

# Which Bank?

**The Situation:** You have \$1,000 saved. Now, you need to figure out which bank you want to invest your money in. You can choose from the following two banks.



**TCF Bank**  
\$100 end  
of each year



**Wells Fargo Bank**  
Account earns 6%  
annual interest



**TCF Bank**

\$100 end  
of each year

**Wells Fargo Bank**

Account earns 6%  
annual interest

p.16

1. Write an equation that represents the total amount of savings at each bank.

Let  $y$  = total savings

Let  $x$  = number of years

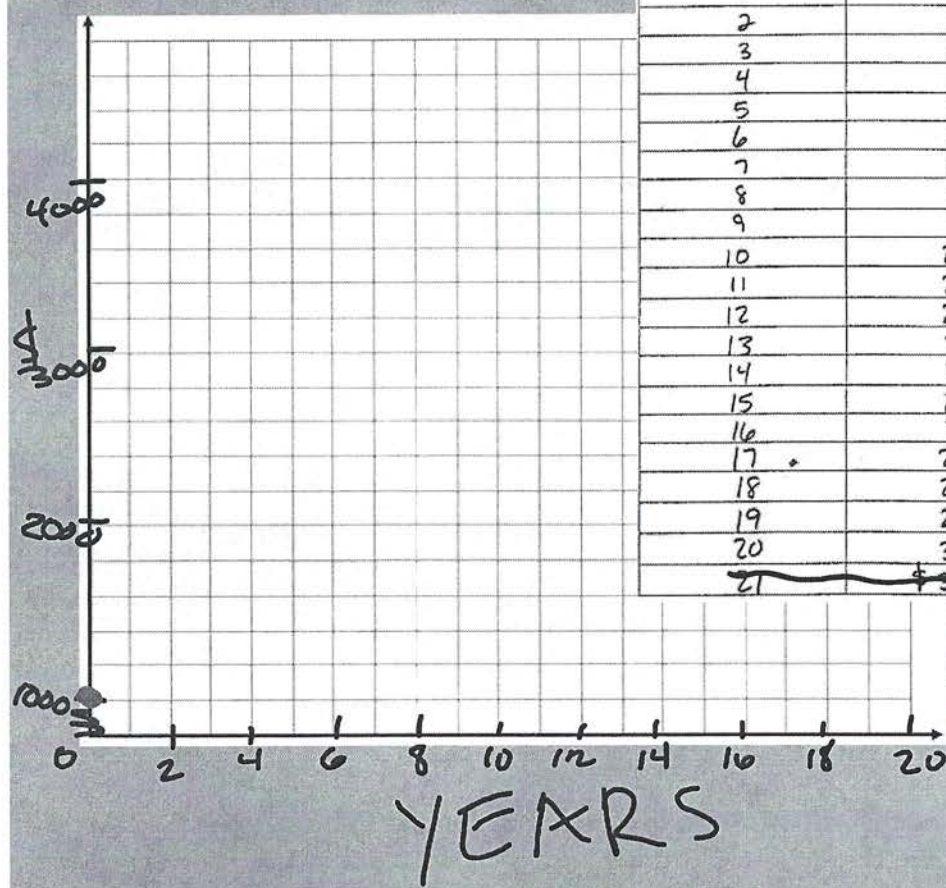


TCF:  $y = 100x + 1000$   $y = mx + b$



Wells Fargo:  $y = 1000(1.06)^x$   $y = a \cdot b^x$

# Which Bank



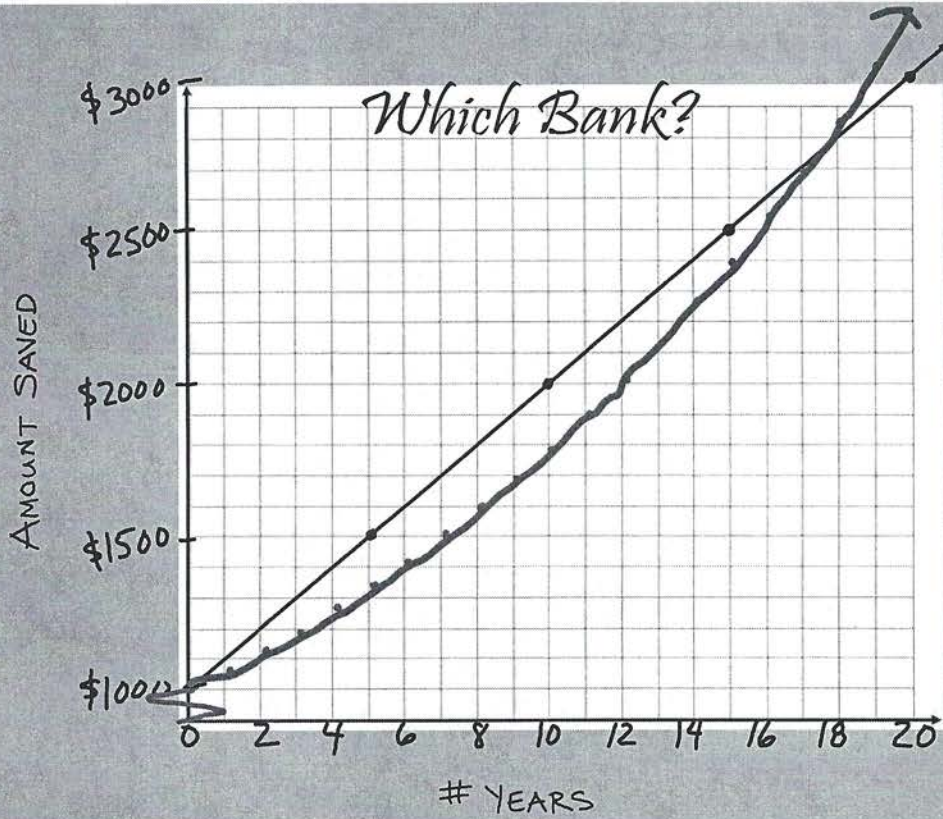
| Number of years<br>X | Total Savings at TCF<br>y1 | Total Savings at Wells<br>y2 |
|----------------------|----------------------------|------------------------------|
| 0                    | \$ 1000                    | \$ 1000                      |
| 1                    | 1100                       | 1060                         |
| 2                    | 1200                       | 1123.60                      |
| 3                    | 1300                       | 1191.02                      |
| 4                    | 1400                       | 1262.48                      |
| 5                    | 1500                       | 1338.23                      |
| 6                    | 1600                       | 1418.52                      |
| 7                    | 1700                       | 1503.63                      |
| 8                    | 1800                       | 1593.85                      |
| 9                    | 1900                       | 1689.48                      |
| 10                   | 2000                       | 1790.85                      |
| 11                   | 2100                       | 1898.30                      |
| 12                   | 2200                       | 2012.20                      |
| 13                   | 2300                       | 2132.93                      |
| 14                   | 2400                       | 2260.90                      |
| 15                   | 2500                       | 2396.56                      |
| 16                   | 2600                       | 2540.35                      |
| 17                   | 2700                       | 2692.77                      |
| 18                   | 2800                       | 2854.34                      |
| 19                   | 2900                       | 3025.60                      |
