

The Project for Human Resource Development Scholarship
by Japanese Grant Aid (JDS)

Basic Mathematics Aptitude Test
2018

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 for the reference purpose.

Name : _____

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

[PART I] Calculate the followings.

1. $5 + 2 \times (3 - (1 - 2))$

Answer : _____

2. $\left(1 + \frac{1}{3} \times \frac{4}{5} \div \frac{2}{15}\right) + \frac{5}{2}$

Answer : _____

3. $(\sqrt{2} - \sqrt{12}) \times (\sqrt{2} + \sqrt{12})$

Answer : _____

4. $\left(\left(\frac{1}{2}\right)^{-2} \times \left(\frac{1}{16}\right)^{0.25}\right)^{-2} \div \left(\frac{1}{9}\right)^{-1}$

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 z.

$$\frac{15 - z}{2} = 2z$$

Answer : _____

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

$$-0.5x + 3y = 9.5$$

$$-x + 2y = 7$$

Answer : _____

3. Consider the straight line in the (x,y)-plane that passes through the points (1,2) and (a,3). In addition, the slope of the straight line is 3. Find the value of a.

Answer : _____

4. Calculate the following.

$$\sum_{m=1}^{100} (m - 1)$$

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.

$$4x^2 - 3x = 0$$

Answer : _____

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

$$\log_{10}x < 3$$

Answer : _____

3. Find the minimum integer x satisfying the following inequality.

$$\sum_{k=1}^x \left(\frac{1}{2}\right)^{1-k} > 60$$

Answer : _____

4. Consider the following five values,
{-1, 4, 2x, -x, 5}.

Suppose that the average of these five values is 2x. Find the median.

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-order derivative of the following.

$$y = \sqrt{2x}$$

Answer : _____

2. Solve the following equation for z.

$$\int_{-5}^z x dx = 0$$

Answer : _____

3. Let $A = \begin{bmatrix} 1 & 8 \\ 2 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} \lambda & 0 \\ 0 & \lambda \end{bmatrix}$. Suppose that the determinant of $A - B$ is zero. Find the value of λ .

Answer : _____

4. Consider the following function, $C(x) = x \log_e x$, where $x > 0$. Find x at which the value of the function is minimized. Note that e is a mathematical constant which is the base of the natural logarithm

Answer : _____

[PART V] Fill in the following blanks with correct answers.

1. Find the first derivative of the following.

$$f(\theta) = (\sin\theta)^2.$$

Answer : _____

2. Consider a sequence $\{a_k\}_{k=1}^{\infty}$ with $a_k = (2r)^{k-1}$. Find the value r which satisfies

$$\sum_{k=1}^{\infty} a_k = 10$$

Answer : _____

3. Suppose that $\vec{a} = (3 - x, 1)$ and $\vec{b} = (x, -2)$ are vertical. Find x .

Answer : _____

4. On a circle, 8 points are selected. How many triangles with edges in these points exist?

Answer : _____