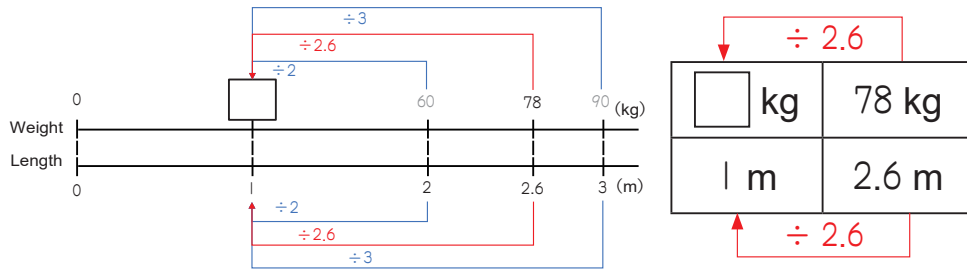


6 - 1

Division of Decimal Numbers

Dividing by Decimal Numbers (1)

Example A 2.6 m long iron pipe weighs 78 kg. How much does 1 m of the pipe weigh?



The math sentence is “ $96 \div 1.6$,” but how can we calculate it?

According to the above diagram, we can make the math sentence $78 \div 2.6$. This division problem can be solved in the following way.

$$\begin{array}{r} 78 \div 2.6 = 30 \\ \downarrow 10 \text{ times} \quad \downarrow 10 \text{ times} \\ 780 \div 26 = 30 \end{array} \quad \text{Equal}$$

The weight of 16 m of the iron pipe

Also another way is

$$\begin{array}{r} 78 \div 2.6 = 30 \\ \downarrow 10 \text{ times} \\ 78 \div 26 = 3 \end{array} \quad \begin{array}{l} \leftarrow 10 \text{ times} \\ \text{The weight of } 0.1 \text{ m of the iron pipe} \end{array}$$

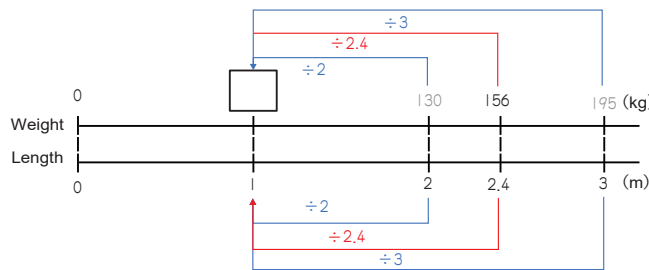
Math sentence

$$78 \div 2.6 = 30$$

Answer 30 kg

1 A 2.4 m long copper pipe weighs 156 kg. How much does 1 m of the pipe weigh?

Math sentence

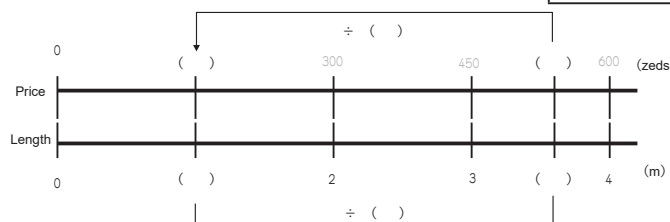


Answer _____

2 A 3.6 m long ribbon costs 540 zeds. How much does 1 m of ribbon cost? (“zed(s)” is the fictional currency unit.)

Math sentence

() zeds	() zeds
() m	() m



Answer _____

Complete the number line diagram and table.

6 - 2

Division of Decimal Numbers

Dividing by Decimal Numbers (2)

Example Find the following quotients based on $221 \div 65 = 3.4$.

1 $22.1 \div 6.5 = \boxed{3.4}$

$$\begin{array}{l} 22.1 \div 6.5 = 3.4 \\ \downarrow 10 \text{ times} \quad \downarrow 10 \text{ times} \\ 221 \div 65 = 3.4 \end{array} \quad \text{Equal}$$

2 $221 \div 6.5 = \boxed{34}$

$$\begin{array}{l} 221 \div 6.5 = 34 \\ \downarrow 10 \text{ times} \\ 221 \div 65 = 3.4 \end{array} \quad \frac{1}{10}$$

3 $22.1 \div 65 = \boxed{0.34}$

$$\begin{array}{l} 22.1 \div 65 = 0.34 \\ \downarrow 10 \text{ times} \\ 221 \div 65 = 3.4 \end{array} \quad \frac{1}{10}$$

We should remember these rules. It is very interesting!
Especially, it is careful that the divisor becomes $\frac{1}{10}$, the quotient will be 10 times.



1 Find the quotient of each of the following based on $238 \div 17 = 14$.

1 $23.8 \div 1.7 = \boxed{}$

2 $238 \div 1.7 = \boxed{}$

3 $23.8 \div 17 = \boxed{}$

4 $2.38 \div 17 = \boxed{}$

What if we multiply the divisor by 100?