| 20                   | 3000                       | 3207.14                      |
| 21                   | <del>3100</del>            | <del>3397.56</del>           |

Use your data to complete the following table. Round to the nearest cent.

| Number of years<br>X | Total Savings at TCF<br>y1 | Total Savings at Wells Fargo<br>y2 |
|----------------------|----------------------------|------------------------------------|
| 0                    | 1000                       | 1000                               |
| 1                    |                            | 1060                               |
| 2                    |                            | 1123.60                            |
| 3                    |                            | 1191.02                            |
| 4                    |                            |                                    |
| 5                    |                            |                                    |
| 6                    |                            |                                    |
| 7                    |                            |                                    |
| 8                    | $y = 100x + 1000$          |                                    |
| 9                    |                            |                                    |
| 10                   |                            | → 1790.85                          |
| 11                   |                            |                                    |
| 12                   |                            |                                    |
| 13                   |                            |                                    |
| 14                   |                            |                                    |
| 15                   |                            | → 2396.56                          |
| 16                   |                            |                                    |
| 17                   |                            |                                    |
| 18                   |                            |                                    |
| 19                   |                            |                                    |
| 20                   | 3000                       | 3207.14                            |

$(1.06)^x$





$x < 18$   
 • TCF is a better investment 1-17 years  
 • WF is a better investment 18 or more years  
 $x > 18$

1. Describe the relationship for the T.C.F. graph.

a.

b.

