MATHEMATICS(A) (2016)

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

Marks	

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

(1) If we make a sequence selecting three elements from three different elements $\{1, 2, 3\}$ and we permit overlapped elements for the sequence, then the total number of sequences is $\boxed{\text{[1-1]}}$. If we do not take into account the order, the total number of the selections is $\boxed{\text{[1-2]}}$.

(2) With a two dimensional surface, if we take $(2, 1)$ as the center point and consider a transformation with a rotation angle of $45°$, then point $(3, 3)$ is transformed into point $\boxed{\text{[1-3]}}$.

(3) The graph of cubical function

$$y = \boxed{\text{[1-4]}}\,x^3 + \boxed{\text{[1-5]}}\,x^2 + \boxed{\text{[1-6]}}\,x + \boxed{\text{[1-7]}}$$

goes through the points $(0, 1), (-1, -2), (1, 2), (2, 9)$.

(4) If a function $f(x)$ in the domain $x \in [0, 2]$ is

$$f(x) = |x - 1| + |x^2 - 2x|,$$

then the minimum value is $\boxed{\text{[1-8]}}$ and the maximum one is $\boxed{\text{[1-9]}}$.

(5) Under the condition $2x^2 + y^2 = 4$ for real numbers x, y, the maximum value of $4x + y^2$ is $\boxed{\text{[1-10]}}$ and the minimum one is $\boxed{\text{[1-11]}}$.

(6) There are five white balls and three red balls. If we put these eight balls in a row with no adjoining red balls, then the number of these arrangements is $\boxed{[1\text{-}12]}$. If we put these eight balls in a row with adjoining red balls, then the number of possible arrangements is $\boxed{[1\text{-}13]}$.

(7) Binary number 10100101 is equal to decimal number $\boxed{[1\text{-}14]}$.

(8) $2 - \log_{10} 2 - 2\log_{10} 5$ is written as a single logarithm $\log_{10}\boxed{[1\text{-}15]}$.

(9) The shortest distance from O(0, 0) to the line passing through A(2, 3) and B(3, 5) is $\boxed{[1\text{-}16]}$.

(10) For triangle ABC with AB=6cm, BC=7cm and $\angle$BAC=60°, CA=$\boxed{[1\text{-}17]}$ cm.

2. Consider a parabola $y = x^2$. Answer the following questions and fill in your responses in the corresponding boxes on the answer sheet.

(1) The line that goes through the point $(0, \frac{3}{2})$ and is orthogonal to a tangent line to the part of parabola $y = x^2$ with $x > 0$ is

$$y = \boxed{\text{[2-1]}}\, x + \frac{3}{2}, \qquad (*)$$

and x-coordinate of the intersection of the above two lines is $\boxed{\text{[2-2]}}$.

(2) With respect to the intersection, it holds that

$$\int_0^{\boxed{\text{[2-2]}}} x^2\, dx. = \boxed{\text{[2-3]}}$$

Let S_1 be the value of this area.

(3) Letting S_2 be the value of the region surrounded with the line $(*)$, this parabola, and the line $x = 0$ implies $S_2 = \boxed{\text{[2-4]}}$.

(4) The ratio of S_2 to S_1 is

$$\frac{S_2}{S_1} = \boxed{\text{[2-5]}}.$$

3. The table below shows the scores of 10 students for Questions A and B in the examination.

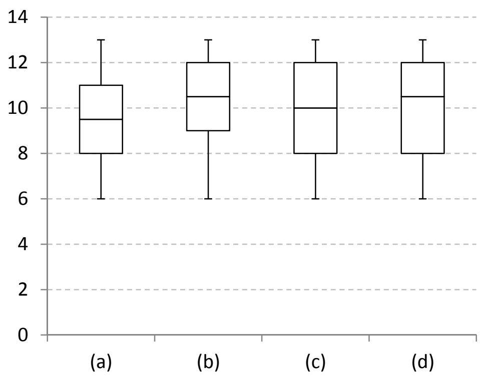
											Mean	SD*
Question A	3	5	6	4	[3-1]	1	7	7	8	3	5.0	2.1
Question B	3	5	6	4	5	8	6	5	5	3	[3-3]	[3-5]
Total	6	10	12	8	[3-2]	9	13	12	13	6	[3-4]	2.5

(* SD: Standard deviation)

By using the data, answer the following questions and fill in your responses in the corresponding boxes on the answer sheet.

(1) Answer the appropriate numbers for [3-1] – [3-5] in the table. Note that the mean and the standard deviation are calculated to 1 decimal place.

(2) Choose the boxplot for the total score among (a)–(d) [3-6].



(3) Choose the condition of correlation coefficient r between scores of Questions A and B among (a)–(e) [3-7].

(a) $r < -0.6$, (b) $-0.6 \leq r < -0.2$, (c) $-0.2 \leq r < 0.2$,
(d) $0.2 \leq r < 0.6$, (e) $r \geq 0.6$