PROBLEM 2-1

Given		Solution:
Discount rate	10%	

	Cash Flow	Year (s)	Present Value
a.	$500	5	$ 310
b.	$500	5	$ 1,895
c.	$500	50	$ 4,957
d.	$500	100	$ 5,000

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Solution Legend
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PROBLEM 2-2

Solution Legend	
	= Value given in problem
	= Formula/Calculation/Ana
	= Qualitative analysis or S
	= Goal Seek or Solver cell
	= Crystal Ball Input
	= Crystal Ball Output

Given

a.

Initial investment	$ 4,000,000.00
Annual Cash Flow	500,000.00
Project Life	10

Solution:

IRR = 4.28%

Given

b.

Year	Cash Flow
0	$ (4,000,000.00)
1	500,000.00
2	500,000.00
3	500,000.00
4	500,000.00
5	300,000.00
6	500,000.00
7	500,000.00
8	500,000.00
9	500,000.00
10	500,000.00
11	500,000.00
12	500,000.00
13	500,000.00
14	500,000.00

Solution:

IRR = 7.94%


lysis required
hort answer required

PROBLEM 2-3

Given

Growth rate for years 1-5	5%	
EBIT (1)	$ 100,000	
CAPEX for year 0	$ 400,000	
CAPEX for years 1-5	-	per year over and above annual depreciation expense
Depreciation Expense	$ 80,000	
Tax rate	30%	
Debt Retirements for years 1-5	$ 15,000	per year
New working capital for years 1-5	20%	of new EBIT

Solution Legend

	= Value given in problem
	= Formula/Calculation/Analysis required
	= Qualitative analysis or Short answer required
	= Goal Seek or Solver cell
	= Crystal Ball Input
	= Crystal Ball Output

Solution

	Year 0	1	2	3	4	5
EBIT		$ 100,000	$ 105,000	$ 110,250	$ 115,763	$ 121,551
Taxes		(30,000)	(31,500)	(33,075)	(34,729)	(36,465)
NOPAT		$ 70,000	$ 73,500	$ 77,175	$ 81,034	$ 85,085
Plus: Depreciation		80,000	80,000	80,000	80,000	80,000
Less: CAPEX	(400,000)	(80,000)	(80,000)	(80,000)	(80,000)	(80,000)
Less: New working capital needs **(Note 1)**	(20,000)	(1,000)	(1,050)	(1,103)	(1,158)	24,310
Plus: Salvage value of the fixed assets in year 5 (assumed to equal its book value) **(Note 2)**						400,000
Firm Free Cash Flow (FFCF)	**$ (420,000)**	**$ 69,000**	**$ 72,450**	**$ 76,073**	**$ 79,876**	**$ 509,396**
Net Fixed Assets (beginning of the year)	$ -	$ 400,000	$ 400,000	$ 400,000	$ 400,000	$ 400,000
Plus: CAPEX	400,000	80,000	80,000	80,000	80,000	80,000
Less: Depreciation Expense for the Year	-	(80,000)	(80,000)	(80,000)	(80,000)	(80,000)
Net Fixed Assets (end of the year)	**$ 400,000**	**$ 400,000**	**$ 400,000**	**$ 400,000**	**$ 400,000**	**$ 400,000**

Note 1: At the end of year 5 the total investment in working capital is returned to the firm in an amount equal to its book value.

Note 2: We define the terminal value of the project's fixed assets as the net fixed asset

PROBLEM 2.4

Note: The text incorrectly labeled the column headings for 2009 and 2010. This solution has corrected the labels.

