TEKSING TOWARD STAAR

MATHEMATICS®

GRADE 5

Lesson Projections

Six Weeks 1

Lesson 2

Compare Decimals

Place-value charts and number lines can be used to compare decimals.

The place value of the digits can also be used to compare decimals.

The symbols used to compare numbers are:
< (is less than), **>** (is greater than), and
= (is equal to).

NOTE

Remember, placing a zero at the end of a decimal does not change its value.

5.4 = 5.4**0**

15.34 = 15.34**0**

715.04 = 715.04**0**

Place-Value Chart to Compare Decimals

Looking at the numbers in a place-value chart can help compare decimals.

EXAMPLE 1

Use a place-value chart to compare 2.7 and 2.725.

Zeros can be written at the end of 2.7 until it has the same number of digits to the right of the decimal point as 2.725. So, 2.7 = 2.7**00**.

Ones	.	Tenths	Hundredths	Thousandths
2	.	7	**0**	**0**
2	.	7	2	5

- Start at the left.
  Look at the digits in the ones place.

  2.700 2.725

  Both numbers have a 2 in the ones place.
- Look at the digits in the tenths place.

  2.700 2.725

  Both numbers have a 7 in the tenths place.
- Look at the digits in the hundredths place.

  2.700 2.725

Since 2 > 0, then 2.725 > 2.700 and 2.700 < 2.725.

EXAMPLE 2

Use a place-value chart to compare 0.227 and 0.28.

Zeros can be written at the end of 0.28 until it has the same number of digits to the right of the decimal point as 0.227. So, 0.28 = 0.28**0**.

Ones	.	Tenths	Hundredths	Thousandths
0	.	2	2	7
0	.	2	8	**0**

- Start at the left.
  Look at the digits in the ones place.

  0.227 0.280

  Both numbers have a 0 in the ones place.

- Look at the digits in the tenths place.

  0.227 0.280

  Both numbers have a 2 in the tenths place.

- Look at the digits in the hundredths place.

  0.227 0.280

Since 8 > 2, then 0.28 > 0.227 and

0.227 < 0.28.

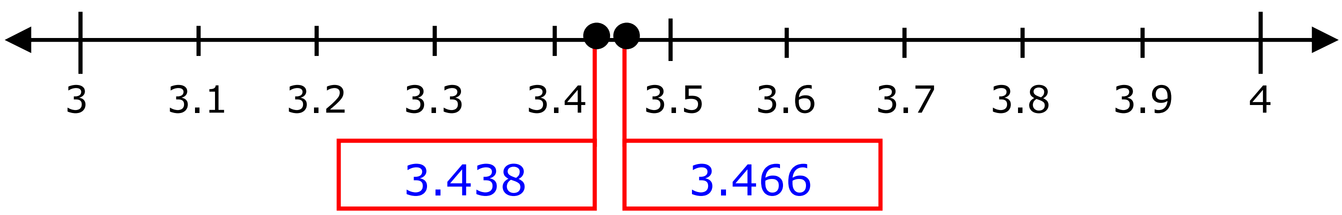
Number Line to Compare Decimals

Looking at decimals on a number line can also help compare the numbers.

EXAMPLE

Compare 3.466 and 3.438.

- Place 3.466 and 3.438 on a number line.



- Both numbers are greater than 3 and less than 4.
- The numbers are the same in the ones and tenths places.
- Look at the hundredths places.
  3 < 6, therefore 3.438 comes first on the number line between 3.4 and 3.5.
- 3.466 is a little to the right of the middle between 3.4 and 3.5.
- 3.438 is closer to 3.4 than 3.5.
- 3.466 is closer to 3.5 than 3.4.

So, 3.438 < 3.466 and 3.466 > 3.438.

Place-Value to Compare Decimals

A simple way to compare decimals is to use what you know about place-value.

EXAMPLE

Compare 2.49 and 2.485.

Step 1 Line up the decimal points.	**Step 2** Compare the ones.	**Step 3** Compare the tenths.	**Step 4** Compare the hundredths.
2.49 ↓ 2.485	2.49 ↓ 2.485 $2 = 2$	2.49 ↓ 2.485 $4 = 4$	2.49 ↓ 2.485 $9 > 8$

Since $9 > 8$, then $2.49 > 2.485$ and $2.485 < 2.49$.

