SMILE WORKCARDS

Number and Algebra Mixed Pack Four

Contents

Put them in their place

You will need to work in pairs.

- Put the numbers on each row in order from smallest to largest.
- For each section make sure you both agree on the order before moving on.

1. Directed numbers

		in order
A	5, -7, 2, -3, 1, -9, 4	-9, -7, -3, 1, 2, 4, 5
B	8, -2, 9, -5, 3, -1, 7	-5, 9
C	-12, 17, 25, -6, 0, -7, 3	
D	8, -1000, -100, -5, -15, 300	

2. Decimals

A	0.001, 0.3, 0.1, 0.01, 0.05, 0.03	0·001, 0·01, 0·03, 0·05, 0·1, 0·3
B	0.041, 0.008, 0.037, 0.003, 0.57, 0.5	0·003, 0·57
C	7.01, 0.17, 0.71, 7.1, 3.01, 30.1	
D	4.1, 0.004, 0.00005, 0.52, 4.01, 0.036	

3. Fractions

A	$^2/_3$, $^1/_2$, $^1/_3$, $^4/_5$, $^3/_5$, $^1/_7$, $^3/_4$	$^1/_7$, $^1/_3$, $^1/_2$, $^3/_5$, $^2/_3$, $^3/_4$, $^4/_5$
B	$^1/_2$, $^2/_5$, $^1/_4$, $^1/_{10}$, $^6/_{10}$, $^3/_8$, $^9/_8$	$^1/_{10}$, $^9/_8$
C	$^4/_{10}$, $^1/_3$, $^7/_{10}$, $^5/_4$, $1^1/_2$, $^{12}/_7$, $^1/_5$	
D	$2^3/_5$, $^{17}/_2$, $^6/_7$, $^{12}/_8$, $^5/_8$, $^8/_{10}$, $^1/_9$	

4. Powers

A	2^2, 8, $\sqrt{17}$, 3^2, 9^2, $\sqrt{25}$, 16	2^2, $\sqrt{17}$, $\sqrt{25}$, 8, 3^2, 16, 9^2
B	3, $\sqrt{12}$, 7, 1^3, $\sqrt{36}$, 10, 4^2	1^3, 4^2
C	$\sqrt{35}$, 5, 3^2, 2^3, 9, 6^2, 11	
D	$\sqrt[3]{27}$, 4^3, 30, 7^2, $\sqrt{64}$, 17, 2^2	

- Check your answers to questions 1 - 4 before doing question 5.

5. A mixed bag

A	1.5^2, $^3/_5$, $\sqrt{1.6}$, 3^2, -0.8, $\sqrt{2.6}$, 2.8^2	-0·8, $^3/_5$, $\sqrt{1.6}$, $\sqrt{2.6}$, $1·5^2$, $2·8^2$, 3^2
B	$^5/_8$, 0.75, $^1/_2$, 0.51, $\sqrt{0.9}$, $\sqrt{0.16}$, $^7/_{10}$	$\sqrt{0·16}$, $\sqrt{0·9}$
C	$^{13}/_4$, 3.6, 3^3, $\sqrt{100}$, -20, $\sqrt{10}$, $-^7/_8$	
D	$\sqrt[3]{10}$, -3.1, -3.25, 1.4^2, 2, $\sqrt{11}$, $-^{10}/_3$	

Four signs

Use a calculator and your judgement to find the signs that belong in the circles.

1. (37 ◯ 21) ◯ 223 = 1000
2. (756 ◯ 18) ◯ 29 = 1218
3. 27 ◯ (36 ◯ 18) = 675
4. 31 ◯ (87 ◯ 19) = 2108
5. 476 ◯ (2040 ◯ 24) = 391
6. (3461 ◯ 276) ◯ 101 = 37
7. (967 ◯ 34) ◯ (1023 ◯ 654) = 369369
8. (2^9 ◯ 8^2) ◯ 9 = 64
9. (619 ◯ 316) ◯ 425 ◯ 196 = 924
10. 6975 ◯ (36 ◯ 39) = 93

Some sums for your mind - *an activity for two*

Use sensible guesswork to match the Questions to the Answers.

