

# 2014 Grade 6 Mathematics

This is an unofficial translation of 2014 Japanese  
Achievement Test. Original may be found at

[https://www.nier.go.jp/14chousa/pdf/14mondai\\_shou\\_sansuu\\_a.pdf](https://www.nier.go.jp/14chousa/pdf/14mondai_shou_sansuu_a.pdf)

and

[https://www.nier.go.jp/14chousa/pdf/14mondai\\_shou\\_sansuu\\_b.pdf](https://www.nier.go.jp/14chousa/pdf/14mondai_shou_sansuu_b.pdf)

The English translation is licensed under the Creative Commons  
Attribution-NonCommercial-ShareAlike 4.0

<https://creativecommons.org/licenses/by-nc-sa/4.0/>

## 2014 Problem Set A

[1] Calculate the following.

(1)  $46 + 57$

(2)  $903 \times 6$

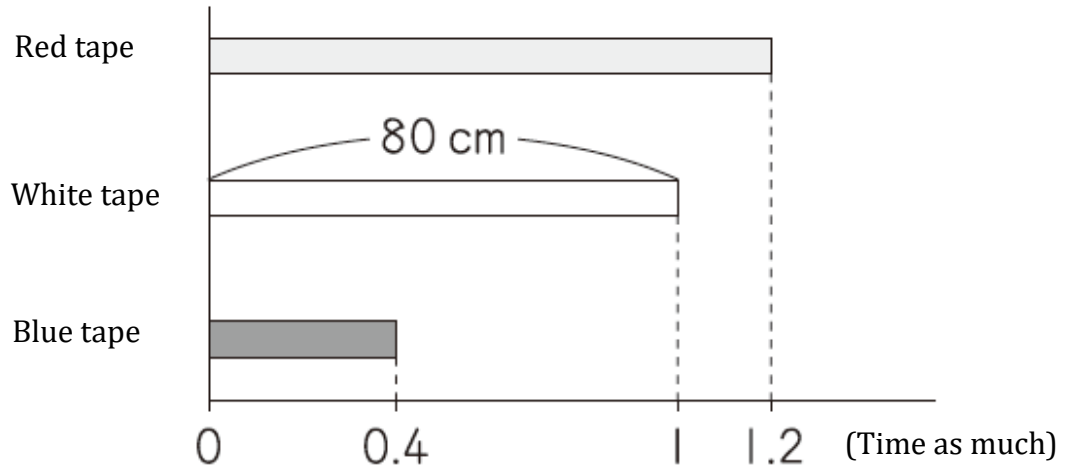
(3)  $9 - 0.8$

(4)  $2 \div 5$  (Divide completely and write the quotient as a decimal number.)

(5)  $100 - 20 \times 4$

(6)  $\frac{1}{3} + \frac{2}{5}$

- [2] As shown in the figure below, the lengths of a red tape and a blue tape based on the length of a white tape are represented.



- (1) Select the expression that will calculate the length of the red tape from 1 through 4 below and write the number.

- 1  $80 + 0.2$
- 2  $80 - 0.2$
- 3  $80 \times 1.2$
- 4  $80 \div 1.2$

- (2) Select the expression that will calculate the length of the blue tape from 1 through 4 below and write the number.

- 1  $80 + 0.6$
- 2  $80 - 0.6$
- 3  $80 \times 0.4$
- 4  $80 \div 0.4$

- [3] Which of the following fractions is greater than  $\frac{1}{2}$ ? Select from **1** through **4** below and write the number.

**1**  $\frac{3}{5}$

**2**  $\frac{3}{6}$

**3**  $\frac{3}{8}$

**4**  $\frac{3}{10}$

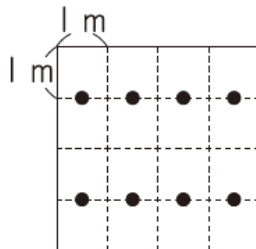
- [4] We are going to find out the number of people per  $1 \text{ m}^2$  in Room A.

The area of Room A is  $8 \text{ m}^2$ , and there are 16 people in the room.

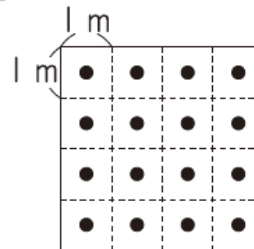
- (1) Which of the figures represents Room A? Select from **1** through **4** below and write the number.

Note that each • represents one person.

