# RAYTHEON MARCHANT CALCULATOR BINARY-OCTAL

MODEL
10MR

## OPERATING INSTRUCTIONS

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*President*



# MARCHANT
# RAYTHEON BINARY-OCTAL
# CALCULATOR

**Model – 10MR**

## DESCRIPTION

The Raytheon-Marchant Binary-Octal calculator, model 10MR, is a ten-bank desk calculator which operates in the octal number system. The calculator has all the standard operating features of the Marchant Figuremaster, and, in addition, a stop-lock lever has been added to facilitate conversions of numbers to the decimal system. The 8 and 9 multiplier keys have also been retained to facilitate decimal to octal conversions.

The octal scale of notation is simply related to the binary scale as follows:

**TABLE 1**

| OCTAL | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|---|
| BINARY | 000 | 001 | 010 | 011 | 100 | 101 | 110 | 111 |

Both the binary scale and the octal digits appear on the keys and dials of the calculator so that the binary equivalent of any octal number, or vice versa, may be read directly. On the keys, the binary digits appear in grey directly above the red octal digits, with dots representing zeros and vertical bars representing ones. The same markings appear on the dials.

To convert binary numbers to octal numbers proceed as follows:

1. Mark off groups of three digits each in the binary number both to the left and to the right of the binary point.

2. Read the direct octal equivalent of each group of three binary digits from the table above.

**Example:**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| BINARY | 100 | 101 | 111 | 011 | . | 010 | 110 |
| OCTAL | 4 | 5 | 7 | 3 | . | 2 | 6 |

In addition to the regular binary and octal symbols, the Upper Dials also contain the decimal digits 8 and 9, which permits the direct reading of decimal numbers from the Upper Dials when performing conversions from octal to decimal.

The standard operations of addition, subtraction, multiplication and division are performed on the binary-octal calculator in the same manner as similar operations are performed on the standard Marchant Figuremaster calculator Standard double precision routines and many special machine methods may be used provided that it is remembered that the Upper Dials carry in the decimal system, while the remainder of the calculator, with the exception of the 8 and 9 multiplier keys, is strictly octal.

Since all of the keys and dials display the binary equivalent of each octal figure appearing thereon, factors and other amounts entered into the calculator may be set up directly in binary or equally readily in the octal system, the same key being depressed in either case, the operator being free to observe either the binary notation or the octal digit on the keys in selecting the keys to depress. Similarly, all results, such as products, quotients, totals, and the like, may be read off directly in binary figures or as octal numbers at the operator's option, since all such results are simultaneously displayed in both systems. Wherever reference is made to the octal system throughout the following instructions, the numbers referred to as octal may optionally be handled directly as binary numbers without necessity for any separate process of translating from binary to octal or vice versa.

The following abbreviations are used in this manual:

| | |
|---|---|
| KBD | Keyboard Dials |
| UD | Upper Dials |
| MD | Middle Dials |



## ADDITION

Addition is performed as follows:

1. Clear the calculator
2. Tab carriage to position 1.
3. Position MD pointer to "+" on KBD slide, and position slide so KBD pointer indicates octal point selected for KBD quantity.
4. Enter octal augend in KBD; touch add control.
5. Enter octal addend in KBD; touch add control.
6. Read octal sum in MD.

*Note:* The UD counts the number of operations in the decimal system.

**Example of Addition**

| | |
|---|---|
| 4351.7620 | augend |
| +5516.3754 | addend |
| 12070.3574 | sum |

## SUBTRACTION

Subtraction is performed as follows:

1. Clear the calculator
2. Tab carriage to position 1.
3. Position MD pointer to "+" on KBD slide, and position slide so KBD pointer indicates octal point selected for KBD quantity.
4. Enter octal minuend in KBD; touch add control.
5. Enter octal subtrahend in KBD; touch subtract control.
6. Read octal difference in MD. (See Note.)

*Note:* A negative difference appears in complementary form. In order to read negative differences directly from MD, operations on minuend and subtrahend must be reversed, or the complement of the difference converted to a direct indication of the negative amount by shifting the carriage to line up KBD with the significant figures to be converted, copying to the corresponding KBD all figures appearing in line therewith in MD, including any 7's at the left, and then depressing the Neg. X and the "2" multiplier keys.

