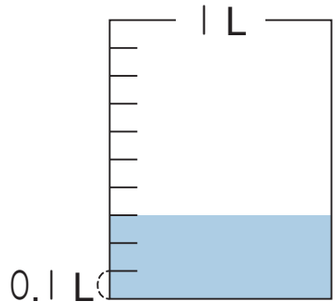
14 - 1 Decimal Numbers

How to Represent Decimal Numbers (1)

Instruction When 1 L is divided into 10 equal parts, each part is written as 0.1 L. It is read as "zero point one" litres.



The amount of water is 3 parts of $\frac{1}{10}$.

So it is $\frac{3}{10}$ L.

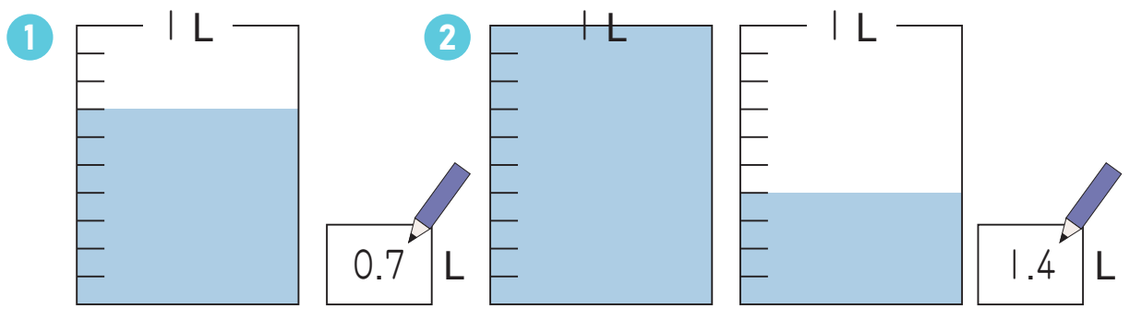
This $\frac{1}{10}$ is also written as 0.1.

So, 3 parts of 0.1 is 0.3 L.

0.3
Decimal Point

Numbers such as 0.1 and 0.3 are called **decimal numbers**.

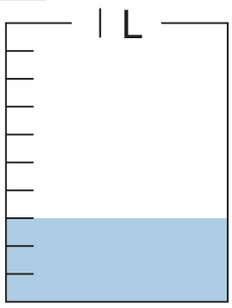
Example How many litres of water are in the containers shown below?



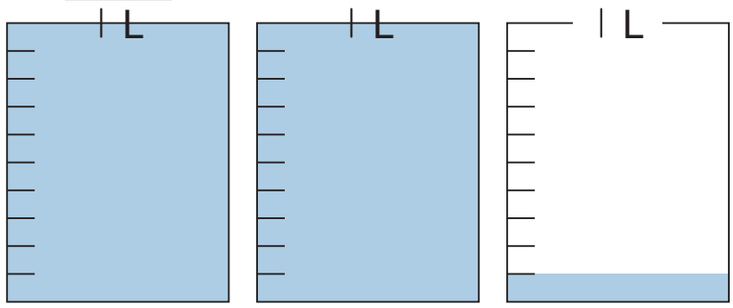
Think about how many 0.1 L are there? There are 7 and 14 respectively. In the case of (2), the amount of water is 1 L and 0.4 L added together. It is written as "1.4" L and is read as "one point four" litres.

How many litres of water are in the containers?

1 ☐ L



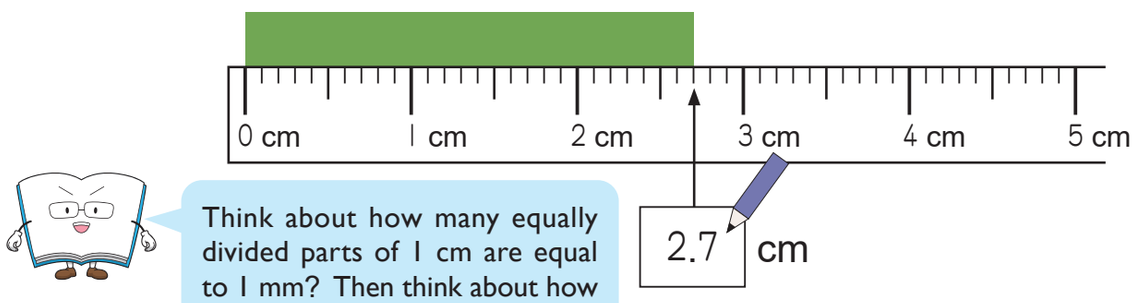
2 ☐ L



14 - 2 Decimal Numbers

How to Represent Decimal Numbers (2)