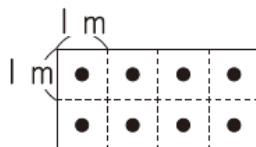
**1**



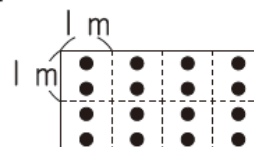
**2**



**3**



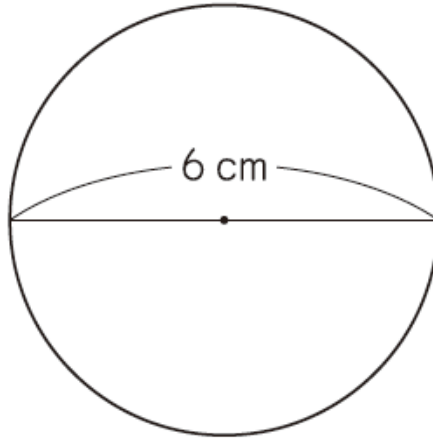
**4**



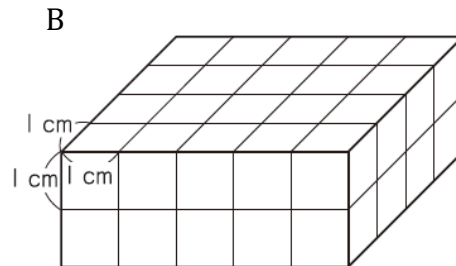
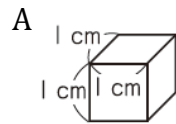
- (2) Write the expression to calculate the number of people per  $1 \text{ m}^2$  in Room A. You do not have to write the answer.

[5] Answer the following questions.

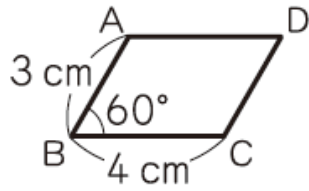
- (1) Write the expression to calculate the circumference of the circle shown below and the answer. Use 3.14 as the value of  $\pi$ .



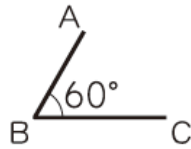
- (2) As shown in the figure below, we used Cube A to make Rectangular Prism B. How many  $\text{cm}^3$  is the volume of B? Write your answer.



[6] We are going to draw Parallelogram ABCD shown below.

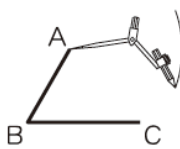
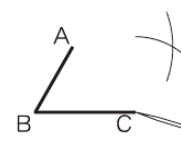
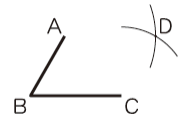
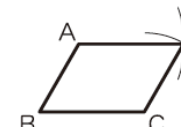


First, we drew side AB and side BC.



Next, we are going to complete the parallelogram using the method described below.

Method of drawing using a compass

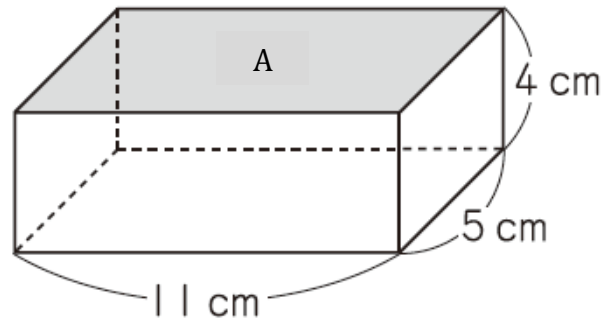
<p>(1) Draw an arc centered at Point A and the radius of 4 cm (the length of side BC).</p> 	<p>(2) Draw an arc centered at Point C and the radius of 3 cm (the length of side AB).</p> 
<p>(3) Let the point of intersection be Point D.</p> 	<p>(4) Connect Point A and Point D and also Point C and Point D.</p> 

What properties of parallelograms is **the method of drawing using a compass** using? Select one from 1 through 4 below and write the number.

In a parallelogram

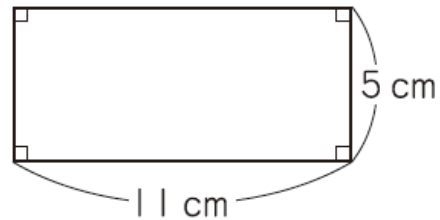
- |  |
|--|
| <p><b>1</b> opposite sides are parallel.<br/> <b>2</b> opposite sides are equal in length.<br/> <b>3</b> opposite angles are equal in measure.<br/> <b>4</b> the diagonals intersect at their midpoints.</p> |
|--|

[7] There is a rectangular prism like the one shown below.

