EASY INSTRUCTIONS FOR OPERATING THE

CONTROLLED-KEY

COMPTOMETER

REG. U. S. PAT. OFF.

ft

COMPTOMETER DIVISION

FELT AND TARRANT MFG. CO.
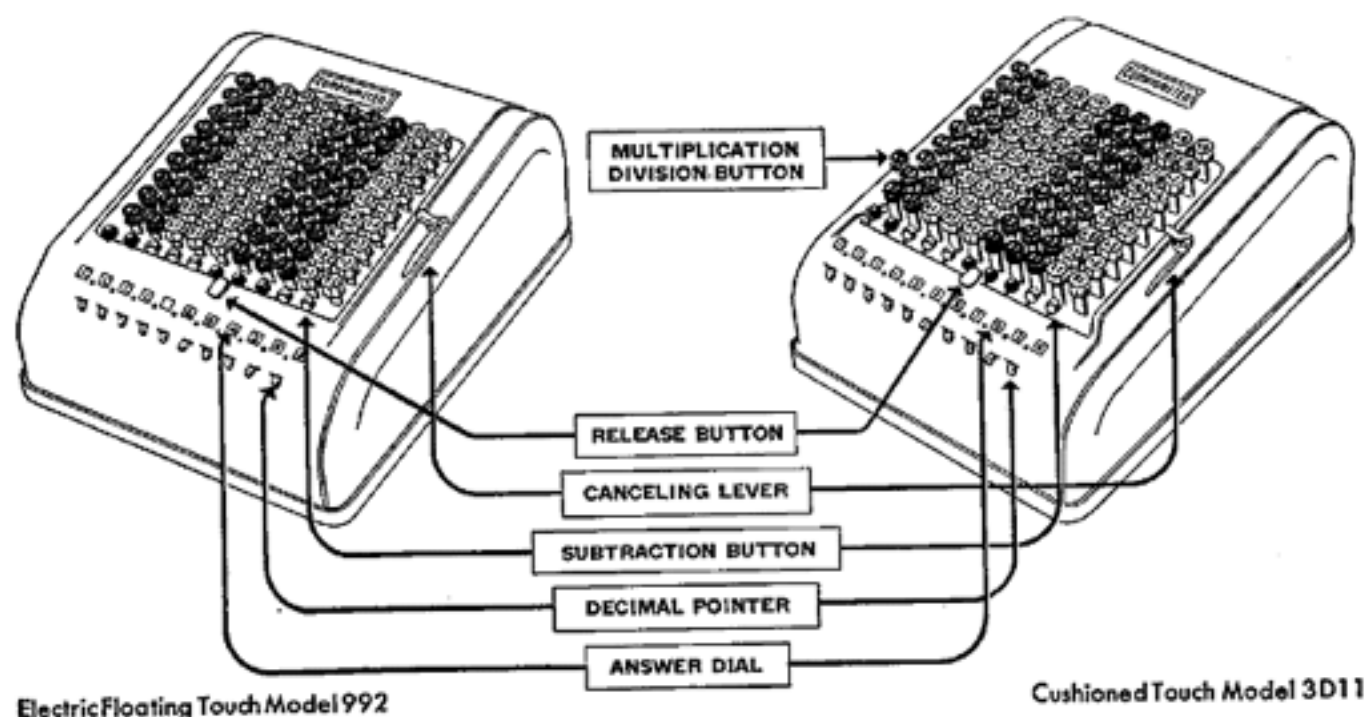
1735 NORTH PAULINA ST.

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	.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

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.

green. On 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,

MULTIPLICATION DIVISION BUTTON

RELEASE BUTTON

CANCELING LEVER

SUBTRACTION BUTTON

DECIMAL POINTER

ANSWER DIAL

Electric Floating Touch Model 992

Cushioned Touch Model 3D11

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 ivory or light

clears the answer dials. 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 release key at the upper right-hand corner or just above the answer dials 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.

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
1,677.24	1,717.61	1,324.29	2,03520	1,044.79	1,209.11

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.

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
5036	5659	5590	337.27	468.74	566.42	2,873.20

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 Correct an Incomplete Key Stroke

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

Method of Correcting Operating Errors When H-J-M-K and 3DII Comptometers Are Being Used

In adding and subtracting, 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 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 release button and the correction is made. Continue adding on the key that locked and signaled the error, 2.	.45
	.23
	.34
	.12
	——
	1.14

In adding, when a locked keyboard signals an operating error and the last key operated is found locked, touch the 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 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.

	.22
(3)	.75
	.16
	.80
	.20
	——
	2.13

Method of Correcting Operating Errors When the New Electric 992 Comptometer Is Being Used

In adding and subtracting, when a locked key signals an operating error, the key on which the operating error was made will be held in a depressed position. Complete the stroke on the depressed key and touch the Release Button. Continue adding with the key that locked and signaled the operating error.

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.

Old Method of Operating Error Correction

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.

New Method of Operating Error Correction Non-Electric Comptometer

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

Electric Comptometer

When an operating error is made, all the keyboard locks except the key or keys on which the operating error was made. The operating error is indicated visually and by touch in that the key or keys misoperated are held in a depressed position and remain so until the operating error has been corrected. Make a full depression of the keys misoperated. Touch the Release Button and continue through the operation.

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
858,585		340,160	1,759,200	6,647,297

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
1,603,890	1,350,008	1,278,844	835,843	

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
3,329,482	230,490	2,027,958	5,943,735	1,230,832

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
502,227	4,235,231	5,247,426	2,855,532	511,863

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
1462	546	2914	3071	95220

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
1026	52326	1677	559	4984

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
3450	7221	532	92,016	70,512

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
49,568	160,499.60	152501.74	31421.5028	2,804,326

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
75,585 *a g*	46,814 52 8	25 4,659	101,669,575	176, 5 ...

