Solutions for Midterm#1   Feb 22,2006

Question #1   [10 points]

Mary the housepainter knocked on Tom's household door on Monday and said "I will paint your house for $20,000." Tom said, "I need to think about this and I'll get back to you by Thursday."

Tom did not respond on Thursday. Mary arrived at Tom's house on Friday and began to paint. Tom left the house at 8 am and saw Mary painting but said nothing. The following Tuesday, Mary presented Tom a bill for $20,000. Tom refused to pay.

They brought their dispute to you, the local judge. What is your decision and why?

A: Five necessary elements for a valid and enforceable contract:
- **Offer**
- **Acceptance**
- **Consideration (≈ Payment plan, Exchange, etc.)**
- **Legal Subject**
- **Competence of the Parties**

➔ **mention 3out of 5 get 2.5 points for each.**

[Offer] Mary the housepainter knocked on Tom's household door on Monday and said "I will paint your house for $20,000."➔ Mary gave an offer.

[Acceptance] Tom said, "I need to think about this and I'll get back to you by Thursday." Tom did not respond on Thursday.➔ Tom did not accept.

Mary arrived at Tom's house on Friday and began to paint. Tom left the house at 8 am and saw Mary painting but said nothing. ➔ Tom still did not accept because no response (silence) is not an acceptance.

[Competence] If Mary is competent (has license of painting and is an adult), then the competent requirement is met.
If Tom is an adult and conscious, then he is competent.

[Legal subject or consideration]
➔ **[Conclusion 2.5']** No contract ➔ Even if both Mary and Tom are competent. It is reasonable that Tom refused to pay.

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Question #2   [10 points]

What is Fast-Tracking? Discuss one advantage and one disadvantage of the concept.

- **Definition**
  Fast-tracking is starting the construction phase at a point when only limited design work has been completed.

- **Advantages and disadvantages:**

	Design-Build
Advantages	*Disadvantages*
1. May expedite delivery (project is likely to complete sooner)	
	2. Can be riskier since owner doesn't know full costs before beginning to build and gives out the contract to one firm that covers a larger scope.
	3. Owner has less control over individual players; architect is not tasked with checking on the contractor for adherence to design intent or assessment of completion of the work for payment purposes.

Question #3   [20 points]

A contract was entered into for which an estimate of the project costs (exclusive of the contractor's profit) equal to $22,425,000 was agreed to by the parties. The contractor's profit was agreed to be 6% of the estimated cost. The contract further provided that the owner would reimburse all the project costs to the contractor as they were expended and would pay the contractor's profit periodically as the work progressed. The contract further provided that the owner and contractor would share in any cost overruns or underruns, 60% to the owner and 40% to the contractor.

(a) **With respect to commercial terms, what kind of contract was this?**

Cost Plus % Fee
   Correct: Cost Reimbursable, Target Estimate, Cost + Incentive Fee
   Not Correct: Lump Sum, Fixed Price, GMP, etc.

(b) If the total costs on project completion, exclusive of contractor's profit, had been $24,975,000, how much would the owner have paid for the job?

Total amount that owner has to pay for the job:
Estimated Cost + 60% of the Overrun + 6% of the Estimated Cost

- Overrun = 24,975,000 – 22,425,000 = 2,550,000
- Owner is responsible for 60% of the overrun
  → 2,550,000 * 0.6 = 1,530,000
- Owner also needs to pay the contractor's profit, 6% of the estimated cost, which is 22,425,000 * 0.06 = 1,345,500

Total = 22,425,000 + 1,530,000 + 1,345,500 = $25,300,500

(c) Under the circumstances in (b), what would be the contractor's actual profit?

