

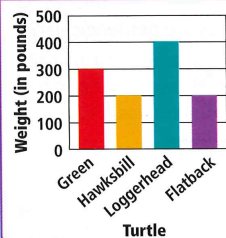
Add and Subtract Whole Numbers and Decimals

FAST FACT • SCIENCE

The rarest of all sea turtles is the Kemp's ridley turtle. It weighs between 80 and 100 pounds.

PROBLEM SOLVING The heaviest sea turtle is the leatherback turtle. It can weigh 1,000 pounds more than the heaviest turtle shown in the graph. What is the maximum weight of a leatherback?

MAXIMUM WEIGHTS OF SEA TURTLES



The hawksbill turtle was so named because it has a beaklike mouth.

CHECK WHAT YOU KNOW

Use this page to help you review and remember important skills needed for Chapter 3.

ROUND WHOLE NUMBERS AND DECIMALS

Round each number to the nearest thousand.

- | | | | |
|-----------|---------------|--------------|-------------|
| 1. 17,922 | 2. 308,389 | 3. 3,278,623 | 4. 45,325 |
| 5. 82,390 | 6. 3,569,203 | 7. 20,344 | 8. 23,056 |
| 9. 12,005 | 10. 4,035,654 | 11. 28,138 | 12. 456,979 |

Round each number to the nearest hundredth.

- | | | | |
|-----------|-----------|------------|-----------|
| 13. 4.108 | 14. 0.598 | 15. 12.835 | 16. 3.652 |
| 17. 9.305 | 18. 0.133 | 19. 2.846 | 20. 9.673 |

ADD AND SUBTRACT MONEY

Find the sum or difference. Estimate to check.

- | | | | |
|--------------------------|--------------------------|--------------------------|--------------------------|
| 21. \$5,789
+ \$4,569 | 22. \$9,468
- \$4,263 | 23. \$2,635
+ \$3,508 | 24. \$7,545
- \$5,023 |
| 25. \$6,390
+ \$4,743 | 26. \$8,092
- \$1,953 | 27. \$7,597
+ \$8,146 | 28. \$6,204
- \$2,132 |
| 29. \$6.87 + \$3.87 | 30. \$8.75 - \$6.43 | 31. \$4.99 + \$12.64 | 32. \$2.03 + \$27.89 |
| 33. \$56.78 - \$6.89 | 34. \$76.02 + \$34.85 | 35. \$25.83 + \$20.40 | 36. \$65.47 - \$31.23 |

VOCABULARY POWER

REVIEW

sum [sum] *noun*

Sum is originally from the Latin root word *summus*, which means "highest." The Greeks and Romans added numbers from the bottom and wrote the answer or sum at the top. What word for the top of a mountain comes from *summus*?

PREVIEW

estimate
front-end estimation



www.harcourtschool.com/mathglossary

Round Whole Numbers

Learn

CROWD PLEASERS The programs for this year's women's college basketball championships need to be ordered. The programs come in boxes of 10,000 each. Last year, 29,619 people attended the championships. How many boxes of programs should be ordered?

To be sure enough programs are ordered, round 29,619 up to the next ten thousand. You can use a number line to round.



29,619 rounded to the next ten thousand is 30,000. So, 3 boxes of 10,000 programs should be ordered.

Another way to round is to use the rounding rules.

Example

Round 149,987 to the nearest hundred thousand.

STEP 1

Decide the place to which you want to round. ↓
149,987

STEP 2

If the digit to the right is less than 5, round down. If the digit to the right is 5 or greater, round up.
149,987 ↓ 4 < 5
100,000 Round down.

More Examples

Round 1,265,483 to the place of the blue digit.

A

1,265,483
↓
1,000,000 2 < 5
Round down.
1,265,483 rounded to the nearest million is 1,000,000.

B

1,265,483
↓
1,300,000 6 > 5
Round up.
1,265,483 rounded to the nearest hundred thousand is 1,300,000.

