Simple interest (3.1)

T-Bills: you pay a little less than $1,000 now. When the T-Bill matures (maturity between 1 month & 1 year), you get $1,000 (the face value).

T-note: you pay about $1,000 (probably a little more) now. Every 6 months you receive a small "coupon." When the T-note matures, you get $1,000.
T-note maturities are between 1 & 10 years.

T-bond: like a T-note but has 20 or 30 year maturity time.

Simple interest formula:

$$A = P(1 + rt)$$

- A: face value
- P: amount you pay now
- r: annual interest rate
- t: time to maturity in years

Today, for T-bills, $r \approx \underbrace{0.25\%}_{0.0025}$

$t = 1/12 \longleftrightarrow$ matures in 1 month

$t = 1 \longleftrightarrow$ matures in 1 year

T-bills always have $A = \$1{,}000$.

If $r = 0.25\%$ and $t = \frac{1}{2}$ (6 months).

What is P?

$$1000 = P \underbrace{(1 + (0.0025)(\tfrac{1}{2}))}_{\underbrace{1 + 0.00125}_{1.00125}}$$

$$\frac{1000}{1.00125} = P = \$998.75$$

Interest earned $= \$1.25$

What if $t = \frac{1}{2}$ and $r = 7\%$?

$$1000 = P \underbrace{(1 + (0.07)(1/2))}_{1.035}$$

$\frac{1000}{1.035} = P = 966.18$

Interest earned = $33.82

This is 3.5% of P, not 3.5% of A.

If $t = \frac{1}{4}$ (3 months) and $A = 1000$ and $P = 999.00$, what is r?

$A = P(1 + rt)$

$1000 = 999(1 + r(1/4))$

$\frac{1000}{999} = 1 + \frac{r}{4}$

$\frac{1000}{999} - 1 = \frac{r}{4}$

$4\left(\frac{1000}{999} - 1\right) = r = 0.004004$

$= 0.4004\%$

Homework #1

If you pay P for T-Bill that matures in m months, where P & m are in the table below, what is interest rate r (to the nearest 0.01%)?

P	m	r
990	6	
950	12	
999	1	
998	3	

#2 How much does it cost to buy a T-bill with 1-month maturity and 0.3% (annual) interest?