Japanese Grant Aid for Human Resource Development Scholarship (JDS)

Basic Mathematics Aptitude Test

2016

Solution

Prepared by Japanese Development Service Co., Ltd.

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 II 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.

Registration No.: _____

Name: _____

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

[PART I] Answer the following questions. **Points: 5/each, Total:25**

1. Calculate the following.

$-\left(\frac{1}{3}-\frac{3}{4}\right)+\frac{5}{24}$ $= -\left(\frac{4-9}{12}\right)+\frac{5}{24}=\frac{10+5}{24}=\frac{15}{24}=\frac{5}{8}$

Answer: $\frac{5}{8}$ *or* *0.625*

2. Calculate the following.

$0.5\times\left(\frac{1}{4}-1.5\right)\div\frac{1}{\left(\frac{1}{2}\right)}$ $=\frac{1}{2}\times\frac{-5}{4}\times\frac{1}{2}=-\frac{5}{16}$

Answer: $-\frac{5}{16}$ *or* *0.3125*

3. Calculate the following.

$\left(\frac{1}{3}\right)^{-2}+100^{\frac{1}{2}}$ $= 9+10=19$

Answer: 19

4. Find the equation of the linear function passing through the following 2 points.

$(1,\ 3),\quad (-3,\ 3)$

Answer: $y=3$

5. Find the equation of the linear function using the following information.

$slope:\ 2,\quad y\ intercept:\ -7$

Answer: $y=2x-7$

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

[PART II] Answer the following questions. **Points: 5/each, Total:25**

1. Solve the following equation for x.

   $\frac{2}{3}x + 8 = \frac{1}{2}x + 2$ $x = -36$

   Answer: $x = -36$

2. Solve the following simultaneous equations.

   $\begin{cases} 4x - y = 9 \\ 5x + 2y = 8 \end{cases}$ $(x,\ y) = (2,\ -1)$

   Answer: $(x,\ y) = (2,\ -1)$

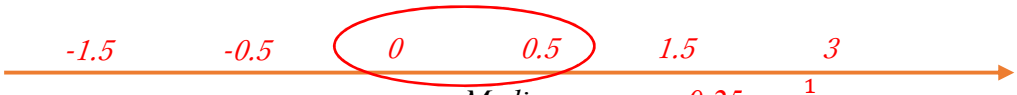
3. Solve the following inequality for x.

   $1 \leq \frac{3x-1}{2}$ $3x - 1 \geq 2$

   Answer: $x \geq 1$

4. Find the median of the following six values.

   $\left\{1.5,\ -\frac{1}{2},\ 3,\ 0,\ -\frac{3}{2},\ 0.5\right\}$ $(0 + 0.5)/2 = 0.25$

   Median: *0.25 or* $\frac{1}{4}$

5. There are 2 groups, A and B. Group A consists of 30 people and group B consists of 40 people. The average score of math exam of group A was 65 points and group B was 78 points. Calculate the average score of the whole people. The answer should be rounded to the nearest whole number.

   $(30 \times 65 + 40 \times 78) \div 70 = 72.42$

   Answer: *72*

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

[PART III] Answer the following questions. **Points: 5/each, Total:25**

1. The sum of the digits of a two-digit number is 12. The difference of the digits is 2. Find the number if the units digit is larger than the tens digit.

$\begin{cases} a+b=12 \\ a-b=2 \end{cases}$ $a=7,\ b=5$

Answer: 57

2. Solve the following for x.

$x+2x^2-1=0$ $(2x-1)(x+1)=0$

Answer: $x=\frac{1}{2},\ -1$

3. Solve the following equation.

$log_6(2x-3)=log_6(x+2)$ $2x-3=x+2$

Answer: $x=5$

4. Evaluate the following expression using $log_{12}3=0.4421$ *and* $log_{12}7=0.7831$.

$log_{12}21$

$log_{12}21=log_{12}(3\times 7)=log_{12}3+log_{12}7=0.4421+0.7831$
$=1.2252$

Answer: 1.2252

5. Solve the following inequality for x.

$7^{3x-1}<1$ $7^{3x-1}<7^0$ $3x-1<0$

Answer: $x<\frac{1}{3}$

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

[PART IV] Answer the following questions. **Points: 5/each, Total:25**

1. Determine the first-derivative of the following.

   $f(x) = (x+1)^3$

   Answer: $f'(x) = 3(x+1)^2$

2. Find the following definite integral.

   $\int_0^1 (6x - 9)\, dx$ $[3x^2 - 9x]_0^1 = 3 - 9 = -6$

   Answer: -6

3. Calculate the following.

   $\begin{bmatrix} -1 & 0 \\ 3 & 7 \end{bmatrix} \times \begin{bmatrix} 3 & -1 \\ 2 & 4 \end{bmatrix}$

   Answer: $\begin{bmatrix} -3 & 1 \\ 23 & 25 \end{bmatrix}$

4. The following table shows the growth rate of recent 3 years. Calculate the average growth rate. Use $\sqrt[3]{3} = 1.442$ for the calculation. The answer should be rounded to the 2nd decimal point.

Year	2013	2014	2015
Growth rate	2%	3%	4%

   $\sqrt[3]{2 \times 3 \times 4} = \sqrt[3]{24} = 2\sqrt[3]{3} = 2 \times 1.442 = 2.884$

   Answer: *2.88*

5. You start to deposit $10 into own bank account at the beginning of every year for 10 years from this year. The interest rate is 5% compounded annually. How much will your savings finally become at the end of 10 years later? Use $1.05^{10} = 1.63$ for the calculation.

   $S = \$10 \times (1+0.05)^{10} + \$10 \times (1+0.05)^9 + \$10 \times (1+0.05)^8 + \ldots + \$10 \times (1+0.05)$

   $= \$10 \times (1.05 + 1.05^2 + 1.05^3 + \cdots + 1.05^{10})$

   $= \$10 \times \frac{1.05(1.05^{10} - 1)}{1.05 - 1} = \$10 \times \frac{1.05 * 0.63}{0.05} = \$132.3$

   Answer: *$132.3*