that means you're gonna have to learn them. Doh.

Q1 Match these four number sequences with their names:

a) 2, 4, 6, 8, ...

b) 1, 3, 5, 7, ...

c) 1, 4, 9, 16, ...

d) 1, 8, 27, 64, ...

Don't worry about the shapes — they're just there to make the page look a bit prettier.

Q2 Write down the squares of the first four even numbers, starting from $2^2 = 4$.

Q3 Write down the 8th:

a) even number

b) odd number

c) square number

d) cube number

Remember, a square number is a number times by itself. A cube number is a number times itself then by itself again. Simple eh?

Q4 Write down the following from this list of numbers: 20, 25, 15, 21, 11, 16, 27, 64

a) all the odd numbers

b) all the square numbers

c) all the even numbers

d) all the cube numbers.

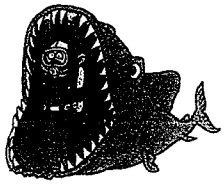
Q5 Write down:

a) the first 10 even numbers

b) the first 15 odd numbers

c) the first 5 square numbers

d) the first 8 cube numbers



Q6 Write down the following from this list of numbers: $7.437, 3, \sqrt{2}, \frac{1}{2}, \pi, \sqrt{3}$

a) all the integers

b) all the rational numbers

c) all the irrational numbers

d) all the real numbers

Multiples and Factors

Q1 Sort these numbers into 3 lists: multiples of 3, multiples of 4 and multiples of 5.
33 25 1016 164 21 63 10 39 175 50 4036 51 35 11144 110 512

a) In the multiples of 5, what do you notice about the last digit?

b) In the multiples of 3, what do you notice about the digit sum?

c) In the multiples of 4, what do you notice about the last 2 digits?

For the last bit, you need to look at the 2 digit number at the end — what does it always divide by?

Q2 Is 3 a factor of 2001?

Q3 What's the LCM of 8 and 12?

Q4 Write down:

a) the first 12 multiples of 6, and the first 10 multiples of 8.

b) any common multiples (the ones that are in both lists).

c) the lowest common multiple (LCM).

Q5 Find:

a) all the factors, in order, of each of these numbers: 12 18 24 30

b) the common factors.

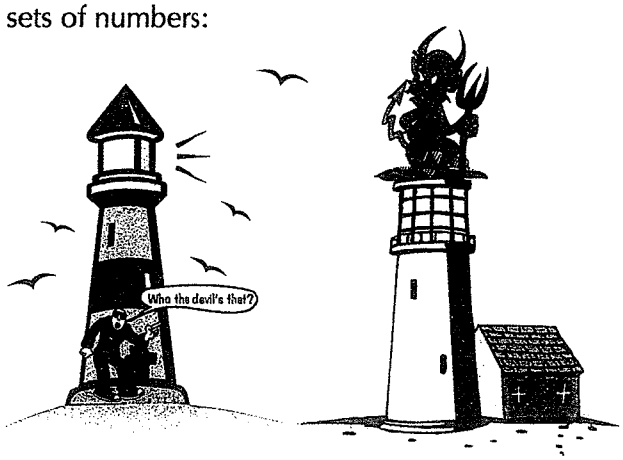
c) the highest common factor (HCF) of the four numbers.

Q6 Find the highest common factor of the following sets of numbers:

a) 32 and 48.

b) 45 and 105.

c) 36, 84 and 132.



Q7 Find all the factors of 300.

Q8 Craggy Point Lighthouse flashes every 25 seconds, and Devil's Rock Lighthouse flashes every 40 seconds. If they flash together, how soon will it be before they flash together again?

These 2 are asking more or less the same question — you need to find the lowest common multiple of both timespans.

Q9 There are two sets of traffic lights outside Eric's house. One day, he times how often they change. Set A turns green every 60 seconds. Set B turns green every 70 seconds. At midday precisely they both turn green together. At what time will they both turn green together again?

Primes and Prime Factors

Q1 In the ten by ten square opposite, circle all the prime numbers. The first three have been done for you.

1	②	③	4	⑤	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Q2 Find out which of the following numbers are prime:

71 77 83 107 117

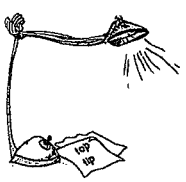
Q3 Is 729,064 a prime number?

