

EASY INSTRUCTIONS
FOR OPERATING THE

CONTROLLED-KEY

COMPTOMETER

REG. U. S. PAT. OFF.

COMPTOMETER DIVISION

FELT AND TARRANT MFG. CO.

1735 NORTH PAULINA ST.

CHICAGO 22, ILLINOIS

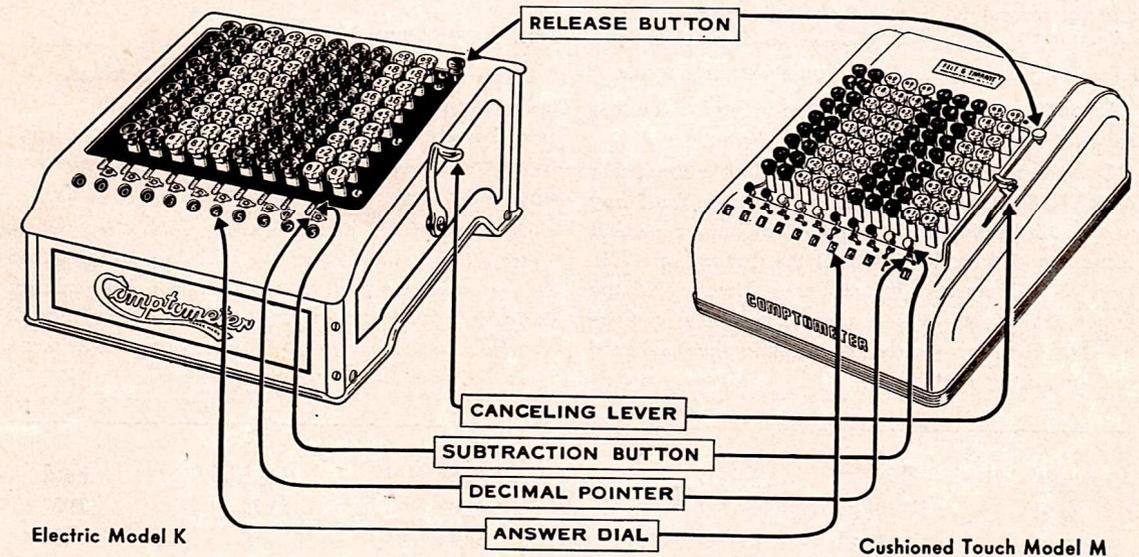
DECIMAL EQUIVALENTS OF COMMON FRACTIONS

| 4THS | | 6THS | | 8THS | | 12THS | | 16THS | |
|-------|-------|------|-------|------|-------|-------|--------|-------|--------|
| 1 | .25 | 1 | .1667 | 1 | .125 | 1 | .0833 | 1 | .0625 |
| 2 | .5 | 2 | .3333 | 2 | .25 | 2 | .1667 | 2 | .125 |
| 3 | .75 | 3 | .5 | 3 | .375 | 3 | .25 | 3 | .1875 |
| | | 4 | .6667 | 4 | .5 | 4 | .3333 | 4 | .25 |
| | | 5 | .8333 | 5 | .625 | 5 | .4167 | 5 | .3125 |
| | | 6 | | 6 | .75 | 6 | .5 | 6 | .375 |
| | | | | 7 | .875 | 7 | .5833 | 7 | .4375 |
| | | | | 8 | .6667 | 8 | .5 | 8 | .5 |
| | | | | 9 | .75 | 9 | .5625 | 9 | .5625 |
| | | | | 10 | .8333 | 10 | .625 | 10 | .625 |
| | | | | 11 | .9167 | 11 | .6875 | 11 | .6875 |
| | | | | | | 12 | .75 | 12 | .75 |
| | | | | | | | | 13 | .8125 |
| | | | | | | | | 14 | .875 |
| | | | | | | | | 15 | .9375 |
| 64THS | | | | | | | | | |
| 1 | .0156 | 22 | .3438 | 43 | .6719 | | | | |
| 2 | .0313 | 23 | .3594 | 44 | .6875 | | | | |
| 3 | .0469 | 24 | .375 | 45 | .7031 | | | | |
| 4 | .0625 | 25 | .3906 | 46 | .7188 | | | | |
| 5 | .0781 | 26 | .4063 | 47 | .7344 | | | | |
| 6 | .0938 | 27 | .4219 | 48 | .75 | | | | |
| 32NDS | | | | | | | | | |
| 7 | .1094 | 28 | .4375 | 49 | .7656 | 1 | .03125 | 17 | .53125 |
| 8 | .125 | 29 | .4531 | 50 | .7813 | 2 | .0625 | 18 | .5625 |
| 9 | .1406 | 30 | .4688 | 51 | .7969 | 3 | .09375 | 19 | .59375 |
| 10 | .1563 | 31 | .4844 | 52 | .8125 | 4 | .125 | 20 | .625 |
| 11 | .1719 | 32 | .5 | 53 | .8281 | 5 | .15625 | 21 | .65625 |
| 12 | .1875 | 33 | .5156 | 54 | .8438 | 6 | .1875 | 22 | .6875 |
| 13 | .2031 | 34 | .5313 | 55 | .8594 | 7 | .21875 | 23 | .71875 |
| 14 | .2188 | 35 | .5469 | 56 | .875 | 8 | .25 | 24 | .75 |
| 15 | .2344 | 36 | .5625 | 57 | .8906 | 9 | .28125 | 25 | .78125 |
| 16 | .25 | 37 | .5781 | 58 | .9063 | 10 | .3125 | 26 | .8125 |
| 17 | .2656 | 38 | .5938 | 59 | .9219 | 11 | .34375 | 27 | .84375 |
| 18 | .2813 | 39 | .6094 | 60 | .9375 | 12 | .375 | 28 | .875 |
| 19 | .2969 | 40 | .625 | 61 | .9531 | 13 | .40625 | 29 | .90625 |
| 20 | .3125 | 41 | .6406 | 62 | .9688 | 14 | .4375 | 30 | .9375 |
| 21 | .3281 | 42 | .6563 | 63 | .9844 | 15 | .46875 | 31 | .96875 |
| | | | | | | 16 | .5 | | |

INTRODUCTION

THE COMPTOMETER is a key-driven adding and calculating machine which performs quickly and easily all forms of arithmetical figuring involving addition, multiplication, division, and subtraction.

each key top is a large and small figure. The large figures are used for addition and multiplication; the small figures for division and subtraction. The answer dials show the result of the calculation. The lever at the right, called the canceling lever, clears



Method of operation is the same for Models J, K, and M.

