Corporate Finance Core Principles and Applications 7th edition Ross Solutions Manual

SKU: 9781264413119-SOLUTIONS

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Chapter 2
FINANCIAL STATEMENTS AND CASH FLOW

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CHAPTER WEBSITES

Section	*Web Address*
2.1	Yahoo Finance Website: finance.yahoo.com CNN Money Website: money.cnn.com SEC Website: www.sec.gov FASB Website: www.fasb.org IFRS Website: www.ifrs.org
2.3	Income tax history: www.tinyurl.com/y3rzqcx2 IRS Website: www.irs.gov TBEXAM.COM
End-of-chapter material	Yahoo Finance Website: finance.yahoo.com Coca-Cola Website: www.coca-cola.com/ Intuit Website: www.intuit.com

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End of Chapter Solutions
Corporate Finance: Principles and Applications
7th edition
Ross, Westerfield, Jaffe, and Jordan

XX-XX-2022

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Prepared by

Brad Jordan
University of Florida

Joe Smolira
Belmont University

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CHAPTER 1
INTRODUCTION TO CORPORATE FINANCE

Answers to Concept Questions

1. The three basic forms are sole proprietorships, partnerships, and corporations. Some disadvantages of sole proprietorships and partnerships are unlimited liability, limited life, difficulty in transferring ownership, and hard to raise capital funds. Some advantages are simplicity, less regulation, the owners are also the managers, and sometimes personal tax rates are better than corporate tax rates. The primary disadvantage of the corporate form is the double taxation to shareholders on distributed earnings and dividends. Some advantages include the following: limited liability, ease of transferability, ability to raise capital, and unlimited life. When a business is started, most take the form of a sole proprietorship or partnership because of the relative simplicity of starting these forms of businesses.

2. To maximize the current market value (share price) of the equity of the firm (whether it's publicly traded or not).

3. In the corporate form of ownership, the shareholders are the owners of the firm. The shareholders elect the directors of the corporation, who in turn appoint the firm's management. This separation of ownership from control in the corporate form of organization is what causes agency problems to exist. Management may act in its own or someone else's best interests, rather than those of the shareholders. If such events occur, they may contradict the goal of maximizing the share price of the equity of the firm.

4. Such organizations frequently pursue social or political missions, so many different goals are conceivable. One goal that is often cited is revenue minimization; that is, provide whatever goods and services are offered at the lowest possible cost to society. A better approach might be to observe that even a not-for-profit business has equity. Thus, one answer is that the appropriate goal is to maximize the value of the equity.

5. Presumably, the current stock value reflects the risk, timing, and magnitude of all future cash flows, both short term *and* long term. If this is correct, then the statement is false.

6. An argument can be made either way. At the one extreme, we could argue that in a market economy, all these things are priced. Thus, there is an optimal level of, for example, unethical and/or illegal behavior, and the framework of stock valuation explicitly includes these. At the other extreme, we could argue that these are noneconomic phenomena and are best handled through the political process. A classic (and highly relevant) thought question that illustrates this debate goes something like this: "A firm has estimated that the cost of improving the safety of one of its products is $30 million. However, the firm believes that improving the safety of the product will only save $20 million in product liability claims. What should the firm do?"

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7. The goal will be the same, but the best course of action toward that goal may be different because of differing social, political, and economic institutions.

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8. The goal of management should be to maximize the share price for the current shareholders. If management believes that it can improve the profitability of the firm so that the share price will exceed $35, then they should fight the offer from the outside company. If management believes that this bidder or other unidentified bidders will actually pay more than $35 per share to acquire the company, then they should still fight the offer. However, if the current management cannot increase the value of the firm beyond the bid price, and no other higher bids come in, then management is not acting in the interests of the shareholders by fighting the offer. Since current managers often lose their jobs when the corporation is acquired, poorly monitored managers have an incentive to fight corporate takeovers in situations such as this.

9. We would expect agency problems to be less severe in other countries, primarily due to the relatively small percentage of individual ownership. Fewer individual owners should reduce the number of diverse opinions concerning corporate goals. The high percentage of institutional ownership might lead to a higher degree of agreement between owners and managers on decisions concerning risky projects. In addition, institutions may be better able to implement effective monitoring mechanisms on managers than can individual owners, based on the institutions' deeper resources and experiences with their own management. The increase in institutional ownership of stock in the United States and the growing activism of these large shareholder groups may lead to a reduction in agency problems for U.S. corporations and a more efficient market for corporate control.

10. How much is too much? Who is worth more, Larry Ellison or Tiger Woods? The simplest answer is that there is a market for executives just as there is for all types of labor. Executive compensation is the price that clears the market. The same is true for athletes and performers. Having said that, one aspect of executive compensation deserves comment. A primary reason that executive compensation has grown so dramatically is that companies have increasingly moved to stock-based compensation. Such movement is obviously consistent with the attempt to better align stockholder and management interests. When stock prices soar, management cleans up. It is sometimes argued that much of this reward is due to rising stock prices in general, not managerial performance. Perhaps in the future, executive compensation will be designed to reward only differential performance, that is, stock price increases in excess of general market increases.

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CHAPTER 2
FINANCIAL STATEMENTS AND CASH FLOW

Answers to Concept Questions

1. Liquidity measures how quickly and easily an asset can be converted to cash without significant loss in value. It's desirable for firms to have high liquidity so that they have a large factor of safety in meeting short-term creditor demands. However, since liquidity also has an opportunity cost associated with it, namely that higher returns can generally be found by investing the cash into productive assets, low liquidity levels are also desirable to the firm. It's up to the firm's financial management staff to find a reasonable compromise between these opposing needs

2. The recognition and matching principles in financial accounting call for revenues, and the costs associated with producing those revenues, to be "booked" when the revenue process is essentially complete, not necessarily when the cash is collected or bills are paid. Note that this way is not necessarily correct; it's the way accountants have chosen to do it.

3. The bottom-line number shows the change in the cash balance on the balance sheet. As such, it is not a useful number for analyzing a company.

4. The major difference is the treatment of interest expense. The accounting statement of cash flows treats interest as an operating cash flow, while the financial statement of cash flows treats interest as a financing cash flow. The logic of the accounting statement of cash flows is that since interest appears on the income statement, which shows the operations for the period, it is an operating cash flow. In reality, interest is a financing expense, which results from the company's choice of debt/equity. We will have more to say about this in a later chapter. When comparing the two cash flow statements, the financial statement of cash flows is a more appropriate measure of the company's operating performance because of its treatment of interest.

5. Market values can never be negative. Imagine a share of stock selling for −$20. This would mean that if you placed an order for 100 shares, you would get the stock along with a check for $2,000. How many shares do you want to buy? More generally, because of corporate and individual bankruptcy laws, net worth for a person or a corporation cannot be negative, implying that liabilities cannot exceed assets in market value.