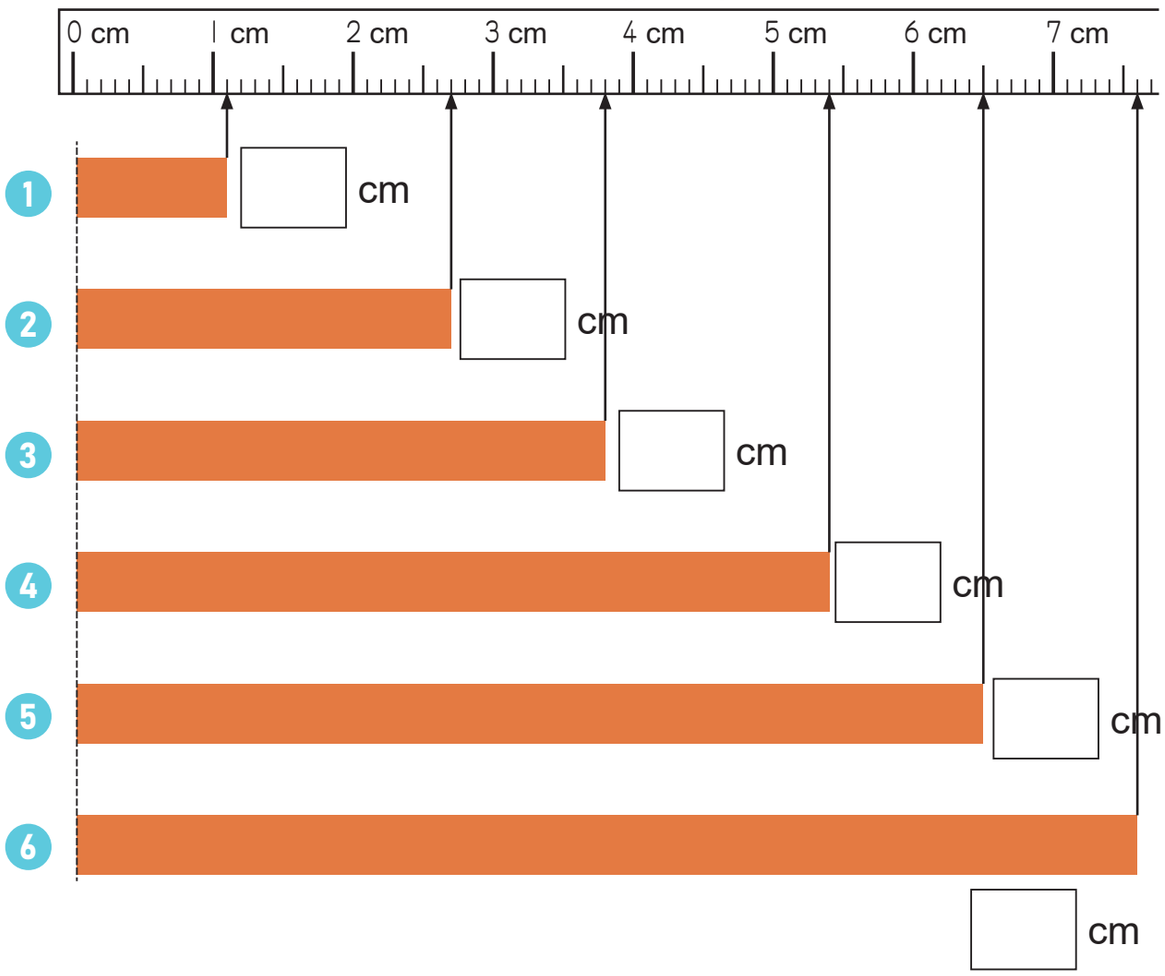
Example What is the length of the tape in centimetre (cm)?



Think about how many equally divided parts of 1 cm are equal to 1 mm? Then think about how you can express 1 mm in cm?

1 cm is divided into 10 equal parts. One part 1 mm.
So the length of the tape is 2 cm and 7 mm. 7 mm can be called 0.7 cm. So 2 cm and 0.7 cm together equal 2.7 cm.

What are the lengths of the following 6 tapes in centimetres?

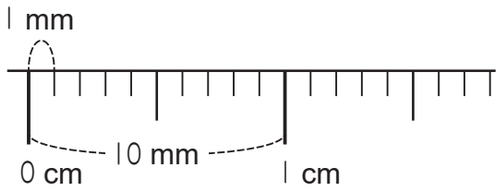


14 - 3 Decimal Numbers

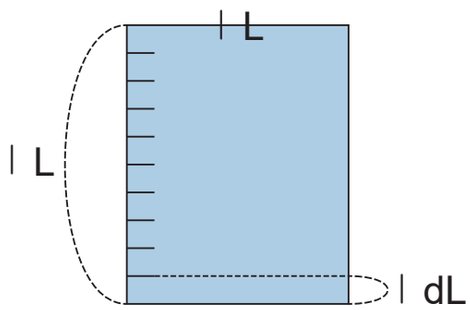
How to Represent Decimal Numbers (3)

Instruction Learn the units of length and capacity.