Operation is exceedingly simple—no operating lever to pull, no crank to turn, no preliminary setting of dials. Nothing to do but press the keys and read the answer—the machine does the rest.

The keyboard is arranged in eight or more columns* of nine keys each, which are grouped in alternating sections, colored green and white. On

the answer dials. The pointers above the answer dials are used to point off decimals. The cut-offs or buttons at the left of each column are used for subtraction. The red release key at the upper right-hand corner unlocks the keyboard after an incomplete key stroke error has been corrected. See page 5 for proper use of controlled-key.

*The Comptometer is manufactured in three standard sizes: 8, 10, and 12-columns. A 20-column Comptometer is also manufactured for use in heavy statistical and distribution work.

ADDITION

General Instructions

THE two columns of white keys on the right side of the keyboard are for adding units and tens of cents. The next three columns of green keys are for adding units, tens, and hundreds of dollars. The adjoining three columns of white keys are for adding thousands, tens of thousands, and hundreds of thousands, amounts. Keys farther to the left are for adding correspondingly higher denominations.

In addition always use the large figures on the keys.

Only one key should be operated at a time. For example, in adding \$3.45, first press down the 3 key in the third column, then the 4 key in the second column and then the 5 key in the first column. No keys are depressed for ciphers. Always lift the finger slightly off the key after each stroke. For the first few days go slowly, memorizing the keyboard and acquiring rhythm.

Remember to place the finger on the key desired and press it down until you feel it strike bottom. This push-stroke requires practice. It differs distinctly from the sharp staccato blow of the typewriter. It is the easiest known stroke on the finger. It eliminates the impact of striking the key.

Full Keyboard Method

Below are six columns of figures to be added. Use only the index and second finger. The index finger is to be used for all figures except the right-hand figure which should be added with the second finger.

Use the full keyboard, adding each item across from left to right. If you find the keyboard locked it is a positive signal of misoperation. The rule for correcting operating errors is explained on page 5. For the first few days go slowly. Speed will come later. Depress only one key at a time.

| <u>No. 1</u> | <u>No. 2</u> | <u>No. 3</u> | <u>No. 4</u> | <u>No. 5</u> | <u>No. 6</u> |
|--------------|--------------|--------------|--------------|--------------|--------------|
| 41.79 | 91.59 | 79.27 | 42.67 | 21.25 | 96.57 |
| 18.57 | 78.25 | 65.76 | 58.14 | 15.96 | 5.82 |
| 21.45 | 451.35 | 413.45 | 87.00 | 43.21 | 68.42 |
| 4.67 | 6.47 | 135.00 | 45.50 | 87.65 | 102.19 |
| 432.35 | 5.60 | 223.57 | 235.00 | 1.92 | 79.18 |
| 14.46 | 12.35 | 86.40 | 57.68 | 218.19 | 517.29 |
| 5.38 | 38.00 | 240.00 | 68.77 | 93.15 | 61.48 |
| 432.25 | 913.50 | 33.46 | 433.24 | 37.92 | 43.27 |
| 165.70 | 42.34 | 5.67 | 700.00 | 479.99 | 197.52 |
| 540.62 | 78.16 | 41.71 | 307.20 | 45.55 | 37.25 |

Add each column and write the total obtained. Then prove at once by re-adding the column. For practice add each column at least four times. If

an error is made it is usually the result of trying to go too fast.

TOUCH METHOD

TOUCH method of addition provides the greatest degree of speed and accuracy and is simple and easy to learn. Touch method is highly recommended, because it eliminates time spent in looking from the work to the keyboard. Only the lower half of the keyboard is used in touch addition; all keys are within easy reach of the fingers.

To add 6, strike 3 twice

To add 7, strike 3 and 4

To add 8, strike 4 twice

To add 9, strike 4 and 5

Upon examining the keys it will be noticed that the odd-numbered keys: 1, 3, 5, etc., are concave. The even keys: 2, 4, etc., are flat-topped. This is to facilitate touch operation.

With this in mind add the following examples.

Begin at the top of each column and add down. Use the first finger for adding in the tens column only and the second finger for adding the units column only. Keep each finger on its own column. Find the keys by sense of touch, as much as possible.

In adding it is necessary to acquire a smooth rhythmic stroke. Hold a pencil between the thumb and palm of the operating hand. This helps to balance the hand and the pencil is always in readiness for writing down answers.

A Comptometer improperly placed is detrimental to speed and ease of operation. It should be placed at right angles or slightly to the right of the operator with the left edge in a direct line with the center of the body. The desk and the seat of the chair should be of a height to permit the feet to touch the floor and the fingers to rest comfortably on the keys.

| <u>No. 1</u> | <u>No. 2</u> | <u>No. 3</u> | <u>No. 4</u> | <u>No. 5</u> | <u>No. 6</u> | <u>No. 7</u> |
|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| 22 | 33 | 43 | 23 | 67 | 84 | 25 |
| 23 | 34 | 33 | 36 | 43 | 47 | 92 |
| 33 | 43 | 12 | 43 | 77 | 63 | 14 |
| 34 | 32 | 54 | 48 | 65 | 84 | 52 |
| 44 | 31 | 23 | 35 | 95 | 93 | 71 |
| 45 | 35 | 32 | 49 | 48 | 32 | 42 |
| 55 | 53 | 24 | 43 | 64 | 26 | 35 |
| 54 | 25 | 25 | 36 | 23 | 82 | 92 |
| 43 | 24 | 35 | 42 | 72 | 48 | 25 |
| 353 | 310 | 281 | 355 | 554 | 559 | 448 |

Add each column and compare the total obtained with that shown at foot of column. For practice add

each column at least four times. Practice for a full rhythmic stroke. Speed will come with practice.

