GAP CLOSING

Decimal Computation

Module 8

Decimal Computation

Diagnostic

1. Complete the question and write the equation using decimals.

   a) 5 hundredths + 9 hundredths =

   b) 13 hundredths + 8 tenths =

   c) 99 hundredths + 6 hundredths =

   d) 12 tenths – 6 tenths =

   e) 45 hundredths – 3 tenths =

   f) 4 tenths – 12 hundredths =

2. Add

   a) 0.03 + 0.12 = _____

   b) 4.12 + 3.09 = _____

   c) 5.1 + 0.42 = _____

   d) 4 + 3.2 = _____

   e) 15 + 3.2 = _____

3. Subtract

   a) 0.12 – 0.04 = _____

   b) 3.1 – 1.1 = _____

   c) 5.02 – 1.45 = _____

   d) 4.3 – 1.75 = _____

   e) 3 – 1.4 = _____

   f) 8.25 – 4.3 = _____

4. Circle the best estimate.

   a) 3.14 + 5.8   about 2   about 5   about 10   about 20

   b) 5.8 – 3.14   about 2   about 5   about 10   about 20

   c) 30.14 – 24.7   about 2   about 5   about 10   about 20

   d) 4.8 + 0.26   about 2   about 5   about 10   about 20

Decimal Computation

5. **The sum of two decimals is given. What might the decimals be?**

   a) 5.9   b) 4.23

6. **The difference of two decimals is given. What might the decimals be?**

   a) 5.9   b) 4.23

7. **Is adding 4.36 + 4.2 more like adding 436 + 42 or more like adding 436 + 420? Explain.**

8. **Tell why 10 × 4.2 = 42.**

9. **Multiply**

   a) 10 × 15.1 = _____   b)   100 × 0.02 = _____

   c) 100 × 3.2 = _____   d)   10 × 4.8 = _____

10. **Divide**

    a) 34.8 ÷ 10 = _____

    b) 612.2 ÷ 10 = _____

    c) 5.3 ÷ 10 = _____

Adding Decimal Tenths or Hundredths

Learning Goal

- reasoning about the relationship between the sum of two decimal tenths or two decimal hundredths and related whole numbers.

Open Question

1. Fill in values and solve.

   There has to be at least one 2 in one of the numbers on the left of the equal sign, one 9 in the other number on the left and at least one 4 on the right in the sum.

   ☐☐.☐ + ☐.☐ =

   List as many combinations as you can think of.

2. Fill in values and solve.

   There has to be at least one 2 in one of the numbers on the left, one 9 in the other number on the left and at least one 4 and one 7 on the right in the sum.

   ☐☐.☐☐ + ☐.☐☐ =

   List as many possibilities as you can think of.

Think Sheet

We add to combine things. Adding decimals is just like adding whole numbers.

Just as
3 ones + 9 ones = 12 ones (3 + 9 = 12),
3 tens + 9 tens = 12 tens (30 + 90 = 120), or
3 hundreds + 9 hundreds = 12 hundreds (300 + 900 = 1200),
so
3 tenths + 9 tenths = 12 tenths (0.3 + 0.9 = 1.2) and
3 hundredths + 9 hundredths = 12 hundredths (0.03 + 0.09 = 0.12)

Adding Tenths
Suppose we walked 4.9 km and then another 8.3 km. We would be adding 4.9 to 8.3.
• We can think:
4.9 is 49 tenths and 8.3 is 83 tenths, so the total is 132 tenths, or 13.2.

Tens	Ones	Tenths	Hundredths
	4	9	
+	8	3	
1	3	2	

We can see that ones are added to ones and tenths are added to tenths.

• We can use an alternate strategy, as well.
For example, 4.9 + 8.3 is 0.1 less than 5 + 8.3. So 13.3 − 0.1 = 13.2.

Adding Hundredths
• If we are adding 4.28 to 8.03, we can think:
4.28 is 428 hundredths and 8.03 is 803 hundredths, so the total is 1231 hundredths or 12.31.

