Compound Interest Introduction

Apply the skill to decisions and designs

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: compare annual compounding and simple interest on \$200.00 at 10% for 2 years. Find each final balance and which is greater. Round only final money amounts.

2. Deposit: \$400.00 earns 5% compounded annually for 2 years. List the balance after each year. Round only the final balance to cents.

3. Fund: compare annual compounding and simple interest on \$100.00 at 20% for 3 years. Find each final balance and which is greater. Round only final money amounts.

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: after 3 annual 4% growth steps the balance is exactly $\frac{70304}{125}$ dollars. Divide back through the growth factors to find the starting balance.

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: compare annual compounding and simple interest on \$300.00 at 6% for 2 years. Find each final balance and which is greater. Round only final money amounts.

8. Equipment reserve: after 3 annual 8% growth steps the balance is exactly $\frac{39366}{125}$ dollars. Divide back through the growth factors to find the starting balance.

Answer Key

1. Compound \$242.00; simple \$240.00; compound is greater by \$2.00.
2. Year 1: \$420.00; Year 2: \$441.00.
3. Compound \$172.80; simple \$160.00; compound is greater by \$12.80.
4. Compound \$882.00; simple \$880.00; compound is greater by \$2.00.
5. \$500.00
6. Compound \$1040.40; simple \$1040.00; compound is greater by \$0.40.
7. Compound \$337.08; simple \$336.00; compound is greater by \$1.08.
8. \$250.00

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. The yearly multiplier is $1 + 10/100 = \frac{11}{10}$.
2. Year 1: $200(\frac{11}{10}) = 220$ dollars.
3. Year 2: $220(\frac{11}{10}) = 242$ dollars.
4. Simple balance $= 200[1 + (10/100)(2)] = 240$ dollars.
5. Compound minus simple: $242 - (240) = 2$ dollars. This is positive, so the compound balance is greater by \$2.00; it includes interest on earlier interest.

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.

Problem 3

1. The yearly multiplier is $1 + 20/100 = \frac{6}{5}$.
2. Year 1: $100(\frac{6}{5}) = 120$ dollars.
3. Year 2: $120(\frac{6}{5}) = 144$ dollars.
4. Year 3: $144(\frac{6}{5}) = \frac{864}{5}$ dollars.
5. Simple balance $= 100[1 + (20/100)(3)] = 160$ dollars.
6. Compound minus simple: $\frac{864}{5} - (160) = \frac{64}{5}$ dollars. This is positive, so the compound balance is greater by \$12.80; it includes interest on earlier interest.

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. Undo all yearly growth factors: $\frac{70304}{125} \div (1 + 4/100)^3 = 500$ dollars, the starting balance.
2. The yearly multiplier is $1 + 4/100 = \frac{26}{25}$.
3. Year 1: $500(\frac{26}{25}) = 520$ dollars.
4. Year 2: $520(\frac{26}{25}) = \frac{2704}{5}$ dollars.
5. Year 3: $\frac{2704}{5}(\frac{26}{25}) = \frac{70304}{125}$ dollars.

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. The yearly multiplier is $1 + 6/100 = \frac{53}{50}$.
2. Year 1: $300(\frac{53}{50}) = 318$ dollars.
3. Year 2: $318(\frac{53}{50}) = \frac{8427}{25}$ dollars.
4. Simple balance $= 300[1 + (6/100)(2)] = 336$ dollars.
5. Compound minus simple: $\frac{8427}{25} - (336) = \frac{27}{25}$ dollars. This is positive, so the compound balance is greater by \$1.08; it includes interest on earlier interest.

Problem 8

1. Undo all yearly growth factors: $\frac{39366}{125} \div (1 + 8/100)^3 = 250$ dollars, the starting balance.
2. The yearly multiplier is $1 + 8/100 = \frac{27}{25}$.
3. Year 1: $250(\frac{27}{25}) = 270$ dollars.
4. Year 2: $270(\frac{27}{25}) = \frac{1458}{5}$ dollars.
5. Year 3: $\frac{1458}{5}(\frac{27}{25}) = \frac{39366}{125}$ dollars.

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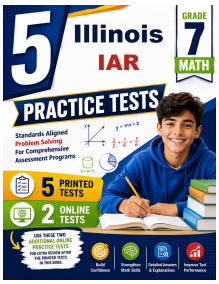

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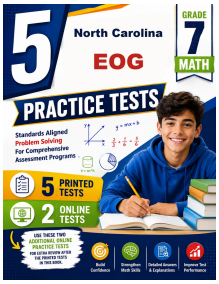

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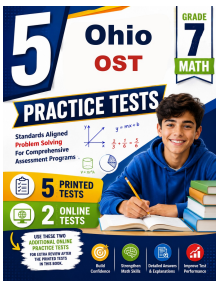

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