6. For a successful company that is rapidly expanding, for example, capital outlays will be large, possibly leading to negative cash flow from assets. In general, what matters is whether the money is spent productively, not whether cash flow from assets is positive or negative.

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7. It's probably not a good sign for an established company, but it would be fairly ordinary for a start-up, so it depends.

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8. For example, if a company were to become more efficient in inventory management, the amount of inventory needed would decline. The same might be true if it becomes better at collecting its receivables. In general, anything that leads to a decline in ending NWC relative to beginning NWC would have this effect. Negative net capital spending would mean more long-lived assets were liquidated than purchased.

9. If a company raises more money from selling stock than it pays in dividends in a particular period, its cash flow to stockholders will be negative. If a company borrows more than it pays in interest and principal, its cash flow to creditors will be negative.

10. The adjustments were purely accounting changes; they had no cash flow or market value consequences.

Solutions to Questions and Problems

NOTE: All end-of-chapter problems were solved using a spreadsheet. Many problems require multiple steps. Due to space and readability constraints, when these intermediate steps are included in this solutions manual, rounding may appear to have occurred. However, the final answer for each problem is found without rounding during any step in the problem.

Basic

1. To find owners' equity, we must construct a balance sheet as follows:

Balance Sheet

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CA	$ 5,400	CL	$ 4,000
NFA	28,100	LTD	10600
		OE	??
TA	$33,500	TL & OE	$33,500

We know that total liabilities and owners' equity (TL & OE) must equal total assets of $33,500. We also know that TL & OE is equal to current liabilities plus long-term debt plus owners' equity, so owners' equity is:

Owners' equity = $33,500 − 10,600 − 4,100
Owners' equity = $18,800

And net working capital (NWC) is:

NWC = CA − CL
NWC = $5,400 − 4,100
NWC = $1,300

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2. The income statement for the company is:

Income Statement	
Sales	$538,610
Costs	297,180
Depreciation	43,400
EBIT	$198,030
Interest	20,600
EBT	$177,430
Taxes (21%)	37,260
Net income	$140,170

One equation for net income is:

Net income = Dividends + Addition to retained earnings

Rearranging, we get:

Addition to retained earnings = Net income − Dividends
Addition to retained earnings = $140,170 − 34,000
Addition to retained earnings = $106,170

3. To find the book value of current assets, we use: NWC = Current assets − Current liabilities. Rearranging to solve for current assets, we get:

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CA = NWC + CL
CA = $275,000 + 945,000
CA = $1,220,000

The market value of current assets and fixed assets is given, so:

Book value CA = $1,220,000 Market value NWC = $1,250,000
Book value NFA = 3,500,000 Market value NFA = 5,400,000
Book value assets = $4,720,000 Total = $6,650,000

4. Taxes = .10($10,275) + .12($41,775 − 10,275) + .22($89,075 − 41,775) + .24($170,050 − 89,075)
+ .32($189,000 − 170,050)
Taxes = $40,711.50

The average tax rate is the total tax paid divided by taxable income, so:

Average tax rate = $40,711.50 / $189,000
Average tax rate = .2154 or 21.54%

The marginal tax rate is the tax rate on the next $1 of earnings, so the marginal tax rate is 32%.

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5. To calculate OCF, we first need the income statement:

Income Statement	
Sales	$49,800
Costs	23,700
Depreciation	2,300
EBIT	$23,800
Interest	1,800
Taxable income	$22,000
Taxes (22%)	4,840
Net income	$17,160

OCF = EBIT + Depreciation − Taxes
OCF = $23,800 + 2,300 − 4,840
OCF = $21,260

6. The net capital spending is the increase in fixed assets, plus depreciation, so:

$$\text{Net capital spending} = \text{NFA}_{\text{end}} - \text{NFA}_{\text{beg}} + \text{Depreciation}$$

Net capital spending = $4,750,000 − 3,940,000 + 435,000
Net capital spending = $1,245,000

7. The long-term debt account will increase by $8.7 million, the amount of the new long-term debt issue. Since the company sold 3 million new shares of stock with a $1 par value, the common stock account will increase by $3 million. The capital surplus account will increase by $16.5 million, the value of the new stock sold above its par value. Since the company had a net income of $11.55 million, and paid $5.3 million in dividends, the addition to retained earnings was $6.25 million, which will increase the accumulated retained earnings account. So, the new long-term debt and stockholders' equity portion of the balance sheet will be:

Long-term debt	$ 35,200,000
Total long-term debt	$ 35,200,000
Shareholders' equity	
Preferred stock	$ 1,430,000
Common stock ($1 par value)	9,435,000
Capital surplus	46,100,000
Accumulated retained earnings	49,450,000
Total equity	$ 106,415,000

8. The cash flow to creditors is the interest paid minus the change in long-term debt, so:

Cash flow to creditors = Interest paid − Net new borrowing
$$\text{Cash flow to creditors} = \$175{,}000 - \left(\text{LTD}_{\text{end}} - \text{LTD}_{\text{beg}}\right)$$

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Cash flow to creditors = $175,000 − ($2,450,000 − 2,340,000)
Cash flow to creditors = $65,000

9. The cash flow to stockholders is the dividends paid minus any new equity purchased by shareholders, so:

Cash flow to stockholders = Dividends paid − Net new equity
Cash flow to stockholders = $215,000 − $\left(\left[\text{Common}_{end} + \text{APIS}_{end}\right] - \left[\text{Common}_{beg} + \text{APIS}_{beg}\right]\right)$
Cash flow to stockholders = $215,000 − ([$493,000 + 5,125,000] − [$479,000 + 4,816,000])
Cash flow to stockholders = −$108,000

Note: APIS is the additional paid-in surplus.

10. We know that the cash flow from assets must be equal to the cash flow to creditors plus the cash flow to stockholders, so:

Cash flow from assets = Cash flow to creditors + Cash flow to stockholders
Cash flow from assets = $65,000 − 108,000
Cash flow from assets = −$43,000

Now, we can use the relationship between the cash flow from assets and the operating cash flow, change in net working capital, and capital spending to find the operating cash flow. Doing so, we find:

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Cash flow from assets = OCF − Change in NWC − Net capital spending
−$43,000 = OCF − (−$49,000) − 550,000
Operating cash flow = $458,000

Intermediate

11.

a. The accounting statement of cash flows explains the change in cash during the year. The accounting statement of cash flows will be:

Statement of Cash Flows

Operations	
Net income	$221
Depreciation	98
Changes in other current assets	−11
Change in accounts payable	11
Total cash flow from operations	$319
Investing activities	
Acquisition of fixed assets	−$265
Total cash flow from investing activities	−$265

