Rounding decimals

A scale reads 7.648 pounds, but nobody needs all those digits. Which shorter number is closest to the real weight?

WORDS TO KNOW

Round: trade a number for a shorter number that is as close to it as possible.

Halfway mark: the point exactly between the two neighbors, such as 7.5.

≈: "is about". Write 7.648 ≈ 8, not 7.648 = 8.

Neighbors: the two numbers on either side of your number that stop at the place you keep. To the nearest whole number, the neighbors of 7.648 are 7 and 8.

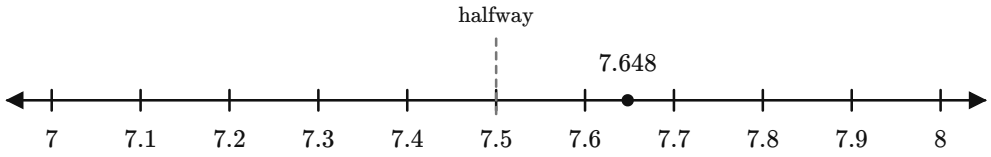
Deciding digit: the digit just to the right of the place you keep.

KEY IDEAS

1. Pick the closer neighbor

Find the two neighbors at the place you keep, then see which one your number is closer to. On the number line, 7.648 sits to the right of the halfway mark 7.5, so it is closer to 8.

Rounded to the nearest whole number, 7.648 ≈ 8. Round to the nearest tenth or hundredth the same way: find the two neighbors that stop at that place, and pick the closer one.



2. One digit decides

The halfway mark always has a 5 just after the place you keep. So you only need to look at the deciding digit. Digits further right never change the answer.

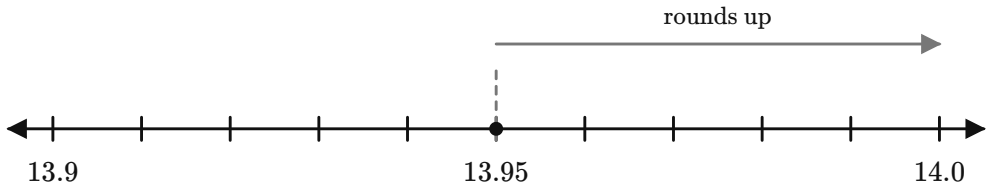
Deciding digit 0, 1, 2, 3 or 4: keep the lower neighbor. The kept digit stays, and the digits after it are dropped.

Deciding digit 5, 6, 7, 8 or 9: take the upper neighbor. The kept digit goes up by one.

3. Halfway rounds up, and a 9 can carry

A number exactly halfway, like 13.95 between 13.9 and 14.0, is equally close to both neighbors. The usual rule, used in this lesson, rounds it up. When the kept digit is a 9, going up by one carries: ten tenths make a one, so one tenth more than 13.9 is 14.0.

Keep a zero at the end when it sits in the place you were asked for: 13.95 ≈ 14.0 to the nearest tenth, not 14.



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WATCH OUT

- **Look at the right digit.** Use the digit just after the place you keep, not the last digit. For 35.718 to the nearest tenth, the deciding digit is the 1, not the 8, so 35.718 ≈ 35.7.
- **Round once, from the original number.** Rounding in steps can push a number onto the halfway mark and give the wrong answer. Example 3 shows how.
- **A rounded number is a different number.** Write ≈, never =.

WORKED EXAMPLES

Example 1. A ribbon is 16.284 meters long. Round it to the nearest whole number, tenth and hundredth.

1. Whole number: the neighbors are 16 and 17. The deciding digit is the tenths digit, 2. That is less than 5, so keep 16.
2. Tenth: the neighbors are 16.2 and 16.3. The deciding digit is the hundredths digit, 8. That is 5 or more, so go up to 16.3.
3. Hundredth: the neighbors are 16.28 and 16.29. The deciding digit is the thousandths digit, 4, so keep 16.28.

Answer: 16.284 ≈ 16, 16.284 ≈ 16.3 and 16.284 ≈ 16.28.

Example 2. A tank holds 23.97 gallons. Round it to the nearest tenth.

1. The tenths digit is 9, so the lower neighbor is 23.9. One tenth more carries: the 9 tenths become 0 tenths and the 3 ones become 4 ones. The upper neighbor is 24.0.
2. The deciding digit is the hundredths digit, 7. That is 5 or more, so go up.

Answer: 23.97 ≈ 24.0. Keep the zero: it is the tenths digit you were asked for.

Example 3. Round 15.346 to the nearest tenth. Why is rounding in steps wrong here?

1. Round once. The neighbors are 15.3 and 15.4, and the halfway mark is 15.35. The deciding digit is the hundredths digit, 4, so 15.346 ≈ 15.3.
2. In steps, you would first round to the hundredth: 15.35. That sits exactly on the halfway mark, so it would then round up to 15.4.
3. But 15.346 is really closer to 15.3. It is 0.046 from 15.3 and 0.054 from 15.4.

Answer: 15.346 ≈ 15.3. Rounding in steps gives the wrong answer, 15.4.

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