Problem-Solving 1

The coaches of six teams kept a record of the total number of miles the members of their team ran to prepare for a cross-country meet.

Miles to Prepare for Meet	
Team	Number of Miles
Red	133.34
White	127.401
Blue	133.309
Yellow	139.1
Green	134.003
Brown	127.43

1. Write a true comparison for the number of miles for Team Brown and Team White. Use > or < in the comparison.

2. Explain why your comparison is correct.

3. Write a different true comparison for the number of miles for Team Brown and Team White. Use > or < in the comparison.

4. Explain why your comparison is correct.

Miles to Prepare for Meet	
Team	Number of Miles
Red	133.34
White	127.401
Blue	133.309
Yellow	139.1
Green	134.003
Brown	127.43

5. Write a true comparison for the number of miles for Team Red and Team Blue. Use > or < in the comparison.

6. Explain why your comparison is correct.

7. Write a different true comparison for the number of miles for Team Red and Team Blue. Use > or < in the comparison.

8. Explain why your comparison is correct.

Ordering Decimals

Place-value charts and number lines can be used to order decimals. The place value of the digits can also be used to order decimals.

NOTE

Remember, placing a zero at the end of a decimal does not change its value.

5.4 = 5.40

15.34 = 15.340

715.04 = 715.040

Place-Value Chart to Order Decimals

Looking at the numbers in a place-value chart can help order decimals.

EXAMPLE 1

Use a place-value chart to order 5.602, 5.51, 0.871 and 4.52 from least to greatest.

Remember

Zeros can be written at the end of a decimal without changing its value.

Ones	.	Tenths	Hundredths	Thousandths
5	.	6	0	2
5	.	5	1	**0**
0	.	8	7	1
4	.	5	2	**0**

- Start at the left.
  Three of the numbers have a 4 or a 5 in the ones place.

  5.602　　5.510　　0.871　　4.520

  These numbers will be greater than the number that has a zero in the ones place.

  The least number is 0.871.

Ones	.	Tenths	Hundredths	Thousandths
5	.	6	0	2
5	.	5	1	**0**
0	.	8	7	1
4	.	5	2	**0**

- Two of the numbers have a 5 in the ones place and one of the numbers has a 4 in the ones place.

  5.602 5.51 4.520

  The number with a 4 in the ones place is less than the numbers with a 5 in the ones place.

- Decide which of the two numbers with a 5 in the ones place is less. Look at the next place value, the tenths place.

  5.602 5.510

  One of the numbers with a 5 in the ones place has a 6 in the tenths place.

  The other number with a 5 in the ones place has a 5 in the tenths place.

  Since 5 is less than 6, the number 5.51 is less than the number 5.602.

The numbers in order from least to greatest are: 0.871 < 4.52 < 5.51 < 5.602

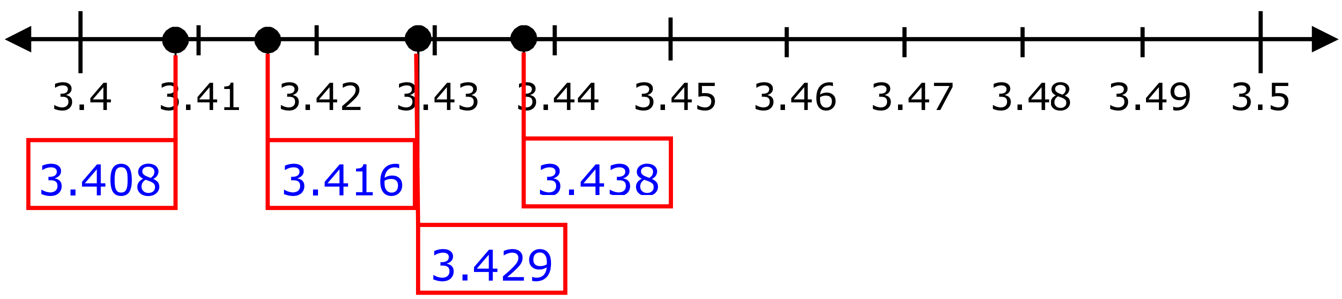
Number Line to Order Decimals

Looking at decimals on a number line can also help order the numbers.

EXAMPLE

Order 3.416, 3.438, 3.408 and 3.429.

