



*Future Value*

# Math 1030 #9b

*Total Return*

## Savings Plans and Investments

*Investments*

## Total and Annual Return

*Annual Return*

Total Return -- the relative change in the investment value over a period of time.

$$\begin{aligned} \text{total return} &= \frac{\text{new value} - \text{starting principal}}{\text{starting principal}} \\ &= \frac{A - P}{P} \quad (\text{percentage, NOT a dollar value}) \\ &= \frac{A}{P} - \frac{P}{P} = \frac{A}{P} - 1 \end{aligned}$$

Annual Return -- the average annual rate at which your money grew  
(APY) over a period of time.

$$\text{annual return} = \left( \frac{A}{P} \right)^{(1/Y)} - 1 \quad (\text{also a percentage})$$

EX 1: Three years after buying 20 shares of XYZ stock for \$25 per share, you sell the stock for \$8500. Find the total and annual return on this investment.

$$P = 25(20) = \$500 \quad A = \$8500$$

$$\begin{aligned} \text{total return: } \frac{8500 - 500}{500} &= \frac{8000}{500} = \frac{80}{5} = 16 \\ &= 1600\% \end{aligned}$$

$$\begin{aligned} \text{annual return: } \left( \frac{8500}{500} \right)^{1/3} - 1 &= 17^{1/3} - 1 \approx 1.57128 \\ &\approx 157.128\% \end{aligned}$$

## Types of Investments

- 1) Stocks - gives you a share of ownership in a company. The only way to get money from a stock is to sell.
- 2) Bonds - a promise of future cash. The issuer pays simple interest and promises to pay the principal by some later date.
- 3) Cash - money deposited in bank accounts, CDs and U.S. Treasury Bills

## Things to consider when investing

- 1) Liquidity - How easy is it to get to your money?
- 2) Risk - Is the principal invested at risk?
- 3) Return - How much return (total or annual) do you expect to earn?

EX 2: Which investment in 1900 would have been worth more at the end of 2008?

- a) \$10 in stocks
- b) \$75 in bonds
- c) \$500 in cash

Historical Returns  
1900-2008

Category	Average Annual Return
Stocks	6.0%
Bonds	2.1%
Cash	1.0%

which formula to use?

Compound interest formula,  
compounding annually

$$A = P(1 + APR)^Y$$

(a)  $P = 10, APR = 6\%, Y = 108$

$$A = 10(1 + 0.06)^{108}$$

$$A \approx \$5,407.96$$

(b)  $P = 75, APR = 2.1\%, Y = 108$

$$A = 75(1 + 0.021)^{108}$$

$$A \approx \$707.69$$

(c)  $P = 500, APR = 1\%, Y = 108$

$$A = 500(1 + 0.01)^{108}$$

$$A \approx \$1,464.46$$