Kids 'n Calculators

by *Dick Holmes*
Mathematics Consultant
Calgary Board of Education

Illustrations by *Mrs. Bev Hubert*
Calgary Board of Education

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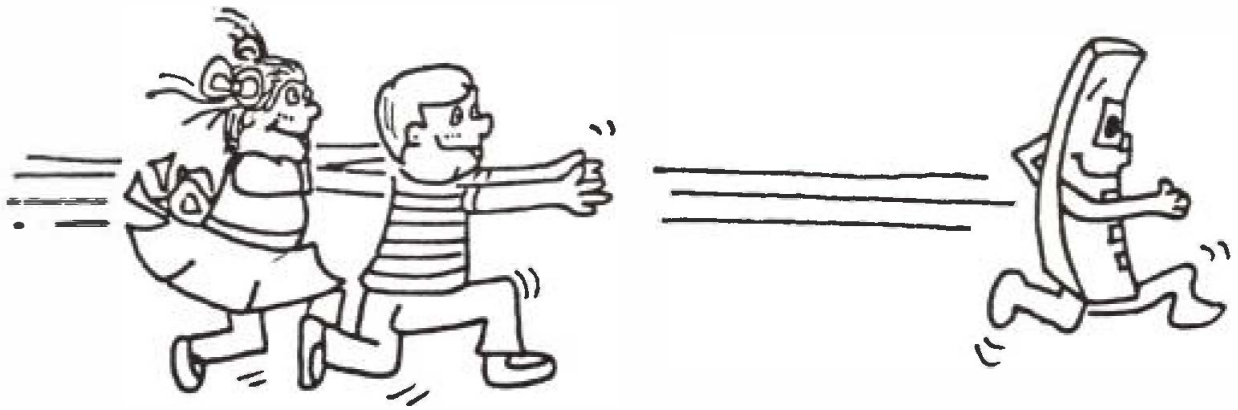
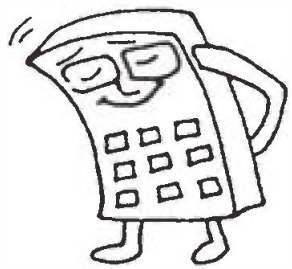


Introduction of the Calculator



Schools and teachers will have to answer these among other questions before introducing the calculator in the classroom.

1. What is the purpose of the calculator in the classroom?
2. Who will use the calculators?
3. To what extent will the calculators be used?
4. What new things can be done or what things can be done more effectively with the addition of calculators?
5. What pitfalls will possibly occur because of the use of the machine?
6. What security problems require attention?
7. What considerations need be given in selecting a calculator?
8. What public relations work needs to be done with parents before introducing the calculators?

Classroom Uses

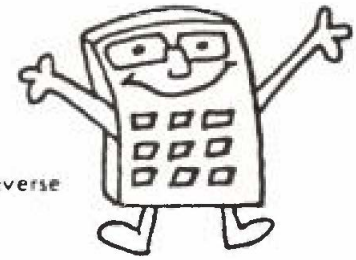
Some of the ways in which electronic calculators may be beneficial in the classroom include:

1. Immediate reinforcement for checking.
2. Accuracy of computation.
3. Analyze computatianal steps.
4. Develop and reinforce estimation skills.
5. Learning resource for self-discovery and exploration.
6. Explore patterns of numbers.

7. Motivation and success.
8. Introduce order of operations and use of parentheses.
9. Approximate and find square roots.
10. Study statistics, exponents, consumer topics.
11. Compute perimeter, area and volume.
12. Round decimals and find percent.
13. Calculations in problem solving.