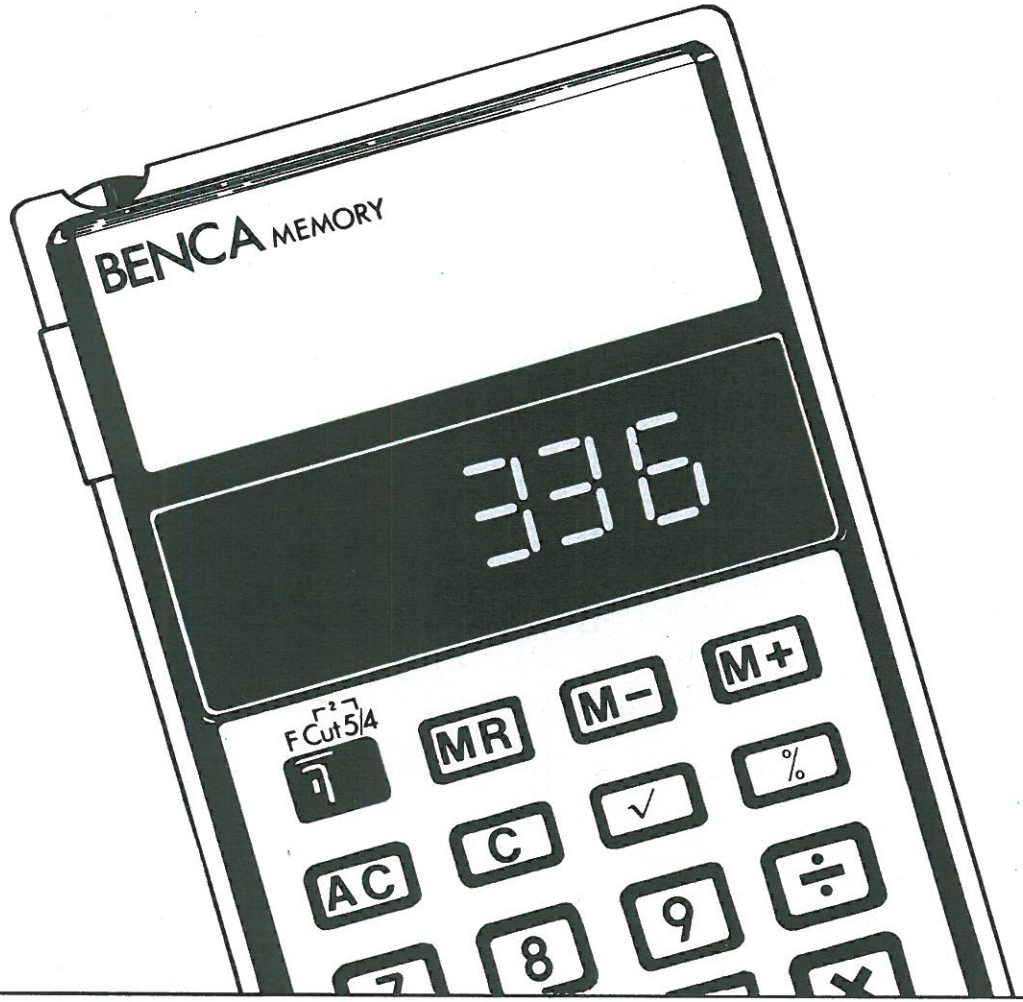
When you have agreed the results check them with a calculator.