### Examples of Subtraction

| | | | |
|---|---|---|---|
| 71560.504 | minuend | 356434.12 | minuend |
| −45277.731 | subtrahend | −6452476.71 | subtrahend |
| 24260.553 | difference | 71703735.21 | complement of difference |
| | | −6074042.57 | difference |



## MULTIPLICATION

Multiplication is performed as follows:

1. Clear the calculator.
2. Tab carriage to position 10.
3. Enter octal multiplicand in KBD.
4. Position KBD slide so that KBD pointer indicates KBD octal point. Position MD pointer on this slide over number corresponding to number of digits after octal point in multiplier. At conclusion of calculation, this pointer will indicate octal point of product appearing in MD. Also, position UD pointer to the number on back cover corresponding to the number of digits after octal point in multiplier. At conclusion of problem, this pointer will indicate octal point in multiplier.
5. Touch multiplier keys corresponding to digits of multiplier, starting with most significant digit (leftmost), with non-shift key not depressed.
6. Read octal product in MD.

*Note:* When negative multiplication is desired, the negative multiplication key should be depressed in advance of the multiplier key. Since the multiplier key operation automatically releases this negative multiplication key, it will be found most convenient to depress the repeat negative multiplication key in case the negative multiplier contains a plurality of digits. This repeat negative multiplication key may be released by depression of the stop key or the tab key.

### Example of Multiplication

| | |
|---|---|
| 421763.5 | multiplicand |
| x3125.607 | multiplier |
| 1543644030.5313 | product |

## DIVISION

Division is performed as follows:

1. With carriage at extreme left, clear the calculator.
2. Choose an octal point on KBD suitable for entry of all dividends and divisors, and set the KBD pointer to this position.
3. Decide how many digits it is desired to compute after the octal point in the quotient and depress the columnar tab key numbered one greater than this number. Touch the "Tab" key, bringing the carriage to this position. Move MD pointer to "+" on KBD slide.
4. Position clear and return lever forward.
5. Enter octal dividend in KBD, setting it up with reference to the chosen octal point, and touch add control.
6. Enter octal divisor in KBD with respect to the same octal point.
7. Shift carriage to line up first digits of dividend and divisor, or touch "Tab" key to bring carriage fully to the right.
8. Touch divide key.
9. Read octal quotient in UD with the octal point indicated by the division sign on the back cover.

*Note 1:* UD clears automatically before division if stop key is not depressed. If for any reason such clearance is not desired, stop key may be held depressed while divide key is being depressed.

*Note 2:* By following the above instructions, a series of divisions may be handled with each quotient correctly pointed off automatically at the conclusion of the calculation and with the carriage automatically positioned ready for entry of the next dividend.

*Note 3:* If the number of digits before and after the octal point in the dividend and divisor are such that it is not possible to use the same octal point in KBD for both the dividend and divisor, then the UD pointer may be positioned as many orders to the right or left of the division sign on the back cover as the KBD octal point used for the dividend is to the right or left of the KBD octal point used for the divisor, whereupon this pointer will correctly indicate the octal point in the quotient at the conclusion of the calculation. In this case, the number of digits computed after the octal point in the quotient is one less than the sum of the number of the columnar tab key depressed and the number of orders that the UD pointer is located to the left of the division sign on the back cover.

### EXAMPLE OF DIVISION

314670 dividend



## CONVERSION

Conversion from the octal number system to the decimal number system and vice versa may be performed by several different methods. Two methods for decimal to octal conversion are described herein, the first of which is of general use for any numbers with accuracy to approximately the capacity of the machine, while the second method provides exact accuracy for purely fractional numbers. Three methods for octal to decimal conversion are described including, as above, a general method and an exact method for fractional numbers, and also an alternative method especially convenient for the conversion of integral numbers.

## CONVERSION DECIMAL TO OCTAL

I. GENERAL METHOD APPLICABLE TO INTEGRAL, MIXED, AND FRACTIONAL NUMBERS

Accuracy Obtainable:

a. On integral numbers: Exact.

b. On mixed numbers and fractional numbers having no zeros after octal point: Accurate to tenth digit after octal point.

c. On fractional numbers having zeros after octal point: Accurate to nine significant digits.

1. Clear calculator; tab carriage to column 9. Depress non-shift key.

2. Divide the decimal number to be converted into pairs of digits each way from the decimal point. In Column A of Table 2 find the line listing the position of the first significant digit in the decimal number; note the "Corresponding Factor" in column B and enter this factor at extreme left of KBD. (See Note 1 re Conversion Card.)