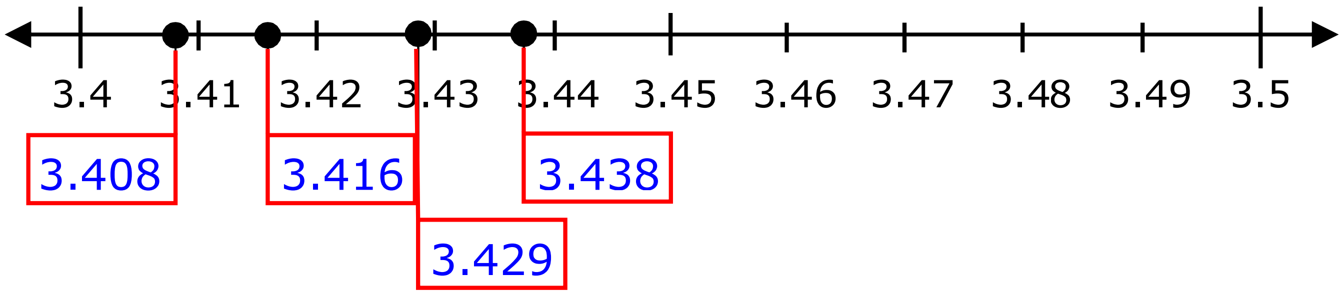
- Place 3.416, 3.438, 3.408 and 3.439 on a number line.



- All four numbers are greater than 3.4 and less than 3.5.
- The numbers are the same in the ones and tenths places.
- Look at the hundredths places.

  3.40 < 3.41 < 3.42 < 3.43, therefore 3.408 comes first on the number line between 3.4 and 3.41.

  3.408 is closer to 3.41 than 3.4.



- 3.416 comes next on the number line between 3.41 and 3.42.

  3.416 is closer to 3.42 than 3.41.

- 3.429 comes next on the number line between 3.42 and 3.43.

  3.429 is closer to 3.43 than 3.42.

- 3.438 comes last on the number line between 3.43 and 3.44.

  3.438 is closer to 3.44 than 3.43.

So, 3.438 > 3.429 > 3.416 > 3.408 and

3.408 < 3.416 < 3.429 < 3.438.

Place-Value to Order Decimals

A simple way to order decimals is to use what you know about place-value.

EXAMPLE

Order 2.497, 2.45, 2.479 and 2.48.

Step 1 Line up the decimal points.	**Step 2** Compare the ones.	**Step 3** Compare the tenths.	**Step 4** Continue to compare the tenths.
2.497 ↓ 2.45 ↓ 2.479 ↓ 2.48	2.497 ↓ 2.45 ↓ 2.479 ↓ 2.48 2 = 2 = 2 = 2	2.497 ↓ 2.45 ↓ 2.479 ↓ 2.48 9 > 5 9 > 7 9 > 8 So, 2.497 is the greatest number.	2.45 ↓ 2.479 ↓ 2.48 8 > 5 and 7, so 2.48 is the next greatest number. 7 > 5, so 2.479 is the next greatest number, and 2.45 is the least number.

So, 2.497 > 2.48 > 2.479 > 2.44 and

2.44 < 2.479 < 2.48 < 2.497.

Problem-Solving 2

The table shows the batting averages for five players who were on the Texas Rangers.

Texas Rangers Batting Averages	
Player	Batting Average
L. Nix	0.304
A. Soriano	0.296
K. Mench	0.271
H. Blalock	0.299
M. Young	0.322

NOTE

The lowest batting average number is the best batting average.

1. List the batting averages in order from best to worst.
2. List the names of the players in order from the player with the worst batting average to the player with the best batting average.
3. E. Kunz had a batting average that is better than L. Nix's but worse that M. Young's. List 3 possible batting averages for E. Kunz.
4. Explain why the possible batting averages for E. Kunz are correct.