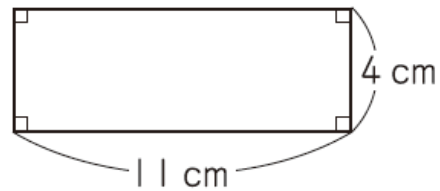


Select the quadrilateral that will be Face A in this rectangular prism from **1** through **4** below and write the number.

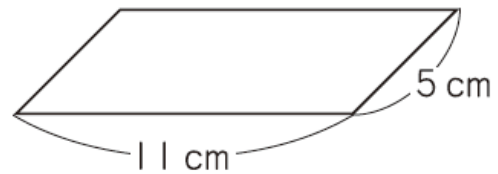
**1** Rectangle



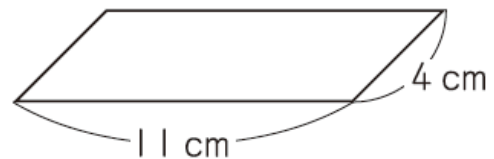
**2** Rectangle



**3** Parallelogram



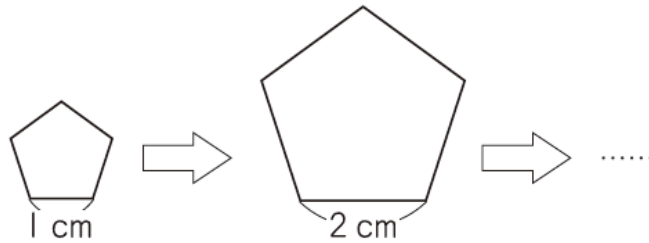
**4** Parallelogram



[8] Select a problem whose answer can be calculated by  $100 - 20 \times 4$  from **1** through **4** below and write the number.

- 1** We bought one 100-yen pack of gum and 4 pieces of 20-yen candies. How much is the total cost?
- 2** We went shopping with one 100-yen coin. We bought 4 pieces of 20-yen candies. How much is the change?
- 3** We bought 4 each of 100-yen pen and 20-yen pencil. How much is the total cost?
- 4** 100-yen pens are being sold with 20-yen discount. If we buy 4 of those pens, how much is the total cost?

[9] We investigated the perimeter of a regular pentagon when the length of its side is changed 1 cm, 2 cm, 3 cm, ... and summarized the results in the table below.



Length of a side ( $\square$ cm)	1	2	3	4	
Perimeter ( $\triangle$ cm)	5	10	15	20	

If we let the length of 1 side be  $\square$  cm and the perimeter be  $\triangle$  cm, which equations represent the relationship between  $\square$  and  $\triangle$  correctly? Select one from **1** through **4** below and write the number.

- 1**  $\triangle + 5 = \square$
- 2**  $\square + 5 = \triangle$
- 3**  $\triangle \times 5 = \square$
- 4**  $\square \times 5 = \triangle$



## 2014 Problem Set B

[1] Satoshi and his friends are thinking about the following problem.

Problem

Enter different numbers in  $\square$  and calculate " $37 \times \square$ ."

Satoshi first entered "1," "2," and "3" in the box and calculated using the algorithm.

$$\begin{array}{r} 37 \\ \times \square 1 \\ \hline 37 \end{array}$$

$$\begin{array}{r} 37 \\ \times \square 2 \\ \hline 74 \end{array}$$

$$\begin{array}{r} 37 \\ \times \square 3 \\ \hline 111 \end{array}$$

The product of  $37 \times 3$  is 111, with 3 of the same numeral.



Satoshi

Next, he entered "4," "5," and "6" in the box and calculated the products.

$$\begin{array}{r} 37 \\ \times \square 4 \\ \hline 148 \end{array}$$

$$\begin{array}{r} 37 \\ \times \square 5 \\ \hline 185 \end{array}$$

$$\begin{array}{r} 37 \\ \times \square 6 \\ \hline 222 \end{array}$$

The product of  $37 \times 6$  is 222, with 3 of the same numeral.



Satoshi

(1) He is going to enter "7," "8," and "9" in the box and calculate to see if 3 of the same numeral will be in a product.

