

Sect 1.4 - Rounding and Estimating

Objective a: Rounding Whole Numbers to a given place value.

Many times, people will give rounded figures for convenience. For example, in Chris Isidore article “GM's uphill climb out of bankruptcy,” July 7th, 2009 on www.cnnmoney.com, the article is quoted as saying: “CSM's forecast for new vehicle sales calls for 2009 U.S. industry-wide sales to come in below 10 million vehicles.” Here, we are not given an exact figure for the expected number of new cars the U.S. auto industry will sell, but we are given a rounded figure that allows us to appreciate the number of vehicles involved.

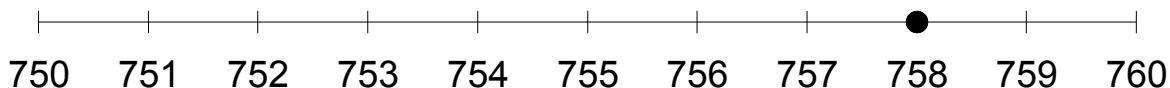
To see how rounding works, let's use a number line and look at some examples.

Round the following numbers to the nearest ten:

Ex. 1 758

Solution:

Here, we are trying to figure if 758 is closer to 75 tens (750) or to 76 tens (760). Let's look at these numbers on a number line:

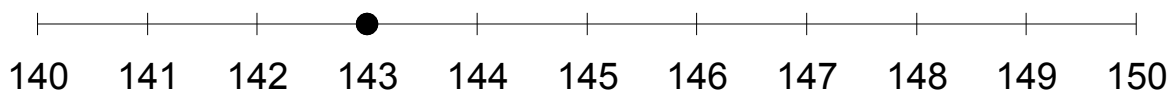


We can see that 758 is closer to 760. So, the answer is 760. We can write this as $758 \approx 760$. The symbol $\approx$ means “approximately equal to” and is used when we have rounded a number.

Ex. 2 143

Solution:

Here, we are trying to figure if 143 is closer to 14 tens (140) or to 15 tens (150). Let's look at these numbers on a number line:



We can see that 143 is closer to 140. So, $143 \approx 140$.

Ex. 3 635

Solution:

Here, we are trying to figure if 635 is closer to 63 tens (630) or to 64 tens (640). Let's look at these numbers on a number line:



We can see that 635 is exactly half way between 630 and 640. In Math and Science, when this is the case, we will round up to the higher number. So, $635 \approx 640$.

There are many circumstances where you might round down. If you have a pond that can support up to 635 fish and you can only buy the fish in lots of ten, then you would round down and buy 63 lots of ten or 630 fish.

Rules for Rounding:

- 1) If the first digit to the right of the round-off digit is less than 5, keep the round-off digit the same. If the first digit to the right of the round-off digit is 5 or greater, add one to the round off digit.
- 2) Replace every digit to the right of the round-off digit by zeros.

Round the following to the nearest hundred:

Ex. 4 7638

Solution:

The round-off digit 6 is in the hundreds place.

The digit immediately to the right of the round-off digit is 3. Since this is smaller than 5, we will keep the six the same and replace all the digits to the right of 6 by zeros:

$$7638 \approx 7600.$$

7638
↑

Ex. 5 9382

Solution:

The round-off digit 3 is in the hundreds place.

The digit immediately to the right of the round-off digit is 8. Since this is 5 or larger, we will add one to the three and replace all the digits to the right of 3 by zeros:

$$9382 \approx 9400.$$

9382
↑

Ex. 6 93,753

Solution:

The round-off digit 7 is in the hundreds place.

The digit immediately to the right of the round-off digit is 5. Since this is 5 or larger, we will add one to the seven and replace all the digits to the right of 7 by zeros:

$$93753 \approx 93,800.$$

93753
↑

Round off the following numbers to the indicated place value:

Ex. 7

Number	Tens	Hundreds	Thousands
756,948			
34,351			
28			
4,492,499			
200			
9,052			
79,999			

Solution:

Number	Tens	Hundreds	Thousands
756,948	$\approx 756,950$	$\approx 756,900$	$\approx 757,000$
34,351	$\approx 34,350$	$\approx 34,400$	$\approx 34,000$
28	≈ 30	≈ 0	≈ 0
4,492,499	$\approx 4,492,500$	$\approx 4,492,500$	$\approx 4,492,000$
200	≈ 200	≈ 200	≈ 0
9,052	$\approx 9,050$	$\approx 9,100$	$\approx 9,000$
79,999	$\approx 80,000$	$\approx 80,000$	$\approx 80,000$

Objective b: Estimating problems.

Estimating means to do the rounding before we do the problem. If we are given a place value, we round each number to that place value and then perform the operations.

Estimate by rounding each number to the nearest hundred:

Ex. 8 $1175 + 326 + 79 + 5$

Solution:

First, round each number to the nearest hundred and then add:

1175	→	1200	→	1200
326	→	300	→	300
79	→	100	→	100
<u>+ 5</u>	→	<u>+ 0</u>	→	<u>+ 0</u>
				1600

The answer is 1600.

Ex. 9 $9,741 - 835$

Solution:

First, round each number to the nearest hundred and then subtract:

				⁸ 17
9741	→	9700	→	9700
<u>- 835</u>	→	<u>- 800</u>	→	<u>- 800</u>
				8900

So, the answer is 8900.

Ex. 10 In the year 2000, the US population was 282,158,336 people. By the year 2010, it had increased by 28,074,527 people. For the year 2050, the US population is projected to be 439,010,253 people. (Source: www.census.gov)

a) Round each figure to the nearest million and estimate the US population in 2010.

b) Round each figure to the nearest million and estimate the projected change in the US population from 2000 to 2050.

Solution:

a) 282,158,336	→	282,000,000
<u>+ 28,074,527</u>	→	<u>+ 28,000,000</u>
		310,000,000

The US population was 310 million people in 2010.

b) 439,010,253	→	439,000,000
<u>- 282,158,336</u>	→	<u>- 282,000,000</u>
		157,000,000

The US population is expected to grow by 157 million people from 2000 to 2050.