Decimal Number Line

1. Your teacher will make a benchmark line in the middle, at the left end, and at the right end of the big blank number line.
2. Work on this activity in Partner Pairs and your teacher will give you a Partner Pair order number.
3. Your teacher will choose 1 Partner Pair to place the 0 and the 5 cards on the number line. The class will discuss the placement of these two cards on the number line.
4. Your teacher will number the Partner Pairs, then give 2 decimal cards to each Partner Pair. Each Partner Pair will place 1 of their decimal cards on the number line in the Partner Pair number order.
5. Each Partner Pair will describe the strategy used to place their card on the number line.
6. Begin the rotation again with Partner Pair 1 placing their remaining card on the number line and describing their placement strategy.
7. Continue until all cards are placed on the number line, then the class stands back and looks at the number line and discusses the placement of all cards on the number line.

EXTENSION

1. Your teacher will give each Partner Pair two blank cards. Use a dry erase marker to write a decimal that is not on the number line on each of the cards.

2. Trade cards with another Partner Pair.

3. Begin the rotation again with Partner Pair 1 placing both of their cards on the number line and describing their placement strategy to the whole class.

4. Continue until all cards are placed on the number line.

5. The whole class stands back and looks at the number line.

6. The class discusses placement of all the cards on the number line.

Lesson 4

Multiplication of Whole Numbers

Multiplication is a shortcut for combining groups of equal size.

EXAMPLE

Your family is taking 268 pounds of aluminum cans to a recycling center. The recycling center pays 12¢ per pound for aluminum cans that are brought for recycling.

Adding 12¢ for 268 times would take a very long time, so using multiplication is a much faster process.

Two terms in multiplication are **factor** and **product**.

The **factors** are the numbers being multiplied. Factors represent the number in each group and the number of groups.

The **product** is the result of the multiplication and represents the total.

The operation of multiplication can be indicated by the multiplication symbol (×) or by a dot (•).

2 × 3 can also be written as 2 • 3.

EXAMPLE

The More Music store ordered a new CD by Silly Sounds. During the first week, the store sold 2 boxes of the CDs. There are 81 CDs in each box.

What is the number of CDs the store sold during the first week?

The number in each group is 81.

The number of groups is 2.

$$\begin{array}{r} 81 \\ \times \ \ 2 \\ \hline 162 \end{array}$$

81 ← Factor

2 ← Factor

162 ← Product

So, the store sold 162 CDs during the first week.

If you know how to multiply 1-digit numbers such as 8×6, you can also multiply larger numbers such as 8×666.

Multiplying multi-digit numbers is done one at a time.

Each product is called a **partial product**.

Multiply the value of each digit from one factor by the value of each digit from the other factor. Then find the sum of the partial products.

Multiply a 3-Digit Number by a 1-Digit Number

These procedures can be used to multiply when both factors are greater than 10:

- Multiply the value of each digit in the 3-digit number by the value of the 1-digit number, one at a time.

  List the partial products and then add.

- Multiply without listing the partial products.

  Use what you know about regrouping.

EXAMPLE

The fire department in a large Texas city responded to 555 calls per day during one week. Find the number of calls they responded to during that week.

To solve the problem, multiply 555 by 7.

One Way

Multiply the value of each digit in the 3-digit number by the value of the 1-digit number, one at a time.

List the partial products and then add.

```
 HTO
 555
×  7
----
  35   Multiply the ones.  7 x 5 ones = 35
 350   Multiply the tens.  7 x 5 tens = 350
3500   Multiply the hundreds.  7 x 5 hundreds = 3500
----
3885   Add the partial products. 35 + 350 + 3500 = 3885
```

So, the fire department responded to 3,885 calls during that week.

Another Way

Multiply without listing the partial products.
Use what you know about regrouping.

```
  HTO
  3 3
  555
×   7
-----
 3885
```

Multiply the **ones**.
Since **35** ones is **3** tens and **5** ones,
Write **5** in the ones place.
Write **3** above the tens place so you won't forget it.

Multiply the **tens**.
Since **35** tens is **3** hundreds and **5** tens,
add the **5** tens to the 3 tens you already have.
Write **8** in the tens place.
Write **3** above the hundreds place so you won't forget it.

Multiply the **hundreds**.
Since **35** hundreds is **3** thousands and **5** hundreds,
add the **5** hundreds to the 3 hundreds you already have.
Write **8** in the hundreds place.
Write **3** in the thousands place.

So, the fire department responded to 3,885 calls during that week.

Either way, the fire department responded to 3,885 calls during that week.

Multiply a 2-Digit Number by a 2-Digit Number

These procedures can be used to multiply when both factors are greater than 10:

- Multiply the value of each digit in one factor by the value of each digit in the other factor.
  List the partial products and then add.