- Contractor is responsible for the overrun by 40%;
  2,550,000 * 0.4 = 1,020,000
- Original Profit = 22,425,000 * 0.06 = 1,345,500

Actual Profit = Original Profit – 40% of Overrun
= 1,345,500 – 1,020,000 = $325,500

Question #4 [20 points]

You have just won the lottery and will receive $500,000 now. Your attorney offers to pay you A. equal payments of $50,000 at the end of each year for the next 20 year if you agree to give him $500,000 now; or B. $ 40,000 at the beginning of each year from now for the next 15 years and then $300,000 at the end of the year 15. If you think that you can invest at 10%, should you accept any of those offers?

Option a

P=?

A=50,000

0 1 2 3 4   20

N=20,
i=10%
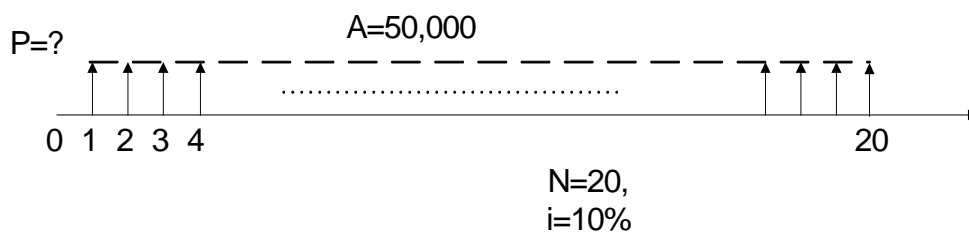
P=50,000(P/A, 10%, 20)=50,000*8.5136=425,680<500,000 ➔ reject option a.

B:

$$F=300,000$$

$$A=40,000$$

0 1 2 3 4   15

N=15,
i=10%
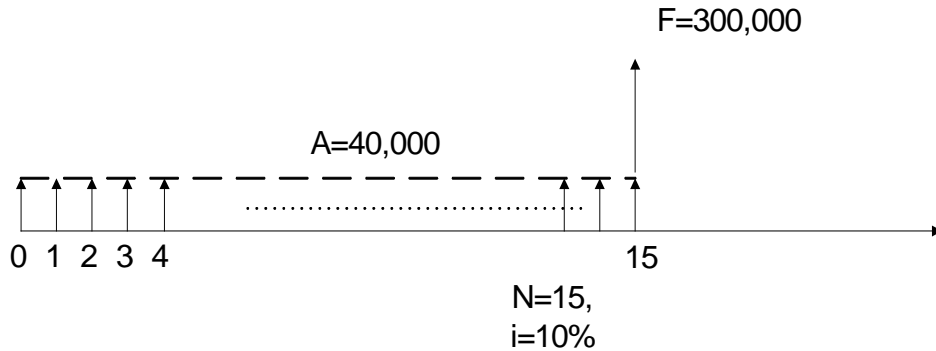
P=40,000+40,000(P/A, 10%, 14)+300,000(P/F,10%,15)
=40,000+40,000*7.3667+300,000*0.2394=40,000+294,668+71,820=406,448<500,000 ➔ reject offer B.

Question #5 [20 points]

Consider four mutually exclusive alternatives that each have an 8-year useful life:

	A	B	C	D
Initial Cost	$1,000	$800	$600	$500
Uniform annual Benefit	$50	$113	$92	$130
Salvage Value	$0	$500	$500	$0

(a) If the minimum attractive rate of return is 8%, which alternative should be selected and why?

Step 1: Arrange investments in increasing order of cost:

D	C	B	A
$500	$600	$800	$1000

SOLUTION 1 for Step 2
Step 2: Calculate NPV for each alternative with MARR=8%

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D)

$130

$0

$500
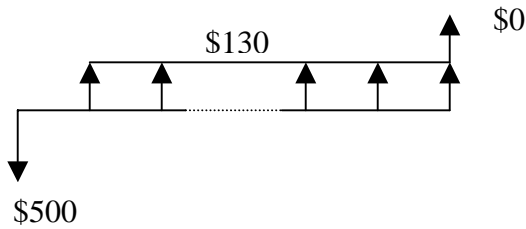
NPV = 30(P/A, 8%, 8) + $0(P/F, 8%, 8) =-500+130*5.747=247.11

