

Japanese Grant Aid for Human Resource Development Scholarship (JDS)

Basic Mathematics Aptitude Test 2014

Prepared by Graduate School of International Relations, International University of Japan

Note:

- You have 60 minutes to complete.
- No calculators are allowed.
- Show all your work and write your answers in the designated space.
- Part I and Part II are 'Basic Math,' and Part III and Part IV are 'Applied Math.' The test result is only for the reference purpose and basically does not affect the selection procedure. However, some accepting universities may require the candidates who apply for the economics-related fields of study to have analytical and numerical skills.

Name : _____

(Please show all your work here and write your answers in the designated space)

[PART I] Calculate the followings.

1. $3 - (2 + 1 - 4)$

Answer : _____

2. $\left\{ \frac{1}{4} - \left(\frac{1}{3} - \frac{1}{2} \right) \right\} - \frac{5}{12}$

Answer : _____

3. $\frac{1}{3} \div 0.5 \times \left(\frac{1}{3} - \frac{3}{4} \right)$

Answer : _____

4. $\left(4 \times \left(\frac{1}{2} \right)^{-2} \times 2^3 \right)^{\frac{2}{7}} \times \left(\frac{1}{2} \right)^3$

Answer : _____

(Please show all your work here and write your answers in the designated space)

[PART II] Answer the following questions.

1. Solve the following equation for y .

$$-y + 2 = 3 - \frac{y}{2}$$

Answer : _____

2. Solve the following simultaneous equations for x and y .

$$\begin{aligned}x - 3y &= -7 \\ -2x + 3y &= 8\end{aligned}$$

Answer : _____

3. Solve the following inequality for x .

$$-\frac{8}{5}x - 5 \geq -x - 7$$

Answer : _____

4. Suppose that the average of the following six values,

$$\{-4, 3, -2, x, x + 2, -3\},$$

is equal to -2 . Derive the value of x .

Answer : _____

(Please show all your work here and write your answers in the designated space)

[PART III] Answer the following questions:

1. Solve the following for x .

$$2x^2 - 5x = 3$$

Answer : _____

2. Find the region of z satisfying the following inequality.

$$\left(\frac{1}{4}\right)^{z+2} < 8$$

Answer : _____

3. Find the region of x satisfying the following inequality.

$$\log_{0.5}(x+1) > 1$$

Answer : _____

4. Assume that $\sum_{k=1}^{\infty} \delta^{k-1} = 3$ and $0 < \delta < 1$. Find the value of δ .

Answer : _____

(Please show all your work here and write your answers in the designated space)

[PART IV] Answer the following questions:

1. Determine the first-derivative of the following.

$$y = x^2 + 3x$$

Answer : _____

2. Find the following definite integral. Notes: e is a mathematical constant which is the base of the natural logarithm. The value of e is approximately equal to 2.71828.

$$\int_1^e \frac{1}{x} dx$$

Answer : _____

3. Let $A = \begin{bmatrix} 3 & 1 \\ 4 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} x & 0 \\ 0 & x \end{bmatrix}$. Suppose the determinant of $A - B$ is zero, so that $A - B$ is not invertible. Solve for x .

Answer : _____

4. The profit π is described by the following function:

$$\pi = (100 - 4q)q - q^2,$$

where q is output. Find the output q at which the profit is maximized, and find the corresponding profit π .

Answer : _____