1 cm = 10 mm



1 L = 10 dL



Example Write the numbers in the □.

1 6.1 cm = 6 cm 1 mm

2 8 L 7 dL = 8.7 L

Write the numbers in the □.

1 2.3 cm = □ cm □ mm

2 4.8 cm = □ cm □ mm

3 8.6 cm = □ cm □ mm

4 □ cm = 6 cm 1 mm

5 □ cm = 7 cm 4 mm

6 1.2 L = □ L □ dL

7 3.9 L = □ L □ dL

8 5.7 L = □ L □ dL

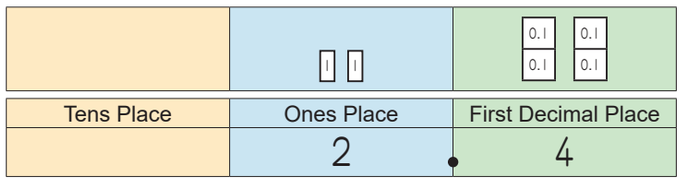
9 □ L = 9 L 1 dL

10 □ L = 2 L 5 dL

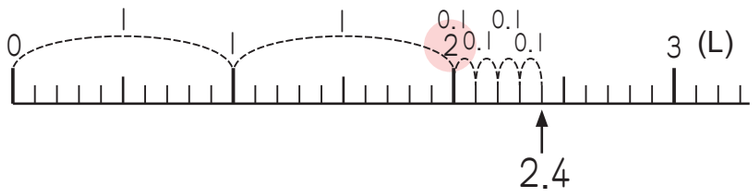
14 - 4 Decimal Numbers

Structure of Decimal Numbers

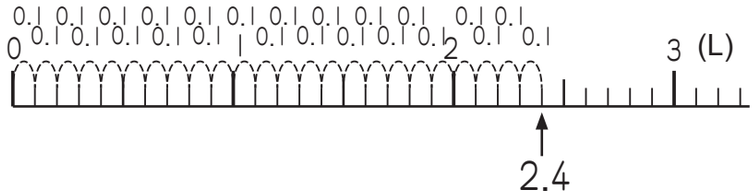
Instruction The place to the right of the decimal point is called the **first decimal place**.



The number 2.4 represents two 1's (Ones Place) and four 0.1's (First Decimal Place).



The number 2.4 is made of twenty-four 0.1's.



Example Write the numbers in the □.

1. 3.4 is made of 3 1's and 4 0.1's.
2. 3.4 is made of 34 0.1's.

Write the numbers in the □.

1. 4.6 is made of □ 1's and □ 0.1's.
2. 4.6 is made of □ 0.1's.
3. □ is made of seven (7) 1's and two (2) 0.1's.
4. □ is made of fifty-eight (58) 0.1's.

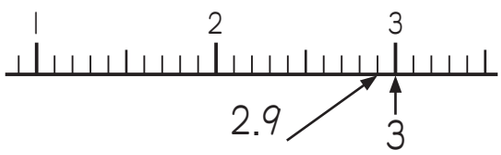
14 - 5 Decimal Numbers

Comparing Numbers

Example Which numbers is greater, 2.9 or 3?

There are three kinds of solutions for this problem. You can use one of them.
The first method is using the number line.
The second method is thinking about how many 0.1's there are in each number.
The third method is using the diagram to compare numbers.

First Method



Second Method

2.9 is made of twenty-nine (29) 0.1's.
3 is made of thirty (30) 0.1's.

Answer 2.9 < 3

Third Method

Ones Place	First Decimal Place
2	9
3	

Compare the numbers in the greatest place.

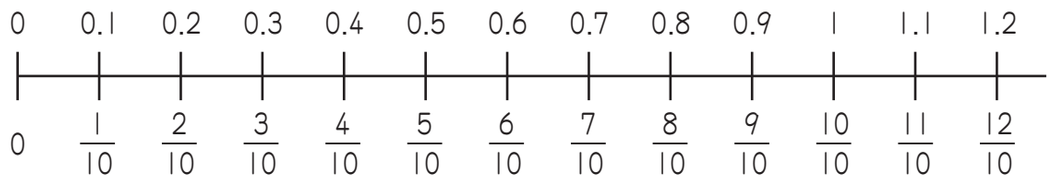
Compare the following two numbers and write the appropriate sign (< or >) in the □.

1. 0.4 □ 0.6
2. 0.7 □ 0.2
3. 4.5 □ 6.1
4. 0.5 □ 1.5
5. 3.4 □ 4.3
6. 7.1 □ 7.5
7. 1 □ 0.9
8. 1.9 □ 2
9. 3 □ 3.1
10. 6 □ 2.1
11. 8 □ 8.2
12. 0 □ 0.5
13. 1.3 □ 0.3
14. 0.1 □ 0
15. 0 □ 1.2

14 - 6 Decimal Numbers

Decimal Numbers and Fractions

Instruction The decimal numbers and fractions match the following.



