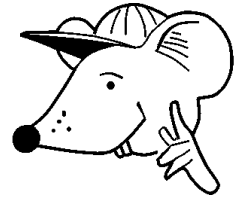




MATHEMATICS



N.S. Yr. 6 P.73

Checking results of calculations.

Equipment

Paper, pencil, calculator with four functions plus square root button (for later use) and, if possible, change of sign button.

MathSphere

© MathSphere P.O. Box 1234 Worthing BN13 2UJ www.mathsphere.co.uk

Concepts

This module is concerned with developing techniques for checking calculations. It is very easy for children to assume that because a calculation is done on a calculator, it must be correct. Their faith in the electronics is probably justified, but what about their faith in their own abilities?

We look here at checking using the following methods:

a) Doing the inverse operations. If a division has just been calculated, do the opposite multiplication to check.

Eg. $17.5 \div 5 = 3.5$ Check by doing 3.5×5 to see if it comes to 17.5

b) Checking a total by adding the numbers in reverse order.

Eg. $43.6 + 8.9 + 32.7 + 6.8 = 92.0$

Does $6.8 + 32.7 + 8.9 + 43.6$ also equal 92.0 ?

Also by splitting up a column of numbers into groups and totalling each separately.

c) Doing an equivalent calculation.

Eg. $642 \times 6 = 3\,852$ Check with $642 \times 3 \times 2$ or $(600 \times 6) + (42 \times 6)$

Eg. $46.8 - 23.5 = 23.3$ Check with $40 - 23.5 + 6.8$

d) Perform an approximate calculation to see if the answer is in the correct range.

Eg. $448 \div 49 = 9.1428571$ Check: $450 \div 50 = 9$

Eg. $4\,613 - 2\,955 = 1\,658$ Check: $4\,600 - 3\,000 = 1\,600$

e) Carry out some simple tests such as two even numbers multiplied together always give an even number. The sum of an odd number and an even number is always an odd number.

f) Use divisibility of numbers tests.

Eg. $33 \times 15 = 495$ Each of the numbers in the sum is a multiple of 3, so the answer must be a multiple of 9 (which it is!).



It is easy to think that because a calculator is an electronic tool, it always gives the right answer.

Big mistake!

You see, the calculator may do the sums correctly, but can you be sure you typed the numbers in accurately?

It's very easy to make a typing error.

In this module, we are going to look at different ways to check your calculations.

Method 1: Do the inverse (opposite) calculation.

1. Work out these sums and then do the opposite calculation to check your answer.

Eg. in part **a.** work out $4.8 - 2.9 = 1.9$ and then check with $1.9 + 2.9$ and see if it comes to **4.8**

- a.** $4.8 - 2.9$ **b.** $6.78 - 3.29$ **c.** $56.82 + 36.81$ **d.** $624.4 \div 7$
e. $\frac{1}{4}$ of 51.36 **f.** Find one third of 27.75 **g.** 6.3^2 **h.** $47.2 \div 8$

Method 2: Add numbers in the reverse order.

2. Sometimes we want to check the total of lots of numbers. One way to do this is to add them in the reverse order.

Eg. $6.2 + 5.7 + 9.2 + 4.5 + 1.3 = 26.9$

Check by adding: $1.3 + 4.5 + 9.2 + 5.7 + 6.2$

Try this idea with these sums.

- a.** $5.3 + 4.9 + 2.8 + 4.3 + 12.6 + 3.7 + 4.3$
b. $12.45 + 65.83 + 48.15 + 62.43 + 12.54 + 63.59 + 99.45 + 28.45 + 42.87$
c. $45.83 + 53.83 + 26.73 + 12.84 + 34.63 + 52.95 + 83.85 + 27.66$
d. $3.57 + 25.5 + 0.05 + 4.65 + 47.93 + 0.03 + 26$



Don't forget, the calculator may be able to do sums accurately, but can you type them in without making any mistakes?

Here you can try some different ideas for checking your work.

Method 1: Do the inverse (opposite) calculation.

1. Work out these sums and then do the opposite calculation to check your answer. Use a calculator if you wish.

Eg. in part **a.** work out $78.6 + 96.5 = 175.1$ and then check with $175.1 - 96.5$ and see if it comes to **78.6**

- a.** $78.6 + 96.5$ **b.** What is $\frac{1}{4}$ of £34.52 ? **c.** 5.34^2 **d.** 2.43×13.2
e. $\frac{1}{8}$ of 140.32 **f.** $78.39 - 52.86$ **g.** 45.6^2 **h.** $64.92 - 61.83$

Method 2: Add numbers in the reverse order.

