EASY INSTRUCTIONS FOR OPERATING THE

ACCURACY KEY

Comptometer

COMPTOMETER CORPORATION
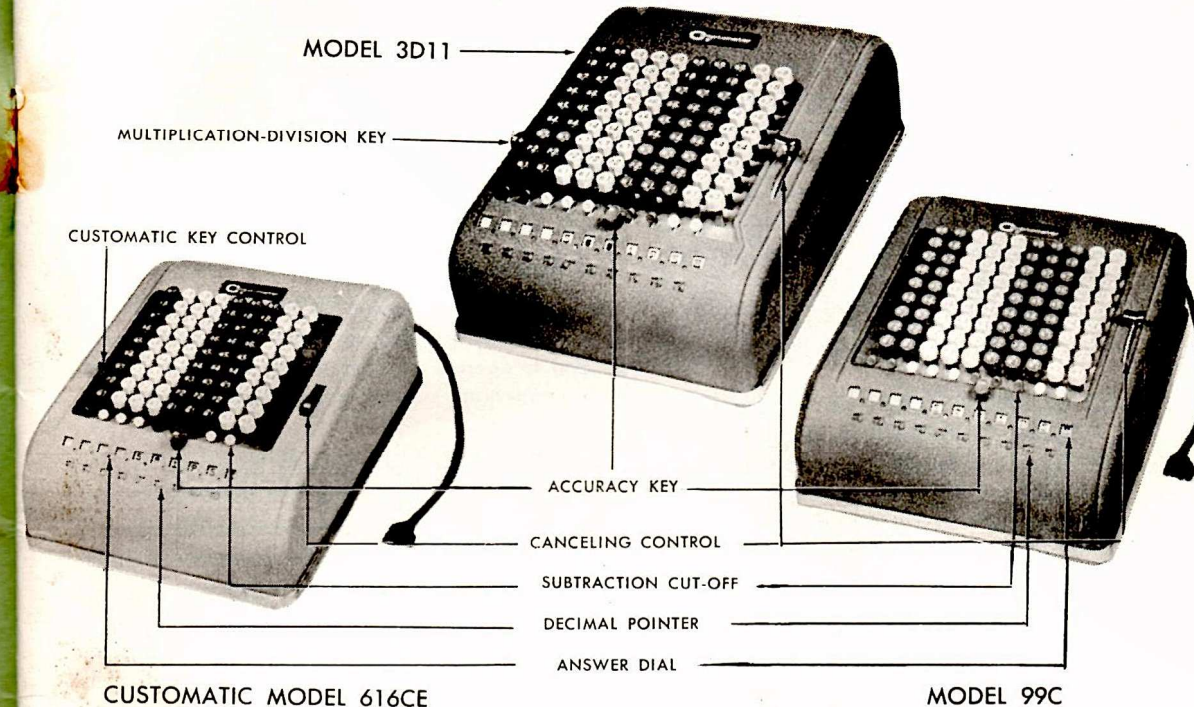
1735 NORTH PAULINA STREET

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	.75	6	.5	6	.375
				7	.875	7	.5833	7	.4375
						8	.6667	8	.5
						9	.75	9	.5625
						10	.8333	10	.625
						11	.9167	11	.6875
								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
7	.1094	28	.4375	49	.7656
8	.125	29	.4531	50	.7813
9	.1406	30	.4688	51	.7969
10	.1563	31	.4844	52	.8125
11	.1719	32	.5	53	.8281
12	.1875	33	.5156	54	.8438
13	.2031	34	.5313	55	.8594
14	.2188	35	.5469	56	.875
15	.2344	36	.5625	57	.8906
16	.25	37	.5781	58	.9063
17	.2656	38	.5938	59	.9219
18	.2813	39	.6094	60	.9375
19	.2969	40	.625	61	.9531
20	.3125	41	.6406	62	.9688
21	.3281	42	.6563	63	.9844

