

**Personal Finance
Final Exam (Solutions)**

Name: _____

Section I. Multiple Choice Questions

*Please circle the correct answer for each of the following questions. Note that there is **only one correct** answer for each question. Please also note that **some questions ask for true answers** and some refer **to false answers**. Each question is worth 2 points.*

1. John is looking to buy a motorcycle, and has the following three financing options: (a) pay \$1,100 today, (b) pay \$100 a month for twelve months, or (c) pay \$1,200 in one year. Given no other information, which of the following statements *must* be **true**?

- A) Option (a) is necessarily the best because it involves the least total payment.
- B) Option (b) is necessarily the best because it allows John to pay in convenient installments.
- C) Option (c) is necessarily better than option (a) because, although it is a larger amount, it allows John to push the payments further into the future.
- D) Option (c) is necessarily better than option (b) because, although they both require the same total payment, payments are due earlier under option (b).

Answer: D

2. Which of the following statements is **true** about the balance of a single deposit in an interest earning savings account? (Only one is true.)

- A) If the balance doubles after 15 years, it will more than triple after 30 years because of compound interest.
- B) The balance will grow exponentially, but only if the interest rate increases so that the dollar amount of interest earned increases.
- C) The balance will grow exponentially, but only if the interest rate is high enough.
- D) The balance will not grow exponentially because multiple deposits are required to achieve exponential growth.

Answer: A

3. Which of the following is **true** of the amortization of an installment loan with fixed monthly payments?

- A) The principal portion of the monthly payment decreases over time.
- B) The principal portion of the monthly payment increases over time.
- C) The interest portion of the monthly payment increases over time.
- D) The monthly payment increases over time.

Answer: B

4. Which of the following is **true** about mortgages?

- A) Because adjustable-rate mortgages generally offer a lower APR, they are always better than fixed-rate mortgages, except when mortgage rates are at historic lows.
- B) If a 15-year and 30-year mortgage have the same APR, the total interest paid on the 15-year mortgage will be equal to the interest paid during the first 15 years of the 30-year mortgage, but less than the total interest paid on the 30-year mortgage.
- C) Homeowners should never refinance their mortgage because closing costs are expensive.
- D) The longer a mortgage borrower intends to keep a home, the more likely it becomes that he or she will benefit from taking points.

Answer: D

5. Which of the following is **false** about bonds?

- A) If the yield-to-maturity on a bond is greater than the bond's coupon rate, the bond will sell at a premium.
- B) If a bond is selling at a discount, and the interest rate investors use to price the bond falls, the price of the bond will increase.
- C) A Treasury bill will always trade at a discount.
- D) The yield-to-maturity on a bond will be equal to the bond's coupon rate only if the bond is purchased at par.

Answer: A

6. Which of the following statements is **false** of the effects inflation?

- A) Over a long period of time, inflation decreases the purchasing power of a dollar.
- B) If inflation unexpectedly increases, borrowers suffer because their debt payments will increase in real terms.
- C) Inflation may not decrease *real* income over the long-term if wages adjust for inflation.
- D) For a given nominal return, higher inflation implies a lower real return.

Answer: B

7. Which of the following statements is **true** of risk diversification?

- A) An investor may reduce the standard deviation of the returns on his or her portfolio by buying several shares of the same company's stock.
- B) Risk diversification is desirable because it reduces the chance of an extreme loss without reducing the chance of an extreme gain.
- C) An investor may completely eliminate financial risk in a U.S. stock portfolio by diversifying across a sufficient number of stocks.
- D) Risk may be diversified even if two assets are positively correlated (i.e. have a correlation coefficient of greater than zero).

Answer: D

8. Which of the following statements about risk is **false**?

- A) Corporations below investment grade have a higher risk of defaulting on their debt obligations than investment grade corporations. An investor that buys the bond of such a company may not receive the contractual payments promised by the bond in the event of such a default. This is an example of default risk.
- B) If the cost of living increases faster than expected, a retiree may be unable to purchase as much as he or she planned during retirement. This is an example of inflation risk.
- C) A retiree may die before using all of his or her retirement funds. This is an example of longevity risk.
- D) Because stock prices fluctuate often, an investor may be forced to sell his or her stock at a price lower than that at which it was purchased. This is an example of financial risk.