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Financing activities	
Proceeds of long-term debt	$24
Dividends	−65
Total cash flow from financing activities	−$41
Change in cash (on balance sheet)	$ 13

b. The change in net working capital is the ending net working capital minus the beginning net working capital, so:

$$\begin{aligned}\text{Change in NWC} &= \text{NWC}_{\text{end}} - \text{NWC}_{\text{beg}} \\ &= \left(\text{CA}_{\text{end}} - \text{CL}_{\text{end}}\right) - \left(\text{CA}_{\text{beg}} - \text{CL}_{\text{beg}}\right) \\ &= ([\$118 + 326] - 394) - ([\$105 + 315] - 383) \\ &= \$50 - 37 \\ &= \$13\end{aligned}$$

c. To find the cash flow generated by the firm's assets, we need the operating cash flow and the capital spending. Since there are no interest payments, EBIT is the same as EBT. Calculating each of these, we find:

Operating cash flow	
EBT	$288
Depreciation	98
–Taxes	67
Operating cash flow	$319

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Next, we will calculate the capital spending, which is:

Capital spending	
Ending fixed assets	$1,040
–Beginning fixed assets	873
Depreciation	98
Capital spending	$265

Now we can calculate the cash flow generated by the firm's assets, which is:

Cash flow from assets	
Operating cash flow	$319
–Capital spending	265
–Change in NWC	13

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Cash flow from assets	$41

12. To construct the cash flow identity, we will begin with cash flow from assets. Cash flow from assets is:

Cash flow from assets = OCF − Change in NWC − Net capital spending

So, the operating cash flow is:

OCF = EBIT + Depreciation − Taxes
OCF = $186,085 + 71,830 − 29,172
OCF = $228,743

Next, we will calculate the change in net working capital which is:

$$\text{Change in NWC} = \text{NWC}_{\text{end}} - \text{NWC}_{\text{beg}}$$

$$\text{Change in NWC} = (\text{CA}_{\text{end}} - \text{CL end}) - (\text{CA}_{\text{beg}} - \text{CL beg})$$

Change in NWC = ($71,588 − 40,597) − ($61,587 − 31,690)
Change in NWC = $1,094

Now, we can calculate the capital spending. The capital spending is:

$$\text{Net capital spending} = \text{NFAend} - \text{NFA}_{\text{Neg}} + \text{Depreciation}$$

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Net capital spending = $537,177 − 448,512 + 71,830
Net capital spending = $160,495

Now, we have the cash flow from assets, which is:

Cash flow from assets = OCF − Net capital spending − Change in NWC
Cash flow from assets = $228,743 − 160,495 − 1,094
Cash flow from assets = $67,154

The company generated $67,154 from its assets. The cash flow from operations was $228,743, and the company spent $1,094 on net working capital and $160,495 on fixed assets.

The cash flow to creditors is:

Cash flow to creditors = Interest paid − New long-term debt

$$\text{Cash flow to creditors} = \text{Interest paid} - (\text{Long-term debt}_{\text{end}} - \text{Long-term debt}_{\text{beg}})$$

Cash flow to creditors = $25,142 − ($182,900 − 178,440)
Cash flow to creditors = $20,682

The cash flow to stockholders is a little trickier in this problem. First, we need to calculate the new equity sold. The equity balance increased during the year. The only way to increase the

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equity balance is through addition to retained earnings or selling equity. To calculate the new equity sold, we can use the following equation:

New equity = Ending equity − Beginning equity − Addition to retained earnings
New equity = $385,268 − 299,969 − 81,771
New equity = $3,528

What happened was the equity account increased by $85,299. Of this increase, $81,771 came from addition to retained earnings, so the remainder must have been the sale of new equity. Now we can calculate the cash flow to stockholders as:

Cash flow to stockholders = Dividends paid − Net new equity
Cash flow to stockholders = $50,000 − 3,528
Cash flow to stockholders = $46,472

The company paid $20,682 to creditors and $46,472 to its stockholders.

Finally, the cash flow identity is:

Cash flow from assets = Cash flow to creditors + Cash flow to stockholders

$67,154 = $20,682 + $46,472

The cash flow identity balances, which is what we expect.

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13. With the information given, we have the capital spending, change in NWC, and cash flow to stockholders. The cash flow to creditors is:

Cash flow to creditors = Interest paid − New long-term debt
Cash flow to creditors = $2,530 − 23,400
Cash flow to creditors = −$20,870

Now we can use the cash flow identity to calculate the OCF:

OCF − Change in NWC − Net capital spending = Cash flow to creditors + Cash flow to stockholders

OCF − $3,670 − $25,200 = −$20,870 + ($9,120 − 3,480)
OCF = –$20,870 + 5,640 + 3,670 + 25,200
OCF = $13,640

14.

a. The interest expense for the company is the amount of debt times the interest rate on the debt. So, the income statement for the company is:

Income Statement	
Sales	$489,300

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Cost of goods sold	157,300
Selling expenses	84,200
Depreciation expense	58,300
EBIT	$189,500
Interest expense	29,400
EBT	$160,100
Taxes	38,424
Net income	$121,676

b. And the operating cash flow is:

OCF = EBIT + Depreciation − Taxes
OCF = $189,500 + 58,300 − 38,424
OCF = $209,376

15. To find the OCF, we first calculate net income.

Income Statement	
Sales	$393,800
Costs	260,750
Other expenses	10,700
Depreciation expense	26,400
EBIT	$95,950
Interest expense	19,625
EBT	$76,325
Taxes	16,430
Net income	$59,895
Dividends	$16,900
Addition to retained earnings	$42,995

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a. The operating cash flow was:

OCF = EBIT + Depreciation − Taxes
OCF = $95,950 + 26,400 − 16,430
OCF = $105,920

b. The cash flow to creditors is the interest paid minus any net new long-term debt, so:

CFC = Interest − Net new LTD
CFC = $19,625 − (−$14,800)
CFC = $34,425

Note that the net new long-term debt is negative because the company repaid part of its long-term debt.

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c. The cash flow to stockholders is the dividends paid minus any net new equity, or:

CFS = Dividends − Net new equity
CFS = $16,900 10,500
CFS = $6,400

d. We know that CFA = CFC + CFS, so:

CFA = $34,425 + 6,400
CFA = $40,825

CFA is also equal to (OCF − Net capital spending − Change in NWC). We already know OCF. Net capital spending is equal to:

Net capital spending = Increase in NFA + Depreciation
Net capital spending = $35,750 + 26,400
Net capital spending = $62,150

Now we can use:

CFA = OCF − Net capital spending − Change in NWC
$40,825 = $105,920 − 62,150 − Change in NWC
Change in NWC = $2,945

16. The solution to this question works the income statement backward. Starting at the bottom:

Net income = Dividends + Addition to retained earnings = $2,370 + 6,800 = $9,170

Now, looking at the income statement:

EBT − EBT × Tax rate = Net income

Recognize that EBT × Tax rate is the calculation for taxes. Solving this for EBT yields:

$$\text{EBT} = \text{Net income} / (1 - \text{Tax rate}) = \$9{,}170 / (1 - .22) = \$11{,}756$$

Now you can calculate:

EBIT = EBT + Interest = $11,756 + 5,300 = $17,056

The last step is to use:

