PV of net working capital recovered at the end: N=3, I%=12 (Required Rate of Return), PV=CPT, FV=25000 (NWC INVESTMENT)
PV of operating cash flow: Fixed Cost = Sales – VC – FC; N=3, I=12, PV=CPT, PMT=-180000, FV=0 | NPV: USE CASH FLOW
Your firm is thinking about purchasing a new machine. The new machine would cost $4,500,000 today. The new machine would operate for 4 years at which time it could be sold for $900,000. The CCA rate is 30%. The asset class will remain open. The new machine will generate revenues of $1,750,000 per year. The annual operating costs associated with the new machine are $1,100,000 per year. The corporate tax rate is 45%. Required rate of return: 9%.

- PV Salvage Value: N=4, I=9%, PV=CPT, PMT = 0, FV=900000
- PVCCATS = [(4.5MM * 0.3 * 0.45)/(0.09 + 0.3)] * [1+(0.09/2)/(1+0.09)] – [(900000 * 0.3 * 0.45)/(0.09+0.3)] * (1/(1+0.09^4))

A firm purchases a Class 8 equipment for $1,000,000 (CCA Rate 20%) for a 10-year project. **What will be the CCA tax shield in year 4? The tax rate is 35%**. The half-year rule is in effect and the asset class will remain open

YEAR	UCC	CCA	ANSWERS
1 (1/2 rule in effect)	$1000000	$100000 (1000000*0.5)*0.2	$900000
2	900000	180000 (900K*0.2)	720000
3	720000	144000	576000
4	576000	115200	460800

115200 * 0.35 =$40,320
Loblaws has annual sales of $1.9 million, depreciation of $238,000, and net working capital of $196,001. The firm has a tax rate of 35% and a profit margin of 8.2%. The firm has no long-term debt. What is the **amount of the annual operating cash flow**?

- OCF = SALES * PROFIT MARGIN in % + Depreciation

Marti purchased a stock one year ago at a price of $23.89. Over the past year she has received a total of $1.63 in dividends. Today she sold the stock for $22.84. **What total percentage return did Marti earn on this investment**?

- Use rE formula = ((1.63 + 22.84)/23.89)-1 OR N=1, I=CPT, PV=-23.89, PMT=1.63, FV=22.84

What are the **arithmetic and geometric average returns** for a stock with annual returns of 21 percent, 8 percent, -32 percent, 41 percent, and 5 percent?

- **Arithmetic** = (21 + 8 – 32 + 41 + 5)/5; **Geo** = (1+.21)(1+.08)(1+-.32)(1+.41)(1+.05)^(1/5) – 1

Which one of the following stocks is correctly priced based on CAPM, if the risk-free rate of return is 3.8 percent and the market risk premium is 8.5 percent?

- BETA = [Expected Return – Risk Free Rate]/Risk Premium e.g. Stock D has B: 1.2; ER: 14% → [0.14 – 0.038]/0.085 = 1.2 (MATCH!)

Your portfolio has a beta of 1.08. The portfolio consists of 20 percent Treasury bills, 45 percent in stock A, and 35 percent in stock B. Stock A has a risk-level equivalent to that of the overall market. **What is the beta of stock B**? REMEMBER: T Bills is risk free; beta = 0

- 0.20 * 0; 0.45 * 1 = 45%, (1.08 – 0.45)/0.35 = 1.8

What is the **expected return** for the following portfolio?
Investment A = 200, B = 300, C = 500; Return A = 0.15, B = 0.1, C = 0.25

- Expected Return = (200*0.15 + 300*0.1 + 500*0.25) / (200+300+500) = 0.185

You need $2,000 to buy a new stereo for your car. If you have $800 to invest at 5% per year compounded annually, how long will you have to wait to buy the stereo?

- N = CPT, I=5, PV=-800, FV = 2000, PMT = 0; 18.7 YEARS

Jacob Money Inc. has a profit margin of 11% and a retention ratio of 70%. Last year, the firm had sales of $500 and total assets of $1,000. The desired total debt ratio is 75%. **What is the firm's sustainable growth rate**?

- [(500*0.11)/250]*0.7

A Windsor Ontario firm has a net income of $32,000 which provides a 12% return on assets. The firm has a debt-equity ratio of .40. What is the **return on equity**?