TOUCH METHOD

Adding Whole Numbers and Dollars and Cents

TO ADD the following three and four-figure items use the index finger for all figures except the extreme right-hand figure. The second finger is used only in adding the extreme right-hand figure. With eyes on the work—no glancing back and

forth from keyboard to work sheet—it is apparent that the danger of misreading figures is greatly reduced. The superior adaptability of the Comptometer to touch operation gives it a positive advantage in speed-with-accuracy.

| No. 1 | No. 2 | No. 3 | No. 4 | No. 5 | No. 6 | No. 7 |
|-------|-------|-------|-------|-------|-------|--------|
| 212 | 367 | 378 | 24.36 | 54.56 | 33.45 | 70.00 |
| 364 | 238 | 265 | 42.67 | 43.21 | 65.34 | 543.21 |
| 543 | 762 | 532 | 43.24 | 32.61 | 77.21 | 29.00 |
| 267 | 926 | 461 | 62.42 | 11.33 | 43.12 | 98.23 |
| 845 | 545 | 637 | 17.56 | 32.24 | 63.33 | 378.80 |
| 963 | 823 | 572 | 24.36 | 82.27 | 63.44 | 345.45 |
| 787 | 415 | 726 | 21.11 | 72.56 | 14.55 | 896.87 |
| 312 | 564 | 847 | 32.35 | 23.24 | 54.33 | 454.22 |
| 357 | 382 | 623 | 46.54 | 72.27 | 25.98 | 30.00 |
| 386 | 637 | 549 | 22.66 | 44.45 | 65.67 | 27.42 |

Add each column and write the total obtained. Then prove at once by re-adding the column. For practice add each column four times in order to fix firmly in mind the combinations used.

"Split" Method of Addition

In adding long columns it is often an advantage to split the items, adding first the cents and then the dollars. Add columns number 4, 5, 6 and 7 using this method. First add cents only, adding the tens with the first finger and the units with the second finger, leaving the total of cents in the answer dials.

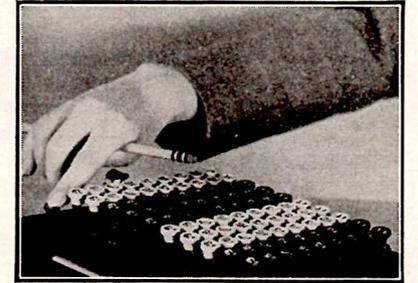
Then add the dollars, using the first finger for the tens and the second finger for the units. Correct selection of keys is made entirely by sense of touch. In adding column number 7 use the first finger for both hundreds and tens of dollars.

Add each column and write the total obtained. Then prove at once by re-adding the column. For practice add each column at least four times in order to fix firmly in mind the combinations used.

As previously mentioned under General Addition Instructions, a locked keyboard is a positive signal of misoperation. The rule for correcting misoperation is found on page 5.

CONTROLLED-KEY

THE "Controlled-Key" is a positive system of automatic control which prevents operating errors caused by fumbled or incomplete key strokes. The "Controlled-Key" mechanism gives instant signal of an operating error, by locking all columns except the column in which the incomplete key stroke was made—and this is left open for correction. With positive protection against operating errors, the operator can speed up safely and be assured of a higher degree of first time accuracy.



After correcting the incomplete key stroke, touch the red release key and continue adding.

How to Correct an Incomplete Key Stroke

There is no guesswork required in using **Controlled-Key**, neither is there a complicated formula to follow.

In adding, when a locked keyboard signals an operating error, the use of **Controlled-Key** is as simple as going back to the last key operated. If this key is left open for correction, complete the stroke, touch the red release button and continue adding, starting on the key that locked and signaled the error as shown in the example.

Example:

In adding this short column, intentionally press the 5 cent key part way down. On attempting to strike the 2-key, you find it locked. Go back and depress again the last key operated (5), touch the red release button and the correction is made. Continue adding on the key that locked and signaled the error, 2.

In adding, when a locked keyboard signals an operating error and the last key operated is found locked, touch the red release button, add in the previous key in same column, and continue adding

with the key that locked and signaled the error as shown in the example.

Example:

In adding this column, intentionally press the 30-key part way down. Then give the 40-key a regular stroke. On attempting to strike the 5-key, you find it locked. To correct, go back to the last key depressed (40), and you will find it locked. Touch the red release button and add in the previous key (30). This completes the correction. Continue adding, beginning on the key that locked and signaled the error, 5.

.45
.23
.34
.12
—
1.14

In Multiplication and Division

When the key locks, the positive danger signal prevents an error slipping into an answer without the knowledge of the operator.

Owing to the speed of the Comptometer, it is simpler, and faster to cancel and go over the problem than to stop and make the correction.

MULTIPLICATION

Example: Multiply 1364 x 57

PLACE the first finger of the left hand on the 50 key and the first finger of the right hand on the 7 key. Strike the 57 in this position as many times as the right-hand figure (4) of the multiplicand indicates. Move both fingers one column to the left and strike as many times as indicated by the second figure (6) of the multiplicand. Continue to move to the left, striking in each column the multiplier as many times as indicated by the successive figures (3—1) of the multiplicand.

In beginning multiplication confine yourself to the use of the first finger of the right hand and the first finger of the left hand.

After the fingers have been positioned on the keys representing the multiplier, strike slowly, giving each key a full push-stroke, until you feel it strike bottom. Raise the fingers slightly above the keys after each stroke. Speed will develop quickly.

After placing the fingers on the proper keys, look at the example, rather than the keyboard, so that the figures will not be misread.

In each of the following examples use the first finger of the left hand for the tens figure of the multiplier and the first finger of the right hand for the unit figure:

| | | | | |
|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|
| <u>No. 1</u> 24.531 35 | <u>No. 2</u> 12.456 68 | <u>No. 3</u> 5.315 64 | <u>No. 4</u> 23.456 75 | <u>No. 5</u> 84.143 79 |
| <u>No. 6</u> 35.642 45 | <u>No. 7</u> 15.341 88 | <u>No. 8</u> 45.673 28 | <u>No. 9</u> 36.341 23 | <u>No. 10</u> 14.683 47 |
| <u>No. 11</u> 89.986 37 | <u>No. 12</u> 15.366 15 | <u>No. 13</u> 65.418 31 | <u>No. 14</u> 94.345 63 | <u>No. 15</u> 14.312 86 |
| <u>No. 16</u> 26.433 19 | <u>No. 17</u> 46.541 91 | <u>No. 18</u> 63.222 83 | <u>No. 19</u> 46.812 61 | <u>No. 20</u> 46.533 11 |

Example: Multiply 314 x 45

Place the first and second fingers of the right hand on the keys in the right-hand columns representing the multiplier (45), and strike as many times as indicated by the right-hand figure (4) of the multiplicand; move the fingers one column to the left and strike as many times as the second figure (1) of the multiplicand indicates. Continue to move to the left, striking as many times as the succeeding figure (3) of the multiplicand indicates.

The first and second fingers of both hands are more commonly used than any of the other fingers. A safe rule to follow is to use the longest finger for the highest number.

Multiply each of the following problems, using the fingers as shown by the abbreviations in front of, and following the multiplier. 1L and 2L indicate first and second fingers of the left hand. 1R and 2R indicate first and second fingers of the right hand.

