

Exponential, Logistic, and Growth Models

Exponential structure, compound interest, growth and decay, logistic behavior, Newton-style models, and data fitting.

Name _____ Date _____

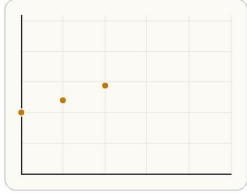
32 main 2-up grid 2 pages

Completion Reward



Shown here as a small pack artifact, not a preview destination.

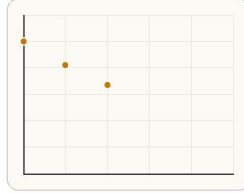
1. In $y = 500(1.2)^x$, what does 1.2 represent?



In an exponential model, 1.2 means each step multiplies the quantity by 1.2, which is 20% growth.

- A. A 20% growth factor each step
- B. A 1.2 unit additive increase
- C. The y-intercept
- D. The x-intercept

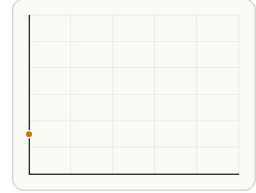
2. Which base represents exponential decay?



Exponential decay occurs when each step multiplies by a factor strictly between 0 and 1.

- A. 1.18
- B. 0.82
- C. 2
- D. 10

3. In $y = 75(1.3)^x$, what is the initial value?



The coefficient in front is the starting amount before any growth steps happen.

- A. 1.3
- B. 0
- C. 30
- D. 75

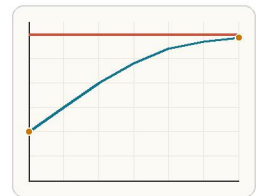
4. What growth factor matches 7% growth per period?

- A. 0.93
- B. 7
- C. 0.07
- D. 1.07

5. What decay factor matches 15% decay per period?

- A. 0.85
- B. 1.15
- C. 0.15
- D. 1.85

6. What makes a logistic model different from pure exponential growth?



Unlike exponential growth, a logistic curve levels off near a limiting value or carrying capacity.

- A. It levels off toward a limiting value.
- B. It always decreases.
- C. It never uses a growth factor.
- D. It changes by a fixed additive amount each step.

7. Which model shows 5% growth from an initial value of 80?

- A. $y = 80(1.05)^x$
- B. $y = 80(0.95)^x$
- C. $y = 5(1.8)^x$
- D. $y = 80 + 5x$

8. Which model shows 30% decay from an initial value of 40?

- A. $y = 40(0.7)^x$
- B. $y = 40(1.3)^x$
- C. $y = 30(0.4)^x$
- D. $y = 40 - 0.3x$

9. For $y = 200(0.6)^x$, what happens as x increases?

- A. The outputs approach 0.
- B. The outputs approach 200.
- C. The outputs become negative.
- D. The outputs grow without bound.

10. For a logistic model with carrying capacity 500, what happens in the long run?

- A. The outputs always stay at 0.
- B. The outputs alternate positive and negative.
- C. The outputs level off near 500.
- D. The outputs must become exactly 1.

11. What is the best first step when writing an exponential model from percent growth?

- A. Convert the percent to a growth factor.
- B. Square the percent.
- C. Take a logarithm immediately.
- D. Subtract the percent from the initial value.

12. A student says 12% growth means add 12 inside the exponent base. What is the mistake?

- A. Percent growth changes the multiplicative factor to 1.12, not 12.
- B. They should divide by 12 instead.
- C. They should always use base 12.
- D. Growth should be written linearly, not exponentially.

13. Evaluate $y = 200(1.5)^x$ when $x = 2$. Answer with a number.

14. Evaluate $y = 80(0.9)^x$ when $x = 3$. Answer with a number.

15. A population starts at 300 and grows by 10% each year. What is the population after 1 year? Answer with a number.

16. A medicine amount starts at 50 mg and decays by 20% per hour. What amount remains after 1 hour? Answer with a number.

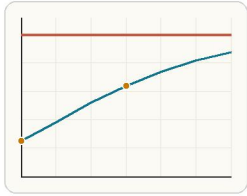
17. Find A for $A = 1000(1.05)^2$. Answer with a number.

18. For $P(x) = 100 / (1 + 4(0.5)^x)$, find $P(0)$. Answer with a number.

19. For $P(x) = 250 / (1 + 3(0.7)^x)$, what value is the carrying capacity? Answer with a number.

20. Evaluate $T(t) = 20 + 60(0.8)^t$ at $t = 1$. Answer with a number.

21. A value starts at 500 and grows by 8% each period. What is the value after 2 periods? Answer with a number.



The curve rises and then levels off near its long-run cap.

22. A value starts at 240 and decays by 25% each period. What is the value after 2 periods? Answer with a number.

23. Evaluate $y = 64(0.5)^3$. Answer with a number.

24. For $y = 900(0.97)^x$, what is the initial amount? Answer with a number.

25. Use $y = 12(1.5)^x$ to find y when $x = 2$. Answer with a number.

26. For $P(x) = 60 / (1 + 2(0.5)^x)$, find $P(1)$. Answer with a number.

27. What percent increase corresponds to factor 1.18? Answer with a number.

28. Write an exponential growth model for an initial value of 400 with 6% growth per period. Answer in the form $y = \dots$

29. Write an exponential decay model for an initial value of 90 with 12% decay per period. Answer in the form $y = \dots$

30. Write a model for \$500 invested at 4% annual growth. Answer in the form $A = \dots$

31. Write the general logistic form with carrying capacity 120. Answer in the form $P = \dots$

32. A table shows values 12, 18, 27, 40.5. Write the exponential model if x starts at 0. Answer in the form $y = \dots$

x	y
0	12
1	18
2	27
3	40.5

A constant multiplicative factor shows up as the same ratio from row to row.