FIN 301 – Final Exam – Practice Exam Solutions

1. **C** – Fixed rate par value bond

   A bond is "sold at par" when the coupon rate is equal to the market rate.

2. **C** – As beta decreases, CAPM will decrease as well

   We can see in the equation below that if beta decreases, the required return on the investment will decrease as well. A lower beta represents a lower level of risk. Since there is a direct relationship between risk and return, as risk decreases, the required return on an investment will decrease as well.

   $E(R_i) = (R_f) + (B_i)[E(R_m) – (R_f)]$

3. **E** – Increasing working capital as a percent of sales

   A is incorrect – Lowering beta means that the firm is exposed to less risk. When all else is held equal, reducing risk will increase the intrinsic value of the firm.

   B is incorrect – If the company pays less in taxes, it will have more money going towards net income. All else held equal, increasing net income will increase the intrinsic value of the firm.

   C is incorrect – All else held equal, increasing revenue growth will increase the value of the firm.

   D is incorrect – Lowering the risk-free rate will reduce the company's cost of capital. All else held equal, reducing the cost of capital will increase the intrinsic value of the firm.

   E is correct – All else held equal, using more working capital relative to sales will not increase the value of the firm. Remember, working capital is the difference between a company's current assets and current liabilities.

4. **D** – Spread to treasuries

   Spread to treasuries = Yield on corporate bond – Yield on Treasury with same maturity. Spread to treasuries is a measure of a corporate bond's default risk.

5. **C** – The 10-year bond will have a value $114.45 lower than the 30-year bond

   We will need to find the value of the 30-year and 10-year bonds. Then, we will take the difference to get our answer.

   Before doing any calculations, we know the value of both bonds will increase because the market rate is decreasing. Bond values and market interest rates always move in opposite directions. We also know the value of the 30-year bond will increase more than the value of the 10-year bond because longer maturity bonds are more sensitive to changes in the market interest rate. Therefore, we can actually eliminate answer choices B, D, and E right away.

   <u>30-Year Bond</u>

n	i	PV	PMT	FV
60	4.5	Solve	60	1,000

   PV = $1,309.57

   Since the bond makes coupon payments semiannually, we need to multiply the number of years by 2 to find the number of semiannual periods. This is why n is 60 in this problem (30 years x 2 = 60 semiannual periods).

   We also need to adjust i to a semiannual interest rate by dividing the bond's expected yield by 2. This is why i was input as 4.5 (9% / 2 = 4.5%).

   Annual coupon payment = Maturity value x Coupon rate = $1,000 x 0.12 = $120
   Semiannual coupon payment = $120 / 2 = $60

   Make sure to note that when solving for the coupon payment, we used the coupon rate of 12% instead of the bond yield of 9%. Once we found that the annual coupon payment is $120, we found the semiannual coupon payment by dividing the annual coupon payment by 2. The coupon rate multiplied by the maturity value of the bond will always give you the annual coupon payment, even when the bond makes semiannual coupon payments.

The PV of the bond was a negative number because the PMT and FV inputs were entered as positive numbers. If PMT and FV were entered as negative numbers, the PV of the bond would have been a positive number. It is important that PMT and FV always have the same sign in these problems because they both represent cash flows *received* by the bondholder. You can think of the PV of the bond as the price the bondholder *paid* to purchase the bond.

10-Year Bond

n	i	PV	PMT	FV
20	4.5	Solve	60	1,000

PV = $1,195.12

All of the inputs for this calculation were the same as above except for n. Now, n is 20 because this bond has 10 years to maturity and makes semi-annual interest payment (10 years x 2 = 20 semi-annual periods)

Difference in value = Value of 30-year bond – Value of 10-year bond
Difference = $1,309.57 – $1,195.12 = $114.45

6. **A** – 12.4%

This problem provides us with more information than we need to solve the problem. All we need to do is use the CAPM equation to find the expected return. Therefore, you can totally ignore "years to maturity" and "alpha." Both are given as extra information to try to confuse us. We use the treasury bill rate as the input for R_f and the average S&P 500 return as the input for $E(R_m)$.

$E(R_i) = (R_f) + (B_i)[E(R_m) – (R_f)]$
$E(R_i) = 4\% + (1.2)(11\% – 4\%)$
$E(R_i) = 12.4\%$

Note that we would have had to do an extra step if the problem asked for observed return instead of expected return. The observed return is what we actually earned on the investment. Since we are given the alpha value, we could find observed return; however, we don't need to do that for this problem. Make sure you pay attention to the difference between expected return (what is expected based on CAPM) and observed return (what we actually earned).

Alpha = Observed return – Expected return

7. **A** – A measure of the difference between the observed return and the expected return for an asset

8. **C** – Positive $8

   A put option gives you the option to sell a share of stock at the strike price. The intrinsic value of a put option is the difference between the strike price and the current price. We know the intrinsic value will be positive because the strike price is above the current market price, so we can eliminate A and B right away.

   Intrinsic value (put option) = Strike price – Current price
   Intrinsic value (put option) = $44 – $36 = $8

   We did not need to use the $12 market price of the option to calculate the intrinsic price of the option. However, the problem could have asked us to find the time value of the option. The time value of an option is the market price of the option minus the intrinsic value of the option. We did not have to worry about the time value of the option because we were only asked to find the option's intrinsic value. Make sure to read option problems carefully to determine if you are asked for the intrinsic value or time value of the option.

9. **E** – Credit rating B

   Spread to treasuries is a measure of the default risk of a bond. Lower credit rating bonds have more default risk. Bonds with higher default risk have a higher spread to treasuries. Credit rating B is the lowest credit rating out of the bonds given.

10. **C** – Prepayment risk

    Prepayment risk is the risk that the bond is called early. Non-callable bonds cannot be called at any point, so they have no prepayment risk. Callable bonds pay higher interest rates than comparable non-callable bonds because of the prepayment risk that callable bonds have that non-callable bonds do not.

11. **E** – A company's market value is its assets and future cash flows discounted for timing and risk.