Answer: C

9. Assume you are in the 25% tax bracket and you contribute \$1,000 of your pre-tax income to your employer's traditional 401(k) plan. Your take-home pay will then:

- A) Decline by \$1,000.
- B) Decline by \$750.
- C) Decline by \$250.
- D) Remain the same.

Answer: B

10. Which of the following is **true** about taxes?

- A) If the short-term capital gains tax rate was equal to the long-term capital gains tax rate, there would be no tax benefit from holding stocks over long periods of time.
- B) If a tax payer is in the 25% marginal tax bracket, all of his or her taxable income is taxed at a rate of 25%.
- C) The mortgage interest deduction makes mortgage financing less expensive than it otherwise would be.
- D) If a tax payer has any itemizable deductions, he or she should always forego the standard deduction and itemize his or her deductions.

Answer: C

Section II. Short Answer Questions

Please write your answers to the following questions in the spaces provided. Please show your work and reasoning if you wish to receive partial credit. Each question is worth 3 points.

11. At the beginning of each year for three years, Anna makes a \$150 contribution into a savings account earning a 2% interest rate. At the end of the third year, what is the balance in Anna's account?

Ending balance: \$468.24

$$F = \$150(1.02^3 + 1.02^2 + 1.02) = \$468.24$$

12. Donny has a \$5,000 balance on his credit card with an APR of 15%. If he makes monthly payments of \$200, how long will it take him to pay off his credit card?

Number of months: 31

The monthly interest rate is $15\%/12 = 1.25\%$

<u>Time Value of Money</u>	
PV	\$5,000
FV	\$0
i	1.25%
PMT	-\$200
n=	31

13. Alfonso and his fiancé, Regina, are shopping around for a mortgage on the \$360,000 house of their dreams. One bank offers them a 30-year mortgage with a 6% APR and 20% down payment. Calculate the monthly payment on this mortgage.

Monthly payment: \$1,726.71

After the down payment, the couple must borrow $\$360,000 \times 0.80 = \$288,000$. The monthly interest rate will be $6\%/12 = 0.5\%$. The monthly payments will be:

<u>Time Value of Money</u>	
PV	\$288,000
FV	\$0
i	0.5%
n	31
PMT=	-1,726.71

14. Big Corporation Inc. paid a dividend of \$20 per share last year. Value the company's stock using discount rate of 12% and assuming dividend growth of 2% per year.

Price per share: \$204

$$P_0 = \frac{D_0(1 + g)}{r - g} = \frac{\$20(1.02)}{0.12 - 0.02} = \$204$$

15. Anita is saving for her son's college education. She expects to earn an average return of 7% on her investment account and will need \$100,000 in 12 years. She plans to meet this goal by setting aside the same amount at the *beginning* of each year for the next 12 years (starting today). What amount must she set aside each year to meet her goal?

Annual contribution: \$5,224.48

<u>Time Value of Money</u>	
Mode	BEG
PV	\$0
FV	\$100,000
i	7%
n	12
PMT=	-\$5,224.48

16. The Jackson's spend \$220 per week on groceries. If inflation is 3% per year, how much should they expect to pay per week on groceries ten years from today?

Weekly grocery bill in ten years: \$295.66

$$P_T = P_0(1 + i)^T = \$220(1.03)^{10} = \$295.66$$

17. An investor uses a discount rate of 5% to value riskless investments. He is considering making a \$15,000 equity investment in a new coffee shop in his neighborhood. Depending on the success of the coffee shop, the investor will either receive \$5,000 or \$50,000, each with a 50% probability, in five years. The investor requires a risk premium of 15% on such a risky investment. Calculate the net present value (NPV) of this investment.

NPV: -\$3,948

The expected value of the investment in five years is $0.5 * \$5,000 + 0.5 * \$50,000 = \$27,500$.

The discount rate is $15\% + 5\% = 20\%$.