- Debt Equity Ratio = Debt / Equity, ROE = EM * ROA, 1.4*.12 = 0.168 * 100 = 16.8%

Using the Du Pont Identity Method, calculate the **equity multiplier** given the following information: profit margin 14%; total asset turnover 1.7; return on equity 29.08%.

- Dupont = ROE/(TAT*PM) = EM; EM = (0.2908)/(0.14*1.7) = 1.2

Current assets of the Smart Inc. are $94,700. Accounts payable is $36,200, net income is $12,400 and sales are $110,800. What is the net working capital turnover rate for Smart Inc.?

- NWC = CA – CL = 94700 – 36200 = 58500; NWC TR = 110800 / 58500 = 1.894

DEF's common stock just paid a dividend of $3 per share. You expect the dividend to increase by 5% per year in perpetuity. If you require a 15% rate of return what is the price of the stock today?

- P0 = D1 / r-g → (3(1+0.05))/(0.15-0.05) = 31.50

XYZ's stock is currently selling for $51. The expected dividend one year from now is $1.50 and the required return is 10%. The dividends are expected to grow at a constant rate in perpetuity. What is this firm's **dividend growth rate** assuming the **constant dividend growth model** is appropriate?

- P0 = DIV1/(rE - g) → 51 = 1.50/(0.1-g) → 0.1g=1.5/51 → g=0.1-0.02941 → .1 = 0.7058

XYZ Company's preferred shares will pay a constant dividend of $2.00 per year forever, starting in 1 year. Given the risk of the shares you think the appropriate discount rate should be 20% per year for the first 3 years. You then think the discount rate should drop to 12% per year in year 4 and will last forever. How much would you be willing to pay for these preferred shares?

- 2.00/0.12 = 16.67 (forever rate); 16.67/1.2^3 = 9.65 → (2/1.2) + (2/1.12^2) + (2/1/12^3) = 4.213 → 9.65+4.213 = ANS

Carol Singer holds a 5.4% coupon bond that has a quoted price of $995 and will make its next semi-annual payment in one month. What is the accrued interest for this bond?

- **Because bond FACE VALUE IS NOT MENTIONED, ASSUME IT IS $1000**
- Annual Payment Required: 0.054*1000 = 54/2 = 77 (2 because it is semi-annually)
- Question says 5 months into 6th one (which we are scheduled to pay); 5/6 = 0.833333333 → 0.833333333 * 27 = $22.5

Canadian Treasury bills with 1-year to maturity have a yield to maturity of 0.98% per year. If you expect inflation to be 1.4% per year over the upcoming year, what is your **expected real rate of return**?

- 1 + R(Nominal Rate) = (1+r(real)) * (1+h(inflation))
- 1 + 0.0098 = (1+r) * (1 + 0.014) → 1.0098/1.014 = 1+r → r = 0.99587988 – 1 = 0.00414 * 100 = -0.414%

You buy a 10-year bond with a 4% coupon rate (paid annually) and a $1,000 face value at par. If the yield to maturity increases to 5% per year compounded annually one year from now, what is your 1-year **holding period return**?
N = 9 (1 year has gone), I=5, PV= CPT, PMT=1000*0.04 = 40, FV = 1000; PV= -928.92
Return: (928.92 – 1000)+40 / (1000) = -0.03108 * 100 = -3.1%
A bond with a $5,000 face value and 20 years to maturity has a coupon rate of 5% per year (paid semi-annually). If its yield to maturity is 3.6% per year compounded semi-annually, what is **its value today**?

- N = 20 * 2 (SEMI ANNUAL), I = 3.6/2 (SEMI), PV= CPT, PMT = 0.05 * 5000 = 250/2 (SEMI) = 125 → PV = -5991.90

You have borrowed $12,000 from Rob M. Blind lenders. If they require you to make payments of $400 at the end of each month for a period of six years in order to pay off this loan, what **annual percentage rate (APR) compounded monthly are they charging** on this loan?