C)

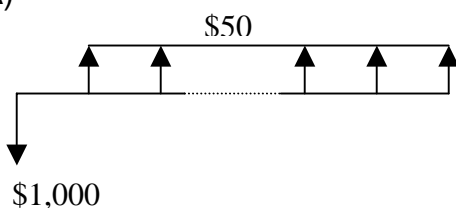
$92

$500

$600
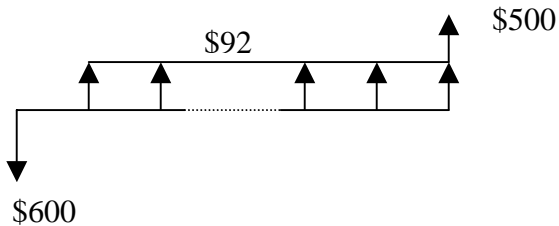
NPV = -$600 + $92(P/A, 8%, 8) + $500(P/F, 8%, 8) =-600+92*5.747+500*0.5403
     =-600+528.72+270.15=198.87

B)

$113

$500

$800
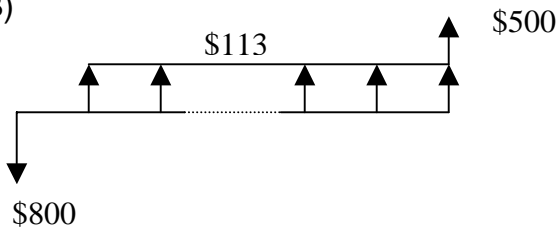
NPV = -$800 + $113(P/A,8%, 8) + $500(P/F, 8%, 8) =-800+113*5.747+500*0.5403
     =-800+649.41+270.15=119.56

A)

$50

$1,000

NPV = 0 = -$1,000 + $50(P/A, 8%, 8)=-1000+50*5.747=-712.65

Step 3: Discard any investment where NPV<0. A is the only investment where NPV<0, so it is rejected. B, C, and D must be further evaluated.

Step 4: Calculate the IRR of each *incremental* investment

C-D:

IRR:
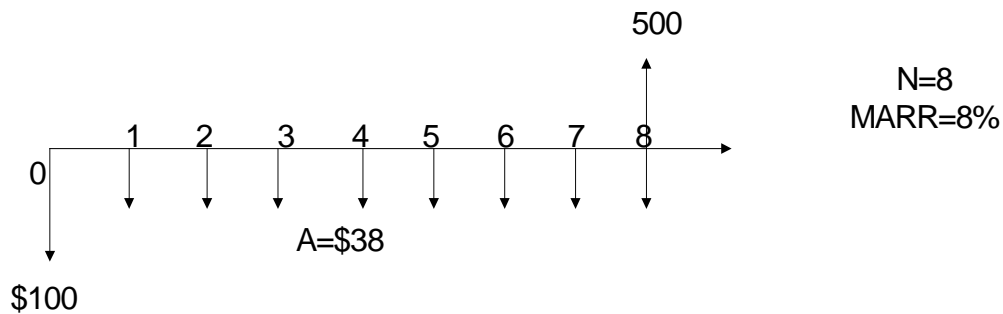
4% NPV=-100-38(P/A, I%,8)+500(P/F,I%,8)=-100-38*6.7326+500*0.73069=10.35

5% NPV=-100-38(P/A, I%,8)+500(P/F,I%,8)= -100-38*6.2097+500*0.62742=-22.27
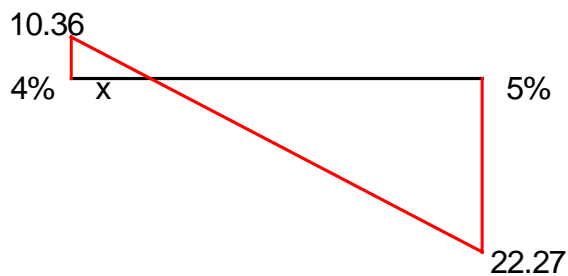
X/10.36=(5%-4%-x)/22.27, x=0.32%
IRR(C-D)=4%+0.32%=4.32%
IRR(C-D)<MARR➔choose D