2. Sometimes we want to check the total of lots of numbers. One way to do this is to add them in the reverse order.

Eg. $5.3 + 6.8 + 3.5 + 2.8 + 4.7 = 23.1$

Check by adding: $4.7 + 2.8 + 3.5 + 6.8 + 5.3$

Try this idea with these sums.

- a.** $6.3 + 8.4 + 22.5 + 54.6 + 132.5 + 3.9 + 412.1$
b. $34.65 + 96.43 + 473.65 + 23.43 + 8.45 + 34.61 + 7.45 + 34.85 + 14.65$
c. $24.84 + 54.65 + 84.65 + 32.63 + 76.35 + 94.67 + 95.34 + 35.63$
d. $2.7 + 26.84 + 1.12 + 0.05 + 62 + 0.3 + 0.03$

I hope you are getting the idea now.



Here are some columns of numbers to add up.

First of all, add them up on your calculator starting at the top and working down.

Next, add them from the bottom up.

Lastly, divide the column into groups of numbers (about 10 in each group), add each group up and then find the total of the groups.

Column	A	B	C	D
	15.46	3.7	67.438	£86.93
	34.76	12.8	9	£ 8.56
	83.98	9.45	86.4	£ 4.83
	35.78	0.4	0.635	£98.34
	14.93	9.53	85.724	£77.77
	98.47	9.63	0.78	£25.83
	58.15	12.8	54.83	£15.73
	69.45	23.87	12.34	£18.65
	94.03	49.3	9.56	£95.36
	56.93	78.99	0.6	£58.42
	82.78	0.67	23.734	£84.74
	46.83	56.4	537.957	£ 8.37
	75.93	3.74	872.958	£ 7.83
	27.93	6.74	89	£ 4.75
	11.67	9.34	58.48	£74.81
	14.73	8.8	9.144	£85.73
	56.83	3.65	1.26	£ 5.93
	58.38	15.6	3.26	£67.67
	77.88	78.4	9.62	£ 3.64
	23.54	25.6	6.87	£ 9.57
	96.46	8.54	9.37	£10.58
	83.84	6.84	95.48	£ 7.59
	82.15	9.8	9.46	£34.62
	45.73	4.9	26	£85.49
	27.63	5.73	48.42	£42.22
	27.43	8.5	9.5	£ 9.62
Top to bottom				
Bottom to top				
Added in groups				

Method 3: Think of an equivalent sum.

In this section, you should think of another sum that will give you the same answer so you can check your calculation.

Eg. Calculate $56.45 + 34.89$ This comes to **91.34**.

Now check with another sum that will give the same answer,
For instance $56 + 34 + 0.45 + 0.89$

Eg. Calculate $45.78 - 3.67 = 42.11$ Check with $42 + 0.78 - 0.67$

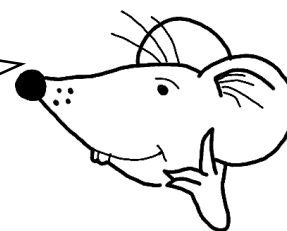
1. a. $79.54 + 7.98$ b. $11.86 - 5.72$ c. 4.8×4 d. $8.55 \div 5$
 e. $1\,250 \times 20$ f. $8 - 4.83$ g. 92×12 h. $75.6 \div 7$

You can discuss your equivalent sums with your friends and see what ideas you had.

For example, $375 \times 15 = (375 \times 10) + (375 \times 5)$

Or $375 \times 3 \times 5$

Or $(300 \times 15) + (70 \times 15) + (5 \times 15)$

**Method 4: Check by doing an approximate sum.**

Eg. Calculate $9.54 \times 2.8 = 26.712$

We can check this is about right by working out $10 \times 3 = 30$

2. Here are some for you to try. Work each one out and then try an approximate sum.

- a. 8.9×8.3 b. 4.6^2 c. $16.8 + 31.7$ d. $61.2 \div 6$
 e. $2\,546 + 4\,498$ f. $4\,873 - 3\,829$ g. 28.56×9 h. 19.4^2

3. Here are some harder problems. Work them out on **your calculator** and then do an approximate sum to see if your answers are about right.

