It is noted that calculator usage is increasing and that little information was found on the effect of calculators on learning mathematics in elementary school. The activities described and included are intended to be examples of ways in which calculators may be used with existing curriculum materials. It is assumed that each teacher would select, modify, and develop activities with the best interest of children and the goals of the existing instructional program in mind. The document has been prepared to: (1) stimulate the use of calculators in the elementary grades; (2) provide teachers with "starter" ideas, and (3) provide suggestions for dealing with concepts that arise in the course of instruction with calculators. Samples of survey instruments designed to assess student opinions are provided. All examples of worksheets and student activities are noted according to the skill or area they are designed to promote. Brief guidelines for using calculators and notes on classroom management and calculator use are also included. (MP)
CESM
CALCULATORS IN ELEMENTARY
SCHOOL MATHEMATICS

TEACHER RESOURCE PACKET

TERRENCE G. COBURN
ROBERT E. REYS
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ARTHUR L. WHITE

THIS MATERIAL IS BASED UPON RESEARCH SUPPORTED
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FOUNDATION.
I. Introduction

A. Purpose

Calculator usage in our society is increasing and little information is available on the effect of calculators on learning mathematics in the elementary school. The activities described and included in this packet are examples of ways in which calculators may reasonably be used with the existing curriculum materials. These activities have not been prepared as prescriptions for your use of calculators. It is assumed that each individual teacher will select, modify and develop activities with the best interest of the children and the goals of the existing instructional program in mind. This packet has been prepared to:

1. Stimulate the use of calculators for mathematics learning and instruction in the elementary grades.

2. Provide teachers with "starter ideas" for the use of calculators in teaching elementary school mathematics.

3. Provide suggestions to teachers for dealing with mathematical concepts which arise in the course of instruction because of the use of calculators.

4. Provide an annotated bibliography of calculator related resources available to elementary school mathematics teachers.

B. Guidelines for use of calculators

It is important to be able to determine when using the calculator for mathematics instruction is apt to be advantageous. To help in making these judgments it is useful to review the properties and characteristics of calculators so that the instruction can capitalize on these characteristics. A list of the characteristics of calculators follows:

1. Fast
2. Accurate
3. Increased computing power
4. Simple to operate
5. Convenient
6. Motivating
If any of these characteristics are desirable and consistent with the goals of the lesson then the calculator would probably provide an advantage. Or a general rule -- use the calculator for teaching and learning mathematics unless there is a good reason not to.

C. Classroom management and calculator use

Each student should fill out a registration form which includes name, grade, teacher, date, and registration number for the calculator. Each child should put his name on the piece of paper provided, cut it out and tape it on the space on the front of the TI 1000 just below the red display shield.

The children should be instructed to double check that their calculator is turned off when it is not in use. It is suggested that a system of cubby holes be available for children to put their calculators in when not in use.

The batteries can be replaced by using a key or other rigid object to remove back plate. The batteries should last for 30-50 hours of use. When the battery is low the calculator will give strange results.
CESM

CALCULATORS IN ELEMENTARY

SCHOOL MATHEMATICS

WORKSHOP

OCTOBER 1977

BY

TERRENCE G. COBURN

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OAKLAND SCHOOLS

PONTIAC MICHIGAN

UNIVERSITY OF MISSOURI

UNIVERSITY OF IOWA

OHIO STATE UNIVERSITY

PURDUE UNIVERSITY

OHIO STATE UNIVERSITY
Example: For each pair of words below place an X on the blank that best tells how you feel about--

SNOW

like ___ : X : ___ : ___ : hate

cold X : ___ : ___ : ___ : hot

work ___ : ___ : X : ___ : play

These responses would indicate that the person likes snow but is not crazy about it. The person thinks snow is very cold and that snow means some work and some play.

Directions: For each pair of words below place an X on the blank that best tells how you feel about--

MATH

beneficial ___ : ___ : ___ : ___ : harmful

passive ___ : ___ : ___ : ___ : active

understandable ___ : ___ : ___ : ___ : mysterious

frill ___ : ___ : ___ : ___ : necessary

deep ___ : ___ : ___ : ___ : shallow

bad ___ : ___ : ___ : ___ : good

changing ___ : ___ : ___ : ___ : constant

tool ___ : ___ : ___ : ___ : toy

strange ___ : ___ : ___ : ___ : familiar

weak ___ : ___ : ___ : ___ : strong

simple ___ : ___ : ___ : ___ : complicated

confining ___ : ___ : ___ : ___ : expanding

sad ___ : ___ : ___ : ___ : happy

brave ___ : ___ : ___ : ___ : scared

slow ___ : ___ : ___ : ___ : fast

crutch ___ : ___ : ___ : ___ : tool

boring ___ : ___ : ___ : ___ : exciting

jump in ___ : ___ : ___ : ___ : hold back

hard ___ : ___ : ___ : ___ : easy

more ___ : ___ : ___ : ___ : less
Example: For each pair of words below place an X on the blank that best tells how you feel about—

**SNOW**

like \[	ext{X} \] : like : hate

cold \[	ext{X} \] : hot

work \[	ext{X} \] : play

These responses would indicate that the person likes snow but is not crazy about it. The person thinks snow is very cold and that snow means some work and some play.

Directions: For each pair of words below place an X on the blank that best tells how you feel about—

**CALCULATORS**

beneficial \[	ext{X} \] : harmful

passive \[	ext{X} \] : active

understandable \[	ext{X} \] : mysterious

frill \[	ext{X} \] : necessary

deep \[	ext{X} \] : shallow

bad \[	ext{X} \] : good

changing \[	ext{X} \] : constant

tool \[	ext{X} \] : toy

strange \[	ext{X} \] : familiar

weak \[	ext{X} \] : strong

simple \[	ext{X} \] : complicated

confining \[	ext{X} \] : expanding

sad \[	ext{X} \] : happy

brave \[	ext{X} \] : scared

slow \[	ext{X} \] : fast

crutch \[	ext{X} \] : tool

boring \[	ext{X} \] : exciting

jump in \[	ext{X} \] : hold back

hard \[	ext{X} \] : easy

more \[	ext{X} \] : less
### CESM Teacher Background Information

**Directions:** Fill in the circle beneath the appropriate responses:

<table>
<thead>
<tr>
<th>Grade Level</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
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</thead>
<tbody>
<tr>
<td>Age</td>
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<td>How many years have you been teaching elementary school?</td>
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<tr>
<td>8-11</td>
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</tbody>
</table>

**How many college credits do you have in mathematics?**

- 0 semester hours
- 0 quarter hours

(Check One)

<table>
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<tr>
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<th>0</th>
<th>1-3</th>
<th>4-7</th>
<th>8-11</th>
<th>12-15</th>
<th>16-19</th>
<th>20-23</th>
<th>24-27</th>
<th>over 23</th>
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</tbody>
</table>

**Is there a calculator at your home?**

- Yes
- No

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**How often do you use the calculator?**

- Frequently
- Occasionally
- Seldom
- Never

<table>
<thead>
<tr>
<th>Frequently</th>
<th>Occasionally</th>
<th>Seldom</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
CALCULATOR REGISTRATION

Instructions:

A. Fill in the information asked for on lines 1, 2, 3, and 4 below.

B. Print your name in the box at the upper right hand corner of this paper.

C. Cut out the box with your name on it.

D. Tape it on the front of your calculator over the gold colored space that has TI-1000 on it.

1. NAME ____________________________
   (First) ____________________________ (Last)

2. GRADE ____________________________ TEACHER ____________________________

3. DATE ____________________________
   (Month) (Day) (Year)

4. FROM BACK OF CALCULATOR:

   Serial No. ____________________________
To count by one's

Press: 1, +, =, =, =, =, ...

1. Count to 100 by one's

**Purpose:** Reinforce Counting
Size of 100 (requires 100 button pushes)
Illustrate repeated addition
Observe Numeration system patterns

2. Can you make the calculator count by two's? (2, +, =, =, ... ) Do you reach 100 sooner? Let's race to 100 or more. Group A count by Two's, Group B count by Three's. Go! (Group is done when everyone in group has exceeded 100). Which group finished first? Why?

