

2024 年度日本政府(文部科学省)奨学金留学生選考試験

QUALIFYING EXAMINATION FOR APPLICANTS FOR THE JAPANESE
GOVERNMENT (MONBUKAGAKUSHŌ) SCHOLARSHIP 2024

学科試験 問題

EXAMINATION QUESTIONS

(専修学校留学生)

SPECIAL TRAINING COLLEGE STUDENTS

数 学

MATHEMATICS

注意 ☆試験時間は **60 分**。

PLEASE NOTE: THE TEST PERIOD IS **60 MINUTES**.

Nationality		No.		Marks	
Name	(Please print full name, underlining family name)				

Answer the following questions and fill in your responses in the corresponding boxes on the answer sheet.

1. Fill in the blanks with the correct numbers.

(1) $(x-1)(x+1)(x^2+1)(x^4+1) = x^8 + \boxed{}.$

(2) $|\pi-4| + |\pi-2| = \boxed{}.$

(3) For any $\theta \in \mathbb{R}$, we have

$$(\sin \theta + \cos \theta)^2 + (\sin \theta - \cos \theta)^2 = \boxed{}.$$

(4) Solve the following equation

$$\begin{cases} 3x + y = 7 \\ x - 4y = 11. \end{cases}$$

Solutions are $x = \boxed{\textcircled{1}} $ and $y = \boxed{\textcircled{2}} .$

(5) Solve the following inequality

$$x^2 - 2x - 15 < 0.$$

Solution is given by $\boxed{\textcircled{1}} < x < \boxed{\textcircled{2}} .$

2. There are eight boys and five girls. We are to choose four members out of them. Fill the following blanks with the suitable numbers.

(1) The total number of ways to choose four members is .

(2) The number of ways to choose four members, two of which are boys and two of which are girls, is .

(3) The number of ways to choose four members, at least one of which is a boy and at least one of which is a girl, is .

3. Fill in the following blanks with the suitable numbers.

(1) Solve the following equation

$$2^{2x} - 6 \cdot 2^x + 8 = 0.$$

Solutions are given by $x =$ ^① or $x =$ ^②.

(2) Solve the following equation

$$\log_2(x - 1) = 3.$$

Solution is given by $x =$.

(3) Find the coefficient of x^2 in $(2x + 3)^5$. Answer is .

(4) We assume that $f(x) = 6x^2 - 4x + 3$. Then,

i. $f(3) =$ ^①,

ii. $f'(2) =$ ^②,

iii. $\int_0^1 f(x)dx =$ ^③.

4. We assume that $\vec{a} = (2, 0)$, $\vec{b} = (-3, 2)$ and $\vec{c} = (1, 4)$. Fill in the following blanks with the suitable numbers.

(1) $2\vec{a} - \vec{b} = \left(\boxed{\textcircled{1}}, \boxed{\textcircled{2}} \right).$

- (2) Write $\vec{c}$ as a linear combination of $\vec{a}$ and $\vec{b}$. Answer is

$$\vec{c} = \boxed{\textcircled{1}} \vec{a} + \boxed{\textcircled{2}} \vec{b}.$$

- (3) Calculate the dot product (inner product) of $\vec{a}$ and $\vec{c}$. Answer is

$$\vec{a} \cdot \vec{c} = \boxed{}.$$