5th 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	

※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

[5th Kyu]   Section 2: Application Test

1 There are 36 chocolate bars and 60 biscuits. They are distributed to as many children as possible so that each child gets an equal number of chocolate bars and an equal number of biscuits without any chocolate bars and biscuits left over.

(1)   How many children can receive the chocolate bars and biscuits?

(2)   How many chocolate bars and how many biscuits can one child receive?

2 The figure shows the net of a triangular prism. Consider the solid when it is folded.

(3)   Which points meet point C? Answer all the points.

(4)   Which faces are perpendicular to the triangular base? Choose all the faces from ① to ⑤.
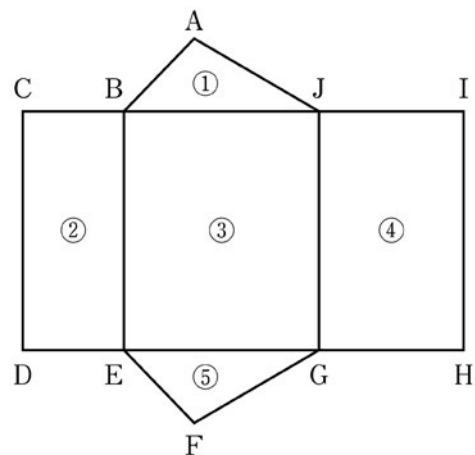
3 A stationery store sells three kinds of notebook sets, A, B and C. The table shows the number of notebooks and the price for each set. You don't need to consider tax.

Set	Number of notebooks	Price
A	3	390 yen
B	5	605 yen
C	7	861 yen

(5) For set A, find the price per notebook. Include units in your answer.

(6) Of the three kinds of sets, which set is the cheapest price per notebook? Choose one from A, B and C. Also find the price per notebook for this set. Include units in your answer.

4 When a ball is released above the ground, the ball bounces and always reaches a certain height that is $\frac{3}{7}$ times the height where the ball is released. Include units in your answer.

(7) When the ball is released at a point $4\frac{2}{3}$ m above the ground, find the height, in m, that the ball reaches after it bounces.

(8) When the ball is released from a certain height, the ball reaches $1\frac{4}{5}$ m above the ground. Find the height, in m, where the ball is released.

5 The following shapes from ① to ⑥ in Figure 1 are made up of squares of the same size.

Figure 1

① ② ③ ④ ⑤ ⑥
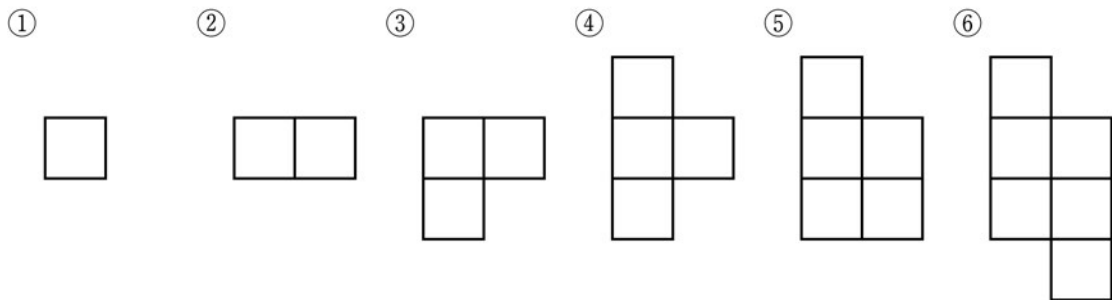
(9) Which shapes have exactly one axis of symmetry? Choose all from ① to ⑥.

(10) Which shapes have a point of symmetry? Choose all from ① to ⑥.

(11) A shape that has an axis of symmetry is made by adding a square to shape ⑤ as shown in Figure 2. To which position from A to I is a square to be added? Choose all possible positions from A to I.

Figure 2
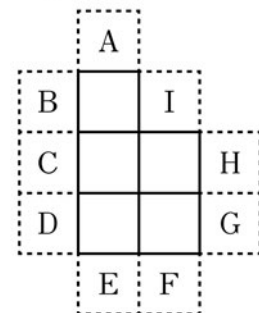
6 Alice went to a train station from home. She started to walk at a speed of 80 m per minute from home. On the way to the station, she ran at a speed of 110 m per minute so that she did not miss the train. It took 16 minutes for her to get to the station from home. Let x minutes be the time she walked for.