B-D:

IRR:
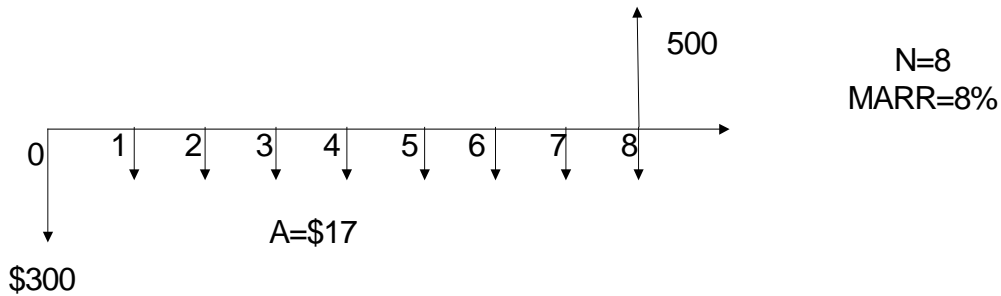
2% NPV=-300-17(P/A, I%,8)+500(P/F,I%,8) =-300-17*7.3252+500*0.8535
       =-300-124.53+426.75=2.22

3% NPV=--300-17(P/A, I%,8) +500(P/F,I%,8)= -300-17*7.0195+500*0.78941
       =-300-119.33+394.71=-24.62
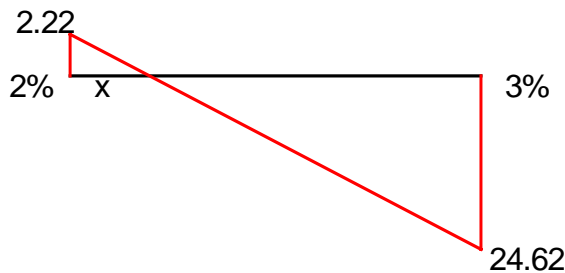
X/2.22=(3%-2%-x)/24.62, x=0.08%

IRR(B-D)=2.08%

IRR(B-D)<MARR➜choose D

Because neither C nor B is worth the additional incremental investment, D is the best alternative. Put another way, D is the largest investment that meets the IRR hurdle. Choose Option D.
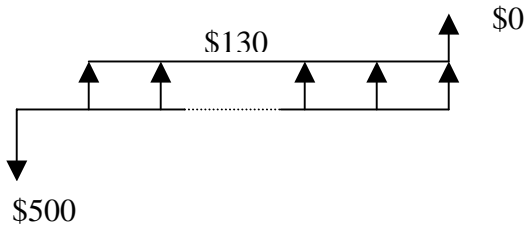
(b) Considering only alternatives B and D, at what interest rate I, would your answer to part (a) change?
IRR(B-D)=2.08%

SOLUTION 2 for step 2:
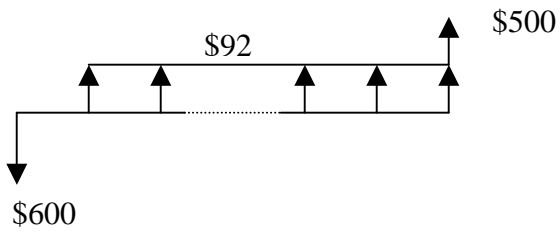Step 2: Calculate the IRR of each alternative (approximately +/- 1%)

D)