32NDS			
1	.03125	17	.53125
2	.0625	18	.5625
3	.09375	19	.59375
4	.125	20	.625
5	.15625	21	.65625
6	.1875	22	.6875
7	.21875	23	.71875
8	.25	24	.75
9	.28125	25	.78125
10	.3125	26	.8125
11	.34375	27	.84375
12	.375	28	.875
13	.40625	29	.90625
14	.4375	30	.9375
15	.46875	31	.96875
16	.5		

INTRODUCTION

MODEL 3D11

MULTIPLICATION-DIVISION KEY

CUSTOMATIC KEY CONTROL

ACCURACY KEY

CANCELING CONTROL

SUBTRACTION CUT-OFF

DECIMAL POINTER

ANSWER DIAL

CUSTOMATIC MODEL 616CE   MODEL 99C

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

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.

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 Comptometer is available in various capacities* with each column containing 9 keys, grouped in alternating sections, colored green and ivory.

On each key top is a large and small figure. The large figures are used for addition and multiplication; the small figures show for division and subtraction. The answer dials show the result of the calculation. The answer dials are cleared by touching the canceling control located at right of keyboard. The pointers below 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 Accuracy Key, located at the base of the fourth row of keys just above the answer dials, unlocks the keyboard after the incomplete key stroke has been corrected.

(See page 5 for proper use of Accuracy Key.)

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. Practice this push-stroke in rhythm. It differs distinctly from the sharp staccato stroke used when typing. 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 used to operate all keys except those in the extreme right-hand column which should be touched 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. Touch only one key at a time.

No. 1	No. 2	No. 3	No. 4	No. 5	No. 6
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 misoperation occurs 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, touch 3 twice
To add 7, touch 3 and 4
To add 8, touch 4 twice
To add 9, touch 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 an angle 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.

No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7
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.

How to use the ACCURACY KEY

The Accuracy Key is a positive system of automatic control which prevents errors caused by fumbled or incomplete key strokes. The Accuracy Key mechanism gives instant signal of misoperated keys with positive protection against such misoperations; the operator can speed up safely and be assured of accuracy.

Different model Comptometers employ slightly different methods of correcting misoperated keys. Follow the instructions below to correct misoperated keys for the model Comptometer you are using.

Comptometer Models 992, 99C and 616 Customatic
IN ADDING AND SUBTRACTING

When a locked key signals a misoperation, the misoperated key will be in a semi-depressed position and the motor will continue to run. Complete the touch of the semi-depressed key and touch the Accuracy Key. Continue adding with the key that locked and signaled the misoperation.

EXAMPLE

In adding this short column intentionally press the 5 cent key part way down. On attempting to add the 3 dollar key, you find it locked. Go back to the last key touched (5), complete the stroke, touch the Accuracy Key and continue adding with the key that locked and signaled the error (3).

.45
3.25
.67
.45
——
4.82

IN MULTIPLICATION AND DIVISION

The Accuracy Key prevents errors from slipping into the answer without the knowledge of the operator. When a key is misoperated, the entire keyboard locks except the key or keys on which the misoperation occurred. The misoperation is indicated three ways: visually, by sound of the motor continuing to run, and by touch, in that the key or keys misoperated are held in a semi-depressed position and remain so until corrected. Complete the touch of the semi-depressed key or keys, then touch the Accuracy Key and continue through the operation.

Comptometer Model J, M, K or 3D11

The Accuracy Key mechanism gives instant signal of a misoperated key, by locking all columns **except** the column in which the incomplete key stroke was made; this column is left open for correction. When a key locks in adding, it is a positive signal that an incomplete key stroke was made either on the last key depressed or the key previous to the last.

RULE 1. When a key locks, always go back and try to operate the last key touched. If this key goes down, touch the Accuracy Key and continue the addition, starting on the key that locked and signaled the error.

RULE 2. But if the last key touched is found locked, touch the Accuracy Key and add in the previous key; then continue the addition, starting on the key that locked and signaled the error.

EXAMPLE OF RULE 1

In adding this short column intentionally press the 5 cent key part way down. On attempting to add the 3 dollar key, you find it locked. Following your rule, go back and add the last key depressed (5), touch the Accuracy Key, and the correction is made. Continue adding, starting on the key that locked and signaled the error, 3.