Look at the last digit — it's a dead giveaway.

Q4 Write each of the following numbers as a product of prime factors:

90 120 140 180 210 864 1000

Q5 Find the prime factorisation of 504.



Oh Factor Tree, Oh Factor Tree... Don't forget this little gem — it might seem a waste of time, but it'll mean you can't miss any prime factors.

Q6 Express each of the following as the sum of two prime numbers: 10, 20, 30

Q7 Express the following as a product of prime factors:

a) 7
b) 9
c) 47
d) 105
e) 648
f) 220
g) 405
h) 25920

Remember to make sure that all the numbers in your factorisation are prime.

Q8 Which of these numbers are not prime? Show a factor for evidence.

113 35 784 20 97

Fractions, Decimals and Percentages

The main thing to remember is that there's no real difference between fractions, decimals and percentages — they all just mean "a part of..."

Q1 Change these decimals to percentages:

a) 0.28
b) 0.57
c) 0.875
d) 0.4725
e) 0.04
f) 0.045

These are the easy ones — all you've got to do is move the decimal point.

Q2 Change these percentages to decimals:

a) 35%
b) 35.8%
c) 70%
d) 7%
e) 0.7%
f) 5.5%

Q3 Turn these fractions into exact percentages:

a) $\frac{7}{8}$
b) $\frac{5}{16}$
c) $\frac{13}{40}$
d) $\frac{17}{20}$
e) $\frac{14}{25}$
f) $\frac{67}{80}$

Q4 Work these out as decimals correct to 3 decimal places, then write them as percentages:

a) $\frac{2}{9}$
b) $\frac{13}{15}$
c) $\frac{7}{18}$
d) $\frac{4}{11}$
e) $\frac{7}{12}$
f) $\frac{5}{13}$

Always do fractions to decimals to percentages and back in that order. It's a good reliable method to stick to.

Q5 Turn these percentages into fractions in their lowest terms:

a) 12.5%
b) 37.5%
c) 62.5%
d) 87.5%
e) 7.5%
f) 17.5%

Q6 Tariq got these scores in his exams:

$\frac{37}{50}$ for English, $\frac{14}{20}$ for History, $\frac{71}{85}$ for Maths and $\frac{39}{60}$ for Basket Weaving.

a) Convert these marks to percentages (to 1 decimal place if necessary).

b) Which were his best and worst results?

Q7 Jamila has scored 18 out of 25 in her test, and Diana has scored 16 out of 20. Who got the higher percentage?

Fractions

Don't forget to make the bottom numbers the same when adding or subtracting fractions. Avoid using your calculator for these questions (unless you're told otherwise).

Q1 For each fraction pair, put them both over a common denominator to see which is bigger. Write out the original fraction pair using the "greater than" sign $>$:

a) $\frac{3}{4}, \frac{4}{5}$ **b)** $\frac{2}{3}, \frac{5}{8}$ **c)** $\frac{1}{3}, \frac{2}{5}$ **d)** $\frac{13}{20}, \frac{7}{10}$

Q2 Add these fractions together, giving your answers in their simplest forms:

a) $\frac{1}{5}+\frac{1}{5}$ **c)** $\frac{3}{16}+\frac{5}{16}$ **e)** $1\frac{2}{5}+\frac{4}{5}$ **g)** $\frac{7}{2}+\frac{7}{3}$

b) $\frac{1}{4}+\frac{3}{4}$ **d)** $1\frac{1}{4}+\frac{3}{4}$ **f)** $2\frac{2}{3}+\frac{2}{3}$ **h)** $\frac{14}{3}+\frac{23}{4}$

Q3 Do these subtractions, giving your answers in their simplest forms:

a) $\frac{7}{8}-\frac{1}{8}$ **c)** $\frac{2}{3}-\frac{1}{3}$ **e)** $2-\frac{5}{8}$ **g)** $\frac{23}{8}-\frac{5}{8}$

b) $\frac{4}{5}-\frac{2}{5}$ **d)** $1-\frac{2}{5}$ **f)** $1\frac{3}{4}-\frac{1}{4}$ **h)** $\frac{9}{5}-\frac{3}{5}$