2 Find the quotient of each of the following based on $896 \div 28 = 32$.

1 $89.6 \div 2.8 = \boxed{}$

2 $896 \div 2.8 = \boxed{}$

3 $89.6 \div 28 = \boxed{}$

4 $8.96 \div 28 = \boxed{}$

What if we multiply the divisor by 100?



3 Find the quotient of each of the following based on $477 \div 159 = 3$.

1 $47.7 \div 15.9 = \boxed{}$

2 $477 \div 15.9 = \boxed{}$

3 $47.7 \div 159 = \boxed{}$

4 $477 \div 1.59 = \boxed{}$

6 - 3

Division of Decimal Numbers

Division of Decimal Numbers (1)

Example Calculate $4.2 \div 3.5$ by using the division algorithm.

$$3.5 \overline{)4.2} \quad \rightarrow \quad \begin{array}{r} 3.5 \overline{)4.20} \\ \text{10 times} \quad \text{10 times} \end{array} \quad \rightarrow \quad \begin{array}{r} 1.2 \\ 3.5 \overline{)4.20} \\ \underline{35} \\ 70 \\ \underline{70} \\ 0 \end{array}$$



According to the division rule, the quotient is same even when calculating after multiplying both divisor and dividend by 10.

$$\begin{array}{r} 1.2 \\ 3.5 \overline{)4.20} \\ \underline{35} \\ 70 \\ \underline{70} \\ 0 \end{array}$$

Move the decimal point of the divisor **one place** to the right to make it a whole number (This means that the divisor becomes 10 times).

Move the decimal point of the dividend to the right the same number of places (**one place**) (This means that the dividend also become 10 times).

Divide by the whole number divisor. We can add a 0 at the end of the dividend.

The decimal point of the quotient will be in the same position as the decimal point of the dividend after it was moved to the right.

Calculate the following division problems by using the division algorithm.

- 1 $5.6 \div 1.6$ 2 $6.5 \div 2.6$ 3 $7.8 \div 6.5$ 4 $5.1 \div 3.4$

$$\begin{array}{r} \square \square \\ 1.6 \overline{)5.6} \\ \underline{\square \square} \\ \square \square \\ \underline{\square \square} \\ \square \square \end{array}$$

$$\begin{array}{r} \square \square \\ 2.6 \overline{)6.5} \\ \underline{\square \square} \\ \square \square \square \\ \underline{\square \square \square} \\ \square \square \square \end{array}$$

$$6.5 \overline{)7.8}$$

$$3.4 \overline{)5.1}$$

- 5 $3.6 \div 2.4$ 6 $4.2 \div 1.5$ 7 $9.1 \div 2.6$ 8 $7.7 \div 1.4$
 9 $36.5 \div 2.5$ 10 $89.3 \div 3.8$ 11 $65.1 \div 4.2$ 12 $57.6 \div 4.5$

5		6		7		8	
9		10		11		12	

6 - 4

Division of Decimal Numbers

Division of Decimal Numbers (2)

Example Calculate $3.45 \div 1.5$ by using the division algorithm.

$$1.5 \overline{) 3.45} \quad \rightarrow \quad \begin{array}{r} 1.5 \overline{) 3.45} \\ \text{10 times} \quad \text{10 times} \end{array} \quad \rightarrow \quad \begin{array}{r} 2.3 \\ 1.5 \overline{) 3.45} \\ \underline{3 } \\ 4 \\ \underline{4 } \\ 0 \end{array}$$



Based on the division rule, we think of $34.5 \div 15$, which has the same quotient.

$$\begin{array}{r} 2.3 \\ 15 \overline{) 34.5} \\ \underline{30} \\ 45 \\ \underline{45} \\ 0 \end{array}$$

Move the decimal point of the divisor **one place** to the right to make it a whole number (This means that the divisor becomes 10 times).

Move the decimal point of the dividend to the right the same number of places (**one place**) (This means that the dividend also become 10 times).

Divide by the whole number divisor. The decimal point of the quotient will be in the same position as the decimal point of the dividend after it was moved to the right.

Calculate the following division problems by using the division algorithm.

- 1 $6.76 \div 1.3$ 2 $8.51 \div 2.3$ 3 $7.05 \div 4.7$ 4 $9.88 \div 3.8$

$$\begin{array}{r} \square \square \\ 1.3 \overline{) 6.76} \\ \underline{\square \square} \\ \square \square \\ \underline{\square \square} \\ \square \end{array} \quad \begin{array}{r} \square \square \\ 2.3 \overline{) 8.51} \\ \underline{\square \square} \\ \square \square \\ \underline{\square \square} \\ \square \end{array} \quad \begin{array}{r} \square \square \\ 4.7 \overline{) 7.05} \\ \underline{\square \square} \\ \square \square \\ \underline{\square \square} \\ \square \end{array} \quad \begin{array}{r} \square \square \\ 3.8 \overline{) 9.88} \\ \underline{\square \square} \\ \square \square \\ \underline{\square \square} \\ \square \end{array}$$

