

Announcement

- The **fourth Hour Exam:**
April 25, Friday in class.

Please show up in time. There will be no make-up exam.

- The exam will contain 16 problems, all of which are multiple choice questions. Please bring your pencils and ID to the exam.

April 21, 2008

Help Session

Leader: Brenda Sanders.

Meeting time:

Wednesday 4:00-6:00PM (April 23)

Location: Lawson 221.

8% bonus points will be given to those students who regularly attend this help sessions.

Office Hours: Wednesday: 1:00 p.m. to 3:00 p.m.

**Friday: 10 a.m. to 12 p.m.
at Woody Hall A310.**

Investments at Simple Interests (Linear Growth)

$$A = P + n(Pr)$$

- A → accumulated (total) principal
P → beginning principal
r → rate of interest (written as a decimal)
n → number of years of investment

Review Question

9. You have \$3500 that you invest at 7% simple interest. How long will it take for your balance to reach \$4235?

- A) Two years
B) Three years
C) Four years
D) Five years

$$\begin{aligned} A &= P + n(P \times r) \\ &= 3500 + n(3500 \times 7\%) \end{aligned}$$

Compound Interest (Exponential Growth)

If an original population (P) grows exponentially with effective Rate r, at the end of n compounding periods the population will be

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

- A → accumulated population (or principal)
P → beginning population (or principal, the initial balance)
r → rate of interest (written as a decimal) per compounding period
n → number of compounding periods of investment

Example: Certificate of Deposit

Suppose that you will need \$15,000 to pay for a year of college for your child 18 years in the future, and you can buy a certificate of deposit whose interest rate of 10% compounded quarterly is guaranteed for the period. How much do you need to deposit?

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

Solution:

In this case $A = \$15,000$, $r = 0.10/4 = 0.025$, and $n = 72$

$$\$15000 = P(1 + 0.025)^{72} \rightarrow \$15000 = 5.91723 P$$

$$P = \$15000 / 5.91723 = \$2534.94$$

Answer: you need to make an initial deposit \$2534.94.

Review Question

12. Suppose you invest in an account that pays 5% interest, compounded quarterly. You would like your investment to grow to \$5000 in 16 years. How much would you have to invest in order for this to happen?

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

$$5000 = P \times \left(1 + \frac{5\%}{4}\right)^{16 \times 4}$$

- A) \$2258
- B) \$2374
- C) \$3125
- D) \$4153

Terminology for Interest Rates

A **nominal rate** is any stated rate of interest for a specified length of time, such as a 3% annual interest rate on a saving account or a 1.5% monthly rate on a credit card balance. By itself, such a rate *does not indicate or take into account whether or how often interest is compounded.*

The effective rate is the actual percentage rate of increase for a length of time, *taking into account compounding.*

When stated per year, the effective rate is called the **effective annual rate (EAR)**. For saving, it is also called the **annual percentage yield (APY)** or *annual equivalent yield.*

Effective Rate Per Period

$$\text{Effective rate per } n \text{ period} = \frac{P(1+r)^n - P}{P}$$

$$= (1+r)^n - 1$$

- A → accumulated population (or principal)
- P → beginning population (or principal, the initial balance)
- r → rate of interest (written as a decimal) per compounding period
- n → number of compounding periods of investment

Review Question

2. What is the APY for 5.3% compounded quarterly?

A) 5.3% $APY = (1+r)^n - 1$

B) 5.4% $APY = (1 + 0.053/4)^4 - 1 = 0.0541 = 5.41\%$

- C) 5.5%
- D) 5.6%

Savings Formula:

$$A = d \left[\frac{(1+r)^n - 1}{r} \right]$$

Example: An individual saves \$100 per month, deposited directly into her credit union account on payday, the last day of the month. The account earns 6% per year, **compounded monthly**. How much will she have at the end of 5 years, assuming that the credit union continues to pay the same interest rate?

$$A = d \left[\frac{(1+r)^n - 1}{r} \right]$$

where d is a uniform deposit per period (deposited at the end of the period). r is the interest rate per period. A is the accumulated amount.

Solution: In this case $d = \$100$, the monthly interest rate is $0.06/12$.

Answer: $A = \$100 \left[\frac{(1 + \frac{0.06}{12})^{60} - 1}{\frac{0.06}{12}} \right] = \6977.00

Review Question

5. Tara has \$85 deducted from her paycheck at the end of each month and put into a savings account earning 9% interest compounded monthly. She continues these deposits for ten years. How much is the account worth at the end of the ten years?

A) \$208

B) \$2496

C) \$16,450

D) \$21,150

$$A = d \left[\frac{(1+r)^n - 1}{r} \right]$$

$$= 85 \times \left[\frac{\left(1 + \frac{9\%}{12}\right)^{10 \times 12} - 1}{\frac{9\%}{12}} \right]$$