2013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 2013

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.

(2013)

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) $2a^2b^3 \times (-3ab^2)^2 \div (-6a^3b^5) = \boxed{}$.

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

$|x-1|<3$; $\boxed{①} < x < \boxed{②}$.

(3) When $x^2-3x+1=0$, then $x+\dfrac{1}{x}=\boxed{①}$, $x^2+\dfrac{1}{x^2}=\boxed{②}$.

(4) There are ten cards numbered from 1 to 10. Take out three cards from them.

i) The probability that the product of the numbers of the three cards is an odd number is $\dfrac{1}{\boxed{①}}$.

ii) The probability that the sum of the numbers of the three cards is an even number is $\dfrac{1}{\boxed{②}}$.

(5) Take a triangle ABC, where $\overrightarrow{AB}=(x,2,1)$, $\overrightarrow{BC}=(-1,y,4)$ and $\overrightarrow{CA}=(3,-5,z)$.

Then $x=\boxed{①}$, $y=\boxed{②}$ and $z=\boxed{③}$ and the scalar product of two vectors $\overrightarrow{AB}\cdot\overrightarrow{AC}=\boxed{④}$.

(6) The graph of $y=\log_2(8x-16)$ corresponds to a graph shown by shifting the graph of $y=\log_2 x$ by $\boxed{①}$ on the x-axis and by $\boxed{②}$ on the y-axis.

(7) 2, $\boxed{①}$, $\boxed{②}$, -7 , ··· is an arithmetic progression.

$\boxed{③}$, -6, $\boxed{④}$, -54, ··· is a geometric progression.

(8) If $\sum_{k=1}^{n} \frac{1}{k(k+1)} = \frac{6}{7}$, then $n = \Box$.

(9) When $f(x) = (x+3)(x-5)$, then a differential coefficient $f'(-1) = \Box$.

2. On the plane xy, there are a parabola $y = x^2 + x - 2$ ···ⓐ and a straight line $y = 3x + a$ ···ⓑ.

(1) The xy coordinates of the vertex of ⓐ are $\left(\frac{[①]}{2}, \frac{[②]}{4} \right)$.

When ⓐ and ⓑ have common points, then $a \geqq$ [③].

(2) If a = 1, then the x coordinates of the intersection of ⓐ and ⓑ are [①] and [②], and the area (area A) which is surrounded by ⓐ and ⓑ is $\frac{[⑤]}{3}$. When a circle with the radius r $(x^2 + y^2 = r^2)$ is included by area A, then $0 < r < \frac{[④]}{10}$.

3. Find the integer that is the closest to the result of the calculation, and fill the blanks with a number shown below.

(1) $\frac{1}{3} - \left(\frac{1}{5} - \frac{7}{2} \right) = \Box$

(2) $\left(\sqrt{5} - \sqrt{2} \right)^2 = \Box$

(3) $\sin 30° + \cos 45° + \tan 60° = \Box$

(4) $\frac{2}{3} + \left(\frac{2}{3} \right)^2 + \left(\frac{2}{3} \right)^3 + \left(\frac{2}{3} \right)^4 + \left(\frac{2}{3} \right)^5 = \Box$

(5) $\int_0^2 (x^2 + 3x - 1) dx = \Box$

① 1 ② 2 ③ 3 ④ 4 ⑤ 5 ⑥ 6 ⑦ 7 ⑧ 8 ⑨ 9