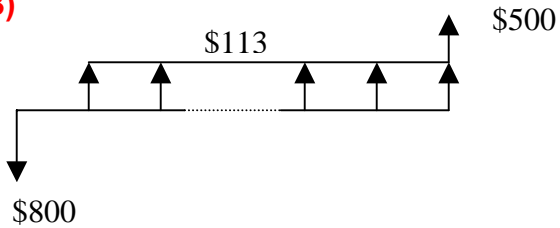$$NPV = 0 = -\$500 + \$130(P/A, i\%, 8) + \$0(P/F, i\%, 8)$$

$$IRR_D = 20\%$$

C)

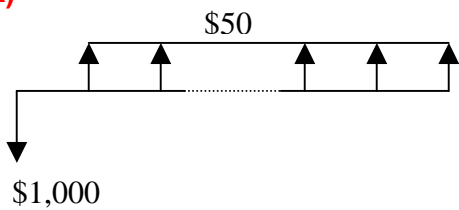$$NPV = 0 = -\$600 + \$92(P/A, i\%, 8) + \$500(P/F, i\%, 8)$$

$$IRR_C = 14\%$$

B)

$$NPV = 0 = -\$800 + \$113(P/A, i\%, 8) + \$500(P/F, i\%, 8)$$
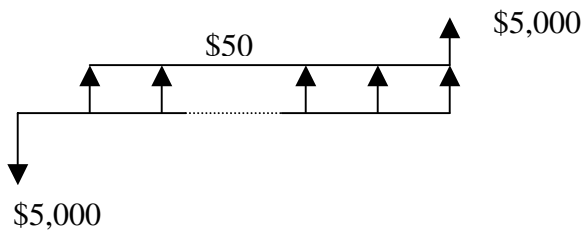
$$IRR_B = 11\%$$

A)

NPV = 0 = -$1,000 + $50(P/A, i%, 8)

Question #6   [20 points]

You are considering buying a government bond, which has the face value of $5,000 and pays
$50 quarterly for 5 years.

(a) **What are the nominal and effective interest rates of this government bond?**

**the investment pays $50 per quarter, or $200 per year. The nominal yearly rate =
$200/$5,000 = 4%**

$i_{eff} = [1 + (r/m)]^m - 1$

$i_{eff} = [1 + (0.040/4)]^4 - 1 = 4.06\%$

(b) **You bought this bond. And after 3 years, the new annual nominal interest rates
have increased by 2% over the original annual nominal rate. How much is the bond
worth at the end of year 3?**
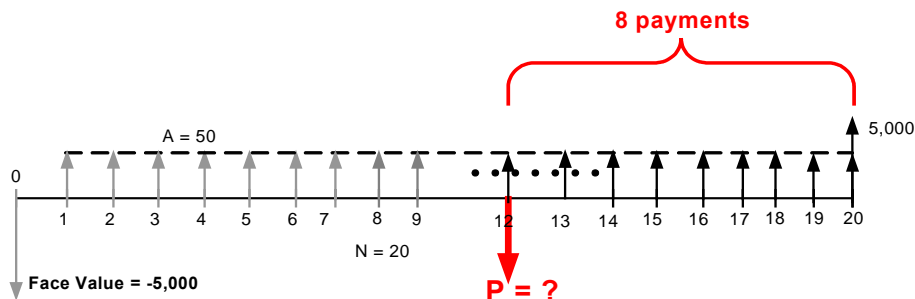
Solution 1:

- The new annual nominal interest rate is 4 + 2 = **6%**

P_3 = 50 (P/A, 1.5%, 8) + 5,000 (P/F, 1.5%, 8)
   = 50 * 7.4853 + 5,000 * 0.8875 = <u>$4,810.27</u>

Solution 2:

The new annual nominal interest rate is 4 + 2 = 6%
i_{eff} = [1 + (0.060/4)]^4 − 1 = 6.01%
P_3 = 200 (P/A, 6.01%, 2) + 5,000 (P/F, 6.01%, 2)
       =200 * 1.8334 + 5,000 * 0.8900=366.68+4450=<u>4816.68</u>