3. Touch whatever multiplier keys are required to build up in orders 9 and 10 of UD the pair of digits for which the factor was selected.

4. Shift carriage two orders to the left. Change KBD to the next factor in Column B, starting it at extreme left of KBD, and build up the next two digits in orders 7 and 8 of UD.

(See Note 2 re Conversion Card.)
(See Note 3 re entries for fractional digits.)

5. Repeat this process for each pair of digits to be converted.

6. When multiplying by the factor "1" corresponding to the first and second digits before the decimal point, flip over the MD marker immediately to the right of the digit "1" in KBD, and the UD marker below the division sign on the back cover. (See Note 4.)

7. Upon completion of the foregoing steps, the decimal number converted appears properly pointed off in UD, and the octal equivalent properly pointed off in MD.



*Note 1:* If Conversion Card is used, omit reference to Table 2. Lay Conversion Card on keyboard in back of "7" keys with dotted vertical line at left of KBD and leave it in this position throughout problem. Find in parenthesis at left of card position of first significant digit relative to decimal; and enter amount which appears opposite this on card into KBD directly in line with amount on card.

*Note 2:* If Conversion Card is used, merely change KBD to next amount on card, entering it in line with amount on card.

*Note 3:* In converting mixed numbers, it is to be noted that the first significant digit in the Column B factors, for Column A digits after the decimal point, is entered in the next KBD column to the right of the first digit of Column B factors for Column A digits before the decimal. This is taken care of by keeping the dotted vertical line in Column B (or on Conversion Card) at the same KBD location for all factors.

*Note 4:* If the problem is such that the factor "1" is not employed (as where fractional numbers only are involved), octal point in MD may be set (or if off board, may be noted) as lining up with the octal point of any other KBD factor, for instance the first KBD factor entered in Step 2 or the last KBD factor employed.

## EXAMPLE

Given decimal number 291563.4805 to find octal equivalent:

1. Clear calculator; tab carriage to column 9. Depress non-shift key.
2. Dividing the number into pairs of digits each way from the decimal point, the leftmost pair of digits are the fifth and sixth digits before the decimal. From Column B of Table 2, or from Conversion Card, the corresponding factor is 23420, which is set up at the extreme left of KBD.
3. The amount expressed by the fifth and sixth digits, namely 29, is to be built up in the two leftmost dials of UD. This may be done by depressing the No. 9 multiplier key three times and the No. 2 multiplier key.
4. Shift the carriage two orders to the left. Change KBD to the next factor from Column B or Conversion Card, namely 144, which amount is also set up at the extreme left of KBD. Build into the next two dials of UD the amount represented by the next two digits of the decimal number, namely 15. This may be done by depressing the No. 8 and No. 7 multiplier keys or by depressing the No. 5 key three times.
5. Shift carriage two orders to the left. Change to the next factor, namely the digit "1" set up in the leftmost column of KBD. Build into the next two dials of UD the amount represented by the next two digits of the decimal number, namely 63. This may be done by depressing the No. 9 key seven times.
6. Before shifting, flip over the MD marker to the right of the digit "1" in KBD, which marks the octal point to the right of the 14th dial in MD. Also, flip over the UD marker beneath the division sign on the back cover, thus placing the decimal point in the number being converted to the right of the 5th dial in UD.
7. Shift carriage two orders to the left. Change KBD setting to the next amount in Column B or on the Conversion Card, namely 0507534122. In this case, the amount is set into KBD so that these ten digits appear in the respective ten columns of KBD, the first significant digit 5 thus appearing in the 9th column of KBD. Build up in the next two dials of UD the amount of the next pair of digits, namely 48. This may be done by depressing the No. 8 multiplier key six times.
8. Shift carriage two orders to the left. Change KBD setting to the next factor, namely 0321556135, and build up in the next two dials of UD the next two digits of the decimal number, namely 05, which merely requires depressing of the No. 5 multiplier key.
9. The octal equivalent 1071353.366 appears in MD, and the decimal number converted can be checked in UD, both amounts being properly pointed off by the markers previously set.