Raise the fingers slightly above the keys after each stroke.

| | | | | |
|---------------------------------|--------------------------------------|---------------------------------|---------------------------------------|---------------------------------------|
| <u>No. 1</u> 43 1R 34 2R | <u>No. 2</u> 13 2R 42 1R | <u>No. 3</u> 47 1L 62 1R | <u>No. 4</u> 83 1L 37 1R | <u>No. 5</u> 276 1L 345 1 & 2R |
| <u>No. 6</u> 19 2R 54 1R | <u>No. 7</u> 342 1L 153 2 & 1R | <u>No. 8</u> 43 1L 39 1R | <u>No. 9</u> 43 1L 13 1R | <u>No. 10</u> 56 89 1 & 2R |
| <u>No. 11</u> 75 1R 46 2R | <u>No. 12</u> 83 1L 87 1R | <u>No. 13</u> 28 1L 19 1R | <u>No. 14</u> 284 1L 324 1 & 2R | <u>No. 15</u> 104 1L 678 1 & 2R |

For practice purposes it may be convenient to split the multiplier when it contains four figures. Example: Multiply 12,365 x 8,379. First multiply 12,365 by 79, leaving the result in the machine. Then multiply 12,365 by 83, starting the 83 in the fourth and third columns.

NOTE: A hyphen indicates where the multiplier should be split. When multiplying with two figures, the first finger of each hand is usually used. Point off as many places from the right as there are decimals in both factors.

| | | | | |
|---|---------------------------------|--------------------------------|----------------------------------|--|
| <u>No. 16</u> 67.44 1L 735 1 & 2R | <u>No. 17</u> 245.6 65-35 | <u>No. 18</u> 5613 27-18 | <u>No. 19</u> 584.26 53-78 | <u>No. 20</u> 5362 1L 523 1 & 2R |
|---|---------------------------------|--------------------------------|----------------------------------|--|

| | | | | |
|--|--|--|--|---|
| <u>No. 21</u> 17465 <u>43-45</u> | <u>No. 22</u> 15082 1L <u>31.04</u> 1 & 2R | <u>No. 23</u> 13461 <u>19-19</u> | <u>No. 24</u> 13723 <u>73-65</u> | <u>No. 25</u> 191.47 <u>92-23</u> |
| <u>No. 26</u> 4817 <u>37-29</u> | <u>No. 27</u> .5447 1L <u>625</u> 1 & 2R | <u>No. 28</u> 6714 <u>73-68</u> | <u>No. 29</u> 3672 <u>94-45</u> | <u>No. 30</u> 574.4 <u>16-17</u> |

Large Decimal Multiplications

IN MULTIPLYING large numbers containing decimals, it is advisable to strike from the left toward the right. Hold the multiplier with its left-hand figure on the left-hand column of the machine. Strike here as many times as is shown by the left-hand figure of your multiplicand, and then move one column to the right, etc. Point off as many answer dials from the left as the sum of the whole places in the multiplicand and multiplier.

the machine and in this position strike once. Move each finger one column to the right and strike two times; one more column to the right and strike three times—then four times, then five times. The result as it stands in the answer dials is 053774820. (An eight column Comptometer was used in figuring this problem.) There are two whole places in 12.345 and one in 4.356, making together three answer dials to point off from the left of the machine, and the answer is 53.77482.

NOTE: Hyphen in multiplier indicates where it may be split.

Example: Multiply 12.345 x 4.356

Hold 4356 with the 4 on the left-hand column of

Examples:

| | | | |
|--|--|--|---|
| <u>No. 1</u> 346.21 1L <u>4.67</u> 1 & 2R | <u>No. 2</u> 14.374 2 & 1L <u>32.78</u> 1 & 2R | <u>No. 3</u> 2.2635 <u>9.4-56</u> | <u>No. 4</u> .35624 <u>91.-47</u> |
| <u>No. 5</u> 11.463 1L <u>37.8</u> 1 & 2R | <u>No. 6</u> 4627.1 1L <u>.846</u> 1 & 2R | <u>No. 7</u> 26.516 2 & 1L <u>21.68</u> 1 & 2R | <u>No. 8</u> 314.62 <u>7.3-49</u> |
| <u>No. 9</u> 243.82 2 & 1L <u>53.33</u> 1 & 2R | <u>No. 10</u> 986.4 2 & 1L <u>31.32</u> 2 & 1R | <u>No. 11</u> 328.64 <u>16.-17</u> | <u>No. 12</u> 304.69 2 & 1L <u>216.7</u> 1 & 2R |

Three-Factor Multiplication

WHEN three numbers are to be multiplied such as, 57 bolts of 12 yards each at \$1.25 per yard, proceed as follows: Multiply 57 x 12 on the right of the machine. Leave the result 684 in the answer dials. Since 684 is registered in the machine once it is necessary to multiply it only 124 times more. Therefore, hold 124 with the 4 over the

left-hand figure (6) of the 684. Strike the number of times indicated, six; move to the right one column and strike the number of times indicated, eight. Move one more column to the right and strike four times. The answer is \$855.00. In moving from left to right, the figure in the answer dial under the 4 key shows the number of times 124 should be struck.

Examples:

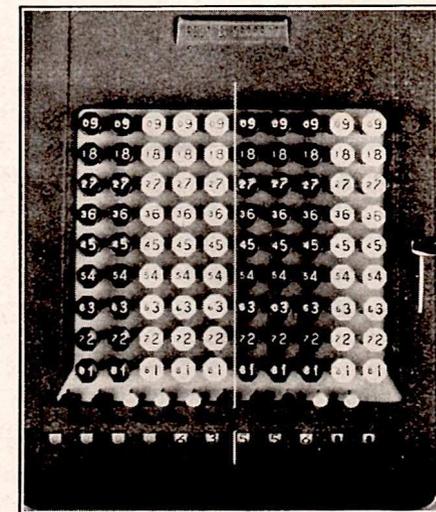
| | | | |
|----------------------------------|---------------------------------|----------------------------------|---------------------------------|
| <u>No. 1</u> 345 x 289 x .56 | <u>No. 2</u> 789 x 88 x 5.46 | <u>No. 3</u> 6452 x 344 x .66 | <u>No. 4</u> 33 x 875 x 4.58 |
| <u>No. 5</u> 645 x 4456 x .28 | <u>No. 6</u> 389 x 673 x 438 | <u>No. 7</u> 75 x 6489 x 567 | <u>No. 8</u> 372 x 44 x 8879 |

NOTE: Point off as many places from the right as the sum of the decimals in the three factors.