2. Describe the relationship for the WELLS FARGO graph.

a.

b.

3. For how many years is it better to invest their money at...

TCF? \_\_\_\_\_

Wells Fargo? \_\_\_\_\_

4. Express each of your answers in #3 as an inequality. Let  $x$  = number of years.

TCF \_\_\_\_\_

Wells Fargo \_\_\_\_\_

| Number of years<br>$X$ | Total Savings at TCF<br>$y_1$ | Total Savings at Wells Fargo<br>$y_2$ |
|------------------------|-------------------------------|---------------------------------------|
| 0                      | \$ 1000                       | \$ 1000                               |
| 1                      | 1100                          | 1060                                  |
| 2                      | 1200                          | 1123.60                               |
| 3                      | 1300                          | 1191.02                               |
| 4                      | 1400                          | 1262.48                               |
| 5                      | 1500                          | 1338.23                               |
| 6                      | 1600                          | 1418.52                               |
| 7                      | 1700                          | 1503.63                               |
| 8                      | 1800                          | 1593.85                               |
| 9                      | 1900                          | 1689.48                               |
| 10                     | 2000                          | 1790.85                               |
| 11                     | 2100                          | 1898.30                               |
| 12                     | 2200                          | 2012.20                               |
| 13                     | 2300                          | 2132.93                               |
| 14                     | 2400                          | 2260.90                               |
| 15                     | 2500                          | 2396.56                               |
| 16                     | 2600                          | 2540.35                               |
| 17                     | 2700                          | 2692.77                               |
| 18                     | 2800                          | 2854.34                               |
| 19                     | 2900                          | 3025.60                               |
| 20                     | 3000                          | 3207.14                               |
| 21                     | \$ 3100                       | \$ 3399.56                            |

p.19

For 7-12, decide whether the table represents a linear or exponential function. Circle either linear or exponential. Then, write the function formula.

7.

|   |    |   |   |   |    |    |     |     |
|---|----|---|---|---|----|----|-----|-----|
| x | 0  | 1 | 2 | 3 | 4  | 5  | 6   | 7   |
| y | 12 | 8 | 4 | 0 | -4 | -8 | -12 | -16 |

-4 -4 -4 -4 -4

Linear or exponential?

$$f(x) = 12 - 4x$$

$$-4x + 12$$

8.

|   |    |   |     |      |       |        |         |          |
|---|----|---|-----|------|-------|--------|---------|----------|
| x | 0  | 1 | 2   | 3    | 4     | 5      | 6       | 7        |
| y | 10 | 5 | 2.5 | 1.25 | 0.625 | 0.3125 | 0.15625 | 0.078125 |

0.5 0.5 0.5

Linear or exponential?

$$f(x) = 10\left(\frac{1}{2}\right)^x$$

a. b<sup>x</sup>

**CW** p.18-21 (1,2,6,7,12,15abcde)

**P** p.18-21 (all)

**p.18**

| Linear Function   | Exponential Function  |
|---|---|
| $f(x) = mx + b$   | $f(x) = a \cdot b^x$  |
| $b$ is the <i>starting value</i> ,<br>$m$ is the <i>rate</i> or the <i>slope</i> .<br>$m$ is positive for growth, negative for decay. | $a$ is the <i>starting value</i> ,<br>$b$ is the <i>growth rate</i> .<br>$b > 1$ for growth, $0 < b < 1$ for decay.                         |
| If the growth or decay involves increasing or decreasing by a fixed number (constant difference), use a <b>linear</b> function        | If the growth or decay is expressed using multiplication (including words like "doubling" or "halving") use an <b>exponential</b> function. |

For 1-6, decide whether the word problem represents a linear or exponential function. Circle either linear or exponential. Then, write the function formula.

1. A gym's customers must pay \$50 for a membership, plus \$3 for each time they use the gym.

Linear or exponential?

$f(x) = 3x + 50$

2. There are 20,000 owls in the wild. Every decade, the number of owls is halved.

Linear or exponential?

$f(x) = 20,000(0.5)^x$

3. A library has 8000 books, and is adding 500 more books each year.

Linear or exponential?