- 5 $4.83 \div 2.3$ 6 $9.18 \div 5.1$ 7 $8.06 \div 6.2$ 8 $9.94 \div 7.1$
 9 $5.28 \div 1.6$ 10 $8.12 \div 2.8$ 11 $13.56 \div 2.4$ 12 $20.59 \div 5.8$

5		6		7		8	
9		10		11		12	


6 - 6

Division of Decimal Numbers

Division of Decimal Numbers (4)

Example Calculate $8.547 \div 2.31$ by using the division algorithm.

$$2.31 \overline{)8.547} \quad \rightarrow \quad \begin{array}{r} 2.31 \overline{)8.547} \\ \text{100 times} \quad \text{100 times} \end{array} \quad \rightarrow \quad \begin{array}{r} 3.7 \\ 2.31 \overline{)8.547} \\ \underline{693} \\ 167 \\ \underline{167} \\ 0 \end{array}$$



$$\begin{array}{r} 3.7 \\ 2.31 \overline{)8.547} \\ \underline{693} \\ 167 \\ \underline{167} \\ 0 \end{array}$$

According to the division rule, the quotient is same even when calculating after multiplying both divisor and dividend by 100.

Move the decimal point of the divisor **two places** to the right to make it a whole number (This means that the divisor becomes 100 times).

Move the decimal point of the dividend to the right the same number of places (**two places**) (This means that the dividend also become 100 times). Think of " $854.7 \div 231$."

Divide by the whole number divisor. The decimal point of the quotient will be in the same position as the decimal point of the dividend after it was moved to the right.

Calculate the following division problems by using the division algorithm.

- ① $9.963 \div 3.69$ ② $3.585 \div 2.39$ ③ $5.024 \div 1.57$ ④ $7.488 \div 4.16$

$$\begin{array}{r} \square \square \\ 3.69 \overline{)9.963} \\ \square \square \square \\ \square \square \square \\ \square \square \square \end{array}$$

$$\begin{array}{r} \square \square \\ 2.39 \overline{)3.585} \\ \square \square \square \\ \square \square \square \\ \square \square \square \end{array}$$

$$1.57 \overline{)5.024}$$

$$4.16 \overline{)7.488}$$

- ⑤ $5.248 \div 3.28$ ⑥ $9.672 \div 4.03$ ⑦ $9.184 \div 2.24$ ⑧ $8.512 \div 1.52$

- ⑨ $7.854 \div 1.87$ ⑩ $8.976 \div 2.64$ ⑪ $8.568 \div 4.76$ ⑫ $7.539 \div 3.59$

⑤		⑥		⑦		⑧	
⑨		⑩		⑪		⑫	

6 - 7

Division of Decimal Numbers

Division of Decimal Numbers (5)

Example Calculate $7.8 \div 3.25$ by using the division algorithm.

$$3.25 \overline{)7.8} \quad \rightarrow \quad \underset{100 \text{ times}}{3.25} \overline{) \underset{100 \text{ times}}{7.800}} \quad \rightarrow \quad \begin{array}{r} 2.4 \\ 3.25 \overline{)7.800} \\ \underline{650} \\ 1300 \\ \underline{1300} \\ 0 \end{array}$$

$$\begin{array}{r} 2.4 \\ 3.25 \overline{)7.800} \\ \underline{650} \\ 1300 \\ \underline{1300} \\ 0 \end{array}$$



Based on the division rule, we think of $780.0 \div 325$, which has the same quotient.

Move the decimal point of the divisor **two places** to the right to make it a whole number (This means that the divisor becomes 100 times).

Move the decimal point of the dividend to the right the same number of places (**two places**) (This means that the dividend also become 100 times).

Think of " $780 \div 325$."

Divide by the whole number divisor. We can add a "0" at the end of the dividend if it is necessary.

The decimal point of the quotient will be in the same position as the decimal point of the dividend after it was moved to the right.

Calculate the following division problems by using the division algorithm.

- 1 $4.6 \div 1.84$ 2 $1.6 \div 0.25$ 3 $6.2 \div 2.48$ 4 $4.2 \div 5.25$

$$1.84 \overline{)4.6} \quad \begin{array}{r} \square \\ \square \\ \square \\ \square \\ \square \\ \square \\ \square \\ \square \end{array}$$

$$0.25 \overline{)1.6} \quad \begin{array}{r} \square \\ \square \\ \square \\ \square \\ \square \\ \square \\ \square \\ \square \end{array}$$