Selection of a Suitable Calculator

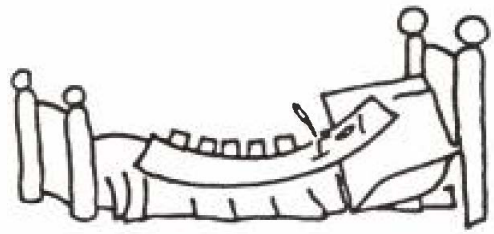
In selecting a calculator for classroom use, some considerations should include:



1. What functions are needed?
2. Has the calculator a floating decimal point?
3. Does the machine have a constant key or a key which performs this function?
4. What logic does the machine use (algebraic, arithmetic, reverse polish)?
5. Is an adaptor available for the machine?
6. Is the display clear and large?

Care of the Calculator

1. Check to ensure the switch is off when the calculator is not in use.
2. Use a finger to push the keys - not a pen or pencil.



Before Using the Calculator

When exploring the calculator before use, check to see:

1. That all display lights are working (a row of 8's uses all the lights.)
2. That the calculator is functioning correctly (do a few large multiplication questions for which the answer is known).
3. What the calculator does when division by zero occurs.
4. How the machine indicates an overflow.
5. If the calculator is programmed to round or truncate decimals.

Multiplication

You may use your calculator to find the product of numbers in a number of different ways.

Find the answer to the following questions by putting the numbers directly into the display and using the multiplication key.

$23 \times 46 =$

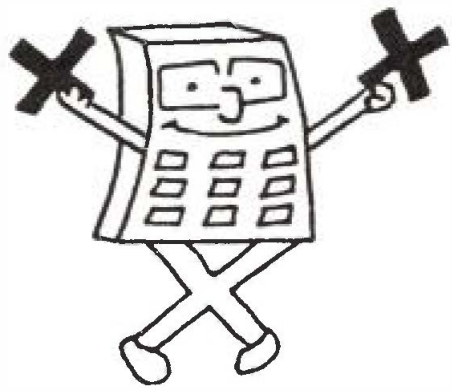
$16 \times 54 =$

$256 \times 4569 =$

Another method of multiplying with the calculator is finding partial products and then finding the sum of the parts. Can you see where all the numbers come from in these examples? (Note the place holding positions of each multiplicand.)

23		12 43	
x 46		16 56	
18	(6 x 3)	24 08	(56 x 43)
12	(6 x 2)	6 72	(56 x 12)
12	(4 x 3)	6 88	(16 x 43)
8	(4 x 2)	1 92	(16 x 12)
1058		2 05 84 08	

This method of multiplying will be very useful when the product of two numbers is too large for the calculator display. It will be possible to find the answer using o calculator.



Find the product of each of the following:

a. 12 345 x 67 809

b. 246 813 x 135 792

c. 473 625 x 694 537

Estimation

Estimation is an important skill in mathematics. Use rounding skills to help you select the largest number in each row. Use your calculator to check your answers.

38 x 52	12 x 88	29 x 61
502 - 347	651 - 459	298 - 147
352 ÷ 23	82 ÷ 6	1468 ÷ 72

Large Numbers

Find the value of these expressions:

$6^3 =$

$5^5 =$ $\qquad (2 + 1)^5 - (12 - 8)^3$

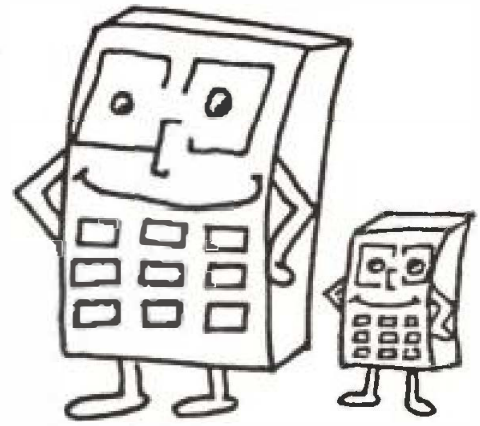
$7^1 =$

$10^1 =$ $\qquad \dfrac{0.000006 \times 0.00033 \times 17\,000\,000}{0.0034 \times 1\,100\,000\,000 \times 0.00004}$ (Scientific Notation)

Which of the following are Pythagorean Triples?

10, 24, 25	16, 24, 30
6, 8, 10	423, 1064, 1145

Unit Price



Find the amount saved by buying the larger size.