12. **B** – Decrease

    If inflation increases, the market interest rate should increase as well, since investors will require higher bond yields to offset inflation. When the market rate (yield) increases, bond values decrease. Remember that market interest rates and bond prices will always move in opposite directions.

13. **E** – Both A and B

14. **A** – The callable bond will typically have a higher yield than a comparable non-callable bond

    Callable bonds, which have prepayment risk, are riskier for investors than comparable non-callable bonds. Thus, investors will require a higher rate of return on a callable bond than a non-callable bond if all else is held equal. Call options increase risk for investors and decrease risk for issuers.

15. **C** – Floating-rate corporate bond

    Floating-rating bonds are the only type of bond where the issuer retains the interest rate risk. A floating-rate bond means that the bond's coupon rate fluctuates with the market rate. We don't deal with floating-rate bonds much in this class because all of calculation problems are for fixed rate bonds. However, it is fair game for floating-rate bonds to come up on qualitative problems like this one.

16. **C** – $46.42

    Value to common equity = Corporate value – Long-term debt – Short-term liabilities – Preferred stock
    Value to common equity = $40 million – $5 million – $180,000
    Value to common equity = $34,820,000

    Intrinsic price per share = Value to common equity / Number of shares outstanding
    Intrinsic price per share = $34,820,000 / 750,000
    Intrinsic price per share = $46.42

17. **A** – Stock L – Correlation = 0.0

    The stock with the correlation closest 0 will provide the most risk reduction. The least risk reduction will come from the stock with an absolute value for correlation closest to 1. In this case, Stock O would give the least risk reduction.

18. **C** – $673

n	i	PV	PMT	FV
20	2	Solve	0	1,000

    PV = –$673

    N is 20 because we have a 10-year semiannual bond. (10 years x 2 = 20 semiannual periods).

    We also need to adjust i to a semiannual interest rate by dividing the bond's expected yield by 2. This is why i was input as 2 (4% / 2 = 2%).

    Annual coupon payment = 0 since this is a zero-coupon bond.

    FV = $1,000 since the bond has a face value of 1,000.

19. **C** – Buy the stock because the stock is currently undervalued

    If the investor truly believed that Apple's intrinsic value is $115, they should buy at $93 today and wait until the stock's prices increases to its intrinsic value of $115.

20. **B** – Sell the stock if the investor owns it because the stock is overvalued

    If the investor truly believes that Google's intrinsic value is $622, they should sell the stock at $697 if they already own it. If they don't sell, they should expect the price to eventually decrease to the intrinsic value of $622.

21. **D** – 9.375%

Total market value of debit and equity = Market value of debt + Market value of equity
Total market value of debit and equity = $3 million + $7 million = $10 million

Weight of debt = Market value of debt / Total market value of debt and equity
Weight of debt = $3 million / $10 million = 0.30

Weight of equity = Market value of equity / Total market value of debt and equity
Weight of equity = $7 million / $10 million = 0.70

WACC = (Weight of debt)(Cost of debt)(1 – Tax rate) + (Weight of equity)(Cost of equity)
WACC = (0.30)(5%)(1 – 0.35) + (0.70)(12%) = 9.375%

22. **C** – 0.5

In both years 1 and 2, the company's stock return is half the market return. A beta of 0.5 means that a stock is expected to have a return equal to 50% of the market return.

23. **B** – Negative 1.0

In year 1, the company's stock return is –3%, while the market return is 3%. In year 2, the company's stock return is 5%, while the market return is –5%. If a company has a beta of 1, the company is expected to earn the market return. If a company has a beta of –1, the company's return is expected to move in the opposite direction of the market by the same amount as the market return.

24. **A** – If a company's tax rate increases but the yield to maturity of its non-callable bonds remains the same, then, all other factors held constant, the firm's WACC should decrease.

    A – This statement is accurate – Since interest payments on debt are tax deductible, we multiply the before tax cost of debt by one minus the tax rate when calculating WACC. Therefore, a higher tax rate will result in a lower after-tax cost of debt and a lower overall WACC.

    B – This statement is not accurate – The cost of debt financing is almost always lower than the cost of equity financing. There is a direct relationship between risk and return. Since equity is riskier than debt, equity financing is more expensive than debt financing.

    C – This statement is not accurate – Reinvesting the firm's earnings into the company through retained earnings still has a cost of capital. Capital investments coming from retained earnings are equity investments in the company. Since equity has more risk than debt, the cost of raising capital from retained earnings is typically higher than the cost of debt.

25. **D** – Bonds don't have any default risk

    This statement is false. Make sure to note that all of the other statements about bonds are true.

26. **A** – A par bond

27. **A** – The yield must be less than the coupon rate

28. **B –** The maturity risk premium is zero

    Pure expectations theory says that the expected return on purchasing five consecutive one-year bonds will be equal to the expected return on one five-year bond. This means that according to pure expectations theory investors do not earn a greater yield from purchasing long-term bonds than they do from purchasing many consecutive short-term bonds. Thus, if pure expectations theory holds true, the maturity risk premium will be zero. Note that we do not think that pure expectations hypothesis holds true in real life; however, this problem tells us to assume that pure expectations theory holds.

29. **A** – Floating-rate bonds

    The issuer takes on the interest rate risk when selling floating-rate bonds. The bondholder takes on the interest rate risk when purchasing fixed-rate bonds.

30. **B** – Invest in the project if the net present value is positive.

31. **E** – All of the above

32. **E** – $2,100,000

    Value of a perpetuity = Annual cash flow / Discounting rate
    Value of a perpetuity = $52,500 / 0.025 = $2,100,000

    This answer tells us that if the interest rate is 2.5%, receiving $52,500 every year forever has the same value as receiving $2,100,000 today.

33. **B** – NPV is calculated using only net cash flow.

34. **E** – $102,442

In this problem, there is no cash flow in year 0. In many problems, you will be making an initial investment in a project in year 0, and then you will receive cash inflows from the project in future years. However, this problem simply wants you to find the present value of the cash flows in years 1–3 based on a 10% interest rate. Thus, the cash flow in year 0 is $0 for this problem.