.45
3.25
.67
.45
——
4.82

EXAMPLE OF RULE 2

In adding this column, intentionally press the 30 key part way down. Then give the 40 key a regular stroke. On attempting to add the 5 key, you find it locked. To correct, go back to the last key depressed (40), and you will find it locked. Following the rule, touch the Accuracy Key and add in the previous key (the 30). This completes the correction and you continue adding, beginning on key which locked and signaled the error, 5.

.22
.75
.56
2.80
3.20
——
7.53

IN MULTIPLICATION AND DIVISION EXCEPT MODEL 3D11

When the key locks under the fingers, the positive danger signal prevents an error from slipping into an answer without the knowledge of the operator. Owing to the speed of the Comptometer adding-calculating machine it is simpler and faster to cancel and go over the problem than to stop and make the correction.

IN MULTIPLICATION AND DIVISION USING MODEL 3D11

Simply push back the multiplication and division button at left of keyboard before starting to multiply or divide. If, and when, a key is misoperated, all the keys held will lock except the key or keys misoperated. These are left open so that the operator may correct the misoperation without removing fingers from the keyboard. Touch the key or keys that can be depressed and continue operating.

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:

No. 1	No. 2	No. 3	No. 4	No. 5
24,531	12,456	5,315	23,456	84,143
35	68	64	75	79

No. 6	No. 7	No. 8	No. 9	No. 10
35,642	15,341	45,673	36,341	14,683
45	88	28	23	47

No. 11	No. 12	No. 13	No. 14	No. 15
89,986	15,366	65,418	94,345	14,312
37	15	31	63	86

No. 16	No. 17	No. 18	No. 19	No. 20
26,433	46,541	63,222	46,812	46,533
19	91	83	61	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.

No. 1	No. 2	No. 3	No. 4	No. 5
43	13	47	83	276
1R 34 2R	2R 42 1R	1L 62 1R	1L 37 1R	1L 345 1 & 2R

No. 6	No. 7	No. 8	No. 9	No. 10
19	342	43	43	56
2R 54 1R	1L 153 2 & 1R	1L 39 1R	1L 13 1R	89 1 & 2R

No. 11	No. 12	No. 13	No. 14	No. 15
75	83	28	284	104
1R 46 2R	1L 87 1R	1L 19 1R	1L 324 1 & 2R	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.

No. 16	No. 17	No. 18	No. 19	No. 20
67.44	245.6	5613	584.26	5362
1L 735 1 & 2R	65—35	27—18	53—78	1L .523 1 & 2R

No. 21	No. 22	No. 23	No. 24	No. 25
17465	15082	13461	13723	191.47
43—45	*1L* 31.04 *1 & 2R*	19—19	73—65	92—23

No. 26	No. 27	No. 28	No. 29	No. 30
4817	.5447	6714	3672	574.4
37—29	*1L* 625 *1 & 2R*	73—68	94—45	16—17

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.

Example: Multiply 12.345 x 4.356

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

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.

Examples:

No. 1	No. 2	No. 3	No. 4
346.21	14.374	2.2635	.35624
1L 4.67 *1 & 2R*	*2 & 1L* 32.78 *1 & 2R*	9.4—56	91.—47

No. 5	No. 6	No. 7	No. 8
11.463	4627.1	26.516	314.62
1L 37.8 *1 & 2R*	*1L* .846 *1 & 2R*	*2 & 1L* 21.68 *1 & 2R*	7.3—49

No. 9	No. 10	No. 11	No. 12
243.82	986.4	328.64	304.69
2 & 1L 53.33 *1 & 2R*	*2 & 1L* 31.32 *2 & 1R*	16.—17	*2 & 1L* 216.7 *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:

No. 1	No. 2	No. 3	No. 4
345 x 289 x .56	789 x 88 x 5.46	6452 x 344 x .66	33 x 875 x 4.58