Tens	Ones	Tenths	Hundredths
	4	2	8
+	8	0	3
1	2	3	1

• We can use an alternate strategy. For example, 4.28 + 8 = 12.28 and then 12.28 + 0.03 = 12.31.

We estimate sums by thinking about the whole number parts only or the whole number parts and the tenths.

For example, 3.48 + 9.62 is about 3 + 9 = 12.
But 3.48 is close to 3.5 and 9.62 is close to 9.5, so 3.48 + 9.62 is also close to 3 + 9 + 1 = 13.

Decimal Computation

1. Complete the question and write the equation in standard form.
   (0.4 is standard form)

   a) 7 tenths + 15 tenths =

   b) 23 tenths + 47 tenths =

   c) 37 hundredths + 39 hundredths =

   d) 183 hundredths + 99 hundredths =

2. Describe your strategy for 1b and 1d.

3. Estimate the sums. Explain your thinking.

   a) 15.3 + 19.8

   b) 3.4 + 17.8

   c) 0.9 + 1.9

4. Add

   a) 4.7 + 3.2 =   b) 14.7 + 3.3 =

   c) 15.9 + 8.4 =   d) 11.9 + 13.7 =

   e) 4.07 + 12.83 =   f) 8.93 + 17.28 =

   g) 0.99 + 0.89 =   h) 3.27 + 6.73 =

 Decimal Computation

5. Explain your strategy for 4c and 4g.

6. Make up an addition question that involves decimal tenths that you think is easy. Explain why it is easy.

7. You add two decimal tenth numbers greater than 0 and the answer is 14.0. Tell three things you know about those two numbers.

Adding Mixed Decimals

Learning Goal

- using the patterns of the place value system to add decimal tenths to decimal hundredths.

Open Question

The sum of ☐.☐☐ and ☐☐.9 is 18.01.

List as many things as you can that are true about the two numbers being added. Explain how you know.

List 5 possible pairs of numbers the numbers could be.

Think Sheet

When we add 37 + 420, we might start with 420 and add 3 tens to the 2 tens part of 420 to get 4 hundreds + 5 tens and then add the last 7 to get 457.

If we used a place value chart, it would look like this:

Hundreds	Tens	Ones
	3	7
+ 4	2	0
4	5	7

If we add a decimal in tenths to a decimal in hundredths, it is important to add tenths to tenths and hundredths to hundredths. For example, suppose we walked 13.2 m and then another 5.78m.

To find the total distance, we would add:

13.2 + 5.78 is 10 + (3 + 5) ones + (2 + 7) tenths + 8 hundredths = 18.98

If we lined the numbers up, it would look like this: 13.2
                                                              +   5.78

We can estimate the sum of decimal tenths and decimal hundredths using just the whole number parts or using the tenths as well.

For example, 13.2 + 5.78 is about 13 + 5 = 18.
But 5.78 is close to 6, so 13.2 + 5.78 is also about 13 + 6 = 19.

1. Complete the question and write the equation in standard form.
   (0.4 is standard form)

   a) 7 tenths + 15 hundredths =

   b) 23 hundredths + 47 tenths =

   c) 37 hundredths + 39 tenths =

   d) 183 hundredths + 99 tenths =

                    Decimal Computation

2. Describe your strategy for 1b and 1d.

3. Estimate the sums. Explain your thinking.

   a) 15.38 + 19.8

   b) 3.24 + 17.8

   c) 0.99 + 1.9

4. Add

   a) 4.75 + 13.2 =

   b) 14.7 + 3.3 =

   c) 15.92 + 138.4 =

   d) 11.9 + 13.72 =

   e) 4.57 + 12.33 =

   f) 18.9 + 17.58 =

   g) 0.99 + 0.8 =

   h) 3.78 + 26.7 =

5. Explain your strategy for 4c and 4g.

6. When you add a decimal tenth number (such as 4.2) to a decimal hundredth number (such as 195.27), you always get a decimal hundredth sum. Why is that true?