Make sure to remember that when entering cash flows into the cash flow register, you enter the amount of the cash flow first, and then you press the CF_j button on your calculator. You always enter the amount of the cash flow **before** pressing the CF_j button.

CF 0 = 0
CF 1 = 35,000
CF 2 = 40,000
CF 3 = 50,000
i = 10

NPV = 102,442

This answer tells us that the present value of receiving $35,000 1 year from now, $40,000 2 years from now, and $50,000 3 years from now based on a 10% interest rate is $102,442. You could also say that if the interest rate is 10%, you would be indifferent between receiving $102,442 today or the cash flows in years 1–3 over the next 3 years.

You could have found this answer by finding the PV of each of the cash flows in years 1–3 and then adding them together. In fact, this is exactly what your calculator is doing for you. Here is what the math your calculator is doing for you when you use your cash flow register looks like:

PV of CF 1 = $35,000 / $(1 + 0.10)^1$ = $31,818
PV of CF 2 = $40,000 / $(1 + 0.10)^2$ = $33,058
PV of CF 3 = $50,000 / $(1 +0 .10)^3$ = $37,566

NPV = $31,818 + $33,058 + $37,566 = $102,442

As you can see, it wasn't too difficult to find the answer to this problem without using the cash flow register. However, when you start dealing with problems with more and more cash flows, the cash flow register will save you a lot of time and effort.

35. **B** – It decreases

Interest rates and bond values move in opposite directions.

36. **A** – $796.15

n	i	PV	PMT	FV
20	4	Solve	25	1,000

PV = –$796.15

Since the bond makes coupon payments semiannually, we need to multiply the number of years by 2 to find the number of semiannual periods. This is why n is 20 in this problem (10 years x 2 = 20 semiannual periods).

We also need to adjust i to a semiannual interest rate by dividing the bond's expected yield by 2. This is why i was input as 4 (8% / 2 = 4%).

Annual coupon payment = Maturity value x Coupon rate = $1,000 x 0.05 = $50
Semiannual coupon payment = $50 / 2 = $25

Make sure to note that when solving for the coupon payment, we used the coupon rate of 5% instead of the bond yield of 8%. Once we found that the annual coupon payment is $50, we found the semiannual coupon payment by dividing the annual coupon payment by 2. The coupon rate multiplied by the maturity value of the bond will always give you the annual coupon payment, even when the bond makes semiannual coupon payments.

The PV of the bond was a negative number because the PMT and FV inputs were entered as positive numbers. If PMT and FV were entered as negative numbers, the PV of the bond would have been a positive number. It is important that PMT and FV always have the same sign in these problems because they both represent cash flows *received* by the bondholder. You can think of the PV of the bond as the price the bondholder *paid* to purchase the bond.

37. **C** – Systematic risk can be diversified away through holding many different types of holdings.

This statement is false. Investors cannot diversify away systematic risk.

38. **E** – All of the above

39. **A** – Company ABC – Standard deviation = 40%

The company with the highest standard deviation is the most risky.

40. **A** – $243,652

In this problem, you are going to have a cash outflow in year 0 because the company is making an initial investment of $400,000 at the start of the project. Make sure that you always enter cash outflows as negative numbers and cash inflows as positive numbers.

Make sure to remember that when entering cash flows into the cash flow register, you enter the amount of the cash flow first, and then you press the CF_j button on your calculator. You always enter the amount of the cash flow **before** pressing the CF_j button.

CF 0 = –400,000
CF 1 = 65,000
CF 2 = 125,000
CF 3 = 600,000
i = 8

NPV = 243,652

If a project has an NPV of $0, the project is earning a rate of return exactly equal to the required rate of return. Since this project has a positive NPV, it means that this project is earning a rate of return greater than the project's required rate of return of 8%.

41. **A** – The discount rate that makes the NPV equal to zero.

42. **A** – Pure expectations hypothesis

43. **D** – Market segmentation hypothesis

44. **C** – 2.3%

Real rate of interest = Nominal rate of interest – Inflation rate
Real rate of interest = 3.5% – 1.2% = 2.3%

45. **C** – $1,126

n	i	PV	PMT	FV
40	2.5	Solve	30	1,000

PV = –$1,126

n - Since the bond makes coupon payments semiannually, we need to multiply the number of years by 2 to find the number of semiannual periods. This is why n is 40 in this problem (20 years x 2 = 40 semiannual periods).

i - We also need to adjust i to a semiannual interest rate by dividing the bond's expected yield by 2. This is why i was input as 2.5 (5% / 2 = 2.5%).

pmt - Annual coupon payment = Maturity value x Coupon rate = $1,000 x 0.06 = $60
Semiannual coupon payment = $60 / 2 = $30

Make sure to note that when solving for the coupon payment, we used the coupon rate of 6% instead of the bond yield of 5%. Once we found that the annual coupon payment is $60, we found the semiannual coupon payment by dividing the annual coupon payment by 2. The coupon rate multiplied by the maturity value of the bond will always give you the annual coupon payment, even when the bond makes semiannual coupon payments.

The PV of the bond was a negative number because the PMT and FV inputs were entered as positive numbers. If PMT and FV were entered as negative numbers, the PV of the bond would have been a positive number. It is important that PMT and FV always have the same sign in these problems because they both represent cash flows *received* by the bondholder. You can think of the PV of the bond as the price the bondholder *paid* to purchase the bond.

46. **A** – Fundamental

47. **A** – Analyzing charts to find a stock's volume of trading activity

48. **B** – Unsystematic

Unsystematic risk is the firm-specific risk.

49. **C** – 13.68%

Weight of debt = 0.45
Cost of debt = 6%
Tax rate = 0.35
Weight of equity = 0.55
WACC = 9.28%

WACC = (Weight of debt)(Cost of debt)(1 – Tax rate) + (Weight of equity)(Cost of equity)
9.28% = (0.45)(6%)(1 – 0.35) + (0.55)(Cost of equity)
Cost of equity = 13.68%

This problem asks us to find the firm's cost of equity. Since we now know how to find a firm's cost of equity with CAPM, it might be a little bit confusing that we used WACC here to find the cost of equity. We had to use WACC here because of the information that we were given in the problem. To use CAPM to find the cost of equity, we need a risk-free rate, expected return on the market, and Beta. Since we weren't given this information but were given all of the other inputs to the WACC formula besides for cost of equity, that's why we used WACC here to solve instead of CAPM.