No. 5	No. 6	No. 7	No. 8
645 x 4456 x .28	389 x 673 x 438	75 x 6489 x 567	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.
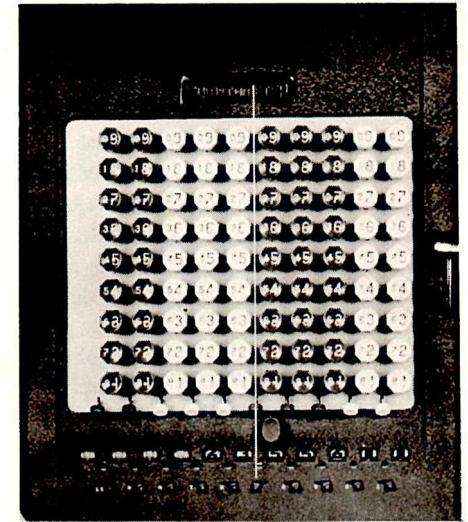
Permanent Decimal Point—this is located between the fifth and sixth column of keys, directly over Decimal Pointer No 5.

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:

4¾	(4.75)	yards @	$1.25
16½	(16.5)	yards @	.34½
148¼	(148.25)	yards @	.06¼

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 48¾, two columns for 236¾, etc.

Example No. 1

1⅛	(1.125)	yards @	$ .48
12¼	(12.25)	yards @	.64¾
67		yards @	.50
6⅜	(6.375)	yards @	1.23

Accumulated Total **$49.81**

Example No. 2

16⅔	(16.667)	yards @	$ .34½
172		yards @	.06½
25¼	(25.25)	yards @	1.89
256		yards @	.19

Accumulated Total **$113.29**

CORRECT ANSWERS AT A GLANCE!

Unretouched photo actual size

Late model Comptometers have LARGE, EASY TO READ, answer dials. Approximately 40% of a calculating machine operator's figuring time is spent in reading and recording answers. Comptometer's large answer dials can be read FASTER and with less fatigue!

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: (1) Do not hold subtraction cut-off after setting as it will return to normal <u>automatically</u> on Models M, 3D11, 992, 99C and Customatic. (2) Subtraction cut-offs must be held back <u>manually</u> while subtracting on the J, K and earlier models.

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.

(See Note Page 12)

1.	'4.36 **Add large figures**	2.	'8.34 **Add large figures**
	1.25 **Small figures 124**		.68 **Small figures 067**
	3.11		7.66
3.	'21.43 **Add large figures**	4.	1'70.36 **Add large figures**
	6.42 **Small figures 0641**		.85 **Small figures 0084**
	15.01		169.51
5.	'65.23 **Add large figures**	6.	'6.42 **Add large figures**
	31.00 **Small figures 30****		1.93 **Small figures 1*2**
	34.23		4.49
7.	'15.60 **Add large figures**	8.	'48.50 **Add large figures**
	8.83 **Small figures 0882**		9.60 **Small figures 0*5***
	6.77		38.90

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

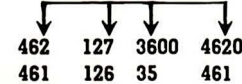|	
To subtract or divide with	63500
Use small figures	634

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

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

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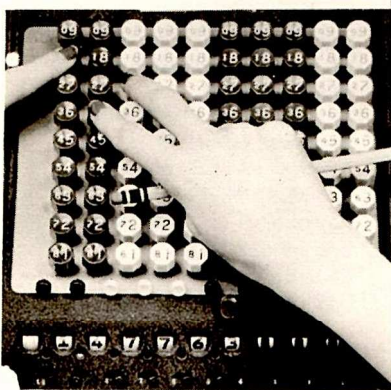
Hold 133 (the divisor) using small figures less one (132) directly over 147. Depress these divisor keys until the amount in the register dials at the base of the columns in which you are holding the divisor is less than 133.

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.
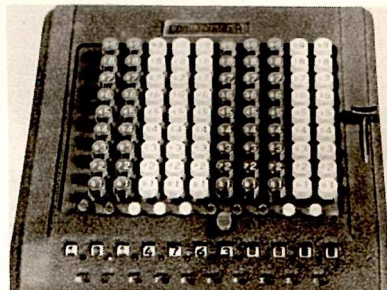
Remainder is 014.

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.