- Multiply without listing every partial product.
  Use what you know about regrouping.

- Multiply using the Distributive Property of Multiplication.
  Break apart one of the factors before multiplying.

EXAMPLE

The school auditorium has 14 rows.
Each row has 28 seats.
Find the number of seats in the auditorium.

To solve the problem, multiply 14 by 28.

One Way

Multiply the value of each digit in one factor by the value of each digit in the other factor.

List the partial products and then add.

Tens → TO ← Ones

```
   14
 × 28
 ----
   32    Multiply by the ones.
         8 x 4 ones = 32
   80    8 x 10 ones = 80
   80    Multiply the tens.
         20 x 4 tens = 80
  200    20 x 10 tens = 200
 ----
  392    Add the partial products.
         32 + 80 + 80 + 200 = 392
```

So, there are 392 seats in the auditorium.

Another Way

Multiply without listing every partial product.
Use what you know about regrouping.

```
   3
  14
× 28
 112
```

Multiply by the **ones**. **8** x 14 ones = **?**
8 x 4 ones = **32** → **2** ones with **3** tens to regroup
8 x 10 ones = **80** → **8** tens + **3** tens = **11** tens

So, **8** x 14 = **112**

```
   3
  14
× 28
 112
 280
 392
```

Multiply by the **tens**. **20** x 14 tens = **?**
20 x 4 ones = **80** → **8** tens + **0** ones
20 x 10 ones = **200** → **2** hundreds

So, **20** x 14 = **280**.

Add the partial products. **112** + **280** = **392**

So, there are 392 seats in the auditorium.

Another Way

Use what you know about the Distributive Property of Multiplication.

Break apart one of the factors before multiplying.

Break apart one factor into numbers that are easy to multiply.	14 x 28 = (**10** + **4**) x 28
Multiply.	**10** x 28 = **280** **4** x 28 = **112**
Add the two products.	**112** +**280** **392**

So, there are 392 seats in the auditorium

Using any of these procedures for multiplying two-digit numbers, there are 392 seats in the auditorium.

NOTE

Zeros may seem like "nothing" in a factor or product, but they are very important.

EXAMPLE

The website www.staarmaterials.com receives an average of 305 visits per week. At this rate, about how many visits would the website receive in 4 weeks?

To find the answer, multiply 305 by 4.

```
 HTO
  2
 305
×  4
----
1220
```

4 x 5 = 20 → **2** tens + **0** ones

There are no tens in 305, but that does not mean we can forget about the tens.

4 x 0 = **0** tens

0 tens + **2** tens = **2** tens

4 x 300 = **1200**

1 thousand + **2** hundreds

So, at this rate, the website would receive about 1,220 visits in 4 weeks.

Multiply a 3-Digit Number by a 2-Digit Number

When you multiply a 3-digit number by a 2-digit number, you are finding 6 products and several sums. So, it is very important to record **every** step.

These procedures can be used to multiply a 3-digit number by a 2-digit number:

- Multiply the value of each digit in one factor by the value of each digit in the other factor, record each product, and then find the sum of the partial products.
- Multiply without using the partial products.

  Use what you know about regrouping.
- Multiply using the Distributive Property of Multiplication.

  Break apart one of the factors before multiplying.

EXAMPLE

The fifth grade class is making mementos for a Cinco de Mayo celebration. Each of the 674 students in the school will be given 1 memento made using 24 cm of ribbon. Find the amount of ribbon needed to make all of the mementos.

To solve the problem, multiply 24 × 674.

One Way

Multiply the value of each digit in one factor by the value of each digit in the other factor, record each product, then find the sum of the partial products.

```
  HTO
  674
×  24
   16   ← 4 x 4 = 16
  280   ← 4 x 70 = 280
 2400   ← 4 x 600 = 2400
   80   ← 20 x 4 = 80
 1400   ← 20 x 70 = 1400
12000   ← 20 x 600 = 12000
16176
```

Multiply by the **ones**.

4 x 4 = **16**

4 x 70 = **280**

4 x 600 = **2400**

Multiply by the **tens**.

20 x 4 = **80**

20 x 70 = **1400**

20 x 600 = **12000**

Add the **partial products**.