$f(x) = 500x + 8000$

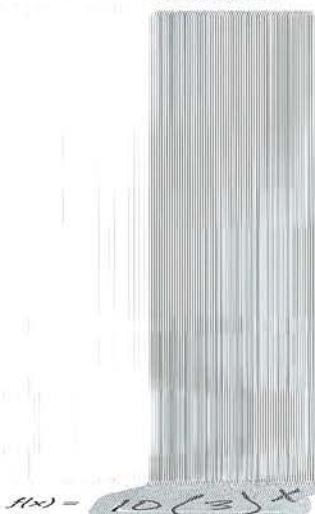
4. At the start of a carnival, you have 50 ride tickets. Each time you ride the roller coaster, you have to pay 6 tickets.

Linear or exponential?

$f(x) = 50 - 6x$

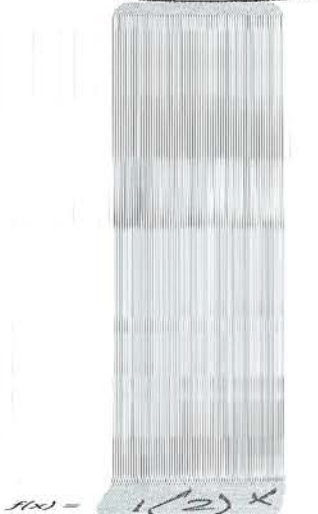
5. A bank account starts with \$10. Every month, the amount of money in the account is tripled.

Linear or exponential?



6. As a reward, you ask for a penny the first day and to double the amount each day for 30 days.

Linear or exponential?





For 7-12, decide whether the table represents a linear or exponential function. Circle either linear or exponential. Then, write the function formula.

p.19

7.

|   |    |   |   |   |    |    |     |     |
|---|----|---|---|---|----|----|-----|-----|
| x | 0  | 1 | 2 | 3 | 4  | 5  | 6   | 7   |
| y | 12 | 8 | 4 | 0 | -4 | -8 | -12 | -16 |

Linear or exponential?  
 $f(x) = -4x + 12$

8.

|   |    |   |     |      |       |        |         |          |
|---|----|---|-----|------|-------|--------|---------|----------|
| x | 0  | 1 | 2   | 3    | 4     | 5      | 6       | 7        |
| y | 10 | 5 | 2.5 | 1.25 | 0.625 | 0.3125 | 0.15625 | 0.078125 |

Linear or exponential?  
 $f(x) = 10(0.5)^x$

9.

|   |   |   |   |    |    |    |    |    |
|---|---|---|---|----|----|----|----|----|
| x | 0 | 1 | 2 | 3  | 4  | 5  | 6  | 7  |
| y | 2 | 5 | 8 | 11 | 14 | 17 | 20 | 23 |

Linear or exponential?  
 $f(x) = 3x + 2$

10.

|   |     |     |     |      |       |        |         |          |
|---|-----|-----|-----|------|-------|--------|---------|----------|
| x | 0   | 1   | 2   | 3    | 4     | 5      | 6       | 7        |
| y | 0.4 | 0.6 | 0.9 | 1.35 | 2.025 | 3.0375 | 4.55625 | 6.834375 |

Linear or exponential?  
 $f(x) = 0.4(1.5)^x$

11.

|   |   |   |    |    |    |    |     |     |
|---|---|---|----|----|----|----|-----|-----|
| x | 0 | 1 | 2  | 3  | 4  | 5  | 6   | 7   |
| y | 3 | 6 | 12 | 24 | 48 | 96 | 192 | 384 |

Linear or exponential?  
 $f(x) = 3(2)^x$

12.

|   |    |    |      |       |        |        |         |          |
|---|----|----|------|-------|--------|--------|---------|----------|
| x | 0  | 1  | 2    | 3     | 4      | 5      | 6       | 7        |
| y | 50 | 35 | 24.5 | 17.15 | 12.005 | 8.4035 | 5.88245 | 4.117715 |

Linear or exponential?  
 $f(x) = 50(0.7)^x$

For 13-14, WITHOUT A CALCULATOR make a table for the linear or exponential function.