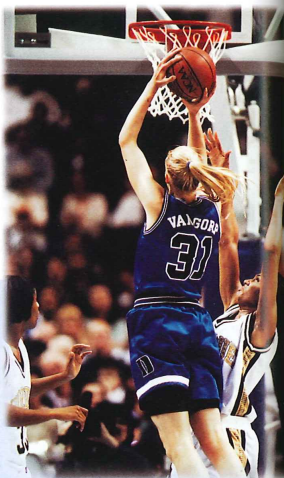
C

1,265,483
↓
1,270,000 5 = 5
Round up.
1,265,483 rounded to the nearest ten thousand is 1,270,000.

Quick Review

What is the value of each 5?

- 582,017
- 3,456
- 5,034,768
- 57,316
- 17,063,521



▲ 1982 was the first year the NCAA held championships for women's basketball. About 10,000 people attended.

Check

1. Explain why 735,489 rounded to the nearest ten thousand is 740,000.

Round each number to the place of the blue digit.

2. 2,681
3. 178,365
4. 1,532,300
5. 33,689
6. 6,023,490

Round 1,654,508 to the place named.

7. thousands
8. ten thousands
9. hundred thousands
10. hundreds
11. tens
12. millions

Practice and Problem Solving

Extra Practice, page 58, Set A

Round each number to the place of the blue digit.

13. 78,210
14. 350,962
15. 5,811,326
16. 606,310
17. 890,352

Round 2,908,365 to the place named.

18. thousands
19. ten thousands
20. hundred thousands
21. hundreds
22. tens
23. millions

Name the place to which each number was rounded.

24. 191,562 to 190,000
25. 4,236,810 to 4,000,000
26. 80,154 to 80,200

USE DATA For 27–29, use the table.

27. Which 2 years had the same attendance, rounded to the nearest thousand?
28. How many people in all attended the NCAA Women's Championships in 1999, 2000, and 2001?
29. **What's the Error?** Sean says that, rounded to the nearest thousand, the attendance in 1997 was the same as in 1998. Describe Sean's error.

Year	Attendance
1996	23,291
1997	16,714
1998	17,976
1999	17,733
2000	20,060
2001	20,551

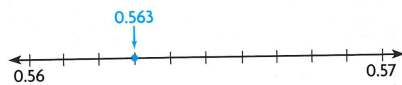
Mixed Review and Test Prep

30. $68 + 25 = \square$
31. $71 - 29 = \square$
32. Use mental math to find the sum $15 + 8 + 2 + 5$.
33. How many sides does a quadrilateral have?
34. **TEST PREP** The orchestra has 18 violins and violas. There are 8 more violins than violas. How many violins are in the orchestra?
A 13 B 10 C 8 D 5

Round Decimals

Learn

WINGING IT The Pygmy Blue is the smallest butterfly in the United States. Its average width is 0.563 inch. What is the width rounded to the nearest hundredth of an inch? You can use a number line to round 0.563 to the nearest hundredth.



0.563 is closer to 0.56 than to 0.57. So, 0.563 inch rounded to the nearest hundredth of an inch is 0.56 inch.

Examples

Round 0.4537 to the place of the blue digit. Use the rounding rules.

A 0.4537 $7 > 5$ ↓ 0.454 Round up.	B 0.4537 $3 < 5$ ↓ 0.45 Round down.	C 0.4537 $5 = 5$ ↓ 0.5 Round up.
--	---	--

Check

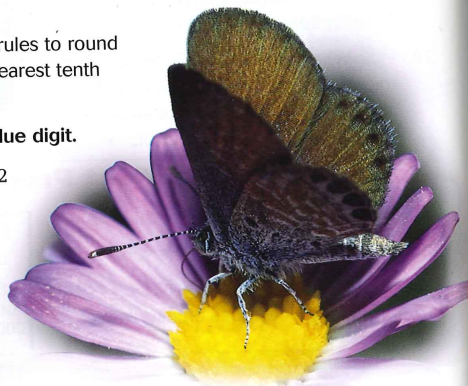
1. **Explain** how you can use the rounding rules to round \$8.49 to the nearest dollar and to the nearest tenth of a dollar.

Round each number to the place of the blue digit.