Select the one calculation whose product will have 3 of the same numeral from **1** through **3** below and write the number.

**1**

$$\begin{array}{r} 37 \\ \times \boxed{7} \\ \hline \end{array}$$

**2**

$$\begin{array}{r} 37 \\ \times \boxed{8} \\ \hline \end{array}$$

**3**

$$\begin{array}{r} 37 \\ \times \boxed{9} \\ \hline \end{array}$$

Satoshi and Yoshiko noticed that 3 of the same numeral will be in the products of  $37 \times \square$ . They thought about why 3 of the same numeral will be in the product when the multiplier is 6.

$$\begin{aligned} 37 \times 3 &= 111 \\ 37 \times 6 &= 222 \end{aligned}$$

Two of them realized that they can explain without actually calculating why  $37 \times 6$  will be 222 based on  $37 \times 3 = 111$ . Their explanation is as follows.



"Satoshi's explanation"

$$\begin{aligned} 37 \times 6 &= 37 \times (3 \times 2) \\ &= (37 \times 3) \times 2 \\ &= 111 \times 2 \\ &= 222 \end{aligned}$$



"Yoshiko's explanation"

6 in  $37 \times 6$  can be considered as  $3 \times 2$ . Then, the product,  $37 \times 6$ , is double of  $37 \times 3$ . Therefore, the product is double of 111, or 222.

(2) Next we are going to explain that the product of  $37 \times 24$  is 888.

Explain why the product of  $37 \times 24$  is 888 based on the explanation of one of the two above and write the explanation using words and expressions.

- [2] Akira received the data below from the school office as he investigated the water usage at the school.

Total amount of water used at school

Months	4•5	6•7	8•9	10•11	12•1	2•3	Year
Amount (m <sup>3</sup> )	550	1500	950	900	800	800	5500

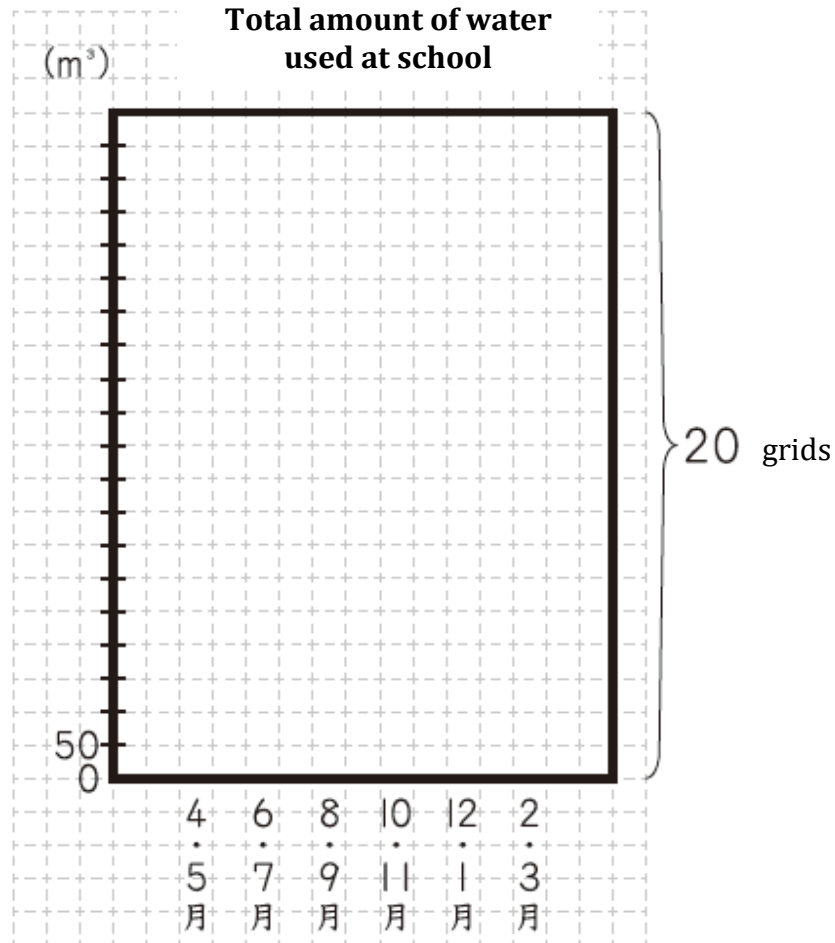
❖ "4•5" means the total amount of water used in April and May.

