3.3 Adding and Subtracting Decimals

Focus Add and subtract decimals to thousandths.

When you go to the theatre to see a movie, your attendance and how much you paid to see the movie are entered in a database.
Data are collected from theatres all across Canada and the United States.
Movie studios use these data to help predict how much money the movie will earn.

Explore

Shrek 2 was one of the highest-earning movies of 2004.
The table shows how much money *Shrek 2* earned in Canada and the United States for the first week it played in theatres.
Studios record the earnings in millions of US dollars.

Date	Earnings (US$ Millions)
Wednesday, May 19	11.786
Thursday, May 20	9.159
Friday, May 21	28.340
Saturday, May 22	44.797
Sunday, May 23	34.901
Monday, May 24	11.512
Tuesday, May 25	8.023

➤ Estimate first.
Then find the combined earnings on:
- the first 2 days
- Saturday and Sunday
- all 7 days

➤ Estimate first.
Then find the difference in earnings on:
- Thursday and Friday
- Saturday and Sunday
- Sunday and Monday
- the days with the greatest and the least earnings

Reflect & Share

Share your results with another pair of classmates.
Discuss the strategies you used to estimate and to find the sums and differences.
Why do you think the earnings on 3 of the days are so much higher? Explain.

Connect

When we add or subtract decimals, we estimate if we do not need an exact answer.
We also estimate to check the answer is reasonable.

Example

Ephram is a long-distance runner. His practice distances for 5 days last week are shown in the table.

Day	Distance (km)
Monday	8.85
Tuesday	12.25
Wednesday	10.9
Thursday	9.65
Friday	14.4

a) How far did Ephram run in 5 days last week?

b) How much farther did Ephram run on Tuesday than on Thursday?

A Solution

a) 8.85 + 12.25 + 10.9 + 9.65 + 14.4

Use front-end estimation.

Add the whole-number part of each decimal.

Think: 8 + 12 + 10 + 9 + 14 = 53

Ephram ran about 53 km.

Add. Write each number with the same number of decimal places.

Use zeros as placeholders: 8.85, 12.25, 10.90, 9.65, 14.40

Record the numbers without the decimal points.

Add as you would whole numbers.

$$\begin{array}{r} {\scriptstyle 2\,3\,1} \\ 885 \\ 1225 \\ 1090 \\ 965 \\ +\ 1440 \\ \hline 5605 \end{array}$$

Since the estimate is 53 km, place the decimal point after the first 2 digits; that is, between the 6 and the 0.

Ephram ran 56.05 km.

b) Ephram ran 12.25 km on Tuesday and 9.65 km on Thursday.

Estimate.

12.25 − 9.65

Think: 12 − 9 = 3

Ephram ran about 3 km farther on Tuesday.

Subtract. Align the numbers.
Subtract as you would whole numbers.

$$\begin{array}{r} {}^{11}\cancel{12}{}^{12}\cancel{.}25 \\ -\ 9.65 \\ \hline 2.60 \end{array}$$

2.6 is close to the estimate 3, so the answer is reasonable.
Ephram ran 2.6 km farther on Tuesday than on Thursday.

Practice

1. Use front-end estimation to estimate each sum or difference.

a) 2.876 − 0.975 **b)** 71.382 + 6.357

c) 125.12 + 37.84 **d)** 9.7 − 1.36

2. The tallest building in the world is the Taipei 101 in Taiwan. Its height is 0.509 km. The tallest building in North America is the Sears Tower in Chicago, USA. Its height is 0.442 km. What is the difference in the heights of the buildings?

3. Four classes of students from Mackenzie School are planning a field trip. The total cost of the trip is $1067.50.
To date, the classes have raised: $192.18, $212.05, $231.24, $183.77

a) How much money have the classes raised so far?

b) How much more money do the classes need to raise in total?

Show your work.

4. **Assessment Focus** A baker wants to make 3 different kinds of chocolate chip cookies. The recipes call for 2.75 kg, 4.4 kg, and 5.55 kg of chocolate chips. The baker has 10.5 kg of chocolate chips.

a) How many kilograms of chocolate chips does the baker need? Estimate to check your answer is reasonable.

b) Does the baker have enough chocolate chips to make the cookies? How do you know?

c) The baker wants to follow the recipes exactly.
If your answer to part b is no, how many more kilograms of chocolate chips are needed? If your answer to part b is yes, how many kilograms of chocolate chips will the baker have left over?

5. Estimate, then calculate, the sum below.
Explain how you estimated.
$46.71 + 3.9 + 0.875$

6. The Robb family and the Chan family have similar homes.
The Robb family sets its thermostat to 20°C during the winter months.
Its monthly heating bills were: $171.23, $134.35, and $123.21
The Chan family used a programmable thermostat to lower the temperature at night, and during the day when the family was out.
The Chan family's monthly heating bills were: $134.25, $103.27, and $98.66

a) How much money did each family pay to heat its home during the winter months?

b) How much more money did the Robb family pay?
Estimate to check your answer is reasonable.

c) What other things could a family do to reduce its heating costs?

7. Find two numbers with a difference of 151.297.

8. Use each of the digits from 0 to 7 once to make this addition true.
Find as many different answers as you can.

$$\begin{array}{r} \square.\square\square\square \\ +\ \square.\square\square\square \\ \hline 5.788 \end{array}$$

9. A student subtracted 0.373 from 4.81 and got the difference 0.108.

a) What mistake did the student make?

b) What is the correct answer?

10. Two 4-digit numbers were added. Their sum was 3.3.
What could the numbers have been?
Find as many different answers as you can. Show your work.

11. **Take It Further** Find each pattern rule. Explain how you found it.

a) 2.09, 2.13, 2.17, 2.21, …

b) 5.635, 5.385, 5.135, 4.885, …

Reflect

How did your knowledge of estimation help you in this lesson?