2. 0.783
3. 0.256
4. 0.1732
5. 0.685
6. 0.66

Round 0.6285 to the place named.

7. tenths
8. hundredths
9. thousandths
10. ones



Quick Review

Round each number to the place of the blue digit.

1. 572
2. 1,194
3. 25,357
4. 175,506
5. 415,723

Remember

- Rounding rules:
- Find the place to which you want to round.
 - If the digit to the right is less than 5, round down.
 - If the digit to the right is 5 or greater, round up.

Practice and Problem Solving

Extra Practice, page 58, Set A

Round each number to the place of the blue digit.

11. 3.193
12. 29.423
13. 2.0475
14. 0.86
15. 1.234

Round 2.5438 to the place named.

16. tenths
17. hundredths
18. thousandths
19. ones

Name the place to which each number was rounded.

20. 0.562 to 0.56
21. 6.8354 to 6.835
22. 80.154 to 80.2
23. 1.7592 to 1.759
24. 5.9273 to 6
25. 2.3625 to 2.36

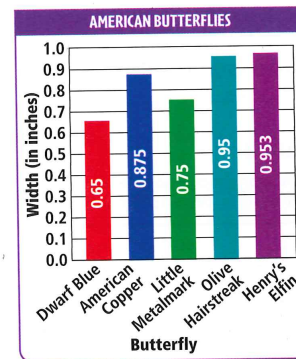
Round to the nearest tenth of a dollar and to the nearest dollar.

26. \$10.56
27. \$0.42
28. \$0.98
29. \$5.45
30. \$4.02
31. \$32.36
32. \$9.49
33. \$10.91

Round each number to the nearest hundredth.

34. nine hundred thirty-four thousandths
35. $10 + 5 + 0.2 + 0.06 + 0.002$
36. seven and eighty-three thousandths
37. $2 + 0.8 + 0.09 + 0.005 + 0.0003$

USE DATA For 38–40, use the graph.



38. Round the width of the Dwarf Blue to the nearest tenth of an inch.
39. Which two butterflies are the same width when each width is rounded to the nearest hundredth of an inch?
40. Which butterfly is 0.88 inch wide when its width is rounded to the nearest hundredth of an inch?
41. **Vocabulary Power** Round means "to increase or decrease to the nearest unit." What is another math definition for round?

Mixed Review and Test Prep

42. Write nine thousandths in standard form. (p. 22)
43. Round 4,807 to the nearest ten. (p. 38)
44. Order 1.65, 1.56, and 1.6 from greatest to least. (p. 28)
45. Write 3.024 in word form. (p. 22)

46. **TEST PREP** Tim ran the first half of a race 1.9 seconds faster than the second half. He ran the second half in 20.6 seconds. What was Tim's total time?

- A 18.7 sec
- B 22.5 sec
- C 39.3 sec
- D 43.1 sec

Estimate Sums and Differences

Learn

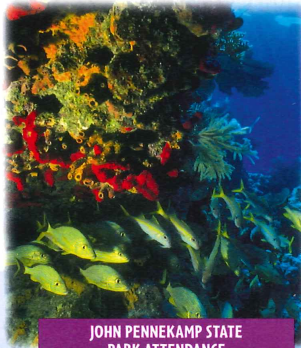
UNDERWATER FLORIDA John Pennekamp Coral Reef State Park, located on Key Largo, off the coast of southern Florida, was the first undersea park in the United States. The park consists of 60,124 underwater acres and includes the famous coral reef. It also has 2,960 acres of coastal land. About how many total acres does the park have?

You can round to estimate sums and differences of whole numbers. When you **estimate**, you find a number that is close to an exact amount.

$$\begin{array}{r} 60,124 \rightarrow 60,000 \\ + 2,960 \rightarrow + 3,000 \\ \hline 63,000 \end{array}$$

Round to the nearest thousand. Then add.

So, John Pennekamp Coral Reef State Park has about 63,000 acres.