$$2.48 \overline{)6.2}$$

$$5.25 \overline{)4.2}$$

- 5 $6.8 \div 4.25$ 6 $1.4 \div 1.75$ 7 $5.5 \div 1.25$ 8 $5.4 \div 2.25$

- 9 $8.5 \div 1.25$ 10 $9.2 \div 3.68$ 11 $6.9 \div 1.84$ 12 $9.2 \div 7.36$

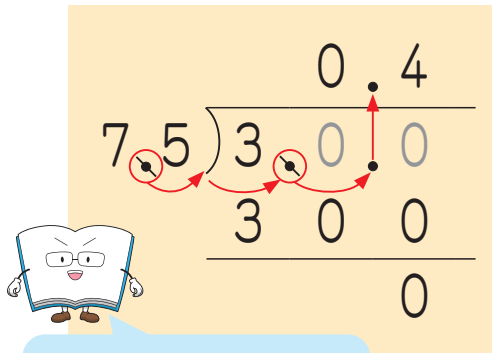
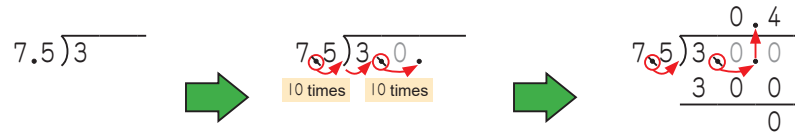
5		6		7		8	
9		10		11		12	

6 - 8

Division of Decimal Numbers

Division of Decimal Numbers (6)

Example Calculate $3 \div 7.5$ by using the division algorithm.



Move the decimal point of the divisor **one place** to the right to make it a whole number (This means that the divisor becomes 10 times).

Move the decimal point of the dividend to the right the same number of places (**one place**) (This means that the dividend also become 10 times) and write a "0" in the dividend.

Based on the division rule, we think of $30 \div 75$, which has the same quotient.

Divide by the whole number divisor. We can add a "0" at the end of divided when it is necessary. The decimal point of the quotient will be in the same position as the decimal point of the dividend after it was moved to the right.

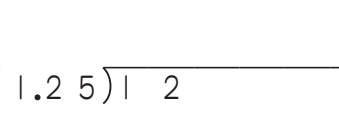
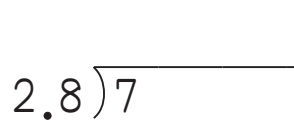
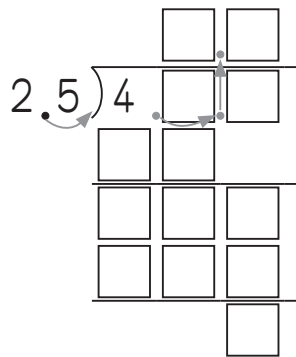
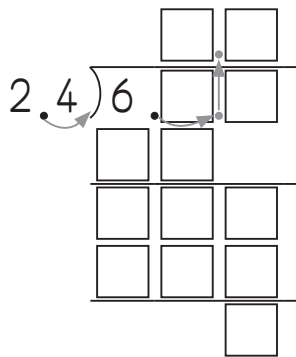
Calculate the following division problems by using the division algorithm.

1 $6 \div 2.4$

2 $4 \div 2.5$

3 $7 \div 2.8$

4 $12 \div 1.25$



5 $4 \div 1.6$

6 $42 \div 5.6$

7 $8 \div 2.5$

8 $6 \div 7.5$

9 $63 \div 8.4$

10 $28 \div 2.5$

11 $84 \div 1.12$

12 $54 \div 22.5$

5		6		7		8	
9		10		11		12	

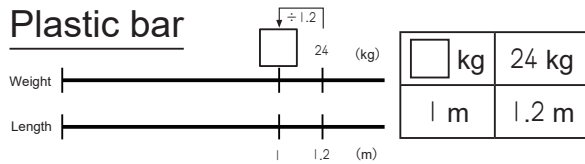
6 - 9

Division of Decimal Numbers

Size of the Quotients

Example I have a 1.2 m long plastic bar that weighs 24 kg and a 0.8 m long metal bar that weighs 24 kg. How much does 1 m of each bar weigh?

Plastic bar

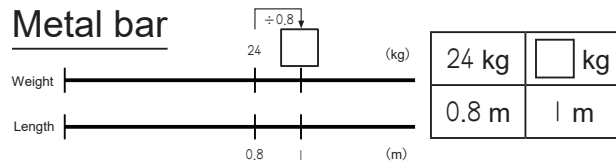


Math sentence

$$24 \div 1.2 = 20$$

Answer 20 kg

Metal bar



Math sentence

$$24 \div 0.8 = 30$$

Answer 30 kg

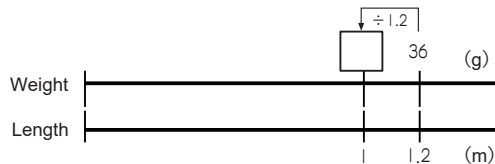
When dividing by decimal numbers less than 1, the quotient will be greater than the dividend.

If a 2 m long bar weighs 24 kg, we can find 12 kg per m by using division ($24 \div 2$). When the lengths of bar are 1.2 m and 0.8 m, we also can use division.

1 I have 1.2 m long iron wire that weighs 36 kg and a 0.9 m long copper wire that weighs 36 kg. How much does 1 m of each wire weigh?