Decimal numbers can be converted to fractions and fractions can be converted to decimal numbers.

For example, 0.6 is made of six (6) 0.1's. In other words, it is made of six (6) $\frac{1}{10}$. So, 0.6 is $\frac{6}{10}$.

$\frac{7}{10}$ is made of seven (7) $\frac{1}{10}$. In other words, it is made of seven (7) 0.1's. So, $\frac{7}{10}$ is 0.7.

Example Which numbers is greater, 0.4 or $\frac{3}{10}$?

0.4 is made of four (4) 0.1's ($\frac{1}{10}$). So, 0.4 is $\frac{4}{10}$.

$\frac{3}{10}$ is made of three (3) $\frac{1}{10}$ (0.1's). So, $\frac{3}{10}$ is 0.3.

Answer $0.4 > \frac{3}{10}$

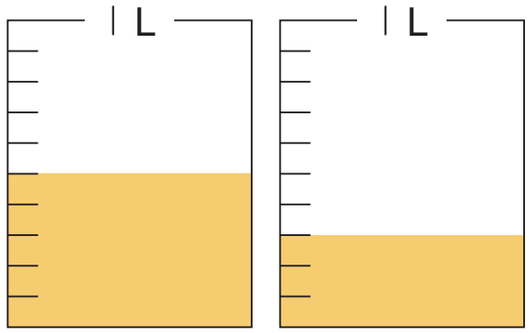
Compare the following two numbers and write the appropriate sign (< or >) in the □.

1. 0.8 □ $\frac{7}{10}$
2. 0.5 □ $\frac{6}{10}$
3. 1.2 □ $\frac{11}{10}$
4. $\frac{14}{10}$ □ 1.5
5. $\frac{23}{10}$ □ 2.4
6. $\frac{35}{10}$ □ 3.1

14 - 7 Decimal Numbers

Addition of Decimal Numbers (1)

Example A bottle contains 0.5 L of juice and another bottle contains 0.3 L of juice. How much juice is there altogether?



0.5 + 0.3

If we think of 0.1 L as a unit, 0.5 is made of five (5) 0.1's, and 0.3 is made of three (3) 0.1's.
There are eight (8) 0.1's altogether.

Math Sentence: 0.5 + 0.3 = 0.8

Answer: 0.8 L

1 A container has 0.4 L of milk and another container has 0.3 L of milk. How much milk is there altogether?

Math Sentence: ____

Answer: ____ L

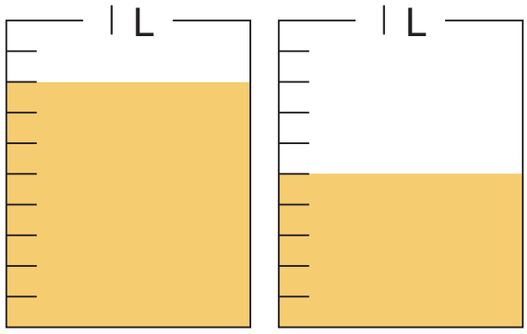
2 Calculate the following addition problems.

1. 0.4 + 0.2 = ____
2. 0.2 + 0.7 = ____
3. 0.6 + 0.1 = ____
4. 0.3 + 0.5 = ____
5. 0.1 + 0.5 = ____
6. 0.8 + 0.1 = ____
7. 0.5 + 0.4 = ____
8. 0.3 + 0.5 = ____
9. 0.3 + 0.6 = ____
10. 0.5 + 0.2 = ____
11. 0.2 + 0.2 = ____
12. 0.4 + 0.4 = ____

14 - 8 Decimal Numbers

Addition of Decimal Numbers (2)

Example A bottle contains 0.8 L of juice and another bottle contains 0.5 L of juice. How much juice is there altogether?



0.8 + 0.5

If we think of 0.1 L as a unit, 0.8 is made of eight (8) 0.1's, and 0.5 is made of five (5) 0.1's. There are thirteen (13) 0.1's altogether. 10 is regrouped to the ones place. So it becomes 1.3.

Math Sentence: 0.8 + 0.5 = 1.3

Answer: 1.3 L

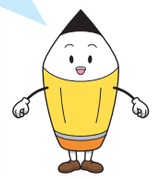
1 A container has 0.9 L of milk and another container has 0.6 L of milk. How much milk is there altogether?

Math Sentence: ☐

Answer: ☐ L

2 Calculate the following addition problems.

You do not have to write "0," when the answer is "1.0."