50. **C** – Invest in the project if the net present value is greater than a predetermined rate of return.

51. **C** – 8.70%

n	i	PV	PMT	FV
60	Solve	–925	40	1,000

i = 4.35

Yield on the bond = 4.35% x 2 = 8.70%

The n input for this problem is 60 because the bond is a 30-year bond that makes semiannual interest payments, so the bond has 60 semiannual periods (30 x 2 = 60).

Annual coupon payment = Maturity value x Coupon rate = $1,000 x 0.08 = $80
Semiannual coupon payment = $80 / 2 = $40

You were told the PV and FV of the bond in the problem. However, you need to make sure that you enter all of the inputs with the correct signs. PMT and FV need to have the same sign, and PV needs to have the opposite sign.

52. **C** – 18.79%

The first step to solving this problem is to enter the cash flows in years 0–3 into your cash flow register. Make sure that you input the initial investment of $10,000 as a negative number because it is a cash outflow. Then, you will enter each of the cash flows in years 1–3 as positive numbers because they are cash inflows.

CF 0 = –10,000
CF 1 = 2,000
CF 2 = 5,000
CF 3 = 8,000

IRR = 18.79%

Note that you do not need to input an interest rate when solving for IRR. This answer tells us that the expected return for this project is 18.79%. We would accept this project as long as 18.79% is greater than the required rate of return for the project.

53. **A** – U.S. Treasury notes

54. **D** – One year from now, Bond A's price will be higher than it is today.

We know that both of the bonds will have a value of exactly $1,000 at maturity. We can tell A is a discount bond because its coupon rate is lower than the yield for the bond. We can tell B is a premium bond because its coupon rate is higher than the yield for the bond. The price of bond A will increase over time until it reaches a value of $1,000 at maturity. The price of bond B will decrease over time until it reaches a value of $1,000 at maturity.

55. **D** – 5.39%

Information Given
Risk free rate = 2%
Expected return on the market = 9%
Beta = 0.8
Tax rate = 0.35
Weight of debt = 0.4
Weight of equity = 0.6

Solve for the cost of debt
N = 20
PV = –1,240
PMT = 30
FV = 1,000

I = 1.59

Cost of debt = 1.59% x 2 = 3.18%

Solve for the cost of equity
$E(R_i) = (R_f) + (B_i)[E(R_m) – (R_f)]$
E(R) = 2% + (0.8)(9% – 2%)
E(R) = 7.6%

Solve for WACC
WACC = (Weight of debt)(Cost of debt)(1 – Tax rate) + (Weight of equity)(Cost of equity)
WACC = (0.4)(3.18%)(1 – 0.35) + (0.6)(7.6%)
WACC = 5.39%

56. **C** – 8%

To solve this problem, you will need to use the CAPM equation. You can use the Treasury bill rate as the risk-free rate and the return on the S&P 500 as the expected return on the market.

$E(R_i) = (R_f) + (B_i)[E(R_m) – (R_f)]$
$E(R_i) = 2\% + (1.5)(6\% – 2\%)$
$E(R_i) = 8\%$

57. **C** – 20.73%

The first step to solving this problem is to enter the cash flows in years 0–3 into your cash flow register. Make sure that you input the initial investment of $700,000 as a negative number because it is a cash outflow. Then, you will enter each of the cash flows in years 1–3 as positive numbers because they are cash inflows.

CF 0 = –700,000
CF 1 = 350,000
CF 2 = 225,000
CF 3 = 450,000

IRR = 20.73%

Note that you do not need to input an interest rate when solving for IRR. This answer tells us that the expected return for this project is 20.73%. We would accept this project as long as 20.73% is greater than the required rate of return for the project.

58. **B** – Gross cash flows are used to calculate the payback period.

One of the disadvantages of payback period is that gross cash flows are used. Since gross cash flows are used in the payback period calculation, there is no discounting of cash flows and payback period does not take the time value of money into account.

59. **A** – Call

60. **B** – When interest rates decrease

This is when the issuer of a bond is most likely to call its bonds because the issuer can call the bonds and then reissue them at the lower interest rate.

61. **C** – Zero-coupon bonds

Reinvestment risk is the risk related to the fact that investors do not know the future interest rate at which they will be able to reinvest the bonds' coupon payments. Since zero-coupon bonds do not make coupon payments, they do not have reinvestment risk.

62. **B** – $1,352,297

In this problem, you are going to have a cash outflow in year 0 because the company is making an initial investment of $1.3 million at the start of the project. Make sure that you always enter cash outflows as negative numbers and cash inflows as positive numbers.

Make sure to remember that when entering cash flows into the cash flow register, you enter the amount of the cash flow first, and then you press the CF_j button on your calculator. You always enter the amount of the cash flow **before** pressing the CF_j button.

CF 0 = –1,300,000
CF 1 = 800,000
CF 2 = 1,100,000
CF 3 = 900,000
CF 4 = 420,000
i = 9

NPV = 1,352,297

If a project has an NPV of $0, the project is earning rate of return exactly equal to the required rate of return. Since this project has a positive NPV, this project is earning a rate of return greater than the project's required rate of return of 9%.

63. **E** – Prepayment risk

This is the risk that a bond will be called by the issuer. Only callable bonds have prepayment risk.

64. **B** – 5.0

Since the project is expected to generate $100,000 for all 6 years of the project, you can use the equation to solve for payback period.

Payback period = $500,000 / $100,000 = 5 years

The company will recover its initial investment of $500,000 in the project after 5 years. Note that you didn't need to use the discount rate of 4% to solve this problem.

65. **E** – $875

n	i	PV	PMT	FV
10	3.5	Solve	20	1,000

PV = –$875

Since the bond makes coupon payments semiannually, we need to multiply the number of years by 2 to find the number of semiannual periods. This is why n is 10 in this problem (5 years x 2 = 10 semiannual periods).