JOHN PENNEKAMP STATE PARK ATTENDANCE

Year	Number of Visitors
1991–1992	782,421
2000–2001	1,050,749

Example 1

About how many more people visited the park in 2000–2001 than in 1991–1992? Use the table.

$$\begin{array}{r} 1,050,749 \rightarrow 1,100,000 \\ - 782,421 \rightarrow - 800,000 \\ \hline 300,000 \end{array}$$

Round to the nearest hundred thousand. Then subtract.

So, about 300,000 more people visited the park in 2000–2001.

You can also round to estimate sums and differences of decimals.

More Examples

<p>A Round to the nearest whole number. Then subtract.</p> $\begin{array}{r} 89.5 \rightarrow 90 \\ - 1.83 \rightarrow - 2 \\ \hline 88 \end{array}$	<p>B Round to the nearest tenth. Then add.</p> $\begin{array}{r} 3.675 \rightarrow 3.7 \\ 2.502 \rightarrow 2.5 \\ + 0.32 \rightarrow + 0.3 \\ \hline 6.5 \end{array}$	<p>C Round to the nearest dollar. Then add.</p> $\begin{array}{r} \$10.00 \rightarrow \$10 \\ + \$ 8.19 \rightarrow + \$ 8 \\ \hline \$18 \end{array}$
---	---	---

Quick Review

Round to the nearest thousand.

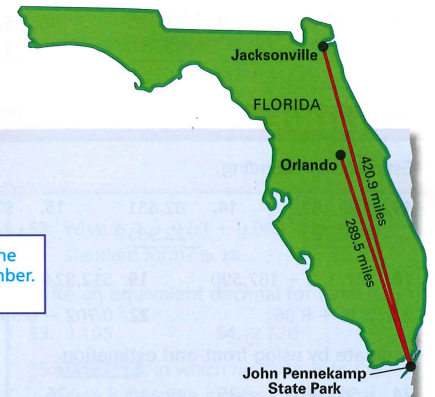
- 457,986
- 2,057,516
- 2,954
- 9,051,687
- 326,198

VOCABULARY

estimate
front-end estimation

Front-End Estimation

Another way to estimate a sum or difference is to use **front-end estimation**. When you use front-end estimation, you add or subtract the values of the front digits of each number.



Example 2

About how much farther is the park from Jacksonville than from Orlando?

$$\begin{array}{r} 420.9 \rightarrow 400 \\ - 289.5 \rightarrow - 200 \\ \hline 200 \end{array}$$

Subtract the values of the front digits of each number.

So, the park is about 200 miles farther from Jacksonville than from Orlando.

More Examples

<p>A $3,287 + 4,501$</p> $\begin{array}{r} 3,287 \rightarrow 3,000 \\ + 4,501 \rightarrow + 4,000 \\ \hline 7,000 \end{array}$	<p>B $587 - 435$</p> $\begin{array}{r} 587 \rightarrow 500 \\ - 435 \rightarrow - 400 \\ \hline 100 \end{array}$	<p>C $13.6 + 22.9$</p> $\begin{array}{r} 13.6 \rightarrow 10 \\ + 22.9 \rightarrow + 20 \\ \hline 30 \end{array}$
--	--	---

- In Example A, how would a rounded estimate differ from the front-end estimate?
- When you use front-end estimation to estimate a sum, is your estimate greater than or less than the actual sum? Explain.

Check

- Explain** how you use front-end estimation to estimate the sum $73.25 + 91.02$.
- How is estimating sums and differences of decimals like estimating sums and differences of whole numbers?

Estimate by rounding.

- $85,476 - 41,131$
- $845,008 + 124,895$
- $1.22 + 3.51$
- $\$1.78 - \1.04
- $4.87 + 2.94$

Estimate by using front-end estimation.

8. $\begin{array}{r} 752,401 \\ -491,922 \end{array}$ 9. $\begin{array}{r} 21,421 \\ +32,970 \end{array}$ 10. $\begin{array}{r} \$52.89 \\ -\$18.78 \end{array}$ 11. $\begin{array}{r} 5.681 \\ +3.025 \end{array}$ 12. $\begin{array}{r} 4.35 \\ -0.78 \end{array}$

Practice and Problem Solving Extra Practice, page 58, Set B

Estimate by rounding.