**Purpose:** Reinforce multiples of 2 and 3
Illustrate repeated addition
Note difference in time in counting by 2's and 3's.
(relate to ratio?)
Observe Numeration system patterns
Counting

3. Count by Five's, Ten's.

4. Count to One Thousand by One's. How long do you think it will take?

Let's check.

Purpose: Reinforce Counting
Size of 1000
Observe Numeration system patterns

5. Extras:
Count by Nine's and describe the patterns.
Make up your own counting patterns.

6. Count to Ten by one-tenth's (.1).
(.1, +, =, =, ...

7. Count to Ten by one-hundredth's (.01). How long do you think it will take?
8. You have been doing repeated addition. Can you also do repeated multiplication? What happens? Compare:

\[ 2, +, =, =, \ldots \]

with

\[ 2, \times, =, =, =, \ldots \]

(What does the flashing display mean?)
Solve the following problems:

1. $42 + 37 = \underline{ }$
2. $376 - 197 = \underline{ }$
3. $17 \times 36 = \underline{ }$
4. $221 \div 17 = \underline{ }$

Are your answers reasonable?

Turn over the paper and work some of the problems first graders made up for themselves after working the above problems.
Problems First Graders
Gave Themselves

\[ 182796 + 35240 = \]

(give the verbal name
for your answers)

\[ 1000 \times 1000 = \]

\[ 4326 \times 7825 = \]

\[ 1265418 \times 872563 = \]

\[ 459 \div 63 = \]

(talk about rounding)
Concepts

Can you make the calculator count backwards from 10? (Hint: 10, 9, 8, 7, 6, 5, 4, 3, 2, 1)

Write the numbers you get in the blanks below.

10

 Do you see a pattern?

What does it remind you of? (A Thermometer?)

If you start at six and go down ten, where do you stop?

Solve

6-10 =

Try

9-14 =

Describe on the thermometer.
Applications

1. If each of the 424 kids in this school brought 6 cookies to school, how many cookies would we have altogether?

   How much money would the school make if you sold each cookie for five cents?

   (How does your answer differ from the usual dollars and cents notation?)

2. A bicycle wheel usually has about 32 spokes. If there are 123 bikes at the school bike rack, how many spokes are there?

3. How many seconds are there in a year?

   How long would it take to count to this number by one's?
Applications

4. A small bag of M & M's usually contains 23 candies. Your class has 12 girls and 14 boys. If you had 9 bags of M & M's, how many candies would each person get (include the teacher)?

If you don’t break any individual candies, how many will be left over?

5. Suppose you stacked up 424 math books in a single stack on the playground. How high would the stack be?
Problem Solving activities are designed to require students to tackle an original problem and draw together a variety of mathematical concepts in new and interesting ways. Such activities often generate several interesting side issues which teach mathematics and give children experience directing their own thinking. The following illustrates some of the experiences involved in problem solving.

Find \( \square \) so that

\[ \square \times \square = 437 \]

First try: \( 53 \times 53 = \square \)

but \( \square > 437 \)

So 53 is too big.
Problem Solving

Try:
20x20 = 

and < 437

Thus, 20 is too small

Try:
23x23 = 

> 437

Thus, 23 is too

Try:
21x21 = 441 > 437

Now, since 20x20 = 400 < 437

and 21x21 = 441 > 437
Problem Solving

Try:
20.5\times 20.5 =

Try:
20.7\times 20.7 =

Try:
20.9\times 20.9 =

Try:
20.91\times 20.91 =

Can you get any closer?

Try:
20.905\times 20.905 = 437.01902

But shouldn't the number end in 5?

Multiply by hand to check.
Problem Solving

\[
\begin{array}{c}
20.905 \\
\times 20.905 \\
\hline
104525 \\
1881450 \\
4181000 \\
\underline{437019025}
\end{array}
\]

Did the calculator round off or drop the 5?

Check by:

\[
20.906 \times 20.906 = \square
\]

Should end in 6. Did it round off or drop the last digit?

Try:

\[
20.9049 \times 20.9049 = 437.01484
\]

Try:

\[
20.9048 \times 20.9048 = 437.01066
\]

Try:

\[
20.9046, x, = \square
\]

How many digits in the answer? Why?
Problem Solving

Check by multiplying by hand:  \[ 20.9046 \times 20.9046 \]

(Check 437.00230116)

Reason for only seven digits is that eighth digit is a zero.

Now continuing:

\[ 20.9045, x, \]
\[ 20.90455, x, \]
\[ 20.90453, x, \]
\[ 20.90454, x, \]
\[ 20.904545, x, \]

Check by hand: 13. 2.
Thus we have a good approximation for the solution, but still not exactly the solution. It is mathematically impossible to ever get exactly the right answer to this problem regardless of how long we work.
The following pages are taken from elementary school mathematics textbooks. The comments at the bottom of each page are designed to illustrate some of the ways a calculator might be used with existing textbook pupil pages.
EXERCISES

Find the average.

1. 3, 7, 2
2. 2, 6, 5, 3
3. 4, 8
4. 6, 2, 7
5. 4, 2, 7, 2, 5
6. 14, 12, 16
7. 40, 50, 45
8. 10, 0, 8, 2
9. 35, 42, 58
10. 90, 90, 90, 90
11. 20, 30, 40, 50, 60
12. 1, 2, 8, 5, 9, 7, 3
13. 43, 65, 28, 53, 26
14. 34, 35, 38, 36, 37, 30
15. 5, 8, 10, 15, 19, 9

Solve these problems.

16. John's scores on his spelling tests were 60, 80, 70, 100, 90. What was his average score?

17. The temperature was measured for a week at 1 o'clock. The following temperatures were recorded:
   Sun. 40°, Mon. 42°, Tues. 50°, Wed. 49°, Thurs. 35°, Fri. 45°, Sat. 54°.
   What was the average temperature for the week?

HEALTH CHART

<table>
<thead>
<tr>
<th>Weight</th>
<th>Height</th>
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</thead>
<tbody>
<tr>
<td>Bob</td>
<td>124 pounds</td>
</tr>
<tr>
<td>Paul</td>
<td>132 pounds</td>
</tr>
<tr>
<td>John</td>
<td>110 pounds</td>
</tr>
</tbody>
</table>

18. What is the average weight of the three boys?

19. What is the average height of the three boys?

Calculator Use

The basic concept being taught is the concept of average. Do the exercises with a calculator. Have students write out the steps. Supplement the problems with ones involving your own students. For example, what is the average age of our class (list on the board)? What is the average number of minutes our class spends traveling to school? Have students determine if answers are reasonable.

<table>
<thead>
<tr>
<th></th>
<th>1. 2 tens + 4 ones</th>
<th>2. 5 tens + 3 ones</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>20 + 4</td>
<td>__ + __</td>
</tr>
<tr>
<td></td>
<td>24</td>
<td>__</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>3. 7 tens + 6 ones</th>
<th>4. 4 tens + 0 ones</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>__ + __</td>
<td>__ + __</td>
</tr>
<tr>
<td></td>
<td>__</td>
<td>__</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>5. 8 tens + 5 ones</th>
<th>6. 9 tens + 9 ones</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>__ + __</td>
<td>__ + __</td>
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<td>__</td>
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</tbody>
</table>

**Calculator Use**

Do the problems without the calculator and then do them with the calculator.

Further activities could include "What do you subtract from 24 to blank out the tens digit?" (24-20=4). Or, "What do you subtract from 48 to make the unit's digit zero?" (48-8=40).

Use of the Calculator with Text Pages

Subtract:

1. 76
   \[ \underline{-59} \]
2. 79
   \[ \underline{-21} \]
3. 64
   \[ \underline{-17} \]
4. 46
   \[ \underline{-23} \]
5. 91
   \[ \underline{-37} \]
6. 87
   \[ \underline{-15} \]
7. 88
   \[ \underline{-54} \]
8. 62
   \[ \underline{-20} \]
9. 67
   \[ \underline{-16} \]
10. 94
    \[ \underline{-86} \]
11. 47
    \[ \underline{-9} \]
12. 94
    \[ \underline{-65} \]
13. 96
    \[ \underline{-81} \]
14. 26
    \[ \underline{-5} \]
15. 91
    \[ \underline{-65} \]
16. 81
    \[ \underline{-43} \]
17. 20
    \[ \underline{-9} \]
18. 84
    \[ \underline{-27} \]
19. 56
    \[ \underline{-28} \]
20. 92
    \[ \underline{-78} \]
21. 93
    \[ \underline{-47} \]
22. 68
    \[ \underline{-29} \]
23. 72
    \[ \underline{-35} \]
24. 81
    \[ \underline{-66} \]
25. 64
    \[ \underline{-39} \]

Calculator Use

2 lines by hand. Have neighbor check on calculator. If you miss more than one, do the next ten, check your own with calculator. If you miss more than one of the second ten, do the last five and check with calculator.