Given

TCM Petroleum	Dec-09	Dec-10
Sales	$12,211.00	$ 13,368.00
Cost of Goods Sold	(9,755.00)	(10,591.00)
Gross Profit	2,456.00	2,777.00
Selling, General, & Administrative Expense	(704.00)	(698.00)
Operating Income Before Deprec.	1,752.00	2,079.00
Depreciation, Depletion, & Amortization	(794.00)	(871.00)
Operating Profit	958.00	1,208.00
Interest Expense	(265.00)	(295.00)
Non-Operating Income/Expense	139.00	151.00
Special Items	20.00	-
Pretax Income	852.00	1,064.00
Total Income Taxes	(340.80)	(425.60)
Net Income	$ 511.20	$ 638.40
Purchase of PP&E (CAPEX)	875	1,322
Increase in Net Working Capital	102	(430)
TCM's average tax rate	40%	40%

Solution Legend

	= Value given in problem
	= Formula/Calculation/Analysis required
	= Qualitative analysis or Short answer required
	= Goal Seek or Solver cell
	= Crystal Ball Input
	= Crystal Ball Output

CAPEX estimated as follows:
CAPEX = NET PP&E ending + Depreciation - NET PP&E
Increase in Net Working Capital estimated as follows:
NWC 2010 - NWC 2009

Solution

a. FCF Calculations for 2009-2010

	Year 2009	Year 2010
EBIT	$ 958	$ 1,208
EBIT(1-T) = NOPAT	575	725
Plus: Depreciation Expense	(794)	(871)
Less: CAPEX	(875)	(1,322)
Less: Working Capital Investment	(102)	430
Firm Free Cash Flow	**$ (1,196)**	**$ (1,038)**

b. Estimated FCF for 2011-2015

	Year 2010	2011	2012	2013	2014	2015
EBIT (Growing at 10% per year)	$ 1,208	$ 1,329	$ 1,462	$ 1,608	$ 1,769	$ 1,945
EBIT(1-.40) = NOPAT	725	797	877	965	1,061	1,167
Plus: Depreciation Expense	871	1,003	1,103	1,203	1,303	1,403
Less: CAPEX	(1,322)	(1,000)	(1,000)	(1,000)	(1,000)	(1,000)
Less: Working Capital Investment	430	(100)	(100)	(100)	(100)	(100)
Firm Free Cash Flow	**$ (1,038)**	**$ 700**	**$ 880**	**$ 1,068**	**$ 1,264**	**$ 1,470**

PROBLEM 2-5

Given		
Incremental revenue growth for years 1-	10.0%	
Revenues (current)	$ 9,000,000	
Incremental Revenues	$ 900,000	
CAPEX for year 0	$ 1,860,000	
CAPEX for years 1-5	$ -	
Maintenance expense for years 1-5	$ 120,000	per year
Depreciable life of ovens	5	years
Depreciation Expense	$ 372,000	
Tax rate	30%	
Discount Rate	9%	

Solution

	Year 0	1	2	3
Incremental Revenues		$ 900,000	$ 900,000	$ 900,000
Incremental Depreciation		(372,000)	(372,000)	(372,000)
Incremental maintenance expense		(120,000)	(120,000)	(120,000)
Incremnental EBIT		$ 408,000	$ 408,000	$ 408,000
Taxes		(122,400)	(122,400)	(122,400)
NOPAT		$ 285,600	$ 285,600	$ 285,600
Plus: Depreciation		372,000	372,000	372,000
Less: CAPEX	(1,860,000)	-	-	-
Less: New working capital needs		-	-	-
Project Free Cash Flow (PFCF)	**$ (1,860,000)**	**$ 657,600**	**$ 657,600**	**$ 657,600**

Net Present Value	$ 697,835
Internal Rate of Return	23%

Solution Legend
= Value given in problem
= Formula/Calculation/Analysis required
= Qualitative analysis or Short answer required
= Goal Seek or Solver cell
= Crystal Ball Input
= Crystal Ball Output

	4		5
$	900,000	$	900,000
	(372,000)		(372,000)
	(120,000)		(120,000)
$	408,000	$	408,000
	(122,400)		(122,400)
$	285,600	$	285,600
	372,000		372,000
	-		-
	-		-
$	**657,600**	**$**	**657,600**

PROBLEM 2-6

Given	
Initial Investment in software	$ (55,000)
Technician training cost	$ (10,000)
Hourly Rate	25
Tax Rate	30%
Discount Rate	9%
Additional Investment per year for software upgrades	$ 15,000
% Reduction in hours of technician time for installation	25%
Total hours of installation per year	6,000

