22.812 Spring 2004 Problem Set 1 Solutions
PSB 1.1, 1.2, 2.1, 2.4, 2.6, 2.13

1.1: Consider the following balance sheet entries

Assets			
current	cash		$50,000
	accounts recievable		$50,000
	Inventories		$150,000
noncurrent	manufacturing plant at cost	$600,000	
	depreciation	$300,000	
	net fixed assets		$300,000
	Land		$150,000
Liabilities			
current	notes payable		$50,000
	accounts payable		$100,000
noncurrent	long term mortgage bonds		$100,000
	preferred stock ($100pv)		$100,000
	common stock ($10pv)		$200,000
	capital surplus		$100,000
	retained earnings		$50,000

The first step is to divide the assets and liabilities into current and noncurrent categories.

A: compute the firm's working capital **(5 pts.)**

The working capital is the value of the current assets less the current liabilities

Current assets = $250,000
Current liabilities = $150,000

Working Capital = $100,000

B: If the firm had the net income after tax of $100,000 what were the earnings per share? **(5 pts.)**

The earnings per share are applicable to the common stock. 6% of the net income is paid as dividends on the preferred stock, so 94% is applicable to the common stock. The earnings is therefore $94,000
There are 20,000 shares of common stock, so the earnings to stock ratio is **$4.70 per share**.

C: When the firm issued its common stock, what was the market price of the stock per share? **(5 pts.)**

We assume that the preferred stock is sold at the par value. The sum of the common stock liability and the capital surplus is the money raised through issuing stocks. Therefore, the market price of the common stock can be deduced given that the capital surplus arises from the sale of these shares of stock

Capital Surplus + Common Stock Liability = $100,000 + $200,000 = $300,000

Divided by the number of common stock shares (20,000) gives the stock price of **$15.00 per share.**

1.2: The accounting information was taken from the book of Alpha Manufacturing Company, on the basis of this information compute the total sales for the period

Construct the income statement for the period **(10 pts.)**

Net sales	x
New purchases (cost of goods sold)	(83,000)
Operating expenses	(22,000)
Depreciation	(10,000)
Net operating profit	x – 115,000
Non-operating revenue	5000
Net income before taxes	x – 110,000
Income taxes	(10,000)
Net income	x – 120,000

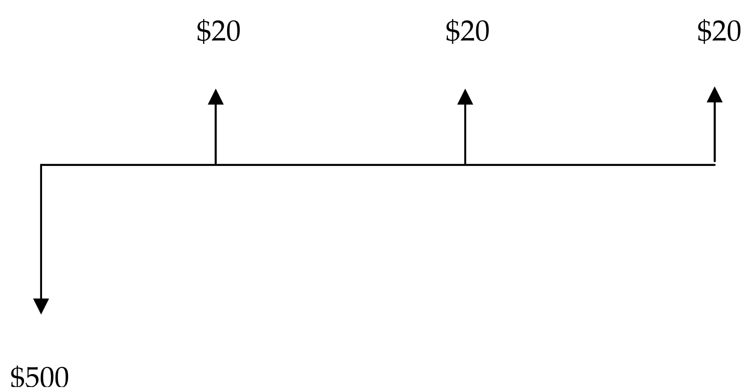
But we are told that net income = $27,400.

Hence net sales = **$147,400**

2.1: A typical bank offers you a Visa card that charges interest on unpaid balances at a 1.5% per month compounded monthly. This means that the nominal interest rate (annual percentage) rate for this account is A and the effective annual interest rate is B. Suppose your beginning balance was $500 and you make only the required minimum monthly payment (payable at the end of each month) of $20 for the next 3 months. If you made no new purchases with this card during this period, your unpaid balance will be C at the end of the 3 months. What are the values of A,B, and C? **(5 pts. each, total 15 pts.)**

A = (1.5%)(12) = **18%**
B = $(1+0.015)^{12}-1$ = **19.56%**

To do this problem we construct a cash-flow diagram



C = -500 (F/P, 1.5%, 3) + 20 (F/A,1.5%,3) =

$$-\$500\frac{F}{P}+\$20\frac{F}{A}=-\$500(1+i)^{N}+\$20\left[\frac{(1+i)^{N}-1}{i}\right]=-\$461.93$$

C = **-$461.93**

2.4: Suppose that $1,000 is placed in a bank account at the end of each quarter over the next 10 years. Determine the total accumulated value (future worth) at the end of the 10 years where the interest rate is 8% compounded quarterly **(5 pts.)**

$$F=A\left[\frac{(1+i_q)^{N}-1}{i_q}\right]=\$1{,}000\left[\frac{\left(1+\frac{0.08}{4}\right)^{40}-1}{\frac{0.08}{4}}\right]=\$60{,}402\approx\$60{,}000$$

2.6: Suppose that $5,000 is placed in a bank account at the end of each quarter over the next 10 years. Determine the total accumulated value (future worth) at the end of the 10 years when the interest rate is

using a similar procedure to that listed in 2.4, we calculate the effective annual interest rate.