7. Why does 5.3 + 18.79 have the same answer as 5.30 + 18.79?

8. Make up a story problem where you would add 5.2 to 3.49. Solve the problem.

Subtracting Decimal Tenths or Hundredths

Learning Goal

- reasoning about the relationship between the difference of two decimal tenths or two decimal hundredths and related whole numbers.

Complete each subtraction question.

54 – 37 =

5.4 – 3.7 =

5.48 – 3.78 =

5.42 – 3.72 =

6.3 – 4.6 =

6.38 – 4.38 =

How are some of the questions alike?

How are they different?

Make up 4 or more subtraction questions that are alike in some way.

Answer each question. Tell how the questions are alike.

 Decimal Computation

Think Sheet

We subtract to show what is left, to see how much to add, or to see how far apart two amounts are. Subtracting decimals is just like subtracting whole numbers. We can use similar strategies.

Just as
12 ones – 3 ones = 9 ones (12 – 3 = 9)
12 tens – 3 tens = 9 tens (120 – 30 = 90)
12 hundreds – 3 hundreds = 9 hundreds (1200 – 300 = 900),

so
12 tenths – 3 tenths = 9 tenths (1.2 – 0.3 = 0.9) and
12 hundredths – 3 hundredths = 9 hundredths (0.12 - 0.03 = 0.09)

Subtracting Tenths
Suppose we had 4.3 kg of beef and 8.2 kg of chicken.

If we want to know how much more chicken we have, we subtract. There are many ways to do this, including thinking that 4.3 + 4 = 8.3. If there were 8.3 kg of chicken, that would be 4 more kilograms. Since there is only 8.2 kg of chicken, take away 0.1 kg. The difference is 3.9 kg instead of 4 kg.

Tens	Ones	Tenths	Hundredths
	8	2	
–	4	3	
	3	9	

Subtracting Hundredths
If we are subtracting 4.37 from 8.29, we can think:
4.37 is 437 hundredths and 8.29 is 829 hundredths, so the difference is 392 hundredths, or 3.92.

Tens	Ones	Tenths	Hundredths
	8	2	9
–	4	3	7
	3	9	2

We estimate differences by thinking about the whole number parts only or the whole number parts and the tenths.

For example, 11.7 – 8.3 is about 11 – 8 = 3. But 11.7 is close to 12, so 12 – 8 = 4.

Decimal Computation

Subtracting Decimal Tenths or Hundredths (Continued)

1. **Complete the question and write the equation in standard form.**
   (0.4 is standard form)

   a) **30 tenths – 14 tenths =**

   b) **71 tenths – 47 tenths =**

   c) **52 hundredths – 39 hundredths =**

   d) **183 hundredths – 98 hundredths =**

2. **Describe your strategy for 1b and 1d.**

3. **Estimate the difference. Explain your thinking.**

   a) **45.1 – 19.2**

   b) **73.4 – 59.7**

   c) **38.1 – 19**

4. **Subtract**

   a) **34.7 – 23.2 =**   b)   **63.5 – 13.8 =**

   c) **175.9 – 88.4 =**   d)   **101.7 – 13.9 =**

   e) **64.07 – 22.87 =**   f)   **38.39 – 17.48 =**

   g) **15.12 – 7.89 =**   h)   **103.27 – 56.78 =**

5. **Explain your strategy for 4d and 4g.**

6. **How much farther did Andrew jump than Evan if Andrew jumped 1.67 m and Evan jumped 1.49 m? Describe two ways to figure that out.**

7. **Put in the digits in the boxes to make these questions true:**

    1   1   2   2   3   3   4   8   9

    1☐.2☐ – 3.☐9 = 10.☐2

    ☐0☐.4 – 8☐.☐ = ☐0.5

                   Decimal Computation

Subtracting Mixed Decimals

Learning Goal

- using the patterns of the place value system to subtract decimal hundredths from decimal tenths or decimal tenths from decimal hundredths.

Open Question

Put digits in the boxes to create a number ☐☐☐.☐ .