- N = 6 * 12 (MONTHLY), I = CPT, PV = 12000, PMT = -400, PV = 0 → I = 2.91% * 12 (MONTHLY) = 34.92%

The grand prize in the OMG Lottery is a choice between $1,000 paid at the beginning of each month for a period of 10 years and a lump sum paid immediately. If you can invest at an effective annual interest rate of 5%, what is the minimum lump sum you would be willing to accept as winner of this lottery?

- Find PV of lottery payment for 10 years, it starts at the beginning of each month (use **BGN**). I/Y is given to us as EAR (convert to monthly)
- R = [((EAR +1) ^ (1/m)) – 1] * m
- R = [((0.05 + 1) ^ (1/12)) – 1] * 12; R = (1.05^(1/m) – 1) * 12; 0.048889485 per year → divide by 12 for monthly = 0.00407412.. * 100 = I/Y
- N = 10 * 12 (MONTHLY) = 120, I = 0.407412, PV = CPT, PMT = 1000, FV = 0; PV = 95173

What **annual percentage rate (APR)** compounded monthly is equivalent to an interest rate of 6.25% per year compounded semi-annually?

- APR so use EAR formula, semi annual so m is 2, second formula is monthly so m = 12
- EAR = [1+(APR/m)]^m - 1 = [1+(0.0625/2)]^2 – 1 = 0.0634765625 → NOW CONVERT TO APR MONTHLY
- R = [((EAR +1) ^ (1/m)) – 1] * m → [((0.0634765625 + 1) ^ (1/12)) – 1] * 12 = 0.0617 = 6.17%

Candy Kane has taken out a $250,000 mortgage at a quoted rate of 6.3% compounded semi-annually. If the mortgage requires monthly payments over a term of 20 years, with each payment made at the end of the period, **what is the required monthly payment**?

- EAR = [1+(APR/m)]^m - 1 = [1+(0.063/2)]^2 – 1 = 0.06399225 → NOW CONVERT TO EAR TO GET MONTHLY
- R = [((EAR +1) ^ (1/m)) – 1] * m → [((0.06399225 + 1) ^ (1/12)) – 1] * 12 = 0.06218869555 per year → divide by 12 for monthly = 0.518..%
- N = 20 * 12 (MONTHLY) = 240, I = 0.518, PV = 250000, PMT = CPT, FV = 0 → PMT = 1822.37

You wish to establish a scholarship fund for students at Clever College. The fund would pay an annual scholarship that would start at $5,000 awarded one year from now and increase by 3.5% per year forever. If the fund could earn an effective annual return of 6%, how much would you need to contribute to the scholarship fund today for it to be fully funded?

- Perpetuity (Scholarship/funding question); since it says increase by X% → Growing Perpetuity; C one year from now = 5000 (a year from now)
- R = 0.06, g = 3.5%, PV = 5000/(0.06 - 0.035) = 200000

Holly Daze has taken out a ten-month zero-**coupon loan** of $3,000. If the lender charges 7.2% per year compounded quarterly, what is the amount she must **pay back at the end of the loan**?

- **IMPORTANT FOR N:** 10 month and it is a quarterly bond
- N = One Quarter is 3 months → 10/3 = 3.33333333
- N = 3.333333333, I = 7.2 / 4 (Quarterly) = 1.8, PV = 3000, PMT = 0, FV = CPT
- FV = -3183.81