13. $\begin{array}{r} 93,582 \\ +82,785 \end{array}$ 14. $\begin{array}{r} 82,631 \\ -22,965 \end{array}$ 15. $\begin{array}{r} \$7.92 \\ +\$5.39 \end{array}$ 16. $\begin{array}{r} 30.23 \\ +13.65 \end{array}$ 17. $\begin{array}{r} \$7.36 \\ -\$6.41 \end{array}$
18. $397,352 + 187,590$ 19. $512,824 - 495,008$ 20. $1,289,405 + 3,321,945$
21. $2.39 + 8.06$ 22. $0.702 - 0.397$ 23. $14.782 + 8.110$


Estimate by using front-end estimation.

24. $\begin{array}{r} 502,963 \\ -132,631 \end{array}$ 25. $\begin{array}{r} 42,110 \\ +16,850 \end{array}$ 26. $\begin{array}{r} 2.704 \\ +1.818 \end{array}$ 27. $\begin{array}{r} \$500.00 \\ -\$279.65 \end{array}$ 28. $\begin{array}{r} 7.153 \\ +4.099 \end{array}$
29. $5,278 + 3,621$ 30. $13,500 - 11,693$ 31. $6,345,672 - 1,254,789$
32. $24.89 - 17.34$ 33. $33.872 + 12.946$ 34. $37.054 + 27.922$

Estimate to compare. Write $<$ or $>$ for each \bullet .

35. $69,210 + 24,391 \bullet 68,258 + 45,924$ 36. $74,361 + 24,391 \bullet 91,308 - 25,924$
37. $82,356 - 14,638 \bullet 86,551 - 13,725$ 38. $8.14 - 4.89 \bullet 7.45 - 2.37$
39. $2.8 + 9.1 \bullet 11 + 5$ 40. $7.925 + 5.392 \bullet 15.431 - 4.974$


USE DATA For 41–42, use the table.

41. About how much farther is it to John Pennekamp State Park from Chattanooga, TN, than from Montgomery, AL?
42. Josh drove from his home in Greensboro, NC, to John Pennekamp State Park, and then he drove to visit his cousin in Tallahassee, FL. About how many miles did he drive?
43.  **Write a problem** in which front-end estimation gives an estimate closer to the exact answer than rounding.



DISTANCE TO JOHN PENNEKAMP STATE PARK (in miles)	
Chattanooga, TN	836.22
Greensboro, NC	850.34
Montgomery, AL	746.49
Tallahassee, FL	539.02

44. Three duffel bags weigh 49.49 pounds, 53.73 pounds, and 77.89 pounds. Estimate the total weight to the nearest pound.

45.  **What's the Question?** Ally and three friends are in line to buy tickets for a snorkeling trip. Ally is right behind Eric and in front of Lynn. Lee is last. Eric is the answer.

46. **REASONING** There are 1.609344 kilometers in 1 mile. Estimate to the nearest tenth the number of kilometers in 3 miles.

Mixed Review and Test Prep

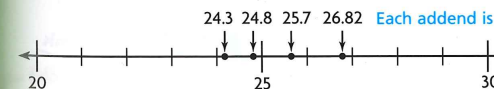
47. $4,954 + 2,608 = \square$
48. True or false: $505,736 > 505,746$ (p. 8)
49. Compare 7.064 and 7.644 using $<$, $>$, or $=$. (p. 28)
50. Round 1,435,987 to the nearest hundred thousand. (p. 38)
51. **TEST PREP** Which is 5,567,398 rounded to the nearest million? (p. 38)
52. What is $7 + 0.03 + 0.009$ written in standard form? (p. 22)
- Write an equivalent decimal for each.** (p. 26)
53. 0.105 54. 2.720
55. **TEST PREP** In which number does the digit 8 have the greatest value? (p. 2)
- F 91,358 H 38,195
G 53,891 J 19,583
- A 5,000,000 C 6,000,000
B 5,600,000 D 6,500,000

Problem Solving Thinker's Corner 

Another way to estimate is called clustering. **Clustering** is a method used when all addends are close to, or clustered around, a number.