Permanent Decimal Point Multiplication

WHEN factors contain changing decimals it will be easier and faster for the operator to use a method of working the multiplications over a fixed or Permanent Decimal Point. Between the fifth and sixth column of keys, directly over Decimal Pointer No. 5, is the position known as the Permanent Decimal Point. See illustration.

Usually the price factor is held on the keyboard—dollars to the left of the Permanent Decimal Point, and cents to the right of the Permanent Decimal Point. With the price factor in this position strike it in as many times as the unit figure of the quantity indicates.



Permanent Decimal Point—this is located between the fifth and sixth column of keys, directly over Decimal Pointer No. 5.

Move price factor one column to the left for each additional whole number in the quantity, and one column to the right for each column of decimals in the quantity.

Example:

345 lbs. @ \$.65 per lb. **Answer \$224.25**

Hold price factor \$.65 so that the 6 key is held in the fifth column and the 5 key in the fourth column. Strike the price factor five times for the unit figure of quantity. Move price factor one column to the left and strike it four times for the TENS figure of quantity. Move price factor again one column to the left

and strike it three times for the HUNDREDS figures of the quantity—\$224.25 now appears in the answer dials correctly pointed off.

Work the following problems over the Permanent Decimal Point, following the explanation in the previous paragraph.

Examples:

- 1. 307 hrs. @ \$.45 per hr. = \$138.15
- 2. 65 doz. @ .22 per doz. = 14.30
- 3. 45 tons @ 7.75 per ton = 348.75
- 4. 15 days @ 4.50 per day = 67.50
- 5. 241 bolts @ .67 each = 161.47

Accumulative Multiplication Using Permanent Decimal

A RAPID and accurate method of checking and proving original multiplications is by accumulation. This method is very effective in proving payrolls, cost sheets, material requisitions, inventory sheets, invoices, etc.; in fact it should be used wherever it is desired to total the products of several multiplications. To obtain the best results from accumulative multiplication, it should be performed over the fixed or Permanent Decimal Point. This Permanent Decimal Point is between the fifth and sixth columns, or as previously explained, directly over Decimal Pointer No. 5.

It is easy to remember that the sixth (white) column of keys is UNITS of DOLLARS; the fifth column is TENS of CENTS and the fourth column is UNITS of CENTS.

Example:

4³/₄ (4.75) yards @ \$1.25
 16¹/₂ (16.5) yards @ .34¹/₂
 148¹/₄ (148.25) yards @ .06¹/₄
 Accumulated Product \$20.90

Hold the price \$1.25 with the 1 in the sixth (white) column, the 2 in the fifth and the 5 in the fourth column. Multiply toward the right; strike four times, seven times, and five times. The answer dials show \$5.9375. LEAVE THIS IN THE MACHINE.

Multiply the second item in a similar manner holding .345 with the 3 in the fifth, 4 in the fourth, and 5 in the third columns, respectively. As the yardage commences in the TENS COLUMN, move the price position one column to the left before commencing

the multiplication. Strike from left to right one, six, and five times, respectively, and the accumulation in answer dials now shows \$11.63. LEAVE THIS IN THE MACHINE.

For the third item hold .0625 with the 6 in the fourth column. As the yardage commences in the HUNDREDS COLUMN, move the price position two columns to the left before starting the multiplication. Strike in the keys one, four, eight, two, and five times in their respective columns. The accumulated answer of \$20.895 now appears in answer dials. If at any time fingers drop off the keyboard on THE RIGHT-HAND SIDE, continue to strike with fingers that still remain on keyboard.

By the use of this method positive proof is obtained on:

- (a) Each individual extension
- (b) Decimal point in the final result
- (c) Addition of items

Always take the **price position** on keyboard as previously explained—if the quantity has more than one whole number move the price position (before multiplying) one column to the left on the keyboard for each additional whole number in the quantity. For instance, move one column to the left for 48³/₄, two columns for 236³/₄, etc.

Example No. 1

1¹/₈ (1.125) yards @ \$.48
 12¹/₄ (12.25) yards @ .64³/₄
 67 yards @ .50
 6³/₈ (6.375) yards @ 1.23
 Accumulated Total \$49.81

Example No. 2

16²/₃ (16.667) yards @ \$.34¹/₂
 172 yards @ .06¹/₂
 25¹/₄ (25.25) yards @ 1.89
 256 yards @ .19
 Accumulated Total \$113.29

FIRST-TIME ACCURACY

ONLY when machine figuring becomes entirely automatic and the human element of error in operation ceases to be a factor, can there be dependable first-time accuracy in mechanical calculation.

This is evidenced by the fact that accounting offices in which first-time results are accepted without being checked or refigured, are so few as to be negligible. When working against a predetermined

total such proof is, of course, unnecessary.

First-time machine figuring, however, should closely approximate absolute accuracy on all classes of figure work.

With the Comptometer it does that.

In figuring a recent inventory of a chain of 100 grocery stores, the first-time accuracy of the Comptometer was 99.551%.

Subtraction

Subtraction is the process of finding the difference between two numbers. This is performed on the Comptometer by using the small figures on the key-tops and the subtraction "cut-off" or button.

NOTE: When using the Model M Comptometer do not hold the subtraction button after setting it for a subtraction. It returns to normal when the carry has been foiled.

Example: 98 — 75 = 23.

Put 98 in the right of keyboard. Hold back "cut-off" or button (see note) at the left of the figure 9; depress a small 7 in the second column and a small 4 (5 less 1) in the first column — answer 23. To prove, add 75 to 23 in machine. Answer 98 agrees with amount started with.

Example: 845 — 702 = 143.

Put 845 in the right of keyboard. Hold back "cut-off" or button (see note) at the left of the figure 8; depress a small 7 in the third column, a small cipher in the second column, and a small 1 (2 less 1) in the first column — answer 143. To prove, add 702 to 143 in machine. Answer 845 agrees with amount started with.

Example: \$28.64 — \$9.62 = \$19.02

Put 28.64 in right of keyboard. Hold back "cut-off" or button (see note) at left of figure 2. Borrow from fourth column by depressing cipher key; as there are no small 9 figures, ignore the 9 in the third column, depress small 6 in the second column and a small 1 (2 less 1) in the first column — answer \$19.02. To prove, add \$9.62 to \$19.02 in machine. Answer \$28.64 agrees with amount started with.