Q4 Find:

a) $\frac{1}{5}$ of £80 **c)** $\frac{1}{6}$ of 24 000 people **e)** $\frac{2}{3}$ of 90°

b) $\frac{1}{8}$ of 48 kg **d)** $\frac{1}{4}$ of 180 days **f)** $\frac{3}{5}$ of £4500

Q5 Do these first by hand, then check the results by calculator:

a) $\frac{3}{4}\times\frac{3}{4}$ **b)** $\frac{2}{5}\times\frac{1}{8}$ **c)** $1\frac{7}{8}\times1\frac{4}{5}$ **d)** $3\frac{5}{8}\times2\frac{2}{15}$

Q6 Do these first by hand, then by calculator and compare:

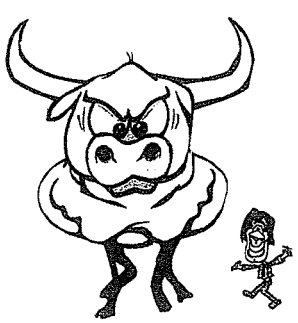
a) $\frac{2}{5}\div\frac{1}{4}$ **b)** $1\frac{3}{4}\div\frac{5}{8}$ **c)** $3\frac{1}{2}\div2\frac{1}{4}$ **d)** $5\frac{1}{3}\div2\frac{2}{3}$

Q7 Farmers in Broughton have been growing vegetables.

a) Farmer Richard owns 900 hectares of land. At the moment $\frac{2}{5}$ of this is used for growing vegetables. How many hectares is this?

b) Farmer Paddy down the road has a 1200 hectare farm, of which 720 hectares are for vegetables. What fraction of his land is for vegetables? Give your answer in its simplest form.

c) Farmer Richard wants to increase his production of vegetables so that it uses the same fraction of his land as Farmer Paddy. How many more hectares must he turn over to vegetables?



Percentage Basics

There's a treat in store for you now — two whole pages of lovely percentage questions. This first one's all about finding a percentage of a number, so when you see a % symbol you know what to do — write the percentage as a decimal and then multiply.

Q1 How much is:

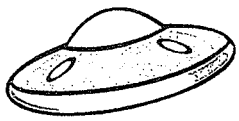
a) 1% of £35
b) 2% of £18
c) 5% of £90
d) 8% of £60
e) 22% of £4
f) 35% of £2
g) 60% of £5
h) 150% of £200
i) 125% of £500?

Q2 What is:

a) 16% of £3200
b) 20% V.A.T. on a bill of £48.80
c) 27% of 550 square miles
d) 92% of 6500 people
e) 16% of 350 lizards
f) 18% of 2250 cars?

Q3 Rewrite, translating the percentages into actual numbers:

a) Out of 44500 voters in the town, 32% voted for the Conservatives.
b) 18% of 3500 cars stopped had defects.
c) 15% of the cake's weight of 450 grams is butter.
d) 19% of the 1300 rare birds found were diseased.



Q4 Find:

a) 4% of 550 children
b) 7% of 900 grams
c) 2% of 4500 lorries
d) 8% of 2550 insects
e) 3% of 1400
f) 5% of 6500
g) 7.5% of £30
h) 2.5% of £4200
i) 100.5% of 360
j) 120.5% of 2000 grams

Q5 Is 34% of 68 the same as 68% of 34?
Is 5% of 43 the same as 43% of 5?
Will this always be true?

Percentage Basics

...and now for your second percentage instalment. This page gives you tons of practice at finding a number as a percentage of another number. It's not as bad as it looks — to find x as a percentage of y, divide x by y then multiply by 100.

Q6 Rewrite the following sentences, using percentages:

a) 3 out of every 10 people in Darkley believe in ghosts.

b) 4 out of 5 people are against annoying ringtones on buses.

c) One in every eight workers are off sick at present.

d) Only 3 out of 20 children thought there should be more homework.

Q7 580 books were delivered to a warehouse and 29 were found to be damaged. What percentage were damaged?

Q8 A 150 gram serving of fruit salad contains 17 grams of sugar. What percentage is sugar? (1 decimal place)

Q9 250 g of butter contains 202 g of fat. What percentage is fat?