Sol	
	= Value given i
	= Formula/Calc
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	= Crystal Ball C

Solution

		Year 1	Year 2	Year 3
Year	**0**			
Rev		$ 37,500	$ 37,500	$ 37,500
Upgrade Expense		(15,000)	(15,000)	(15,000)
EBIT		$ 22,500	$ 22,500	$ 22,500
Less: Taxes		(6,750)	(6,750)	(6,750)
NOPAT		$ 15,750	$ 15,750	$ 15,750
Plus: DEP		-	-	-
Less: CAPEX	(65,000)	-	-	-
Project Free Cash Flows (PFCF)	**$ (65,000)**	**$ 15,750**	**$ 15,750**	**$ 15,750**

NPV	$ (3,738)
IRR	7%
Payback Period	4.13

ution Legend

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culation/Analysis required
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Solver cell
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Output

	4		5
$	37,500	$	37,500
	(15,000)		(15,000)
$	22,500	$	22,500
	(6,750)		(6,750)
$	15,750	$	15,750
	-		-
	-		-
$	**15,750**	**$**	**15,750**

PROBLEM 2-7

Given		
Investment (CAPEX in year 0)	$ (600,000)	
Depreciable life	5	years
Initial units for year 1	100,000	
Revenue per unit	1.50	
Growth Rate per year in units rec	25%	
Tax Rate	30%	
Disposal cost per unit	$ 0.20	
Required Return	15%	

Solution: Part a

	Year 0	1	2	3
Units recycled		100,000	125,000	156,250
Revenues		$ 150,000	$ 187,500	$ 234,375
Depreciation Expense		(120,000)	(120,000)	(120,000)
EBIT		$ 30,000	$ 67,500	$ 114,375
Less: Taxes		(9,000)	(20,250)	(34,313)
NOPAT		$ 21,000	$ 47,250	$ 80,063
Plus: Depreciation expense		120,000	120,000	120,000
Less: CAPEX	(600,000)	-	-	-
Project Free Cash Flows	**$ (600,000)**	**$ 141,000**	**$ 167,250**	**$ 200,063**

Solution: Part b

NPV	63,804
IRR	19%

Solution: Part c

	Year 0	1	2	3
Units recycled		75,000	93,750	117,188
Revenues		$ 112,500	$ 140,625	$ 175,781
Depreciation Expense		(120,000)	(120,000)	(120,000)
EBIT		$ (7,500)	$ 20,625	$ 55,781
Less: Taxes		2,250	(6,188)	(16,734)
NOPAT		$ (5,250)	$ 47,250	$ 80,063
Plus: Depreciation expense		120,000	120,000	120,000
Less: CAPEX	(600,000)	-	-	-
Project Free Cash Flows	**$ (600,000)**	**$ 114,750**	**$ 167,250**	**$ 200,063**

NPV	$ 40,978
IRR	17%

The investment still looks like a good one with a positive NPV and an IRR that exceeds the required retu

Solution: Part d

	Year 0	1	2	3

Units recycled		100,000	125,000	156,250
Revenues		$ 150,000	$ 187,500	$ 234,375
Disposal cost		(20,000)	(25,000)	(31,250)
Depreciation Expense		(120,000)	(120,000)	(120,000)
EBIT		$ 10,000	$ 42,500	$ 83,125
Less: Taxes		(3,000)	(12,750)	(24,938)
NOPAT		$ 7,000	$ 47,250	$ 80,063
Plus: Depreciation expense		120,000	120,000	120,000
Less: CAPEX	(600,000)	-	-	-
Project Free Cash Flows	**$ (600,000)**	**$ 127,000**	**$ 167,250**	**$ 200,063**
NPV	51,630			
IRR	18%			

Yes, even including the $0.20 per unit in disposal costs the project appears to be worthwhile.

