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

Basic Mathematics Aptitude Test 2022

Note:

- The test is a computer-scored multiple-choice test.
- You have 60 minutes to complete.
- No calculators are allowed.
- Part I and Part II are 'Basic Math,' and Part III, IV and Ⅴ are 'Applied Math.'
- Select one(1) integer 0 to 9 for each square.
- Each square correspond to each answer number of computer-scored answer sheet.

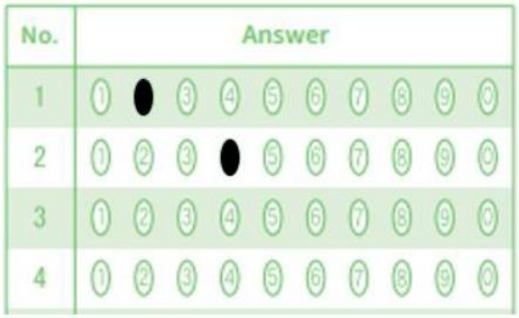
Example:

Please select integer number that correspond to □.

➢ $3 \times 8 =$ □ □ (2 digits)

No.1 No.2

Fill the oval shape completely by a pencil that you think it is the appropriate answer as shown in the picture below.



Name : _____

【PART I】 Calculate the followings and select integer number that correspond to ☐.

- $2 - (2 - 2\times(4 + (2 - 6))) = \square$ → No.1

- $\left(1 + \frac{1}{3} \times \frac{3}{4} \div \frac{1}{4}\right) - \frac{2}{5} \times \frac{10}{4} = \square$ → No.2

- $(\sqrt{3} - \sqrt{7}) \times (\sqrt{3} + \sqrt{7}) = -\square$ → No.3

- $\left(2^{-2} \times \left(\frac{1}{2}\right)^{-2}\right)^{-4} \div \left(\frac{1}{3}\right)^{2} = \square$ → No.4

【PART II】 Answer the following questions and select integer number that correspond to □.

- Solve the following equation for x.

$$\left(\frac{10-x}{3}\right) = 3x$$

Answer : $x =$ □ (No.5)

- Solve the following simultaneous equations for x and y.

$$-x + 6y = 19$$
$$-x + 2y = 7$$

Answer : $x = -$□ (No.6), $y =$□ (No.7)

- Find the region x satisfying the following inequality, where | | indicates the absolute value.

$$|x + 3| < 2$$

Answer : $-$□ $< x <$ $-$□ (No.8, No.9)

- Solve the following.

$$\sum_{n=1}^{5}(2n-1)$$

Answer : □□ (2digits) (No.10, No.11)

【PART III】 Answer the following questions and select integer number that correspond to □.

- Solve the following equation for x.

$$\frac{x^2}{4} = 4$$

Answer : $x =$ □, $-$ □
(No.12, No.13)

- Find the region of x satisfying the following inequality.

$$x^2 < 4x - 3$$

Answer : □ $< x <$ □
(No.14, No.15)

- Solve the following equation for x.

$$log_{10}(x) = log_{10}(2x - 4)$$

Answer : $x =$ □
(No.16)

- Consider the following five values, {1, 2, 7, 6, 4}. Suppose that the average of these five values is $log_2(x)$. Find the value of x.

Answer : $x =$ □□ (2digits)
(No.18, No.17)

【PART IV】 Answer the following questions and select integer number that correspond to □.

➢ Determine the first-order derivative of the following. Note that *e* is a mathematical constant which is the base of the natural logarithm.

$$y = 2x^2 + e^x + log_e x + 5$$

Answer： $y' = \boxed{}\, x + e^x + \dfrac{\boxed{}}{x}$

No.19 (first box), No.20 (second box)

➢ Find the following definite integral.

$$\int_{-1}^{0} 2x dx$$

Answer： $-\boxed{}$

No.21

➢ Let A=$\begin{bmatrix} 1 & 2 \\ 1 & 4 \end{bmatrix}$. Find the inverse matrix of A.

Answer： $\begin{bmatrix} \boxed{} & -\boxed{} \\ -0.5 & 0.5 \end{bmatrix}$

No.22 (first box), No.23 (second box)

➢ The profit π is described by the following function: $\pi(q) = (200 - 2q)q - 0.5q^2$, where *q* is output. Find the output *q* at which the profit is maximized.

Answer： q = $\boxed{}\boxed{}$ (2digits)

No.24 (first box), No.25 (second box)

【PART V】 Answer the following questions and select integer number that correspond to $\square$.

- Find the first derivative of the following. $f(\theta) = (\sin\theta)^2 + (\cos\theta)^2$

Answer : $\square$

No.26

- Conduct a sequence $\{a_k\}_{k=1}^{\infty}$ with $a_k = r^{1-k}$. Find the value r which satisfies $\sum_{k=1}^{\infty} a_k = 4$

No.27

Answer : $r = \frac{\square}{\square}$

No.28

➢ Suppose that $\vec{a}= (x-4,-1)$ and $\vec{b}= (x,-4)$ are vertical. Find x.

Answer : $x =$ ☐

No.29

➢ There are 6 male and 5 female students in the program. A group consisting of 3 male and 2 female students will be formed to work on a group project. Find how many different groups can be formed.

Answer : ☐☐☐ (3digits)

No.32

No.31

No.30