

# 4<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 examinee number and name 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.

Examinee Number	—	Name	
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※Your personal information will be handled appropriately according to the "Handling of Personal Information" agreement that was approved at the time of registration.



公益財団法人  
日本数学検定協会  
The Mathematics Certification Institute of Japan

## [4th Kyu] Section 2: Application Test

1

Answer the following.

- (1) Which of the following situations can be expressed as  $320 + x = y$ ? Choose one from ① to ④.

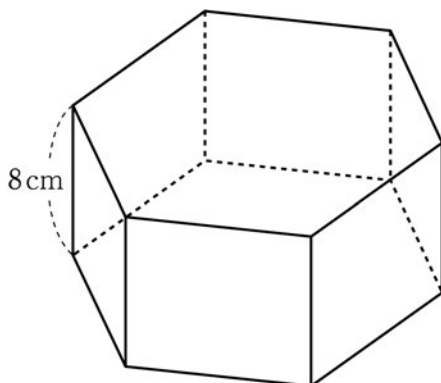
- ① After reading  $x$  pages of a book that has 320 pages,  $y$  pages are left.
- ② Buying a book that costs  $x$  yen and a pen that costs  $y$  yen, the total cost is 320 yen.
- ③ Putting an orange weighing 320 g in a box weighing  $x$  g, the total weight is  $y$  g.
- ④ A rectangle of perimeter 320 cm has length  $x$  cm and width  $y$  cm.

- (2) There are 25 students in Alice's class. Let  $x$  be the number of students who go to school by bicycle and let  $y$  be the remaining number of students. Express the relationship between  $x$  and  $y$  as an equation. *(Expression skill)*

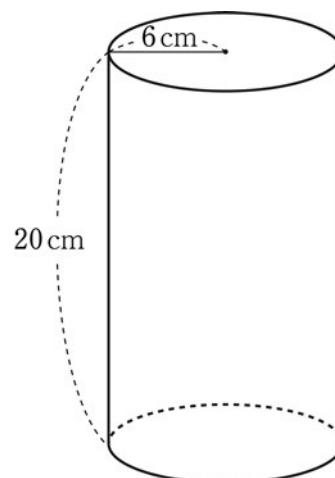
2

The following solids are boxes of snacks. Find the volume, in  $\text{cm}^3$ , of each of the solids. Include units in your answer. Use 3.14 for the ratio of the circumference of a circle to its diameter. *(Measurement skill)*

- (3) Hexagonal prism of base area  $300 \text{ cm}^2$



- (4) Cylinder



3

The following shows the lunch set menu in a restaurant. You choose one rice from two choices, one main dish from four choices and one side dish from three choices.

<b>Lunch Set Menu</b> Choose one from each category.	
<b>Rice:</b> Plain rice, Fried rice	
<b>Main dish:</b> Chicken, Beef, Fish, Vegetables	
<b>Side dish:</b> Salad, Soup, Fruit	

- (5) If you choose fried rice, how many different combinations of main dishes and side dishes can you make?
- (6) How many different lunch sets can you make?

4

The table below contains information on the highest temperatures and lowest temperatures in a city from Monday to Friday. The numbers show the difference between the temperatures and  $25^{\circ}\text{C}$ . Positive numbers indicate temperatures higher than  $25^{\circ}\text{C}$ . Negative numbers indicate temperatures lower than  $25^{\circ}\text{C}$ .

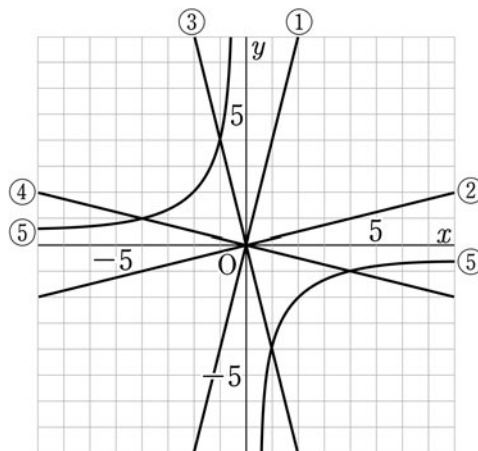
		Monday	Tuesday	Wednesday	Thursday	Friday
Difference between $25^{\circ}\text{C}$	Highest temperature	-2	7	3	0	-3
	Lowest temperature	-6	-3	-4	-5	-10