Net Working Capital = current assets (cash, AR, inventory**)– current liabilities
Cash flow on assets = $ flow to bondholders + flow to shareholders
(*free cash flow = cash flow from assets)
capital spending = purchase of fixed assets – sale of fixed assets
= ending fixed assets – beginning + depreciation
Additions to NWC = nwc end – nwc beginning *(NWC = Net Working Capital)*
Cash Flow Creditors = interest paid – net new borrowing (diff in long term debt**)
Cash Flow from Shareholders = dividends paid – net new equity raised
Tot $ flow from assets = $ invested fixed assets - # invested in NWC
Average Tax Rate = Total taxes paid / total taxable income
Current Ratio = current assets / current liabilities
Quick Ratio = (current assets – inventory) / current liabilities
Cash Ratio = (cash + cash equivalents) / current liabilities
Net working Capital to Total Assets = net working capital / total assets
Interval Measure = current assets / average daily operating costs
Total Debt Ratio = (total assets – total equity) / total assets
Debt/Equity Ratio = total debt / total equity
Equity multiplier = Total Assets / Total Equity **or** = 1 + debt equity ratio
Long-Term Debt Ratio = long term debt / (long term debt + total equity)
aka. Total capitalization
Time Interest Earned Ratio = Earnings before interest & taxes / interest
Cash Coverage Ratio = (EBIT + Depreciation) / interest
Inventory Turnover = COGS / inventory ** (higher ratio is better) **
Day Sales in Inventory = 365 days / inventory turnover
Receivables turnover = Sales / AR
Days' Sales in Receivables = 365 days / receivables turnover
Net Working Capital Turnover = sales / net working capital
Fixed Asset Turnover = sales / net fixed assets
Total Asset Turnover = sales / total assets **OR** 1 / Capital Intensity Ratio
Profit Margin = net income / sales
Gross Profit Margin = (Sales – COGS) / Sales
Operating Profit Margin = (Sales – COGS – expenses) / Sales
Return on Equity = Net Income / Total Equity
Earnings per Share = Net income / shares outstanding
Price – Earnings Ratio = Price Per Share / Earnings per Share
higher value = more growth fiture
Market to Book Ratio = market value per share / book value per share
< 1 = not successful >1 = successful

ROE = Net income / Total equity **OR** (Net income/ Assets) ÷ (Assets/total equity)
= ROA * Equity Multiplier
= ROA * (1 + D/E ratio)
= (net income / sales) * (sales / assets) * (Assets / total equity)
= profit margin * total assets turnover * equity multiplier
Return on Assets (ROA) = net income / total Assets
ROA = Profit margin * total asset turnover ratio (leave pm as a percentage or decimal) **Retention/Plowback ratio =** retained earnings/ net income **OR** *1 – Dividend payout ratio*
(Dividend) Payout Ratio = Cash dividends / Net income
Capital Intensity Ratio = Total Assets / Total Sales **OR** 1/ Total Asset Turnover Ratio
Internal Growth Rate (g) = (ROA * R) / (1-ROA*R) **R is Retention Rate **
Sustainable Growth Rate (g*) = (ROE * R) / (1 – ROE*R)
D/E Ratio = New Borrowing / Addition to retained earnings
FV = PV * (1 + r)t) → **Simple Interest ** 500* (1+0.06*30) – (30 is # periods, 0.06=r)
FV = pv * (1 + r)^t → ** Compound Interest**
FVA = (C * ((1 + r)^t) -1) / r
PV = FV / (1+r)^t
PVA = C * [1 –(1 / (1 + r)^t] / r
PV = C / r → **regular perpetuity** **C = payment**
PV = C/ (r – g) → **growing perpetuity** **C = payment**
PV = [C / (r – g)] * [1 – {(1 –g) / (1+r)}^t] →**growing annuity**
1 + EAR= (1 +(APR/m)) ^m = (1 + EPR) ^f Effective Annual rate (EAR), Annual Percentage Rate (APR), Effective Monthly Rate (EPR) **(APR is always compounded)**
EPR = PR/m → **only when m and f are same**
EFN = Increase in Total Assets – increase in A/P + addition to R/E
= A*g – L*g – (PM)(S)(1+g)(r)
A= Assets, G = growth, S = sales, L=Liability, r = Retention Ratio
Increase in Total Assets = A * g
increase in Accounts Payable = accounts payable * g
m=compounding, f= # of payment periods

FIN 300 Tip Sheet

Free Cash Flow:
Free CF = CF_{asset} = $CF_{creditor}$ + $CF_{shareholder}$
- Free CF = CF_{Asset}=Operating Cash Flow - Net Capital Spending – Change in Net Working Capital

Operating Cash Flow = NI + Depreciation + Interest
= EBIT + Depreciation – Taxes
Net Capital Spending = Net Fixed Asset $_{end}$ - Net Fixed Asset $_{bgn}$ + Depreciation
Change in NWC = NWC $_{end}$ – NWC $_{bgn}$
- $CF_{creditor}$ = Interest – Net Borrowing
- $CF_{shareholder}$ = Dividend Paid – Net new equity