The processes to follow in subtraction:

1. Put larger amount in the Comptometer.
2. Hold back "cut-off" or button at the left of an amount in the register equal to or larger than the amount to be subtracted.
3. Holding back the "cut-off" or button depress the amount to be subtracted in small figures, less one.
4. If necessary to borrow, hold back the "cut-off" or button at the left of the column or columns from which you borrow. Depress the small cipher key in such column or columns.

Cipher keys are used in the amount to be subtracted if they come between figures of value, but are ignored if at the end of a number. The 9's are ignored unless they come at the end of a number when one less than nine (8) is depressed.

The apostrophe in the following problems indicates where the "cut-off" or button is to be held back.

- | | |
|--|---|
| <p>1. '4.36 Add large figures 1.25 Small figures 124</p> <hr/> <p>3.11</p> <p>3. '21.43 Add large figures 6.42 Small figures 0641</p> <hr/> <p>15.01</p> <p>5. '65.23 Add large figures 31.00 Small figures 30**</p> <hr/> <p>34.23</p> <p>7. '15.60 Add large figures 8.83 Small figures 0882</p> <hr/> <p>6.77</p> | <p>2. '8.34 Add large figures .68 Small figures 067</p> <hr/> <p>7.66</p> <p>4. '170.36 Add large figures .85 Small figures 0084</p> <hr/> <p>169.51</p> <p>6. '6.42 Add large figures 1.93 Small figures 1*2</p> <hr/> <p>4.49</p> <p>8. '48.50 Add large figures 9.60 Small figures 0*5*</p> <hr/> <p>38.90</p> |
|--|---|

Use of Small Figures in Subtraction or Division

NOTE 1. In subtracting or dividing, use the keys with the corresponding small figures, except for the right-hand figure of value, for which one less must be used.

Right-Hand Figure
of Value

| | | | | |
|----------------------------|-----|-----|------|------|
| | ↓ | ↓ | ↓ | ↓ |
| To subtract or divide with | 462 | 127 | 3600 | 4620 |
| Use small figures | 461 | 126 | 35 | 461 |

NOTE 2. The small cipher keys should be depressed the same as any other figure when they appear between figures of value, as in 704, but should be disregarded if they are at the right of the amount, as in 7500.

| | |
|----------------------------|-------|
| To subtract or divide with | 704 |
| Use small figures | 703 |
| To subtract or divide with | 7500 |
| Use small figures | 74 |
| To subtract or divide with | 46005 |
| Use small figures | 46004 |

*Used to designate columns in which no keys are depressed.

| | |
|----------------------------|-------|
| To subtract or divide with | 63500 |
| Use small figures | 634 |

NOTE 3. If the right-hand figure of value in the amount is a 1, then one less is 0, and this small cipher should be struck.

| | |
|----------------------------|------|
| To subtract or divide with | 3241 |
| Use small figures | 3240 |
| To subtract or divide with | 3100 |
| Use small figures | 30 |

NOTE 4. As there are no small 9 keys, pass any column which contains 9; except where 9 is the right-hand figure of value, then the small 8 is used.

| | |
|----------------------------|------|
| To subtract or divide with | 8947 |
| Use small figures | 8 46 |
| To subtract or divide with | 1695 |
| Use small figures | 16 4 |
| To subtract or divide with | 983 |
| Use small figures | 82 |
| To subtract or divide with | 379 |
| Use small figures | 378 |

DIVISION

DIVISION is the process of finding the number of times one number is contained in another.

Although division is not used as frequently in the average office as addition and multiplication, it is, however, very important and used extensively in statistics of all kinds.

The machine method of division is more simple on the Comptometer than the mental or written process for it consists merely of a series of subtractions and the quotient, or answer figure, is a record of the number of subtractions made.

Division on the Comptometer is as simple as any other operation. The underlying principle of division is explained in the following example:

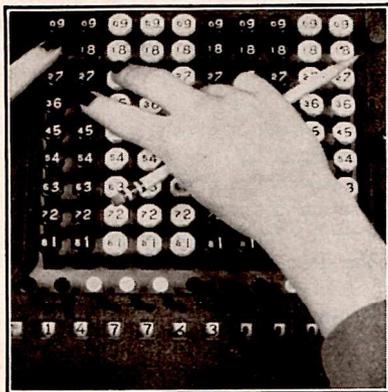
Example: 1477.63 ÷ 133

Place 147763 (the dividend) into the left side of the Comptometer using large figures.

Pull down the decimal pointer on the machine in the same position as it appears in the written dividend. (1477|63). The divisor (133) contains three DIVIDEND DECIMAL

whole numbers; that is, it has three figures to the left of its decimal point. Move your finger to the left of the dividend decimal position three places. Pull down the pointer in this position. You have now established the decimal point for your answer. (1|47763).

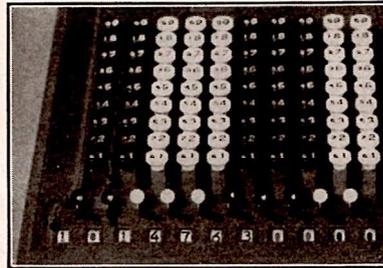
ANSWER DECIMAL



Hold 133 (the divisor) using small figures less one (132) directly over 147. Depress these divisor keys until the amount in the register dials at the base of the columns in which you are holding the divisor is less than 133.

In this example, the remainder is 014, which is less than your divisor, 133.

Move your divisor position, held on the keyboard, one place to the right. You are now holding your divisor over 147 in the register dials.



Remainder is 014.

Depress 132 (divisor figures). Remainder is 014 which is less than your divisor 133.

Move your divisor position, held on keyboard, one place to the right. You are now holding your divisor over 146 in the register dials.

Depress 132 (divisor figures). The remainder is 013 which is less than your divisor, 133.

Move your divisor position, held on keyboard, one place to the right. You are now holding your divisor over 133 in the register dials.

Depress 132 (divisor figures). The remainder is 000.

Copy your answer — 11.11.

Example: 8153.40 ÷ 254

Place 815340 (the dividend) into the left side of the Comptometer using large-numbered keys.

Locate your dividend decimal position: 8153|40.

DIVIDEND DECIMAL

Establish your answer decimal point position: 8|15340.

ANSWER DECIMAL

Hold your divisor 254 (using small-figured keys 253) over 815 in the register dials.

Depress 253 (divisor figures) until the remainder in the register dials is less than the divisor, 254. Remainder is 053.

Move your divisor position, held on keyboard, one place to the right over 533 in the register dials.

Repeat depressing and moving until the entire problem is completed.

