$I = Prt$ $A = P(1+rt)$ $A = P\left(1+\frac{r}{n}\right)^{nt}$ $A = P\frac{\left(1+\frac{r}{n}\right)^{nt}-1}{\frac{r}{n}}$ $P = PMT\frac{1-\left(1+\frac{r}{n}\right)^{-nt}}{\frac{r}{n}}$ $Y = \left(1+\frac{r}{n}\right)^{n}-1$

1. (6pts) 13 is 32 percent of which number?

$A = P \cdot B$ $13 = 0.32 \cdot B$

$B = \frac{13}{0.32} = 40,625$

2. (8pts) How much should be deposited now in an account bearing 4.18% interest, compounded quarterly, in order to have \$2000 in five years?

$A = P\left(1+\frac{r}{n}\right)^{nt}$ $P = \frac{2000}{1.23..} = 1624.55$

$2000 = P\left(1+\frac{0.0418}{4}\right)^{4 \cdot 5}$

$2000 = P \cdot 1.2311..$

3. (10pts) A pair of sneakers with original price \$99 is on sale with an 18% reduction in price. A shopper bought the discounted pair in Kentucky, where sales tax is 6%. What is the total amount she paid for the sneakers?

$99 \cdot 0.18 = 17.82$ amount of discount

$99 - 17.82 = 81.18$ discounted price

$81.18 \cdot 0.06 = 4.87$ tax

Price with tax $= 81.18 + 4.87 = 86.05$

OR

Price with tax $=$

$99 \cdot 0.82 \cdot 1.06 =$

18% reduction is 82% of price

6% tax added is $1.06 \cdot$ price,

4. (8pts) You took out a loan of \$500 with simple interest rate 10% and repaid it with \$562.50. How long did you have the loan?

$562.50 = 500\left(1 + 0.10 t\right)$ $| \div 500$ I had the loan 1.25 years

$1.125 = 1 + 0.1t$ $| -1$

$0.125 = 0.1t$ $| \div 0.1$

$t = 1.25$

5. (14pts) Single mom Fiona, who has two children, files income taxes using the "head of household" filing status. She earned $54,000 in wages, $690 in interest, and deposited $7,000 into a retirement account; she paid $6,200 in mortgage interest, $1,400 in property taxes, $3,100 in state income taxes and donated $300 to charity.
a) Find Fiona's gross income and adjusted gross income.
b) Use the table below to first determine Fiona's taxable income (don't forget the exemptions) and then find the tax on this income.

| Tax rate	Head of Household
10%	up to $13250
15%	$13,250 to $50,400
25%	$50,400 to $130,150
28%	$130,150 to $210,800
33%	$210,801 to $413,350
35%	$413,351 to $441,000
39.6%	above $441,000
Standard Deduction	$9300
Exemptions (per person)	$4050

a) Gross income: $54000 + 690 = 54,690$

Adj. gross income: $54690 - 7000 = 47,690$

b) Itemized deductions total.
$6200 + 1400 + 3,100 + 300 = 11,000$
    greater than stand. ded of 9300

taxable income $= 47,690 - (11,000 + 3 \cdot 4050)$
$= 47,690 - 23150 = 24,540$

$\overset{10\%}{\underset{}{|}} \quad 13250 \quad 15\% \quad 50,400$
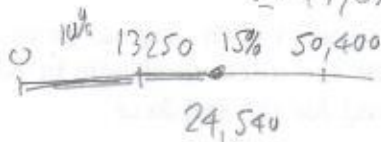
$24,540$

$Tax = 0.10 \cdot 13250 + 0.15(24,540 - 13,250) = 1325.00 + 1693.50 = 3018.50$

$\underset{11,290}{}$

6. (14pts) Angelo would like to save for a $14,000 motorcycle.
a) How much should he deposit every week into an account with 4.75% interest, compounded weekly, in order to have $14,000 in five years?
b) How much of the final amount is from deposits and how much from interest?

a) $14,000 = P \dfrac{\left(1 + \dfrac{0.0475}{52}\right)^{52.5} - 1}{\dfrac{0.0475}{52}}$

$14,000 = P \cdot 293.32...$

$P = \dfrac{14,000}{293.32} = 47.73 \left(\text{weekly deposit}\right)$

b) Total deposit $= 47.73 \cdot 52.5$
$= 12,409.80$

Interest $= 14000 - 12,409.80$
$= 1590.20$

8. (8pts) Bologna Bank is offering a 2.34% interest rate on an account that is compounded daily, while Salami Savings has an account with interest rate 2.32%, compounded quarterly. Which account is the better deal?

$$Y = \left(1 + \frac{r}{n}\right)^{nt} - 1$$

$$Y_1 = \left(1 + \frac{0.0234}{365}\right)^{365} - 1 = 1.023675 \leftarrow \text{bigger, so Bologna Bank is better deal}$$

$$Y_2 = \left(1 + \frac{0.0232}{4}\right)^{4} - 1 = 1.023403$$

Bonus. (10pts) Darius invested $5000 in a mutual fund. Six years later, this investment had value $13,500. Assuming annual compounding, at what annual rate did this investment grow?

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

$$13,500 = 5000\left(1 + \frac{r}{1}\right)^{1 \cdot 6}$$

$$13,500 = 5000 (1+r)^{6} \qquad | \div 5000$$

$$2.7 = (1+r)^{6} \qquad \Big|^{\frac{1}{6}}$$

$$2.7^{\frac{1}{6}} = \left((1+r)^{6}\right)^{1/6}$$

$$1.1800- = 1+r \qquad \text{About 18\% annually}$$

$$0.18\ldots = r$$

7. (32pts) True story: physician assistant Hayley Arceneaux spent three days in orbit on a SpaceX spacecraft. Made-up part: to house all the memorabilia connected to this flight, she decided to build an addition to her house costing $104,000, financing it with a 15-year loan at interest rate 2.34%, compounded monthly.

a) What is her montly payment on the loan?

b) What are her total payments over the course of the loan? How much of this amount is for interest?

c) How much of her first payment goes toward interest, and how much towards the principal?

d) What is the balance on the loan after 9 years?

a)

$$P = PMT \frac{1 - \left(1 + \frac{r}{n}\right)^{-nt}}{\frac{r}{n}}$$

$$104,000 = PMT \cdot \frac{1 - \left(1 + \frac{0.0234}{12}\right)^{-12 \cdot 15}}{\frac{0.0234}{12}}$$

$$104,000 = PMT \cdot 151.67..$$

$$PMT = \frac{104,000}{151.67..} = 685.65 \quad \text{monthly payment}$$

b.) $685.65 \cdot 12 \cdot 15 = 123,417$ $\underset{\text{payment}}{\text{total}}$

$123,417 - 104,000 = 19,417$ is interest

c) $104,000 \cdot \frac{0.0234}{12} = 202.80$ $\underset{\text{interest}}{\text{toward}}$

$685.85 - 202.80 = 483.05$ $\underset{\text{interest}}{\text{toward}}$

d) Loan balance = present value of remaining payments (6 years)

$$P = 685.65 \cdot \frac{1 - \left(1 + \frac{0.0234}{12}\right)^{-12 \cdot 6}}{\frac{0.0234}{12}} = 685.65 \cdot 67.11.. = 46,016.13$$

$\uparrow$

Balance after 9 years