External Financing Needs:
Retention Ratio (Plowback Ratio) = $\frac{\text{Retained Earning}}{\text{NI}}$
Dividend Payout Ratio = 1 – Retention Ratio = $\frac{\text{Dividend}}{\text{NI}}$
EFN = Asset*g – Current Liability*g – Sale(1+g)*Payout Ratio*Retention Ratio
If operating < full capacity, use current asset.
If operating = fall capacity, use total asset.
Internal Growth Rate = ROA * Retention Ratio
External Growth Rate = ROE * Retention Ratio

The Time Value of Money:
Simple Interest: FV = PV(1 + rt)
Compound Interest: FV = $PV(1 + r)^t$

Ordinary Annuities:
FV = PMT{[$(1+r)^t$-1]/r}
PV = PMT{[1-1/$(1+r)^t$]/r}

Growing Annuities:
PV=[PMT_1/(r-g)]*{1-[(1+g)/(1+r)]^n}

Annuity Due:
PV = Current Payment + $PV_{ordinary\ annuity}$
PV = (1+r) $PV_{ordinary\ annuity}$
FV = (1+r) $FV_{ordinary\ annuity}$ = $(1+r)^t$ $PV_{annuity\ due}$
(*Tips:* calculator input: BGN)

Perpetuities:
PV = PMT/r
(*Tips*: calculator input: n=10000000)

Growing Perpetuities:
PV = PMT_1/(r-g)

Interest Rates:
APR: annual percentage rate; quoted rate
EAR: effective annual rate
EPR: effective periodic rate
C/Y: compound per year
P/Y: payment per year

$$EPR = \left(1+\frac{APR}{C/Y}\right)^{\frac{C/Y}{P/Y}} - 1$$

$$EAR = \left(1+\frac{APR}{C/Y}\right)^{C/Y} - 1$$

(*Tips:* calculator input:
if r=APR, change P/Y, C/Y
if r=EPR, P/Y=1, C/Y=1)

Continuously compounding: EAR = $e^{APR} - 1$

Bonds:
Coupon rate = $\frac{\text{Coupon payment}}{\text{Face value}}$

Bond price = PV = $\text{Coupon} * \frac{1-\left(\frac{1}{1+r}\right)^t}{r} + \frac{\text{Face value}}{(1+r)^t}$

(*Tips:* calculator input:
if semi-annual coupon payment, PMT=annual coupon/2.
if quarterly coupon payment, PMT=annual coupon/4.)
1+inflation rate = (1+nominal rate)/(1+real rate)

Valuing Stocks:
Dividend yield = D_1/P_0
Capital gains yield = $(P_1 – P_0)/P_0$
Percentage return = r = Dividend yield + Capital gain yield = $(D_1 + P_1 – P_0)/P_0$

No Growth:
N=∞ *(Perpetuity)*: $P_0 = \frac{D}{r}$

N=t(*Ordinary annuity*): $P_0 = \text{Dividend} * \frac{1-\left(\frac{1}{1+r}\right)^t}{r}$

Constant Growth:
N=∞ *(Constant perpetuity)*: $P_0 = \frac{D_1}{r-g} = \frac{D_0(1+g)}{r-g}$

N=t(*Growing annuity*): $P_0 = \text{Dividend} * \frac{1-\left(\frac{1}{1+r}\right)^t}{r}$

Risk and Return in Capital Markets
Arithmetic Average Return = $\frac{R_1+R_2+R_3+\cdots+R_n}{n}$
Geometric Average Return = $[(1+R_1)(1+R_2)\ldots(1+R_n)]^{1/n}$ -1
Variance = $\frac{(R_1-\text{Average})^2+(R_2-\text{Average})^2+\ldots.+(R_n-\text{Average})^2}{n-1}$
Variance$_{(Portfolio)}$ = $w_A Var_A + w_B Var_B + 2\, w_A w_B Corr_{A,B}$
Rate of return$_{(Portfolio)}$ = Fraction in $Asset_1$ x $Rate_1$ + Fraction $Asset_2$ x $Rate_2$