16 + **280** + **2400** + **80** + **1400** + **12000** = **16176**

So, at least 16,176 cm of ribbon is needed to make the mementos.

Another Way

Multiply without listing the partial products.
Use what you know about regrouping.

```
 HTO
 2 1
 674
×  24
-----
 2696
```

Multiply by the **ones**. **4** x 674 = **?**
4 x 4 = **16** → **6** ones with **1** ten to regroup
4 x 70 = **280** → **8** tens + **1** ten with **2** hundreds to regroup
4 x 600 = **2400** → **24** hundreds + **2** hundreds
So, **4** x 674 = **2696**

```
  HTO
  1
  2 1
  674
×   24
------
  2696
 13480
------
 16176
```

Multiply by the **tens**. **20** x 674 = **?**
20 x 4 = **80** → **8** tens and **0** ones
20 x 70 = **1400** → **4** hundreds with **1** thousand to regroup
20 x 600 = **12000** → **12** thousands + **1** thousand

So, **20** x 674 = **13480**

Add the **partial products**.
2696 + **13480** = **16176**

So, at least 16,176 centimeters of ribbon is needed to make the mementos.

Another Way

Use what you know about the Distributive Property of Multiplication.

Break apart one of the factors before multiplying.

Break apart one factor into numbers that are easy to multiply.	24 x 674 = (**10** + **10** + **2 + 2)** x 674
Multiply.	**10** x 674 = **6740** **10** x 674 = **6740** **2** x 674 = **1348** **2** x 674 = **1348**
Add the four products.	6740 6740 1354 +1354 16176

So, at least **16,176** centimeters of ribbon is needed to make the mementos.

Using any of these procedures for multiplying multi-digit numbers, at least 16,176 cm of ribbon is needed to make the mementos.

Checking Multiplication

Always check multi-digit multiplication because so many steps are involved that it is easy to make a mistake.

These are 2 different methods that can be used to check multiplication:

- Reverse the factors.
- Use the lattice method.

EXAMPLE

Jerissa found the product of **38** x **24** = **912**.

Now she needs to check to make sure her multiplication is correct.

- Jerissa can **reverse the factors**.

$$
\begin{array}{r}
{\scriptstyle 1} \\
{\scriptstyle 3} \\
24 \\
\times\ 38 \\
\hline
{\scriptstyle 1}\;\; \\
192 \\
720 \\
\hline
912
\end{array}
\qquad\qquad
\begin{array}{r}
{\scriptstyle 1} \\
{\scriptstyle 3} \\
38 \\
\times\ 24 \\
\hline
{\scriptstyle 1}\;\; \\
152 \\
760 \\
\hline
912
\end{array}
$$

If reversing the factors gives the same product, then the multiplication is correct.

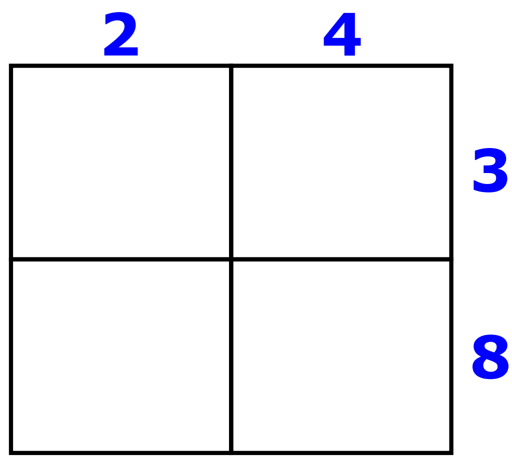
If reversing the factors does not give the same product, then one of the products is not correct.

So, reversing the factors shows Jerissa's work is correct.

- Jerissa could also **use the lattice method**.

Step 1: Draw a grid.

Write one factor on top.
Write the other factor on the right.

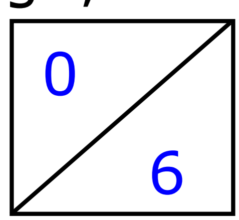


Step 2: In each square, write a product.

Multiply the digit at the top of the column by the digit to the right of the row.

Note: Use a diagonal line to separate the digits in each product.

