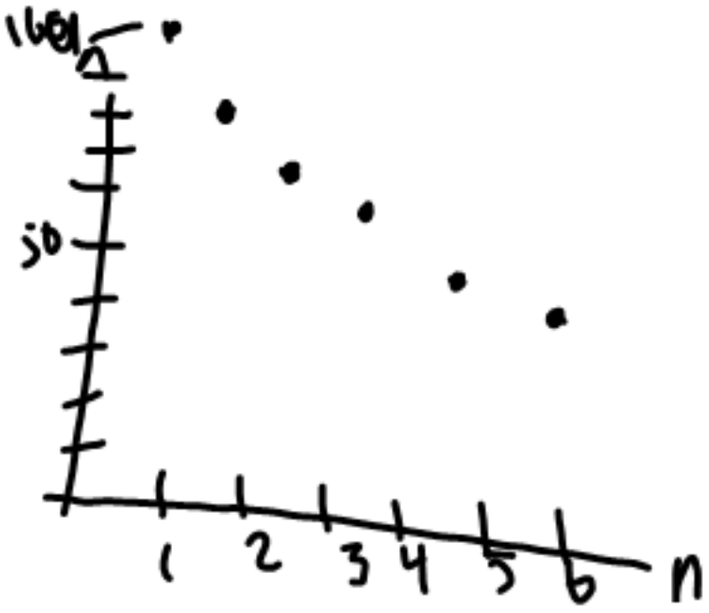



This is not a perfect seglence

100, 85, 70, 60, 48, 42 ...

ratio = $\frac{\text{now}}{\text{previous}}$

0.85 0.82 0.86 0.8 0.88

- find a reasonable common ratio

mean = $\frac{0.85 + 0.82 + 086 + 0.8 + 0.88}{5} \approx 0.84$

- write the recursive formula

$u_1 = 100$

$u_n = (u_{n-1})(0.84)$

- write out the first 6 terms & compare

100, 84, 70.56, 59.3, 50, 42.

# Percentage

**Growth**

ratio $> 1$

$\text{ratio} = 1 + \frac{\text{Percent}}{100}$

**Decay**

ratio $< 1$

$\text{ratio} = 1 - \frac{\text{Percent}}{100}$

---

ratio $0.84$ $16\%$ decay

$0.84 = 1 - \frac{\text{percent}}{100}$

$0.84 = 1 - b$

$-1 \quad -1$

$-0.16 = -b$

$b = 0.16 = \frac{16}{100}$

---

Decay by $15\%$ $\Rightarrow$ $\text{ratio} = 1 - \frac{15}{100}$

$= 1 - 0.15$

$= 0.85$

$$\begin{cases} u_0 = 5{,}000 \\ u_n = (u_{n-1})(0.85) \end{cases}$$

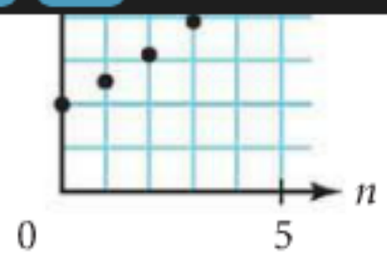
---

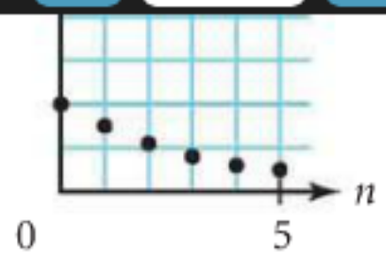
ratio $= 1.37$ $37\%$ growth

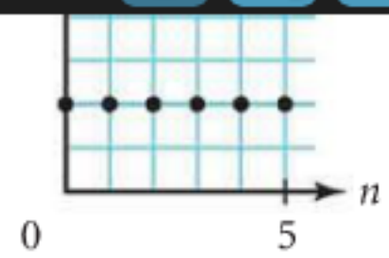
$1.37 = 1 + p$

$-1 \quad -1$

$p = 0.37 = \frac{37}{100}$




**5.** Factor these expressions so that the variable appears only once. For example, $x + 0.05x$ factors into $x(1 + 0.05)$.

**a.** $x + Ax$ @ **b.** $A - 0.18A$ @ **c.** $x + 0.08125x$ **d.** $2u_{n-1} - 0.85u_{n-1}$

mult

$A(1 - 0.18)$

$x(1 + 0.08125)$

## Reason and Apply

**6.** Suppose the initial height from which a rubber ball drops is 100 in. The rebound heights to the nearest inch are 80, 64, 51, 41, . . . .