12% compounded annually **(10 pts.)**

$$i_a = (1+\frac{r}{m})^m - 1 = (1+\frac{0.12}{1})^1 - 1 = 12\%$$

$$F = A\left[\frac{(1+i_a)^N - 1}{i_a}\right] = \$20{,}000\left[\frac{(1+0.12)^{10} - 1}{0.12}\right] = \$350{,}974.70 \approx \$351{,}000$$

12% compounded quarterly **(10 pts.)**

$$F = A\left[\frac{(1+i_q)^N - 1}{i_q}\right] = \$5{,}000\left[\frac{\left(1+\frac{0.12}{4}\right)^{40} - 1}{\frac{0.12}{4}}\right] = \$377006.3 \approx \$377{,}000$$

12% compounded monthly **(10 pts.)**

$$i_q = (1+\frac{r}{m})^m - 1 = (1+\frac{0.12}{(4)(3)})^3 - 1 = 3.03\%$$

$$F = A\left[\frac{(1+i_q)^N - 1}{i_q}\right] = \$5{,}000\left[\frac{(1+0.303)^{40} - 1}{0.303}\right] = \$379{,}589.30 \approx \$380{,}000$$

12% compounded continuously **(10 pts.)**

$$i_q = e^{\left(\frac{r}{k}\right)} - 1 = e^{0.12/4} - 1 = 3.05\%$$

$$F = A\left[\frac{(1+i_q)^N - 1}{i_q}\right] = \$5{,}000\left[\frac{(1+0.0305)^{40} - 1}{0.0305}\right] = \$380{,}914.90 \approx \$381{,}000$$

2.13: Suppose you have the choice of investing in (1) a zero-coupon bond that costs $513.60 today, pays nothing during its life, and then pays $1,000 after 5 years or (2) a municipal bond that costs $1,000 today, pays $67 semiannually, and matures at the end of the 5 years. Which bond would provide the higher yield to maturity (or return on your investment).

At the point of maturity, the value of the (1) bond is $1,000
At the point of maturity the value of the (2) bond is $1,000 but you have received $670 in interest payments.

Draw the cash flow diagram for each option:

Option I

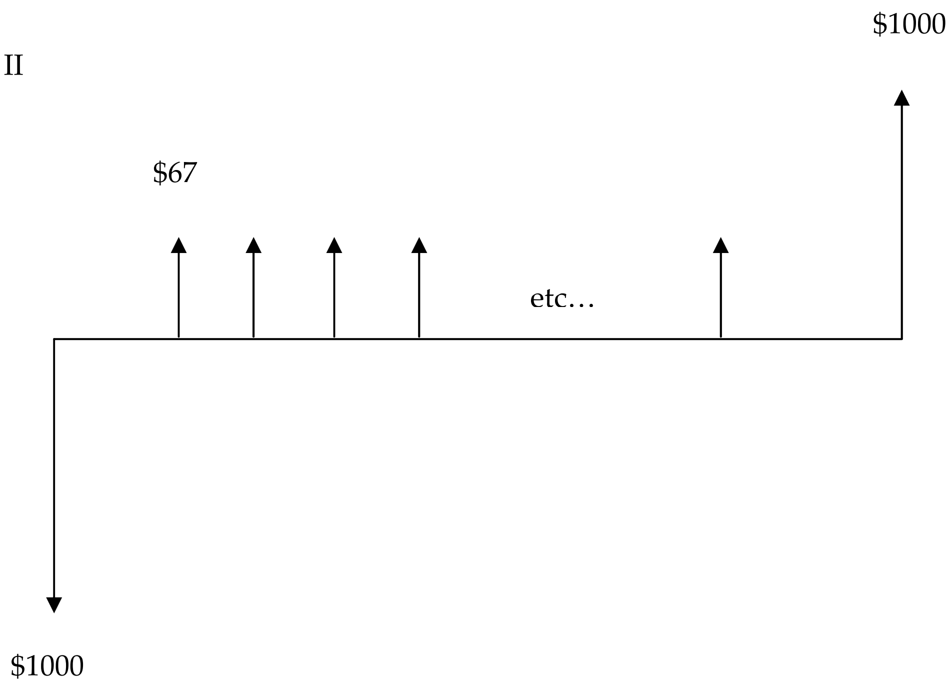
Return on investment in this case, i, is given by:

$$-513.6 + \frac{1000}{(1+i)^{10}} = 0$$

where i is the effective interest rate per half-year period

i = **6.89% (5 pts.)**

Option II



Return on investment, j, in this case is given by

$$-\$1000 + 67(P/A, j\%, 10) + 1000(P/F, j\%, 10) = 0$$

$$-\$1000 + \$67\left[\frac{(1+j)^N - 1}{j(1+j)^N}\right] + \$1000\left[\frac{1}{(1+j)^N}\right] = 0$$

Solving the above equation for j will give 6.70%, however the solution is intuitive.

j = **6.70% (5 pts.)**

The First Option has the higher return on investment. **(5 pts.)**