Find each answer.

1. \(3 \times 5\)  
2. \(2 \times 7\)  
3. \(5 \times 6\)  
4. \(9 \times 1\)  
5. \(0 \times 8\)  
6. \(6 \times 6\)  
7. \(5 \times 7\)  
8. \(9 \times 3\)  
9. \(4 \times 8\)  
10. \(3 \times 9\)  
11. \(4 \times 9\)  
12. \(8 \times 3\)  
13. \(4 \times 6\)  
14. \(3 \times 8\)  
15. \(5 \times 5\)  
16. \(6 \times 5\)  
17. \(9 \times 2\)  
18. \(7 \times 0\)  
19. \(9 \times 4\)  
20. \(4 \times 7\)  
21. \(8 \times 4\)  
22. \(7 \times 5\)  
23. \(7 \times 4\)  
24. \(3 \times 6\)  
25. \(10 \div 5\)  
26. \(6 \div 1\)  
27. \(16 \div 4\)  
28. \(18 \div 2\)  
29. \(24 \div 3\)  
30. \(18 \div 3\)  
31. \(36 \div 6\)  
32. \(25 \div 5\)  
33. \(35 \div 7\)  
34. \(27 \div 9\)  
35. \(32 \div 8\)  
36. \(24 \div 8\)  
37. \(28 \div 7\)  
38. \(30 \div 5\)  
39. \(30 \div 6\)  
40. \(27 \div 3\)  
41. \(36 \div 9\)  
42. \(35 \div 5\)  
43. \(9 \div 9\)  
44. \(24 \div 4\)  
45. \(28 \div 4\)  
46. \(32 \div 4\)  
47. \(21 \div 3\)  
48. \(36 \div 4\)  

**Calculator Use**

Drill and practice in pairs with calculator.

5. Solve the equations.

- [A] \(5 + (8 + 7) = n\)
- [B] \((5 + 8) + 7 = n\)
- [C] \((9 + 7) + 8 = x\)
- [D] \(9 + (7 + 8) = x\)
- [E] \((9 + 8) + 7 = q\)

\[ [f] \quad 5 + (3 \times 4) = r \]
\[ [g] \quad (5 + 3) \times 4 = s \]
\[ [h] \quad (5 + 4) \times 3 = a \]
\[ [i] \quad 3 \times (5 + 2) = t \]
\[ [j] \quad (3 \times 5) + 2 = y \]

\[ [k] \quad (3 \times 4) + (5 \times 4) = q \]
\[ [l] \quad 8 \times 4 = s \]
\[ [m] \quad (5 \times 6) + (4 \times 6) = n \]
\[ [n] \quad 9 \times 6 = t \]
\[ [o] \quad 5 \times 0 = a + 0 \]

6. Solve the equations.

- [A] \((4 \times 6) + 7 = n\)
- [B] \((3 \times 7) + 8 = y\)
- [C] \((8 \times 3) + 9 = a\)
- [D] \((6 \times 3) + 6 = c\)
- [E] \((9 \times 3) + 6 = d\)
- [F] \((8 \times 2) + 8 = s\)
- [G] \((7 \times 6) + 9 = t\)
- [H] \((5 \times 6) + 5 = n\)

\[ 6 \times 2 + q = 20 \]
\[ 3 \times 8 + t = 30 \]
\[ 4 \times 7 + r = 34 \]
\[ 3 \times 9 + n = 35 \]
\[ 6 \times 7 + b = 42 \]
\[ 8 \times 9 + a = 81 \]
\[ 9 \times 6 + x = 60 \]
\[ 7 \times 7 + y = 55 \]

\[ (n \times 4) + 3 = 23 \]
\[ (y \times 6) + 5 = 41 \]
\[ (r \times 9) + 5 = 50 \]
\[ (t \times 8) + 3 = 51 \]
\[ (n \times 7) + 6 = 62 \]
\[ (b \times 6) + 5 = 59 \]
\[ (c \times 7) + 8 = 64 \]
\[ (d \times 6) + 5 = 47 \]

7. Write an equation for each problem. Solve the equation.

[A] In her rock collection, Sue had 6 boxes with 5 rocks in each box. She found 3 more rocks. How many rocks did she have in all?

[B] Ned shot 6 arrows, gave Fred a turn, and then shot 3 more arrows. Ned did this 7 times. How many arrows did he shoot?

8. The same letter is used more than once in the equations below. As in exercise A, give the number that will make the equation true.

- [A] \(n + n = 16\)
- [B] \(a \times a = 16\)
- [C] \(y + y = 18\)
- [D] \(y \times y = 81\)
- [E] \(t + t = 64\)
- [F] \(5 + n + n = 9\)
- [G] \(x + x + 7 = 15\)
- [H] \(r \times r \times r = 27\)
- [I] \(s + s + s = 12\)

[Think]

Give a number for \(y\) so that the equation \(y \times y = y + y\) will be true.

Find another such number.

[Calculator Use]

Basically use as is with calculators.
Note: order of operations solving equations
Encourage some beefing of numbers
For example:

\[ a \times a = 256 \]
\[ q \times q = 1369 \]
\[ p \times p \times p = 343 \]

Suggest a competition on "Think" problem between one student with calculator and one without.
To find the quotient for \(4 \div 1428\), we find the greatest number of fours that can be subtracted from 1428. Since \(100 \times 4\) is less than 1428 and \(1000 \times 4\) is greater than 1428, we look for the quotient between 100 and 1000. Since \(300 \times 4 < 1428\) and \(400 \times 4 > 1428\), we find the quotient as shown in example A.

\[\begin{array}{c|c|c}
\hline
357 & 300 \times 4 & 4 \sqrt{1428} \\
1200 & & 300 \\
228 & 50 \times 4 & 1200 \\
200 & & 228 \\
28 & 7 \times 4 & 200 \\
28 & & 28 \\
0 & & 0 \\
\hline
\end{array}\]

Think:
- We can subtract 300 fours from 1428.
- Then we can subtract 50 more fours.
- Finally, we can subtract 7 more fours.

Write:
- \(4 \sqrt{1428}\)
- \(300\)
- \(50\)
- \(7\)

Give the missing numbers and the quotients for examples B and C.

\[\begin{array}{c|c|c}
\hline
6 \sqrt{1842} & \times 6 & 6 \sqrt{3204} \\
1800 & & 3200 \\
42 & & 42 \\
42 & & 0 \\
0 & & 0 \\
\hline
\end{array}\]

EXERCISES

Copy each exercise and find the quotient and remainder.

1. \(2 \sqrt{1534}\)  
2. \(5 \sqrt{3641}\)  
3. \(8 \sqrt{5030}\)  
4. \(4 \sqrt{3008}\)
5. \(3 \sqrt{1527}\)  
6. \(7 \sqrt{2804}\)  
7. \(6 \sqrt{5316}\)  
8. \(9 \sqrt{7134}\)
9. \(6 \sqrt{3504}\)  
10. \(7 \sqrt{2835}\)  
11. \(8 \sqrt{3986}\)  
12. \(9 \sqrt{5050}\)
13. \(4 \sqrt{2008}\)  
14. \(9 \sqrt{8003}\)  
15. \(6 \sqrt{5994}\)  
16. \(8 \sqrt{5930}\)

Calculator Use:

- Do problems 1, 6, 11, 16 using paper and pencil.
- Do problems 4, 7, 10, 13 with the calculator.
- Check problem 4 using paper and pencil.
- Check problem 16 using the calculator.