We also need to adjust i to a semiannual interest rate by dividing the bond's expected yield by 2. This is why i was input as 3.5 (7% / 2 = 3.5%).

Annual coupon payment = Maturity value x Coupon rate = $1,000 x 0.04 = $40
Semiannual coupon payment = $40 / 2 = $20

Make sure to note that when solving for the coupon payment, we used the coupon rate of 4% instead of the bond yield of 7%. Once we found that the annual coupon payment is $40, we found the semiannual coupon payment by dividing the annual coupon payment by 2. The coupon rate multiplied by the maturity value of the bond will always give you the annual coupon payment, even when the bond makes semiannual coupon payments.

The PV of the bond was a negative number because the PMT and FV inputs were entered as positive numbers. If PMT and FV were entered as negative numbers, the PV of the bond would have been a positive number. It is important that PMT and FV always have the same sign in these problems because they both represent cash flows *received* by the bondholder. You can think of the PV of the bond as the price the bondholder *paid* to purchase the bond.

66. **B** – 3.25 years

Our company will need to bring $100,000 in cash flows to recover the cost of its initial investment in the project. In the first 3 years of the project, we receive $90,000 ($20,000 + $40,000 + $30,000 = $90,000) in cash flows, so we will need to collect $10,000 in year 4 to achieve our full payback period.

The project is expected to bring in $40,000 in year 4, so we will not need to wait until the end of year 4 because we only need to collect $10,000 ($10,000/$40,000 = 0.25). This means we will reach our payback period in 3.25 years.

67. **D** – The longer the maturity of a bond, the more sensitive the bond will be to changes in the discount rate (i.e., the investors' required rate of return). If interest rates go up, all other factors the same, a bond with a longer time to maturity will have a larger capital loss than an equivalent bond with a shorter time to maturity.

    A is incorrect – Market interest rates (yields) and bond prices move in opposite directions. If interest rates increase, we should expect bond prices to go down.

    B is incorrect – We calculate both the yield to call and the yield to maturity when valuing callable bonds. The YTC does not always exceed the YTM.

    C is incorrect – The 30-year bond would have a longer duration.

    D is correct – Long-term bonds are more sensitive to changes in interest rates. When interest rates increase, bond values go down. Thus, a long-term bond will have a larger capital loss than an equivalent short-term bond when interest rates increase if all other factors are held the same.

    E is incorrect – We generally do see the expected rate of return equal to the required rate of return on bonds.

68. **A** – A 10-year zero coupon bond.

    This is because the bond with the longest maturity and lowest coupon rate (longest duration) will have the largest percentage change in value when interest rates change.

69. **B** – It is used to show the projects that will produce the best return given the amount that must be invested initially.

70. **E** – Both bonds have the same value.

    The only difference between these two bonds is that bond 2 is a callable bond. If you assume that these bonds were issued at par, you know that interest rates have increased since the bond's yield is greater than its coupon rate. The issuer of bond 2 would call bond 2 only if interest rates decreased. Since bond 2 will not be called and the only difference between the bonds is bond 2's call option, you would value the bonds the same way. This means that both bonds will have the same value.

71. **A** – Stocks A and B: Correlation = 1.0.

    Highly correlated stocks give the least amount of risk reduction. A correlation of 1 means that stocks A and B are perfectly correlated.

72. **B** – Project 2, project 1, project 3, project 4.

    You want to invest in the projects with the highest profitability index first.

73. **C** – 3.9%

    Spread to Treasuries is the difference between the yield on a corporate bond and the yield on a comparable maturity U.S. Treasury bond. The difference between the 10-year corporate bond and the 10-year Treasury bond is 3.9% (6.5% – 2.6% = 3.9%).

74. **E** – Both A and B

75. **E** – Municipal bonds

76. **E** – 8.3%

    Taxable equivalent yield = r / (1 – Tax rate)
    Taxable equivalent yield = 5% / (1 – 0.40) = 8.3%

    This answer means that this investor is earning the same return on this municipal bond as he would on a corporate bond with a yield of 8.3% because of the tax savings associated with municipal bonds. This is why investors in high tax brackets are willing to accept lower returns on municipal bonds in exchange for the tax exemption associated with municipal bonds.

77. B – Project 2, then project 1

    You want to invest in the projects with the highest profitability index first.

    Profitability index = NPV / Project cost

    Project 1 = $500,000 / $350,000 = 1.43
    Project 2 = $425,000 / $170,000 = 2.50
    Project 3 = $400,000 / $300,000 = 1.33

78. **A** – $1,135

Since we have a callable bond and market interest rates (6%) < coupon rate (8%), we know that the company will probably be interested in calling the bond once they can. In a very large majority of cases, if the market interest rate < bond's coupon rate, the bond will be called. However, there are some rare circumstances where the bond might not be called even if market interest rates have fallen below coupon rates, so we always want to calculate the "price to call" and the "price to maturity" before we pick an answer choice just to make sure that the bond will definitely be called.

Price to call

n	i	PV	PMT	FV
12	3	Solve	40	1,050

PV = –$1,135

If the bond were called, n is 12 since the bond can be called after 6 years (6 x 2 = 12). The fact that this bond is a 25-year bond does not matter if the bond is called after 6 years.

In this problem, i is 3% because the current market interest rate is 6% and the bond makes semiannual coupon payments (6% / 2 = 3%).

Annual coupon payment = Maturity value x Coupon rate = $1,000 x 0.08 = $80
Semiannual coupon payment = $80 / 2 = $40

FV is $1,050 because the bond pays a call premium of 5% over face value ($1,000 x 1.05 = $1,050). If the problem had said that the bond had a 105% premium, it would have meant the same thing as saying the bond pays a call premium of 5% over face value.

Price to maturity

n	i	PV	PMT	FV
30	3	Solve	40	1,000

PV = -$1,196

Now that we've found the price to call, we just need to double-check to make sure that the bond will definitely be called.

Here, n is 30 since we are calculating the bond's price to maturity. The FV is 1,000 since we will not incur the call premium if the bond is not called.