Q10 Rocky Canyon Mine can't produce copper economically unless the ore contains at least 28% of the metal. Recently 4500 tonnes of ore has yielded 1168 tonnes of copper. Can they carry on?

These questions can have a lot of waffle in 'em... and most of it you can just ignore — put the story into maths, then forget about the rest of it.

Q11 Sarah has bought herself a new laptop costing £1250. She's also bought a new printer for £150 and a desk for £100.

a) How much did she spend altogether?

b) What percentage of her total outlay was the cost of the printer?

c) What percentage of her total outlay was the cost of the laptop?

Rounding Numbers

Well, this page should give you plenty of practice at rounding — and isn't that just what you've always wanted...?

Q1 Round to one decimal place:

a) 4.73 **c)** 6.75 **e)** 11.76

b) 8.92 **d)** 19.476 **f)** 20.85

Q2 Round to two decimal places:

a) 4.763 **c)** 17.094 **e)** 14.986

b) 5.0852 **d)** 12.990 **f)** 17.098

Q3 Round these weights off to the nearest gram.

Remember those units: 1 g = 0.001 kg

a) 4.86932 kg **c)** 1.00982 kg **e)** 3.0605 kg

b) 1.00942 kg **d)** 2.070695 kg **f)** 0.0039 kg

Q4 Round these angles to the nearest $\frac{1}{10}$ degree.

a) 12.83° **c)** 27.04° **e)** 57.8159°

b) 12.89° **d)** 24.97° **f)** 57.8951°

Q5 Round off these distances to the nearest 100 metres – i.e. to one decimal place:

a) 5.768 km **c)** 8.48 km **e)** 17.685 km

b) 9.039 km **d)** 8.41 km **f)** 17.658 km

Q6 Write these numbers correct to 3 significant figures:

a) 6762 **c)** 6769.5 **e)** 2009.75

b) 6767.5 **d)** 2005 **f)** 2000

Q7 Write these numbers correct to 2 significant figures:

a) 0.352 **c)** 0.00574 **e)** 0.0356

b) 0.0357 **d)** 4.01964 **f)** 1.0356

Q8 Write the populations of these cities to 3 significant figures, which in this particular case will be the same as rounding off to the nearest 1000:

a) Bigtown – 369387 **d)** Littlewich – 129960

b) Shortville – 102008 **e)** Megaborough – 479940

c) Middlethorpe – 190886 **f)** Port Average – 157095

Rounding Errors and Estimating

Q1 What is the error when each of these numbers is given to 1 significant figure?

a) 7.2

b) 8.4

c) 10.21

d) 7.56

e) 8888

f) 13012

Q2 Find the range of possible values for x for each of the following. Give your answers as inequalities.

a) $x = 120$ to the nearest 10

b) $x = 300$ to the nearest 100

c) $x = 10.2$ to 1 d.p.

d) $x = 7.5$ to 2 s.f.

e) $x = 8800$ to 2 s.f.

f) $x = 1010$ to 3 s.f.

Q3 For each calculation: **i)** round off the figures to 1 significant figure, and work out an estimate to the calculation.
ii) use your calculator to find a more exact answer. Round it to 3 s.f.

a) $6.81 + 9.13 + 17.93$

b) $63.56 - 42.85$

c) 8.63×7.42

d) $\dfrac{4.35 \times 2.86}{1.92}$

e) $\dfrac{91.2 - 72.4}{17.68}$

f) $\dfrac{99.8 \times 4.7}{9.84}$

Remember — round everything to 1 sig fig... then do the calculation.

Q4 **i)** Round off the figures to 1 significant figure, and use them to estimate the answer to the calculation.
ii) Use your calculator to find a more exact answer, to 3 d.p.:

a) $\dfrac{0.38 \times 1.14}{0.189}$

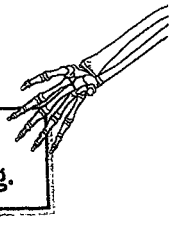
b) $\dfrac{3.725 - 1.628}{4.96 \times 1.98}$

c) $\dfrac{1.12 \times 0.880}{1.08 \times 2.970}$

d) $0.59 + 1.42 - 0.385$

e) $\dfrac{0.803}{3.965} + 1.074$

f) $\dfrac{5.843 + 8.925 - 3.185}{7.24 - 2.19}$



Always show your working — you sometimes get marks for that even if your answer's wrong.