Estimate: $24.8 + 26.82 + 24.3 + 25.7$

Look at the number line. These four numbers all cluster around 25.



Use $25 + 25 + 25 + 25$ or $4 \times 25 = 100$.

So, the estimated sum is 100.

Use clustering to estimate each sum.

1. $445 + 463 + 455$ 2. $891 + 904 + 912 + 885$
3. $10.51 + 11.2 + 9.9 + 9.65$ 4. $1,891 + 1,975 + 2,004$



Add and Subtract Whole Numbers

Learn

MAKE A DIFFERENCE! At the Wildlife Center, volunteers are helping scientists place black-footed ferrets back into their natural habitats. This year's volunteers have logged 12,385 hours of service. Last year they logged 10,098 hours. How many hours did they log for both years?

Example 1

Add. $12,385 + 10,098$
Estimate. $12,000 + 10,000 = 22,000$

$$\begin{array}{r} 11 \\ 12,385 \\ +10,098 \\ \hline 22,483 \end{array}$$

Start with the ones.
Regroup as needed.

So, the volunteers logged 22,483 hours for both years. This is close to the estimate, so the answer is reasonable.

Example 2

How many more hours were logged this year than last year?

Subtract. $12,385 - 10,098$
Estimate. $12,000 - 10,000 = 2,000$

$$\begin{array}{r} 17 \\ 2\ 7\ 15 \\ 12,385 \\ -10,098 \\ \hline 2,287 \end{array}$$

Start with the ones.
Regroup as needed.

So, the volunteers logged 2,287 more hours this year than last year. This is close to the estimate, so the answer is reasonable.

- How do you use place value when you add and subtract?



▲ A black-footed ferret



Technology Link
More Practice: Harcourt Mega Math The Number Games, *Tiny's Think Tank*, Levels B, C

Quick Review

- $450 + 550$
- $5,700 - 2,200$
- $4,200 - 600$
- $24,000 + 48,000 + 86,000$
- $73 + 27 + 42 + 58$

Check

1. Explain how you know which place values to regroup when adding.

Find the sum or difference. Estimate to check.

- $6,317 + 8,903$
- $12,911 - 10,260$
- $11,004 + 8,986$
- $607,411 - 249,897$
- $998,623 - 771,128$

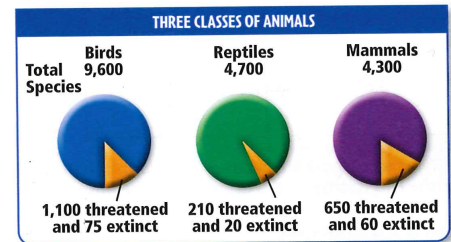
Practice and Problem Solving

Extra Practice, page 58, Set C

Find the sum or difference. Estimate to check.

- $5,752 - 1,842$
- $8,875 + 4,908$
- $327,032 - 109,986$
- $17,620 - 9,003$
- $675,531 + 318,746$
- $234 + 125 + 681$
- $6,010 - 498$
- $2,943 + 7,894$
- $1,298 + 786 + 412$
- $511,832 + 238,778$
- $61,933 - 12,040$
- $208 + 816 + 7,049$
- $17,001 - 8,542$
- $209,123 - 146,897$

USE DATA For 21–23, use the circle graphs.



- How many species of birds are *not* threatened and *not* extinct? How many species of reptiles? How many species of mammals?
- How many threatened and extinct species are there in all three classes of animals?
- Write About It** How many more bird species are threatened than reptile species? Explain.
- During track practice, four runners ran the $\frac{1}{4}$ -mile run. Greg finished after Sean. Alex finished before Sean but after Louis. Who finished first?

