# Fitting/interpreting exponential models

6 questions | 15 marks

Equivalent correct methods earn the corresponding marks.

**1.** Fit an exponential rule to y(0)=40 and y(2)=90. [2 marks]

$b^2 = 90/40 = 2.25$; take the positive root.

**Answer:** $y = 40(1.5)^t$

**2.** Fit a model through (1,24) and (3,54). [2 marks]

$b^2 = 54/24 = 2.25$; b=1.5; A=24/1.5=16.

**Answer:** $y = 16(1.5)^t$

**3.** Values at equally spaced times are 100,130,160. Does a pure exponential rule fit exactly? [3 marks]

The ratios are 1.3 and $160/130 \approx 1.231$, not equal.

The equal differences instead suggest a linear model.

**Answer:** No.

**4.** For $P(t) = 60(0.9)^t$, interpret 60 and 0.9. [2 marks]

$P(0) = 60$ and $P(t+1)/P(t) = 0.9$.

**Answer:** 60 is the time-zero amount; 0.9 retains 90% per time unit.

**5.** A count rises from 80 to 180 in two hours. Under an exponential model, predict the count after one hour. [3 marks]

The hourly multiplier is $\sqrt{180/80} = 1.5$; $80(1.5) = 120$.

**Answer:** 120

**6.** An exponential rule is fitted to observations from days 0 to 10. Explain why its day-100 prediction needs caution. [3 marks]

Growth conditions or limiting resources can change. A fit to ten days does not establish the process for one hundred days.

**Answer:** It extrapolates far beyond the observed data.