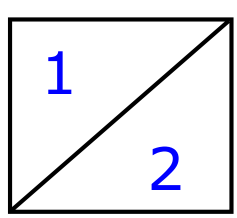
If the product is 1-digit, write the product as 0__. Write 2 x 3 as



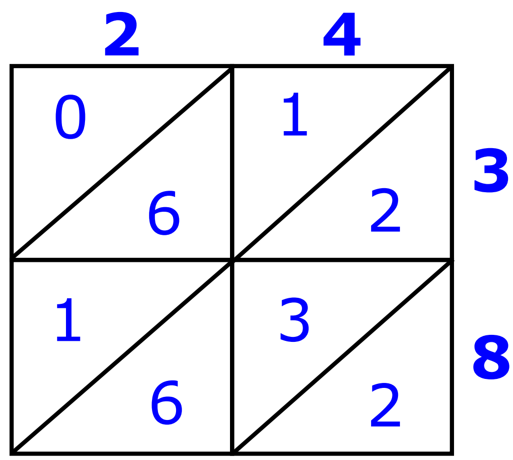
.

If the product is 2-digits, write the tens digit in the top left and write the ones digit in the bottom right.

Write 4 x 3 as

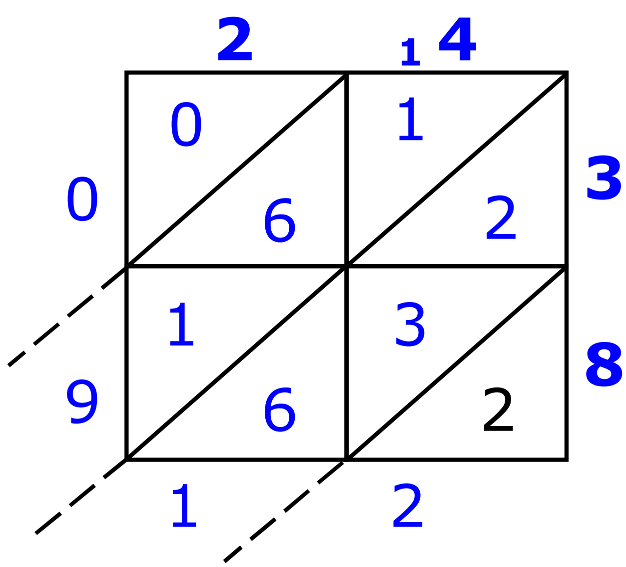


.



Step 3: Add along the diagonals.

Begin at the lower right. For 2-digit sums, add the tens digit to the digits in the next diagonal.



Step 4: Read the product.

Begin reading the product at the top left and end at the bottom right

24 x 38 = 912

The lattice method shows her work is correct.

So, using either method to check multiplication, Jerissa's product is correct.

Problem-Solving 1

Problem 1

A golf shop ordered 124 boxes of golf balls. Each box contains 18 golf balls.

1. How many golf balls did the golf shop order? Show your work.

2. Show your work to check your answer. Use the lattice method or reverse the factors.

Problem 2

An artist sketched 11 charcoal portraits each day for 111 days.

1. What is the total number of portraits he sketched? Show your work.

2. Show your work to check your answer. Use the lattice method or reverse the factors.

Problem 3

Mr. Diaz bought 264 bottles of flavored syrup for his snow cone stand. Each bottle contains 78 ounces of syrup.

1. How many ounces of syrup did Mr. Diaz buy? Show your work.

2. Show your work to check your answer. Use the lattice method or reverse the factors.

Estimating Products

A **product** is the result of multiplication.

Sometimes when you multiply, an exact product is not needed, so you can **estimate** the product.

The answer to any problem can be estimated before you find the exact answer.

The estimate tells you about how large or small the exact answer should be.

If you estimate first, you will know whether your exact answer is **reasonable**. Some problems ask you whether a certain number is a reasonable answer to a problem.

Front-End Estimation of Products

To estimate products, the front digits of the factors can be multiplied.

EXAMPLE

The air mileage between Chicago and New York is 714 miles. Mr. Conrad made the trip 52 times in one year because he flew 26 roundtrips during the year. He earned 1 bonus point for each mile he flew. Did he earn enough bonus points for a flight that requires 30,000 points?

Use front-end estimation to answer the problem because you need to know whether he flew more than or less than 30,000 miles.