- (1) To get the sense of the amount of water used in June•July, 1500 m<sup>3</sup>, he decided to think about it based on the amount of water in a pool near his house.

The pool near Akira's house holds 250 m<sup>3</sup> of water.

How many times as much is the amount of water used in June•July as the amount of water the pool near Akira's house can hold? Write your answer and expression to calculate the answer.

- (2) Akira decided to represent the data in a bar graph. He then drew a rectangular frame with the vertical sides of 20 grids and the horizontal sides of 15 grids, as shown below. He then decided to mark off the vertical axis so that each grid will represent  $50 \text{ m}^3$ .



>>>Horizontal axis show the months, April•May, etc.

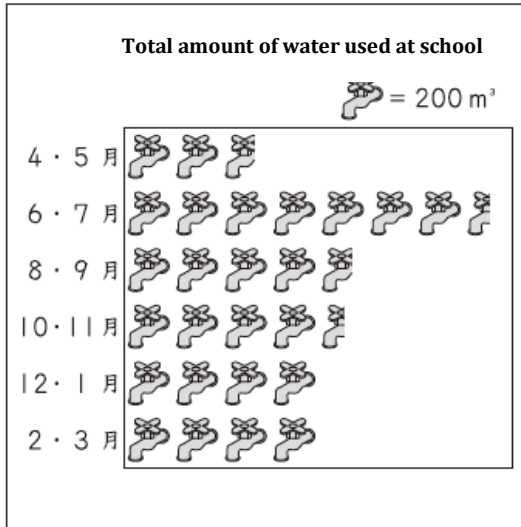
Then he realized that the bar for April•May will fit in the frame but there will be a pair of months whose bar will not fit in the frame.

Select the pair of the months whose bar will not fit in the frame from 1 through 5 below and write the number. Also, explain why the bar will not fit in the frame using words and numbers.

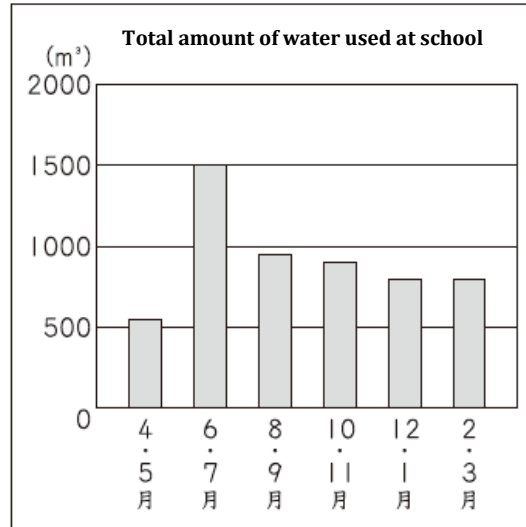
- 1 June•July
- 2 August•September
- 3 October•November
- 4 December•January
- 5 February•March

(3) Akira is going to explain that the amount of water used in June•July is more than  $\frac{1}{4}$  of the amount of water used in a year. Which of the graphs 1 through 4 below will be most useful? Select one and write the number.