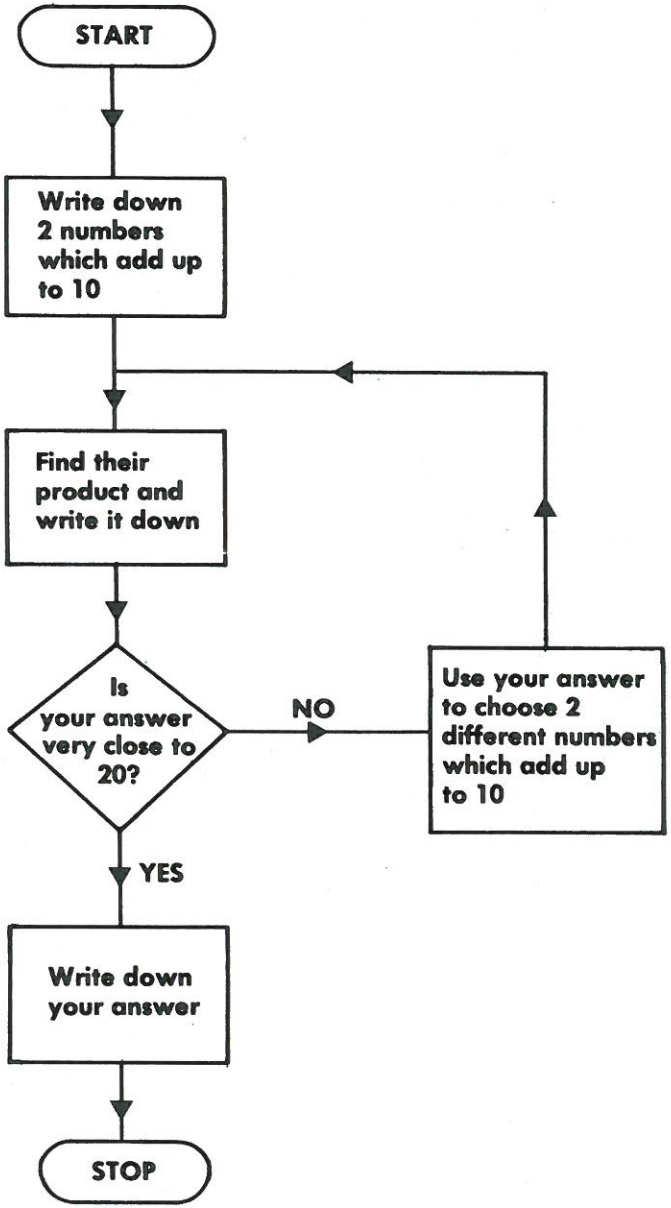
Q	Q	Q
$5 - \frac{3}{7}$	$\frac{5}{7-3}$	$7 \div (5-3)$
$\frac{3}{7-5}$	$7 - \frac{3}{5}$	$3-(7 \div 5)$
$3 - \frac{5}{7}$	$\frac{3-5}{7}$	$\frac{3-7}{5}$
$\frac{5-7}{3}$	$\frac{7-5}{3}$	$\frac{3}{5} - 7$

A	A	A
$\frac{-4}{5}$	2 and a bit	$\frac{2}{3}$
One and a quarter	Just over $4\frac{1}{2}$	About six and a half
A bit more than $1\frac{1}{2}$	$\frac{-2}{3}$	-0· something
-6· something	$3\frac{1}{2}$	1·5

Calculator Trial and Error

The problem is to find the 2 numbers which add up to 10 and whose product is 20.





Invent a similar problem and solve it.

The Game of 2, 3, 4 and 5

This game uses 2, 3, 4 and 5.
How many answers can you make by using these numbers in different ways?

e.g. (a) $3 + 5 + 4 - 2 = \underline{10}$

(b) $(3 \times 5) - (4 \times 2) = 15 - 8 = \underline{7}$

(c) $\frac{5\,(4 + 2)}{3} = \frac{5 \times \cancel{6}^{2}}{\cancel{3}_{1}} = \underline{10}$

Rules

(1) You must use 2, 3, 4 and 5 once and only once.

(2) You can use the square root sign, e.g. $\sqrt{4} = 2$.

(3) You can use the number as a power e.g. $2^5 = 32$.

(4) You can use a cube root sign and "use up" the 3 e.g. $\sqrt[3]{4 \times 2} = 2$.