Create another number ☐☐.☐☐ .

Tell how much more the first number is than the second.

List three pairs of numbers of the same form that are about the same distance apart. Tell how we know they are about the same distance apart. Calculate each difference.

List a pair of numbers of the same form that are closer together, but not a lot closer. Tell how we know they are closer together.

**Think Sheet**

When we subtract 37 from 420, we might think:

To get from 37 to 420, we have to add 3 + 60 + 320 = 383.
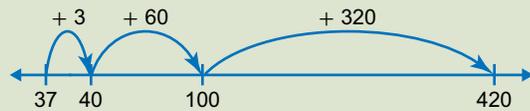
If we subtract a decimal in tenths from a decimal in hundredths, we might go up by some hundredths to get to a whole number or a decimal tenth and then do the rest of the adding.

For example, suppose we need to walk 13.2 km and have gone 5.78 km. To find the distance left to walk, we could add up to subtract.

13.2 - 5.78 is 0.02 + 0.2 + 7.2 = 7.22
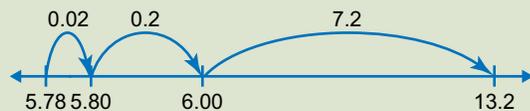
If we lined the numbers up, it would look like this:

$$\begin{array}{r} 13.2 \\ -\ \ 5.78 \\ \hline \end{array}$$

We can estimate differences by considering just the whole number parts or the whole numbers and tenths.

For example, 14.3 – 8.97 is about 14 – 8 = 6.
But 8.97 is close to 9 so 14.3 – 9 is about 5.3.

1. Complete the question and write the equation in standard form.
   (0.4 is standard form)

   a) 7 tenths – 25 hundredths =

   b) 18 tenths – 47 hundredths =

   c) 37 tenths – 39 hundredths =

   d) 183 hundredths – 9 tenths =

2. Describe your strategy for 1b and 1c.

3. Estimate the difference. Explain your thinking.

   a) 65.38 – 19.8

   b) 93.2 – 17.88

   c) 63.1 – 11.47

4. Subtract

   a) 44.75 – 13.2 =   **b) 104.7 – 43.35 =**

   c) 605.9 – 138.46 =   **d) 511.6 – 313.72 =**

   e) 45.57 – 12.8 =   **f) 67.7 – 17.78 =**

   g) 14.38 -9.99 =   **h) 83.1 – 26.77 =**

5. Explain your strategy for 4b and 4g.

Decimal Computation

6. When you subtract a decimal hundredth number (like 4.28) from a decimal tenth number (like 195.2), do you always get a decimal hundredth difference? Explain.

7. Why does 75.3 – 18.79 have the same answer as 80.3 – 23.79?

8. Do you think 14.3 – 7.85 is more complicated than 14.85 – 7.3? Explain.

9. Make up a story problem where you subtract 4.83 from 12.1. Solve the problem.

 Decimal Computation

Learning Goal

- using the patterns of the place value system to mentally multiply or divide decimals by 10 or 100.

Open Question

Ian says that when we multiply 2.46 by 10 or 100 or divide 24.6 by 10, we end up with the same digits, just in different place value columns.

Hundreds	Tens	Ones	Tenths	Hundredths

Do you agree with Ian?

**Explain why or why not.**

Decimal Computation

Think Sheet

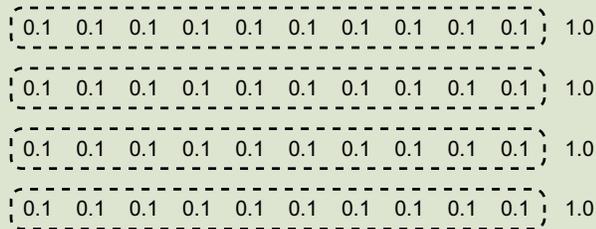Multiplying by 10 or 100 is easier than multiplying by a lot of other numbers.

That is because we only need to think about where the digits in a number appear.

For example, we can think of 10 × 3.4 as 10 groups of 3 ones and 10 groups of 4 tenths.