EBIT = Sales − Costs − Depreciation
$17,056 = $76,800 − 36,900 − Depreciation
Depreciation = $22,844

17. The balance sheet for the company looks like this:

Balance Sheet	$ 255,260

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Cash	$ 99,850	Accounts payable	
Accounts receivable	141,020	Notes payable	100,500
Inventory	229,080	Current liabilities	$ 355,760
Current assets	$ 469,950	Long-term debt	1,181,080
		Total liabilities	$1,536,840
Tangible net fixed assets	$2,028,950		
Intangible net fixed assets	492,150	Common stock	??
		Accumulated ret. earnings	1,239,900
Total assets	$2,991,050	Total liab. & owners' equity	$2,991,050

Total liabilities and owners' equity is:

TL & OE = CL + LTD + Common stock

Solving this equation for equity gives us:

Common stock = $2,991,050 − 1,239,900 − 1,536,840
Common stock = $214,310

18. The market value of shareholders' equity cannot be negative. A negative market value in this case would imply that the company would pay you to own the stock. The market value of shareholders' equity can be stated as: Shareholders' equity = Max([TA − TL], 0). So, if TA is $11,600, equity is equal to $1,300, and if TA is $9,400, equity is equal to $0. We should note here that the book value of shareholders' equity can be negative.

19.

a. The income statement for the company is:

Income Statement	
Sales	$925,000
Costs	631,000
Administrative and selling expenses	167,000
Depreciation expense	96,000
EBIT	$31,000
Interest expense	82,000
EBT	−$51,000
Taxes	0
Net income	−$51,000

b. OCF = EBIT + Depreciation − Taxes
OCF = $31,000 + 96,000 − 0
OCF = $127,000

c. Net income was negative because of the tax deductibility of depreciation and interest expense. However, the actual cash flow from operations was positive because

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depreciation is a noncash expense, and interest is a financing expense not an operating expense.

20. A firm can still pay out dividends if net income is negative; it just has to be sure there is sufficient cash flow to make the dividend payments.

Change in NWC = Net capital spending = Net new equity = 0 (Given)

Cash flow from assets = OCF − Change in NWC − Net capital spending
Cash flow from assets = $127,000 − 0 − 0 = $127,000

Cash flow to stockholders = Dividends − Net new equity
Cash flow to stockholders = $105,000 − 0 = $105,000

Cash flow to creditors = Cash flow from assets − Cash flow to stockholders
Cash flow to creditors = $127,000 − 105,000
Cash flow to creditors = $22,000

Cash flow to creditors is also:

Cash flow to creditors = Interest − Net new LTD

So:

Net new LTD = Interest − Cash flow to creditors
Net new LTD = $82,000 − 22,000
Net new LTD = $60,000

21.

a. The income statement is:

Income Statement	
Sales	$38,072
Cost of goods sold	27,168
Depreciation	6,759
EBIT	$ 4,145
Interest	3,050
Taxable income	$ 1,095
Taxes	241
Net income	$ 854

b. OCF = EBIT + Depreciation − Taxes
OCF = $4,145 + 6,759 − 241
OCF = $10,663

c. $$\text{Change in NWC} = \text{NWC}_{\text{end}} - \text{NWC}_{\text{beg}}$$
$$= (\text{CA}_{\text{end}} - \text{CL}_{\text{end}}) - (\text{CA}_{\text{beg}} - \text{CL}_{\text{beg}})$$

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$$= (\$9,904 - 5,261) - (\$8,025 - 4,511)$$
$$= \$1,129$$

$$\text{Net capital spending} = \text{NFA}_{\text{end}} - \text{NFA}_{\text{beg}} + \text{Depreciation}$$
$$= \$28,053 - 22,790 + 6,759$$
$$= \$12,022$$

$$\text{CFA} = \text{OCF} - \text{Change in NWC} - \text{Net capital spending}$$
$$= \$10,663 - 1,129 - 12,022$$
$$= -\$2,488$$

The cash flow from assets can be positive or negative, since it represents whether the firm raised funds or distributed funds on a net basis. In this problem, even though net income and OCF are positive, the firm invested heavily in both fixed assets and net working capital; it had to raise a net $2,488 in funds from its stockholders and creditors to make these investments.

d. Cash flow to creditors = Interest − Net new LTD
= $3,050 − 0
= $3,050

Cash flow to stockholders = Cash flow from assets − Cash flow to creditors
= −$2,488 − 3,050
= −$5,538

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We can also calculate the cash flow to stockholders as:

Cash flow to stockholders = Dividends − Net new equity

Solving for net new equity, we get:

Net new equity = $2,170 − (−5,538)
= $7,708

The firm had positive earnings in an accounting sense (NI > 0) and had positive cash flow from operations. The firm invested $1,129 in new net working capital and $12,022 in new fixed assets. The firm had to raise $2,488 from its stakeholders to support this new investment. It accomplished this by raising $7,708 in the form of new equity. After paying out $2,170 of this in the form of dividends to shareholders and $3,050 in the form of interest to creditors, $2,488 was left to meet the firm's cash flow needs for investment.

22.

a. Total assets 2022 = $1,327 + 5,470 = $6,797
Total liabilities 2022 = $530 + 2,891 = $3,421
Owners' equity 2022 = $6,797 − 3,421 = $3,376

Total assets 2023 = $1,438 + 6,587 = $8,025

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Total liabilities 2023 = $595 + 3,075 = $3,670
Owners' equity 2023 = $8,025 − 3,670 = $4,355

b. $NWC_{2022} = CA_{2022} - CL_{2022} = \$1,327 - 530 = \$797$

$NWC_{2023} = CA_{2023} - CL_{2023} = \$1,438 - 595 = \$843$

$\text{Change in NWC} = NWC_{2023} - NWC_{2022} = \$843 - 797 = \$46$

c. We can calculate net capital spending as:

Net capital spending = Net fixed assets 2023 − Net fixed assets 2022 + Depreciation
Net capital spending = $6,587 − 5,470 + 1,499
Net capital spending = $2,616

So, the company had a net capital spending cash flow of $2,616. We also know that net capital spending is:

Net capital spending = Fixed assets bought − Fixed assets sold
$2,616 = $2,740 − Fixed assets sold
Fixed assets sold = $2,740 − 2,616
Fixed assets sold = $124

To calculate the cash flow from assets, we must first calculate the operating cash flow. The operating cash flow is calculated as follows (you can also prepare a traditional income statement):

EBIT = Sales − Costs − Depreciation
EBIT = $16,831 − 7,849 − 1,499
EBIT = $7,483

EBT = EBIT − Interest
EBT = $7,483 − 427
EBT = $7,056

Taxes = EBT × .21
Taxes = $7,056 × .21
Taxes = $1,482

OCF = EBIT + Depreciation − Taxes
OCF = $7,483 + 1,499 − 1,482
OCF = $7,500

Cash flow from assets = OCF − Change in NWC − Net capital spending
Cash flow from assets = $7,500 − 46 − 2,616
Cash flow from assets = $4,838

d. $\text{Net new borrowing} = LTD_{2023} - LTD_{2022}$

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Net new borrowing = $3,075 − 2,891
Net new borrowing = $184

Net new borrowing = $184 = Debt issued − Debt retired
Debt retired = $554 − 184
Debt retired = $370

Cash flow to creditors = Interest − Net new LTD
Cash flow to creditors = $427 − 184
Cash flow to creditors = $243

23.