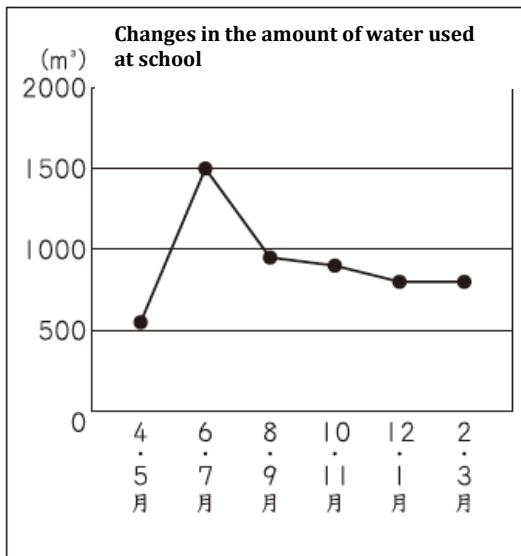
**1** Pictograph



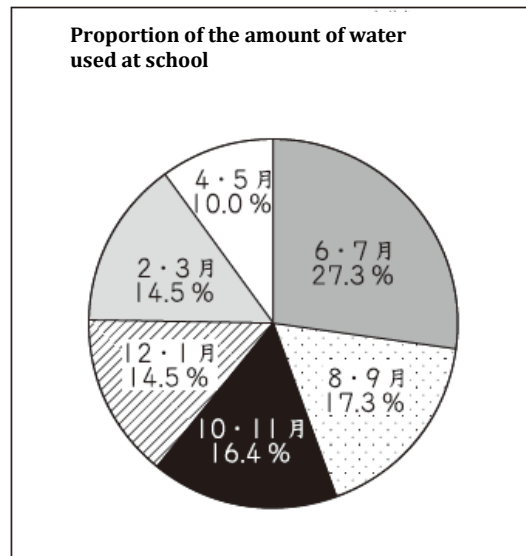
**2** Bar graph



**3** Broken line graph



**4** Circle graph



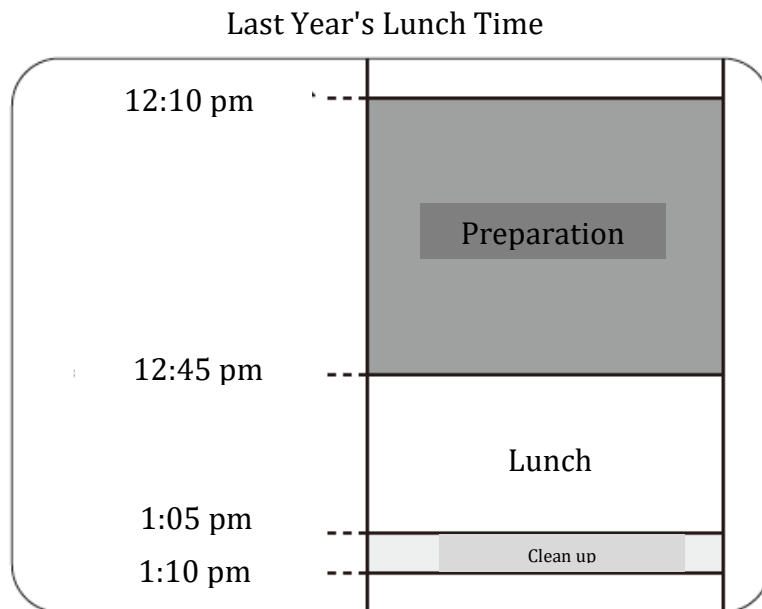
- >>>> 1 Vertical axis shows the months
- 2 Horizontal axis shows the months
- 3 Horizontal axis shows the months
- 4 Sectors show the months

[3] Students in Katsuya's class are making plans for their overnight field trip.

Katsuya and his friends heard from their teacher that there were 2 issues below for the lunch time during last year's trip. They decided to discuss how to solve these issues.

- 1. Because we took time to prepare, we only had short time for eating and cleaning up.
- 2. When rice is served some groups didn't have enough while others had left over.

(1) First, they discussed Issue 1 using the diagram of the lunch schedule from last year's trip.



The lunch time for this year is also from 12:10 pm to 1:10 pm.

Katsuya and his friends decided that they will allocate 5 more minutes for eating and 3 more minutes for cleaning up than last year.

How many minutes should be allocated for preparation this year?  
Write your answer.

(2) Next they discussed Issue 2.

There are 40 students in Katsuya's class. The rice for 40 students will be delivered in a container like the one shown below.



Katsuya thought about ways to distribute rice so that they will not run out or have left over. He said the following.

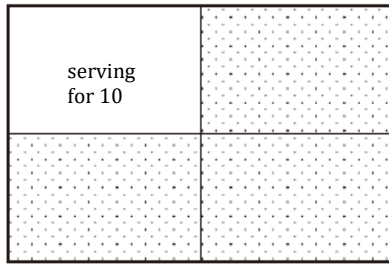


Katsuya

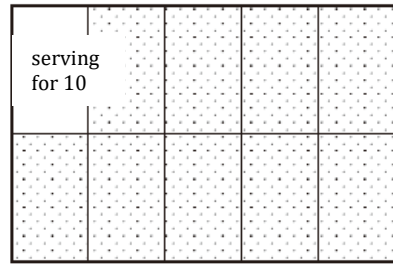
Consider that the container for 40 students is a rectangle. Then, if we create a guideline showing the amount for 10 students, it will make it easier to serve everyone about the same amount.

Which of the figures below show the guideline Katsuya is suggesting?  
Select all that work from **1** through **4** below and write the numbers.

