Multiplying in Parts

1. Remember? You can multiply the thousands, hundreds, tens, and ones separately. Then add to get the final answer. This is called multiplying in parts or the partial products algorithm.

a. 4 × 27

4 × 20 + 4 × 7

_____ + _____

= _____

b. 7 × 83

7 × _____ + 7 × ___

_____ + _____

= _____

c. 8 × 56

____ × _____ + ____ × ___

_____ + _____

= _____

d. 5 × 216

5 × _____ + 5 × _____ + 5 × ___

_____ + _____ + _____

= _____

e. 4 × 3,481

4 × _____ + 4 × _____ + 4 × _____ + 4 × ___

_____ + _____ + _____ + _____

= _____

The partial products can also be written under each other, and then added.

```
   2 8 7
 ×   5
 -------
     3 5   ← 5 × 7
   4 0 0   ← 5 × 80
+ 1 0 0 0  ← 5 × 200
 -------
   1 4 3 5
```

2. Multiply using partial products.

a.

```
   4 9 2
 ×     6
 -------
```

6 × 2 →

6 × 90 →

6 × 400 →

+ _____

b.

```
   2 5 5
 ×     4
 -------
```

+ _____

c.

```
   8 1 7
 ×     7
 -------
```

+ _____

3. Multiply some bigger numbers using partial products.

a.

$$\begin{array}{r} 2\ 5\ 1\ 0 \\ \times\quad\ 9 \\ \hline \end{array}$$

9 × 0 →

9 × 10 →

9 × 500 →

9 × 2,000 → +

b.

$$\begin{array}{r} 4\ 4\ 7\ 8 \\ \times\quad\ 5 \\ \hline \end{array}$$

+

c.

$$\begin{array}{r} 2\ 6\ 0\ 7\ 2 \\ \times\quad\ 6 \\ \hline \end{array}$$

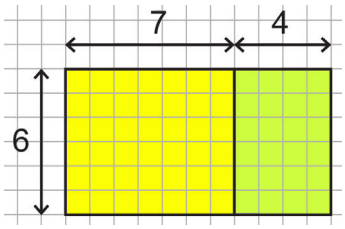
+

Remember? The picture on the right illustrates a principle that ties together area, addition, and multiplication.

The total area is $6 \times (7 + 4)$ square units.

The areas of the two parts are 6×7 and 6×4.

Therefore, $6 \times (7 + 4)$ equals $6 \times 7 + 6 \times 4$.



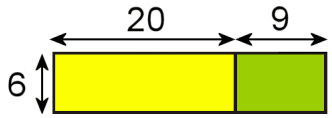
$6 \times (7 + 4) = 6 \times 7 + 6 \times 4$

This principle is called *the distributive property*, because it "distributes" multiplication over addition.
In general, we can express it using symbols: $a \times (b + c) = a \times b + a \times c$.

4. Fill in the missing parts, thinking of the area of the whole rectangle, or of the partial rectangles.

a. $6 \times 29 = 6 \times$ _____ + $6 \times$ _____

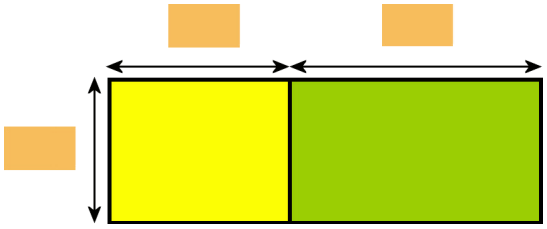
= _____ + _____ = _____



b. $8 \times (10 + 14)$

$= 8 \times$ _____ + $8 \times$ _____

= _____ + _____ = _____

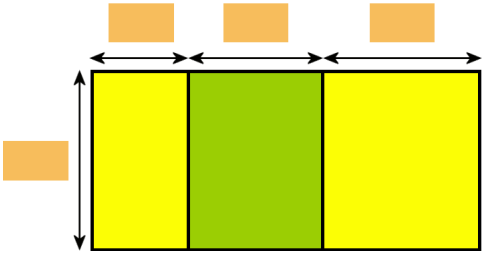


c. $11 \times (3 + 5 + 6)$

= _____ × _____ + _____ × _____ + _____ × _____

= _____ + _____ + _____

= _____



Sample worksheet from
www.mathmammoth.com