Iron wire

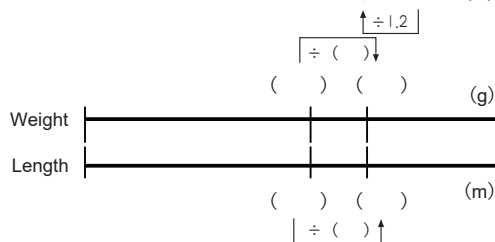
Math sentence



Answer _____

Copper wire

Math sentence



Answer _____

Complete the number line diagram and table.

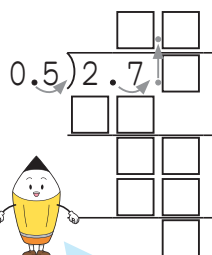
2 Which of the following will have a quotient that is greater than 8?

- (a) $8 \div 1.5$ (b) $8 \div 0.02$ (c) $8 \div 0.64$ (d) $8 \div 5$

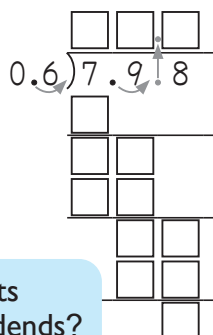
Answer _____

3 Calculate the following division problems by using the algorithm.

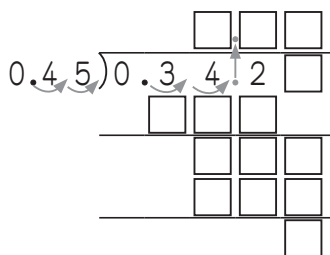
1 $2.7 \div 0.5$



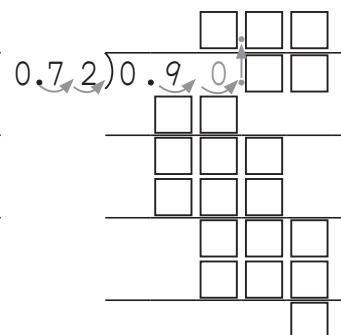
2 $7.98 \div 0.6$



3 $0.342 \div 0.45$



4 $0.9 \div 0.72$



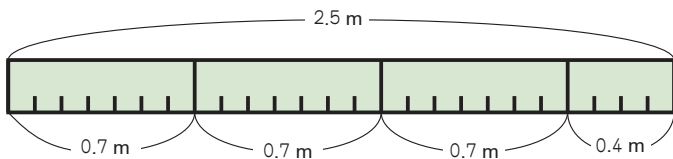
Are all the quotients larger than the dividends?

6 - 10

Division of Decimal Numbers

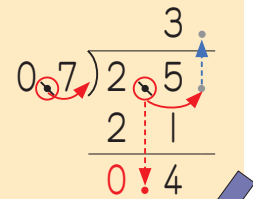
Remainder with Division of Decimal Numbers

Example A 2.5 m ribbon is cut into 0.7 m pieces. How many 0.7 m long pieces of ribbon are there? How long is the remaining piece?



Note that the decimal point of the quotient and the decimal point of the remainder are different!

In division of decimal numbers, the decimal point of the remainder will be in the same place that decimal point of the dividend was in before it was moved.



Math sentence

$$2.5 \div 0.7 = 3 \text{ R } 0.4$$

Answer

3 people can get and 0.4 m will be left over.

Check the answer: (Divisor \times Quotient + Remainder = Dividend)

$$0.7 \times 3 + 0.4 = 2.5$$

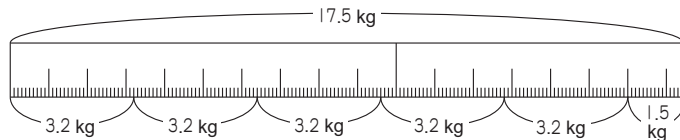
1 Find the whole number quotient and the remainder by using the algorithm.

- ① $4.9 \div 2.3$ ② $6.8 \div 1.5$ ③ $17.5 \div 9.6$ ④ $25.8 \div 6.4$ ⑤ $340 \div 7.5$

1		2		3		4		5	
----------	--	----------	--	----------	--	----------	--	----------	--

2 A 17.5 kg fertilizer is divided into 3.2 kg small packages. How many small packages can we make? How many is the remaining fertilizer?

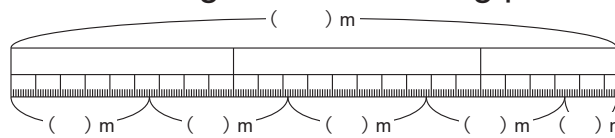
Math sentence



Answer

3 A 24.5 m rope is cut into 5.6 m pieces to make jump ropes. How many jump ropes can we make? How long is the remaining piece of rope?

Math sentence



Answer

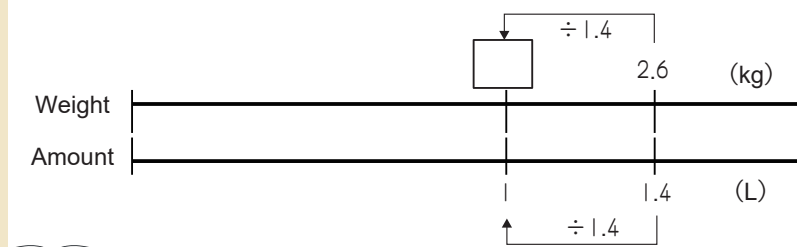
Complete the number line diagram.