2 kg for 68¢; 5 kg for $1.39

3 m for $12.48; 10 m for $35.99

12 cc for 79¢; 39 cc for $2.50

Which is the better buy?

156 g for 45¢; 392 g for 87¢

10 kg for $2.99; 25 kg for $7.45

180 ml for 12¢; 500 ml for 38¢

Fractions to Decimals

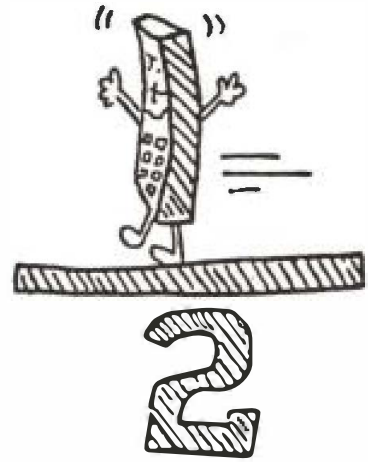
Use your calculator to find the decimal expression for these fractions:

$\frac{1}{3}$ = $\frac{1}{5}$ = $\frac{1}{9}$ =

$\frac{2}{3}$ = $\frac{2}{5}$ = $\frac{2}{9}$ =

$\frac{3}{7}$ = $\frac{3}{5}$ = $\frac{3}{9}$ =

$\frac{1}{2}$ = $\frac{4}{5}$ = $\frac{4}{9}$ =



Order of Operations

Use your calculator to perform the indicated operotions. Enter the numbers and operations in the order in which they appear.

4 + 5 + 3 ÷ 3 =

4 + 4 x 6 ÷ 4 =

12 - 4 ÷ 2 + 3 =

7 - 3 x 6 ÷ 3 =

Use your calculator to find the value of each expression. Keep in mind the correct order of performing operations. Rewrite each question using parentheses to indicate the correct order of performance.

4 + 5 + 3 ÷ 3 =

4 + 4 x 6 ÷ 4 =

12 - 4 ÷ 2 + 3 =

7 - 3 x 6 ÷ 3 =

Put signs (+, -, x, ÷) in the blanks indicating the operation to be performed to make true statements. If parentheses are required, show them. Use your calculator to show your work.

4 _____ 5 _____ 3 _____ 3 = 29

4 _____ 4 _____ 6 _____ 4 = 2

12 _____ 4 _____ 2 _____ 3 = 18

7 _____ 3 _____ 6 _____ 3 = 2

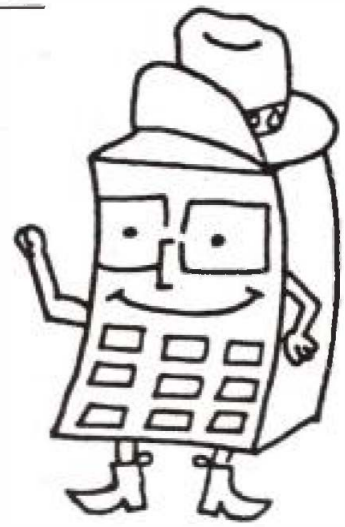
Percent

The manager of Ace Hardware recently announced price increases for a number of articles. The original and new prices are given. Find the amount of the increase in dollars and percent.

Original	New	Amount of Increase	Percent Increase
$ 40	$ 45		
$348.26	$696.56		

A local store advertised a month-end clearance sale by listing the percentage reduction of various articles. Find the amount of the reduction and the sale price.

Original	Percent Reduction	Amount of Reduction	Sale Price
$ 65	20%		
$ 99	33 1/3%		
$1256.89	10%		
$ 175.20	25%		



Change the following percents to decimal fractions.