Mixed Review and Test Prep

- Round 5,567,398 to the nearest million. (p. 38)
- Order 2,430,717; 2,340,717; and 2,470,717 from least to greatest. (p. 10)
- TEST PREP** Which is two and one hundred ninety-three ten-thousandths? (p. 22)
 - 2.93
 - 2.193
 - 2.0193
 - 2.0093

For 26–27, write each number in word form. (p. 22)

- 0.98
- 0.675

Add and Subtract Decimals

Learn

SPLISH SPLASH Tyler's science class recorded the weather for the first week in March. Tyler's job was to measure the rainfall. It rained 2 days during that week. On Tuesday, Tyler recorded 1.95 inches of rain, and on Friday another 0.85 inch fell. How much rain did Tyler record during the first week in March?

Example 1 Add. $1.95 + 0.85$

Estimate. $2 + 1 = 3$

STEP 1	STEP 2	STEP 3
Line up the decimal points to align place-value positions. Add the hundredths.	Add the tenths.	Add the ones. Place the decimal point in the sum.
$\begin{array}{r} 1.95 \\ +0.85 \\ \hline 2.80 \end{array}$	$\begin{array}{r} 1.95 \\ +0.85 \\ \hline 2.80 \end{array}$	$\begin{array}{r} 1.95 \\ +0.85 \\ \hline 2.80 \end{array}$

So, Tyler recorded 2.80 inches of rain during the first week of March. This is close to the estimate, so the answer is reasonable.

More Examples

<p>A $2.69 + 3.83$</p> $\begin{array}{r} 2.69 \\ +3.83 \\ \hline 6.52 \end{array}$ <p>Line up the decimal points.</p> <p>Place the decimal point in the sum.</p>	<p>B $13.76 + 8.5$</p> $\begin{array}{r} 13.76 \\ +8.50 \\ \hline 22.26 \end{array}$ <p>Place a zero for an equivalent decimal.</p>
--	---

- When is it helpful to show an equivalent decimal in addition?

Quick Review

- $321 + 40$
- $64 - 17$
- $1,643 + 2,309$
- $969 - 333$
- $1,075 + 762 + 956$

Technology Link

More Practice: Harcourt Mega Math The Number Games, *Tiny's Think Tank*, Level L *Buggy Bargains*, Level I



Subtract Decimals

Tyler recorded 2.75 inches of rain during the first week in April, and then he measured 4.92 inches of rain for the entire month of April. How much rain fell in April after the first week?



Example 2 Subtract. $4.92 - 2.75$

Estimate. $5 - 3 = 2$

STEP 1	STEP 2	STEP 3
Line up the decimal points to align place-value positions. Subtract the hundredths. Regroup if needed.	Subtract the tenths. Regroup if needed.	Subtract the ones.
$\begin{array}{r} 4.92 \\ -2.75 \\ \hline 2.17 \end{array}$	$\begin{array}{r} 4.92 \\ -2.75 \\ \hline 2.17 \end{array}$	$\begin{array}{r} 4.92 \\ -2.75 \\ \hline 2.17 \end{array}$ <p>Place the decimal point.</p>

So, 2.17 inches of rain fell in April after the first week. This is close to the estimate, so the answer is reasonable.

More Examples

<p>A $5.12 - 1.08$</p> $\begin{array}{r} 5.12 \\ -1.08 \\ \hline 4.04 \end{array}$	<p>B $24.23 - 11.6$</p> $\begin{array}{r} 24.23 \\ -11.60 \\ \hline 12.63 \end{array}$ <p>Place a zero to show an equivalent decimal.</p>	<p>C $1.6 - 0.342$</p> $\begin{array}{r} 1.600 \\ -0.342 \\ \hline 1.258 \end{array}$ <p>Place zeros to show an equivalent decimal.</p>
--	---	---

- Where do you place the decimal point in the answer?
- MATH IDEA** You can add and subtract decimals the same way you add and subtract whole numbers if you line up the decimal points first.

Check

- Explain why you can place zeros to the right of the last digit in a decimal without changing its value.

Find the sum. Estimate to check.

- | | | | | |
|----------------|-----------------|-------------------|------------------|------------------|
| 2. $0.3 + 0.9$ | 3. $2.7 + 1.15$ | 4. $11.74 + 5.12$ | 5. $5.08 + 4.18$ | 6. $12.1 + 9.01$ |
| | $+0.62$ | $6.3 + 1.54$ | | |

LESSON CONTINUES