(Note: Get kids reaction to check on problem 16 for next day and consult hints on division)
Chapter review

1. Give the multiple of 10 that is closest to each number.

2. Give the multiple of 100 that is closest to each number.

3. Write an equation that shows how to estimate the answer for each exercise. Use multiples of 10.

4. Write an equation that shows how to estimate the answer for each exercise. Use multiples of 100.
   [E] 6729 - 3687   [F] 4864 ÷ 697

5. Ironwood is one of the heaviest types of wood. It weighs 93 pounds per cubic foot. Balsa is one of the lightest types of wood. It weighs about 8 pounds per cubic foot. A cubic yard is 27 cubic feet.
   [A] Estimate the weight of a cubic yard of ironwood.
   [B] Estimate the weight of a cubic yard of balsa wood.

6. Some large autos are 19 feet long. One of the largest buses ever built was 57 feet long. Estimate the number of cars that could fit into a space long enough for the bus.

7. One of the longest bicycles ever built was a 10-seater built in 1898. It was 23 feet 9 inches long. Estimate the difference between the length of this bicycle and the total length of 10 ordinary bicycles, each 5 feet 9 inches long.

Think

How many 1-digit numbers are there?
How many 2-digit numbers are there?
Estimate the number of 3-digit numbers.

Calculator Use

3-7 Students make and record estimates. Work problems with calculator and find difference between estimate and calculator answer.
New Concepts

Negative Integers

Decimals

Large Numbers

Multiplication

Division

Estimation

Rounding
Loading batteries

What's inside

How to store in the classroom

First day activities
Example: For each pair of words below place an X on the blank that best tells how you feel about—

**SNOW**

like __: X: __: __: __: __: hate
cold X: __: __: __: __: hot
work __: __: __: X: __: __: play

These responses would indicate that the person likes snow but is not crazy about it. The person thinks snow is very cold and that snow means some work and some play.

Directions: For each pair of words below place an X on the blank that best tells how you feel about—

**MATH**

beneficial __: __: __: __: __: harmful
passive __: __: __: __: __: active
understandable __: __: __: __: __: mysterious
frill __: __: __: __: __: necessary
depth __: __: __: __: __: shallow
bad __: __: __: __: __: good
changing __: __: __: __: __: constant
tool __: __: __: __: __: toy
strange __: __: __: __: __: familiar
weak __: __: __: __: __: strong
simple __: __: __: __: __: complicated
confining __: __: __: __: __: expanding
sad __: __: __: __: __: happy
brave __: __: __: __: __: scared
slow __: __: __: __: __: fast
crutch __: __: __: __: __: tool
boring __: __: __: __: __: exciting
jump in __: __: __: __: __: hold back
hard __: __: __: __: __: easy
more __: __: __: __: __: less
Example: For each pair of words below place an X on the blank that best tells how you feel about--

SNOW

like ___ X: ___: ___: ___ hate
cold X: ___: ___: ___ hot
work ___: ___: ___: ___ play

These responses would indicate that the person likes snow but is not crazy about it. The person thinks snow is very cold and that snow means some work and some play.

Directions: For each pair of words below place an X on the blank that best tells how you feel about--

CALCULATORS

beneficial ___: ___: ___: ___ harmful
passive ___: ___: ___: ___ active
understandable ___: ___: ___: ___ mysterious
frill ___: ___: ___: ___ necessary
deep ___: ___: ___: ___ shallow
bad ___: ___: ___: ___ good
changing ___: ___: ___: ___ constant
tool ___: ___: ___: ___ toy
strange ___: ___: ___: ___ familiar
weak ___: ___: ___: ___ strong
simple ___: ___: ___: ___ complicated
confining ___: ___: ___: ___ expanding
sad ___: ___: ___: ___ happy
brave ___: ___: ___: ___ scared
slow ___: ___: ___: ___ fast
crutch ___: ___: ___: ___ tool
boring ___: ___: ___: ___ exciting
jump in ___: ___: ___: ___ hold back
hard ___: ___: ___: ___ easy
more ___: ___: ___: ___ less
COUNTING ON THE CALCULATOR

Teach Your Calculator to Count

Make your calculator count like this:
1, 2, 3, 4, 5, 6, 7, 8, 9, 10, ...
10, 20, 30, 40, 50, 60, 70, 80, ...
3, 6, 9, 12, 15, 18, 21, 24, ...
990, 991, 992, 993, 994, 995, ...

Finish this sequence.
3, 6, 9, ..., ...

Complete these sequences.
2, 4, 6, 8, 10, ...
5, 10, 15, 20, ...
12, 14, 16, 18, ...
16, 20, 24, 28, ...
127, 129, 131, ...
5, 10, 15, ...

Experiment yourself: Find out how long it takes you to count by ones to 100 on the calculator. Use your information to answer these questions.

How long will it take to count to:

A. 200 by twos?
B. 1000 by ones?
C. 100 by twos?
D. 1000 by tens?
E. 10 by tenths (0.1)?
NUMERATION GAME

Target:

1. Each player needs a copy of this sheet.
2. Each player chooses 3 digits (number keys on the calculator).
3. Players then arrange their 3 digits in the blanks so that the sum is close to the target number.
4. The player coming closest to the target wins the game.

Game 1

\[
\begin{array}{ccc}
\square & \square & \square \\
\hline
\square & \square & \square \\
\hline
\end{array}
\]

\[
\begin{array}{c}
5 \\
2 \\
3 \\
\hline
TARGET NUMBER
\end{array}
\]

Game 2

\[
\begin{array}{ccc}
\square & \square & \square \\
\hline
\square & \square & \square \\
\hline
\end{array}
\]

\[
\begin{array}{c}
7 \\
5 \\
1 \\
\hline
TARGET NUMBER
\end{array}
\]

Game 3

\[
\begin{array}{ccc}
\square & \square & \square \\
\hline
\square & \square & \square \\
\hline
\end{array}
\]

\[
\begin{array}{c}
4 \\
4 \\
7 \\
\hline
TARGET NUMBER
\end{array}
\]

Game 4

\[
\begin{array}{ccc}
\square & \square & \square \\
\hline
\square & \square & \square \\
\hline
\end{array}
\]

\[
\begin{array}{c}
1 \\
2 \\
3 \\
4 \\
\hline
TARGET NUMBER
\end{array}
\]

Game 5

\[
\begin{array}{ccc}
\square & \square & \square \\
\hline
\square & \square & \square \\
\hline
\end{array}
\]

\[
\begin{array}{c}
6 \\
9 \\
6 \\
\hline
TARGET NUMBER
\end{array}
\]

Game 6

\[
\begin{array}{ccc}
\square & \square & \square \\
\hline
\square & \square & \square \\
\hline
\end{array}
\]

\[
\begin{array}{c}
7 \\
4 \\
3 \\
\hline
TARGET NUMBER
\end{array}
\]

Game 7

\[
\begin{array}{ccc}
\square & \square & \square \\
\hline
\square & \square & \square \\
\hline
\end{array}
\]

\[
\begin{array}{c}
1 \\
5 \\
6 \\
3 \\
\hline
TARGET NUMBER
\end{array}
\]

Game 8

\[
\begin{array}{ccc}
\square & \square & \square \\
\hline
\square & \square & \square \\
\hline
\end{array}
\]

\[
\begin{array}{c}
1 \\
7 \\
8 \\
6 \\
\hline
TARGET NUMBER
\end{array}
\]

Game 9

\[
\begin{array}{ccc}
\square & \square & \square \\
\hline
\square & \square & \square \\
\hline
\end{array}
\]

\[
\begin{array}{c}
8 \\
7 \\
5 \\
\hline
TARGET NUMBER
\end{array}
\]
WIPE OUT

JOHN
PRESSED 431

MARY "WIPE OUT"
THE '3'

TELL WHICH KEYS MARY PRESSED

- , 3  + , 0  - , 30  ?

TRY SOME

ENTER WIPE OUT KEYS PRESS THE WRITE THE ANSWER

672  7

384  8

9761  6

9761  7

4332 BOTH 3'S

3 4
NUMERATION

NUMBER LUMBER I

Use your calculator to find the total of each log.

Four hundred ninety-seven plus three hundred six equals

Three thousand two hundred plus five thousand ninety-five plus twelve thousand five hundred equals

Thirty-five thousand plus fifty thousand four hundred plus twenty-three thousand three hundred seven plus nineteen thousand equals

One hundred twenty-five thousand plus thirty-four thousand plus twenty-five hundred plus two hundred thousand equals

Eight hundred sixty-six plus seven hundred thirty-four plus twenty-one thousand seven hundred plus one thousand two hundred six plus one hundred one equals
PRESS THE 2 KEY 10 TIMES.