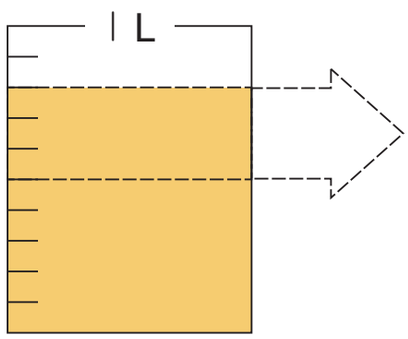


1. 0.8 + 0.3 = ☐
2. 0.7 + 0.5 = ☐
3. 0.9 + 0.6 = ☐
4. 0.4 + 0.7 = ☐
5. 0.6 + 0.6 = ☐
6. 0.8 + 0.9 = ☐
7. 0.7 + 0.5 = ☐
8. 0.2 + 0.8 = ☐
9. 0.5 + 0.5 = ☐
10. 1 + 0.2 = ☐
11. 1 + 0.9 = ☐
12. 0.4 + 1 = ☐

14 - 9 Decimal Numbers

Subtraction of Decimal Numbers (1)

Example There are 0.8 L of juice. A boy drank 0.3 L of it. How many litres of juice are left?



0.8 − 0.3

If we think of 0.1 L as a unit,
0.8 is made of eight (8) 0.1's, and
0.3 is made of three (3) 0.1's.

There are five (5) 0.1's left.

Math Sentence: 0.8 − 0.3 = 0.5

Answer: 0.5 L

1 There are 0.7 L of milk. A girl drank 0.4 L of it. How many litres of milk are left?

Math Sentence: ☐

Answer: ☐ L

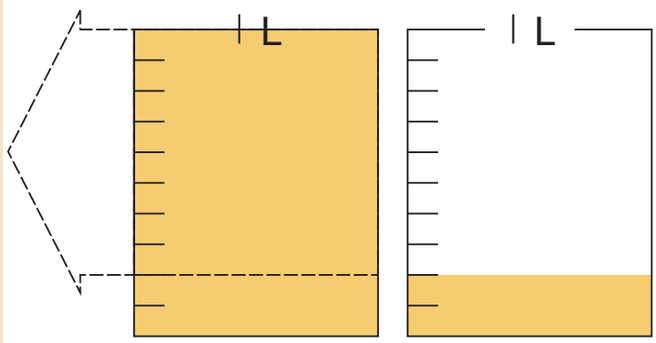
2 Calculate the following subtraction problems.

1. 0.5 − 0.2 = ☐
2. 0.7 − 0.2 = ☐
3. 0.6 − 0.4 = ☐
4. 0.5 − 0.4 = ☐
5. 0.8 − 0.1 = ☐
6. 0.4 − 0.3 = ☐
7. 0.5 − 0.4 = ☐
8. 0.5 − 0.3 = ☐
9. 0.6 − 0.3 = ☐
10. 0.9 − 0.8 = ☐
11. 0.8 − 0.1 = ☐
12. 0.4 − 0.2 = ☐

14 - 10 Decimal Numbers

Subtraction of Decimal Numbers (2)

Example There are 1.2 L of juice. A child drank 0.8 L of it. How many litres of juice are left?



1.2 − 0.8

If we think of 0.1 L as a unit, 1.2 is made of twelve (12) 0.1's, and 0.8 is made of eight (8) 0.1's.

There are four (4) 0.1's left
So, it becomes 0.4.

Math Sentence: 1.2 − 0.8 = 0.4

Answer: 0.4 L

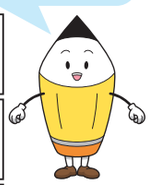
1 There are 1.5 L of orange juice. My mother drank 0.6 L of it. How many litres of orange juice are left?

Math Sentence: ☐

Answer: ☐ L

2 Calculate the following addition problems.

Once again, you do not have to write "0," when the answer is "1.0."

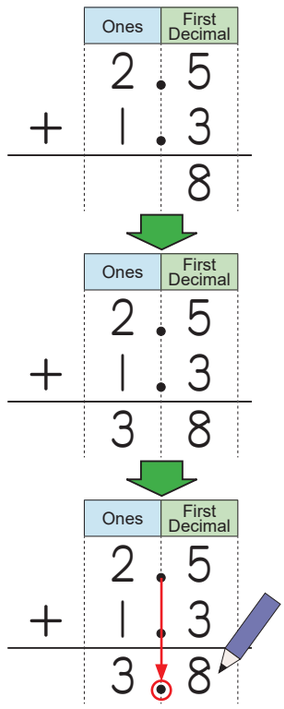


1. 1.4 − 0.5 = ☐
2. 1.2 − 0.8 = ☐
3. 1.3 − 0.6 = ☐
4. 1.1 − 0.7 = ☐
5. 1.6 − 0.9 = ☐
6. 1.3 − 0.4 = ☐
7. 1.5 − 0.5 = ☐
8. 1.7 − 0.9 = ☐
9. 1 − 0.9 = ☐
10. 1 − 0.2 = ☐
11. 1 − 0.1 = ☐
12. 1 − 0.6 = ☐

14 - 11 Decimal Numbers

Addition Algorithm (1)

Example Calculate 2.5 + 1.3 by using the algorithm.