(12) Express the time that she ran for in terms of x. (*Expression skill*)

(13) The distance between home and the station is 1400 m. How long, in minutes, did she walk for? Write an equation in terms of x and solve it. Write the steps leading to your answer with units.

7 In the figure, the graph of the function $y = \dfrac{3}{4}x$ and the graph of the function $y = \dfrac{a}{x}$ cross at point A. Point B lies on the graph of $y = \dfrac{a}{x}$. The x-coordinates of points A and B are -4 and 6, respectively.
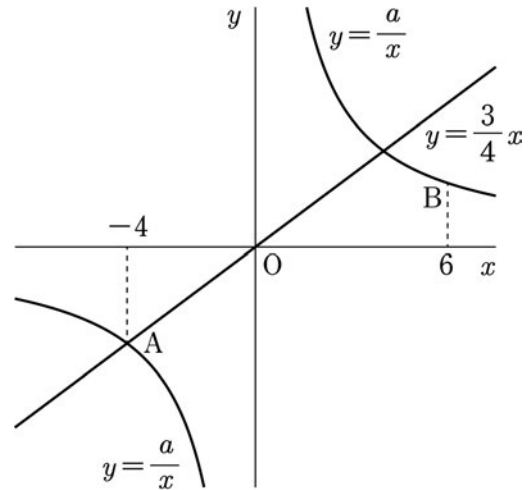
(14) Find the coordinates of point A.

(15) Find the value of a.

(16) Find the coordinates of point B. Write the steps leading to your answer.

8 27 students in grade 7 and 25 students in grade 8 ran a 50-meter dash. The frequency table shows the results. (*Statistical skill*)

50-meter dash

Class Interval (seconds)		Grade 7	Grade 8
Greater than or equal to	less than	Frequency	Frequency
7.0 -	7.5	1	2
7.5 -	8.0	3	2
8.0 -	8.5	6	8
8.5 -	9.0	7	5
9.0 -	9.5	4	3
9.5 -	10.0	4	4
10.0 -	10.5	2	1
Total		27	25

(17)　For grade 8, find the relative frequency of the class interval 8.0-8.5.

(18)　Which of the following statements are true regarding the frequency table? Choose all from ① to ⑥.

①　The class width is 0.5 seconds.

②　For the class interval 9.5-10.0, the relative frequencies of grade 7 and grade 8 are equal.

③　The mode of grade 7 is greater than the mode of grade 8.

④　For grade 8, the mode is greater than the median.

⑤　For grade 7, the cumulative frequency of the classes less than 8.5 seconds is 10.

⑥　For grade 8, the cumulative relative frequency of the classes less than 8.0 seconds is 0.08.

9 Security guards are arranged around a building. The shape of the building is a square when looking at it from above. The guards are arranged at the four corners, denoted by A, and along the four sides of the building, denoted by B, as shown in Figure 1. They are arranged according to the following rules.

Figure 1

A	B	A
B	Building	B
A	B	A

Figure 2

1	9	1
9	Building	9
1	9	1

Rules

- Each A has the same number of guards. Each B has the same number of guards.

- A total of 11 guards are arranged along a straight line (at two As and one B between them).

For example, if there are 40 guards, one guard is arranged at each A and nine guards are arranged at each B as shown in figure 2. Answer the following. (*Organizing skill*)

(19) If there are 36 guards in total, how many guards are arranged at each A and at each B, respectively?

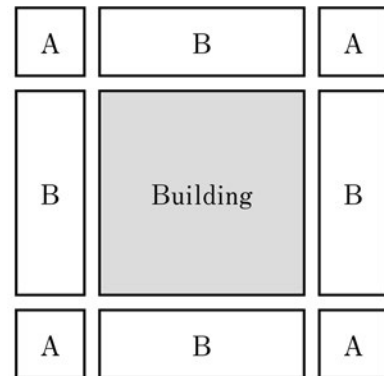(20) If there are 24 guards in total, how many guards are arranged at each A and at each B, respectively?