

Ten Calculator Activities- Teacher's Notes

Introduction

These ten activity sheets can be photocopied and given to pupils at Key Stage 2. It is intended that the teacher introduces and discusses each activity by interacting with the whole class at the start of the main part of the lesson, rather than simply hand out the sheets with no explanation. The plenary can be used to discuss the outcomes of the activity, reinforce the key points and reflect on the lesson's learning objectives.

An excellent resource that you can use with the whole class when discussing each activity is *The BFC (Big Friendly Calculator)* which costs only £25 for a school site license and is available from

www.numeracysoftware.com



Answers

Find the Palindrome

There are an infinite number of solutions to all of the questions. The first ten solutions (in some cases the first five) to each question are:

Multiples of 3:	33, 66, 99, 111, 141, 171, 222, 252, 282 and 303.
Multiples of 4:	44, 88, 212, 232, 252, 272, 292, 404, 424 and 444.
Multiples of 5:	55, 505, 515, 525, 535, 545, 555, 565, 575 and 585
Multiples of 6:	66, 222, 252, 282, 414, 444, 474, 606, 636 and 666.
Multiples of 7:	77, 161, 252, 343, 434, 525, 595, 616, 686 and 707.
Multiples of 8:	88, 232, 272, 424, 464, 616, 656, 696, 808 and 848.
Multiples of 9:	99, 171, 252, 333, 414, 585, 666, 747, 828 and 909.
Multiples of 11:	11, 22, 33, 44, 55, 66, 77, 88, 99 and 121.
Multiples of 12:	252, 444, 636, 696, 828, 888, 2112, 2772, 4224 and 4884.

Square numbers: 121, 484, 676, 10201 and 12321.

Triangular numbers: 55, 66, 171, 595 and 666.

Prime numbers: 11, 101, 131, 151, 181, 191, 313, 353, 373 and 383.

Two palindromes with a difference of 2 are 999 and 1001.

There are many pairs of palindromes with a difference of 10, for example 101 and 111, 121 and 131, 141 and 151, and so on.

There are many pairs of palindromes whose difference is a palindrome, for example pairs which differ by 11 such as 22 and 33, and pairs which differ by 111 such as 222 and 333.

There are many pairs of palindromes with a palindromic product, for example the product of 22 and 111 is 2442.

A Palindrome Investigation

The number 3897 requires 4 additions to produce the palindrome 79497.

The following are examples of numbers which produce palindromes after 1, 2, 3, ..., additions. There are many other possibilities.

4075	after 1 addition
268	after 2 additions
180	after 3 additions
69	after 4 additions
495	after 5 additions
97	after 6 additions
395	after 7 additions
589	after 8 additions

The number 98 (and its reversal 89) requires 24 additions to produce a palindrome. The number 196 does not produce a palindrome even after 237310 additions so it would seem that not every number produces a palindrome.

Broken Keys

For most of these questions there are many different ways of tackling them and so solutions are not provided here.

These sorts of questions get pupils to think about place value, partitioning, equivalent calculations, inverse operations, etc. Pupils also have an opportunity to develop estimation and trial and improvement skills.

Rounding with a Calculator

Many numbers can be generated by this activity and so solutions are not provided here.

Body Ratios

There are no 'answers' to many parts of this practical activity.

If someone's ratio is more than 1 it means they are taller than their armspan.

If someone's ratio is less than 1 it means their armspan is bigger than their height.

The second part of the activity (ratio of height to navel height) should produce a very important number which crops up time and time again in both mathematics and nature; the Golden Ratio, which is 1.618. You could investigate how close the pupils' ratios are to the Golden Ratio.

Zoom

The main focus here is on spotting patterns and relationships and being able to make predictions. The calculator is simply a tool which carries out the low-level task of calculating, while the pupils concentrate on higher-level problem-solving skills. The completed table should look like this:

	MULTIPLY BY				
	2	3	4	5	6
ZOOM IN ON	4	9	16	25	36

When multiplying by 7 and 8 you zoom in on 49 and 64 respectively.

Zoom 2

Like Zoom above, the main focus here is on spotting patterns and relationships. The completed table should look like this:

		DIVIDE BY				
		2	3	4	5	6
ADD OR SUBTRACT	- 3	-6	-4.5	-4	-3.25	-3.6
	- 2	-4	-3	-2.67	-2.5	-2.4
	- 1	-2	-1.5	-1.33	-1.25	-1.2
	0	0	0	0	0	0
	+ 1	2	1.5	1.33	1.25	1.2
	+ 2	4	3	2.67	2.5	2.4
	+ 3	6	4.5	4	3.25	3.6

Fractions Activities

The patterns in these decimal fractions should be fairly obvious and so they will not be explained here.