10 groups of 3 ones is 10 columns of 3 ones, or 3 rows of 10 ones. It is the same as 3 tens.

1	1	1	1	1	1	1	1	1	1	10
1	1	1	1	1	1	1	1	1	1	10
1	1	1	1	1	1	1	1	1	1	10
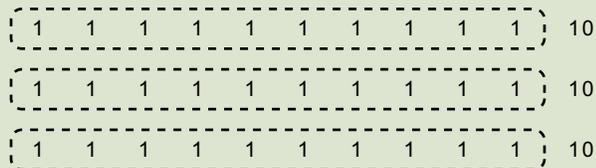
10 groups of 4 tenths is 10 columns of 4 tenths, or 4 rows of 10 tenths. It is the same as 4 ones.

0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	1.0
0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	1.0
0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	1.0
0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	1.0

So, 10 × 3.4 = 34.

The digit that was in the ones place is now in the tens place.

All the other digits move with it.

10 × 3.4

Tens	Ones	Tenths	Hundredths
	3	4	
3	4		

100 × 4.5 means 100 groups of 4 ones and 100 groups of 0.5. That's the same as 4 hundreds and 500 tenths, or 50.

So 100 × 4.5 = 450.

Hundredths	Tens	Ones	Tenths	Hundredths
		4	5	
4	5	0		

The digit that was in the ones place is now in the hundreds place.

All the other digits move with it. The 0 was placed in the ones place to show that the 4 was hundreds.

We can also divide decimals by 10 using the same idea.

If we begin with 15.2, there is 1 ten, 5 ones, and 2 tenths.

If we divide by 10, we share each part among 10 people.

Each share is only $\frac{1}{10}$ as big.

$\frac{1}{10}$ of 10 = 1

$\frac{1}{10}$ of 5 = 0.5

$\frac{1}{10}$ of 0.2 = 0.02

Hundredths	Tens	Ones	Tenths	Hundredths
	1	5	2	
		1	5	2

So 15.2 ÷ 10 = 1.52.

1. **Complete each with the right word. The first one is done for you.**

   a) **When you multiply 4.28 × 100, the 4 ones become 4 _hundreds._**

   b) **When you multiply 3.7 × 10, the 7 tenths become 7 _____.**

   c) **When you multiply 5.03 × 10, the 3 hundredths becomes 3 _____.**

   d) **When you multiply 8.23 × 100, the 3 hundredths become 3 _____.**

   e) **When you divide 198.3 ÷ 10, the 8 ones become 8 _____.**

   f) **When you divide 74.6 ÷ 10, the 6 tenths become 6 _____.**

2. Complete each statement.

   a) $10 \times 5.7 =$ b) $100 \times 5.7 =$

   c) $10 \times 4.02 =$ d) $100 \times 5.92 =$

   g) $100 \times 7.8 =$ f) $10 \times 13.49 =$

3. Complete each statement.

   a) ___ $\times 100 = 370$

   b) ___ $\times 49.1 = 491$

   c) ____ $\times 0.82 = 8.2$

4. Complete each statement.

   a) $16.7 \div 10 =$

   b) $543.2 \div 10 =$

   c) $1.4 \div 10 =$

5. a) Why does it make sense that 4.7 m = 470 cm? What multiplication or division does this describe?

   b) How would you write 5.28 m as centimetres? What multiplication or division does this describe?

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c) Why does it make sense that 43 mm = 4.3 cm? What multiplication or division does this describe?

6. You either multiplied or divided 4328.8 by 10 and the result was 432.88. Did you multiply or divide? How could you tell?

7. Why don't you need to use your multiplication facts to multiply or divide by 10 or 100?

Place Value Chart (1)

Tens	Ones	Tenths	Hundredths
	●		

Tens	Ones	Tenths	Hundredths
	●		

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Place Value Chart (2)

Hundreds	Tens	Ones	Tenths	Hundredths

Hundreds	Tens	Ones	Tenths	Hundredths

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