Solution Legend

= Value given in problem
= Formula/Calculation/Analysis required
= Qualitative analysis or Short answer required
= Goal Seek or Solver cell
= Crystal Ball Input
= Crystal Ball Output

	4		5
	195,313		244,141
$	292,969	$	366,211
	(120,000)		(120,000)
$	172,969	$	246,211
	(51,891)		(73,863)
$	121,078	$	172,348
	120,000		120,000
	-		-
$	**241,078**	**$**	**292,348**

	4		5
	146,484		183,105
$	219,727	$	274,658
	(120,000)		(120,000)
$	99,727	$	154,658
	(29,918)		(46,397)
$	121,078	$	172,348
	120,000		120,000
	-		-
$	**241,078**	**$**	**292,348**

rn.

4	5

	195,313		244,141
$	292,969	$	366,211
	(39,063)		(48,828)
	(120,000)		(120,000)
$	133,906	$	197,383
	(40,172)		(59,215)
$	121,078	$	172,348
	120,000		120,000
	-		-
$	**241,078**	**$**	**292,348**

PROBLEM 2-8

Given		
Cost of Tester	$ 250,000	
Installation and training costs	$ 10,000	
CAPEX (Year 5)	$ 100,000	
Salvage value	$ 5,000	
Depreciation	Straight Line	
Project Life	10	years
Tax rate	30%	
Cost of Capital	12%	

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= Goal See
= Crystal B
= Crystal B

Exhibit P2-8.1

a.

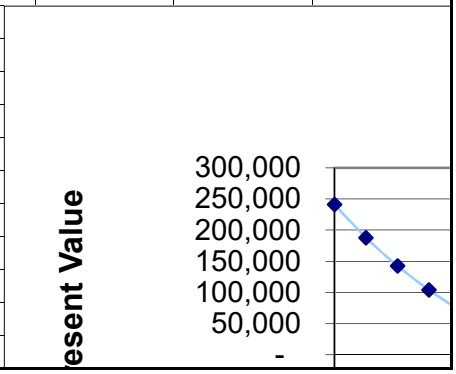
	0	1	2	3	4
Investment Outlays					
Equipment purchases	$ (250,000)				
Installation costs	(10,000)				
Initial Outlay	$ (260,000)				
After-tax salvage value					
Free Cash Flows					
Operating Expense Savings		70,000	70,000	70,000	70,000
Less: Depreciation Expense		(26,000)	(26,000)	(26,000)	(26,000)
Additional Operating Income		$ 44,000	$ 44,000	$ 44,000	$ 44,000
Less: Taxes		(13,200)	(13,200)	(13,200)	(13,200)
NOPAT		$ 30,800	$ 30,800	$ 30,800	$ 30,800
Plus: Depreciation		26,000	26,000	26,000	26,000
Less: CAPEX	(260,000)	-	-	-	-
Free Cash Flow	**$ (260,000)**	**$ 56,800**	**$ 56,800**	**$ 56,800**	**$ 56,800**

b.

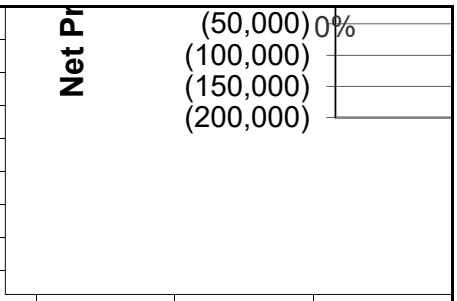
Net Present Value	$ 17,590
Internal Rate of Return	13.61%

NPV Profile

Discount Rates	NPV
0%	241,500
2%	188,124
4%	142,825
6%	104,168
8%	71,000
10%	42,391
12%	17,590
14%	(4,019)
16%	(22,937)
18%	(39,577)



20%	(54,279)
22%	(67,327)
24%	(78,955)
26%	(89,362)
28%	(98,711)
30%	(107,144)
32%	(114,777)
34%	(121,710)
36%	(128,030)
38%	(133,810)
40%	(139,111)



a. Yes, the project is a good one for Gentech. The project's NPV is positive and the IRR is greater th
suggesting that the project is expected to create value for the firm.