Answer: 32.10.

Practice Division Problems

$$\begin{aligned} 4775.38 \div 226 &= 21.13 \\ 2326.59 \div 189 &= 12.31 \\ 6265.45 \div 145 &= 43.21 \\ 95061.75 \div 175 &= 543.21 \\ 978879.74 \div 487 &= 2010.02 \end{aligned}$$

When we have a problem in division such as:

$$194.25 \div 875$$

Put 19425 (the dividend) into the Comptometer.

Establish dividend decimal point.

Point off three places to the left of the dividend decimal position to establish the answer decimal position.

Hold 875 (divisor figures), using small figures 874, over 194. 194 is less than divisor 875.

Move your divisor position, held on keyboard, one place to the right. You are now holding your divisor over 1942 in the register dials.

This is the only difference in the operation of division you have learned so far.

Depress 874 (divisor figures) as many times as shown by the figure in the register dial at the left of the columns in which you are holding the divisor.

The figure 1 appears to the left of these columns.

Depress 874 (divisor figures) one time. The figure 1 changed to 2.

Depress 874 one more time to equal the figure 2. 192 (remainder figure) is less than 875.

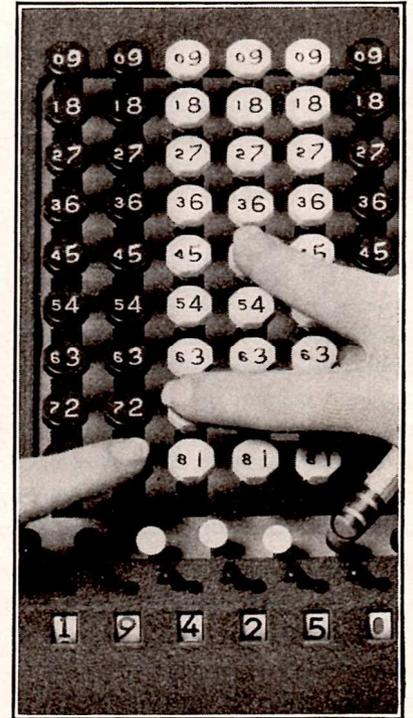
Move your divisor position, held on keyboard, one place to the right.

The number in the register dial at the left of the columns in which you are holding the divisor is 1.

Depress 874 (divisor figures) one time. The figure 1 changed to 2.

Depress 874 (divisor figures) one more time to equal the figure 2. 175 (remainder figure) is less than 875.

Move your divisor position, held on keyboard, one place to the right.



Hold the Divisor over 1942 in the Register Dials.

The number in the register dial at the left of the columns in which you are holding the divisor is 1.

Depress 874 (divisor figures) one time.

The number 1 in the register dial at the left of the columns in which you are holding the divisor did not change.

The remainder is 875. Depress 874 (divisor figures) one time.

Answer is .222.

For all practical purposes it is unnecessary to carry division beyond the fourth figure to the right of the decimal point.

POINTING OFF IN DIVISION

Pointing off on the Comptometer in division is very simple and accurate. Turn down the decimal pointer in the register to agree with the decimal point in the dividend. To establish the ANSWER DECIMAL POINT turn down the pointer as many places to the left of the dividend decimal pointer as there are figures to the left of the decimal point in the divisor. See Illustration.

Example: $134.5 \div 25 = 5.38$

Put the dividend 134.5 into the left side of keyboard. Pull down the decimal pointer between the 4 and 5 to correspond to the decimal point appearing in the dividend. As 25 is a whole number with two figures (2 and 5) we turn down the decimal pointer to the left of the dividend decimal point two places between the 1 and 3. See illustration. This simple method of establishing an accurate decimal position in the answer is found only on the Comptometer.

Drill carefully on the following problems and check your answers with those shown here.

- | | | |
|------------------------------|------------------------------|------------------------------|
| 1. $41.778 \div 45 = .9284$ | 3. $297.364 \div 34 = 8.746$ | 5. $1307.68 \div 22 = 59.44$ |
| 2. $16.7772 \div 44 = .3813$ | 4. $2377.2 \div 56 = 42.45$ | 6. $89089 \div 89 = 1001$ |

If the divisor is a decimal without preceding ciphers the answer pointer is the same as the dividend pointer; but if the divisor has preceding ciphers like .0025 the answer pointer is as many places to the right of the dividend pointer as there are ciphers immediately to the right of the decimal point in the divisor. See illustration.

As there are no small 9 figured keys, leave blank any column which contains 9; except where 9 is the right-hand figure of value, then the small 8 key is used.

The small cipher keys should be depressed the same as any other figure when they appear between figures of value, as in 704, but should be disregarded if they are at the right of the amount, as in 7500. In the latter case, the divisor 7500 would be held as 75 less one (74).

Long Division

Easy Method for Dividing by Five or More Figures, Using Four-Place Trial Divisor and Obtaining Three Answer Figures at a Time

Example: $4567.89 \div 2436.65 =$

Apply rules for pointing off as indicated in illustration above.

After pointing off, register shows 0'456789.

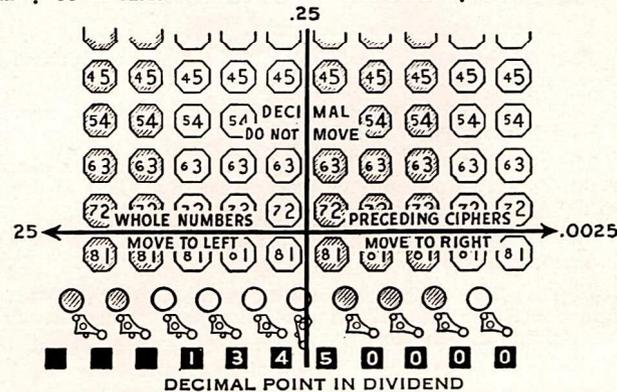


Illustration Showing Direction to Move Decimal Point in Division.

Divide by first four figures of divisor, using small figures on keys (not taking one less) and don't stop dividing until you get the first three answer figures. After getting the third answer figure, continue to hold with left hand the position of the two left-hand figures of divisor.

Place fingers of right hand on columns immediately to right of the two columns held with left hand, on keys for the remaining unused figures* of divisor, holding according to small figures and one less for the extreme right-hand figure of value of divisor. Leave left hand inactive on keyboard.

Depress keys held by right hand the number of times as indicated by first of the three answer figures already obtained. Then move right hand one position to right and strike as many times as indicated by the second answer figure. Again move right hand one position to right and strike as many times as indicated by the third answer figure already obtained.