Q5 A car goes 407 km in 5.11 hours.

a) By rounding off to 1 significant figure, give a rough estimate of its speed in kilometres per hour.

b) Use your calculator to find a more exact result to 3 significant figures.

Powers

Unfortunately, maths powers aren't quite as fun as the superhero kind... but they do obey nifty rules. When you're multiplying, add the powers, and when you're dividing, subtract them.

Q1 Work out the exact value of:

a) 2^5 **d)** 2^8 **g)** 10^5 **j)** 6^3

b) 3^3 **e)** 3^4 **h)** 100^3 **k)** 7^3

c) 4^2 **f)** 5^3 **i)** 8^3 **l)** 10^6

Q2 Simplify by adding or subtracting powers; then work out the exact value:

a) $4^2 \times 4^3$ **d)** $2^7 \times 2^4$ **g)** $5^6 \div 5^4$

b) $2^3 \times 2^5$ **e)** $3^7 \div 3^5$ **h)** $7^{10} \div 7^9$

c) $3^6 \times 3^3$ **f)** $10^{12} \div 10^9$ **i)** $4^6 \div 4^3$

Q3 Simplify as far as possible (in some cases, this just means removing the × signs):

a) $a \times a \times a$ **e)** $x \times y$ **i)** $a \times b \times c \times 5$

b) $2 \times a \times a \times a$ **f)** $x \times y \times z$ **j)** $3 \times x \times x \times 4 \times y$

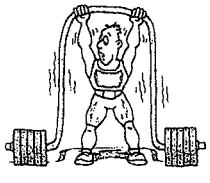
c) $3 \times 2 \times x \times x \times x$ **g)** $x \times x \times x \times y$ **k)** $2 \times y \times x \times 4$

d) $5 \times y \times 4 \times y$ **h)** $x \times x \times y \times y \times y$ **l)** $10 \times k \times j \times k \times j$

Q4 Simplify using the power rules:

a) $x^{10} \div x^4$ **c)** $a^7 \div a^4$ **e)** $\frac{r^5}{r}$

b) $y^5 \div y^2$ **d)** $\frac{b^6}{b^3}$ **f)** $\frac{y^{10}}{y^7}$



Q5 Use the power rules to simplify the following:

a) $3a \times 5a \times 4$ **d)** $2a^3 \times 3a^2$ **g)** $(x^2)^2$

b) $12x \times 3x^2$ **e)** $3p \times 2p^2 \times 4p^3$ **h)** $(y^4)^3$

c) $4y^2 \times 5y$ **f)** $7m^2 \times 3n$ **i)** $(x^3)^{-2}$

Q6 Simplify using the power rules:

a) $\frac{10x^4}{5x^3}$ **b)** $\frac{15a^5}{3a^2}$ **c)** $\frac{12b^4}{4b^3}$ **d)** $\frac{20k^5}{5k^2}$ **e)** $\frac{27x^5}{18y^5}$

Q7 Write using negative powers:

a) $\frac{1}{10^2}$ **b)** $\frac{1}{x^2}$ **c)** $\frac{1}{10^4}$ **d)** $\frac{1}{a^4}$ **e)** $\frac{5}{a^4}$

Square Roots and Cube Roots

Those weird tick signs and microscopic numbers are nowhere near as scary once you know what they mean. $\sqrt{20}$ is the "square root of 20", which is the number which times by itself gives 20. $\sqrt[3]{20}$ means the "cube root of 20" — that's the number for which number × number × number = 20.