The NPV is:

$$NPV = -\$15,000 + \frac{\$27,500}{1.20^5} = -\$3,948$$

18. During 2012, Jason earned \$80,000 in income. He is subject to the following marginal tax rates:

Income	Marginal Tax Rate
from \$0 to \$8,700	10%
over \$8,700 to \$35,350	15%
over \$35,350 to \$85,650	25%
over \$85,650 to \$178,650	28%
over \$178,650 to \$388,350	33%
over \$388,350	35%

Jason qualifies for a \$3,800 personal exemption and may elect to take a \$5,950 standard deduction. In 2012, he had \$7,000 worth of itemizable deductions. How much must Jason pay in taxes for 2012?

Taxes: \$13,330

Because his itemizable deductions are large than the standard deduction, Jason will itemize. His taxable income is:

$$\$80,000 - \$3,800 - \$7,000 = \$69,200$$

And his taxes are therefore:

$$\begin{aligned} Taxes &= 0.10 * \$8,700 + 0.15 * (\$35,350 - \$8,700) + 0.25 * (\$69,200 - \$35,350) \\ &= \$13,330 \end{aligned}$$

19. Amy invests \$4,000 in a blue-chip stock. She holds on to her stock for 30 years before selling it, and so is subject to a deferred long-term capital gains tax of 15%. If the stock returned an average of 12% per year over the 30 years, what is Amy's after-tax return?

After-tax return: 11.42%

The final value of the investment, after taxes, will be:

$$F = P[(1 + r)^N(1 - T) + T] = \$4,000[(1.12)^{30}(1 - 0.15) + 0.15] = \$102,463.74$$

The after tax return is therefore:

$$r_{After-tax} = \left(\frac{F}{P}\right)^{\frac{1}{N}} - 1 = \left(\frac{\$102,463.74}{\$4,000}\right)^{\frac{1}{30}} - 1 = 11.42\%$$

20. Brian makes a \$12,000 investment using \$6,000 of his own savings and borrowing the remaining \$6,000 at a 7% interest rate. If the investment return 14%, what is the return on Brian's \$6,000 investment?

Return: 21%

Brian invests \$12,000 worth of assets with \$6,000 worth of debt and \$6,000 worth of equity. His leverage ratio, L , is therefore $\$12,000/\$6,000 = 2$.

His return on his \$6,000 of equity is:

$$R = Lr - \frac{D}{E}(r - i) = 2 * 14\% - \frac{\$6,000}{\$6,000}(14\% - 7\%) = 21\%$$

Section III. Long Answer Questions

Please write your answers to the following questions in the spaces provided. Please show your work if you wish to receive partial credit. Each question is worth 5 points.

21. John is considering getting an MBA. He currently makes \$40,000 per year and estimates that this would increase to \$65,000 per year if he had an MBA. An MBA will take two years of schooling and cost John \$70,000 per year. If John doesn't pursue an MBA he will continue to earn \$40,000 a year for the next 40 years. If he does pursue an MBA, he will earn nothing for the two years while he is in school and must pay tuition of \$70,000 a year for those two years, but will earn \$65,000 per year for the following 38 years.

For the following questions, assume all cash flows occur at the end of each year.

(a) Using a discount rate of 7%, calculate the net present value (NPV) of pursuing an MBA.

NPV: \$89,210

Because John must forego \$40,000 of income and pay \$70,000 per year for the first two years, his incremental cash flows are -\$110,000. In the remaining 38 years, John will make \$25,000 more per year. The NPV can be found to be:

<u>Cash Flow Analysis</u>	
CF₀	\$0
CF_j	-\$110,000
n_j	2
CF_j	\$25,000
n_j	38
i	7%
NPV=	\$89,210

(b) Calculate the IRR of pursuing an MBA.

IRR: 10.56%

<u>Cash Flow Analysis</u>	
CF₀	\$0
CF_j	-\$110,000
n_j	2
CF_j	\$25,000
n_j	38
IRR=	10.56%

(c) Assuming John requires a return of 7% on such an investment in education, should John pursue an MBA based on calculations above?

Yes/No (circle one)

22. Bobby wants to buy a new sofa set, but does not have enough cash to buy one outright. A local rent-to-own store gives Bobby the option to purchase the sofa set with 91 weekly installments of \$21.99 per week (due at the end of the week). If Bobby were to buy the sofa set from the rent-to-own store outright, it would cost \$1,000.