More Fractions Activities

- (a) $\frac{8}{9}$ (b) $\frac{5}{6}$ (c) $\frac{5}{12}$ (d) $\frac{11}{15}$ (e) $\frac{3}{7}$
- $\frac{1}{32}, \frac{1}{64}, \frac{1}{128}, \frac{1}{256}, \frac{1}{512}$
The sum of the sequence is 1.
- $\frac{1}{81}, \frac{1}{243}, \frac{1}{729}$
The sum of the sequence is 0.5.
- The solicitor provides an additional horse so there are now 18 horses (you might want to tell the pupils this and let them work out the allocations).
The wife gets half i.e. 9 horses.
The son gets one-third i.e. 6 horses.
The daughter gets one-ninth i.e. 2 horses.
There is one horse left over for the solicitor.
The key to it all is that the three fractions do not add up to 1.

Maxbox

The volumes for cuts of 1cm by 1cm, 2cm by 2cm, 3cm by 3cm are:
 $324\text{cm}^3, 512\text{cm}^3, 588\text{cm}^3, 576\text{cm}^3, 500\text{cm}^3, 384\text{cm}^3, 252\text{cm}^3, 128\text{cm}^3$ and 36cm^3 .
The maximum possible volume is 592.593cm^3 , using a cut of 3.333cm by 3.333cm.
An excellent alternative to a calculator for this activity is a spreadsheet.

Find the Palindrome

You may use a calculator to find these palindromes.

1. Find and write down a palindrome which is

- a multiple of 3
- a multiple of 4
- a multiple of 5
- a multiple of 6
- a multiple of 7
- a multiple of 8
- a multiple of 9
- a multiple of 11
- a multiple of 12

Why do you think there are there no palindromes which are multiples of 10?

2. Find and write down a palindrome which is

- a square number
- a triangular number
- a prime number

3. Find and write down two palindromes which have

- a difference of 2
- a difference of 10
- a difference which is a palindrome
- a product which is a palindrome

A Palindrome Investigation

Here are the rules for this investigation:

- Choose any number.
- Reverse the digits and add to the number.
- Keep repeating this until you get a palindrome

Example 1

Choose any number 4075

Reverse the digits 5704

Add the two numbers 9779

4075 produces a palindrome after 1 addition.

Example 2

Choose any number 268

Reverse the digits 862

Add the two numbers 1130

Reverse the digits 0311

Add the two numbers 1441

268 produces a palindrome after 2 additions.

Start with 3897.

How many additions are needed to produce a palindrome?

Find starting numbers which produce palindromes after 1 addition, 2 additions, 3 additions, 4 additions, 5 additions etc.

Are all of these possible?

What is the largest number of additions that are needed to produce a palindrome?

Broken Keys

For each question you must not use a certain key (or keys) on your calculator because it is supposed to be broken. Write a brief note to explain how you answered each question.

1. Work out $798 + 549$ without using the number 9 key.
2. Work out $83,400 - 1670$ without using the zero key.
3. Work out 52×37 without using the number 5 key.
4. Work out $7500 \div 32$ without using the number 3 key.
5. Work out $5800 \div 32$ without using the number 2 and number 3 keys.
6. The odd numbered keys are all broken. Try to get each of the numbers 1, 3, 5, 7 and 9 in the calculator display.
7. The only number key that is working is number 4. Try to get each of the numbers from 1 to 10 in the calculator display.
8. A square has an area of 40 square centimetres.
Work out the length of the sides without using the square root key.
9. A cube has a volume of 100 cubic centimetres.
Work out the length of the sides.
10. Work out $37 \div 14$ without using the division key.
11. Work out 4.75×2.836 without using the multiplication key.
12. Work out 5.9×1.45 without using the decimal point key.

Rounding with a Calculator

Rounding to the Nearest Whole Number

- Pick any number from list A.
- Pick any number from list B.
- Use a calculator to divide the list A number by the list B number.
- Make sure you write down the numbers you use and the exact answer shown on the calculator.
- Round the exact answer to the nearest whole number and write it down.

Repeat this until you have done twelve calculations altogether.

List A	400	750	120	360	950	80
List B	23	185	42	65	88	140

Rounding to Decimal Places

- Write down all the prime numbers between 10 and 100.
- Write each number on a small piece of paper.
- Put all the pieces of paper in a container.
- Pick two numbers without looking.
- Use a calculator to divide the first number by the second number.
- Write down the two numbers and the answer shown on the calculator.
- Put the two numbers back in the container and keep repeating this process until you have done twelve calculations altogether.

Now you must round the twelve exact answers you have written down.