Q1 Use your calculator to find (to 2 dp):

a) $\sqrt{50}$ **c)** $\sqrt{65}$ **e)** $\sqrt{7}$

b) $\sqrt{20}$ **d)** $\sqrt{15}$ **f)** $\sqrt{72}$

Q2 Find the following to 1 dp:

a) $\sqrt[3]{80}$ **d)** $\sqrt[4]{75}$

b) $\sqrt[3]{150}$ **e)** $\sqrt[3]{63}$

c) $\sqrt[4]{5}$ **f)** $\sqrt[3]{10}$

Q3 Find both square roots of the following numbers:

a) 49 **b)** 256 **c)** 90.25 **d)** 86.49

Q4 Given y^2, write down the two possible values of y:

a) $y^2 = 81$ **d)** $y^2 = 100$

b) $y^2 = 25$ **e)** $y^2 = 4$

c) $y^2 = 16$ **f)** $y^2 = 36$

Q5 Given y^3 write down the value of y:

a) $y^3 = 125$ **d)** $y^3 = 27$

b) $y^3 = 64$ **e)** $y^3 = 1$

c) $y^3 = 8$ **f)** $y^3 = 0$

Check your answers using a calculator afterwards.

Q6 Simplify:

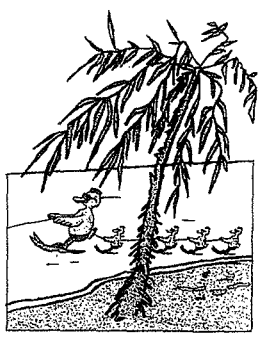
a) $\sqrt{16x^2}$ **f)** $\sqrt{a^4}$

b) $\sqrt{25a^2}$ **g)** $\sqrt[3]{27a^3}$

c) $\sqrt{100m^2}$ **h)** $\sqrt[3]{64a^3b^3}$

d) $\sqrt{64a^2b^2}$ **i)** $\sqrt[3]{1000a^6}$

e) $\sqrt{16a^2b^2c^2}$ **j)** $\sqrt[3]{a^6}$



Standard Form

Writing very big (or very small) numbers gets a bit messy with all those zeros, if you don't use this standard index form. But of course, the main reason for knowing about standard form is... you guessed it — it could come up in a test.

1 billion = 1000 million

Q1 Write in standard form:

a) 5000
b) 9000
c) 90 000
d) 200 000
e) 3 million
f) 30 million
g) 300 million
h) 8 billion
i) 10 billion

Q2 Write in standard form:

a) 5 million
b) 5.8 million
c) 5.85 million
d) 6 000 000
e) 6 700 000
f) 6 750 000

Q3 Write as ordinary numbers:

a) 4×10^3
b) 4.3×10^3
c) 4.35×10^3
d) 4.352×10^5
e) 6×10^4
f) 6.4×10^4
g) 6.42×10^4
h) 6.425×10^4
i) 6.4258×10^4

Q4 Write these numbers in correct standard form, i.e. with just one digit before the point:

a) 35×10^5
b) 160×10^3
c) 45×10^6
d) 127×10^6
e) 58.5×10^4
f) 72.8×10^9
g) 0.3×10^5
h) 0.85×10^6
i) 0.03×10^5

Q5 Evaluate in standard form:

a) $(3 \times 10^4) \times (2 \times 10^5)$
b) $(1.5 \times 10^6) \times (2 \times 10^4)$
c) $(4 \times 10^8) \times (3 \times 10^5)$
d) $(2.5 \times 10^5) \times (5 \times 10^4)$

Don't forget to use your power rules: When you multiply, add the powers. When you divide, subtract them.

Q6 Carry out the following divisions, giving your answers in standard form:

a) $(9 \times 10^7) \div (3 \times 10^2)$
b) $(8 \times 10^{12}) \div (2 \times 10^4)$
c) $(7 \times 10^9) \div (2 \times 10^3)$
d) $(6 \times 10^5) \div (3 \times 10^3)$

Q7 Write these numbers in standard form:

a) 0.0004
b) 0.02
c) 0.025
d) 0.0005
e) 0.00052
f) 0.000527

Q8 Put these in order from smallest to largest: 2.31×10^3, 2450, 1.76×10^3.

Q9 Put these in order from smallest to largest: 1.6×10^{-4}, 6.5×10^{-5}, 0.0078

Solving Equations

You don't need to be a super-sleuth to solve equations, but you will need practice. Always do the same thing to both sides of the equation, and you can't go far wrong. Just keep going 'til you've got the letter on its own.

