2017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 JAPANESE GOVERNMENT (MONBUKAGAKUSHO) SCHOLARSHIPS 2017

学科試験　問題

EXAMINATION QUESTIONS

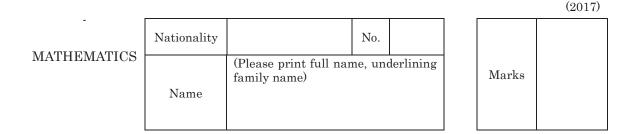## （専修学校留学生）

SPECIAL TRAINING COLLEGE STUDENTS

数　　学

MATHEMATICS

注意☆試験時間は６０分。

PLEASE NOTE : THE TEST PERIOD IS ６０ MINUTES.

MATHEMATICS

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

Marks	

Note that all the answers should be written on the answer sheet.

1. Fill in the following blanks with the correct answers.

(1) $\sqrt{27} - \sqrt{2}(\sqrt{6} + \sqrt{2}) + \dfrac{6}{\sqrt{3}} = \boxed{}$.

(2) Find the range of x that satisfies the following inequality

$\left| x - \dfrac{3}{2} \right| < \dfrac{7}{2}$; $\boxed{①} < x < \boxed{②}$.

(3) When $x^2 - 2ax + a^2 - b^2$ is factorized, it is $\boxed{}$.

(4) The largest is $\boxed{①}$ among $\sqrt[3]{3}$, $\sqrt[4]{9}$ and $\sqrt[7]{27}$, and the smallest is $\boxed{②}$

among 3, $2\log_3 5$ and $3\log_9 5$.

(5) When α and β are the solutions of the quadratic equation $x^2 - 3x + p = 0$,

then $\alpha + \beta = \boxed{①}$. Moreover, when $\alpha^2 + \beta^2 = 1$, then the constant

$p = \boxed{②}$.

(6) How many six digit numbers can be made by using $1, 2, 2, 3, 3, 3$?

The answer is $\boxed{}$.

(7) $-5, -2, 1, \cdots\cdots, 28$ is an arithmetic progression.

The sum of the arithmetic progression $(-5) + (-2) + 1 + \cdots\cdots + 28 = \boxed{}$.

(8) In a space with a coordinate system, when three points $A(1, 3, -2)$,

$B(2, x, 1)$ and $C(y, 1, 4)$ are located on a straight line, then $x = \boxed{①}$,

$y = \boxed{②}$.

(9) Let $f(x) = \dfrac{1}{3}x^3 - 2x^2 + 4x + 1$.

(i) The derivative of $f(x)$, $f'(x) = \boxed{}$.

(ii) The number of real solutions of the equation $f(x) = 0$ is $\boxed{}$.

(iii) The definite integral of $f(x)$, $\displaystyle\int_{-1}^{1} f(x)\, dx = \boxed{}$.

2．A triangle ABC on a plane satisfies AB＝8, BC＝10 and $\cos\angle ABC=\dfrac{4}{5}$.

Let M denote the midpoint of side BC.

Fill in the following blanks with the correct numbers.

(1) AC＝[　　　]．

(2) $\sin\angle ABC$＝[　　　]．

(3) $\angle BAC$＝[　　　]°．

(4) The radius of the circumscribed circle of △ABC＝[　　　]．

(5) The scalar product of two vectors $\overrightarrow{AB}\cdot\overrightarrow{AM}$＝[　　　]．

(6) The scalar product of two vectors $\overrightarrow{MA}\cdot\overrightarrow{MB}$＝[　　　]．

3．On the plane xy, there is the parabola $y=ax^2+bx+c$ which passes through the three points A(1,0), B(3,0) and C(4,3).

Fill in the following blanks with the correct answers.

(1) a＝[①]，b＝[②]，c＝[③]

(2) Let line l be a line which passes through two points A and C.

The equation of line l is $y=$[　　　]．

(3) Let line m be a line which passes through the point B and perpendicular to line l.

The equation of line m is $y=$[　　　]．

(4) Let S be the area of the region bounded by the line l, the line m and the x-axis, then $S=$[　　　]．

M-2