## TABLE 2

| Column A<br>*Relation of Decimal Digits to Decimal Point* | Column B<br>*Corresponding Factor* |
|---|---|
| 9th and 10th digit before decimal point | '5 7 5 3 6 0 4 0 0. |
| 7th " 8th " " " " | '3 6 4 1 1 0 0. |
| 5th " 6th " " " " | '2 3 4 2 0. |
| 3rd " 4th " " " " | '1 4 4. |
| 1st " 2nd " " " " | '1. |
| 1st " 2nd " after " " | .0'0 5 0 7 5 3 4 1 2 2 |
| 3rd " 4th " " " " | .0 0 0'0 3 2 1 5 5 6 1 3\|5 |
| 5th " 6th " " " " | .0 0 0 0 0'0 2 0 6 1 5 7\|3 6 4 |
| 7th " 8th " " " " | .0 0 0 0 0 0 0'0 1 2 5 7\|1 4 3 5 6 |
| 9th " 10th " " " " | .0 0 0 0 0 0 0 0 0'0 0 6\|6 7 6 3 3 7 7 |

*Note 1:* Vertical line in Column B must be at same KBD location for all Column B factors used in any given problem.

*Note 2:* There will seldom be need for setting up any of the numbers to the right of the diagonal line in the fractional factors, and in fact not all of those to the left need to be set up in most cases. It is only necessary to set up one more significant digit than the number of digits to be determined after the decimal or octal point in the first fractional factor entered. One less significant digit may then be set up in the second fractional factor employed, and two less in each successive factor thereafter. For instance, assuming that four digits have been determined before the decimal in a mixed number, and it is, therefore, only desired to determine six digits after the decimal, the significant digits set up would be as follows:

First Fractional Factor — 5075341
Second " " — 321556
Third " " — 2061

II. ALTERNATIVE METHOD FOR FRACTIONAL NUMBERS, GIVING EXACT CONVERSION

1. Assume decimal point to be ten places to the right of its actual position. Convert this ten digit integer to its octal equivalent by Method I, page 8, *EXCEPT* set factors beginning in 9th column of KBD instead of at extreme left of KBD. Do not clear MD.
2. Tab carriage to position 10. Enter 1124027620 in KBD.
3. Touch divide control, with stop control up.
4. Fractional octal equivalent appears in UD with octal point to the left of dial 10.



## CONVERSION OCTAL TO DECIMAL

I. GENERAL METHOD APPLICABLE TO INTEGRAL, MIXED, AND FRACTIONAL NUMBERS

Accuracy Obtainable:

a. On integral numbers: Exact.

b. On mixed numbers greater than 144.0: Accurate to full capacity of machine.

c. On mixed numbers less than 144.0: Accurate to 6 to 8 digits after decimal.

d. On fractional numbers: Accurate to 6 to 8 significant figures.

In case of c and d, variation in accuracy between 6 and 8 digits depends on whether divisors are entered starting in 8th, 9th, or 10th column of KBD, and may be increased to 7 to 8 digit accuracy by applying Note 2.

1. Clear calculator; tab carriage to position No. 10.
2. Enter octal number in KBD, starting at extreme left of KBD. Touch add control, and then touch subtract control to clear UD. Flip over the MD marker to point off properly the amount entered in MD.
3. Set clear and return lever to rear; depress stop key and lock down.
4. Select from Column B, Table 2, factor which constitutes largest divisor contained in MD value. Enter this factor into KBD, so that its octal point as indicated in Column B lines up with octal point set in MD.
   (See Note 1 re Conversion Card.)
   (See Note 2 re greater accuracy.)
5. Touch divide key.
6. Shift carriage two places to the left. Clear KBD. Enter as divisor the next factor which is found in Column B of Table 2 immediately below the factor previously set in the KBD, starting this setup in the same KBD column as the previous factor. Touch divide key.
   (See Note 3 re Conversion Card.)
   (See Note 4 re entries for fractional digits.)

7. Repeat Step 6 until the capacity of the machine is reached, or the desired number of digits have been computed.

8. When dividing by the divisor "1", flip over the UD marker located under the division sign on the back cover, or alternatively complete problem and then flip UD marker so that last two digits computed will be located with reference to the decimal as noted in Column A (or as noted in parenthesis at left of Conversion Card).

9. Decimal equivalent is in UD with decimal point indicated by the white decimal marker.

*Note 1:* If Conversion Card is used, omit reference to Table 2; select largest divisor on Conversion Card contained in MD value; lay card on keyboard in back of "7" keys in such a position that the octal point of this divisor on card lines with octal point set in MD, and leave card in this position throughout problem. Enter divisor selected on card into KBD in direct line above amount on card.