The left hand remains inactive on keyboard.

Resume holding first two figures of divisor, with position for first two figures on the columns marked with left hand, and the position for next two figures on columns immediately to the right.

(If remainder, in register under columns held, should be equal to or larger than the divisor, depress complete divisor once more.)

Move finger position one place to right, and divide to get the next three answer figures, exactly the same way as the first three were obtained.

It is not necessary to strike in the remaining figures of divisor the second time, as these figures would not affect a six-place answer.

* If it is not convenient to hold all at once with the right hand the remaining unused figures of the divisor, then hold one or two of the remaining figures at a time.

Divide 0'456789 by 2436 (holding small figures 2436 with two hands) and don't stop dividing until you get the first three answer figures—187. Don't take the fingers of the left hand from keys 24.

Right-hand fingers take positions on small figures 64 (65 less 1) on columns immediately to right of position held with the left hand.

From left to right, strike small figures 64 once, then move to right and strike eight times, then move to right and strike seven times. Register shows 1'87113545.

Fingers of right hand take position on small figures 36. Right and left hand now hold small figures 2436.

Remainder 1135 is not larger than 2436.

Move both hands one position to the right and divide again by 2436 to get three more answer figures.

Register shows 1'87465. Answer 1.87465.

Division Short Cut

In practical every day work, division is used a great deal in the figuring of averages and percentages. For this reason it is unnecessary in many cases to obtain more than three or four decimal places in the answer.

Example:

| | |
|-------------------------------------|------------------|
| Sales | \$48,672.392 |
| Profit | 2,782.679 |
| Find percent of profit to sales | |
| $\frac{\$ 2,782.679}{\$48,672.392}$ | = .0572 or 5.72% |

Dividing four figures of the dividend (2782) by four figures of the divisor (4867 minus 1) will provide an answer sufficient for practical purposes. A safe rule to follow is to hold **one more figure of the divisor** than figures desired in the answer.

The carrying out of decimals beyond the actual number of places required is a needless waste of time and energy.

Reciprocal Division

The use of reciprocal division in cost, payroll, and statistical work will be very helpful to the operator. The simplicity of this method of division, in addition to its time-saving feature, makes its use very desirable. This method is nothing more than converting division into a multiplication process.

Multiplying any dividend by the reciprocal of its divisor produces the same answer as that obtained by actual division. To obtain the reciprocal of any number, merely divide that number into the figure 1.

Illustration:

| | |
|--|---------------------------|
| Reciprocal of 8 is $1 \div 8$ or .125 | |
| Reciprocal of 413 is $1 \div 413$ or .00242130 | (See Payroll Example) |
| Reciprocal of 555 is $1 \div 555$ or .00180180 | (See Statistical Example) |
| Reciprocal of 755 is $1 \div 755$ or .00132450 | (See Cost Example) |

Reciprocals (See Back Page) of any number from 1 to 2,000 will be found on Reciprocal Card No. 9; and from 1 to 10,000 in Reciprocal Book, form 192.

The easiest way to do reciprocal divisions is to hold the dividend over Permanent Decimal Pointer No. 5, multiplying it from left to right by the recipo-

cal of the divisor. Always point off to the left of the Permanent Decimal Point as many places as there are whole numbers in the divisor. The decimal point and preceding ciphers in the reciprocal are entirely disregarded if the problem is worked over the Permanent Decimal Point.

Example of Cost Work:

755 pieces cost \$66.06. What is the average cost per piece? Answer, \$.0875.
 $\$66.06 \div 755$ is the same as $\$66.06 \times .0013245$ (reciprocal of 755).

Hold the dividend \$66.06 over Permanent Decimal Pointer No. 5 and multiply it by the reciprocal of 755. From left to right strike in the dividend one, three, two, four, and five times respectively. As the

divisor (755) contains three whole numbers, it requires pointing off to the left of Permanent Decimal Pointer No. 5 three places. The answer dial now shows \$.0875.

Example of Payroll Work:

\$35.00 earned in 41.3 hours. What is the average hourly rate? Answer, \$.847.
 $\$35.00 \div 41.3$ is the same as $\$35.00 \times .0024213$ (reciprocal of 413).

Hold the dividend \$35.00 to left of Permanent Decimal Pointer No. 5 and multiply it by the reciprocal of 413. From left to right strike in the dividend two, four, two, one, and three times respectively.

As the divisor (41.3) contains two whole numbers, it requires pointing off to the left of Permanent Decimal Pointer No. 5 two places. The answer dial now shows \$.847.

Example of Statistical Work:

| | | |
|--------------------|-----------------|-----------------------|
| Department A Sales | \$104.56 = | .1884 or 18.84% |
| Department B Sales | 75.54 = | .1361 or 13.61% |
| Department C Sales | 344.21 = | .6202 or 62.02% |
| Department D Sales | 22.14 = | .0399 or 3.99% |
| Department E Sales | 8.55 = | .0154 or 1.54% |
| | <u>\$555.00</u> | <u>1.0000 100.00%</u> |

It is desired to know what percent of the total sales is represented by each department. This requires dividing each of the amounts by the total, or \$555.00.

As 555 contains three whole numbers, it requires pointing off three places to the left of Permanent Decimal Pointer No. 5. Hold the first dividend, \$104.56, to the left of Permanent Decimal Pointer No. 5, and multiply it by the reciprocal of 555. From left to right strike in the dividend one, eight, zero, one, and eight times respectively. The answer dial shows .1884 or 18.84%. In the same manner hold the other departments and multiply by the same reciprocal. To prove accuracy of the work add the results

obtained; these should total 1 or 100%, as the case may be.

In the ordinary division problems found in cost, payroll, and statistical work a four-figure answer is usually sufficient. In order to obtain four-figure accuracy it will be necessary to use six figures of the reciprocal. A safe rule to follow is to use two more figures of the reciprocal than desired figure places in the answer—that is, if a four-place answer is desired use six of the reciprocal figures, if a five-place answer is desired use seven figures of the reciprocal.

With a little practice and the use of Reciprocal Card No. 9, the operator will develop speed on this simple method of division.

Table with 10 columns (100-900) and 100 rows (1-100). Each cell contains a reciprocal value for a given number. The table is organized into groups of 10 rows, labeled 10 through 90 on the left side.

Table with 10 columns (1100-1900) and 100 rows (1-100). Each cell contains a reciprocal value for a given number. The table is organized into groups of 10 rows, labeled 10 through 90 on the left side.

Form 1017-L

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