Since the bond's price to call < price to maturity, we can confirm that the bond will be called. Therefore, the bond's value is $1,135.

79. **D** – 10.2%

To solve this problem, you will need to use the CAPM equation. You can use the Treasury bill rate as the risk-free rate and the return on the S&P 500 as the expected return on the market.

$E(R_i) = (R_f) + (B_i)[E(R_m) – (R_f)]$
$E(R_i) = 3\% + (0.9)(11\% – 3\%)$
$E(R_i) = 10.2\%$

80. **C** – 4.58%

First, we need to solve for the yield on the bond (using our financial calculators) to find the before tax cost of debt.

n	i	PV	PMT	FV
40	Solve	-890.11	30	1,0000

I = 3.52

Cost of debt = 3.52 x 2 = 7.04%

Tax rate = 0.35

After tax cost of debt = 7.04% (1 – 0.35) = 4.58%

Note that this could also be a step in WACC problem where you use this method to find the cost of debt to plug into the WACC equation.

81. **B** – Stock A outperformed stock B.

Both stock A and stock B had a return of 20%; however, stock B has a higher beta than stock A. Since stock B's beta is greater than stock A's beta, stock B is risker than stock A, so stock B should have had a higher average return that stock A. Stock A outperformed stock B because stock A is lower risk than stock B and stock A was still able to earn the same average return as stock B.

82. **C** – Negative 7.9%

    The most common mistake that people make on these problems is to compare the S&P 500 return, which represents the return on the market, to the portfolio's actual return. You need to compare the portfolio's actual return to the expected return on the portfolio. You are given the portfolio's actual return, and you can use the CAPM equation to solve for the expected return on the portfolio.

    $E(R_{portfolio}) = (R_f) + (B_{portfolio})[E(R_m) – (R_f)]$
    $E(R_{portfolio}) = 1.5\% + (1.8)(7\% – 1.5\%)$
    $E(R_{portfolio}) = 11.4\%$

    Alpha = Observed return – Expected return
    Alpha = 3.5% − 11.4%
    Alpha = −7.9%

83. **A** – Immediately and accurately

84. **E** – Both A and C

85. **D** – Alpha measures the difference between a portfolio's expected return and its actual return.

86. **C** – Default risk

87. **D** – The long-term interest rate will equal to an average of the current spot rate and the spot rate investors expect to observe in the future.

    Pure expectations theory says that the expected return on purchasing five consecutive one-year bonds will be equal to the expected return on a five-year bond. This means that according to pure expectations theory investors do not earn a greater yield from purchasing long-term bonds than they do from purchasing many consecutive short-term bonds.

88. **D –** The expected alpha of the mutual fund for the next 5 years will be zero when using gross returns and negative when using net returns.

89. **E –** All of the above

90. **B** – $2,000,000

Value of a perpetuity = Annual cash flow / Discounting rate
Value of a perpetuity = $75,000 / 0.0375 = $2,000,000

This answer tells us that if the interest rate is 3.75%, receiving $75,000 every year forever has the same value as receiving $2,000,000 today.

91. **A –** The higher the coupon rate, the lower the duration of a bond.

A bond's coupon rate and duration have an inverse relationship.

92. **C –** Liquidity preference hypothesis

93. **D –** 1,381

Since the original bond is issued at par, we know the yield on the original bond will be equal to the annual coupon rate of 9%. We also know the yield on the new bond will be 9% because we are told the bonds have the same yield.

<u>New Issue Bond</u>

n	i	PV	PMT	FV
40	4.5	Solve	30	1,0000

PV = –$723.98

This tells us we will get $723.98 for each bond we issue. We want to raise a total of $1,000,000 so we divide $1,000,000 by $723.98 to find the number of bonds we will need to issue.

Number of bonds = $1,000,000 / $723.98
Number of bonds = 1,381

94. **B –** All other things held equal (including component costs), a higher tax rate will lower a firm's WACC only if the firm uses debt financing.

We can see from the WACC equation that if the company's tax rate increases, WACC will decrease.

WACC = (Weight of debt)(Cost of debt)(1 – Tax rate) + (Weight of equity)(Cost of equity)

However, if the firm uses no debt in its capital structure, the weight of debt will be 0%. We can see from the equation that changing the tax rate when the weight of debt is 0%, will not have an impact on WACC.

If a project is higher risk than the company's average project, a discount rate greater than the WACC should be used to value the project. If a project is lower risk than the company's average project, a discount lower than the WACC should be used to value the project.

95. **C** – $1,221

Since we have a callable bond and market interest rates (3%) < coupon rate (6%), we know that the company will probably be interested in calling the bond once they can. In a very large majority of cases, if the market interest rate < bond's coupon rate, the bond will be called. However, there are some rare circumstances where the bond might not be called even if market interest rates have fallen below coupon rates, so we always want to calculate the "price to call" and the "price to maturity" before we pick an answer choice just to make sure that the bond will definitely be called.

Price to call

n	i	PV	PMT	FV
14	1.5	Solve	30	1,040

PV = –$1,221

If the bond were called, n is 14 since the bond can be called after 7 years (7 x 2 = 14). The fact that this bond is a 20-year bond does not matter if the bond is called after 7 years.

In this problem, i is 1.5% because the current market interest rate is 3% and the bond makes semiannual coupon payments (3% / 2 = 1.5%).

Annual coupon payment = Maturity value x Coupon rate = $1,000 x 0.06 = $60
Semiannual coupon payment = $60 / 2 = $30

FV is $1,040 because the bond pays a call premium of 4% over face value ($1,000 x 1.04 = $1,040). If the problem had said that the bond had a 104% premium, it would have meant the same thing as saying the bond pays a call premium of 4% over face value.

Price to maturity

n	i	PV	PMT	FV
40	1.5	Solve	30	1,000

PV = -$1,448.74

Now that we've found the price to call, we just need to double-check to make sure that the bond will definitely be called.

Here, n is 40 since we are calculating the bond's price to maturity. The FV is 1,000 since we will not incur the call premium if the bond is not called.

