

Compound Interest

Key

Compound Interest: $A = P\left(1 + \frac{r}{n}\right)^{nt}$

$A = P(1+r)^t$

- A = Final amount of money (at the end)
- P = Principle - the initial (beginning) amount of money
- r = rate or interest rate (the annual rate as a decimal)
- t = the number of years
- n = the number of times the interest is compounded per year

May use when n = 1
(compounded annually)

- Annually → once per year (1)
- Semiannually → twice per year (2)
- Quarterly → four times per year (4)
- Monthly → twelve times per year (12)
- Daily → 365 times per year

Solve the story problems assuming no deposits or withdrawals.

1. Heather received \$100.00 for her thirteenth birthday. If she saves it in a bank with 5% interest compounded quarterly, how much money will she have in the bank by her 16th birthday?

$$100\left(1 + \frac{.05}{4}\right)^{(4)(3)} = \$116.08$$

2. Roland earned \$1500 last summer. If he deposited the money in a certificate of deposit that earns 12.5% interest compounded monthly, how much money will he have next summer?

$$1500\left(1 + \frac{.125}{12}\right)^{12(1)} = \$1698.62$$

3. The DREAM Company has a savings plan for their employees. If an employee makes an initial contribution of \$2500 and the company pays 7.5% interest compounded quarterly, how much money will the employee have after 10 years?

$$2500\left(1 + \frac{.075}{4}\right)^{4(10)} = \$5255.87$$

4. Juan invests \$7500 at 12% interest for one year. How much money would he have if the interest was compounded...

a) yearly?

$$7500(1 + .12)^1 = \$8400$$

b) daily?

$$7500\left(1 + \frac{.12}{365}\right)^{365(1)} = \$8456.06$$

5. Carmen is saving for a car, which will cost \$20,000. If she puts \$7,000 in an account, which earns 10% interest compounded monthly, how long will it take for her to save enough money to buy the car? (Hint: graph and use $y_2 = 20,000$)

$$7000\left(1 + \frac{.10}{12}\right)^{12t} = 20000$$

$$t = 10.54 \text{ yrs}$$

6. Which kind of account would take longer to double? 1) \$500 at 8% compounded monthly 2) \$10,000 at 8% compounded monthly, or 3) \$2000 at 6% compounded daily

$$t = 8.69 \text{ yrs}$$

$$2000\left(1 + \frac{.06}{365}\right)^{365t}$$

$$t = 11.55 \text{ yrs}$$

$$500\left(1 + \frac{.08}{12}\right)^{12t}$$

$$t = 8.69 \text{ yrs}$$

to double

7. Shane bought stock in a company which is losing 6% of its value every month. If the stock was originally worth \$500 per share, how much would it be worth after:

a) 6 months

$$500(.94)^6 = \$244.93$$

b) 9 months

$$500(.94)^9 = \$286.50$$

c) 1 year

$$500(.94)^{12} = \$237.96$$