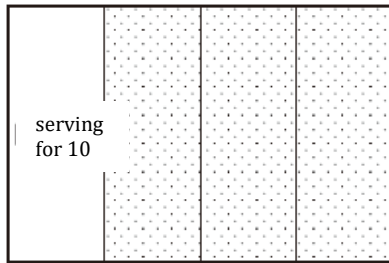
**1**



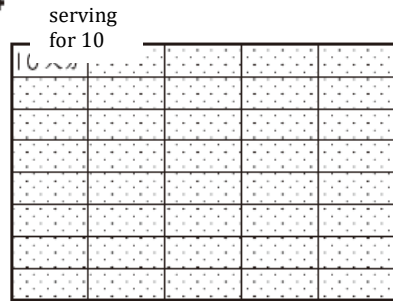
**2**



**3**



**4**

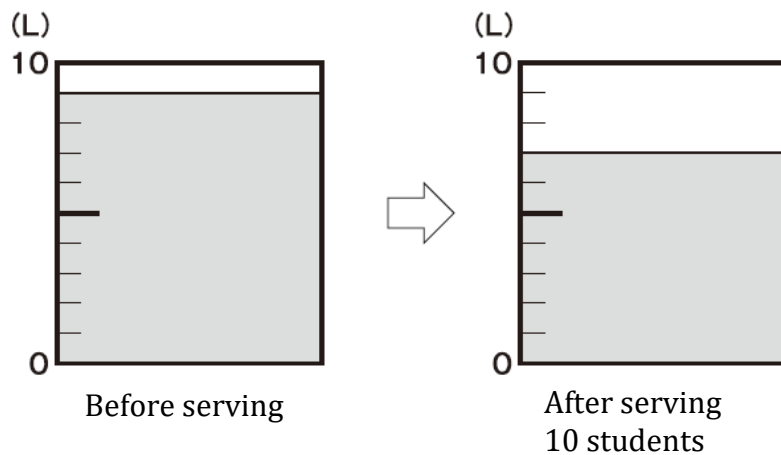
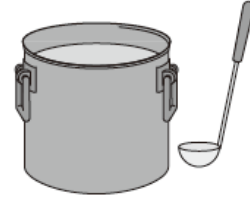




Katsuya and his friends are now at the overnight field trip location.

- (3) Tomomi is supposed to serve soup that is in a container like the one shown in the figure.

Tomomi started serving by thinking one full ladle is 1 serving. The figure below shows the amount of soup before she started serving and after she served 10 students.



Is there enough soup for the remaining 30 students if she continues to serve this way? Select one from **1** through **3** below and write the number. Also, write the reason you selected that number using words and numbers.

- 1** She will not have enough to serve the remaining students.
- 2** She can serve the remaining students and there will be no left over.
- 3** She can serve the remaining students and there will be left over.

[4] During a music lesson, students are learning about rhythm using percussion instruments.



(1) Masaru is playing the rhythm shown in the 4 measures below repeatedly using a tambourine. Consider the rhythm he plays in the first measure as Rhythm A. The second time he will play Rhythm A will be in the 5th measure.



Masaru

1st measure	2nd measure	3rd measure	4th measure	5th measure	6th measure	.....
-------------	-------------	-------------	-------------	-------------	-------------	-------

4-measure rhythm

In which measure will he play Rhythm A for the 3rd time if he continues playing? Write your answer?

(2) Next, Keiko is going to join Masaru and play a duet.

Keiko is going to play the rhythm shown in the 6 measures below repeatedly. The rhythm Keiko plays in her 6th measure is the same as the one Masaru plays in his 4th measure. Let's call this Rhythm B.



Keiko

6-measure rhythm



Masaru

4-measure rhythm

Keiko and Masaru started playing at the same time. Then, on the 12th measure, they played Rhythm B together.

What type of number is "12" in the "12th measure" when they play Rhythm B together? Write your answer using words and numbers "4" and "6."

[5] Sayuri and her friends are researching traditional Japanese culture.

(1) Sayuri is thinking about the way to lay down *tatami* mats.

In the region where Sayuri lives, a *tatami* mat is shaped in a rectangle whose length is twice as long as its width.

There are 3 rules about how to lay *tatami* mats.

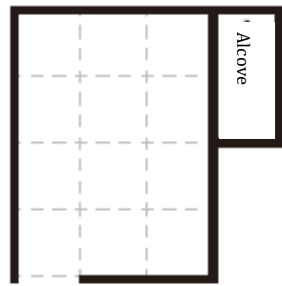


Rule 1 The long side of a *tatami* mat must match the alcove.