Since the bond's price to call < price to maturity, we can confirm that the bond will be called. Therefore, the bond's value is $1,221

96. **E** – Both A and B

97. **E –** 2.46%

n	i	PV	PMT	FV
50	Solve	–1,100	15	1,000

i = 1.23

Yield on the bond = 1.23% x 2 = 2.46%

The n input for this problem is 50 because the bond is a 25-year bond that makes semiannual interest payments, so the bond has 50 semiannual periods (25 x 2 = 50).

Annual coupon payment = Maturity value x Coupon rate = $1,000 x 0.03 = $30
Semiannual coupon payment = $30 / 2 = $15

You were told the PV and FV of the bond in the problem. However, you need to make sure that you enter all of the inputs with the correct signs. PMT and FV need to have the same sign, and PV needs to have the opposite sign.

98. **C –** Strong form

99. **C –** $772.76

The first thing we need to do is find the yield to maturity for the first bond. Then we can use that yield to solve for the value of the second bond.

<u>First Bond</u>

n	i	PV	PMT	FV
40	Solve	-925.50	100	1,000

I = 10.82%

YTM = 10.82% x 2 = 21.64%

<u>Second bond</u>

n	i	PV	PMT	FV
20	10.82	Solve	80	1,000

PV = -$772.76

100. **A –** Weak form

101. **C –** $1,586.11

Interest expense year 1 = $137,000 x 0.065 = $8,905.00
Principal reduction year 1 = $10,491.11 – $8,905.00 = $1,586.11

The most common mistake people make on a problem like this is to multiply the interest rate by the amount of the annual payment instead of the principal balance.

These answers tell us that at the end of year 1, Nick has paid the bank $8,905.00 in interest and has reduced his principal (the amount he owes the bank) by $1,586.11.

Let's take a look to see what Nick will pay in interest and principal next year. Keep in mind that he is going to pay $10,491.11 every year for the life of the loan, but each year the amount of his interest expense will decrease and the amount of principal reduction will increase because the amount of his principal gets smaller and smaller each year.

Principal balance at the end of year 1 = $137,000 – $1,586.11 = $135,413.89
Interest expense year 2 = $135,413.89 x 0.065 = $8,801.90
Principal reduction year 2 = $10,491.11 – $8,801.90 = $1,689.21

Since Nick owed the bank less money at the start of year 2, his interest expense was lower at the start of year 2. His annual payment is always $10,491.11 for all 30 years of the loan, so in year 2, Nick is able to reduce his principal by $1,689.21, which is $103.10 ($1,689.21 – $1,586.11 = $103.10) more than in year 1. Each year the amount of Nick's interest expense will decrease so the amount of his principal reduction will increase because his annual payments stay the same.

You didn't need to do the calculations for year 2 to solve the problem, but understanding how loans work will be helpful in answering conceptual questions on the exam. If you did these calculations for all 30 years, you would find that Nick would owe exactly $0 at the end of 30 years.

102. **B –** $16,905

The first step in solving this problem is to determine the amount of the annual payments for the loan using your financial calculator.

n	i	PV	PMT	FV
5	6.75	–80,000	Solve	0

PMT = $19,381

This tells you that you will need to make annual payments of $19,381 for 5 years to pay off this $80,000 loan based on a 6.75% interest rate. Now that we have found the annual payment, we can solve for the total amount of interest paid over the life of the loan using the following equation.

Total interest expense = (Annual payment)(Number of years) – Amount of the loan
Total interest expense = ($19,381)(5 years) – $80,000 = $16,905

103. **D –** The value of the 30-year bond will increase by $67.04 more than the 15-year bond

For this problem, you need to value each bond using the 8% and 6% market interest rate. However, first notice that we can eliminate answers A and B without doing any math. We know the value of both bonds will increase because the market interest rate is decreasing. Bond value and market interest rate always move in opposite directions. Thus, both A and B can already be eliminated.

15-year bond at 8% market rate

n	i	PV	PMT	FV
30	4	Solve	35	1,000

PV = $913.54

15-year bond at 6% market rate

n	i	PV	PMT	FV
30	3	Solve	35	1,000

PV = $1,098.00

Change in 15-year bond value = $1,098.00 – $913.54 = $184.46

30 year bond at 8% market rate

n	i	PV	PMT	FV
60	4	Solve	35	1,000

PV = $886.88

30 year bond at 6% market rate

n	i	PV	PMT	FV
60	3	Solve	35	1,000

PV = $1,138.38

Change in Bond 2 value = $1,138.38 – $886.88 = $251.50

Bond 2 Change – Bond 1 Change = $251.50 – $184.46 = $67.04

104. **D –** Bonds don't have any default risk is **false**.

    Only government bonds are considered to have zero default risk. Corporate bonds do have default risk because it is possible for corporations to go into bankruptcy.

105. **A –** Interest rate risk

106. **E –** The 10-year corporate bond must have a higher yield than the 5-year corporate bond.

    The rate of inflation increasing over time causes the yield curve to be upward sloping. An upward sloping yield curve means the longer maturity corporate bond will have a higher yield than the shorter maturity corporate bond. We don't have enough information to compare Treasury bonds and corporate bonds in this problem.

107. **B** – 0.778

    We don't cover how a firm's beta is determined in this class; however, it is fair game to see a problem like this where you need to work backwards to find beta when given the other values for the CAPM equation.

    Expected return = Risk-free rate + Beta(Market risk premium)
    11% = 4% + Beta(9%)
    Beta = 0.778

    Alternatively…

    Expected return = Risk-free rate + Beta(Market return – Risk-free rate)
    11% = 4% + Beta(13% – 9%)
    Beta = 0.778

108. **E** – B, C, and D are all correct

    Make sure you know these terms are synonymous.

109. **A** – Issuers like callable bonds because callable bonds allow the issuer to prepay outstanding debt if the issuer can issue new debt at a lower interest rate.

    This is why issuers will only call bonds if interest rates decrease.