13.

|   |                           |
|---|---------------------------|
| x | $f(x) = \frac{1}{2}x + 8$ |
| 0 | 8                         |
| 1 | 8.5                       |
| 2 | 9                         |
| 3 | 9.5                       |
| 4 | 10                        |
| 5 | 10.5                      |
| 6 | 11                        |

14. answer in fractions

|   |   |
|---|---|
| x | $f(x) = 8 \cdot (\frac{1}{2})^x$                                |
| 0 | 8   |
| 1 | $8(\frac{1}{2})^1 = 4$  |
| 2 | $8(\frac{1}{2})^2 = 8 \cdot \frac{1}{4} = 2$                    |
| 3 | $8(\frac{1}{2})^3 = 8 \cdot \frac{1}{8} = 1$                    |
| 4 | $8(\frac{1}{2})^4 = 8 \cdot \frac{1}{16} = 0.5 = \frac{1}{2}$   |
| 5 | $8(\frac{1}{2})^5 = 8 \cdot \frac{1}{32} = 0.25 = \frac{1}{4}$  |
| 6 | $8(\frac{1}{2})^6 = 8 \cdot \frac{1}{64} = 0.125 = \frac{1}{8}$ |

15. A science experiment involves periodically measuring the number of mold cells present on a piece of bread. At the start of the experiment, there are 50 mold cells. Each time a periodic observation is made, the number of mold cells triples. For example, at observation #1, there are 150 mold cells.

p.20

- a) Is this a linear or exponential function? Explain how you know.

Exponential, because the cells are tripling.  
(multiply 3)

- b) Write an equation for the number of mold cells present, where  $x$  stands for the observation number.

# mold cells  $\rightarrow y = 50(3)^x$  ← observation #

- c) Fill in the missing outputs for the table.

|                          |    |     |     |       |       |        |
|--------------------------|----|-----|-----|-------|-------|--------|
| $x =$ observation number | 0  | 1   | 2   | 3     | 4     | 5      |
| $y =$ mold cell count    | 50 | 150 | 450 | 1,350 | 4,050 | 12,150 |

- d) Suppose that the mold begins to be visible as green coloration when the mold cell count exceeds 100,000. On which observation will this happen?

$$50(3)^6 = 36,450$$

$$50(3)^7 = 109,350$$

Mold begins to be visible at observation 7.

- e) What will be the mold cell count on the 20th observation? When you find the answer on your calculator, it will be so large that it displays in scientific notation. Rewrite the answer in decimal notation.

$$50(3)^{20} \approx 1.74 \times 10^{11}$$

$\approx 174,009,000,000$  mold cells

16. Julie gets a pre-paid cell phone. Initially she has a \$40.00 balance on the phone. Each minute of talking costs \$0.15. Let  $x$  stand for the amount of time in minutes that Julie has talked on the phone, and let  $f(x)$  stand for the remaining dollar value of the phone.

p.21

- a) Is this a linear or exponential function? Explain how you know.

Linear, because you subtract \$0.15 each minute.

- b) Write an equation that represents Julie's situation.

$$f(x) = 40 - 0.15x$$

- c) Find the value of  $f(0)$  and explain its meaning in terms of the cell phone.

$$f(0) = 40 - 0.15(0)$$

$$f(0) = 40$$

0 minutes of talking, there's a \$40 balance.

- d) Find the value of  $f(100)$  and explain its meaning in terms of the cell phone.

$$f(100) = 40 - 0.15(100)$$

$$f(100) = 40 - 15$$

$$f(100) = 25$$

After 100 minutes of talking, there's \$25 left.

- e) Find the value of  $x$  that makes  $f(x) = 10$ , and explain its meaning in terms of the cell phone.

$$\begin{array}{r} 10 = 40 - 0.15x \\ -40 = -40 \\ \hline -30 = -0.15x \\ -0.15 \mid -0.15 \end{array}$$

$$\begin{array}{l} x = 200 \\ f(200) = 10 \end{array}$$

200 mins of talking, \$10 remain

- f) Find the value of  $x$  that makes  $f(x) = 0$ , and explain its meaning in terms of the cell phone.

$$\begin{array}{r} 0 = 40 - 0.15x \\ -40 = -40 \\ \hline -40 = -0.15x \\ -0.15 \mid -0.15 \end{array}$$

$$f(266.7) = 0$$

You have about 267 mins before your balance runs out \$0.