Balance sheet as of December 31, 2022

Cash	$33,327	Accounts payable	$42,665
Accounts receivable	44,122		
Inventory	78,447	Long-term debt	111,615
Current assets	$155,896		
Net fixed assets	$280,722	Owners' equity	282,338
Total assets	$436,618	Total liab. & equity	$436,618

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Balance sheet as of December 31, 2023

Cash	$34,095	Accounts payable	$39,997
Accounts receivable	49,708		
Inventory	80,620	Long-term debt	130,222
Current assets	$164,423		
Net fixed assets	$286,169	Owners' equity	280,373
Total assets	$450,592	Total liab. & equity	$450,592

2022 Income Statement

Sales	$ 63,560
COGS	26,816
Other expenses	5,182
Depreciation	9,131
EBIT	$ 22,431
Interest	3,273

2023 Income Statement

Sales	$67,512
COGS	30,260
Other expenses	4,330
Depreciation	9,139
EBIT	$23,783
Interest	4,901

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EBT	$	19,158	EBT		$18,882
Taxes		4,790	Taxes		4,721
Net income	$	14,369	Net income		$14,162
Dividends	$	7,670	Dividends		$11,180
Additions to RE		6,699	Additions to RE		2,982

24. OCF = EBIT + Depreciation − Taxes
OCF = $23,783 + 9,139 − 4,721
OCF = $28,202

$$\text{Change in NWC} = \text{NWCend} - \text{NWCb}_{beg} = (\text{CA} - \text{CL})_{end} - (\text{CA} - \text{CL})_{beg}$$
Change in NWC = ($164,423 − 39,997) − ($155,896 − 42,665)
Change in NWC = $11,195

$$\text{Net capital spending} = \text{NFAend} - \text{NFA beg} + \text{Depreciation}$$
Net capital spending = $286,169 − 280,722 + 9,139
Net capital spending = $14,586

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Cash flow from assets = OCF − Change in NWC − Net capital spending
Cash flow from assets = $28,202 − 11,195 − 14,586
Cash flow from assets = $2,421

Cash flow to creditors = Interest − Net new LTD
$$\text{Net new LTD} = \text{LTD}_{end} - \text{LTD}_{beg}$$
Cash flow to creditors = $4,901 − ($130,222 − 111,615)
Cash flow to creditors = −$13,706

$$\text{Net new equity} = \text{Common stock}_{end} - \text{Common stock}_{beg}$$
Common stock + Retained earnings = Total owners' equity
$$\text{Net new equity} = (\text{OE} - \text{RE})_{end} - (\text{OE} - \text{RE})_{beg}$$
$$\text{Net new equity} = \text{OE}_{end} - \text{OE}_{beg} + \text{RE}_{beg} - \text{RE}_{end}$$
$$\text{RE}_{end} = \text{RE}_{beg} + \text{Additions to RE}$$
$$\text{Net new equity} = \text{OE}_{end} - \text{OE}_{beg} + \text{RE}_{beg} - \left(\text{RE}_{beg} + \text{Additions to RE}_{2020}\right)$$
$$\text{Net new equity} = \text{OE}_{end} - \text{OE}_{beg} - \text{Additions to RE}_{2023}$$
Net new equity = $280,373 − 282,338 − 2,982
Net new equity = −$4,947

Cash flow to stockholders = Dividends − Net new equity

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Cash flow to stockholders = $11,180 − (−$4,947)
Cash flow to stockholders = $16,127

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As a check, cash flow from assets is $2,421.

Cash flow from assets = Cash flow to creditors + Cash flow to stockholders
Cash flow from assets = −$13,706 + 16,127
Cash flow from assets = $2,421

Challenge

25. We will begin by calculating the operating cash flow. First, we need the EBIT, which can be calculated as:

EBIT = Net income + Current taxes + Deferred taxes + Interest
EBIT = $187 + 81 + 11 + 38
EBIT = $317

Now we can calculate the operating cash flow as:

Operating cash flow	
Earnings before interest and taxes	$317
Depreciation	74
Current taxes	−81
Operating cash flow	$310

The cash flow from assets is found in the investing activities portion of the accounting statement of cash flows, so:

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Cash flow from assets	
Acquisition of fixed assets	$194
Sale of fixed assets	−19
Capital spending	$175

The net working capital cash flows are all found in the operations cash flow section of the accounting statement of cash flows. However, instead of calculating the net working capital cash flows as the change in net working capital, we must calculate each item individually. Doing so, we find:

Net working capital cash flow	
Cash	$12
Accounts receivable	12
Inventories	−15
Accounts payable	−11
Accrued expenses	6
Other	−2
NWC cash flow	$2

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Except for the interest expense, the cash flow to creditors is found in the financing activities of the accounting statement of cash flows. The interest expense from the income statement is given, so:

Cash flow to creditors	
Interest	$38
Retirement of debt	145
Debt service	$183
Proceeds from sale of long-term debt	−110
Total	$73

And we can find the cash flow to stockholders in the financing section of the accounting statement of cash flows. The cash flow to stockholders was:

Cash flow to stockholders	
Dividends	$67
Repurchase of stock	32
Cash to stockholders	$99
Proceeds from new stock issue	−39
Total	$60

26. Net capital spending $= NFA_{end} - NFA_{beg} + \text{Depreciation}$

$$= \left(NFA_{end} - NFA_{beg}\right) + \left(\text{Depreciation} + AD_{beg}\right) - AD_{beg}$$

$$= \left(NFA_{end} - NFA_{beg}\right) + AD_{end} - AD_{beg}$$

$$= \left(NFA_{end} + AD_{end}\right) - \left(NFA_{beg} + AD_{beg}\right) = FA_{end} - FA_{beg}$$

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CHAPTER 3
FINANCIAL STATEMENTS ANALYSIS AND FINANCIAL MODELS

Answers to Concept Questions

1. Time trend analysis gives a picture of changes in the company's financial situation over time. Comparing a firm to itself over time allows the financial manager to evaluate whether some aspects of the firm's operations, finances, or investment activities have changed. Peer group analysis involves comparing the financial ratios and operating performance of a particular firm to a set of peer group firms in the same industry or line of business. Comparing a firm to its peers allows the financial manager to evaluate whether some aspects of the firm's operations, finances, or investment activities are out of line with the norm, thereby providing some guidance on appropriate actions to take to adjust these ratios if necessary. Both allow an investigation into what is different about a company from a financial perspective, but neither method gives an indication of whether the difference is positive or negative. For example, suppose a company's current ratio is increasing over time. It could mean that the company had been facing liquidity problems in the past and is rectifying those problems, or it could mean the company has become less efficient in managing its current accounts. Similar arguments could be made for a peer group comparison. A company with a current ratio lower than its peers could be more efficient at managing its current accounts, or it could be facing liquidity problems. Neither analysis method tells us whether a ratio is good or bad, both show that something is different, and tell us where to look.