6 - 11

Division of Decimal Numbers

Rounding the Quotients

Example 1.4 L of sand weighs 2.6 kg. How much does 1 L of this sand weigh? Round the quotient to the second highest place.

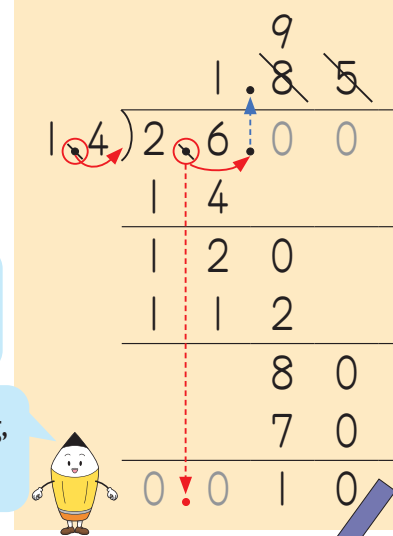


To round to the second highest place, we have to look at the numeral in the third highest place.

According to the previous learning, The remainder is "0.010".

Math sentence

$$2.6 \div 1.4 = 1.\overset{9}{8}5$$



Answer Approximately 1.9 kg

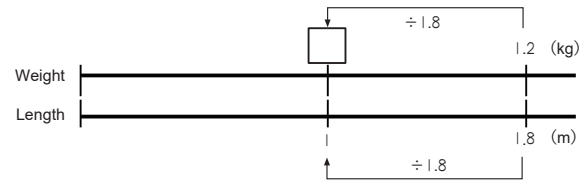
1 Calculate the following. Round the quotient to the second highest place.

- ① $5.2 \div 6.8$ ② $4.1 \div 6.8$ ③ $7.5 \div 4.2$ ④ $4.32 \div 7.8$ ⑤ $7 \div 8.9$

①	②	③	④	⑤
---	---	---	---	---

2 1.8 m of hose weighs 1.2 kg. How much does 1 m of this hose weigh? Round the quotient to the second highest place.

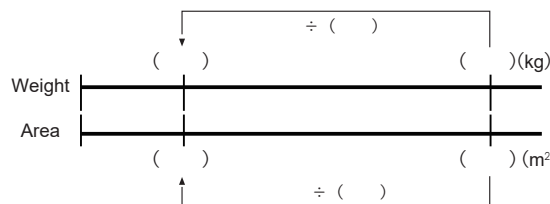
Math sentence



Answer _____

3 3.9 m^2 of iron plate weighs 4.8 kg. How much does 1 m^2 of this iron plate weigh? Round the quotient to the second highest place.

Math sentence



Complete the number line diagram.

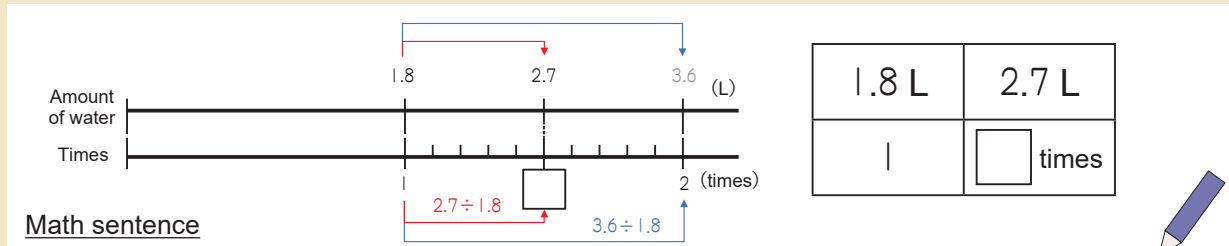
Answer _____

6 - 12

Division of Decimal Numbers

Division and Times as Much with Decimal Numbers (I)

Example My water bottle contains 2.7 L of water. My brother's water bottle contains 1.8 L of water. How many times more litres of water do I have compared to my brother?



Math sentence

$$2.7 \div 1.8 = 1.5$$

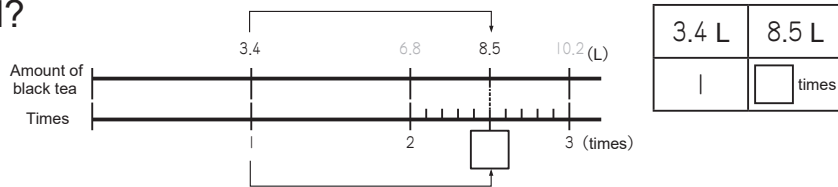
Answer 1.5 times



Even when we have decimal numbers, we can use division to find out how many times one quantity is compared to a base amount.

1 My water bottle contains 8.5 L of black tea. My friend's bottle contains 3.4 L of black tea. How many times more litres of black tea do I have compared to my friend?