*Note 2:* For all numbers having more than 3 digits before the octal point (in fact all numbers greater than 144.0) the method set forth above will give accuracy to the full 10 digit capacity of the machine. On smaller numbers, mixed or fractional, accuracy to at least 9 or 10 digits can be attained by the following change in Step 4: After selecting factor from Table 2, note whether it has the same number of digits before (or initial zeros after) the octal point as the octal number in the MD. If it does have the same number, leave the carriage in position 10, as described in Step 4. Otherwise, shift it to position 9 before entering factor into KBD with octal point in line with octal point in MD.

*Note 3:* If Conversion Card is used, merely change KBD to next amount on card, entering it in line with amount on card.

*Note 4:* In converting mixed numbers, it is to be noted that the first significant digit in the Column B factors, for Column A digits after the decimal point, is entered in the next KBD column to the right of the first digit of Column B factors for Column A digits before the decimal. This is taken care of by keeping the dotted vertical line in Column B (or on Conversion Card) at the same KBD location for all factors.



## EXAMPLE

Given octal number 1461645.054 to find decimal equivalent:

1. Clear calculator; tab carriage to position No. 10.

2. Enter given octal number 1461645.054 in KBD starting at the extreme left of KBD. Touch add control and then subtract control. Flip over the MD marker to left of No. 12 dial to point off this number.

3. Set clear and return lever to rear; depress stop key and lock down.

4. Select from Column B, Table 2, or from Conversion Card, factor which constitutes largest divisor contained in this MD value, which will be 23420. Set this up so that its octal point will align with the octal point in MD, which requires starting the setup in the 8th KBD column.

5. Touch divide key. This computes the first two digits "41" of the decimal equivalent.

6. Shift carriage two places to the left. Clear KBD, enter as divisor the next factor, namely 144., starting this setup in Column 8. Touch divide key.

7. Shift carriage two places to the left. Clear KBD and enter next factor 1. in KBD in Column 8, and touch divide key.

8. Shift carriage two places to the left; clear KBD; and enter next factor 05075341 with the first digit 5 being placed in the 7th KBD column; and touch divide key.

9. Shift carriage two places to the left; change KBD setup to next factor 03215561, and touch divide key.

10. Noting that the last factor set up was for the third and fourth digits after the decimal, flip over the UD marker that will place the last two digits computed as the third and fourth digits after the decimal, namely the marker in front of the fifth dial order of the UD. The corresponding decimal figure now appears properly pointed off in the UD 418725.0859.

## II. ALTERNATIVE METHOD FOR FRACTIONAL NUMBERS, GIVING EXACT CONVERSION

1. Clear calculator; tab carriage to position No, 9.
2. Enter octal fraction in KBD with octal point left of KBD dial 10.
3. Multiply by 112402762.
4. Tab carriage to position No. 9.
5. Clear UD and proceed as in conversion of *integral* octal number of ten digits per General Method, page 13, starting with Step 3 *EXCEPT* enter highest significant digit of each divisor in KBD dial 8.
6. Decimal number is in UD with decimal point to left of dial 10.

## III. ALTERNATIVE METHOD APPLICABLE TO INTEGRAL NUMBERS

1. Clear calculator. Tab carriage to position given by Table 3, as determined by number of octal digits.
2. Enter octal number in KBD with lowest order digit in KBD dial 1. Touch add control.
3. Clear UD. Set clear and return control to rear; depress stop key and lock down.
4. Select divisor from Table 3 corresponding to number of digits and enter in KBD with highest order digit in same column as depressed tab key.
5. Touch divide control.
6. Shift carriage two places left.
7. Clear KBD. Enter next divisor which is found immediately below previous divisor in Table 3, in KBD with highest order digit in same column as depressed tab key.
8. Repeat 5, 6, and 7 until last divisor has been used.
9. Decimal equivalent is in UD with decimal point to right of dial 1.



