

MATHEMATICS(A)

(2015)

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

Marks	
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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 $1 \leq x \leq 4$ 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 [1-7] 0 [1-8] y [1-9] 0".
- (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 $ab =$ [1-10].
- (6) For the equation $|2x - 1| + |x - 2| = 2$, the minimum of x is $x =$ [1-11] and the maximum is $x =$ [1-12].
- (7) For $\omega = \frac{1 + \sqrt{3}i}{2}$, it holds that $\omega^5 =$ [1-13] $+$ [1-14] 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 $a_n =$ [1-15].

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 $\boxed{[2-1]}$, $\boxed{[2-2]}$, and $\boxed{[2-3]}$, respectively.

(2) The area of $\triangle ABC$ is expressed by using a, b, c , and r as

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

(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 $\boxed{[2-7]}$, $\boxed{[2-8]}$, and $\boxed{[2-9]}$ 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 $\boxed{[3-1]}$ and the function $f(x)$ is $f(x) = \boxed{[3-2]}$. In this obtained function, the minimum of the integral $\int_a^x f(t) dt$ is $\boxed{[3-3]}$.