

Estimating Products

To estimate the result of multiplication (product), round the numbers to some close numbers that you can easily multiply mentally.

One method of estimation is to round all factors to the biggest digit (place value) they have. (This is somewhat of a crude method but serves as a starting point in learning estimation.)

For example, estimate 365×24 . Round 365 to nearest hundred, and 24 to nearest ten. So $365 \approx 400$, and $24 \approx 20$. Then $365 \times 24 \approx 400 \times 20 = 8000$. This way it is easy to do since you only need to go single digit (4) times a single digit (2), and tag zeros to the end (000).

Examples:

	Estimation	In reality:	Estimation	In reality:
<i>Look at the biggest place value, and round to nearest hundred or nearest ten.</i>	133×27 $\approx 100 \times 30$ $= 3000$	$\begin{array}{r} 22 \\ 133 \\ \times 27 \\ \hline 931 \\ 2660 \\ \hline 3591 \end{array}$	79×73 $\approx 80 \times 70$ $= 5600$	$\begin{array}{r} 62 \\ 79 \\ \times 73 \\ \hline 237 \\ 5530 \\ \hline 5767 \end{array}$

Practice

1. Estimate products by rounding the factors to the biggest place value (to nearest hundred or nearest ten).

a. 158×32 $\approx 200 \times 30 = 6000$	b. 278×56 $\approx \underline{\quad} \times \underline{\quad} = \underline{\quad}$	c. 29×94 $\approx \underline{\quad} \times \underline{\quad} = \underline{\quad}$
d. 770×33 $\approx \underline{\quad} \times \underline{\quad} = \underline{\quad}$	e. 609×12 $\approx \underline{\quad} \times \underline{\quad} = \underline{\quad}$	f. 88×99 $\approx \underline{\quad} \times \underline{\quad} = \underline{\quad}$
g. 45×97 $\approx \underline{\quad} \times \underline{\quad} = \underline{\quad}$	h. 102×67 $\approx \underline{\quad} \times \underline{\quad} = \underline{\quad}$	i. 45×123 $\approx \underline{\quad} \times \underline{\quad} = \underline{\quad}$
j. 486×21 $\approx \underline{\quad} \times \underline{\quad} = \underline{\quad}$	k. 372×24 $\approx \underline{\quad} \times \underline{\quad} = \underline{\quad}$	l. 209×27 $\approx \underline{\quad} \times \underline{\quad} = \underline{\quad}$

2. One purpose of estimation is to catch gross errors in calculations. For example, if you estimate the result to be 5000, and you calculate it to be 354, you know something is wrong since you're way off.

Choose the best estimate. Then calculate the exact product.

Exact product

- | | | | |
|--------------------|----------------|----------------|----------------|
| 1. 103×52 | a. 6500 | b. 500 | c. 5000 |
| 2. 42×76 | a. 4000 | b. 3200 | c. 4800 |
| 3. 319×25 | a. 6000 | b. 750 | c. 9000 |
| 4. 17×17 | a. 1000 | b. 200 | c. 400 |
| 5. 99×59 | a. 6000 | b. 900 | c. 9000 |
| 6. 47×21 | a. 470 | b. 9700 | c. 1000 |

Were the estimates close?

3. Which product is furthest from its estimate (most 'off')? Can you see why?

Estimations:	Exact products:
a. $236 \times 28 \approx$	$236 \times 28 =$
b. $198 \times 28 \approx$	$198 \times 28 =$
c. $246 \times 28 \approx$	$246 \times 28 =$
d. $178 \times 28 \approx$	$178 \times 28 =$

(You can use the space below for multiplying)