HOW MANY 2's DO YOU SEE? 

TRY THIS:

ENTER 1111111 +, =, =, =, =, =, =, =

8 ONES

WHAT NUMBER IS DISPLAYED? 

HOW MANY DIGITS DOES IT HAVE? 

ADD 999999 + 1 = WHAT HAPPENS?

WHAT IS THE LARGEST NUMBER YOUR CALCULATOR CAN DISPLAY?
Purpose: Get the calculator to show by adding numbers. Fewest trials win!

He enters +.

I will put in

He adds gets 13.

No nines, one

Tell the number of nines and one other digit.

He adds gets.

No nines, one

He adds gets.

One nine and a

He adds gets.

You Got It! You took four steps, now let's see how many steps it takes me.

Wants to get calculator to read 99.

Add 13.

Maybe the 3 is in the ones column.

Add 6.

The 4 must be in the tens column.

Add 50.

I know the 4 is in the ones column!

Add 5.

If the number added makes the sum more than 99, subtract that number and continue. Counts as one turn.
PLACE VALUE

WITH YOUR CALCULATOR

WRITE THE LARGEST THREE DIGIT NUMBER YOU CAN SHOW

WRITE THE LARGEST FOUR DIGIT NUMBER YOU CAN SHOW

WRITE THE LARGEST FIVE DIGIT NUMBER YOU CAN SHOW

WRITE THE LARGEST SIX DIGIT NUMBER YOU CAN SHOW

WRITE THE LARGEST SEVEN DIGIT NUMBER YOU CAN SHOW

WITHOUT YOUR CALCULATOR

WHAT IS THE LARGEST EIGHT DIGIT NUMBER YOU COULD SHOW?
ORDERING

CHOOSE THE SMALLEST NUMBER FROM EACH BOX, ENTER IT AND PUSH +. CHECK YOUR FINAL ANSWER WITH THE CHECK NUMBER.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th>CHECK (\Rightarrow 600)</th>
</tr>
</thead>
</table>
|152| 23| 523| 321|\n|201| 56| 235| 231|\n|129| 147| 352| 213|\n|199| 29| 532| 312|\n
CHOOSE THE LARGEST NUMBER FROM EACH BOX, ENTER IT AND PUSH +. CHECK YOUR FINAL ANSWER WITH THE CHECK NUMBER.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th>CHECK (\Rightarrow 1489)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>CHECK NUMBER</td>
</tr>
</tbody>
</table>
|1  | 153| 801| 0   |\n|2  | 531| 810| 111 |\n|14 | 315| 777| 134 |\n|7  | 222| 569| 39  |\n
CHOOSE THE LARGEST EVEN NUMBER FROM EACH BOX, ENTER IT AND PUSH +. CHECK YOUR FINAL ANSWER WITH THE CHECK NUMBER.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th>CHECK (\Rightarrow 210)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>34</td>
<td>48</td>
<td>120</td>
<td>\n</td>
</tr>
</tbody>
</table>
### Multiplication

**3 Sets of 5**

![Diagram of 3 sets of 5]

**Count by 5's**

\[ 5, +, =, =, = \]

**Try this:** Press 3, x, 5, =

\[ (3 \, \text{times} \, 5) \]

Is the answer also 15?

**Try both ways**

<table>
<thead>
<tr>
<th>Sets</th>
<th>Count</th>
<th>Use x</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 Sets of 2</td>
<td>[ 2 + = = = ]</td>
<td>[ 4 , \times , 2 = ]</td>
</tr>
<tr>
<td>3 Sets of 4</td>
<td>[ \ldots ]</td>
<td>[ \ldots ]</td>
</tr>
<tr>
<td>5 Sets of 3</td>
<td>[ \ldots ]</td>
<td>[ \ldots ]</td>
</tr>
<tr>
<td>4 Sets of 4</td>
<td>[ \ldots ]</td>
<td>[ \ldots ]</td>
</tr>
</tbody>
</table>
G. Immerzeel

Experiences With the Hand-held Calculator in Teaching Computation

Find an easy way to find the sum of these numbers.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>128</th>
<th>356</th>
<th>1245</th>
</tr>
</thead>
<tbody>
<tr>
<td>35</td>
<td>35</td>
<td>35</td>
<td>35</td>
<td>35</td>
</tr>
<tr>
<td>128</td>
<td>128</td>
<td>128</td>
<td>128</td>
<td>128</td>
</tr>
<tr>
<td>356</td>
<td>356</td>
<td>356</td>
<td>356</td>
<td>356</td>
</tr>
<tr>
<td>1245</td>
<td>1245</td>
<td>1245</td>
<td>1245</td>
<td>1245</td>
</tr>
</tbody>
</table>

| 1795 | 4250 | 9278 | 15125 |
| 1795 | 4250 | 9278 | 15125 |
| 1795 | 4250 | 9278 | 15125 |
| 1795 | 4250 | 9278 | 15125 |

| 493  | 5791 | 1234 | 8950 |
| 493  | 5791 | 1234 | 8950 |
| 493  | 5791 | 1234 | 8950 |
| 493  | 5791 | 1234 | 8950 |
| 493  | 5791 | 1234 | 8950 |
| 493  | 5791 | 1234 | 8950 |
| 493  | 5791 | 1234 | 8950 |
| 493  | 5791 | 1234 | 8950 |
| 493  | 5791 | 1234 | 8950 |
| 493  | 5791 | 1234 | 8950 |
Target: Multiplication

Using only the $\times$ and numbers, try to "hit the target."

Try these games.

**GAME 1**
- $E = 25$
- Target Area: 680 710

**GAME 2**
- $E = 12$
- Target Area: 370 400

**GAME 3**
- $E = 15$
- Target Area: 490 510

**GAME 4**
- $E = 21$
- Target Area: 810 830

**GAME 5**
- $E = 49$
- Target Area: 1,500 1,600

**GAME 6**
- $E = 95$
- Target Area: 2,500 2,550

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COMPUTING POWER

USE A CALCULATOR TO SOLVE THESE EXAMPLES.

31 \times 7 = \underline{} \quad 25 \times 9 = \underline{}

76 \times 8 = \underline{} \quad 82 \times 5 = \underline{}

NOW TRY TO SOLVE THESE WITHOUT A CALCULATOR. USE THE
RESULTS FROM ABOVE. CHECK WITH A CALCULATOR IF
NECESSARY.

310 \times 7 = \underline{} \quad 25 \times 900 = \underline{}

31 \times 70 = \underline{} \quad 2500 \times 9 = \underline{}

760 \times 80 = \underline{} \quad 82 \times 50 = \underline{}

76000 \times 8 = \underline{} \quad 820 \times 500 = \underline{}

THESE EXAMPLES MAY BE TOO BIG FOR A CALCULATOR. CAN
YOU DO THEM ANYWAY?

31000 \times 700 = \underline{} \quad 25000000 \times 80 = \underline{}

76000 \times 300000 = \underline{} \quad 82000 \times 5000 = \underline{}}
DIVISION - REPEATED SUBTRACTION

1. Count out 15 chips. Take 3 of them away. Then take three more away, then 3 more, until they are all gone. How many groups of 3 did you take away? __________

2. On your calculator subtract 3 from 15 until you get to 0. Press 15, -, 3, =, =, =, =. How many 3’s did you subtract? __________

3. On your calculator divide 15 by 3. 15 ÷ 3 = __________. Are the answers the same in 1, 2, and 3?

4. Complete the first three steps using 24 chips and taking away groups of 6.
ESTIMATING DIVISION

Target: Division

Using the + and numbers, try to "hit the target."

Enter E → Push + → Enter a number of your choice. → Push =

Pass calculator to other player

On target?

Yes

You Win!

No

Try these games.

GAME 1
E = 1,250
Target Area
25 30

GAME 2
E = 999
Target Area
20 23

GAME 3
E = 6,245
Target Area
30 35

GAME 4
E = 1,862
Target Area
16 17

GAME 5
E = 2,500
Target Area
15 120

GAME 6
E = 1,000,000
Target Area
990 1,010

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SUBTRACT 11 FROM 88 UNTIL YOU GET 0 ON THE DISPLAY.
TO DO THIS PRESS 88 - 11 FOLLOWED BY AS MANY =S AS YOU NEED.