- (7) Find the highest temperature, in  $^{\circ}\text{C}$ , on Monday. Include units in your answer.
- (8) On Wednesday, how much higher, in  $^{\circ}\text{C}$ , is the highest temperature than the lowest temperature? Include units in your answer.
- (9) Which day has the greatest difference between the highest and lowest temperatures?

5

Consider the function  $y = -\frac{1}{4}x$ .

- (10) Choose the graph of the function  $y = -\frac{1}{4}x$  from ① to ⑤.
- (11) Find the range of values of  $y$  for  $-3 \leq x \leq 12$ .



6

One vanilla ice cream costs 130 yen and one chocolate ice cream costs 150 yen at a shop. Becky bought some ice creams which cost a total of 2480 yen. Let  $x$  be the number of vanilla ice creams she bought and let  $y$  be the number of chocolate ice creams she bought. You don't need to consider tax.

- (12) For the total cost, write an equation in terms of  $x$  and  $y$ . (*Expression skill*)
- (13) Becky bought a total of 18 ice creams. How many vanilla ice creams and how many chocolate ice creams did she buy? Write a system of equations in terms of  $x$  and  $y$  and solve it. Write the steps leading to your answer.

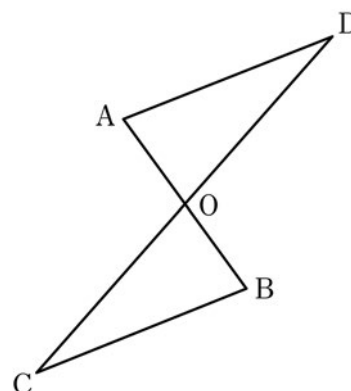
7

A tank contains 20 L of water. The tank can hold 110 L of water. Water is poured in the tank at a constant rate. 3 minutes after pouring, the amount of water in the tank is 50 L. Let  $y$  L of be the amount of water in the tank  $x$  minutes after pouring.

- (14) Express  $y$  in terms of  $x$ . (Expression skill)
- (15) Draw the graph of the relationship between  $x$  and  $y$  on the answer sheet, using a ruler. (Expression skill)
- (16) How many minutes after pouring does the amount of water reach 110 L?

8

In the figure, line segments AB and CD bisect each other at point O. Line segments AD and BC are drawn. Answer the following when proving that  $\triangle AOD$  is congruent to  $\triangle BOC$  in the simplest way.



- (17) Which conditions are required to prove that  $\triangle AOD$  is congruent to  $\triangle BOC$ ? Choose three conditions from the following.
- ①  $AO = BO$       ②  $OD = OC$       ③  $DA = CB$
- ④  $\angle AOD = \angle BOC$       ⑤  $\angle ODA = \angle OCB$       ⑥  $\angle DAO = \angle CBO$
- (18) Which condition in words is required to prove that  $\triangle AOD$  is congruent to  $\triangle BOC$ ? Choose one from the following.
- ① All sides are equal to their corresponding sides (SSS).
- ② Two sides and the included angle are equal to their corresponding parts (SAS).
- ③ Two angles and the included side are equal to their corresponding parts (ASA).
- ④ The hypotenuse and an acute angle are equal to their corresponding parts (HA).
- ⑤ The hypotenuse and a leg are equal to their corresponding parts (HL).

**9**

Answer the following.

*(Organizing skill)*

- (19) There are 27 students in class A and there are 33 students in class B. The students in both classes took a test. The mean score of class A was 84 marks and the mean score of class B was 78 marks. Find the mean score over all the students in the two classes.
- (20) The mean weight of 15 rugby players on a team is 105 kg. During a game, one player got injured and left the field. The mean weight of the remaining 14 players became 106.5 kg. Find the weight, in kg, of the injured player.