2. If a company is growing by opening new stores, then presumably total revenues would be rising. Comparing total sales at two different points in time might be misleading. Same-store sales control for this by only looking at revenues of stores open within a specific period.

3. The reason is that, ultimately, sales are the driving force behind a business. A firm's assets, employees, and, in fact, just about every aspect of its operations and financing exist to directly or indirectly support sales. Put differently, a firm's future need for things like capital assets, employees, inventory, and financing are determined by its future sales level.

4. Two assumptions of the sustainable growth formula are that the company does not want to sell new equity, and that financial policy is fixed. If the company raises outside equity, or increases its debt–equity ratio, it can grow at a higher rate than the sustainable growth rate. Of course, the company could also grow faster than its profit margin increases if it changes its dividend policy by increasing the retention ratio or if its total asset turnover increases.

5. The sustainable growth rate is greater than 20%, because at a 20% growth rate, the negative EFN indicates that there is excess financing still available. If the firm is 100% equity financed, then the sustainable and internal growth rates are equal and the internal growth rate would be greater than 20%. However, when the firm has some debt, the internal growth rate is always

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less than the sustainable growth rate, so it is ambiguous whether the internal growth rate would be greater than or less than 20%. If the retention ratio is increased, the firm will have more internal funding sources available, and it will have to take on more debt to keep the debt–equity ratio constant, so the EFN will decline. Conversely, if the retention ratio is decreased, the EFN will rise. If the retention rate is zero, both the internal and sustainable growth rates are zero, and the EFN will rise to the change in total assets.

6. Common-size financial statements provide the financial manager with a ratio analysis of the company. The common-size income statement can show, for example, that cost of goods sold as a percentage of sales is increasing. The common-size balance sheet can show a firm's increasing reliance on debt as a form of financing. Common-size statements of cash flows are not calculated for a simple reason: There is no possible denominator.

7. It would reduce the external funds needed. If the company is not operating at full capacity, it would be able to increase sales without a commensurate increase in fixed assets.

8. Presumably not, but, of course, if the product had been *much* less popular, then a similar fate would have awaited due to lack of sales.

9. Since customers did not pay until shipment, receivables rose. The firm's NWC, but not its cash, increased. At the same time, costs were rising faster than cash revenues, so operating cash flow declined. The firm's capital spending was also rising. Thus, all three components of cash flow from assets were negatively impacted.

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10. Financing possibly could have been arranged if the company had taken quick enough action. Sometimes it becomes apparent that help is needed only when it is too late, again emphasizing the need for planning.

11. All three were important, but the lack of cash or, more generally, financial resources ultimately spelled doom. An inadequate cash resource is usually cited as the most common cause of small business failure.

12. Demanding cash up front, increasing prices, subcontracting production, and improving financial resources via new owners or new sources of credit are some of the options. When orders exceed capacity, price increases may be especially beneficial.

13. ROE is a better measure of the company's performance. ROE shows the percentage return for the year earned on shareholder investment. Since the goal of a company is to maximize shareholder wealth, this ratio shows the company's performance in achieving this goal over the period.

14. The EBITDA/Assets ratio shows the company's operating performance before interest, depreciation, and taxes. This ratio would show how a company has controlled costs. While taxes are a cost, and interest and depreciation can be considered costs, they are not as easily controlled by company management. Conversely, depreciation and amortization can be altered by accounting choices. This ratio only uses revenue minus costs that are directly related to operations in the numerator. As such, it gives a better metric to measure management performance over a period than does ROA.

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Solutions to Questions and Problems

NOTE: All end-of-chapter problems were solved using a spreadsheet. Many problems require multiple steps. Due to space and readability constraints, when these intermediate steps are included in this solutions manual, rounding may appear to have occurred. However, the final answer for each problem is found without rounding during any step in the problem.

Basic

1. Using the DuPont identity, the ROE is:

ROE = (PM)(TAT)(EM)
ROE = (.0605)(1.87)(1.43)
ROE = .1618 or 16.18%

2. The equity multiplier is:

$EM = 1 + D / E$
EM = 1 + .63
EM = 1.63

One formula to calculate return on equity is:

ROE = ROA(EM)
ROE = .084(1.63)
ROE = .1369 or 13.69%

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ROE can also be calculated as:

$ROE = NI / TE$

So, net income is:

Net income = ROE(TE)
Net income = .1369($645,000)
Net income = $88,313.40

3. This is a multistep problem involving several ratios. The ratios given are all part of the DuPont identity. The only DuPont identity ratio not given is the profit margin. If we know the profit margin, we can find the net income since sales are given. So, we begin with the DuPont identity:

$ROE = .11 = (PM)(TAT)(EM) = (PM)(S / TA)(1 + D / E)$

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Solving the DuPont identity for profit margin, we get:

$$PM = ([ROE][TA]) / ([1 + D/E][S])$$
$$PM = ([.11][\$2,532]) / ([1 + .57][\$5,987])$$
PM = .0296

Now that we have the profit margin, we can use this number and the given sales figure to solve for net income:

$$PM = .0296 = NI / S$$
NI = .0296($5,987)
Net income = $177.40

4. An increase of sales to $23,345 is an increase of:

$$\text{Sales increase} = (\$23,345 - 20,300) / \$20,300$$
Sales increase = .15 or 15%

Assuming costs and assets increase proportionally, the pro forma financial statements will look like this:

Pro forma income statement		Pro forma balance sheet			
Sales	$23,345.00	Assets	$ 54,050	Debt	$ 26,900.00
Costs	19,665.00			Equity	21,397.20
EBIT	3,680.00	Total	$ 54,050	Total	$48,297.20
Taxes (21%)	772.80				
Net income	$ 2,907.20				

The payout ratio is constant, so the dividends paid this year is the payout ratio from last year times net income, or:

$$\text{Dividends} = (\$1,400 / \$2,528)(\$2,907.20)$$
Dividends = $1,610

The addition to retained earnings is:

Addition to retained earnings = $2,907.20 − 1,610
Addition to retained earnings = $1,297.20

And the new equity balance is:

Equity = $20,100 + 1,297.20
Equity = $21,397.20

So the EFN is:

EFN = Total assets − Total liabilities and equity

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EFN = $54,050 − 48,297.20
EFN = $5,752.80

5. The maximum percentage sales increase is the sustainable growth rate. To calculate the sustainable growth rate, we first need to calculate the ROE, which is:

$$\text{ROE} = \text{Net income} / \text{Total equity}$$
$$\text{ROE} = \$4,774 / \$51,700$$
ROE = .0923 or 9.23%

