# 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]

$b^2=\frac{90}{40}=2.25$; take the positive root.

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

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

$b^2=\frac{54}{24}=2.25$; $b=1.5$; $A=\frac{24}{1.5}=16$.

**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 $\frac{160}{130}\approx 1.231$, 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 $\frac{P(t+1)}{P(t)}=0.9$.

**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 $\sqrt{\frac{180}{80}}=1.5$; $80(1.5)=120$.

**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.