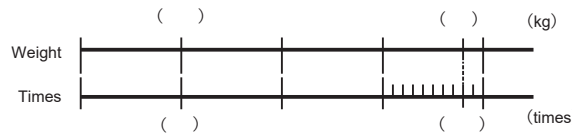
Math sentence



Answer _____

2 A pony at my farm weighed 50 kg at birth. A half year later, it now weighs 190 kg. How many times heavier does the pony weigh now compared to when it was born?

Math sentence



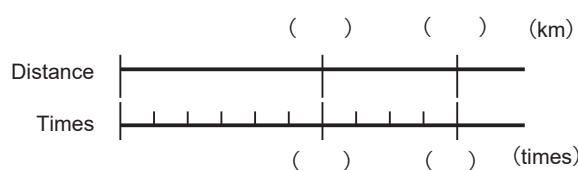
() kg	() kg
()	() times

Complete the number line diagrams and tables.

Answer _____

3 The distance from the train station to my house is 2.1 km. The distance from the train station to my friend's house is 3.5 km. How many times is my house from the train station compared to my friend's house?

Math sentence



() km	() km
()	() times

Answer _____

6 - 13

Division of Decimal Numbers

Division and Times as Much with Decimal Numbers (2)

Example A 10-day old puppy 630 g. This weight is 1.8 times heavier than when it was born. How much did the puppy weigh at birth?

Math sentence
 $630 \div 1.8 = 350$

Answer 350 g

We can also think of this problem as the multiplication sentence,
 $\square \times 1.8 = 630.$

1 A 15-day old kitten weighs 900 g. This weight is 3.6 times heavier than when it was born. How much did the kitten weigh at birth?

Math sentence

Answer _____

2 The area of Town A is 13.8 km². This is 0.6 times the area of Town B. What is the area of Town B?

Math sentence

Answer _____

3 I have two coloured pencils. The red pencil is 9.5 cm long. It is 1.25 times longer than the blue pencil. How long is the blue pencil?

Math sentence

Answer _____

6 - 14

Division of Decimal Numbers

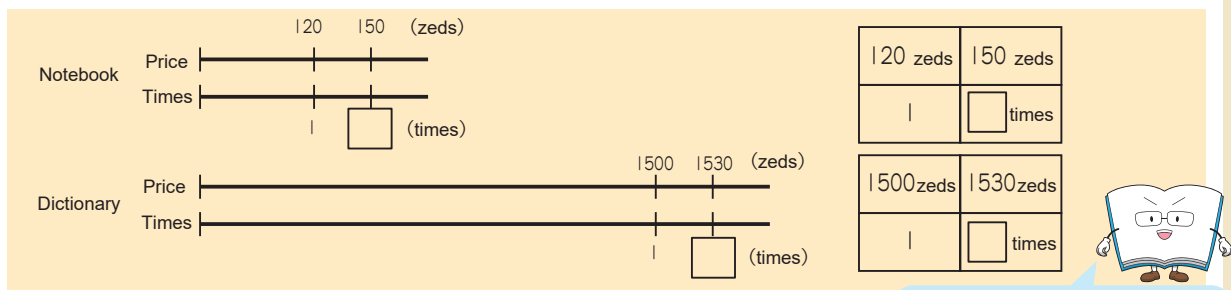
Division and Times as Much with Decimal Numbers (3)

Example The table shows the price of a notebook and a dictionary in 1990 and 2010. Calculate how many times more the prices increased for each item. Which item increased more times.



	1990	2010
Notebook	120 zeds*	150 zeds
Dictionary	1500 zeds	1530 zeds

(*zed(s) is the fictional currency unit.)



The price of the notebook:

Math sentence $150 \div 120 = 1.25$

The price of the dictionary:

Math sentence $1530 \div 1500 = 1.02$

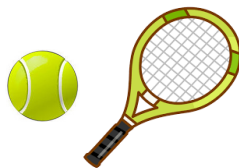
Answer The notebook

We are comparing by finding out what the process would be if we consider the prices for each item in 1990 as 1.

The table shows the price of a tennis ball and a tennis racket in 2000 and 2010. Calculate how many times more the prices increased for each item? Which item increased more times?

Tennis ball

Math sentence

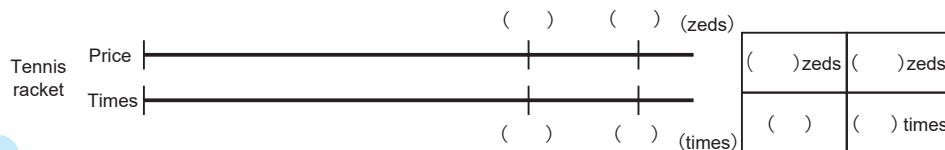
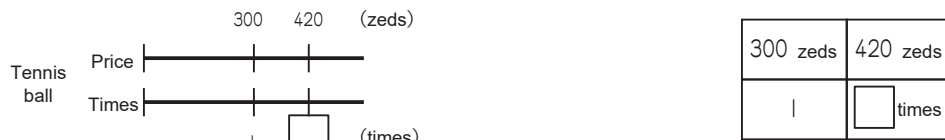


	2000	2010
Tennis ball	300 zeds	420 zeds
Tennis racket	4500 zeds	5400 zeds

(*zed(s) is the fictional currency unit.)