The plowback ratio, *b*, is one minus the payout ratio, so:

b = 1 − .40
b = .60

Now we can use the sustainable growth rate equation to get:

$$\text{Sustainable growth rate} = (\text{ROE} \times b) / (1 - [\text{ROE} \times b])$$
$$\text{Sustainable growth rate} = (.0923[.60]) / (1 - .0923[.60])$$
Sustainable growth rate = .0587 or 5.87%

So, the maximum dollar increase in sales is:

Maximum increase in sales = $38,600(.0587)
Maximum increase in sales = $2,264.04

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6. We need to calculate the retention ratio to calculate the sustainable growth rate. The retention ratio is:

b = 1 − .25
b = .75

Now we can use the sustainable growth rate equation to get:

$$\text{Sustainable growth rate} = (\text{ROE} \times b) / (1 - [\text{ROE} \times b])$$
$$\text{Sustainable growth rate} = (.141[.75]) / (1 - .141[.75])$$
Sustainable growth rate = .1183 or 11.83%

7. We must first calculate the ROE using the DuPont ratio to calculate the sustainable growth rate. The ROE is:

ROE = (PM)(TAT)(EM)
ROE = (.052)(3.2)(.95)
ROE = .1581 or 15.81%

The plowback ratio is one minus the dividend payout ratio, so:

b = 1 − .35

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$b = .65$

Now we can use the sustainable growth rate equation to get:

$$\text{Sustainable growth rate} = (\text{ROE} \times b) / (1 - [\text{ROE} \times b])$$
$$\text{Sustainable growth rate} = (.1581[.65]) / (1 - .1581[.65])$$
$$\text{Sustainable growth rate} = .1145 \text{ or } 11.45\%$$

8. An increase of sales to $9,164 is an increase of:

$$\text{Sales increase} = (\$9{,}164 - 7{,}900) / \$7{,}900$$
$$\text{Sales increase} = .16 \text{ or } 16\%$$

Assuming costs and assets increase proportionally, the pro forma financial statements will look like this:

Pro forma income statement			Pro forma balance sheet		
Sales	$ 9,164.00	Assets	$26,564.00	Debt	$ 9,100.00
Costs	6,217.60			Equity	16,746.40
Net income	$ 2,946.40	Total	$26,564.00	Total	$25,846.40

If no dividends are paid, the equity account will increase by the net income, so:

Equity = $13,800 + 2,946.40
Equity = $16,746.40

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So the EFN is:

EFN = Total assets − Total liabilities and equity
EFN = $26,564 − 25,846.40
EFN = $717.60

9.

a. First, we need to calculate the current sales and change in sales. The current sales are next year's sales divided by one plus the growth rate, so:

$$\text{Current sales} = \text{Next year's sales} / (1 + g)$$
$$\text{Current sales} = \$143{,}500{,}000 / (1 + .15)$$
$$\text{Current sales} = \$124{,}782{,}609$$

And the change in sales is:

Change in sales = $143,500,000 − 124,782,609
Change in sales = $18,717,391

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We can now complete the current balance sheet. The current assets, fixed assets, and short-term debt are calculated as a percentage of current sales. The long-term debt and par value of stock are given. The plug variable is the accumulated retained earnings. So:

Assets		Liabilities and equity	
Current assets	$24,956,522	Short-term debt	$18,717,391
		Long-term debt	$21,800,000
Fixed assets	112,304,348	Common stock	$10,400,000
		Accumulated RE	86,343,478
		Total equity	$96,743,478
Total assets	$137,260,870	Total liabilities and equity	$137,260,870

b. We can use the equation from the text to answer this question. The assets/sales and debt/sales are the percentages given in the problem, so:

$$\text{EFN} = \left(\frac{\text{Assets}}{\text{Sales}}\right) \times \Delta\text{Sales} - \left(\frac{\text{Spontaneous debt}}{\text{Sales}}\right) \times \Delta\text{Sales} - (PM \times \text{Projected sales}) \times (1 - d)$$
$$\text{EFN} = (.20 + .90) \times \$18,717,391 - (.15 \times \$18,717,391) - (.10 \times \$143,500,000) \times (1 - .40)$$
$$\text{EFN} = \$9,171,522$$

c. The current assets, fixed assets, and short-term debt will all increase at the same percentage as sales. The long-term debt and common stock will remain constant. The accumulated retained earnings will increase by the addition to retained earnings for the year. We can calculate the net income for the year as:

Net income = Profit margin × Sales
Net income = .10($143,500,000)
Net income = $14,350,000

The addition to retained earnings for the year will be the net income times one minus the dividend payout ratio, which is:

Addition to retained earnings = Net income$(1 - d)$
Addition to retained earnings = $14,350,000$(1 - .40)$
Addition to retained earnings = $8,610,000

So, the new accumulated retained earnings will be:

Accumulated retained earnings = $86,343,478 + 8,610,000
Accumulated retained earnings = $94,953,478

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The pro forma balance sheet will be:

Assets		Liabilities and equity	
Current assets	$28,700,000	Short-term debt	$21,525,000
		Long-term debt	$21,800,000
Fixed assets	129,150,000	Common stock	$10,400,000
		Accumulated RE	94,953,478
		Total equity	$105,353,478
Total assets	$157,850,000	Total liabilities and equity	$148,678,478

The EFN is:

EFN = Total assets − Total liabilities and equity
EFN = $157,850,000 − 148,678,478
EFN = $9,171,522

10.

a. The sustainable growth rate is:

$$\text{Sustainable growth rate} = (\text{ROE} \times b) / (1 - [\text{ROE} \times b])$$

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where:

b = Retention ratio = 1 − Payout ratio = .65

So:

$$\text{Sustainable growth rate} = (.1050[.65]) / (1 - .1050.65])$$
Sustainable growth rate = .0732 or 7.32%

b. It is possible for the sustainable growth rate and the actual growth rate to differ. If any of the actual parameters in the sustainable growth rate equation differs from those used to compute the sustainable growth rate, the actual growth rate will differ from the sustainable growth rate. Since the sustainable growth rate includes ROE in the calculation, this also implies that changes in the profit margin, total asset turnover, or equity multiplier will affect the sustainable growth rate.

c. The company can increase its growth rate by doing any of the following:

Increase the debt−equity ratio by selling more debt or repurchasing stock.
Increase the profit margin, most likely by better controlling costs.
Decrease its total assets/sales ratio; in other words, utilize its assets more efficiently.
Reduce the dividend payout ratio.

