>> This week we've been looking at capital structure, which is the mix of debt and equity used to finance a firm's assets. The concepts from this week's lectures focused on theories of capital structure, and how to value debt financing. In this set of examples, I want to demonstrate the key valuation metrics. Assume a firm is about to change their capital structure by increasing it's current 80 million debt, to 125 million and debt, the interest rate of debt is nine percent, it is not expected to change. The firm currently has 10 million shares outstanding, and the price per share is $45. If the restructuring is expected to increase the ROE or Return On Equity, what is the minimum level of EBIT that the firm's management must be expecting, ignore taxes in this example. What we need to calculate is the break-even EBIT, that is the pre-tax, and interests level where the earnings per share for the levered firm, the one with debt, are the same as for the unlevered or zero debt firm. Or as in this case, we're looking at a breakeven point between the existing debt structure, and the proposed structure. Here are the inputs from the original problem. Our original debt is 80 million proposed debt 125, R_D or the cost of debt is 9 percent. Holding annual interest is going to be 80 million times 0.9 is equal to 7.2, and the new annual interest is 125 million times 0.09 is 11.25 million. What we're assuming in both cases is that the debt is perpetual, and that the principle remains at its current level of 80 or a 125 million, and that we are paying the debt on this each year. With the new debt, $45 million increase, one million shares can be repurchased, reducing the outstanding shares to nine million. We said the EPS for the new structure equal to the old. This gives us breakeven EBIT minus 11.25 million divided by nine million shares is equal to that same breakeven EBIT minus 7.2 divided by 10 million shares, multiply both sides by nine million shares to now get EBIT minus 11.25 million is equal to EBIT minus 7.2 million multiplied by nine million shares over 10 million shares. We multiply nine million shares over 10 million shares, get EBIT minus 7.2 million. To get EBIT minus 11.25 million is now equal to 0.9 EBIT minus 6.48 million. We subtract 0.9 EBIT from both sides, and add 11.25 million to both sides to get our next result, we have 0.01. multiplied by EBIT is equal to 4.707 million. Divide both sides by 0.1, and we find that the break-even EBIT is equal to 47.7 million. We're going to double-check this result, we'll compare the EPS for the new, and the old structure. The new EPS at the breakeven level of 47.7 million would be EBIT minus 11.25 million divided by nine million. 47.7 minus 11.25 divided by nine is equal to $4.05 per share. For the old EPS at the breakeven level of 47.7 million, we'd have the EBIT of 47.7 minus the interest is 7.2, both of those in millions divided by 10 million shares is equal to $4.05 per share. Habitat Corp has a weighted average cost of capital of 16 percent. That weighted average cost of capital is also known as R_A, or the cost of assets. It has a cost of debt of 13 percent. If the firm's debt to equity ratio is two, what's the cost of equity capital? We're going to ignore taxes. According to M&M Proposition II with no taxes, the cost of equity would be R_E, cost of equity is equal to R_A, the cost of assets plus the quantity R_A minus R_D multiplied by debt to equity. First, let's look what we have. The WACC is the cost of capital for the firm's assets, that's R_A. Cost of debt is R_D, and we have DE or the debt to equity ratio of two. The value of the debt is twice that of the value of equity. It's not important that we know that specific values, really the ratio of debt to equity. Plugging the values into the R_E equation we have R_E is equal to 16 percent plus the quantity 16 minus three percent multiplied by two, the cost of equity is 22 percent. With that debt to equity ratio of two, that again, debt is twice that of equity, we'd fully expect the WACC or R_A to be closer to the cost of debt than to the cost of equity. R_A or WACC is the weighted average cost of debt, and the cost of equity. In this example, we'll assume perpetual cash flows for Case 2, Proposition 1, where we'll account for the tax break on debt. What we wanted to determine is the value of equity for a firm when we're provided with the following values. In a problem will always be given values, and important first step, particularly when we're using equations that may be a bit more complicated, is to be sure we understand what each value represents, and particularly with respect to the notations in the equation. EBIT is equal to 50 million, the tax rate is 21 percent, that's T_C. Debt is equal to $100 million or D, the cost of debt this is pre-tax, is 9 percent or R_D. We're also given the firm's cost of capital. If it were an unlevered firm, that would be 12 percent, and designated with R_U. This is the cost of capital for