No. 26	No. 27	No. 28	No. 29	No. 30
4817	.5447	6714	3672	574.4
37–28	1L 625 1 & 2R	73–68	94–45	16–17
17... 519	3.404, ...	49,468, 32	34,683, ...	9,255, 04 8

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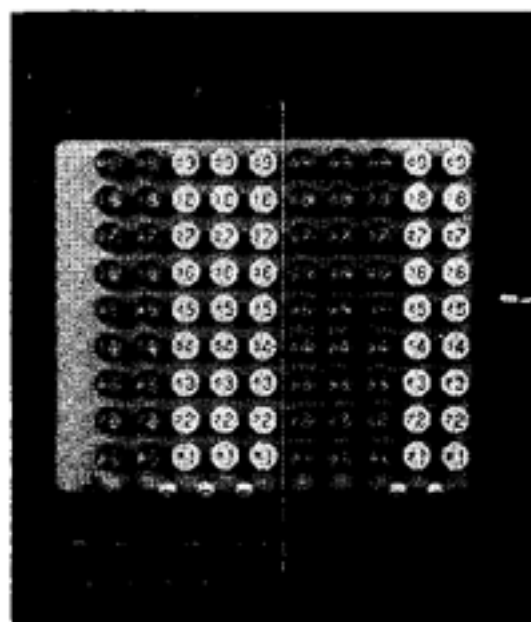
Permanent Decimal Point—this is located between the fifth and sixth column of keys, directly over Decimal Pointer No 5.

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 HUN-DREDS 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

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.

1.	'4.36	Add large figures
	1.25	Small figures 124
	3.11	
3.	'21.43	Add large figures
	6.42	Small figures 0641
	15.01	
5.	'65.23	Add large figures
	31.00	Small figures 30**
	34.23	
7.	'15.60	Add large figures
	8.83	Small figures 0882
	6.77	

2.	'8.34	Add large figures
	.68	Small figures 067
	7.66	
4.	1'70.36	Add large figures
	.85	Small figures 0084
	169.51	
6.	'6.42	Add large figures
	1.93	Small figures 1*2
	4.49	
8.	'48.50	Add large figures
	9.60	Small figures 0*5*
	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
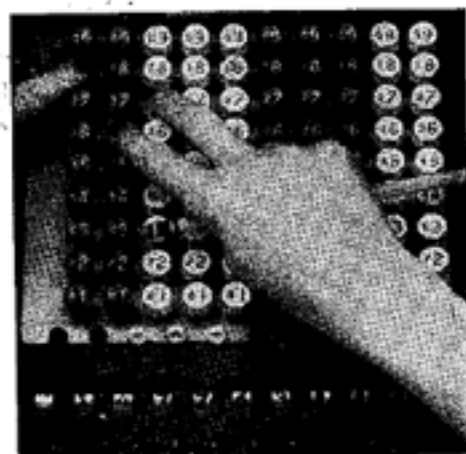
Hold 133 (the divisor) using small figures less one (132) directly over 147. Depress these divisor keys until the amount in the register dials at the base of the columns in which you are holding the divisor is less than 133.

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.
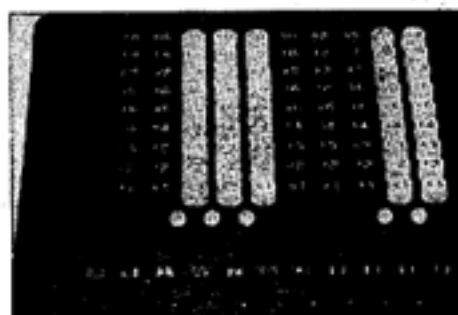
Remainder is 014.

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

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

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.

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.
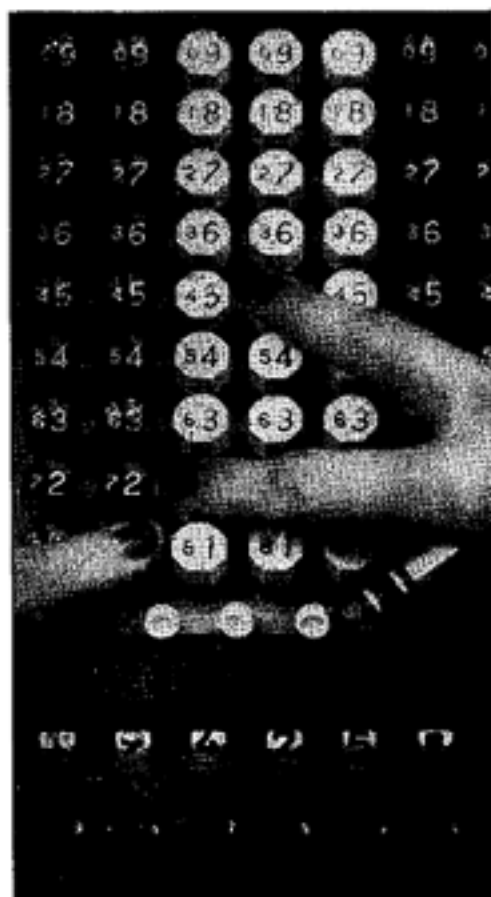
Hold the Divisor over 1942 in the Register Dials.

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).
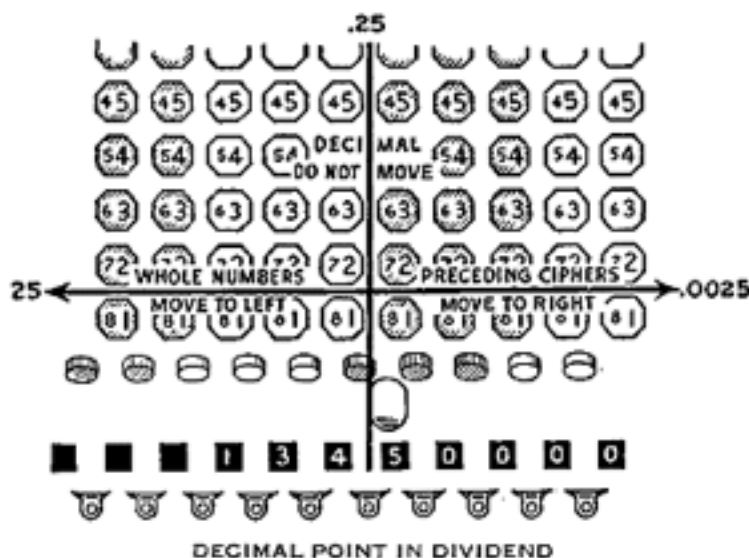
Illustration Showing Direction to Move Decimal Point in Division.