HOW MANY 11s CAN YOU SUBTRACT FROM 88? ________

NEXT DIVIDE 88 BY 11 WITH YOUR CALCULATOR.

88 ÷ 11 = ________

DID YOU GET THE SAME ANSWER FOR EACH? ________

HOW MANY TIMES CAN YOU SUBTRACT:

42 FROM 126? ________  \( 126 \div 42 = ________ \)

24 FROM 456? ________  \( 456 \div 24 = ________ \)

87 FROM 1044? ________  \( 1044 \div 27 = ________ \)

123 FROM 984? ________  \( 984 \div 123 = ________ \)

94 FROM 1598? ________  \( 1598 \div 94 = ________ \)

27 FROM 122? ________  \( 122 \div 27 = ________ \)
DECIMALS

LOOK AT THE DECIMAL POINT

2.5

2.5 IS A NUMBER BETWEEN 2 AND 3

THERE ARE OTHER NUMBERS BETWEEN 2 AND 3. THEY ALL START WITH 2.

NAME SOME: 2.____ 2.____ 2.____ 2.____

ADD

2.5 + 2.7 = ______

2.1 + 2.1 = ______

2.3 + 2.8 = ______

2.6 + 2.6 = ______

2.2 + 2.3 = ______

TELL WHY EACH SUM IS LESS THAN 6.
### DECIMALS

.3 is between 0 and 1

```
| 0 | .3 | 1 |
```

Count by .3

.3, .6, ..., =, =, ...

Stop when you go past 1.0

Count by .2

.2, .4, ..., =, =, ...

Stop when you reach 1.0

Show where .2 would be on the number line.

<table>
<thead>
<tr>
<th>Count and Keep Track</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Count by ...</strong></td>
</tr>
<tr>
<td>.2</td>
</tr>
<tr>
<td>.3</td>
</tr>
<tr>
<td>.4</td>
</tr>
<tr>
<td>.5</td>
</tr>
<tr>
<td>.1</td>
</tr>
<tr>
<td>.6</td>
</tr>
</tbody>
</table>

17
DECIMALS AND FRACTIONS

FIND TWO NUMBERS SO THAT

\[
\_ \div \_ = 0.5
\]

TRY SOME

KEEP TRACK

\[
\begin{align*}
1 & \div 2 = 0.5 \\
7 & \div 14 = \\
3 & \div _ = 0.5 \\
4 & \div _ = 0.5 \\
8 & \div _ = 0.5 \\
_ & \div 4 = 0.5 \\
_ & \div 10 = 0.5
\end{align*}
\]
DECIMAL NUMBER LINE

USE A CALCULATOR TO LOCATE THESE FRACTIONS ON THE ABOVE NUMBER LINE.

\[
\frac{1}{2} \quad \frac{3}{5} \quad \frac{3}{8} \quad \frac{4}{7} \quad \frac{5}{12}
\]

LOCATE THESE FRACTIONS ON THE SECOND NUMBER LINE.

\[
\frac{3}{2} \quad \frac{21}{7} \quad \frac{28}{8} \quad \frac{13}{6} \quad \frac{12}{5}
\]

LOCATE THESE FRACTIONS ON THE THIRD NUMBER LINE.

\[
\frac{120}{3} \quad \frac{88}{2} \quad \frac{236}{4} \quad \frac{236}{5} \quad \frac{4290}{82}
\]
The use of parentheses and the order of operations (multiply, divide, add, subtract—in that order) become important when you use a calculator. If you enter \(2 + (3 \times 4)\) from left to right, the machine will display 20 as the answer. If you enter \((3 \times 4) + 2\), it will display 14 as the answer. Of course, 14 is the answer you want. In the first example, the machine added 2 + 3 and then multiplied by 4 to get 20. The child needs to recognize that the order of operation is as important with a calculator as with pencil and paper. This activity is designed to bring this difficulty to the student's attention and to teach him to check with pencil and paper when the order of operations may be a problem on a calculator. Many youngsters will be confused by the wrong answers they get to the first part of each example.

<table>
<thead>
<tr>
<th>Try these on a calculator.</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(2 + (3 \times 4)) = _____</td>
<td>(9 + (2 \times 5)) = _____</td>
</tr>
<tr>
<td>((3 \times 4) + 2) = _____</td>
<td>((2 \times 5) + .9 = _____</td>
</tr>
<tr>
<td>(75 + (6 \times 5)) = _____</td>
<td>(125 + (8 \times 4)) = _____</td>
</tr>
<tr>
<td>((6 \times 5) + 75 = _____)</td>
<td>((8 \times 4) + 125 = _____)</td>
</tr>
<tr>
<td>(215 + (7 \times 6) = _____)</td>
<td>(512 + (3 \times 7) = _____</td>
</tr>
<tr>
<td>((7 \times 6) + 215 = _____)</td>
<td>((3 \times 7) + 512 = _____</td>
</tr>
</tbody>
</table>

Check your answers with pencil and paper. Circle the problems you did correctly with the calculator. Why are some incorrect? Can you find a way to do these on the calculator?

| 9 + (3 \times 5) | 25 + (7 \times 6) | 145 + (8 \times 7) |

Instructor G. Immerzeel
HIT THE TARGET

START
PRESS 23, +

WHAT IS TARGET?
60 70

TRY AGAIN

PRESS CLEAR

CHOOSE SECOND NUMBER
40, =

ON TARGET?

YES

NOW TRY THESE

PRESS 50, +, TARGET 80 90

PRESS 33, +, TARGET 60 70

PRESS 95, +, TARGET 120 130

PRESS 178, +, TARGET 205 210

PRESS 347, +, TARGET 540 550

PRESS 47, +, TARGET 810 820
Try This Game

1. Take turns:

2. Pick two numbers from the sign.

3. Add the numbers.

4. Cover the answer on the game board with your marker (slips of paper marked X or O work well).

5. First player to get four markers in a straight line wins.

Game Board

<p>| | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>95</td>
<td>636</td>
<td>88</td>
<td>145</td>
<td>672</td>
<td>654</td>
</tr>
<tr>
<td>52</td>
<td>170</td>
<td>895</td>
<td>291</td>
<td>529</td>
<td>181</td>
</tr>
<tr>
<td>981</td>
<td>554</td>
<td>273</td>
<td>309</td>
<td>888</td>
<td>298</td>
</tr>
<tr>
<td>135</td>
<td>565</td>
<td>547</td>
<td>1109</td>
<td>870</td>
<td>59</td>
</tr>
<tr>
<td>77</td>
<td>640</td>
<td>906</td>
<td>661</td>
<td>747</td>
<td>1472</td>
</tr>
<tr>
<td>384</td>
<td>1131</td>
<td>70</td>
<td>875</td>
<td>163</td>
<td>768</td>
</tr>
</tbody>
</table>
ROUNDING DECIMAL FRACTIONS

Round each decimal to the place given and push \( \Box \). Check with the check number.

### Round to hundredths  \( \Box \)  \( \Box \)

<table>
<thead>
<tr>
<th>Decimal</th>
<th>Hundredth</th>
<th>Check Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.613</td>
<td>0.625</td>
<td>1.92</td>
</tr>
<tr>
<td>0.748</td>
<td>0.750</td>
<td></td>
</tr>
<tr>
<td>0.063</td>
<td>0.060</td>
<td></td>
</tr>
<tr>
<td>0.197</td>
<td>0.190</td>
<td></td>
</tr>
<tr>
<td>0.296</td>
<td>0.300</td>
<td></td>
</tr>
</tbody>
</table>

### Round to thousandths  \( \Box \)  \( \Box \)  \( \Box \)

<table>
<thead>
<tr>
<th>Decimal</th>
<th>Thousandth</th>
<th>Check Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.333333</td>
<td>0.333</td>
<td>2.778</td>
</tr>
<tr>
<td>0.666666</td>
<td>0.667</td>
<td>5.400</td>
</tr>
<tr>
<td>0.166666</td>
<td>0.167</td>
<td></td>
</tr>
<tr>
<td>0.833333</td>
<td>0.833</td>
<td></td>
</tr>
<tr>
<td>0.777777</td>
<td>0.778</td>
<td></td>
</tr>
</tbody>
</table>