Practice Division Problems

4775.38 ÷ 226 =	21.13
2326.59 ÷ 189 =	12.31
6265.45 ÷ 145 =	43.21
95061.75 ÷ 175 =	543.21
978879.74 ÷ 487 =	2010.02

When we have a problem in division such as:

194.25 ÷ 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.

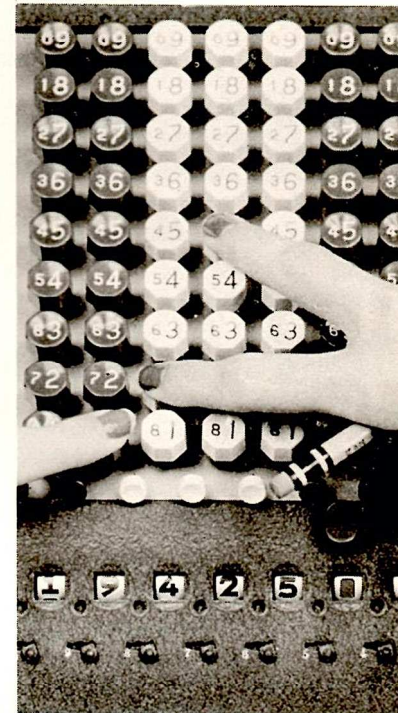Depress 874 one more time to equal the figure 2. 192 (remainder figure) is less than 875.

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.

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.

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 ÷ 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 ÷ 45 = .9284   3. 297.364 ÷ 34 = 8.746   5. 1307.68 ÷ 22 = 59.44
2. 16.7772 ÷ 44 = .3813   4. 2377.2 ÷ 56 = 42.45   6. 89089 ÷ 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).
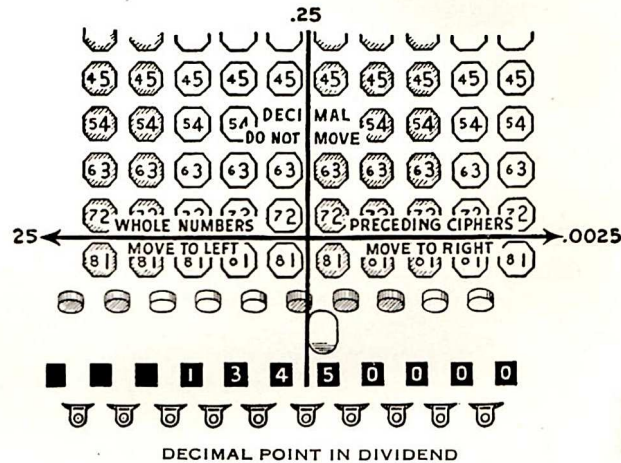
DECIMAL POINT IN DIVIDEND
Illustration Showing Direction to Move Decimal Point in Division.

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 ÷ 2436.65 =

Apply rules for pointing off as indicated in illustration above.

After pointing off, register shows 0'456789.

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 four 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.

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.

* 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.

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

$$\frac{\$ 2,782,679}{\$48,672,392} = .0572 \text{ or } 5.72\%$$

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.

Illustration:

Reciprocal of   8 is 1 ÷   8 or .125
Reciprocal of 413 is 1 ÷ 413 or .00242130
Reciprocal of 555 is 1 ÷ 555 or .00180180
Reciprocal of 755 is 1 ÷ 755 or .00132450

(See Payroll Example)
(See Statistical Example)
(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 recipro-

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.

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.

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 ÷ 755 is the same as $66.06 x .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 ÷ 41.3 is the same as $35.00 x .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%
	$555.00	1.0000	100.0%

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.

