Pre 2nd Kyu

Section 1：Calculation Test

数学検定

PROFICIENCY TEST IN PRACTICAL MATHEMATICS

Test Time : 50 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 sheets.

5．Write only answers on the answer sheets provided.

6．If your answer contains a fraction, write the fraction in simplest form by reducing it to lowest terms.

7．If your answer contains a radical, write your answer in simplest radical form. For example, $\sqrt{12}$ must be expressed as $2\sqrt{3}$.

8．You may not use a calculator, ruler or compass.

9．Turn off your cell phone and do not use it during the test.

10. Ask an examination supervisor if your problem sheets have inconsistent page numbering or missing pages.

11. It is prohibited to disclose the problems to the general public, such as on the Internet, without permission.

Examinee Number	−	Name	

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

[Pre-2nd Kyu]   Section 1: Calculation Test

1 Answer the following.

(1)   Expand and simplify the following expression.

$$(x+6)^2 - (x^2 + 36)$$

(2)   Factorize the following expression.

$$16x^2 - 1$$

(3)   Simplify the following expression.

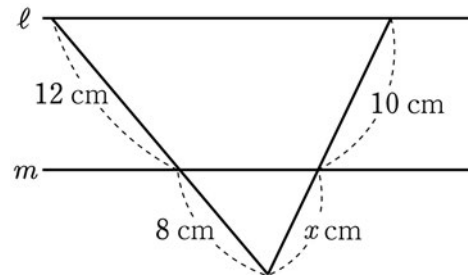$$\sqrt{147} - 2(\sqrt{27} - \sqrt{3})$$

(4)   Solve the following equation.

$$x^2 - 8x - 6 = 0$$

(5) y is directly proportional to the square of x and $y = -12$ when $x = 6$. Find the value of y when $x = -9$.
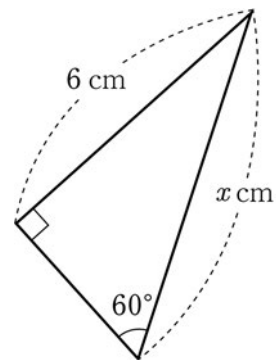
2   Answer the following.

(6)   In the figure, find the value of x when $\ell \parallel m$.

ℓ

12 cm   10 cm

m

8 cm x cm

(7)   In the figure of the right-angled triangle, find the value of x. If the answer is a fraction, rationalize the denominator.

6 cm

x cm

60°

(8)   Expand and simplify the following expression.

$$(2a+3b)(2a-3b)(4a^2+9b^2)$$

(9)   Factorize the following expression.

$$xy+5x+2y+10$$

(10)   Simplify the following expression.

$$\frac{5}{\sqrt{11}+4}+\sqrt{11}$$

3 Answer the following.

(11) Find the coordinates of the vertex of the parabola $y = x^2 - 14x + 50$.

(12) Solve the following equation.

$$\left| x - \frac{7}{2} \right| = \frac{5}{2}$$

(13) Convert the base-ten number 94 to the corresponding base-two number.

(14) If $\sin\theta = \dfrac{\sqrt{7}}{4}$ for $0° < \theta < 90°$, find the following values.

① $\cos\theta$

② $\tan\theta$

(15) Consider two sets $A = \{3, 7, 10, 11, 12, 16\}$ and $B = \{2, 7, 9, 10, 12\}$.

① Find the number of elements of set $A \cap B$.

② Find the number of elements of set $A \cup B$.