

# 5<sup>th</sup> Kyu

## Section 2: Application Test

# 数学検定

## PROFICIENCY TEST IN PRACTICAL MATHEMATICS

Test Time : 60 minutes

### Test Instructions

1. Make sure that you have the correct level (Kyu) test.
2. Do not open the booklet until you are told to do so.
3. Write your name and examinee number on this page.
4. Write your name, examinee number and other necessary information on the answer sheet.
5. Write your answers on the answer sheets provided. Follow any instructions given when solving the problems.
6. If your answer contains a fraction, write the fraction in simplest form by reducing it to lowest terms.
7. You may use a calculator.
8. Turn off your cell phone and do not use it during the test.
9. Ask an examination supervisor if your problem sheets have inconsistent page numbering or missing pages.
10. It is prohibited to disclose the problems to the general public, such as on the Internet, without permission.

Please submit this test upon agreeing to the following "handling of personal information".

Information regarding the handling of all personal information attached to this form

1. Name of Organization : The Mathematics Certification Institute of Japan
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Title : Personal Information Protection Administrator  
Department: Secretariat Contact Information : 03-5812-8340
3. Purpose for Use of Personal Information : Management of examinee information, marking, and for the purpose of identifying candidates
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The Mathematics Certification Institute of Japan, Certification Inquiry Desk  
Bunshodo Building 6F, 5-1-1 Ueno, Taito Ward, Tokyo, 110-0005  
Tel : 03-5660-4804 (Monday to Friday 9:30 - 17:00 not including national holidays, New Year's holidays and organization holidays)
7. Voluntariness of the Provision of Personal Information : Whether to provide personal information to the Organization is entirely up to the examinee. However, if the Organization does not receive accurate information, it may not be possible to provide certain services in an appropriate manner.

Name

Examinee  
Number

—



公益財団法人

日本数学検定協会

The Mathematics Certification Institute of Japan

## [5th Kyu] Section 2: Application Test

1

The distance between Lucy's home and her school is 1.4 km. The distance between her home and a shopping mall is 2.5 times the distance between her home and school.

- (1) Find the distance, in km, between her home and the shopping mall. Include units in your answer.
- (2) The distance between her home and a post office is 1.05 km. How many times longer is the distance between her home and the post office than the distance between her home and school?

2

The table below shows the amount of time that Alice studied at home from Monday to Saturday in a given week.

Day	Mon.	Tue.	Wed.	Thu.	Fri.	Sat.
Study time (hour)	2	1.5	3	2.5	0	X

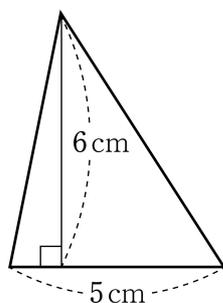
- (3) Find the average study time, in hours, for the 5 days from Monday to Friday.
- (4) If the average study time for the 6 days from Monday to Saturday is 2 hours, find the number for X.

3

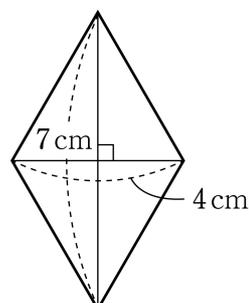
Find the area, in  $\text{cm}^2$ , of each of the following figures. Include units in your answer.

*(Measurement skill)*

- (5) Triangle



- (6) Rhombus



4

The table on the right shows the running distance and time of three runners, A, B and C. Kate and Nick compared the runners' speeds. First, they compared the speeds of A and B as follows.

A and B ran the same distance and the time of B is shorter than A. Therefore B is faster than A.

Running distance and time

	Distance (m)	Time (seconds)
A	50	10
B	50	8
C	100	15

Next, Kate and Nick compared the speeds of B and C in different ways.

Kate

Their running distances for one second are:

B is ( X ) m

C is 6.66... m

Therefore, C is faster than B.

Nick

Their running times for one meter are:

B is 0.16 seconds

C is ( Y ) seconds

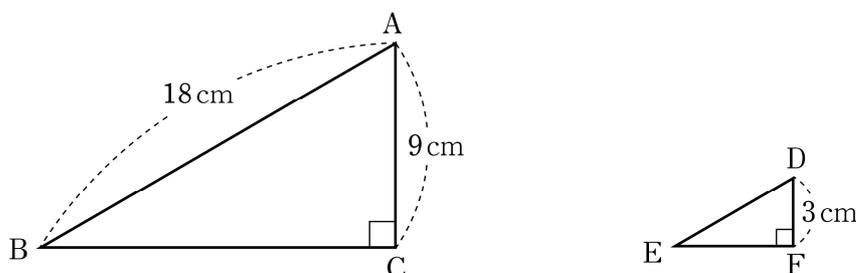
Therefore, C is faster than B.

Answer the following.

- (7) Find the speed of A, in m per second.
- (8) Find the number for X.
- (9) Find the number for Y.

5

In the figure below,  $\triangle ABC$  is reduced to  $\triangle DEF$ , where side BC corresponds to side EF.