34% =

67.3% =

0.06% =

132% =

Functions

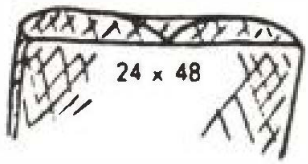
Use a calculator to complete the following tables:

(x, y)	2x + 3y + 4
(2, 3)	
(0, 0)	
(4, 1)	
*(-1, 3)	

(x, y)	x + x x y
(3, 2)	
(5, 3)	
(1, 1)	

Equivalent Expressions

Mark the expressions that are equivalent to the goal expression. Use your calculator to check your answers.



48 x 24

2 x 2 x 2 x 3 x 2 x 2 x 2 x 2 x 3

24(40 + 8)

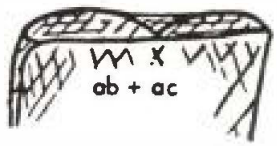
20 x 52

27 x 51

2(10) + 4(1) x 4(10) + 8(1)

(50 x 24) - (2 x 24)

50 x 22



a(b + c)

ac + ab

(c + b)a

a x b x c

ba + ca

a x b x 1 + a x c x 1

Rules for Divisibility

All even numbers are divisible by 2 with no remainder. It is possible to state a rule for divisibility by 2 which has no exceptions. The rule can be stated as follows:

Rule: A number is divisible by 2 if it is an even number.

Another rule that most people are familiar with is the rule for numbers that are divisible by 5. Try these on your calculator. Answer yes or no as to whether or not the numbers are divisible by 5.

200 ____ 56 ____ 14685 ____ 280 ____

Can you state the rule?

Rule: A number is divisible by 5 if it _____

Now try these!

Can you find a rule for numbers that are divisible by 9? Use your calculator to help you answer yes or no as to whether or not these numbers are divisible by 9.

123 ____ 126 ____ 18 ____ 270 ____ 234 ____

Find more numbers which are divisible by 9.

____ ____ ____ ____ ____

Examine carefully those numbers which are divisible by 9. Can you state the rule?

Rule: _____.

It is possible to state rules for divisibility by 3, 4, 6, 8, 7 (this one is difficult). How many rules can you find?

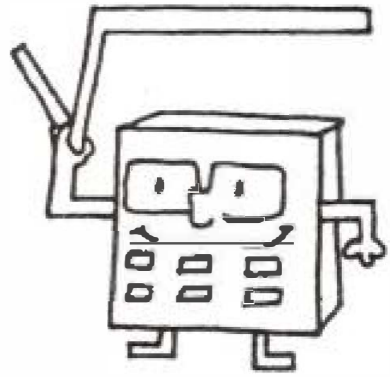
Square Root

Some calculators have a square root key. However, it is very easy to find the square root of a number using your calculator without using a square root key.

Let us find the square root of 320.

1. Guess a number which you think will be close to the square root of 320. (e.g. 16)

2. Divide 320 by the number you selected.
(e.g. $\frac{320}{16} = 20$)
If your guess is the same as the square root of the number, the quotient should be the same as your guess.
If the number and the quotient are not the same:



3. Add the quotient and your guess and divide by 2. (e.g. $\frac{20 + 16}{2} = 18$)

4. Divide 320 by the new numbers.
(e.g. $\frac{320}{18} = 17.777$)
If the divisor and quotient are the same number, you have found the square root.
If they are not the same:

5. Add the quotient and the divisor and divide by 2. (e.g. $\frac{18 + 17.777}{2} = 17.888$)

6. Divide 320 by the result.

7. Continue this pattern until the desired accuracy has been obtained.

This method of finding the square root of a number was developed by Isaac Newton, hence, the name "Newton's Method" of finding the square root. Use "Newton's Method" to find the square root of the following:

a. $\sqrt{850}$

b. $\sqrt{29.63}$

c. $\sqrt{.3456}$

d. $\sqrt{90}$

Cube Root

It is possible to find the cube root of a number using a method very similar to the one used for finding the square root of a number.

