Compound Interest Introduction

Spot mistakes, reason, and work backward

Name _____ **Date** _____ **Score** _____ / 8

QUICK REVIEW

With annual compounding, each new balance is the previous balance times $1 + r$. At 10%, 100 dollars becomes 110 after one year, then 121 after two: $100(1.10)^2 = 121$. Simple interest would give only 120 dollars. Round final money only.

Worked example

Example: \$100.00 earns 10% compounded annually for 2 years. List the balance after each year. Round only the final balance to cents.

1. The yearly multiplier is $1 + 10/100 = \frac{11}{10}$.
2. Year 1: $100(\frac{11}{10}) = 110$ dollars.
3. Year 2: $110(\frac{11}{10}) = 121$ dollars.
Answer: Year 1: \$110.00; Year 2: \$121.00.

Practice Problems

Show your thinking.

1. Savings: after 2 annual 10% growth steps the balance is exactly 242 dollars. Divide back through the growth factors to find the starting balance.

2. Deposit: \$400.00 at 5% annually for 2 years. A student uses simple interest and gets \$440.00. Find the compound balance and explain the difference.

3. Fund: after 3 annual 20% growth steps the balance is exactly $\frac{864}{5}$ dollars. Divide back through the growth factors to find the starting balance.

4. Account: \$800.00 at 5% annually for 2 years. A student uses simple interest and gets \$880.00. Find the compound balance and explain the difference.

5. Longer plan: \$500.00 earns 4% compounded annually for 3 years. List the balance after each year. Round only the final balance to cents.

6. Club reserve: compare annual compounding and simple interest on \$1000.00 at 2% for 2 years. Find each final balance and which is greater. Round only final money amounts.

7. Student fund: after 2 annual 6% growth steps the balance is exactly $\frac{8427}{25}$ dollars. Divide back through the growth factors to find the starting balance.

8. Equipment reserve: \$250.00 at 8% annually for 3 years. A student uses simple interest and gets \$310.00. Find the compound balance and explain the difference.

Answer Key

1. \$200.00
2. Compound \$441.00; simple \$440.00; compound is greater by \$1.00.
3. \$100.00
4. Compound \$882.00; simple \$880.00; compound is greater by \$2.00.
5. Year 1: \$520.00; Year 2: \$540.80; Year 3: \$562.43.
6. Compound \$1040.40; simple \$1040.00; compound is greater by \$0.40.
7. \$300.00
8. Compound \$314.93; simple \$310.00; compound is greater by \$4.93.

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. Undo all yearly growth factors: $242 \div (1 + 10/100)^2 = 200$ dollars, the starting balance.
2. The yearly multiplier is $1 + 10/100 = \frac{11}{10}$.
3. Year 1: $200(\frac{11}{10}) = 220$ dollars.
4. Year 2: $220(\frac{11}{10}) = 242$ dollars.

Problem 2

1. The yearly multiplier is $1 + 5/100 = \frac{21}{20}$.
2. Year 1: $400(\frac{21}{20}) = 420$ dollars.
3. Year 2: $420(\frac{21}{20}) = 441$ dollars.
4. Simple balance $= 400[1 + (5/100)(2)] = 440$ dollars.
5. Compound minus simple: $441 - (440) = 1$ dollars. This is positive, so the compound balance is greater by \$1.00; it includes interest on earlier interest.

Problem 3

1. Undo all yearly growth factors: $\frac{864}{5} \div (1 + 20/100)^3 = 100$ dollars, the starting balance.
2. The yearly multiplier is $1 + 20/100 = \frac{6}{5}$.
3. Year 1: $100(\frac{6}{5}) = 120$ dollars.
4. Year 2: $120(\frac{6}{5}) = 144$ dollars.
5. Year 3: $144(\frac{6}{5}) = \frac{864}{5}$ dollars.

Problem 4

1. The yearly multiplier is $1 + 5/100 = \frac{21}{20}$.
2. Year 1: $800(\frac{21}{20}) = 840$ dollars.
3. Year 2: $840(\frac{21}{20}) = 882$ dollars.
4. Simple balance $= 800[1 + (5/100)(2)] = 880$ dollars.
5. Compound minus simple: $882 - (880) = 2$ dollars. This is positive, so the compound balance is greater by \$2.00; it includes interest on earlier interest.

Problem 5

1. The yearly multiplier is $1 + 4/100 = \frac{26}{25}$.
2. Year 1: $500(\frac{26}{25}) = 520$ dollars.
3. Year 2: $520(\frac{26}{25}) = \frac{2704}{5}$ dollars.
4. Year 3: $\frac{2704}{5}(\frac{26}{25}) = \frac{70304}{125}$ dollars. Rounded final balance: \$562.43.

Problem 6

1. The yearly multiplier is $1 + 2/100 = \frac{51}{50}$.
2. Year 1: $1000(\frac{51}{50}) = 1020$ dollars.
3. Year 2: $1020(\frac{51}{50}) = \frac{5202}{5}$ dollars.
4. Simple balance $= 1000[1 + (2/100)(2)] = 1040$ dollars.
5. Compound minus simple: $\frac{5202}{5} - (1040) = \frac{2}{5}$ dollars. This is positive, so the compound balance is greater by \$0.40; it includes interest on earlier interest.

Problem 7

1. Undo all yearly growth factors: $\frac{8427}{25} \div (1 + 6/100)^2 = 300$ dollars, the starting balance.
2. The yearly multiplier is $1 + 6/100 = \frac{53}{50}$.
3. Year 1: $300(\frac{53}{50}) = 318$ dollars.
4. Year 2: $318(\frac{53}{50}) = \frac{8427}{25}$ dollars.

Problem 8

1. The yearly multiplier is $1 + 8/100 = \frac{27}{25}$.
2. Year 1: $250(\frac{27}{25}) = 270$ dollars.
3. Year 2: $270(\frac{27}{25}) = \frac{1458}{5}$ dollars.
4. Year 3: $\frac{1458}{5}(\frac{27}{25}) = \frac{39366}{125}$ dollars.
5. Simple balance $= 250[1 + (8/100)(3)] = 310$ dollars.
6. Compound minus simple: $\frac{39366}{125} - (310) = \frac{616}{125}$ dollars. This is positive, so the compound balance is greater by \$4.93; it includes interest on earlier interest.

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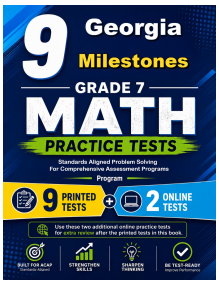

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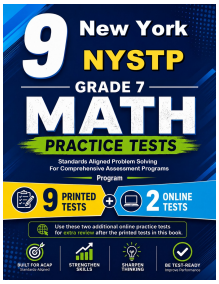

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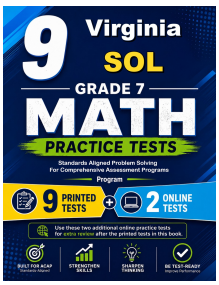

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