- a. $(37.8 + 22.9) \times 9$ b. $93^2 - 17.9$ c. $34.78 + 15.8 - 4.77$
 d. $\pounds 12.88 \div 4$ e. $\pounds 12\,855.60 \div 12$ f. $(54.7 + 28.9) \times 9$
 g. 87.99^2 h. $(57.3 + 9.8) - (12.4 + 6.7)$ i. $\pounds 83.99 \times 58$

Method 3: Think of an equivalent sum.

In this section, you should think of another sum that will give you the same answer so you can check your calculation.

Eg. Calculate 56.89×8 This comes to **455.12**

Now check with another sum that will give the same answer,
For instance $56.89 \times 2 \times 4$

Eg. Calculate $78.34 + 35.82 = 114.16$

Check with $70 + 30 + 8 + 5 + 0.34 + 0.82$

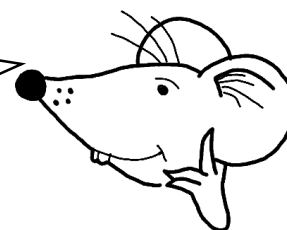
1. a. $90.76 + 8.56$ b. $£34.86 - £3.77$ c. 3.9×6 d. $73.8 \div 6$
e. 84×8 f. $83 - 69.53$ g. $171 \div 9$ h. 3.5×15

You can discuss your equivalent sums with your friends and see what ideas you had.

For example, $984 \times 24 = (984 \times 20) + (984 \times 4)$

Or $984 \times 3 \times 8$

Or $(900 \times 24) + (80 \times 24) + (4 \times 24)$

**Method 4: Check by doing an approximate sum.**

Eg. Calculate $852 \div 12 = 71$

We can check this is about right by working out $800 \div 10 = 80$

2. Here are some for you to try. Work each one out and then try an approximate sum.

- a. 3.8×3 b. 6.9^2 c. $45.6 + 6.9$ d. $646 \div 38$
e. $5744 + 3\,622$ f. $6\,944 - 5\,934$ g. 269×18 h. 1.8^2

3. Here are some harder problems. Work them out **on your calculator** and then do an approximate sum to see if your answers are about right.

- a. $(98.4 + 23.6) \times 5$ b. $61^2 - 45$ c. $63.87 + 34.7 - 7.55$
d. $£20.15 \div 6.2$ e. $£891.88 \div 22$ f. $(33.8 + 14.7) \times 7$
g. 51.86^2 h. $(67.3 + 8.7) - (34.8 + 12.9)$ i. $£78.56 \times 21$

Method 5: Know some facts about numbers.

You should know the following facts by now:

If you **add** two or more **even** numbers, the answer is always **even**.

If you **add** two **odd** numbers, the answer is always **even**.

If you **add** an **odd** number and an **even** number, the answer is always **odd**.

If you **subtract** two **even** numbers, the answer is always **even**.

If you **subtract** two **odd** numbers, the answer is always **even**.

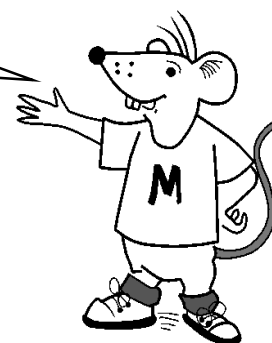
If you **subtract** an **even** number and an **odd** number, the answer is always **odd**.

If you **multiply** two **even** numbers, the answer is always **even**.

If you **multiply** two **odd** numbers, the answer is always **odd**.

If you **multiply** an **odd** and an **even** number, the answer is always **even**.

Use this information to say which of the following are **definitely false** and which **could be true**.



Eg. **1a.** is definitely **false**.

- | | | |
|--------------------------------|-----------------------------------|--------------------------------|
| 1. a. $4 + 6 + 8 = 17$ | b. $23 + 89 = 112$ | c. $34 + 77 = 111$ |
| d. $354 - 256 = 99$ | e. $77 - 39 = 39$ | f. $358 - 243 = 115$ |
| g. $24 \times 26 = 624$ | h. $45 \times 23 = 1\ 035$ | i. $36 \times 23 = 827$ |

I hope you are not using a calculator for these questions.

- | | | |
|--------------------------------------|-------------------------------------|---------------------------------------|
| 2. a. $567 - 366 = 203$ | b. $755 + 957 = 1\ 712$ | c. $644 - 438 = 206$ |
| d. $76 \times 34 = 2\ 583$ | e. $56 + 73 = 127$ | f. $24 + 78 + 92 + 26 = 221$ |
| g. $735 - 257 = 478$ | h. $56 \times 33 = 1845$ | i. $655 \times 233 = 152\ 615$ |
| 3. a. $74 \times 38 = 2\ 812$ | b. $333 - 275 = 57$ | c. $46 + 865 = 911$ |
| d. $66 + 86 = 152$ | e. $582 - 466 = 115$ | f. $78 - 36 = 42$ |
| g. $46 \times 58 = 2\ 668$ | h. $475 \times 73 = 34\ 675$ | i. $6\ 733 + 9\ 835 = 16\ 548$ |

Method 5: Know some facts about factors.

