

Interest Growth Lab

Track how money changes over time.

HIGH SCHOOL • MA.912.FL.3.4

MA.912.FL.3.4 "Explain the relationship between simple interest and linear growth. Explain the relationship between compound interest and exponential growth and the relationship between continuously compounded interest and exponential growth."

NAME _____

DATE _____

INTEREST MODELS

With simple interest, use $A=P(1+rt)$, which can also be written $A=P+Prt$. Since Prt is the same dollar amount added each year, simple interest is linear. With compound interest, use $A=P(1+r)^t$, and with continuous compounding, use $A=Pe^{(rt)}$, which are exponential because equal time periods multiply the balance by a factor.

WORKED EXAMPLE

\$500 earns 6% simple interest for 3 years. Find the final amount.

1. Convert 6% to 0.06.
2. Find the interest: $I=500(0.06)(3)=90$.
3. Add the interest: $A=500+90=590$.

Answer: \$590

PRACTICE 6 problems

- 1** \$240 earns 5% simple interest. Write an equation for the amount A after t years. Is the relationship linear or exponential?

ANSWER _____

- 2** \$180 earns 4% simple interest for 2 years. Find the final amount.

ANSWER _____

- 3** \$200 is compounded annually at 10%. Write an equation for the amount A after t years. Is the relationship linear or exponential?

ANSWER _____

- 4** \$160 is compounded annually at 25% for 2 years. Find the final amount.

ANSWER _____

- 5** \$80 earns interest compounded continuously at 50%. Write an equation for the amount A after t years. Is the relationship linear or exponential?

ANSWER _____

- 6** Two accounts each start with \$400 and earn 10% for 2 years. One uses simple interest and one is compounded annually. Find both final amounts. Which account has more money?

ANSWER _____

APPLY IT Show your work

- 1** Jordan puts \$300 into a simple-interest account at 8% for 4 years to save for a used laptop that costs \$390. How much will Jordan have? Will Jordan have enough to buy the laptop? State whether the growth is linear or exponential.

WORK SPACE

ANSWER _____

- 2** Talia wants a \$360 tablet in 2 years. She deposits \$250 in an account that compounds annually at 20%. How much will she have after 2 years? Will she have enough? State whether the growth is linear or exponential.

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

Account S starts with \$200 and earns 25% simple interest each year. Account C starts with \$200 and earns interest continuously, with $C(t)=200e^{kt}$ and $e^k=5/4$. After 2 years, which account has more money? Show the amount in each account and explain why one model is linear and the other is exponential.

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	\$240 earns 5% simple interest. Write an equation for the amount A after t years. Is the relationship linear or exponential?	A=240+12t; linear
2	\$180 earns 4% simple interest for 2 years. Find the final amount.	\$194.40
3	\$200 is compounded annually at 10%. Write an equation for the amount A after t years. Is the relationship linear or exponential?	A=200(1.10)^t; exponential
4	\$160 is compounded annually at 25% for 2 years. Find the final amount.	\$250
5	\$80 earns interest compounded continuously at 50%. Write an equation for the amount A after t years. Is the relationship linear or exponential?	A=80e^(0.50t); exponential
6	Two accounts each start with \$400 and earn 10% for 2 years. One uses simple interest and one is compounded annually. Find both final amounts. Which account has more money?	Simple interest: \$480; compound interest: \$484; the compounded account has more money.

PART 2 • APPLY IT

- \$396; yes, Jordan will have \$6 more than the laptop cost; linear growth** Find simple interest with $I = Prt = 300(0.08)(4) = 96$, then add it to the principal. Simple interest adds the same \$24 each year, so the model is linear.
- \$360; yes, exactly enough; exponential growth** Use $A = 250(1.20)^2 = 360$. Each year the balance is multiplied by 1.20, so the model is exponential.

CHALLENGE

Account S: $S(t) = 200 + 50t$, so $S(2) = \$300$. Account C: $C(2) = 200(e^k)^2 = 200(5/4)^2 = \312.50 . Account C has \$12.50 more. Account S is linear because it adds \$50 each year. Account C is exponential because it is multiplied by 5/4 each year.

Accept equivalent simple-interest equations, such as $A = 240(1 + 0.05t)$, and money written with or without a trailing zero. For continuous compounding, accept equivalent exact forms that use $e^{(rt)}$ or the given yearly multiplier.