Q1 Solve the following:

a) $4x = 20$

b) $7x = 28$

c) $x + 3 = 11$

d) $x + 19 = 23$

e) $x - 6 = 13$

f) $7x = -14$

g) $2x = -18$

h) $x + 5 = -3$

i) $\frac{x}{2} = 22$

j) $\frac{x}{7} = 3$

k) $\frac{x}{5} = 8$

l) $10x = 100$

m) $2x + 1 = 7$

n) $2x + 4 = 5$

Check your answer by sticking it back into the equation at the end and seeing if it works.

Q2 Solve the following equations:

a) $3(2x + 5) = 39$

b) $7(x - 2) = 126$

c) $9(3x + 4) = 306$

d) $8(5x - 3) = 136$

e) $6(4x + 7) = 282$

f) $7(9x - 8) = 6244$

Q3 Solve:

a) $5x - 9 = 41$

b) $\frac{x}{7} + 14 = 20$

c) $\frac{3x}{4} - 9 = 6$

d) $11x + 4 = 6x + 29$

e) $3x + 8 + 4x - x = 26$

f) $\frac{2x}{3} = 10$

g) $2(3x - 5) = 170$

h) $\frac{4x}{5} - 8 = 72$

i) $10x - 9 - 3x = 40$

j) $x + 2x + 3x + 4x = 1000$

Q4 Solve the following:

a) $5(x - 1) + 3(x - 4) = -11$

b) $3(x + 2) + 2(x - 4) = x - 3(x + 3)$

c) $\frac{3x}{2} + 3 = x$

d) $3(4x + 2) = 2(2x - 1)$

e) $5x + \frac{7}{9} = 3$

f) $2x + \frac{7}{11} = 3$

Using Formulas

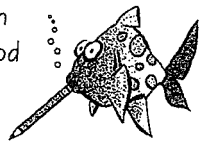
Don't forget the invisible "×" sign when 2 letters are stuck together...
E = Fg actually means E = F × g. Eesh.

Q1 If $p = qr$:

a) Calculate p when $q = 1.5$, $r = 8$.

b) Calculate r when $p = 150$, $q = 3$.

Always do your working in steps — write down the formula first, then again with numbers in, then work it out. It's a good reliable method... and we do like those.



Q2 If $V = IR$:

a) Calculate V when $I = 3.2$, $R = 75$.

b) Calculate I when $V = 12$, $R = 24$.

Q3 Using the formula $V = LBH$ (Volume = Length × Breadth × Height):

a) Calculate V when $L = 4.2$ cm, $B = 3.5$ cm, $H = 1.4$ cm.

b) Calculate H when $V = 250$ m^3, $L = 10$ m, $B = 8$ m.

c) Calculate B when $V = 4500$ mm^3, $L = 30$ mm, $H = 10$ mm.

Q4 Using the formula $a = \frac{bh}{2}$ (Area = $\frac{\text{Base} \times \text{Height}}{2}$):

a) Calculate a when $b = 8.6$ cm, $h = 5.2$ cm.

b) Calculate h when $a = 40$ m^2, $b = 10$ m

Q5 A catering company charge for arranging a meal by using the formula $C = B + np$, where C is the total cost, B is the basic charge, n is the number of guests and p is the additional cost for each guest.

a) Calculate the cost if the basic charge is £80, and there are 45 guests each charged at £4.

b) On a different occasion there were 60 guests each charged at £5, and the total cost was £410. Calculate the value of B.

c) On another occasion the guests are charged at £6 each, the basic charge B is £95, and the total cost is £545. Calculate the value of n, the number of guests.

Q6 Using the formula $v = u + at$:

a) Calculate v when $u = 250$, $a = 32$, $t = 10$.

b) Calculate u when $v = 450$, $a = 10$, $t = 25$.

c) Calculate t when $v = 248$, $u = 150$, $a = 9.8$.

Q7 Using the equation of a straight line $y = mx + c$, where m is the gradient and c is the intercept:

a) Calculate y when $m = 0.4$, $c = 3.5$, $x = 5$.

b) Calculate c if you know that $m = -2$, and the line passes through the point (3, -4).

c) Calculate m if you know that $c = 4$, and the line passes through the point (1, 4.5).

You have now finished this booklet.

Well done.