Exponential relationships - applications test

Name: _____ Date: _____

16 questions | 53 marks | 60 minutes

Apply exact arithmetic, models and logarithmic reasoning to varied contexts with all data supplied.

A scientific calculator may be used.

1. An image is enlarged by factor 2 three times. Write one power for the overall factor and evaluate. [2 marks]

2. A cube has volume $216\ \text{cm}^3$. Write its side as a fractional power and evaluate. [2 marks]

3. A square tile has area $72\ \text{cm}^2$. Find its exact side and perimeter. [3 marks]

4. A rectangle has length $\sqrt{12}+\sqrt{3}$ cm and width $\sqrt{3}$ cm. Find its exact area. [3 marks]

5. A path is $\frac{10}{\sqrt{2}}$ m long. Rationalise and round to 2 decimal places. [3 marks]

6. The table describes two models at equal time steps. [4 marks]

Time	0	1	2	3
A	8	14	20	26
B	10	20	40	80

(a) Identify the linear and exponential model. [2 marks]

(b) Give the next value in each model. [2 marks]

7. A data-storage model is $D = 30(1.25)^t$ GB after t years. Find the value at year 2 and the annual percentage increase. [3 marks]

8. A filtering process retains 80% of a substance each pass from an initial 500 mg. Find the amount after 4 passes. [3 marks]

9. A model doubles every 3 days from 12 units. Write a formula in days t and find the value at day 9. [3 marks]

10. A cooling model is $T = 18 + 32(0.5)^t$ degrees Celsius, with t in hours. [6 marks]

(a) Find the initial temperature. [2 marks]

(b) Find when the model reaches 22°C. [2 marks]

(c) Interpret its horizontal asymptote. [2 marks]

11. Under $M = \log_{10}(\frac{A}{A_0})$, signal X has $M = 3.2$ and signal Y has $M = 5.2$. How many times larger is Y in amplitude? [3 marks]

12. A concentration model uses $p = -\log_{10} c$. The concentration changes from 10^{-3} to 10^{-5}. Find the change in p and the concentration factor. [3 marks]

13. Solve $6(1.3)^t = 15$ to 2 decimal places. [3 marks]

14. For $y = 2^{x-2} + 1$, state its asymptote and the point when $x = 2$. [2 marks]

15. A model is $N = 200(0.9)^t$ with monthly measurements. [6 marks]

(a) Predict at month 2. [2 marks]

(b) The observation is 170. Find the residual. [2 marks]

(c) Does one nonzero residual prove the model is useless? Explain. [2 marks]

16. A claim says that fitting an exponential rule to three months of downloads proves the same growth will last ten years. Explain two flaws. [4 marks]