Line up the numbers vertically in each place.

Calculate each place separately.

First Decimal Place

5 + 3 = 8

Ones Place

2 + 1 = 3

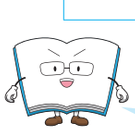
Line up the decimal points from the top and place the decimal point in the answer.

2.5 + 1.3 = 3.8

Calculate the following addition problems by using the algorithm.

1 2.5 + 1.4 2 1.2 + 3.6 3 4.1 + 2.2 4 3.4 + 5.1

	2 . 5		1 . 2				
+	1 . 4	+	3 . 6				
	.		.				



Don't forget to write "0" in the ones place.

We can think of "1" as "1.0."

5 0.3 + 0.6 6 1.5 + 0.3 7 0.7 + 5.2 8 6.3 + 1.2

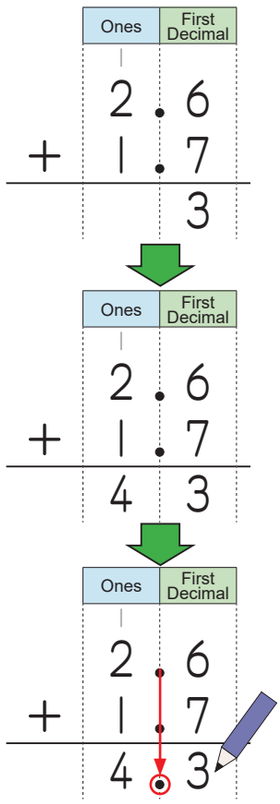
9 0.5 + 1.3 10 0.4 + 0.5 11 1 + 7.1 12 1 + 0.8

5		6		7		8	
9		10		11		12	

14 - 12 Decimal Numbers

Addition Algorithm (2)

Example Calculate 2.6 + 1.7 by using the algorithm.



Line up the numbers vertically in each place.

Calculate each place separately.

First Decimal Place

5 + 3 = 13

Regroup 1 to the ones place.

Ones Place

The regrouped 1 and 2 make 3.

3 + 1 = 4

Line up the decimal points from the top and place the decimal point in the answer.

2.6 + 1.7 = 4.3

Calculate the following addition problems by using the algorithm.

1. 2.7 + 1.6
2. 6.5 + 2.9
3. 3.9 + 1.5
4. 7.6 + 1.7

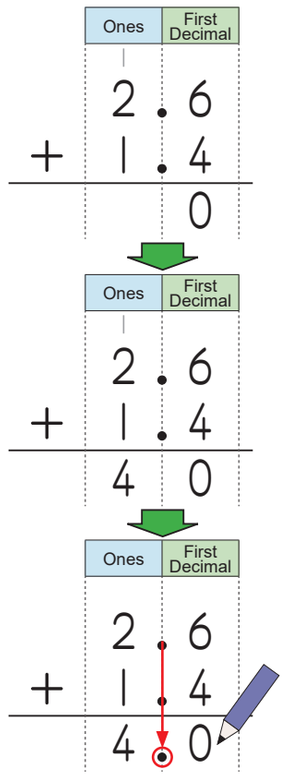
5. 8.9 + 0.6
6. 0.8 + 7.4
7. 0.7 + 0.5
8. 2.9 + 3.3
9. 0.9 + 1.8
10. 4.5 + 0.9
11. 2.4 + 1.7
12. 5.3 + 1.8

5		6		7		8	
9		10		11		12	

14 - 13 Decimal Numbers

Addition Algorithm (3)

Example Calculate 2.6 + 1.4 by using the algorithm.



Line up the numbers vertically in each place.

Calculate each place separately.

First Decimal Place

6 + 4 = 10

Write a 0 in the first decimal place.
Regroup 1 to the ones place.

Ones Place

The regrouped 1 and 2 make 3.

3 + 1 = 4

Line up the decimal points from the top and place the decimal point in the answer.

2.6 + 1.4 = 4.0

In this case, it is fine that the answer is "4".

Calculate the following addition problems by using the algorithm.

1 2.7 + 1.3 2 5.5 + 3.5 3 3.9 + 1.1 4 4.6 + 1.4

5 8.9 + 0.1 6 0.8 + 4.2 7 0.7 + 0.3 8 0.2 + 1.8

9 0.4 + 0.6 10 3.5 + 2.5 11 5.6 + 2.4 12 1.6 + 1.4

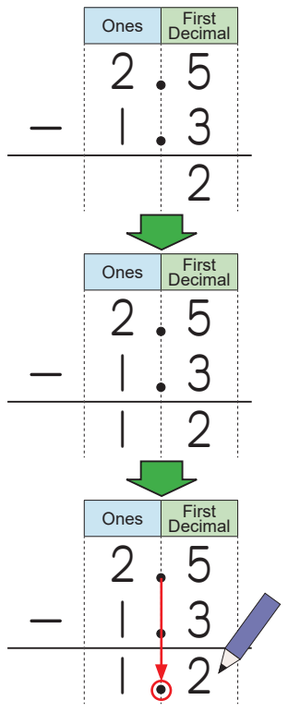
When the answer is "2.0," we can also write "2" as the answer.