b. The NPV profile describes the relationship between the computed NPV and the discount rate. As
positive for all discount rates above the IRR of 13.61% and is negative for all higher discount rates. C
analyzed there is but one value for the IRR. There was the prospect that there might be multiple valu
change sign more than one time. In fact, the change from negative to positive in year 1, positive to n

c. The interest and principal costs associated with debt financing do not affect the project's FCF. Ho
project's required rate of return as we will discuss later in Chapter 4. In other words, the calculation o
we have done it here, captures the effect of financing decisions in the required rate of return calculati

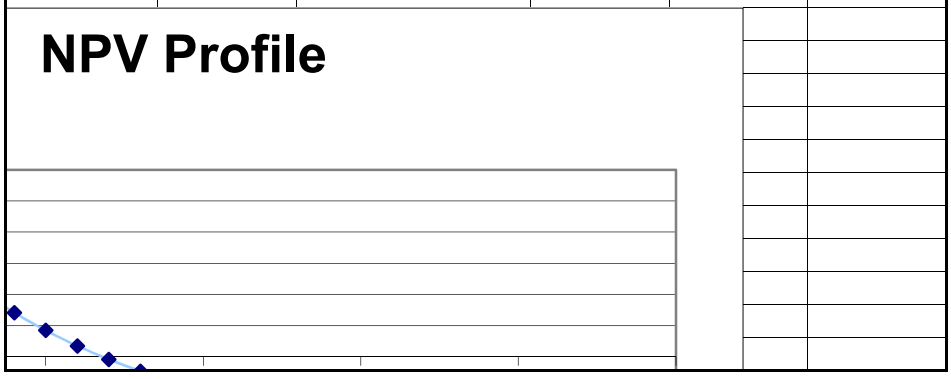
d. As we saw in the above calculation of FCF, there are multiple CAPEX estimates with one in year
change the project FCFs for the years in which they are made.

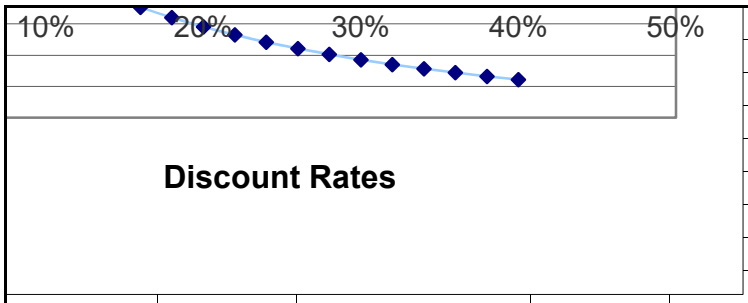
e. There are two basic sources of risk to any investment and they are relevant here. The first relates
this case they relate to savings in operating costs that may or may not equal the projected amounts.
into place the needed equipment. The analysis of these risks is discussed at length in Chapter 3 and
estimates may not prove accurate. We will use various types of sensitivity analysis to address the ris

Solution Legend

ven in problem	
Calculation/Analysis required	
ve analysis or Short answer required	
k or Solver cell	
all Input	
all Output	

Year					
5	6	7	8	9	10
$ (100,000)					
					3,500
70,000	70,000	70,000	70,000	70,000	70,000
(26,000)	(46,000)	(46,000)	(46,000)	(46,000)	(46,000)
$ 44,000	$ 24,000	$ 24,000	$ 24,000	$ 24,000	$ 24,000
(13,200)	(7,200)	(7,200)	(7,200)	(7,200)	(7,200)
$ 30,800	$ 16,800	$ 16,800	$ 16,800	$ 16,800	$ 16,800
26,000	46,000	46,000	46,000	46,000	46,000
(100,000)	-	-	-	-	-
$ (43,200)	**$ 62,800**	**$ 62,800**	**$ 62,800**	**$ 62,800**	**$ 66,300**





an the project's required rate of return

we see in the figure above, the NPV profile is
Consequently, over the range of discount rates
ues that satisfy the IRR since project cash flows
egative in year 5, and negative to positive in year 6.

owever, the use of debt financing does affec the
f the NPV calculated in the traditional manner as
on (not the FCFs).

0 and another in year 5. These cash expenditures

to the potential revenues from the investment. In
Second, there are the cost of acquiring and putting
focuses on considering the possibility that our
k issue.