COMPTOMETER RECIPROCAL TABLE

Page 1 (100 to 1000)

Units column (n → 1000 ÷ n):

n	value	n	value	n	value	n	value	n	value
1	1000.000	21	47.6190	41	24.3902	61	16.3934	81	12.3457
2	500.000	22	45.4545	42	23.8095	62	16.1290	82	12.1951
3	333.333	23	43.4783	43	23.2558	63	15.8730	83	12.0482
4	250.000	24	41.6667	44	22.7273	64	15.6250	84	11.9048
5	200.000	25	40.0000	45	22.2222	65	15.3846	85	11.7647
6	166.667	26	38.4615	46	21.7391	66	15.1515	86	11.6279
7	142.857	27	37.0370	47	21.2766	67	14.9254	87	11.4943
8	125.000	28	35.7143	48	20.8333	68	14.7059	88	11.3636
9	111.111	29	34.4828	49	20.4082	69	14.4928	89	11.2360
10	100.000	30	33.3333	50	20.0000	70	14.2857	90	11.1111
11	90.9091	31	32.2581	51	19.6078	71	14.0845	91	10.9890
12	83.3333	32	31.2500	52	19.2308	72	13.8889	92	10.8696
13	76.9231	33	30.3030	53	18.8679	73	13.6986	93	10.7527
14	71.4286	34	29.4118	54	18.5185	74	13.5135	94	10.6383
15	66.6667	35	28.5714	55	18.1818	75	13.3333	95	10.5263
16	62.5000	36	27.7778	56	17.8571	76	13.1579	96	10.4167
17	58.8235	37	27.0270	57	17.5439	77	12.9870	97	10.3093
18	55.5556	38	26.3158	58	17.2414	78	12.8205	98	10.2041
19	52.6316	39	25.6410	59	16.9492	79	12.6582	99	10.1010
20	50.0000	40	25.0000	60	16.6667	80	12.5000		

Base (top-row) values for each hundred column (N → 1000 ÷ N):

100	200	300	400	500	600	700	800	900
10.0000	5.00000	3.33333	2.50000	2.00000	1.66667	1.42857	1.25000	1.11111

100-column (number → reciprocal ×1000):

no.	value	no.	value	no.	value	no.	value
101	9.90099	126	7.93651	151	6.62252	176	5.68182
102	9.80392	127	7.87402	152	6.57895	177	5.64972
103	9.70874	128	7.81250	153	6.53595	178	5.61798
104	9.61538	129	7.75194	154	6.49351	179	5.58659
105	9.52381	130	7.69231	155	6.45161	180	5.55556
106	9.43396	131	7.63359	156	6.41026	181	5.52486
107	9.34579	132	7.57576	157	6.36943	182	5.49451
108	9.25926	133	7.51880	158	6.32911	183	5.46448
109	9.17431	134	7.46269	159	6.28931	184	5.43478
110	9.09091	135	7.40741	160	6.25000	185	5.40541
111	9.00901	136	7.35294	161	6.21118	186	5.37634
112	8.92857	137	7.29927	162	6.17284	187	5.34759
113	8.84956	138	7.24638	163	6.13497	188	5.31915
114	8.77193	139	7.19424	164	6.09756	189	5.29101
115	8.69565	140	7.14286	165	6.06061	190	5.26316
116	8.62069	141	7.09220	166	6.02410	191	5.23560
117	8.54701	142	7.04225	167	5.98802	192	5.20833
118	8.47458	143	6.99301	168	5.95238	193	5.18135
119	8.40336	144	6.94444	169	5.91716	194	5.15464
120	8.33333	145	6.89655	170	5.88235	195	5.12821
121	8.26446	146	6.84932	171	5.84795	196	5.10204
122	8.19672	147	6.80272	172	5.81395	197	5.07614
123	8.13008	148	6.75676	173	5.78035	198	5.05051
124	8.06452	149	6.71141	174	5.74713	199	5.02513
125	8.00000	150	6.66667	175	5.71429		

Page 2 (1001 to 2000)

Column headers: 1100, 1200, 1300, 1400, 1500, 1600, 1700, 1800, 1900

Base (top-row) values for each column (N → 1 ÷ N):

1100	1200	1300	1400	1500	1600	1700	1800	1900
.90909	.83333	.76923	.71429	.66667	.62500	.58824	.55556	.52632

Left index column (1001–1009, 1 ÷ n):

n	value
1001	.99900
1002	.99800
1003	.99701
1004	.99602
1005	.99502
1006	.99404
1007	.99305
1008	.99206
1009	.99108

Comptometer

BETTER PRODUCTS / TO BETTER BUSINESS