**TABLE 3**

| *Number of Digits* | *Tab MD to Position* | *Divisor* |
|---|---|---|
| 9 or 10 | 9 | 5753604 |
| 7 or 8 | 7 | 36411 |
| 5 or 6 | 5 | 2342 |
| 3 or 4 | 3 | 144 |
| 1 or 2 | 1 | 1 |

## TABLE 4

TABLE OF FACTORS FOR EACH DECIMAL DIGIT
FROM TENTH DIGIT BEFORE TO TENTH DIGIT AFTER DECIMAL POINT

| Column A — *Relation of Decimal Digit to Decimal Point* | Column B — *Corresponding Factor* |
|---|---|
| 10th digit before decimal point | 7 3 4 6 5 4 5 0 0 0. |
| 9th " " " " | 5 7 5 3 6 0 4 0 0.0 |
| 8th " " " " | 4 6 1 1 3 2 0 0.0 0 |
| 7th " " " " | 3 6 4 1 1 0 0.0 0 0 |
| 6th " " " " | 3 0 3 2 4 0.0 0 0 0 |
| 5th " " " " | 2 3 4 2 0.0 0 0 0 0 |
| 4th " " " " | 1 7 5 0.0 0 0 0 0 0 |
| 3rd " " " " | 1 4 4.0 0 0 0 0 0 0 |
| 2nd " " " " | 1 2.0 0 0 0 0 0 0 0 |
| 1st " " " " | 1.0 0 0 0 0 0 0 0 0 |
| 1st " after " " | .0 6 3 1 4 6 3 1 4 6 |
| 2nd " " " " | .0'0 5 0 7 5 3 4 1 2 2 |
| 3rd " " " " | .0 0'0 4 0 6 1 1 1 5 6 5 |
| 4th " " " " | .0 0 0'0 3 2 1 5 5 6 1 3 5 |
| 5th " " " " | .0 0 0 0'0 2 4 7 6 1 3 2 6 1 |
| 6th " " " " | .0 0 0 0 0'0 2 0 6 1 5 7 3 6 4 |
| 7th " " " " | .0 0 0 0 0 0'0 1 5 3 2 7 7 4 5 2 |
| 8th " " " " | .0 0 0 0 0 0 0'0 1 2 5 7 1 4 3 5 6 |
| 9th " " " " | .0 0 0 0 0 0 0 0'0 1 0 4 5 6 0 2 7 7 |
| 10th " " " " | .0 0 0 0 0 0 0 0 0'0 0 6 6 7 6 3 3 7 7 |

*Note:* There will seldom be need for setting up any of the numbers to the right of the diagonal line in the fractional factors, and in fact not all of those to the left need to be set up in most cases. It is only necessary to set up one more significant digit than the number of digits to be determined after the decimal or octal point in the first two fractional factors employed, and one less in each succeeding factor thereafter.



## TABLE 5

DECIMAL – OCTAL EQUIVALENTS

| *Decimal* | | *Octal* | |
|---|---|---|---|
| 1 | $8^0$ | 1 | $10^0$ |
| 8 | $8^1$ | 10 | $10^1$ |
| 64 | $8^2$ | 100 | $10^2$ |
| 512 | $8^3$ | 1,000 | $10^3$ |
| 4,096 | $8^4$ | 10,000 | $10^4$ |
| 32,768 | $8^5$ | 100,000 | $10^5$ |
| 262,144 | $8^6$ | 1,000,000 | $10^6$ |
| 2,097,152 | $8^7$ | 10,000,000 | $10^7$ |
| 16,777,216 | $8^8$ | 100,000,000 | $10^{10}$ |
| 134,217,728 | $8^9$ | 1,000,000,000 | $10^{11}$ |
| 1,073,741,824 | $8^{10}$ | 10,000,000,000 | $10^{12}$ |
| 1 | $10^0$ | 1 | $12^0$ |
| 10 | $10^1$ | 12 | $12^1$ |
| 100 | $10^2$ | 144 | $12^2$ |
| 1,000 | $10^3$ | 1,750 | $12^3$ |
| 10,000 | $10^4$ | 23,420 | $12^4$ |
| 100,000 | $10^5$ | 303,240 | $12^5$ |
| 1,000,000 | $10^6$ | 3,641,100 | $12^6$ |
| 10,000,000 | $10^7$ | 46,113,200 | $12^7$ |
| 100,000,000 | $10^8$ | 575,360,400 | $12^{10}$ |
| 1,000,000,000 | $10^9$ | 7,346,545,000 | $12^{11}$ |
| 10,000,000,000 | $10^{10}$ | 112,402,762,000 | $12^{12}$ |