- Round the first four answers to 1 decimal place.
- Round the next four answers to 2 decimal places.
- Round the last four answers to 3 decimal places.

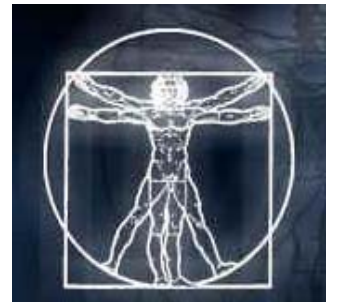
Body Ratios

Working with a partner, measure your height and armspan accurately in centimetres.

Use a calculator to work out the ratio $\frac{\text{height in cm}}{\text{armspan in cm}}$

Measure the height and armspan of your partner and work out his or her height/armspan ratio.

If someone's ratio is more than 1, what does this mean?
If someone's ratio is less than 1, what does this mean?



Compare your ratio with your partner's.
Are they roughly the same or are they different?

Compare your ratios with the ratios of other children in your class.
Are they roughly the same or do they vary?
Do males have different ratios to females?
Do children have different ratios to adults?

Measure the distance from your navel to the floor when you are standing up straight.

Use a calculator to work out the ratio $\frac{\text{height of body in cm}}{\text{height of navel in cm}}$

Compare your ratio with the ratios of other children in your class.
Are they roughly the same or do they vary?

If someone's ratio is high, what does this mean?
If someone's ratio is low, what does this mean?
If you worked out someone's ratio and found that it was less than 1, what does this mean?

Zoom

Use a calculator to work through this cycle of key-presses. You can start with any number you want but must keep going round until the number you get at the end of each cycle seems to be about the same each time.

What number do you zoom in on?

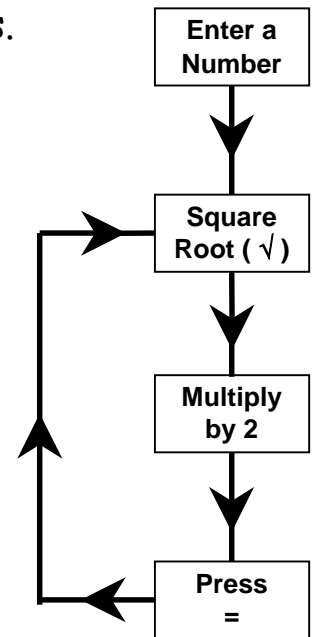
Try a completely different starting number. Does it make a difference?

Instead of multiplying by 2 try multiplying by 3. What number do you zoom in on this time?

What if you multiply by 4 each time?

What if you multiply by 5 each time?

What if you multiply by 6 each time?



Copy this table and use it to record all of the numbers you zoom in on.

	MULTIPLY BY				
	2	3	4	5	6
ZOOM IN ON					

Can you spot any patterns in your results?

Explain these carefully.

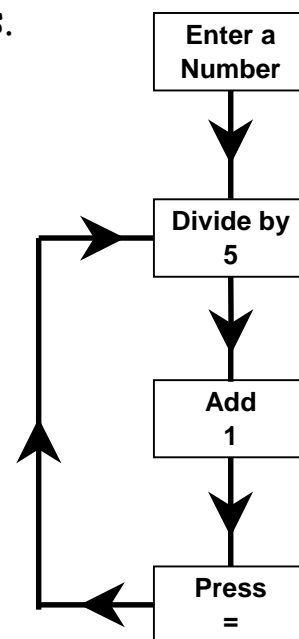
If you multiplied by 7, what do you think you would zoom in on?

If you multiplied by 8, what do you think you would zoom in on?

Write down your predictions and then use your calculator to see if you are right.

Zoom 2

Use a calculator to work through this cycle of key-presses. You can start with any number you want but must keep going round until the number you get at the end of each cycle seems to be about the same each time.



What number do you zoom in on?

Try a completely different starting number.

Try starting with a negative number.

Does it make a difference?

Instead of adding 1 try adding 2 each time.

What number do you zoom in on this time?

What if you add 3 each time?

What if you subtract 1 each time?

What if you subtract 2 each time?

Can you spot any patterns in your results?

Explain these carefully.

Try all of these again but this time divide by 4 instead of by 5.

Explain any patterns you can spot this time.

Copy this table and use it to record all of the numbers you zoom in on.

		DIVIDE BY				
		2	3	4	5	6
ADD OR SUBTRACT	- 3					
	- 2					
	- 1					
	0					
	+ 1					
	+ 2					
	+ 3					

Explain the patterns you can see in the numbers in the table.

