PART A: Multiple Choice Questions
Circle the English letter of the best answer. Circle ONLY one answer for each question.

Knowledge:

1. Which of these relations is exponential?
   (a) \( y = 0.5x \)  
   (b) \( y = 3x^2 \)  
   (c) \( y = 2(x)^3 \)  
   (d) \( y = 3^x \)

2. \( 2^{-4} \) is:
   (a) \( -\frac{1}{8} \)  
   (b) \( -2^4 \)  
   (c) \( \frac{1}{16} \)  
   (d) \( -16 \)

3. \( -3.5^0 \) is:
   (a) \( -3.5 \)  
   (b) \( 0 \)  
   (c) \( 1 \)  
   (d) \( -1 \)

4. Evaluate \( 2.58^{-1.4} \) to 2 decimal places, the answer is:
   (a) \( -3.61 \)  
   (b) \( 0.27 \)  
   (c) \(-0.27 \)  
   (d) \( 3.61 \)

5. A certain type of bacteria doubles every hour. A culture begins with 30 000 bacteria, and have been undergone the doubling process for 8 hours. Which of the following formula best models the growth of the bacteria in the culture?
   (a) \( P = 30000(2)^x \)  
   (b) \( P = 30000(2)^{8x} \)  
   (c) \( P = 30000(8)^x \)  
   (d) \( P = 30000(8)^2 \)

6. The population of fish in a lake grows according to the expression \( 50(1.05)^t \), where \( t \) is the number of years. Find the number of fish after 8 years. Round to the nearest fish.
   (a) 420  
   (b) 80  
   (c) 74  
   (d) 53

7. Write \( x^4 \times x^3 \) as a single power. Then, evaluate for \( x = -2 \).
   (a) 128  
   (b) \(-128 \)  
   (c) 16  
   (d) \(-16 \)

8. The screen of a new graphing calculator has a resolution of 512 by 512 pixels. The number of pixels on the screen can be written as:
   (a) \( (4^2)^5 \)  
   (b) \( (4^3)^4 \)  
   (c) \( (2^3)^6 \)  
   (d) \( (2^4)^4 \)

9. The deer population in a national park is declining every year. The population can be modelled using the formula \( P = 380(0.975)^n \), where \( P \) is the population after \( n \) years. What is the declining rate of the deer population as a percent?
   (a) 97.5\%  
   (b) 38\%  
   (c) 10\%  
   (d) 2.5\%
Part B: Full Solution Questions
Show steps in proper form and provide answer statements get full mark.

Application:

1. A special type of light filter reduces the intensity of the light passing through it by 10%. Light intensity is further reduced as more light filters are placed together. Let $I$ represent the light intensity and $t$ represent the number of light filters. Write an equation that best models the situation. [A: 3]

2. A town’s racoon population is growing exponentially. The expected population can be estimated using the relation $P = 1250(1.013)^n$, where $P$ is the population and $n$ is the number of years.
   (a) What is the current racoon population? [A: 1]
   (b) What is the growth factor for the relation? [A: 1]
   (c) What is the yearly growth rate of the racoon population? Write as a percent. [A: 1]
   (d) What is the expected population in 5 years? [A: 2]
   (e) How long does it take the racoon population to be doubled? [A: 3]

Answers: 1. $I = (0.9)^t$; 2. (a) 1250, (b) 1.013, (c) 1.3%, (d) 1333, (e) 54 years;