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.

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.

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.

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

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.

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.

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.

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

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

Remainder 1135 is not larger than 2436.

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.

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

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.

Register shows 1'87465. Answer 1.87465.

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* 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.

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.

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.

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 ÷   8 or .125
Reciprocal of 413 is 1 ÷ 413 or .00242130   (See Payroll Example)
Reciprocal of 555 is 1 ÷ 555 or .00180180   (See Statistical Example)
Reciprocal of 755 is 1 ÷ 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 reciprocal 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

n	1000/n	100	200	300	400	500	600	700	800	900
		100 10.0000	200 5.00000	300 3.33333	400 2.50000	500 2.00000	600 1.66667	700 1.42857	800 1.25000	900 1.11111
1	1000.000	01 9.90099	01 4.97512	01 3.32226	01 2.49377	01 1.99601	01 1.66389	01 1.42653	01 1.24844	01 1.10988
2	500.000	02 9.80392	02 4.95050	02 3.31126	02 2.48756	02 1.99203	02 1.66113	02 1.42450	02 1.24688	02 1.10865
3	333.333	03 9.70874	03 4.92611	03 3.30033	03 2.48139	03 1.98807	03 1.65837	03 1.42248	03 1.24533	03 1.10742
4	250.000	04 9.61538	04 4.90196	04 3.28947	04 2.47525	04 1.98413	04 1.65563	04 1.42045	04 1.24378	04 1.10619
5	200.000	05 9.52381	05 4.87805	05 3.27869	05 2.46914	05 1.98020	05 1.65289	05 1.41844	05 1.24224	05 1.10497
6	166.667	06 9.43396	06 4.85437	06 3.26797	06 2.46305	06 1.97628	06 1.65017	06 1.41643	06 1.24069	06 1.10375
7	142.857	07 9.34579	07 4.83092	07 3.25733	07 2.45700	07 1.97239	07 1.64745	07 1.41443	07 1.23916	07 1.10254
8	125.000	08 9.25926	08 4.80769	08 3.24675	08 2.45098	08 1.96850	08 1.64474	08 1.41243	08 1.23762	08 1.10132
9	111.111	09 9.17431	09 4.78469	09 3.23625	09 2.44499	09 1.96464	09 1.64204	09 1.41044	09 1.23609	09 1.10011
10	100.000	10 9.09091	10 4.76190	10 3.22581	10 2.43902	10 1.96078	10 1.63934	10 1.40845	10 1.23457	10 1.09890
11	90.9091	11 9.00901	11 4.73934	11 3.21543	11 2.43309	11 1.95695	11 1.63666	11 1.40647	11 1.23305	11 1.09769
12	83.3333	12 8.92857	12 4.71698	12 3.20513	12 2.42718	12 1.95312	12 1.63399	12 1.40449	12 1.23153	12 1.09649
13	76.9231	13 8.84956	13 4.69484	13 3.19489	13 2.42131	13 1.94932	13 1.63132	13 1.40252	13 1.23001	13 1.09529
14	71.4286	14 8.77193	14 4.67290	14 3.18471	14 2.41546	14 1.94553	14 1.62866	14 1.40056	14 1.22850	14 1.09409
15	66.6667	15 8.69565	15 4.65116	15 3.17460	15 2.40964	15 1.94175	15 1.62602	15 1.39860	15 1.22699	15 1.09290
16	62.5000	16 8.62069	16 4.62963	16 3.16456	16 2.40385	16 1.93798	16 1.62338	16 1.39665	16 1.22549	16 1.09170
17	58.8235	17 8.54701	17 4.60829	17 3.15457	17 2.39808	17 1.93424	17 1.62075	17 1.39470	17 1.22399	17 1.09051
18	55.5556	18 8.47458	18 4.58716	18 3.14465	18 2.39234	18 1.93050	18 1.61812	18 1.39276	18 1.22249	18 1.08932
19	52.6316	19 8.40336	19 4.56621	19 3.13480	19 2.38663	19 1.92678	19 1.61551	19 1.39082	19 1.22100	19 1.08814
20	50.0000	20 8.33333	20 4.54545	20 3.12500	20 2.38095	20 1.92308	20 1.61290	20 1.38889	20 1.21951	20 1.08696
21	47.6190	21 8.26446	21 4.52489	21 3.11526	21 2.37530	21 1.91939	21 1.61031	21 1.38696	21 1.21803	21 1.08578
22	45.4545	22 8.19672	22 4.50450	22 3.10559	22 2.36967	22 1.91571	22 1.60772	22 1.38504	22 1.21655	22 1.08460
23	43.4783	23 8.13008	23 4.48430	23 3.09598	23 2.36407	23 1.91205	23 1.60514	23 1.38313	23 1.21507	23 1.08342
24	41.6667	24 8.06452	24 4.46429	24 3.08642	24 2.35849	24 1.90840	24 1.60256	24 1.38122	24 1.21359	24 1.08225