Fractions Activities

1. Use a calculator to work out what $\frac{1}{9}$ is as a decimal.
What about $\frac{2}{9}$ and $\frac{3}{9}$?
Can you spot the pattern and so predict what $\frac{4}{9}$, $\frac{5}{9}$, $\frac{6}{9}$, $\frac{7}{9}$ and $\frac{8}{9}$ will be?
Write down your predictions and then check with your calculator.
2. Use a calculator to work out what $\frac{1}{11}$ is as a decimal.
What about $\frac{2}{11}$ and $\frac{3}{11}$?
Can you spot the pattern and so predict what $\frac{4}{11}$, $\frac{5}{11}$, $\frac{6}{11}$, will be?
Write down your predictions and then check with your calculator.
3. Use a calculator to work out what $\frac{1}{7}$ is as a decimal.
What about $\frac{2}{7}$ and $\frac{3}{7}$?
Can you spot the pattern and so predict what $\frac{4}{7}$, $\frac{5}{7}$ and $\frac{6}{7}$ will be?
Write down your predictions and then check with your calculator.
4. Use a calculator to work out what $\frac{1}{27}$ is as a decimal.
What about $\frac{2}{27}$ and $\frac{3}{27}$?
Can you spot the pattern and so predict what $\frac{4}{27}$, $\frac{5}{27}$, $\frac{6}{27}$ will be?
Write down your predictions and then check with your calculator.
5. Use a calculator to work out what $\frac{1}{33}$ is as a decimal.
What about $\frac{2}{33}$ and $\frac{3}{33}$?
Can you spot the pattern and so predict what $\frac{4}{33}$, $\frac{5}{33}$, $\frac{6}{33}$ will be?
Write down your predictions and then check with your calculator.
6. Use a calculator to work out what $\frac{1}{37}$ is as a decimal.
What about $\frac{2}{37}$ and $\frac{3}{37}$?
Can you spot the pattern and so predict what $\frac{4}{37}$, $\frac{5}{37}$, $\frac{6}{37}$ will be?
Write down your predictions and then check with your calculator.

Can you find any more fractions that have interesting patterns like these?

More Fractions Activities

1. Everyone knows that $0.5 = \frac{1}{2}$ and $0.25 = \frac{1}{4}$ but what about these? Use a calculator to find the fraction that is equivalent to these decimals (most of the numerators and denominators are single-digit numbers).

(a) 0.7777777

(b) 0.8333333

(c) 0.4166666

(d) 0.7333333

(e) 0.4285714

Briefly explain in your own words how you tackled these questions.

2. Write down the next five fractions in this sequence.

$$\frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \frac{1}{16}$$

If the sequence was continued and all the fractions added together what do you think the total would be? Give reasons for your answer. Now use your calculator to work out the total and see if you were right.

3. Write down the next three fractions in this sequence.

$$\frac{1}{3}, \frac{1}{9}, \frac{1}{27}$$

What do you think the total of all the fractions in this sequence would be? Give reasons for your answer.

Now use your calculator to work out the total and see if you were right.

4. A farmer died and in his will asked that his 17 horses be shared out as follows.

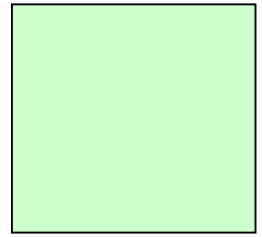
- half of them to be given to his wife
- one-third of them to be given to his son
- one-ninth of them to be given to his daughter.

The family were completely baffled by this but the solicitor in charge of the will was able to sort it out but how?

HINT: Try adding the three fractions together and you'll see where the farmer had gone wrong with his arithmetic.

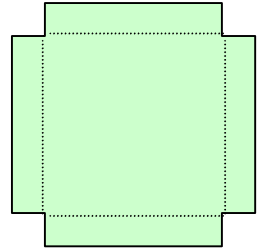
Maxbox

Start with a square piece of paper, 20cm by 20cm.

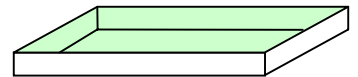


Cut a small square, 1cm by 1cm, from each corner.

Fold up the edges of the paper to get a shallow open-topped box.



What is the volume of the box in cubic centimetres?



What if you had cut a 2cm by 2cm square from each corner and folded up the edges of the paper? What would the volume of the box be this time?

What if you had cut a 3cm by 3cm square from each corner, or a 4cm by 4cm square, or a 5cm by 5cm square, and so on.

What is the maximum volume you can get by cutting squares like this from the corners of the paper?

Extension Activity

So far you have been cutting out squares from each corner which are whole number sizes. Now you are allowed to use decimals. So if you want to, you can cut a square from each corner which measures 2.7cm by 2.7cm, or any other size you want.

What is the maximum volume you can get now?