Try to make all the numbers from 1 to 25 this way.

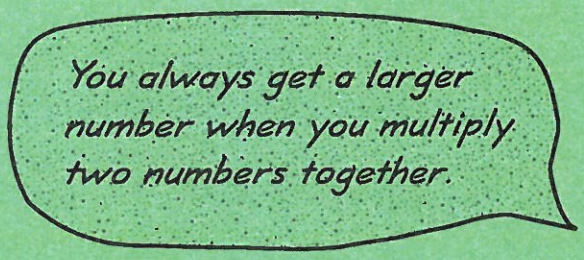
The answer book gives one way for each number.

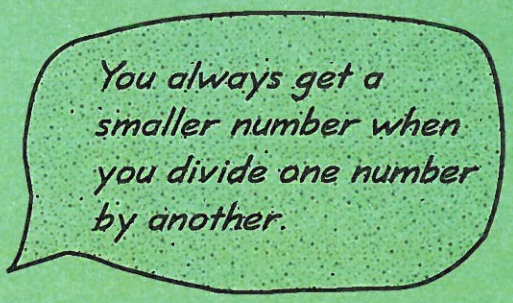
Try to find some answers which are not in the book - you can check these with a friend.

Smile **2061**

CONVINCE YOURSELF!

Investigate the truth of these statements.





Try numbers larger than 1

- *whole numbers*
- *fractions and decimals.*

Try numbers smaller than 1

- *negative numbers*
- *fractions and decimals.*

Game of Four 4's

This game uses four 4's. You have to try and make as many numbers less than 20 as you can,

e.g. $4 + 4 + \frac{4}{4} = 8 + 1 = 9$

$(4 \times 4) - (4 + 4) = 16 - 8 = 8$

Rules

(1) You must use four 4's every time.

(2) You may use decimals $.4 = \frac{4}{10} = \frac{2}{5}$ and $\frac{4}{.4} = 10$

(3) You may use square root sign $\sqrt{4} = 2$

(4) You may use recurring decimals $.\dot{4} = .\ 4\ 4\ 4\ 4\ \ldots\ldots\ldots$

You can get 9 by $\frac{4}{.\dot{4}} = 4 \div \frac{4}{9} = \cancel{4} \times \frac{9}{\cancel{4}} = 9$

or $\sqrt{.\dot{4}} = \sqrt{\frac{4}{9}} = \frac{2}{3}$

Try to make as many numbers as you can between 1 and 20.

The answer book gives one answer for each number - perhaps you can find some answers not in the book!

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TARGET 24

A 3 digit problem

Here are some different ways of making the number **24** using the digit **4**.

$4! + 4 - 4 = 24$

$4! + \sqrt{4} - \sqrt{4} = 24$

$4! \times 4 \div 4 = 24$

Make 24 using each of the digits 1 to 9.

Rules

- The digit is used three times only, and no other digit is used.
- The following function keys may be used.

(x^2 $\sqrt{x}$

y^x $\frac{1}{x}$ $x!$)

FACTORIALS!

We use a special notation for products like these:

$5\times4\times3\times2\times1$ $\quad$ $7\times6\times5\times4\times3\times2\times1$ $\quad$ $9\times8\times7\times6\times5\times4\times3\times2\times1$

$5\times4\times3\times2\times1$ is written $5!$ (read as "five factorial")

$7\times6\times5\times4\times3\times2\times1$ is $7!$ ("seven factorial")

$7!$ works out to be 5040

Work out the following: 1) $5!$

2) $6!$

3) (a) $3!+4!$

(b) $3!\times4!$

(c) $(3+4)!$

(d) $3\times4!$

(e) $4\times3!$

4) (a) $\frac{4!}{4}$ (b) $\frac{4!}{3}$ (c) $\frac{4!}{3!}$ (d) $\frac{4!}{4!}$

5) $(3!)!$

Answer these questions without multiplying out the factorials.
They are not as straightforward as the first five questions.