25	40.0000	25 8.00000	25 4.44444	25 3.07692	25 2.35294	25 1.90476	25 1.60000	25 1.37931	25 1.21212	25 1.08108
26	38.4615	26 7.93651	26 4.42478	26 3.06748	26 2.34742	26 1.90114	26 1.59744	26 1.37741	26 1.21065	26 1.07991
27	37.0370	27 7.87402	27 4.40529	27 3.05810	27 2.34192	27 1.89753	27 1.59490	27 1.37552	27 1.20919	27 1.07875
28	35.7143	28 7.81250	28 4.38596	28 3.04878	28 2.33645	28 1.89394	28 1.59236	28 1.37363	28 1.20773	28 1.07759
29	34.4828	29 7.75194	29 4.36681	29 3.03951	29 2.33100	29 1.89036	29 1.58983	29 1.37174	29 1.20627	29 1.07643
30	33.3333	30 7.69231	30 4.34783	30 3.03030	30 2.32558	30 1.88679	30 1.58730	30 1.36986	30 1.20482	30 1.07527
31	32.2581	31 7.63359	31 4.32900	31 3.02115	31 2.32019	31 1.88324	31 1.58479	31 1.36799	31 1.20337	31 1.07411
32	31.2500	32 7.57576	32 4.31034	32 3.01205	32 2.31481	32 1.87970	32 1.58228	32 1.36612	32 1.20192	32 1.07296
33	30.3030	33 7.51880	33 4.29185	33 3.00300	33 2.30947	33 1.87617	33 1.57978	33 1.36426	33 1.20048	33 1.07181
34	29.4118	34 7.46269	34 4.27350	34 2.99401	34 2.30415	34 1.87266	34 1.57729	34 1.36240	34 1.19904	34 1.07066
35	28.5714	35 7.40741	35 4.25532	35 2.98507	35 2.29885	35 1.86916	35 1.57480	35 1.36054	35 1.19760	35 1.06952
36	27.7778	36 7.35294	36 4.23729	36 2.97619	36 2.29358	36 1.86567	36 1.57233	36 1.35870	36 1.19617	36 1.06838
37	27.0270	37 7.29927	37 4.21941	37 2.96736	37 2.28833	37 1.86220	37 1.56986	37 1.35685	37 1.19474	37 1.06724
38	26.3158	38 7.24638	38 4.20168	38 2.95858	38 2.28311	38 1.85874	38 1.56740	38 1.35501	38 1.19332	38 1.06610
39	25.6410	39 7.19424	39 4.18410	39 2.94985	39 2.27790	39 1.85529	39 1.56495	39 1.35318	39 1.19190	39 1.06496
40	25.0000	40 7.14286	40 4.16667	40 2.94118	40 2.27273	40 1.85185	40 1.56250	40 1.35135	40 1.19048	40 1.06383
41	24.3902	41 7.09220	41 4.14938	41 2.93255	41 2.26757	41 1.84843	41 1.56006	41 1.34953	41 1.18906	41 1.06270
42	23.8095	42 7.04225	42 4.13223	42 2.92398	42 2.26244	42 1.84502	42 1.55763	42 1.34771	42 1.18765	42 1.06157
43	23.2558	43 6.99301	43 4.11523	43 2.91545	43 2.25734	43 1.84162	43 1.55521	43 1.34590	43 1.18624	43 1.06045
44	22.7273	44 6.94444	44 4.09836	44 2.90698	44 2.25225	44 1.83824	44 1.55280	44 1.34409	44 1.18483	44 1.05932
45	22.2222	45 6.89655	45 4.08163	45 2.89855	45 2.24719	45 1.83486	45 1.55039	45 1.34228	45 1.18343	45 1.05820
46	21.7391	46 6.84932	46 4.06504	46 2.89017	46 2.24215	46 1.83150	46 1.54799	46 1.34048	46 1.18203	46 1.05708
47	21.2766	47 6.80272	47 4.04858	47 2.88184	47 2.23714	47 1.82815	47 1.54560	47 1.33869	47 1.18064	47 1.05597
48	20.8333	48 6.75676	48 4.03226	48 2.87356	48 2.23214	48 1.82482	48 1.54321	48 1.33690	48 1.17925	48 1.05485
49	20.4082	49 6.71141	49 4.01606	49 2.86533	49 2.22717	49 1.82149	49 1.54083	49 1.33511	49 1.17786	49 1.05374
50	20.0000	50 6.66667	50 4.00000	50 2.85714	50 2.22222	50 1.81818	50 1.53846	50 1.33333	50 1.17647	50 1.05263
51	19.6078	51 6.62252	51 3.98406	51 2.84900	51 2.21729	51 1.81488	51 1.53610	51 1.33156	51 1.17509	51 1.05152
52	19.2308	52 6.57895	52 3.96825	52 2.84091	52 2.21239	52 1.81159	52 1.53374	52 1.32979	52 1.17371	52 1.05042
53	18.8679	53 6.53595	53 3.95257	53 2.83286	53 2.20751	53 1.80832	53 1.53139	53 1.32802	53 1.17233	53 1.04932
54	18.5185	54 6.49351	54 3.93701	54 2.82486	54 2.20264	54 1.80505	54 1.52905	54 1.32626	54 1.17096	54 1.04822
55	18.1818	55 6.45161	55 3.92157	55 2.81690	55 2.19780	55 1.80180	55 1.52672	55 1.32450	55 1.16959	55 1.04712
56	17.8571	56 6.41026	56 3.90625	56 2.80899	56 2.19298	56 1.79856	56 1.52439	56 1.32275	56 1.16822	56 1.04603
57	17.5439	57 6.36943	57 3.89105	57 2.80112	57 2.18818	57 1.79533	57 1.52207	57 1.32100	57 1.16686	57 1.04493
58	17.2414	58 6.32911	58 3.87597	58 2.79330	58 2.18341	58 1.79211	58 1.51976	58 1.31926	58 1.16550	58 1.04384
59	16.9492	59 6.28931	59 3.86100	59 2.78552	59 2.17865	59 1.78891	59 1.51745	59 1.31752	59 1.16414	59 1.04275
60	16.6667	60 6.25000	60 3.84615	60 2.77778	60 2.17391	60 1.78571	60 1.51515	60 1.31579	60 1.16279	60 1.04167
61	16.3934	61 6.21118	61 3.83142	61 2.77008	61 2.16920	61 1.78253	61 1.51286	61 1.31406	61 1.16144	61 1.04058
62	16.1290	62 6.17284	62 3.81679	62 2.76243	62 2.16450	62 1.77936	62 1.51057	62 1.31234	62 1.16009	62 1.03950