You should know the following facts by now:

Easy:

If a number is **even**, it is divisible by **2**.

If a number **ends in a 0**, it is divisible by **10**.

If a number **ends in 00**, it is divisible by **100**.

If a number **ends in 0 or 5**, it is divisible by **5**.

Harder:

If a number **ends in 00, 25, 50 or 75**, it is divisible by **25**.

If the **last two digits** of a number are **divisible by 4**, the whole number is divisible by **4**.

If the **last three digits** of a number are **divisible by 8**, the whole number is divisible by **8**.

If the **sum of the digits is divisible by 3**, the whole number is divisible by **3**.

If the **sum of the digits is divisible by 9**, the whole number is divisible by **9**.

If the **sum of the digits is divisible by 3** and the number is even, the whole number is divisible by **6**.

Use this information to say which of the following are definitely false and which could be true.

No calculators please!



Eg. **1a.** is definitely **false** because it needs **00** at the end to be divisible by **100**.

- | | |
|--------------------------------------|--|
| 1. a. 560 is divisible by 100 | b. 546 is divisible by 3 |
| c. 654 is divisible by 6 | d. 6 748 is divisible by 4 |
| e. 8 182 is divisible by 9 | f. 6 735 is divisible by 5 |
| g. 67 850 is divisible by 25 | h. 78 998 is divisible by 2 |
|
 | |
| 2. a. $33 \times 21 = 693$ | b. $40 \times 30 = 1\,240$ |
| c. $65 \times 35 = 2\,288$ | d. $25 + 35 + 45 + 55 = 162$ |
| e. $525 + 350 + 575 = 1\,450$ | f. $21 \times 22 = 462$ |
| g. $2\,400 + 3\,500 = 5\,910$ | h. $12 + 15 + 9 + 18 + 12 = 67$ |

Answers**Page 3**

1. a. 1.9 b. 3.49 c. 93.63 d. 89.2 e. 12.84 f. 9.25
 g. 39.69 h. 5.9
2. a. 37.9 b. 435.76 c. 338.32 d. 107.73

Page 4

1. a. 175.1 b. £8.63 c. 28.5156 d. 32.076 e. 17.54 f. 25.53
 g. 2 079.36 h. 3.09
2. a. 640.3 b. 728.17 c. 498.76 d. 93.04

Page 5

Col A	Col B	Col C	Col D
1 401.68	463.72	2 137.82	£1 033.58

Page 6

1. a. 87.52 b. 6.14 c. 19.2 d. 1.71 e. 25 000 f. 3.17
 g. 1 104 h. 10.8
2. a. 73.87 b. 21.16 c. 48.5 d. 10.2 e. 7 044
 f. 1 044 g. 257.04 h. 376.36
3. a. 546.3 b. 8 631.1 c. 45.81 d. £3.22 e. £1 071.30
 f. 752.4 g. 7 742.2401 h. 48 i. £4 871.42

Page 7

1. a. 99.32 b. £31.09 c. 23.4 d. 12.3 e. 672 f. 13.47
 g. 19 h. 52.5
2. a. 11.4 b. 47.61 c. 52.5 d. 17 e. 9 366
 f. 1 010 g. 4 842 h. 3.24
3. a. 610 b. 3 676 c. 91.02 d. £3.25 e. £40.54
 f. 339.5 g. 2 689.4596 h. 28.3 i. £1 649.76

Page 8 In the following answers 'could be true' is used in preference to 'true' because an answer may pass the particular test, but still be wrong.

1. a. False b. Could be true c. Could be true d. False e. False
 f. Could be true g. Could be true h. Could be true i. False
2. a. Could be true b. Could be true c. Could be true d. False
 e. Could be true f. False g. Could be true h. False
 i. Could be true
3. a. Could be true b. False c. Could be true d. Could be true e. False
 f. Could be true g. Could be true h. Could be true i. Could be true

Answers (Contd)**Page 9**

1. a. False b. True c. True d. True e. False
f. True g. True h. True
2. a. Could be true b. False c. False d. False e. Could be true
f. Could be true g. False h. False