6) Write down 4 factors of $6!$

7) Is $19!$ odd or even? Explain.

8) Is 3 a factor of $19!$

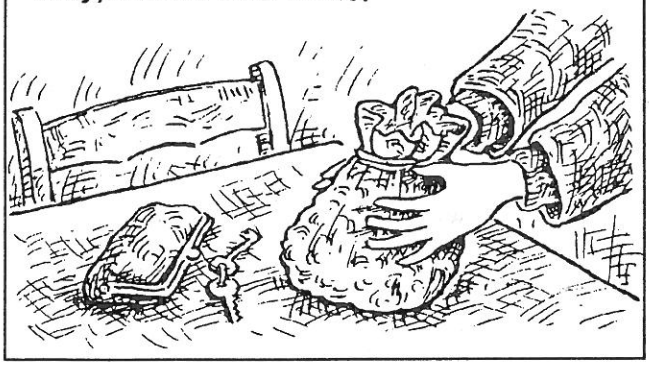
9) Is $19!$ prime? Explain.

10) Is $19!+2$ prime?

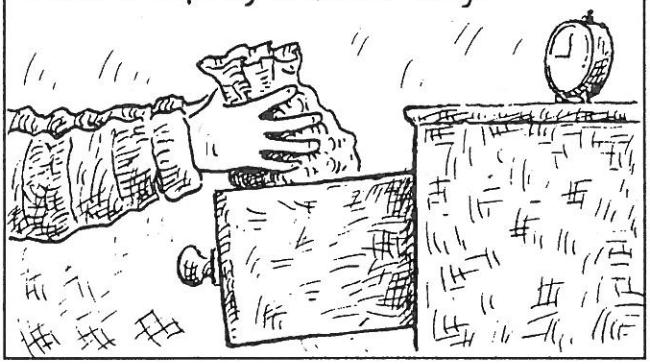
11) (a) How many zeros are there at the end of the number $10!$?
(b) How many zeros are there at the end of the number $25!$?
(c) What about $100!$
Try $1000!$

A Disappearing Act

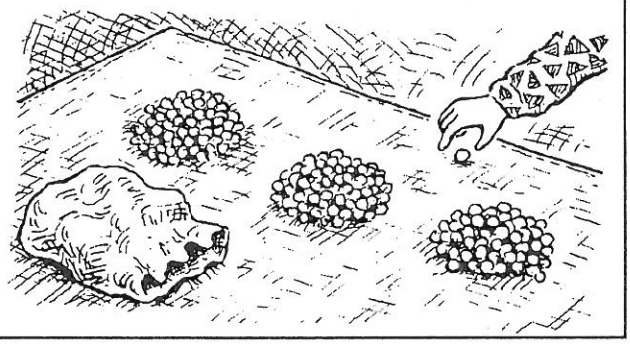
One night Barbara came home with a huge bag of marbles for her 3 children, Tony, Jackie and Mike.



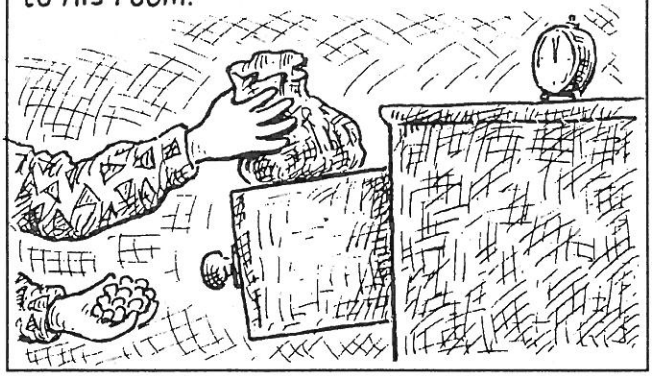
It was late so she put them away in a drawer and said that the children could share them out equally in the morning.