63	15.8730	63 6.13497	63 3.80228	63 2.75482	63 2.15983	63 1.77620	63 1.50830	63 1.31062	63 1.15875	63 1.03842
64	15.6250	64 6.09756	64 3.78788	64 2.74725	64 2.15517	64 1.77305	64 1.50602	64 1.30890	64 1.15741	64 1.03734
65	15.3846	65 6.06061	65 3.77358	65 2.73973	65 2.15054	65 1.76991	65 1.50376	65 1.30719	65 1.15607	65 1.03627
66	15.1515	66 6.02410	66 3.75940	66 2.73224	66 2.14592	66 1.76678	66 1.50150	66 1.30548	66 1.15473	66 1.03520
67	14.9254	67 5.98802	67 3.74532	67 2.72480	67 2.14133	67 1.76367	67 1.49925	67 1.30378	67 1.15340	67 1.03413
68	14.7059	68 5.95238	68 3.73134	68 2.71739	68 2.13675	68 1.76056	68 1.49701	68 1.30208	68 1.15207	68 1.03306
69	14.4928	69 5.91716	69 3.71747	69 2.71003	69 2.13220	69 1.75747	69 1.49477	69 1.30039	69 1.15075	69 1.03199
70	14.2857	70 5.88235	70 3.70370	70 2.70270	70 2.12766	70 1.75439	70 1.49254	70 1.29870	70 1.14943	70 1.03093
71	14.0845	71 5.84795	71 3.69004	71 2.69542	71 2.12314	71 1.75131	71 1.49031	71 1.29702	71 1.14811	71 1.02987
72	13.8889	72 5.81395	72 3.67647	72 2.68817	72 2.11864	72 1.74825	72 1.48810	72 1.29534	72 1.14679	72 1.02881
73	13.6986	73 5.78035	73 3.66300	73 2.68097	73 2.11416	73 1.74520	73 1.48588	73 1.29366	73 1.14548	73 1.02775
74	13.5135	74 5.74713	74 3.64964	74 2.67380	74 2.10970	74 1.74216	74 1.48368	74 1.29199	74 1.14416	74 1.02669
75	13.3333	75 5.71429	75 3.63636	75 2.66667	75 2.10526	75 1.73913	75 1.48148	75 1.29032	75 1.14286	75 1.02564
76	13.1579	76 5.68182	76 3.62319	76 2.65957	76 2.10084	76 1.73611	76 1.47929	76 1.28866	76 1.14155	76 1.02459
77	12.9870	77 5.64972	77 3.61011	77 2.65252	77 2.09644	77 1.73310	77 1.47710	77 1.28700	77 1.14025	77 1.02354
78	12.8205	78 5.61798	78 3.59712	78 2.64550	78 2.09205	78 1.73010	78 1.47493	78 1.28535	78 1.13895	78 1.02249
79	12.6582	79 5.58659	79 3.58423	79 2.63852	79 2.08768	79 1.72712	79 1.47275	79 1.28370	79 1.13766	79 1.02145
80	12.5000	80 5.55556	80 3.57143	80 2.63158	80 2.08333	80 1.72414	80 1.47059	80 1.28205	80 1.13636	80 1.02041
81	12.3457	81 5.52486	81 3.55872	81 2.62467	81 2.07900	81 1.72117	81 1.46843	81 1.28041	81 1.13507	81 1.01937
82	12.1951	82 5.49451	82 3.54610	82 2.61780	82 2.07469	82 1.71821	82 1.46628	82 1.27877	82 1.13379	82 1.01833
83	12.0482	83 5.46448	83 3.53357	83 2.61097	83 2.07039	83 1.71527	83 1.46413	83 1.27714	83 1.13250	83 1.01729
84	11.9048	84 5.43478	84 3.52113	84 2.60417	84 2.06612	84 1.71233	84 1.46199	84 1.27551	84 1.13122	84 1.01626
85	11.7647	85 5.40541	85 3.50877	85 2.59740	85 2.06186	85 1.70940	85 1.45985	85 1.27389	85 1.12994	85 1.01523
86	11.6279	86 5.37634	86 3.49650	86 2.59067	86 2.05761	86 1.70648	86 1.45773	86 1.27226	86 1.12867	86 1.01420
87	11.4943	87 5.34759	87 3.48432	87 2.58398	87 2.05339	87 1.70358	87 1.45560	87 1.27065	87 1.12740	87 1.01317
88	11.3636	88 5.31915	88 3.47222	88 2.57732	88 2.04918	88 1.70068	88 1.45349	88 1.26904	88 1.12613	88 1.01215
89	11.2360	89 5.29101	89 3.46021	89 2.57069	89 2.04499	89 1.69779	89 1.45138	89 1.26743	89 1.12486	89 1.01112
90	11.1111	90 5.26316	90 3.44828	90 2.56410	90 2.04082	90 1.69492	90 1.44928	90 1.26582	90 1.12360	90 1.01010
91	10.9890	91 5.23560	91 3.43643	91 2.55754	91 2.03666	91 1.69205	91 1.44718	91 1.26422	91 1.12233	91 1.00908
92	10.8696	92 5.20833	92 3.42466	92 2.55102	92 2.03252	92 1.68919	92 1.44509	92 1.26263	92 1.12108	92 1.00806
93	10.7527	93 5.18135	93 3.41297	93 2.54453	93 2.02840	93 1.68634	93 1.44300	93 1.26103	93 1.11982	93 1.00705
94	10.6383	94 5.15464	94 3.40136	94 2.53807	94 2.02429	94 1.68350	94 1.44092	94 1.25945	94 1.11857	94 1.00604
95	10.5263	95 5.12821	95 3.38983	95 2.53165	95 2.02020	95 1.68067	95 1.43885	95 1.25786	95 1.11732	95 1.00503
96	10.4167	96 5.10204	96 3.37838	96 2.52525	96 2.01613	96 1.67785	96 1.43678	96 1.25628	96 1.11607	96 1.00402
97	10.3093	97 5.07614	97 3.36700	97 2.51889	97 2.01207	97 1.67504	97 1.43472	97 1.25471	97 1.11483	97 1.00301
98	10.2041	98 5.05051	98 3.35570	98 2.51256	98 2.00803	98 1.67224	98 1.43266	98 1.25313	98 1.11359	98 1.00200
99	10.1010	99 5.02513	99 3.34448	99 2.50627	99 2.00401	99 1.66945	99 1.43062	99 1.25156	99 1.11235	99 1.00100