### Check Numbers

- 1.92
- 37.10
- 34.40
- 2.666666
- 5.400
- 32.137

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GETTING THE RIGHT ANSWER

CLASS

GAME

DIRECTIONS

1. THE TEACHER WRITES TWO OF THE NUMBERS FROM THE SIGN ON THE CHALKBOARD AND DECIDES TO +, -, x, OR ÷.

2. EACH PLAYER ESTIMATES THE ANSWER

3. THE TEACHER FINDS ANSWER ON THE CALCULATOR AND DECIDES ON AN INTERVAL FOR 2 POINTS AND AN INTERVAL FOR 1 POINT.

EXAMPLE: 212 + 682 = 694

2 POINT INTERVAL

791

899

1 POINT INTERVAL

750

950

4. PLAYERS KEEP TRACK OF THEIR OWN SCORE.
ESTIMATING AREAS OF RECTANGLES

1. The rectangle on the left is 5 cm long and 3 cm wide. Its area is \( \text{____cm}^2 \).

2. Fill in the fourth side of the rectangle on the right so that it has the same area. Make your best estimate.

3. Measure the sides of this rectangle.
   
   LENGTH = ____ cm    WIDTH = ____ cm    AREA = ____ cm\(^2\)

4. If the area of your rectangle in #3 is not within 1 cm\(^2\) of the rectangle on the left, erase the side you drew and try again.
Beat the Calculator

Take turns playing. The player with the calculator says a basic fact. The other player writes down the answer under 😊. If the answer is wrong or you get the answer on the calculator first, the other player writes the correct answer under 😞.

<table>
<thead>
<tr>
<th>Game 1</th>
<th>Game 2</th>
<th>Game 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>😊 😞</td>
<td>😊 😞</td>
<td>😊 😞</td>
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</tbody>
</table>

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**I NEED A JOB LIKE THAT!**

Mr. Pennypusher, I have a 20-day job for you to do, but I cannot pay you very much.

That's ok, Mr. Pushover. How about paying me 1 penny the first day, 2 pennies the second day, 4 pennies the third day, 8 pennies the fourth day, and so on for the 20 days?

Sounds like a good deal to me.

Yes, it is a good deal.

For me! Ha! Ha!

---

**Calculator Activity**

Fill in this chart of earnings for Mr. Pennypusher. Use a calculator to get each day's wages and the total earnings for all 20 days.

<table>
<thead>
<tr>
<th>DAY</th>
<th>EARNINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$</td>
</tr>
<tr>
<td>2</td>
<td>$</td>
</tr>
<tr>
<td>3</td>
<td>$</td>
</tr>
<tr>
<td>4</td>
<td>$</td>
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<td>5</td>
<td>$</td>
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<td>6</td>
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<td>17</td>
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<tr>
<td>18</td>
<td>$</td>
</tr>
<tr>
<td>19</td>
<td>$</td>
</tr>
<tr>
<td>20</td>
<td>$</td>
</tr>
<tr>
<td><strong>TOTAL FOR 20 DAYS</strong></td>
<td><strong>$</strong></td>
</tr>
</tbody>
</table>

---

**Mathematics Resource Project**

(a) What is the average amount Mr. Pennypusher made per day? (Divide the total earnings by 20.)

(b) If he worked 8 hours per day, what is the average amount he made per hour?

(c) How much did Mr. Pennypusher average per minute?

(d) If you were paid as much as Mr. Pennypusher averaged per minute, how much would you make for the time you are in your mathematics class per day? per week? per school year?
CROSSNUMBER PUZZLE 1

Across:
1) 2584 11) 1602 18) 54821 − 40061 =
   + 4499  − 1568 20) 25 + 39 + 76 + 67 =
   12) 89 21) 217
3) 9806 13) 8246 24) 874 − 726 =
   − 3147  − 8047  + 55
   + 75 29) 945
7) 5892 27) 58591
   − 5320  + 289  + 846
   + 190 677
10) 1002 15) 12608 30) 373 + 629 + 288 =
    − 985 876
    + 24119

Down:
2) 12589 4) 114 5) 227 + 364 + 243 =
   14463 203 8) 2754 − 2105 =
   + 5662 199
   + 159
3) 91567
   − 26276
Calculator Activities for the Classroom

Down:

9) 36  17) 3946  22) 1776 - 972 =
48  9895  23) 17 + 24 + 19 + 28 =
29  3446  25) 1393 - 763 =
37
+ 23  19) 88,035  26) 518 - 426 =

16) 141
108
112
176
+ 68

972 =
17 + 24 + 19 + 28 =
1393 - 763 =
518 - 426 =
8 + 17 + 14 =

- 42604
1. You had $10.00. You bought a record. What is your change?

2. You have $5.00. Name three things you can buy.

3. You have $10.00. Name pairs of things you can buy.

4. You have $5.00. You need to save $1.50. What is the most you can buy?
HOW OLD ARE YOU?

TAKE YOUR AGE AT YOUR LAST BIRTHDAY (IN YEARS) AND FIGURE ON THE CALCULATOR THE FOLLOWING INFORMATION.

1. THE NUMBER OF DAYS YOU'VE BEEN ALIVE

2. THE NUMBER OF HOURS YOU'VE BEEN ALIVE

3. THE NUMBER OF MINUTES YOU'VE BEEN ALIVE

4. THE NUMBER OF SECONDS YOU'VE BEEN ALIVE
   IF YOU WERE 2 YEARS OLD WOULD THE ANSWER SHOW ON THE DISPLAY
   HOW ABOUT 3 YEARS OLD? 4 YEARS OLD?

5. IF YOU WERE 13 YEARS OLD AT YOUR LAST BIRTHDAY HOW MANY HOURS WOULD YOU HAVE LIVED?

6. IF YOU LIVE TO BE EXACTLY 90 YEARS OLD, HOW MANY DAYS WILL YOU HAVE LIVED?

7. IF A DOG LIVES TO BE 16 YEARS OLD BY OUR CALENDAR AND EACH OF OUR YEARS IS EQUAL TO 7 DOG YEARS HOW MANY DOG YEARS WOULD THE DOG HAVE LIVED?
A one dollar bill is approximately 15.5 cm long. About how far will 10,000,000 one dollar bills reach if laid end to end?

How many dollar bills would you need to stretch from:

- Canada to Mexico?
- Pacific to Atlantic?
- Miami to Washington?

How many dollar bills would you need to:

- Stretch the length of your school?
- Stretch the height of the tallest building in your city?
- Stretch across your state?
- Go to the moon?
- Go to the sun?
- Go around the world?
1. Muscles make up about .4 of a person's body weight. About how much do your muscles weigh?

2. Your intestines (large & small) are about 7.5 m (25 ft.) long. How does this compare with your height?

3. Your body contains 206 bones. Approximately .14 of your bones are in your head. About how many bones are in your head?

4. A person's brain is .02 of his body weight. How much does your brain weigh?

5. Your heart beats about 80 times a minute. How many times does it beat in a day?

6. The human body is about .6 water. How many pounds (kg) of water are there in you?

7. The largest gland in your body is the liver. In a 160 lb (72.5 kg) person the liver is about .03 of the body weight. How much does it weigh?

8. Human bones make up about .18 of a person's total body weight. How much do your bones weigh?

9. The eye blinks about 25 times each minute. Approximately how many times does it blink in a day?

10. The body of an adult contains approximately 5 quarts (4.75 litres) of blood. A blood donor usually gives 1 pint (.475 litres). What fraction of his blood does a donor give?
COMPARATIVE PRICING

Which is the Best Buy?

Circle your choice.

