# Japan-IMF Scholarship Program for Asia 2015-16

## Basic Mathematics Aptitude Test

(Full score: 40)

**Please Note:**

- You have 60 minutes to complete.
- No calculators are allowed.
- Please show all your work and write your answers in the designated space.

*Thank you.*

Reference Number:_____

Name:_____

**Reference Number:**_____**Country:**_____

**Name:**_____

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

**[Part 1] (1 point for each question) Calculate the following:**

1. $0.1 \times (2 - 3) \div (5 - 4.5)$

Answer:_____

2. $\left(\frac{2}{3} \div \frac{4}{6}\right) \times \left(\frac{1}{12} + \frac{4}{8}\right)$

Answer:_____

3. $\left(\frac{1}{3} \times \frac{1}{9}\right)^{-1/3}$

Answer:_____

4. $ln\left(\frac{5}{6} \div \frac{10}{12}\right) - ln(e^{0.9})$

Answer:_____

5. $e^{2 \ln\left[(5+6)^{0.5}\right]} - ln(e^2 \div e^{0.5})$

Answer:_____

**Reference Number:**_____**Country:**_____

**Name:**_____

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

**[Part 2] (2 point for each question) Answer to the following questions:**

1. Find what values of x satisfy $6 + 4x < 5x + 2$ and $x - 1 > 2x - 7$

Answer:_____

2. Solve the following equation: $x + \frac{x}{3} = \frac{x}{4} - 2$

Answer:_____

3. If a quadratic function $y = ax^2 + bx + c$ goes through the points $(x, y) = (1,1)$, $(0,0)$ and $(-4,1)$, then what are the values for the coefficients $(a, b, c)$?

Answer:_____

4. Solve the following equation: $x^2 - 3x + 2 = 0$

Answer:_____

5. Solve the following equation: $25^x = 5$

Answer:_____

Reference Number:_____Country:_____

Name:_____

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

**[Part 3] (3 point for each question) Answer to the following questions:**

1. Differentiate the following function: $f(x) = -x + 20$

Answer:_____
2. Find the partial derivative $\partial^2 f/\partial x \partial y$ when $f(x,y) = (x+y)^{0.5}(y-1)$

Answer:_____
3. Evaluate the following integral: $\int_{-1}^{1}(2 + x^5)dx$

Answer:_____
4. By producing and selling $Q$ units of some commodity, a firm earns total revenue $R(Q) = 20Q - 0.5Q^2$ and incurs a constant cost $C(Q) = 1 - 0.2Q^2 + 9Q$. What production level of Q would maximize this firm's profits (namely, $R(Q) - C(Q)$)?

Answer:_____
5. Differentiate the following function: $f(x) = \frac{e^{2x}}{1+e^{2x}}$

Answer:_____

Reference Number:_____Country:_____

Name:_____

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

**[Part 4] (5 point for each question) Answer to the following questions:**

1. Evaluate the following sum: $\sum_{k=2}^{\infty} 0.5^k$

Answer:_____

2. Compute the matrix $X$ that solves the following equation: $X \begin{pmatrix} 2 & 1 \\ 1 & 3 \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$

Answer:_____