(a) Given the cash price of \$1,000, calculate the implicit APR on the rent-to-own option.

APR: 90.6%

<i>Time Value of Money</i>	
PV	\$1,000
FV	\$0
PMT	-\$21.99
n	91
i=	1.74%

The APR is therefore $52 \times 1.74\% = 90.6\%$.

(b) A competing furniture store offers the same sofa set for \$700. Given this price, calculate the implicit APR on 91 weekly payments of \$21.99.

APR: 151.4%

<i>Time Value of Money</i>	
PV	\$700
FV	\$0
PMT	-\$21.99
n	91
i=	2.91%

The APR is therefore $52 \times 2.91\% = 151.4\%$.

(c) Because the APR on his credit card is 24%, Bobby avoids making purchases with the card. Would it be better for Bobby to rent-to-own or borrow using his credit card to purchase the sofa set?

It would be better for Bobby to rent-to-own / **borrow using his credit card** (circle one).

23. Fifteen years ago, the O'Brian family took out a \$200,000 30-year mortgage at a 4.8% APR. They are now considering refinancing with a new 15-year mortgage at a 3.6% APR. They do not plan to sell the house before their mortgage is paid off. Closing costs for refinancing the home are \$5,000.

(a) What is the current outstanding balance on the O'Brian family's mortgage?

Balance: \$134,458

<u>Time Value of Money</u>	
PV	\$200,000
FV	\$0
i	0.40%
n	360
PMT=	-\$1,049.33
n	180
FV=	-\$134,458

(b) Calculate the NPV of refinancing using a monthly discount rate of 0.4% (4.8% APR).

NPV: \$5,443.17

The original payment at a 4.8% APR is \$1,049.33. The payment with a 3.6% APR would be:

<u>Time Value of Money</u>	
PV	\$134,458
FV	\$0
i	0.30%
n	180
PMT=	\$967.83

The monthly savings would therefore be \$1,049.33 - \$967.83 = \$81.50. The present value of such savings is \$10,443.17:

<u>Time Value of Money</u>	
PMT	\$81.50
FV	\$0
i	0.40%
n	180
PV=	-\$10,443.17

After \$5,000 in closing costs, the NPV is \$5,443.17.

(c) Should the family refinance? **Yes**/No (circle one)

24. Because they understand the importance of sound financial planning, Alice and Jack, two newlyweds, set aside time to plan for retirement. Both are currently 25 years old and plan to retire in 40 years at age 65. They then hope to live off \$60,000 (in today's dollars) per year in retirement and expect their retirement to last 30 years. Because of wedding expenses, they currently have no savings. They estimate that they can earn an average *real* return of 6% on their investments while saving for retirement, and 3% per year after they shift their investments into less risky assets upon retiring.

For the following questions, assume all cash flows occur at the end of the year. Assume zero inflation for questions (a) and (b).

(a) How much must Alice and Jack set aside each year to meet their goals?

Annual contribution: \$7,598.94

To withdraw \$60,000 per year for 30 years, they must accumulate \$1,176,026.48:

<u>Time Value of Money</u>	
PMT	\$60,000
FV	\$0
n	30
i	3%
PV= -\$1,176,026.48	

To do so, they must set aside \$7,598.94 per year for the next 40 years:

<u>Time Value of Money</u>	
PV	\$0
FV	\$1,176,026.48
n	40
i	6%
PMT=	-\$7,598.94

(b) If Alice and Jack make the annual contributions found in part (a) and realize their assumed return of 6%, how much will they have in their retirement account at retirement?

Balance at retirement: \$1,176,026.48 (from above)

(c) If inflation is non-zero, the *real* annual contributions are equal to those found in part (a) above, but the *nominal* contribution will change. If inflation is 2% per year, how much must Alice and Jack set aside at the end of their tenth year of saving?

Contribution in tenth year: \$9,263.07

$$P_T = P_0(1 + i)^T = \$7,598.94(1.02)^{10} = \$9,263.07$$