Tennis racket

Math sentence



Complete the number line diagram and table.

Answer _____

6 - 15

Division of Decimal Numbers

Review (1)

1 Find the quotient of each of the following based on $731 \div 43 = 17$.

1 $73.1 \div 4.3 =$

2 $731 \div 4.3 =$

3 $73.1 \div 43 =$

4 $731 \div 0.43 =$

5 $7.31 \div 43 =$

7 $7.31 \div 4.3 =$

2 Which of the following will have a quotient that is greater than the dividend?

- (a) $36 \div 1.5$ (b) $81 \div 0.9$ (c) $0.066 \div 1.1$ (d) $35.7 \div 0.85$

Answer _____

3 Calculate the following division problems by using the division algorithm.

- 1** $5.88 \div 1.4$ **2** $9.52 \div 3.4$ **3** $9.45 \div 2.7$ **4** $4.93 \div 2.9$

$$1.4 \overline{)5.88} \quad 3.4 \overline{)9.52} \quad 2.7 \overline{)9.45} \quad 2.9 \overline{)4.93}$$

- 5** $1.61 \div 4.6$ **6** $1.45 \div 5.8$ **7** $2.53 \div 4.6$ **8** $5.85 \div 7.8$

- 9** $0.27 \div 1.8$ **10** $0.39 \div 1.5$ **11** $2.16 \div 4.5$ **12** $4.51 \div 5.5$

- 13** $2.79 \div 6.2$ **14** $2.21 \div 3.4$ **15** $4.14 \div 1.8$ **16** $9.66 \div 2.1$

5		6		7		8	
9		10		11		12	
13		14		15		16	

4 Calculate the following division problems by using the division algorithm.

- 1 $5.7 \div 2.28$ 2 $1.1 \div 0.25$ 3 $4.2 \div 1.75$ 4 $3.4 \div 4.25$

$2.28 \overline{)5.7}$ $0.25 \overline{)1.1}$ $1.75 \overline{)4.2}$ $4.25 \overline{)3.4}$

- 5 $2.3 \div 0.92$ 6 $9.3 \div 12.4$ 7 $2.7 \div 2.25$ 8 $1.6 \div 0.25$

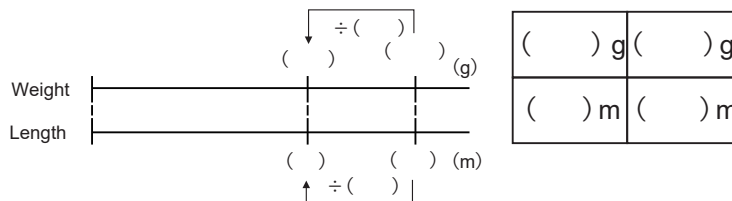
- 9 $12 \div 1.6$ 10 $33 \div 7.5$ 11 $14 \div 2.5$ 12 $54 \div 7.2$

- 13 $8.528 \div 3.28$ 14 $3.925 \div 1.57$ 15 $7.491 \div 2.27$ 16 $7.905 \div 4.65$

5		6		7		8	
9		10		11		12	
13		14		15		16	

5 A 1.5 m long hose weighs 270 g. How much does 1 m of the hose weigh?

Math sentence

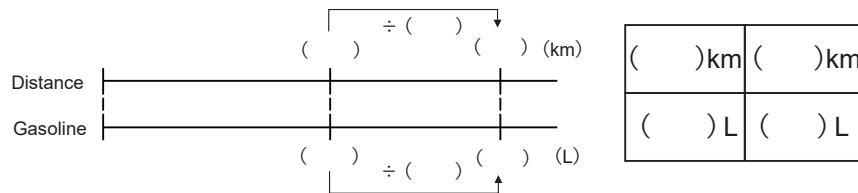


Complete the number line diagrams and tables.

Answer _____

6 A car drive 7.5 km using 0.6 L of gasoline. How far can a car drive on 1 L of gasoline?

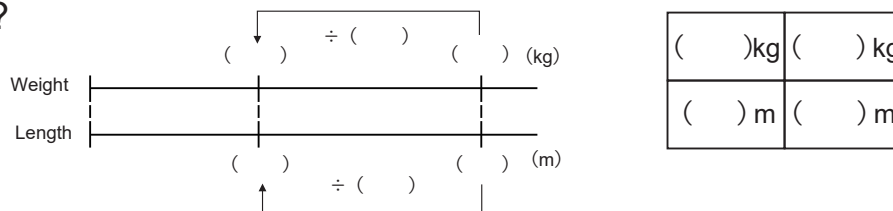
Math sentence



Answer _____

7 2.4 m of plastic stick weighs 10.8 kg. How much does 1 m of this plastic stick weigh?

Math sentence



Answer _____

