

1. (5) Which option will give you more money after ten years? (Option A) A fixed investment of \$10,000 which earns interest of 10% annually for 10 years. (Option B) A savings plan of \$130 per month at 12 percent interest for 10 years.

Options A =  $10(1.1)^{10} = \$25,937$ . Option B =  $\$29,905$ . B is better by  $\$3,968$ .

2. (5) By what percent is the higher option better than the lower option?

$$\frac{3968}{25937} = 15.3\%$$

3. (10) How many years will it take your money to triple at 9% per year?

$$\frac{\log 3}{\log(1.09)} = \frac{.477}{.0373} = 12.7 \text{ years}$$

4. (10) Mark and Joan want to save for their daughter's college education, which they estimate to be \$80,000 in 15 years. How much do they have to save monthly if the interest rate is 7%?

$$s = \$252.40$$

5. (10) If they know that they are going to receive an \$8,000 gift in six years, which they can add to the college fund, how much less will they have to save per month? Assume the \$8000 will be invested differently and will only receive 6% compounded annually.

FV(8000 @ 6% for 9 years) =  $8000(1.06)^9 = \$13,515$   
 Amount needed to save with gift =  $\$80,000 - 13,515 = 66,484$   
 New savings amount = 209.75  
 Difference =  $\$252.40 - 209.75 = 42.65$

6. (10) Compute the add-on interest rate for a loan of \$20,000 for 5 years with a monthly payment of \$450.

$$\left( \frac{27,000}{20,000} - 1 \right) / 5 = 7\%$$

7. (5) Estimate the APR for the previous loan within 1%. For your first guess, try two times the add-on rate you computed in problem 6.

Iteratively test rates against the monthly payment to arrive at 12%

8. (5) From 1980 to 2004, a mutual fund increased from \$10,000 to \$100,000. What was the annual rate of return assuming annual compounding.

$$r = 10^{\frac{1}{24}} - 1 = 10\%$$

9. (20) What will be your monthly house payment (PITI) including principal, interest, taxes, and insurance if you're buying a house for \$380,000 and making a 15% down payment? You are getting 30 year mortgage at 5.8%. In Fairfax County, the annual real estate taxes are \$1.16 per \$100 of value. Assume annual insurance premiums are \$2.50 per \$1000 of value. You can express your answer to the nearest dollar?

$$\begin{aligned} \text{PI} &= 1895 \\ \text{T} &= 367 \\ \text{I} &= 79 \\ \text{PITI} &= 2341 \end{aligned}$$

10. (10) If you want to keep your mortgage payment of \$1200 to a maximum of 35% of your monthly take home income (after taxes), how much do you have to earn annually. Assume 20% of your salary is withheld for taxes.

$$\begin{aligned} .35(1-.20) I &= 1200 \times 12 \\ I &= \$51,428 \end{aligned}$$

11. (10) How much money do you need to invest at 7% to generate a \$200,000 annual income stream for 30 years? This is a good estimate of how much money you will need for a comfortable retirement 30 years from now!

$$\text{Annuity formula} \rightarrow \$2.48 \text{ million}$$

Bonus (5) If your mid semester grade is 65 and 40% of the semester points have been assigned, what do you need to average for the remainder of the semester to get an overall average of 80?

$$.4 \times 65 + .6 x = 80, x = 90$$

Bonus (5) The average of 6 numbers is 8.5. When one of the numbers is discarded, the average of the remaining numbers becomes 7.2. What is the discarded number?

$$6 \times 8.5 - 5 \times 7.2 = 15$$

Bonus (5) Given the slope of line is 2 and a point on the line is (0,-3), (2 pts) what is the x-intercept and (3 pts) what is the x-intercept form of the equation ( $y = m(x-a)$ )?

$$\text{x-intercept} = (3/2, 0) \text{ and x-intercept equation is } y = 2(x - 3/2)$$

Bonus (5) In how many arrangements can a teacher seat 3 girls and 3 boys in a row of six seats if the boys are to have the first, third, and fifth seats?

$$3! \times 3! = 36$$