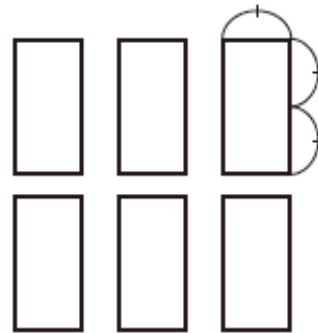
Rule 2 The long side of a *tatami* mat must match the entrance of the room.


Rule 3 The corners from 4 *tatami* mats should not be at the same point.

Sayuri's thinking about the 3 rules above using the diagram of a room below and 6 rectangular cards.



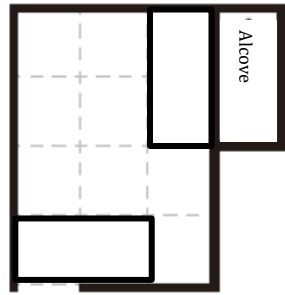
Entrance



In the diagram of a room,  is a square whose side is equal to the short side of the rectangular card.



Fist, based on Rule 1 and Rule 2, she placed 2 cards as shown below.

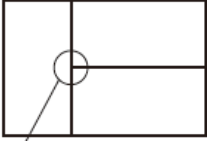
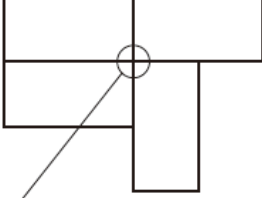


Entrance



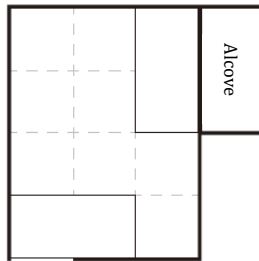
Next, she is thinking about how to place the remaining 4 cards to satisfy Rule 3 by using the examples shown below.

**Examples**

Correct Arrangement	Incorrect Arrangement
 <p>The corners of 4 <i>tatami</i> mat is not around the same point.</p>	 <p>The corners of 4 <i>tatami</i> mats are at the same point.</p>

Draw how the remaining 4 cards should be arranged by tracing ----- in the diagram on the **answer sheet**.

❖ The diagram below is for you to try your ideas. You do not have to use it.



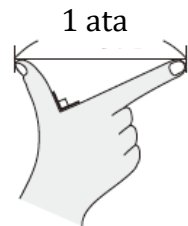
Entrance

- (2) Makoto is going to make a presentation about the easy-to-use length of chopsticks.



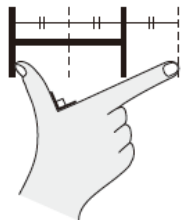
Guidelines for easy-to-use length of chopsticks

It is said that the guideline for the easy-to-use length of chopsticks is "one and a half *ata*."  
 1 *ata* is the distance between the tip of your thumb and the tip of your index finger when they were opened to form a right angle.  
 "One and a half *ata*" is 1.5 times as long as 1 *ata*.

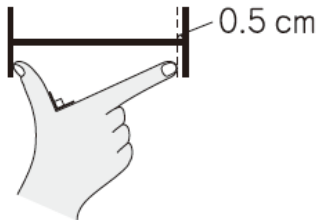


From **1** through **4** below, select one that shows the length of "one and a half *ata*" and write the number.

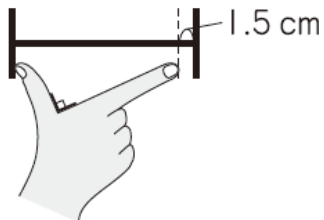
**1**



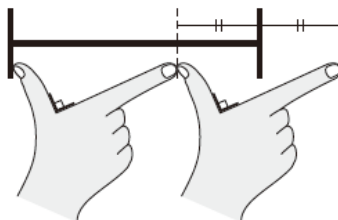
**2**



**3**



**4**



- (3) After listening to Makoto's presentation, Natsuki decided to go buy a pair of chopsticks for her younger sister.

While investigating the length "1 *ata*," she found the following.

"1 <i>ata</i> " is about 10 % of one's height.
--

The height of Natsuki's sister is 140 cm.

If we figure out "one and a half *ata*" based on the sister's height and the guidelines for easy-to-use length of chopsticks above, how many cm will the length of the chopsticks be? Explain how you determined the length using words and expressions. Write your answer also.