	1100		1200		1300		1400		1500		1600		1700		1800		1900	
	1100	.90909	1200	.83333	1300	.76923	1400	.71429	1500	.66667	1600	.62500	1700	.58824	1800	.55556	1900	.52632
1001	.99900	1101	.90827	1201	.83264	1301	.76864	1401	.71378	1501	.66622	1601	.62461	1701	.58789	1801	.55525	1901	.52604
1002	.99800	1102	.90744	1202	.83195	1302	.76805	1402	.71327	1502	.66578	1602	.62422	1702	.58754	1802	.55494	1902	.52576
1003	.99701	1103	.90662	1203	.83126	1303	.76746	1403	.71276	1503	.66534	1603	.62383	1703	.58720	1803	.55463	1903	.52549
1004	.99602	1104	.90580	1204	.83056	1304	.76687	1404	.71225	1504	.66489	1604	.62344	1704	.58685	1804	.55432	1904	.52521
1005	.99502	1105	.90498	1205	.82988	1305	.76628	1405	.71174	1505	.66445	1605	.62305	1705	.58651	1805	.55402	1905	.52493
1006	.99404	1106	.90416	1206	.82919	1306	.76570	1406	.71124	1506	.66401	1606	.62267	1706	.58617	1806	.55371	1906	.52466
1007	.99305	1107	.90334	1207	.82850	1307	.76511	1407	.71073	1507	.66357	1607	.62228	1707	.58582	1807	.55340	1907	.52438
1008	.99206	1108	.90253	1208	.82781	1308	.76453	1408	.71023	1508	.66313	1608	.62189	1708	.58548	1808	.55310	1908	.52411
1009	.99108	1109	.90171	1209	.82713	1309	.76394	1409	.70972	1509	.66269	1609	.62150	1709	.58514	1809	.55279	1909	.52383
1010	.99010	1110	.90090	1210	.82645	1310	.76336	1410	.70922	1510	.66225	1610	.62112	1710	.58480	1810	.55249	1910	.52356
1011	.98912	1111	.90009	1211	.82576	1311	.76278	1411	.70872	1511	.66181	1611	.62073	1711	.58445	1811	.55218	1911	.52329
1012	.98814	1112	.89928	1212	.82508	1312	.76220	1412	.70822	1512	.66138	1612	.62035	1712	.58411	1812	.55188	1912	.52301
1013	.98717	1113	.89847	1213	.82440	1313	.76161	1413	.70771	1513	.66094	1613	.61996	1713	.58377	1813	.55157	1913	.52274
1014	.98619	1114	.89767	1214	.82372	1314	.76104	1414	.70721	1514	.66050	1614	.61958	1714	.58343	1814	.55127	1914	.52247
1015	.98522	1115	.89686	1215	.82305	1315	.76046	1415	.70671	1515	.66007	1615	.61920	1715	.58309	1815	.55096	1915	.52219
1016	.98425	1116	.89606	1216	.82237	1316	.75988	1416	.70621	1516	.65963	1616	.61881	1716	.58275	1816	.55066	1916	.52192
1017	.98328	1117	.89526	1217	.82169	1317	.75930	1417	.70572	1517	.65920	1617	.61843	1717	.58241	1817	.55036	1917	.52165
1018	.98232	1118	.89445	1218	.82102	1318	.75873	1418	.70522	1518	.65876	1618	.61805	1718	.58207	1818	.55006	1918	.52138
1019	.98135	1119	.89366	1219	.82034	1319	.75815	1419	.70472	1519	.65833	1619	.61767	1719	.58173	1819	.54975	1919	.52110
1020	.98039	1120	.89286	1220	.81967	1320	.75758	1420	.70423	1520	.65789	1620	.61728	1720	.58140	1820	.54945	1920	.52083
1021	.97943	1121	.89206	1221	.81900	1321	.75700	1421	.70373	1521	.65746	1621	.61690	1721	.58106	1821	.54915	1921	.52056
1022	.97847	1122	.89127	1222	.81833	1322	.75643	1422	.70323	1522	.65703	1622	.61652	1722	.58072	1822	.54885	1922	.52029
1023	.97752	1123	.89047	1223	.81766	1323	.75586	1423	.70274	1523	.65660	1623	.61614	1723	.58038	1823	.54855	1923	.52002
1024	.97656	1124	.88968	1224	.81699	1324	.75529	1424	.70225	1524	.65617	1624	.61576	1724	.58005	1824	.54825	1924	.51975
1025	.97561	1125	.88889	1225	.81633	1325	.75472	1425	.70175	1525	.65574	1625	.61538	1725	.57971	1825	.54795	1925	.51948
1026	.97466	1126	.88810	1226	.81566	1326	.75415	1426	.70126	1526	.65531	1626	.61501	1726	.57937	1826	.54765	1926	.51921
1027	.97371	1127	.88731	1227	.81500	1327	.75358	1427	.70077	1527	.65488	1627	.61463	1727	.57904	1827	.54735	1927	.51894
1028	.97276	1128	.88652	1228	.81433	1328	.75301	1428	.70028	1528	.65445	1628	.61425	1728	.57870	1828	.54705	1928	.51867
1029	.97182	1129	.88574	1229	.81367	1329	.75245	1429	.69979	1529	.65402	1629	.61387	1729	.57837	1829	.54675	1929	.51840
1030	.97087	1130	.88496	1230	.81301	1330	.75188	1430	.69930	1530	.65359	1630	.61350	1730	.57803	1830	.54645	1930	.51813
1031	.96993	1131	.88417	1231	.81235	1331	.75131	1431	.69881	1531	.65317	1631	.61312	1731	.57770	1831	.54615	1931	.51787
1032	.96899	1132	.88339	1232	.81169	1332	.75075	1432	.69832	1532	.65274	1632	.61275	1732	.57737	1832	.54585	1932	.51760