5		6		7		8	
9		10		11		12	

14-14 Decimal Numbers

Subtraction Algorithm (1)

Example Calculate 2.5 − 1.3 by using the algorithm.



Line up the numbers vertically in each place.

Calculate each place separately.

First Decimal Place

5 − 3 = 2

Ones Place

2 − 1 = 1

Line up the decimal points from the top and place the decimal point in the answer.

2.5 − 1.3 = 1.2

Calculate the following subtraction problems by using the algorithm.

1 2.5 − 1.4 2 3.6 − 1.2 3 4.3 − 2.2 4 5.4 − 3.1

	2 . 5
−	1 . 4
	.

	3 . 6
−	1 . 2
	.

5 3.5 − 0.3 6 1.5 − 0.2 7 5.7 − 4.2 8 6.3 − 4.1

9 1.8 − 0.7 10 4.6 − 3.6 11 1.6 − 1.2 12 7.2 − 7.1

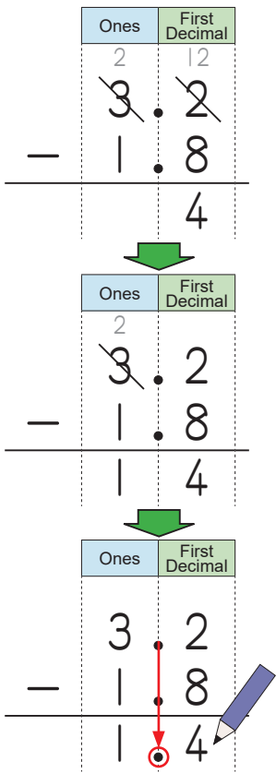
Pay attention to the problem (10). In addition, don't forget to write "0" in the ones place in the roblems (11) and (12).

5		6		7		8	
9		10		11		12	

14 - 15 Decimal Numbers

Subtraction Algorithm (2)

Example Calculate 3.2 − 1.8 by using the algorithm.



Line up the numbers vertically in each place.

Calculate each place separately.

First Decimal Place

You can't take 8 from 2 so you need to regroup from the ones place.

$$12 - 8 = 4$$

Ones Place

Since you regrouped, the ones place becomes 2.

$$2 - 1 = 1$$

Line up the decimal points from the top and place the decimal point in the answer.

$$3.2 - 1.8 = 1.4$$

Calculate the following subtraction problems by using the algorithm.

1. 4.2 − 1.8
2. 3.4 − 1.9
3. 5.3 − 2.7
4. 5.4 − 3.6

5. 3.6 − 0.7
6. 2.6 − 0.8
7. 5.1 − 3.2
8. 6.2 − 5.5
9. 7.4 − 6.6
10. 4.6 − 3.7
11. 2.1 − 1.9
12. 8.3 − 5.7

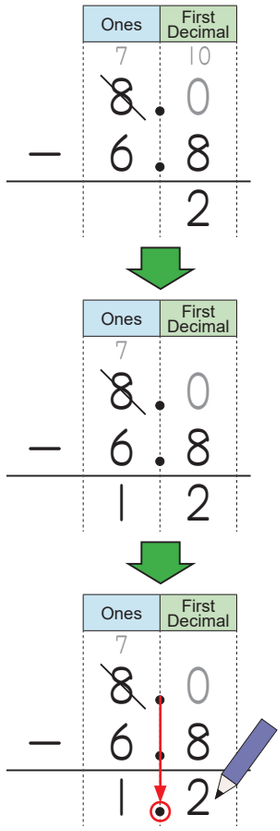
Regarding the problems (8), (9), (10) and (11), don't forget to write "0" in the ones place.

5		6		7		8	
9		10		11		12	

14 - 16 Decimal Numbers

Subtraction Algorithm (3)

Example Calculate 8 − 6.8 by using the algorithm.



Line up the numbers vertically in each place. You can consider 8 as 8.0. Write a 0 in the first decimal place.
Calculate each place separately.

First Decimal Place

You can't take 8 from 0 so you need to regroup from the ones place.

$$10 - 8 = 2$$

Ones Place

Since you regrouped, the ones place becomes 7.

$$7 - 6 = 1$$

Line up the decimal points from the top and place the decimal point in the answer.

$$8 - 6.8 = 1.2$$

Think of "8" as "8.0." "8" is written in the ones place.

Calculate the following subtraction problems by using the algorithm.

