AQA – Exponentials and logarithms – AS Mathematics P2

1. June/2020/Paper_2/No.1

Identify the expression below that is equivalent to $e^{\frac{-2}{5}}$

Circle your answer.

[1 mark]

$\dfrac{1}{\sqrt[5]{e^2}}$ $\quad\quad$ $-\sqrt{e^5}$ $\quad\quad$ $-\sqrt[5]{e^2}$ $\quad\quad$ $\dfrac{1}{\sqrt{e^5}}$

2. June/2020/Paper_2/No.7

The population of a country was 3.6 million in 1989.

It grew exponentially to reach 6 million in 2019.

Estimate the population of the country in 2049 if the exponential growth continues unchanged.

[2 marks]

3. June/2020/Paper_2/No.8

(a) Using $y = 2^{2x}$ as a substitution, show that

$$16^x - 2^{(2x+3)} - 9 = 0$$

can be written as

$$y^2 - 8y - 9 = 0$$

[2 marks]

(b) Hence, show that the equation

$$16^x - 2^{(2x+3)} - 9 = 0$$

has $x = \log_2 3$ as its only solution.

Fully justify your answer.

[4 marks]

4. June/2019/Paper_2/No.4

Show that, for $x > 0$

$$\log_{10} \frac{x^4}{100} + \log_{10} 9x - \log_{10} x^3 \equiv 2(-1 + \log_{10} 3x)$$

[4 marks]

5. June/2019/Paper_2/No.10

As part of an experiment, Zena puts a bucket of hot water outside on a day when the outside temperature is 0°C.

She measures the temperature of the water after 10 minutes and after 20 minutes. Her results are shown below.

Time (minutes)	10	20
Temperature (degrees Celsius)	30	12

Zena models the relationship between θ, the temperature of the water in °C, and t, the time in minutes, by

$$\theta = A \times 10^{-kt}$$

where A and k are constants.

(a) Using $t = 0$, explain how the value of A relates to the experiment.

[1 mark]

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(b) Show that

$$\log_{10}\theta = \log_{10}A - kt$$

[1 mark]

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(c) Using Zena's results, calculate the values of A and k.

[4 marks]