1033	.96805	1133	.88261	1233	.81103	1333	.75019	1433	.69784	1533	.65232	1633	.61237	1733	.57703	1833	.54556	1933	.51733
1034	.96712	1134	.88183	1234	.81037	1334	.74963	1434	.69735	1534	.65189	1634	.61200	1734	.57670	1834	.54526	1934	.51706
1035	.96618	1135	.88106	1235	.80972	1335	.74906	1435	.69686	1535	.65147	1635	.61162	1735	.57637	1835	.54496	1935	.51680
1036	.96525	1136	.88028	1236	.80906	1336	.74850	1436	.69638	1536	.65104	1636	.61125	1736	.57604	1836	.54466	1936	.51653
1037	.96432	1137	.87951	1237	.80841	1337	.74794	1437	.69589	1537	.65062	1637	.61087	1737	.57571	1837	.54437	1937	.51626
1038	.96339	1138	.87873	1238	.80775	1338	.74738	1438	.69541	1538	.65020	1638	.61050	1738	.57537	1838	.54407	1938	.51600
1039	.96246	1139	.87796	1239	.80710	1339	.74683	1439	.69493	1539	.64977	1639	.61013	1739	.57504	1839	.54377	1939	.51573
1040	.96154	1140	.87719	1240	.80645	1340	.74627	1440	.69444	1540	.64935	1640	.60976	1740	.57471	1840	.54348	1940	.51546
1041	.96061	1141	.87642	1241	.80580	1341	.74571	1441	.69396	1541	.64893	1641	.60939	1741	.57438	1841	.54318	1941	.51520
1042	.95969	1142	.87566	1242	.80515	1342	.74516	1442	.69348	1542	.64851	1642	.60902	1742	.57405	1842	.54289	1942	.51493
1043	.95877	1143	.87489	1243	.80451	1343	.74460	1443	.69300	1543	.64809	1643	.60864	1743	.57372	1843	.54259	1943	.51467
1044	.95785	1144	.87413	1244	.80386	1344	.74405	1444	.69252	1544	.64767	1644	.60827	1744	.57339	1844	.54230	1944	.51440
1045	.95694	1145	.87336	1245	.80321	1345	.74349	1445	.69204	1545	.64725	1645	.60790	1745	.57307	1845	.54201	1945	.51414
1046	.95602	1146	.87260	1246	.80257	1346	.74294	1446	.69156	1546	.64683	1646	.60753	1746	.57274	1846	.54171	1946	.51387
1047	.95511	1147	.87184	1247	.80192	1347	.74239	1447	.69108	1547	.64641	1647	.60716	1747	.57241	1847	.54142	1947	.51361
1048	.95420	1148	.87108	1248	.80128	1348	.74184	1448	.69061	1548	.64599	1648	.60680	1748	.57208	1848	.54113	1948	.51335
1049	.95329	1149	.87032	1249	.80064	1349	.74129	1449	.69013	1549	.64558	1649	.60643	1749	.57176	1849	.54083	1949	.51308
1050	.95238	1150	.86957	1250	.80000	1350	.74074	1450	.68966	1550	.64516	1650	.60606	1750	.57143	1850	.54054	1950	.51282
1051	.95147	1151	.86881	1251	.79936	1351	.74019	1451	.68918	1551	.64475	1651	.60569	1751	.57110	1851	.54025	1951	.51256
1052	.95057	1152	.86806	1252	.79872	1352	.73964	1452	.68871	1552	.64433	1652	.60533	1752	.57078	1852	.53996	1952	.51230
1053	.94967	1153	.86730	1253	.79808	1353	.73910	1453	.68823	1553	.64392	1653	.60496	1753	.57045	1853	.53967	1953	.51203
1054	.94877	1154	.86655	1254	.79745	1354	.73855	1454	.68776	1554	.64350	1654	.60459	1754	.57013	1854	.53937	1954	.51177
1055	.94787	1155	.86580	1255	.79681	1355	.73801	1455	.68729	1555	.64309	1655	.60423	1755	.56980	1855	.53908	1955	.51151
1056	.94697	1156	.86505	1256	.79618	1356	.73746	1456	.68681	1556	.64267	1656	.60386	1756	.56948	1856	.53879	1956	.51125
1057	.94607	1157	.86430	1257	.79554	1357	.73692	1457	.68634	1557	.64226	1657	.60350	1757	.56915	1857	.53850	1957	.51099
1058	.94518	1158	.86356	1258	.79491	1358	.73638	1458	.68587	1558	.64185	1658	.60314	1758	.56883	1858	.53821	1958	.51073
1059	.94429	1159	.86281	1259	.79428	1359	.73584	1459	.68540	1559	.64144	1659	.60277	1759	.56850	1859	.53792	1959	.51046
1060	.94340	1160	.86207	1260	.79365	1360	.73529	1460	.68493	1560	.64103	1660	.60241	1760	.56818	1860	.53763	1960	.51020
1061	.94251	1161	.86133	1261	.79302	1361	.73475	1461	.68446	1561	.64061	1661	.60205	1761	.56786	1861	.53735	1961	.50994
1062	.94162	1162	.86059	1262	.79239	1362	.73421	1462	.68399	1562	.64020	1662	.60168	1762	.56754	1862	.53706	1962	.50968
1063	.94073	1163	.85985	1263	.79177	1363	.73368	1463	.68353	1563	.63980	1663	.60132	1763	.56721	1863	.53677	1963	.50942
1064	.93985	1164	.85911	1264	.79114	1364	.73314	1464	.68306	1564	.63939	1664	.60096	1764	.56689	1864	.53648	1964	.50916
1065	.93897	1165	.85837	1265	.79051	1365	.73260	1465	.68259	1565	.63898	1665	.60060	1765	.56657	1865	.53619	1965	.50891
1066	.93809	1166	.85763	1266	.78989	1366	.73206	1466	.68213	1566	.63857	1666	.60024	1766	.56625	1866	.53591	1966	.50865