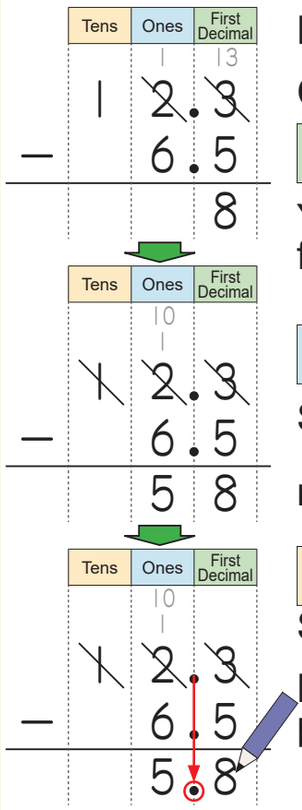
1. 8 − 4.8
2. 7 − 1.9
3. 5 − 2.7
4. 6 − 3.6
5. 2 − 0.7
6. 3 − 0.8
7. 4 − 2.9
8. 5 − 4.5
9. 1 − 0.1
10. 9 − 7.2
11. 2 − 1.8
12. 6 − 5.6

5		6		7		8	
9		10		11		12	

14 - 17 Decimal Numbers

Subtraction Algorithm (4)

Example Calculate 12.3 − 6.5 by using the algorithm.



Line up the numbers vertically in each place.

Calculate each place separately.

First Decimal Place

You can't take 5 from 3, so you need to regroup from the ones place.

13 − 5 = 8

Ones Place

Since you regrouped, the ones place becomes 1. You can't take 6 from 1, so you need to regroup from the tens place.

11 − 6 = 5

Tens Place

Since you regrouped, the tens place becomes 0.

Line up the decimal points from the top and place the decimal point in the answer.

12.3 − 6.5 = 5.8

Calculate the following subtraction problems by using the algorithm.

1 12.4 − 5.6 2 15.8 − 7.9 3 13.2 − 6.6 4 17.1 − 8.3

5 25.3 − 7.5 6 36.3 − 5.9 7 42.3 − 9.7 8 50.3 − 4.8

9 10 − 8.1 10 20 − 2.5 11 43 − 14.3 12 56 − 15.6

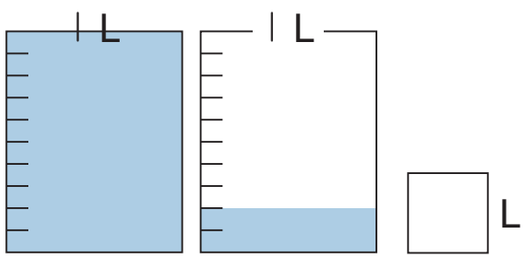
Think of '10," "20," "43" and "56" as "10.0," "20.0," "43.0" and "56.0," respectively.

5		6		7		8	
9		10		11		12	

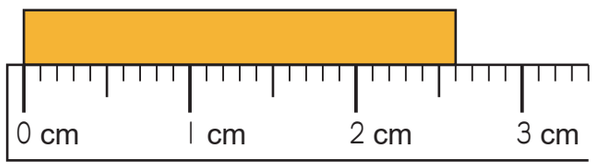
14-18 Decimal Numbers

Review

1 What is the length of the tape and what is the amount of the water? Write the numbers in the ☐.

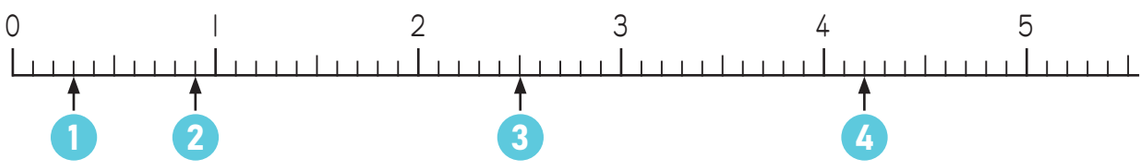
① 

☐ L

② 

☐ cm

2 Look at the following number line. What are the numbers for (1) to (4)? How many 0.1's are in each number?



① Number ☐ How many 0.1's ☐

② Number ☐ How many 0.1's ☐

③ Number ☐ How many 0.1's ☐

① Number ☐ How many 0.1's ☐

3 Compare the following two numbers and write the appropriate sign (< or >) in the ☐.

① 0.7 ☐ 0.5 ② 1.9 ☐ 2 ③ 0.8 ☐ $\frac{9}{10}$

4 Calculate the following problems by using the algorithm.

① 0.4 + 0.1 ② 1.5 + 0.7 ③ 2.8 + 5.4 ④ 0.8 + 0.2

⑤ 6.3 + 1.7 ⑥ 5.6 + 3.5 ⑦ 7.6 − 4.2 ⑧ 2.7 − 0.9

⑨ 8.1 − 7.9 ⑩ 3 − 1.6 ⑪ 4 − 3.8 ⑫ 18.7 − 9.8

①		②		③		④	
⑤		⑥		⑦		⑧	
⑨		⑩		⑪		⑫	