PROBLEM 2-9

Given

Investment	$ (4,000,000)
Plant life	5
Salvage value	$ 400,000
Variable Cost %	45%
Fixed operating cost	$ 1,000,000
Tax rate	38%
Working capital	10%
Required Rate of Return	15%

Change in revenues

This is the solutio
solve for **part b.**
45% for the varia

Exhibit P2-9.1

	Year 0	Year 1	Year 2	Year 3
Sales volume		$ 1,000,000	$ 1,500,000	$ 3,000,000
Unit Price		2.00	2.00	2.50
Revenues		2,000,000	3,000,000	7,500,000
Variable Operating Costs		(900,000)	(1,350,000)	(3,375,000)
Fixed Operating Costs		(1,000,000)	(1,000,000)	(1,000,000)
Depreciation Expense		(800,000)	(800,000)	(800,000)
Net Operating Income		$ (700,000)	$ (150,000)	$ 2,325,000
Less: Taxes		266,000	57,000	(883,500)
NOPAT		$ (434,000)	$ (93,000)	$ 1,441,500
Plus: Depreciation		800,000	800,000	800,000
Less: CAPEX	(4,000,000)	-	-	-
Less: Working Capital	(200,000)	(100,000)	(450,000)	(125,000)
Free Cash Flow	**$ (4,200,000)**	**$ 266,000**	**$ 257,000**	**$ 2,116,500**

NPV	$ 419,435
IRR	18%

a. The project appears to create value in the amount of its NPV = $419,435 and should be accepted.

b. Increasing the variable costs to 55% changes the investment outcome dramatically. The NPV is nov

n to **part a**. of the problem. To
simply type in 55% in place of
ble cost %.

Solution Legend	
	= Value given in problem
	= Formula/Calculation/Analysis required
	= Qualitative analysis or Short answer required
	= Goal Seek or Solver cell
	= Crystal Ball Input
	= Crystal Ball Output

4	5
$ 3,500,000	$ 2,000,000
2.50	2.50
8,750,000	5,000,000
(3,937,500)	(2,250,000)
(1,000,000)	(1,000,000)
(800,000)	(800,000)
$ 3,012,500	$ 950,000
(1,144,750)	(361,000)
$ 1,867,750	$ 589,000
800,000	800,000
-	248,000
375,000	500,000
$ 3,042,750	**$ 2,137,000**

negative at ($599,080).

PROBLEM 2-10

Given	
Machine cost	$ 760,000
Depreciation	Straight line
Annual cost savings	250,000
Machine life	5
Salvage value (before tax)	-
Tax rate	30%
Discount rate	9%

The solution below corresponds to **parts a** and **b**. of the problem. To solve for part **c**. simply substitute $200,000 for the annual cost savings.

Solution

		Year			
Analysis of Cash Flows	**0**	**1**	**2**	**3**	**4**
Additional revenues (cost savings)		250,000	250,000	250,000	250,000
Less: Depreciation expense		(152,000)	(152,000)	(152,000)	(152,000)
Additional EBIT		$ 98,000	$ 98,000	$ 98,000	$ 98,000
Less: Taxes		(29,400)	(29,400)	(29,400)	(29,400)
NOPAT		$ 68,600	$ 68,600	$ 68,600	$ 68,600
Plus: Depreciation		152,000	152,000	152,000	152,000
Less: Capex	(760,000)	-	-	-	-
Less: Change in NWC	-	-	-	-	-
Project Free Cash Flow	**$ (760,000)**	**$ 220,600**	**$ 220,600**	**$ 220,600**	**$ 220,600**
Assessment of Project Value					
NPV	$ 98,057.07				
IRR	13.85%				
Payback	3.45	years			

Problem 2-10

Solution Legend	
	= Value given in problem
	= Formula/Calculation/Analysis required
	= Qualitative analysis or Short answer required
	= Goal Seek or Solver cell
	= Crystal Ball Input
	= Crystal Ball Output

5	
250,000	
(152,000)	
$ 98,000	
(29,400)	
$ 68,600	
152,000	
-	
-	
$ 220,600	