- Estimate the product of 52 × 714 to solve the problem.

$$\begin{array}{r} 714 \\ \times\ 52 \\ \hline \end{array} \longrightarrow \begin{array}{r} 700 \\ \times\ 50 \\ \hline 35000 \end{array}$$

So, Mr. Conrad earned about 35,000 bonus points.

NOTE

The exact product is greater than 35,000 because both numbers were rounded down.

Rounding One Factor to Estimate Products

If one factor is a 1-digit number, you can estimate by rounding only 1 factor.

EXAMPLE

The fifth grade play was performed on 4 different days. Each day, all 389 tickets were sold. About how many tickets were sold for the 4 days?

- Estimate the product of 4 × 389 to solve the problem.

$$4 \times 389$$

Only 1 factor was rounded.

$$4 \times 400 = 1600$$

So, about 1,600 tickets were sold for the 4 days.

NOTE

Since 400 is greater than 389, then 4 × 400 is greater than 4 × 389.

The estimate of 1,600 is greater than the actual product.

This is an **overestimate**.

So, less than 1,600 tickets were sold for the 4 days.

Rounding Both Factors to Estimate

If each factor is a 2-digit or a 3-digit number, you can estimate by rounding each factor to the greatest place value.

EXAMPLE 1

The school auditorium has 38 rows of 53 seats. About how many seats are in the auditorium?

- Estimate the product of 38 × 53 to solve the problem.

$$38 \times 53$$

$$\downarrow \quad \downarrow$$

$$40 \times 50 = 2000$$

Both 38 and 53 were rounded.

So, about 2,000 seats are in the auditorium.

NOTE

This **estimate** is close to the actual product because one factor was rounded up 2 and one factor was rounded down 3.

EXAMPLE 2

A factory made 621 computer stations for a Texas school district. Each station required 43 screws. About how many screws did the factory use for the computer stations?

- Estimate the product of 43 × 621 to solve the problem.

$$43 \times 621$$

Both 43 and 621 were rounded.

$$40 \times 600 = 24000$$

So, about 24,000 screws were used for the computer stations.

NOTE

This **estimate** is less than the actual product because both factors were rounded down.

Compatible Numbers to Estimate Products

When you estimate, look for **compatible numbers**. Compatible numbers are numbers that work well together. In multiplication, they are number pairs that are easy to multiply.

To estimate products, replace one or both factors with compatible numbers.

EXAMPLE

There are 18 weeks in the school semester. Your principal gives each student a school motto pencil each week. There are 618 students in your school. About how many school motto pencils did your principal order for the semester?

- Find compatible numbers for 18 and 618 and use them to estimate the product of 18 × 618.

  Try 20 × 600.

$$\begin{array}{r} 618 \\ \times\ 18 \\ \hline \end{array} \longrightarrow \begin{array}{r} 600 \\ \times\ 20 \\ \hline 12000 \end{array}$$

So, the principal ordered about 12,000 school motto pencils for the semester.

618 is close to 600. 18 is close to 20.
So, the principal ordered about 12,000 motto pencils for the semester.

The estimate of 12,000 is more than the actual product because both numbers were rounded up. This is an **underestimate**.

So, the principal actually ordered less than 12,000 motto pencils.

Any factor is compatible with a multiple of 10, because there are shortcuts for multiplying by multiples of 10.

EXAMPLE

Each of the 63 sections of a rodeo arena has 98 seats. About how many seats are in the rodeo arena?

- Estimate the product of 63 × 98 to solve the problem.

63 × 98

↓ ↓

60 × 100 = 6,000

Both 62 and 100 were rounded to a multiple of 10.

The rodeo arena has about 6,000 seats.

NOTE

This **estimate** is close to the actual product because one factor is rounded down 3 and the other factor is rounded up 2.

Problem-Solving 2

A dining and sight-seeing train at Royal Gorge in Colorado can take 158 passengers at a time. The train runs 26-33 times each month. Find a reasonable number of passengers the train takes in one month.

1. What is the least number of passengers the train takes in one month? Show your work.

2. Use reverse factors of the lattice method to check your multiplication. Show your work.

3. What is the greatest number of passengers the train takes in one month?

4. Use reverse factors of the lattice method to check your multiplication. Show your work.

5. Copy and complete this sentence on your notebook paper.

The dining and sight-seeing train at Royal Gorge in Colorado takes less than _____, more than_____, and between _____ and _____ passengers each month.