- (10)  $\triangle DEF$  can be seen as the image of  $\triangle ABC$  under a reduction with a certain scale factor. Find the scale factor as a fraction whose numerator is 1.
- (11) Find the length, in cm, of side DE. Include units in your answer. (*Measurement skill*)

6

Consider the following six numbers.

$$2, \frac{1}{4}, -1, -2.8, -\frac{10}{3}, 0$$

- (12) Find the least number.
- (13) Find the difference when subtracting the least number from the greatest number. Write the steps leading to your answer.

7

Figure 1 shows square-based prism ABCD-EFGH whose side length of the square is 3 cm and height is 5 cm.

Figure 1

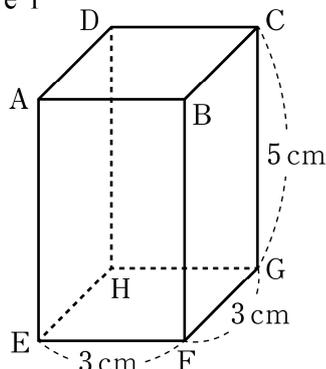
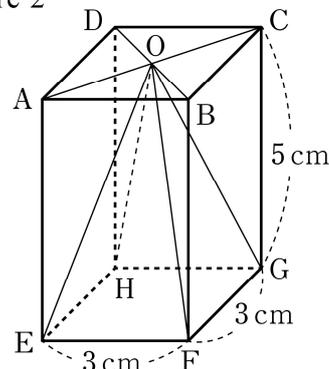


Figure 2



- (14) Find the total surface area, in  $\text{cm}^2$ , of square-based prism ABCD-EFGH. Include units in your answer. *(Measurement skill)*
- (15) Diagonals AC and BD cross at O as shown in Figure 2. Find the volume, in  $\text{cm}^3$ , of the square-based pyramid O-EFGH. Include units in your answer. *(Measurement skill)*
- (16) A string is attached from vertex A to vertex G crossing edge BF such that the string has the minimum length as shown in Figure 3. If the net of the prism is given in Figure 4, sketch the string on the answer sheet.

Figure 3

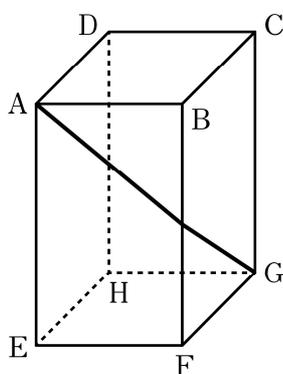
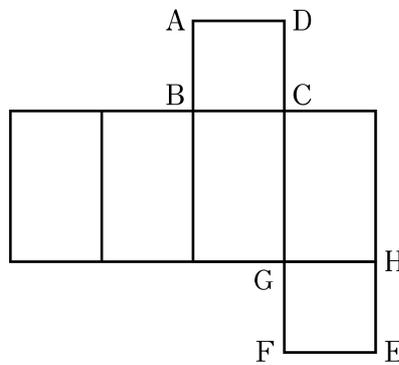


Figure 4



8

The table on the right shows the deepest point for three oceans. *(Statistical skill)*

- (17) Find the difference of the deepest points, in m, between the Pacific Ocean and the Atlantic Ocean? Answer as a positive number and include units in your answer.
- (18) How many times deeper is the deepest point of the Pacific Ocean than the deepest point of the Indian Ocean? Round your answer off to one decimal place.

Deepest point of Oceans

Ocean	Deepest point (m)
Pacific	10920
Atlantic	8605
Indian	7125

9

A tourist walks to a hotel from a temple along the streets according to the following rule.

The route from the temple to the hotel is to be as long as possible within the given area without visiting the same intersection twice.

Figure 1, for example, shows a map where the line segments and the crossing points represent streets and intersections, respectively. Point A represents the temple and point B represents the hotel. Within this area, one of the routes that satisfies the condition above is shown in Figure 2. If we call "one block" the length from one intersection to the next intersection, the tourist walks eight blocks in total in Figure 2. Note that every block has the same distance. *(Organizing skill)*

Figure 1

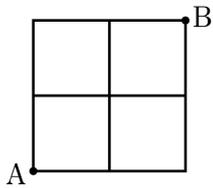


Figure 2

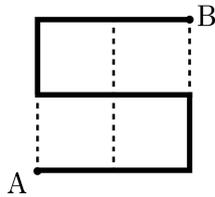


Figure 3

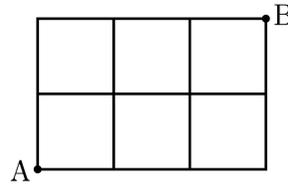
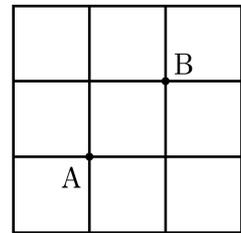


Figure 4



- (19) Within the area in Figure 3, how many blocks does the tourist walk from the temple (point A) to the hotel (point B) according to the rule?
- (20) Within the area in Figure 4, how many blocks does the tourist walk from the temple (point A) to the hotel (point B) according to the rule?