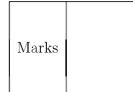
MATHEMATICS(A)

(2015)

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



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

- (1) $2x^2 5x$ for the values $1 \le x \le 4$ takes its maximum [1-1] at x = [1-2], and its minimum [1-3] at x = [1-4].
- (2) Two persons A, B simultaneously toss their individual coins, and win 1 point if the head is face-up, and 0 point if the tail is face-up. The probability that the points of A exceed the points of B after three tosses is 1-5.
- (3) When $a = \sqrt{5} + \sqrt{3}$ and $b = \sqrt{5} \sqrt{3}$, $\frac{a}{b} + \frac{b}{a}$ is equal to an integer [1-6].
- (4) The negation of proposition " $x \neq 0$ and $y \neq 0$ " is " $x = \begin{bmatrix} 1-7 \end{bmatrix} = \begin{bmatrix} 1-8 \end{bmatrix} = \begin{bmatrix} y \end{bmatrix} = \begin{bmatrix} 1-9 \end{bmatrix} = \begin{bmatrix} 1-$
- (5) There exist two circles that go through two points (1,3), (2,4) and are tangent to the y-axis. Letting the radii of the circles be a, b implies that ab = 1.
- (6) For the equation |2x-1|+|x-2|=2, the minimum of x is $x=\boxed{[1-11]}$ and the maximum is $x=\boxed{[1-12]}$.
- (7) For $\omega = \frac{1+\sqrt{3}i}{2}$, it holds that $\omega^5 = \boxed{[1\text{-}13]} + \boxed{[1\text{-}14]}i$, where i denotes the imaginary unit. Note that the answers are real numbers.
- (8) For the sequence $\{a_n\}$ defined by $a_{n+1} a_n = 2n$, $a_1 = 0$ where n is a positive integer, the general term is $a_n = \begin{bmatrix} 1-15 \end{bmatrix}$.

- **2.** A circle O is circumscribed around a triangle ABC, and its radius is r. The angles of the triangle are $\angle CAB = a$, $\angle ABC = b$, and $\angle BCA = c$.
 - (1) The lengths of arcs AB, BC, and CA are expressed by using a, b, c, and r as [2-1], [2-2], and [2-3], respectively.
 - (2) The area of \triangle ABC is expressed by using a,b,c, and r as

$$\frac{r^2}{2} \left\{ \sin \left(\left[2\text{-}4 \right] \right) + \sin \left(\left[2\text{-}5 \right] \right) + \sin \left(\left[2\text{-}6 \right] \right) \right\}.$$

(3) When $a=75^{\circ}, b=60^{\circ}, c=45^{\circ}$, and r=1, the lengths of sides AB, BC, and CA are calculated as [2-7], [2-8], and [2-9] without using trigonometric functions.

3. If a function f(x) satisfies the following equation

$$\int_{a}^{x} f(t) dt = 3x^{2} + (a+8)x + 4,$$

then the constant a is [3-1] and the function f(x) is f(x) = [3-2]. In this obtained function, the minimum of the integral $\int_a^x f(t) dt$ is [3-3].