an all equity firm, no debt. We have the value of an unlevered firm, V_U, as the firm's pre-tax earnings or EBIT, multiplied by one minus the tax rate, and this gives us the D after-tax earnings. We know that the value of an asset is the present value of the cashflows. Here we're assuming that the firm will earn an EBIT of $50 million every year, and its cost of capital is R_U or 12 percent. We calculate the P_V as for a perpetuity or cashflow divided by the cost of capital here, that is EBIT multiplied by one minus the tax rate divided by 12 percent, for a value of unlevered equity of 329.17 million. The value for a levered firm adds the tax shield on debt, where again, the data is assumed to be perpetual. The interest shield is the total amount of debt multiplied by the tax rate or 100 multiplied by 0.21 the tax rate, resulting in the value of a levered firm of 350.17 million. This is the total value of the firm, assuming there are both debt, and equity holders, the value of the debt is assumed to be equal to its par value of 100 million. The

debt holders are only do the principle on the debt, leaving the remaining firm value to the equity holders. The value of the equity is then the value of the levered firm minus the outstanding debt, and in this example, is equal to that 350.17 million minus 100 million that goes to the debt-holders, leaving 250.17 million for the equity holders, that is their value of equity. Faulty Brakes Garage is currently an all equity firm with 50,000 shares of stock outstanding with the market price of $12 per share. The current cost of equity is 17.5 percent, and the tax rate is 23 percent. The firm is considering adding 150,000 of debt to its capital structure. What is the levered value of equity? We start with the value of an unlevered firm, which is EBIT multiplied by one minus the tax rate, and divide it by the unlevered cost of capital. In this example however, we have an unlevered firm with 50,000 shares at a market price of $12 per share. Note that in this problem, we don't need to look at EBIT. We already have the number of outstanding shares, and the market price. That market price was determined by the market, and we can simply calculate the value of the unlevered firm as the number of shares multiplied by the market price or V_U is 50,000 shares times $12 per share, it's equal to 600,000. The value of the levered firm then includes the present value of the interest shield. V_L is equal to V_U plus total amount of debt multiplied by the tax rate, or 600,000 plus 150,000 in debt multiplied by the tax rate for a total value of a levered firm of 634,500. We now have the value of a levered firm, but what we need is the value of equity. Value of the levered firm is also defined as value of debt plus value of equity, which leads us to the value of equity is equal to the value of a levered firm minus the value of the debt. We were given that the debt can be sold for its par value. The value of equity is then 634,500, minus 150,000 and debt is equal to 484,500. In our final example, we have Daisy Delivery with a WACC or R_A of 16.8 percent. The firm has no debt, but is considering going to a 25 percent debt structure. The interest rate on debt will be 9.2 percent, and the tax rate is 21 percent. What is the cost of equity with the new structure? In Part a, we will ignore taxes, and in Part b, we'll include them. We need to start by identifying all the values that were provided in the problem, debt equity, we said they were going to be going to a 25 percent debt structure. Debt to equity would be 25 percent debt, which means the remaining 100 percent of the structure is one minus that, or 0.75. Although you were only given the 25 percent debt structure, we can easily get the debt to equity as 0.25 the given value divided by one minus 0.25 for 0.75. R_A 16.8 percent, R_D 9.2, and the tax rate of 21 percent, the cost of equity for a levered firm ignoring taxes would be R_E is equal to R_U plus R_U minus R_D, and that is multiplied by debt to equity or 0.168 plus the quantity 0.168 minus 0.092. That's multiplied by the debt equity of 0.25 over 0.75, and that would be equal to 0.1933 or 19.33 percent for the cost of equity, when we are ignoring taxes. When we look at Part B where we want to include the tax break, we're now using the same equation as up above. But what we're doing as we're adding the tax break here, we've got R_E then R_U plus the quantity R_U minus R_D multiply by the debt equity ratio multiply by one minus the tax rate, or 0.168 plus the quantity 0.168 minus 0.092 multiplied by 0.25 over 0.75, multiplied by one minus 0.21, 18.8. We see that when we are adding the tax break on debt for the firm, their cost of equity declines from 19.33 percent to 18.88 percent. Now that you've seen this example, go to the practice problems. The equations you need for the problems will be included in the solutions, and these will be your guide for what to put on your equation sheet for the exam. Thank you.