1. A new electronics store has weekly sales of smartphones that grow according to a linear model. The store sold 8 smartphones in its first week ($S_0 = 8$) and 13 smartphones in its second week ($S_1 = 13$).

   (a) Write the recursive formula for the number of smartphones sold, S_n, in the $(n+1)$th week.

   $$S_n = S_{n-1} + \ldots$$

   (b) Write the explicit formula for the number of smartphones sold, S_n, in the $(n+1)$th week.

   $$S_n = \ldots$$

   (c) If this pattern continues, how many smartphones will be sold in the seventh week?

2. A small bookstore's weekly sales of books follow a linear growth pattern. The first week, the store sold 15 books ($B_0 = 15$), and the second week, it sold 20 books ($B_1 = 20$).

   (a) Write the recursive formula for the number of books sold, B_n, in the $(n+1)$th week.

   $$B_n = B_{n-1} + \ldots$$

   (b) Write the explicit formula for the number of books sold, B_n, in the $(n+1)$th week.

   $$B_n = \ldots$$

   (c) Assuming this trend continues, how many books will be sold in the eighth week?

3. A colony of bacteria is growing according to a linear growth model. The initial population (day 0) is $B_0 = 15$, and the population after 8 days is $B_8 = 95$.

   (a) Find an explicit formula for the bacteria population after n days.

   $$B_n = \ldots$$

   (b) After how many days will the bacteria population reach 300?

4. A school of fish in a pond is growing according to a linear growth model. The initial population (month 0) is $F_0 = 20$, and the population after 5 months is $F_5 = 120$.

   (a) Find an explicit formula for the fish population after n months.

   $$F_n = \dots$$

   (b) After how many months will the fish population reach 500?

5. A park currently has 150 benches. To improve accessibility, the city plans to add 4 additional benches at the end of each week for the next 40 weeks.

   (a) How many benches will the park have at the end of 25 weeks?

6. A neighborhood currently has 85 trees. As part of a greening initiative, the community group has decided to plant 5 additional trees at the end of each week for the next 20 weeks.

   (a) How many trees will there be in the neighborhood at the end of 15 weeks?

7. In a small town, a local bakery starts with an initial production of $B_0 = 15$ loaves of bread each day. The bakery has been experiencing an exponential growth in demand, with a daily growth rate of $r = 0.12$.

   (a) Then:

   $$B_1 =$$

   $$B_2 =$$

   (b) Find an explicit formula for B_n, which represents the number of loaves produced on day n.

   $$B_n = \dots$$

   (c) Use your formula to find B_{10}.

   $$B_{10} = \dots$$

   (d) Give all answers accurate to at least one decimal place.

8.

9. "A population of fish in a lake grows according to an exponential growth model, with $F_0 = 40$ and $F_1 = 60$.
   Complete the recursive formula:

$$F_n = \quad \times F_{n-1}$$

   Write an explicit formula for F_n:

$$F_n = \ldots$$

   "

10.

11. "A colony of bees grows according to an exponential growth model, with $B_0 = 40$ and $B_1 = 50$.
    Complete the recursive formula:

$$B_n = \quad \times B_{n-1}$$

    Write an explicit formula for B_n:

$$B_n = \ldots$$

    "

12. Consider a population of rabbits that grows according to the recursive rule $R_n = R_{n-1} + 15$, with an initial population $R_0 = 35$.
    Then:

$$R_1 = \quad R_2 =$$

    Find an explicit formula for the rabbit population. Your formula should involve n (use lowercase n).

$$R_n = \ldots$$

    Use your explicit formula to find R_{50}.

$$R_{50} = \ldots$$

13. Consider a population of trees that grows according to the recursive rule $T_n = T_{n-1} + 10$, with an initial population $T_0 = 100$.
    Then:

$$T_1 =$$

$$T_2 =$$

Find an explicit formula for the tree population. Your formula should involve n (use lowercase n).

$$T_n = \dots$$

Use your explicit formula to find T_{25}.

$$T_{25} = \dots$$

14. Find the logarithm without using your calculator.

$$\log_{10}(10000) = \dots$$

15. Find the logarithm without using your calculator.

$$\log_{10}(1000) = \dots$$

16. Find the logarithm without using your calculator.

$$\log\left(\frac{1}{100000}\right) = \dots$$

17. Find the logarithm without using your calculator.

$$\log\left(\frac{1}{10000}\right) = \dots$$

18. Express the equation in exponential form.

(a)

$$\log_2 4 = 2.$$

That is, write your answer in the form $2^A = B$. Then

$$A = \dots$$

and

$$B = \dots$$

(b)

$$\log_5 25 = 2.$$

That is, write your answer in the form $5^C = D$. Then

$$C = \dots$$

and

$$D = \dots$$

19. Express the equation in exponential form.

(a)

$$\log_3 9 = 2.$$

That is, write your answer in the form $3^A = B$. Then

$$A = \ldots$$

and

$$B = \ldots$$

(b)

$$\log_4 16 = 2.$$

That is, write your answer in the form $4^C = D$. Then

$$C = \ldots$$

and

$$D = \ldots$$

20. Solve correct to 2 decimal places.

$$4(5)^x = 11$$

Then

$$x = \ldots$$

21. Solve correct to 2 decimal places.

$$3(4)^x = 15$$

Then

$$x = \ldots$$

22. Assume there is a certain population of fish in a pond whose growth is described by the logistic equation. It is estimated that the carrying capacity for the pond is 1200 fish. Absent constraints, the population would grow by 110% per year.

If the starting population is given by $p_0 = 100$, then after one breeding season the population of the pond is given by

$$p_1 = \ldots$$

After two breeding seasons the population of the pond is given by

$$p_2 = \ldots$$

23. Assume there is a certain population of turtles in a lake whose growth is described by the logistic equation. It is estimated that the carrying capacity for the lake is 800 turtles. Absent constraints, the population would grow by 90% per year.

    If the starting population is given by $p_0 = 50$, then after one breeding season the population of the lake is given by

    $$p_1 = \ldots$$

    After two breeding seasons the population of the lake is given by

    $$p_2 = \ldots$$

24. Let

    $$P(t) = 30000(1.08)^t$$

    be the population of a town t years after the year 2000.

    Estimate in which year the population will reach 55528.

    Year $= \ldots$

25. Let

    $$P(t) = 25000(1.07)^t$$

    be the population of a city t years after the year 2000.

    Estimate in which year the population will reach 45000.

    Year $= \ldots$

26. The current student population of Miami is 1700. The population increases at a rate of 3.1% each year.

    Write an exponential growth model for the future population $P(x)$ where x is in years:

    $$P(x) = \ldots$$

    What will the population be in 3 years? (Round to nearest student)

    $$P(3) = \ldots$$

27. The current population of a university is 2500. The population increases at a rate of 4.5% each year.

    Write an exponential growth model for the future population $P(x)$ where x is in years:

    $$P(x) = \ldots$$

    What will the population be in 5 years? (Round to nearest student)

    $$P(5) = \ldots$$

28. The current population of a university is 2500. The population increases at a rate of 4.5% each year. Write an exponential growth model for the future population $P(x)$ where x is in years:

$$P(x) = \ldots$$

What will the population be in 5 years? (Round to nearest student)

$$P(5) = \ldots$$

29. The current student population of a town is 1700. The population increases at a rate of 3.1% each year. Write an exponential growth model for the future population $P(x)$ where x is in years:

$$P(x) = \ldots$$

What will the population be in 5 years? (Round to nearest student)

$$P(5) = \ldots$$