1067	.93721	1167	.85690	1267	.78927	1367	.73153	1467	.68166	1567	.63816	1667	.59988	1767	.56593	1867	.53562	1967	.50839
1068	.93633	1168	.85616	1268	.78864	1368	.73099	1468	.68120	1568	.63776	1668	.59952	1768	.56561	1868	.53533	1968	.50813
1069	.93545	1169	.85543	1269	.78802	1369	.73046	1469	.68074	1569	.63735	1669	.59916	1769	.56529	1869	.53505	1969	.50787
1070	.93458	1170	.85470	1270	.78740	1370	.72993	1470	.68027	1570	.63694	1670	.59880	1770	.56497	1870	.53476	1970	.50761
1071	.93371	1171	.85397	1271	.78678	1371	.72939	1471	.67981	1571	.63654	1671	.59844	1771	.56465	1871	.53447	1971	.50736
1072	.93284	1172	.85324	1272	.78616	1372	.72886	1472	.67935	1572	.63613	1672	.59809	1772	.56433	1872	.53419	1972	.50710
1073	.93197	1173	.85251	1273	.78555	1373	.72833	1473	.67889	1573	.63573	1673	.59773	1773	.56402	1873	.53390	1973	.50684
1074	.93110	1174	.85179	1274	.78493	1374	.72780	1474	.67843	1574	.63532	1674	.59737	1774	.56370	1874	.53362	1974	.50659
1075	.93023	1175	.85106	1275	.78431	1375	.72727	1475	.67797	1575	.63492	1675	.59701	1775	.56338	1875	.53333	1975	.50633
1076	.92937	1176	.85034	1276	.78370	1376	.72674	1476	.67751	1576	.63452	1676	.59666	1776	.56306	1876	.53305	1976	.50607
1077	.92851	1177	.84962	1277	.78309	1377	.72622	1477	.67705	1577	.63412	1677	.59630	1777	.56275	1877	.53277	1977	.50582
1078	.92764	1178	.84890	1278	.78247	1378	.72569	1478	.67659	1578	.63371	1678	.59595	1778	.56243	1878	.53248	1978	.50556
1079	.92678	1179	.84818	1279	.78186	1379	.72516	1479	.67613	1579	.63331	1679	.59559	1779	.56211	1879	.53220	1979	.50531
1080	.92593	1180	.84746	1280	.78125	1380	.72464	1480	.67568	1580	.63291	1680	.59524	1780	.56180	1880	.53191	1980	.50505
1081	.92507	1181	.84674	1281	.78064	1381	.72411	1481	.67522	1581	.63251	1681	.59488	1781	.56148	1881	.53163	1981	.50480
1082	.92421	1182	.84602	1282	.78003	1382	.72359	1482	.67476	1582	.63211	1682	.59453	1782	.56117	1882	.53135	1982	.50454
1083	.92336	1183	.84531	1283	.77942	1383	.72307	1483	.67431	1583	.63171	1683	.59418	1783	.56085	1883	.53107	1983	.50429
1084	.92251	1184	.84459	1284	.77882	1384	.72254	1484	.67385	1584	.63131	1684	.59382	1784	.56054	1884	.53079	1984	.50403
1085	.92166	1185	.84388	1285	.77821	1385	.72202	1485	.67340	1585	.63091	1685	.59347	1785	.56022	1885	.53050	1985	.50378
1086	.92081	1186	.84317	1286	.77760	1386	.72150	1486	.67295	1586	.63052	1686	.59312	1786	.55991	1886	.53022	1986	.50353
1087	.91996	1187	.84246	1287	.77700	1387	.72098	1487	.67249	1587	.63012	1687	.59277	1787	.55960	1887	.52994	1987	.50327
1088	.91912	1188	.84175	1288	.77640	1388	.72046	1488	.67204	1588	.62972	1688	.59242	1788	.55928	1888	.52966	1988	.50302
1089	.91827	1189	.84104	1289	.77580	1389	.71994	1489	.67159	1589	.62933	1689	.59207	1789	.55897	1889	.52938	1989	.50277
1090	.91743	1190	.84034	1290	.77519	1390	.71942	1490	.67114	1590	.62893	1690	.59172	1790	.55866	1890	.52910	1990	.50251
1091	.91659	1191	.83963	1291	.77459	1391	.71891	1491	.67069	1591	.62854	1691	.59137	1791	.55835	1891	.52882	1991	.50226
1092	.91575	1192	.83893	1292	.77399	1392	.71839	1492	.67024	1592	.62814	1692	.59102	1792	.55804	1892	.52854	1992	.50201
1093	.91491	1193	.83822	1293	.77340	1393	.71788	1493	.66979	1593	.62775	1693	.59067	1793	.55772	1893	.52826	1993	.50176
1094	.91408	1194	.83752	1294	.77280	1394	.71736	1494	.66934	1594	.62735	1694	.59032	1794	.55741	1894	.52798	1994	.50150
1095	.91324	1195	.83682	1295	.77220	1395	.71685	1495	.66890	1595	.62696	1695	.58997	1795	.55710	1895	.52770	1995	.50125
1096	.91241	1196	.83612	1296	.77160	1396	.71633	1496	.66845	1596	.62657	1696	.58962	1796	.55679	1896	.52743	1996	.50100
1097	.91158	1197	.83542	1297	.77101	1397	.71582	1497	.66800	1597	.62617	1697	.58928	1797	.55648	1897	.52715	1997	.50075
1098	.91075	1198	.83472	1298	.77042	1398	.71531	1498	.66756	1598	.62578	1698	.58893	1798	.55617	1898	.52687	1998	.50050
1099	.90992	1199	.83403	1299	.76982	1399	.71480	1499	.66711	1599	.62539	1699	.58858	1799	.55586	1899	.52659	1999	.50025