**Find the cost per unit**

\[ \text{Price} \div \text{Units} = \text{Cost per Unit} \]

**Detergent**

- 32 oz. $0.89
- 16 oz. $0.49

**Frozen Juice**

- 12 oz. 39 cents
- 8 oz. 25 cents

**Peanut Butter**

- 18 oz. 79 cents
- 30 oz. $1.49

**Tuna**

- 6 oz. 49 cents
- 8 oz. 69 cents

**Dog Food**

- 5 pounds 89 cents
- 25 pounds $4.25

**Beans**

- 28 oz. 83 cents
- 9 oz. $0.39

A fun activity is for the students to get some real prices from grocery stores and find the best buys.
SOLVING EQUATIONS

SOLVE EACH EQUATION GUESS AND CHECK

1. $15 + \square = 29$
2. $\square + 43 = 126$

3. $25 - \square = 16$
4. $54 - \square = 31$

5. $\square - 15 = 35$
6. $\square - 28 = 14$

7. $29 + \square = 40$
8. $\square + 80 = 100$

9. $30 - \square = 15$
10. $100 - \square = 10$

11. $\square - 40 = 40$
12. $\square - 70 = 70$

13. $60 + \square = 60$
14. $60 - \square = 60$

35
### FINDING PATTERNS

#### FIND THE MISSING NUMBERS

<p>| | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>8</td>
<td>11</td>
<td>___</td>
<td>17</td>
<td>23</td>
</tr>
<tr>
<td>9</td>
<td>14</td>
<td>19</td>
<td>___</td>
<td>29</td>
<td>___</td>
</tr>
<tr>
<td>34</td>
<td>40</td>
<td>46</td>
<td>___</td>
<td>58</td>
<td>70</td>
</tr>
<tr>
<td>12</td>
<td>24</td>
<td>36</td>
<td>___</td>
<td>___</td>
<td>72</td>
</tr>
<tr>
<td>50</td>
<td>75</td>
<td>___</td>
<td>125</td>
<td>___</td>
<td>175</td>
</tr>
<tr>
<td>11</td>
<td>49</td>
<td>___</td>
<td>___</td>
<td>163</td>
<td>___</td>
</tr>
<tr>
<td>10</td>
<td>___</td>
<td>___</td>
<td>50</td>
<td>60</td>
<td>___</td>
</tr>
<tr>
<td>127</td>
<td>130</td>
<td>133</td>
<td>___</td>
<td>139</td>
<td>___</td>
</tr>
<tr>
<td>36</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
In this game the player may choose from 1, 2, 3, 4, 5, 6, 7, 8, or 9.

Player No. 1 presses 3, +

Player No. 2 presses 4, +

Player No. 1 presses 8, +

Player No. 2's turn

The player to get 30 wins take turns being the player to start.
Here's an exciting way to play this popular numbers game. For those who don’t know how to play NIM, you take turns to add numbers five or less to a running total. The player who reaches the total of 25 wins the game.

Technically, NIM is a “trivial” game in which the first player always wins if he makes the right moves. This is just the game for you to beat the champ.

**NUMBER OF PLAYERS:** Two.

**APPROXIMATE TIME REQUIREMENT:** Three to five minutes.

**SKILLS INVOLVED:** Simple addition. Ability to induce a formula for consistently winning the game.

**CHANCE FACTOR:** No chance is involved if you know the system.

**PLAY OF THE GAME:**

1. The first player enters 1, 2, 3, 4, or 5 in the calculator.

   *Toby is the first player. She enters a one and presses the plus key.*

2. Players take turns adding any number from 1 to 5 to the number on display.

   *Stan adds a three to the one and gets a total of four. From this point on, the game proceeds as follows:*

<table>
<thead>
<tr>
<th>PLAYER’S MOVE</th>
<th>NEW TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toby adds 3.</td>
<td>7</td>
</tr>
<tr>
<td>Stan punches in 2 more.</td>
<td>9</td>
</tr>
<tr>
<td>Nonchalantly, Toby adds 4.</td>
<td>13</td>
</tr>
<tr>
<td>Stan meditates briefly, then adds 5.</td>
<td>18</td>
</tr>
<tr>
<td>Toby senses victory... and carefully adds 1.</td>
<td>19</td>
</tr>
</tbody>
</table>

3. The game ends whenever the total reaches 25. The player who arrives at this total is the winner.

   *At this stage of the game, Stan is stuck. He cannot make the 19 become a 25 because he may not add a number greater than five. Whatever other number he adds, Toby can come up with the clincher. For example, if he adds one, she adds five; if he adds two, she adds four, and so on.*

4. The second player in the previous game begins the next game.

   *Stan enters the first number to begin the next game. He chose the number five. Here’s how the game goes:*

<table>
<thead>
<tr>
<th>STAN</th>
<th>TOBY</th>
<th>NEW TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
<td>12</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>13</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>16</td>
</tr>
</tbody>
</table>

   *Stan is stuck again. Obviously reaching the number 19 is a part of the system!*
VARIATIONS:
You can change both the total number to be reached and the limit for the numbers added during each turn. For example, you can try to reach a total of 365 using any number less than 30.

WINNING STRATEGY:
If you play the game repeatedly, you will probably figure out how to win it every time. In case you are in a hurry to show off to your friends, here's the system:

1. If you are the first player, begin with the number one.
2. Subtract whatever number your opponent adds from six. When it is your turn to add, use this difference. (If your opponent adds a 1, you add 5 [i.e., 6-1]. If your opponent adds a 2, you add 4 [i.e., 6-2]. And so on . . .)
3. If your opponent begins the game, watch out for these intermediate totals: 7, 13 and 19. Try to arrive at them during any convenient round in the game. From then on, you can win the game by using the second strategy move above.

For more advanced players here's the formula for winning NIM with any other target total and added restrictions:

(1) If N is the target total and n is the number you may not exceed during each addition, then find N/(n + 1). Disregard the quotient; the remainder you get is the number to begin the game with. For example, if you are trying to reach 73 by adding any number from 1 to 9, then N = 73 and n = 9.

\[
\frac{N}{n+1} = \frac{73}{10}
\]

\[
\frac{10}{73} = \frac{70}{}\quad \text{remainder}
\]

You should begin this game with 3.

(2) Subtract the number your opponent adds from (n + 1). The difference you get is the number you should add. If your opponent adds 3, you should add 7 (i.e., 10 - 3). If your opponent adds 6, you add 4.

(3) If you subtract multiples of (n + 1) from N, you get the intermediate totals to shoot for if your opponent begins the game. For N = 73 and n = 9, the intermediate totals you should shoot for are 63, 53, 43, 33, 23, 13 and 3. Once you reach any of these numbers, you can win! Simply apply the second strategy listed above.

MORE VARIATIONS:
1. Play NIM so that the first person to reach or exceed the target number loses.

2. Many NIM type games can be invented by using different rules for choosing the number a player may add during his move. Suppose the first player to reach or exceed a target number N wins (or loses – take your pick). Here are several ways to restrict a single-digit number a player can add during his turn. Pick one and play!
THE BIG ZERO

RULES

1. For two players or a small group. Find the secret number.

2. One player presses a secret number, -, =, =, and passes the calculator to the other player.

3. The other player may enter a number followed by =, trying to get 0 to show on the display.

4. The number pressed to get 0 is the secret number.

5. Can you find other player's secret number?
Example: For each pair of words below place an X on the blank that best tells how you feel about—

**SNOW**

like _____ _____ _____ _____ _____ hate
cold _____ _____ _____ _____ _____ hot
work _____ _____ _____ _____ _____ play

Directions: For each pair of words below place an X on the blank that best tells how you feel about—

**MATH**

bad _____ _____ _____ _____ _____ good
sad _____ _____ _____ _____ _____ happy
boring _____ _____ _____ _____ _____ exciting
jump in _____ _____ _____ _____ _____ hold back
hard _____ _____ _____ _____ _____ easy
more _____ _____ _____ _____ _____ less
Example: For each pair of words below place an X on the blank that best tells how you feel about--

SNOW

like _____ _____ _____ _____ _____ hate
cold _____ _____ _____ _____ hot
work _____ _____ _____ _____ play

Directions: For each pair of words below place an X on the blank that best tells how you feel about--

CALCULATORS

bad _____ _____ _____ _____ _____ good
sad _____ _____ _____ _____ _____ happy
boring _____ _____ _____ _____ _____ exciting
jump in _____ _____ _____ _____ _____ hold back
hard _____ _____ _____ _____ _____ easy
more _____ _____ _____ _____ _____ less
Directions: Read each question and fill in the space below your answer.

1. Is there at least one calculator in your home?

   YES  NO

   [ ]  [ ]

2. Are you allowed to use a calculator at home?

   YES  NO

   [ ]  [ ]

3. Do you think you would do better in math if you used a calculator?

   YES  NO  DON'T KNOW

   [ ]  [ ]  [ ]

4. Do you have a calculator of your own?

   YES  NO

   [ ]  [ ]