

Multiplication for Young People

Darren S. Tapp

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We have studied multiplication. For example $3 \times 4 = 12$.

$$3 \times 4 = 3 + 3 + \underbrace{3 + 3}_{6}$$
$$\underbrace{\hspace{10em}}_{9}$$
$$\underbrace{\hspace{15em}}_{12}$$

We even worked out a multiplication table.

\times	1	2	3	4	5	6	7	8	9	10
1	1	2	3	4	5	6	7	8	9	10
2	2	4	6	8	10	12	14	16	18	20
3	3	6	9	12	15	18	21	24	27	30
4	4	8	12	16	20	24	28	32	36	40
5	5	10	15	20	25	30	35	40	45	50
6	6	12	18	24	30	36	42	48	54	60
7	7	14	21	28	35	42	49	56	63	70
8	8	16	24	32	40	48	56	64	72	80
9	9	18	27	36	45	54	63	72	81	90
10	10	20	30	40	50	60	70	80	90	100

What about larger numbers? For example 15×5 . We could make the table even bigger, but that would take time and we might run out of paper. It will be better to perform a sequence of smaller steps and put that together for the answer. Such a sequence of steps is called an algorithm. We will work out several examples showing each step.

Our first example is 23×3

$$\begin{array}{r} 23 \\ \times 3 \\ \hline \end{array} \longrightarrow \begin{array}{r} 23 \\ \times 3 \\ \hline 9 \end{array} \longrightarrow \begin{array}{r} 23 \\ \times 3 \\ \hline 69 \end{array}$$

We look at each digit. First we multiply the 3×3 which is 9 then we multiply the 2×3 which is a 6 in the tens place.

Our second example 15×5 .

$$\begin{array}{r} 15 \\ \times 5 \\ \hline \end{array} \longrightarrow \begin{array}{r} 15 \\ \times 5 \\ \hline 5 \end{array} \longrightarrow \begin{array}{r} 15 \\ \times 5 \\ \hline 75 \end{array}$$

We look at each digit. We can do the math one digit at a time. First we do the 5×5 which is 25, we carry the 2. Next we multiply 1×5 which is 5 and add the 2 which yields 7. 15×5 is 75

We can do very large numbers with this process! For example 76×4

$$\begin{array}{r} 76 \\ \times 4 \\ \hline \end{array} \longrightarrow \begin{array}{r} 76 \\ \times 4 \\ \hline 4 \end{array} \longrightarrow \begin{array}{r} 76 \\ \times 4 \\ \hline 304 \end{array}$$

First do 6 times 4 which is 24. Write the 4 and carry the 2 tens. Then $7 \times 4 = 28$ plus the 2 that we carried which is 30. Write the 30 next to the 4, $76 \times 4 = 304$.

Here are some for you to try.

$$\begin{array}{r} 14 \\ \times 2 \\ \hline \end{array}$$

$$\begin{array}{r} 15 \\ \times 3 \\ \hline \end{array}$$

$$\begin{array}{r} 11 \\ \times 7 \\ \hline \end{array}$$

$$\begin{array}{r} 13 \\ \times 7 \\ \hline \end{array}$$

$$\begin{array}{r} 42 \\ \times 4 \\ \hline \end{array}$$

$$\begin{array}{r} 28 \\ \times 6 \\ \hline \end{array}$$

$$\begin{array}{r} 74 \\ \times 8 \\ \hline \end{array}$$

$$\begin{array}{r} 92 \\ \times 5 \\ \hline \end{array}$$

$$\begin{array}{r} 84 \\ \times 7 \\ \hline \end{array}$$

$$\begin{array}{r} 99 \\ \times 9 \\ \hline \end{array}$$