Short-term or Liquidity Ratio:

$$\text{Current ratio} = \frac{\text{Current assets}}{\text{Current liabilities}}$$

$$\text{Quick ratio} = \frac{\text{Current assets} - \text{Inventory}}{\text{Current liabilities}}$$

$$\text{Cash ratio} = \frac{\text{Cash}}{\text{Current liabilities}}$$

$$\text{NWC} = \frac{\text{NWC}}{\text{Total assets}}$$

$$\text{Interval measure} = \frac{\text{Current assets}}{\text{Average daily operating costs}}$$

Long-term or Financial Leverage Ratio:

$$\text{Debt ratio} = \frac{\text{Assets} - \text{Equity}}{\text{Assets}}$$

$$\text{Debt/equity ratio} = \frac{\text{Debt}}{\text{Equity}}$$

$$\text{Equity multipler} = \frac{\text{Assets}}{\text{Equity}} = 1 + \frac{\text{Debt}}{\text{Equity}}$$

$$\text{Long} - \text{term debt ratio} = \frac{\text{LT Debt}}{\text{LT Debt} + \text{Equity}}$$

$$\text{Times interest earned} = \frac{\text{EBIT}}{\text{Interest}}$$

$$\text{Cash coverage ratio} = \frac{\text{EBIT} + \text{Depr}}{\text{Interest}}$$

Asset Utilization Turnover Ratio:

$$\text{Inventory turnover} = \frac{\text{COGS}}{\text{Inventory}}$$

$$\text{Day's sales in inventory} = \frac{365}{\text{Inventory turnover}}$$

$$\text{Receivables turnover} = \frac{\text{Sales}}{\text{A/R}}$$

$$\text{Day's sales in receivables} = \frac{365}{\text{Receivable turnover}}$$

$$\text{NWC turnover} = \frac{\text{Sales}}{\text{NWC}}$$

$$\text{Fixed assets turnover} = \frac{\text{Sales}}{\text{Net FA}}$$

$$\text{Assets turnover} = \frac{\text{Sales}}{\text{Total assets}} = \frac{1}{\text{Capital intensity ratio}}$$

Profitability Ratio:

$$\text{Profit margin} = \frac{\text{NI}}{\text{Sales}}$$

$$\text{ROA} = \frac{\text{NI}}{\text{Assets}}$$

Du Pont Identity: $\text{ROE} = \frac{\text{NI}}{\text{Equity}} = \frac{\text{NI}}{\text{Sales}} * \frac{\text{Sales}}{\text{Assets}} * \frac{\text{Assets}}{\text{Equity}}$

= Profit margin*Total assets turnover*Equity multiplier
= ROA * Equity multiplier

Market Value Ratio:

$$\text{Price} - \text{earning ratio} = \frac{\text{Price per share}}{\text{Earning per share}}$$

$$\text{Market to book ratio} = \frac{\text{Mkt value per share}}{\text{Book value per share}}$$

EV/EBITDA= [mkt value to equity + mkt value of interest bearing debt + preferred shares + minority interest – cash] / EBITDA

Capital Budgeting:
If NPV>0, accept
If IRR>WACC, accept
Probability index = (NPV+Capital Exp.)/Capital Exp.
Investment decision: NPV -> IRR -> Payback

Asset in class 13 - straight-line method:

$$D = \frac{\text{Capital Exp.} - \text{Salvage}}{\text{Year of useful life}}$$

Asset in other classes - declining method:
Depreciation 1st year (half-year rule): D = CCA rate*UCC*0.5
Depreciation other years: D = CCA rate*UCC

Annual CCATS = Depreciation*Tax rate
NPV = PV(OCF) + PV(CCATS) + PV(Net Capital Spending) + PV(NWC)
OCF = (Revenue – Expenses)(1-Tax)
PV(OCF): N=number of payments, r=required rate, pmt=OCF per year.

$$PV(CCATS) = \frac{\text{Capital Exp.}*CCA*Tax}{CCA+r} * \frac{1+0.5r}{1+r} - \frac{\text{Salvage}*CCA*Tax}{CCA+r} * \frac{1}{(1+r)^t}$$

$$PV(\text{Net Capital Spending}) = -\text{Capital Exp.} + \frac{\text{Salvage}}{(1+r)^t}$$

$$PV(NWC) = \text{Investment in NWX} + \frac{\text{Recovery NWC}}{(1+r)^t}$$