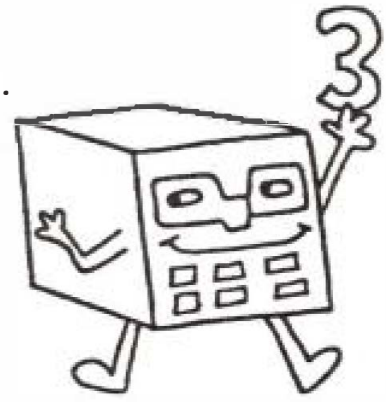
Let us find the cube root of 320.

1. Guess a number which you think will be close to the cube root of 320. (e.g. 5)

2. The number ÷ guess ÷ guess + guess ÷ 3.
(e.g. 320 ÷ 5 ÷ 5 + 5 + 5 ÷ 3 = 7.6)

If your guess is the same as the cube root of the number, then the answer from step 2 cubed will equal the number.
(e.g. $7.6^3 \neq 320$)

If your guess was not the cube root, then:



3. Repeat step 2 using the result from step as your new guess.
(e.g. 320 ÷ 7.6 ÷ 7.6 + 7.6 + 7.6 ÷ 3 = 6.91)

4. Continue this pattern until the desired accurocy has been obtained.

Find the cube root of each of the following:

a. 2197 c. 515

b. 65 456 d. 3003

Number Patterns

Many interesting number patterns can be examined quickly with the use of your calculator. Try these. Use your calculator to find the first three or four answers; then complete the pattern without doing any actual calculation. When you have finished, use your calculator to check your answers.

1 x 1 =
11 x 11 =
111 x 111 =
1111 x 1111 =
11 111 x 11 111 =
111 111 x 111 111 =
1 111 111 x 1 111 111 =
11 111 111 x 11 111 111 =
111 111 111 x 111 111 111 =

66 x 66 =
666 x 666 =
6666 x 6666 =
66 666 x 66 666 =
666 666 x 666 666 =
6 666 666 x 6 666 666 =

37 x 3 =
37 x 6 =
37 x 9 =
37 x 12 =
37 x 15 =
37 x 18 =
37 x 21 =
37 x 24 =

37 037 x 3 =
37 037 x 6 =
37 037 x 9 =
37 037 x 12 =
37 037 x 15 =
37 037 x 18 =
37 037 x 21 =
37 037 x 24 =

Find $n^3 - n$ when n = 2, 3, 4, 5, 6, 7.

Can you state a rule for the highest common factor of the answers?

Rule: $n^3 - n$ is always a multiple of _____

Find $x^2 + x + 41$ when x = 0, 1, 2, 3 . . .

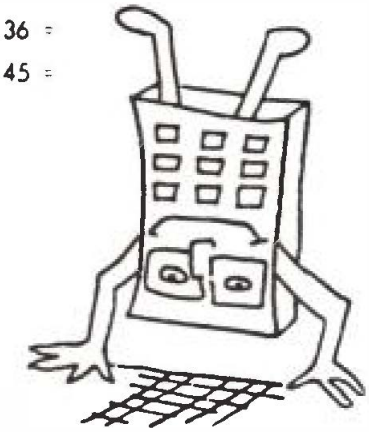
Is the result always a prime number? _____

Nimble Nine

The number nine is a fascinating number. Can you find the pattern for the following after doing only two or three on your calculator?

1 2 3 4 5 6 7 8 9 × 9 =
× 18 =
× 27 =
× 36 =
× 45 =
× 54 =
× 63 =
× 72 =
× 81 =

2 4 6 9 1 3 5 8 × 9 =
× 18 =
× 27 =
× 36 =
× 45 =



9 9 9 9 9 × 1 =
× 2 =
× 3 =
× 4 =
× 5 =
× 6 =
× 7 =

9 × 9 =
99 × 99 =
999 × 999 =
9999 × 9999 =
9 999 × 9 999 =
99 999 × 99 999 =
999 999 × 999 999 =

1 ÷ 9 =
2 ÷ 9 =
3 ÷ 9 =
4 ÷ 9 =
5 ÷ 9 =
6 ÷ 9 =
7 ÷ 9 =
8 ÷ 9 =
9 ÷ 9 =

9 × 9 + 7 =
9 × 98 + 6 =
9 × 987 + 5 =
9 × 9876 + 4 =
9 × 98 765 + 3 =
9 × 987 654 + 2 =
9 × 9 876 543 + 1 =

Motivation and Fun

Most numbers on the calculator, when looked at upside down, resemble letters of the alphabet. The letters represented are:

1	3	4	5	7	8	9	0	(2)
I	E	h	S	L	B	G	O	(Z)

with a little imagination

Students can write problems for other students to solve; math skills can be reviewed, codes can be decoded, etc.