110. **B** – The efficient markets hypothesis

111. **C –** 9.2%

Taxable equivalent yield = r / (1 – Tax rate)
Taxable equivalent yield = 6% / (1 – 0.35) = 9.23%

This answer means that this investor is earning the same return on this municipal bond as he would on a corporate bond with a yield of 9.2% because of the tax savings associated with municipal bonds. This is why investors in high tax brackets are willing to accept lower returns on municipal bonds in exchange for the tax exemption associated with municipal bonds.

112. **D –** 36%

Stock return = $((P_{new} – P_{old}) + \text{Dividend}) / P_{old}$
Stock return = ($120 - $100) + ($4 div/quarter * 4 quarters/yr) / $100
Stock return = ($20 + $16) / $100
Stock return = $36 / 100 = 0.36 = 36%

113. **A –** 5.13%

This problem asks us to find the annual coupon rate for this bond. Before doing any math, we can conclude that, since this is a discount bond (PV is less than FV), the bond's coupon rate must be less than the market interest rate of 6%. Therefore, we can eliminate answer choices D and E.

n	i	PV	PMT	FV
40	3	-900	Solve	1,000

PMT = 25.67
Annual coupon payment = (25.67 semi-annually)(2x per year) = $51.35 per year
Annual coupon rate = $51.35 / $1000 = 0.0513 = 5.13%

114. **A –** Negative $41.52

We can actually eliminate answer choices C, D, and E before doing any calculations. We are told that market interest rates are increasing. Since market interest rates and bond prices always move in opposite directions, we know that this bond's value is going to decrease when market increase rates go from 8% to 10%.

Bond's value at 8% market interest rate

n	i	PV	PMT	FV
60	4	Solve	0	1,000

PV = -$95.06

Since we are told that this bond is semi-annual, the input for n is 60 (30-years * 2 payments per year) and the input for i is 4 (8% annual yield / 2). The input for pmt is 0 since we are told it is a zero-coupon bond. The input for FV is $1,000 since we are told that the bond's face value is $1,000.

Bond's value at 10% market interest rate

n	i	PV	PMT	FV
60	5	Solve	0	1,000

PV = -$53.54
The inputs for N, PMT, and FV are the same as our last calculation. The only difference is that I is now 5 (10% annual yield / 2).

Change in bond's market value = Value at market interest rate of 8% – Value at market interest rate of 10%
Change in bond's market value = $95.06 - $53.54 = $41.52

115. **E –** All of the above

116. **C –** Company's P/E Ratio

A company's P/E ratio is not needed for DCF analysis. However, we would need a company's P/E ratio to value their stock using a relative valuation approach, which is another approach to fundamental analysis.

117. **D –** Anchoring attributes cause and effect significance to chance events.

Answer choice D is false – The Hot Hand Fallacy, not anchoring, is when an investor attributes causal significance to chance events.

118. **C –** The value of the 15-year bond will be $58.33 higher than the 30-year bond.

We will need to find the value of the 30-year and 15-year bonds. Then, we will take the difference to get our answer.

Before doing any calculations, we know the value of both bonds will decrease because the market rate is increasing. Bond values and market interest rates always move in opposite directions. We also know the value of the 30-year bond will decrease more than the value of the 15-year bond because longer maturity bonds are more sensitive to changes in the market interest rate. Therefore, we can actually eliminate answer choices B, D, and E, since we know that the value of the 15-year bond will end up being higher than the value of the 30-year bond.

<u>30-Year Bond</u>

n	i	PV	PMT	FV
60	5.5	Solve	35	1,000

PV = -$651.00

<u>15-Year Bond</u>

n	i	PV	PMT	FV
30	5.5	Solve	35	1,000

PV = -$709.33

Difference in value = Value of 15-year bond – Value of 30-year bond
Difference = $709.33 – 651.00 = $58.33

119. **B –** In addition to diversification, some other ways to reduce risk associated with financial assets are hedging, insurance, and selling the financial asset.

120. **B –** False

Stocks above the risk-return line have positive alphas while stocks below the risk-return line have negative alpha. The information given in this problem has things reversed, which is why it is false.

121. **D –** $1,164

A 30-year bond purchased 20 years ago is the same thing as a 10-year bond purchased today. Since the market interest rate (4%) is < the bond's coupon rate (6%), we know that we are dealing with a premium bond. Therefore, we can eliminate answer choices A and B before we do any calculations.

n	i	PV	PMT	FV
20	2	Solve	30	1,000

PV = -$1,163.51

122. **A –** True

123. **C –** $1,099

Since we have a callable bond and market interest rates (9%) < coupon rate (10%), we know that the company will probably be interested in calling the bond once they can. In a very large majority of cases, if the market interest rate < bond's coupon rate, the bond will be called. However, there are some rare circumstances where the bond might not be called even if market interest rates have fallen below coupon rates, so we always want to calculate the "price to call" and the "price to maturity" before we pick an answer choice just to make sure that the bond will definitely be called.

Price to call

n	i	PV	PMT	FV
30	4.5	Solve	50	1,090

PV = –$1,106

If the bond were called, n is 30 since the bond can be called after 15 years (15 x 2 = 30). The fact that this bond is a 25-year bond does not matter if the bond is called after 15 years.

In this problem, i is 4.5% because the current market interest rate is 9% and the bond makes semiannual coupon payments (9% / 2 = 4.5%).

Annual coupon payment = Maturity value x Coupon rate = $1,000 x 0.10 = $100
Semiannual coupon payment = $100 / 2 = $50

FV is $1,090 because the bond pays a call premium of 9% over face value ($1,000 x 1.09 = $1,090). If the problem had said that the bond had a 109% premium, it would have meant the same thing as saying the bond pays a call premium of 9% over face value.

Price to maturity

n	i	PV	PMT	FV
50	4.5	Solve	50	1,000

PV = -$1,099

Here, n is 50 since we are calculating the bond's price to maturity. The FV is 1,000 since we will not incur the call premium if the bond is not called.

Now that we've found the price to call, we just need to double-check to make sure that the bond will definitely be called.

Since the bond's price to call > price to maturity, we can conclude that the bond WILL NOT BE CALLED. Therefore, the bond's value is $1,099, NOT $1,106.