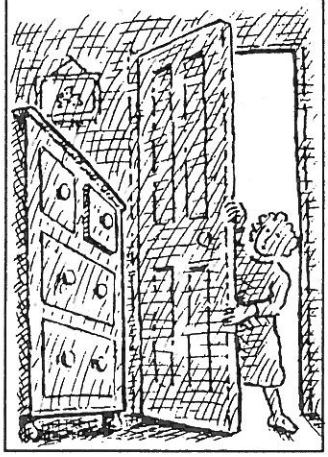
During the night, Tony secretly went to the drawer, shared the marbles into 3 equal groups and found that there was one marble left over.



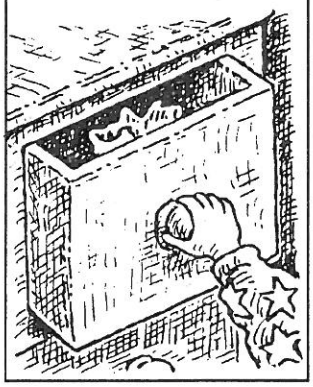
He put 2 of the groups back in the bag and took his share plus the one left over back to his room.



Later during the same night Jackie...

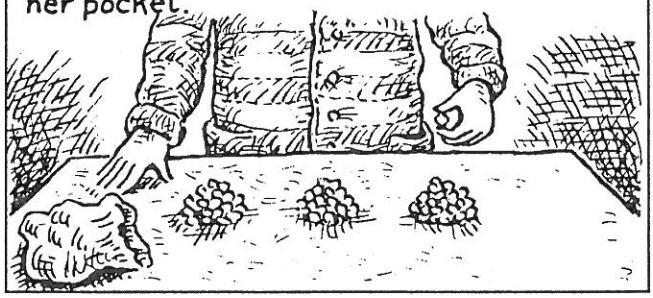


....and Mike each crept to the drawer and repeated Tony's performance.

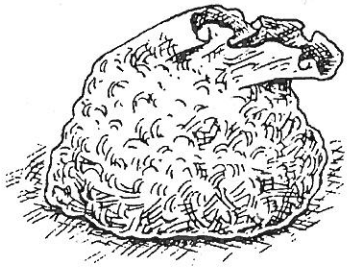


In the morning Barbara decided to share out the marbles to avoid arguments. She thought the bag looked smaller but decided it must be her imagination.

She shared the marbles into 3 equal groups. There was one left over which she put in her pocket.



How many marbles were in the bag originally?



log Button

You will need a scientific calculator.

1. Enter **10** on your calculator.

   Press the log button.

   What is the result?

   Repeat for 100, 1000 . . .
   Tabulate your results.

   What do you find?

   Now do the same to find the log of 5, 50, 500 . . .

   Describe your results.

2. Use the log button on your calculator to tabulate log 1, log 2, . . . log 10.

   Use your results to calculate a) log 400

   b) log 7000

   c) log 90

   Check your calculations with the log button.

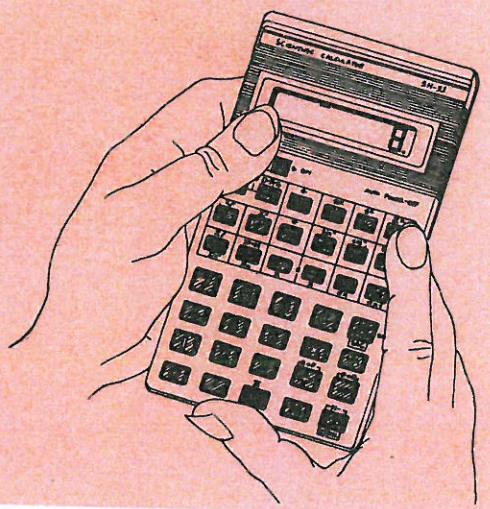
   Can you predict log 750?

3. By trying different values of x, y and n and by using the [log] button investigate

$\log x + \log y = \log ?$

$\log x - \log y =$

$\log(x^n)$



Turn over

4. Use what you have discovered to calculate

a) log 750

b) log 35

c) log 144

Work out log 375 without a calculator.
Explain your method.