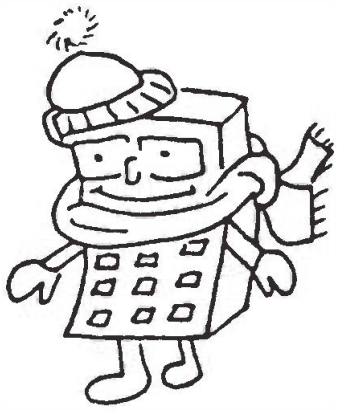
From Games, Tricks and Puzzles for a Hand Calculator

What did the cannibals say when they saw their dinner guest getting angry?

$\frac{228440}{4} - 1.66 =$ _____

What did Snoopy add to his doghouse as a result of his dog-fights with the Red Baron?

$(3 \times 303 + 50)7 \times 8 =$ _____



What kind of a double doesn't a golfer want at the end of a round of golf?

$1956 \times 4 + 153 \times 4 =$ _____

From The Calculator Book

A dingaling

$$\frac{56^2 + 8^3 + 243968}{2^5} = \text{\_\_\_\_\_}$$

Good for travel in a winter wonderland

$$\frac{25(18765 + 11115)}{4} + 65^3$$

Enter your age, then double it. Now add 5 and multiply by 50. Add the amount of change in your pocket, up to one dollar. Subtract the number of days in a year; add 115; divide by 100. Result - your age, then a decimal, then the amount of change.

Choose a number; add 10; multiply by 2; divide by 4; subtract 5; multiply by 2.

Games with Calculators

A few games that can be used in the classroom and that will reinforce computational and estimation skills are cited here.

Nim

The original game of Nim was played with a pile of sticks. Players took turns taking one, two or three sticks from the pile until only one stick remained. The player having to take the last stick lost the game.

A similar game can be played by two people using a calculator. The calculator should read 0 to begin the game. The first player pushes the 1, 2 or 3 key, followed by the + key and hands the machine to the second player. This player pushes the 1, 2 or 3 key, followed by the + key and hands the calculator back to the first player. This continues, players alternating turns and adding 1, 2 or 3 until 21 has been reached. The player making this total loses the game. A simple variation to this but changing the winning strategy would be to have the player making 21 win the game.

To make the game more difficult or for variety in strategy, use other keys and a different goal number, e.g. Use 1, 2, 3, 4, 5, 6 with goal number 50
Use 1, 4, 7 with goal number 50

One Only

Each player uses his own calculator. Select a number and using only the selected number key and any of the function keys (+, −, ×, ÷ or =) get the calculator to read some pre-selected goal number.

Example: number 4; goal 13 $(4 \times 4 + 4 \div 4 + 4 + 4)$

There will usually be a number of ways to get the goal number. A possible variation would be to achieve the goal in as few moves as possible.

Zero

A game to develop estimating skills and number awareness can be played by one person using a calculator. Select any six-digit number and put it in the display. Using any operation (+, −, ×, ÷, =) and any two-digit numbers get the calculator to display 0 in four moves. A move consists of one operation with one two-digit number. Multiplication and division by 0 are not allowed.

To make the game more difficult do not allow any two digits in the six-digit number to be the same.

One Hundred

The object of the game is to use each of the number keys once with any combination of the function keys (+, −, ×, ÷, =) to get the calculator to read 100.

Many variations of this game can be played.

Example: use the number keys in any order
use the number keys in order from smallest to largest
use the number keys in order from largest to smallest