**a.** What is the rebound ratio for this ball? (h)

**b.** What is the height of the tenth rebound?

**c.** After how many bounces will the ball rebound less than 1 in.? Less than 0.1 in.?

**7.** Suppose the recursive formula $u_0 = 100$ and $u_n = (1 - 0.20)u_{n-1}$ where $n \geq 1$

Table of Contents

## Review

**17.** The population of the United States grew 13.20% from 1990 to 2000. The population reported in the 2000 census was 281.4 million. What population was reported in 1990? Explain how you found this number.

**18.** An elevator travels at a nearly constant speed from the ground level to an observation deck at 160 m. This trip takes 40 s. The elevator's trip back down is also at this same constant speed.

**a.** What is the elevator's speed in meters per second?

**b.** How long does it take the elevator to reach the restaurants, located 40 m above ground level? @

**c.** Graph the height of the elevator as it moves from ground level to the observation deck.

$u_1 = 2000$

$u_n$: 281.4 ÷ 13.2%

13.20/10 = 1.320 cr

yr 2000 ← $u_1$ = 281.4 million

$u_n = (u_{n-1})(1.132)$

1.32% growth

1 ± 0.32

This is not a perfect sequence

Diff: -15, -15, -10, -12, -6

100, 85, 70, 60, 48, 42 ...

ratio = $\frac{\text{now}}{\text{previous}}$

$\frac{85}{100} = 0.85$, .82, .86, .8, .88

- find a reasonable common ratio

ave ratio $\approx 0.847$

model

- write the recursive formula

$$\begin{cases} u_1 = 100 \\ u_n = (u_{n-1}) \cdot (.842), \quad n \geq 2 \end{cases}$$

- write out the first 6 terms & compare

100, 84.2, 70.9, 59.7, 50.3, 42.3

→ Geometric ⇒ % problems

| Growth | Decay |
| --- | --- |
| ratio > 1 | 0 < Ratio < 1 |
| $\text{ratio} = 1 + \frac{\text{Percent}}{100}$ | $\text{ratio} = 1 - \frac{\text{Percent}}{100}$ |

ratio = 0.842 — 15.8% Decay

$$0.842 = 1 - \frac{\text{Percent}}{100}$$

$$(-100)(-0.158) = \left(-\frac{\text{percent}}{100}\right)(100)$$

$$15.8 = \text{percent}$$

ratio 1.79 — 79% Growth

$$1.79 = 1 + \frac{\text{Percent}}{100}$$

$$-1 \quad -1$$

$$0.79 = \text{Percent}/100$$

Start with 200 & grow by 12%

ratio $= 1 + \frac{12}{100} = 1.12$

$$\begin{cases} u_1 = 200 \\ u_n = (u_{n-1})(1.12) \end{cases}$$

This is not a perfect sequence

dd -15, -15, -10, -12, -6

100, 85, 70, 60, 48, 42 ...

$\frac{85}{100}$ $\frac{70}{85}$ .85, .82, .86, .8, .88

ratio = $\frac{\text{now}}{\text{prev}}$

- find a reasonable common ratio

mean = 0,842

- write the recursive formula

$u_1 = 100$

$u_n = (u_{n-1})(0.842)$

- write out the first 6 terms & compare

100, 84.2, 70.6, 59.3, 49.8, 41.8

# Geometric

## Growth
ratio > 1

ratio = $1 + \frac{\text{percent}}{100}$

## Decay
$0 <$ ratio $< 1$

ratio $= 1 - \frac{\text{Percent}}{100}$

---

5000 increase (growth) by 3% each day

ratio $= 1 + \frac{3}{100}$
$= 1.03$

$u_0 = 5000$
$u_n = (u_{n-1})(1.03)$

---

2500 calories per day, decrease (decay) by 3% each day

ratio $= 1 - \frac{3}{100}$
$= 0.97$

$u_0 = 2500$
$u_n = (u_{n-1})(0.97)$ ( $u_n = 0.97\, u_{n-1}$

$u_1 = u_0\ 0.97 = 2500(0.97) = 2425$
$u_2 = u_1\ 0.97 = 2425(0.97) =$

ratio = 0.842  15.8% Decay

$$0.842 = 1 - \frac{\text{percent}}{100}$$

$$\overset{-1}{(-100)}\overset{-1}{(-0.158)} = \left(-\frac{\text{percent}}{100}\right)(-100)$$

$$15.8 = \text{percent}$$

---

ratio = 1.34  34% growth

$$1.34 = 1 + \frac{\text{Percent}}{100}$$

$$\overset{-1}{0.34} = \frac{\text{percent}}{100}$$