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Intermediate

22. The solution requires substituting two ratios into a third ratio. Rearranging Debt/Total assets:

Firm A	Firm B
$D/\text{TA} = .60$	$D/\text{TA} = .35$
$(\text{TA} - E)/\text{TA} = .60$	$(\text{TA} - E)/\text{TA} = .35$
$(\text{TA}/\text{TA}) - (E/\text{TA}) = .60$	$(\text{TA}/\text{TA}) - (E/\text{TA}) = .35$
$1 - (E/\text{TA}) = .60$	$1 - (E/\text{TA}) = .35$
$E/\text{TA} = .40$	$E/\text{TA} = .65$
$E = .40(\text{TA})$	$E = .65(\text{TA})$

Rearranging ROA = Net income/Total assets , we find:

$\text{NI}/\text{TA} = .045$	$\text{NI}/\text{TA} = .08$
$\text{NI} = .045(\text{TA})$	$\text{NI} = .08(\text{TA})$

Since ROE = Net income/Equity , we can substitute the above equations into the ROE formula, which yields:

$\text{ROE} = .045(\text{TA})/.40(\text{TA})$	$\text{ROE} = .08(\text{TA})/.65(\text{TA})$
$\text{ROE} = .045/.40$	$\text{ROE} = .08/.65$
ROE = .1125 or 11.25%	ROE = .1231 or 12.31%

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12. Profit margin = Net income / Sales
Profit margin = –£26,382 / £315,650
Profit margin = −.0836 or −8.36%

As long as both net income and sales are measured in the same currency, there is no problem; in fact, except for some market value ratios like EPS and BVPS, none of the financial ratios discussed in the text are measured in terms of currency. This is one reason why financial ratio analysis is widely used in international finance to compare the business operations of firms and/or divisions across national economic borders. The net income in dollars is:

Net income = Profit margin × Sales
Net income = −.0836($385,815)
Net income = −$32,246.38

13.

a. The equation for external funds needed is:

$$\text{EFN} = \left(\frac{\text{Assets}}{\text{Sales}}\right) \Delta \text{Sales} - \left(\frac{\text{Spontaneous debt}}{\text{Sales}}\right) \Delta \text{Sales} - (\text{PM} \times \text{Projected sales}) \times (1 - d)$$

where:

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$$\text{Assets / Sales} = \$38,233,000 / \$31,200,000 = 1.2254$$
$$\Delta\text{Sales} = \text{Current sales} \times \text{Sales growth rate} = \$31{,}200{,}000(.18) = \$5{,}616{,}000$$
$$\text{Spontaneous debt / Sales} = \$4,598,000 / \$31,200,000 = .1474$$
$$\text{Profit margin} = \text{Net income/Sales} = \$5,372,000 / \$31,200,000 = .1722$$
$$\text{Projected sales} = \text{Current sales} \times (1 + \text{Sales growth rate})$$
$$= \$31{,}200{,}000(1 + .18) = \$36{,}816{,}000$$

$$d = \text{Dividends / Net income} = \$1,485,000 / \$5,372,000 = .2764$$

so:

EFN = (1.2254 × $5,616,000) − (.1474 × $5,616,000) − (.1722 × $36,816,000) × (1 − .2764)

EFN = $1,467,640

b. The current assets, fixed assets, and short-term debt will all increase at the same percentage as sales. The long-term debt and common stock will remain constant. The accumulated retained earnings will increase by the addition to retained earnings for the year. We can calculate the addition to retained earnings for the year as:

Net income = Profit margin × Sales
Net income = .1722($36,816,000)
Net income = $6,338,960

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The addition to retained earnings for the year will be the net income times one minus the dividend payout ratio, which is:

Addition to retained earnings = Net income(1 − *d*)
Addition to retained earnings = $6,338,960(1 − .2764)
Addition to retained earnings = $4,586,660

So, the new accumulated retained earnings will be:

Accumulated retained earnings = $24,167,000 + 4,586,660
Accumulated retained earnings = $28,753,660

The pro forma balance sheet will be:

Assets		Liabilities and equity	
Current assets	$11,313,840	Short-term debt	$5,425,640
		Long-term debt	$6,868,000
Fixed assets	33,801,100	Common stock	$2,600,000
		Accumulated RE	28,753,660
		Total equity	$31,353,660

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Total assets	$45,114,940	Total liabilities and equity	$43,647,300

The EFN is:

EFN = Total assets − Total liabilities and equity
EFN = $45,114,940 − 43,647,300
EFN = $1,467,640

c. The sustainable growth rate is:

Sustainable growth rate = (ROE × *b*) / (1 - [ROE × *b*])

where:

ROE = Net income / Total equity = $5,372,000 / $26,767,000 = .2007
b = Retention ratio = Retained earnings / Net income = $3,887,000 / $5,372,000 = .7236

So:

Sustainable growth rate = (.2007[.7236]) / (1 - .2007[.7236])
Sustainable growth rate = .1699 or 16.99%

d. With a lower dividend, the company can meet its goals. With a zero dividend, EFN is:

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Assets		Liabilities and equity	
Current assets	$11,313,840	Short-term debt	$5,425,640
		Long-term debt	$6,868,000
Fixed assets	33,801,100	Common stock	$2,600,000
		Accumulated retained earnings	30,505,960
		Total equity	$33,105,960
Total assets	$45,114,940	Total liabilities and equity	$45,399,600

The EFN is:

EFN = Total assets − Total liabilities and equity
EFN = $45,114,940 − 45,399,600
EFN = −$284,660

If the dividend decrease is insufficient, the company does have several other alternatives. It can increase its asset utilization and/or its profit margin. The company could also increase the debt in its capital structure. This will decrease the equity account, thereby increasing ROE.

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14. This is a multistep problem involving several ratios. It is often easier to look backward to determine where to start. We need receivables turnover to find days' sales in receivables. To calculate receivables turnover, we need credit sales, and to find credit sales, we need total sales. Since we are given the profit margin and net income, we can use these to calculate total sales as:

PM = .071 = NI / Sales
PM = .071 = $213,700 / Sales
Sales = $3,009,859

Credit sales are 80% of total sales, so:

Credit sales = .80($3,009,859)

Credit sales = $2,407,887
Now we can find receivables turnover by:

Receivables turnover = Credit sales/Accounts receivable
Receivables turnover = $2,407,887 / $126,385
Receivables turnover = 19.05 times

Days' sales in receivables = 365 days / Receivables turnover
Days' sales in receivables = 365 / 19.05
Days' sales in receivables = 19.16 days

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15. The solution to this problem requires a number of steps. First, remember that Current assets + Net fixed assets = Total assets. So, if we find the current assets and the total assets, we can solve for net fixed assets. Using the numbers given for the current ratio and the current liabilities, we solve for current assets:

Current ratio = Current assets / Current liabilities
Current assets = Current ratio(Current liabilities)
Current assets = 1.45($1,140)
Current assets = $1,653

To find the total assets, we must first find the total debt and equity from the information given. So, we find the net income using the profit margin:

Profit margin = Net income / Sales
Net income = Profit margin(Sales)
Net income = .083($8,370)
Net income = $694.71

We now use the net income figure as an input into ROE to find the total equity:

ROE = Net income/Total equity

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Total equity = Net income / ROE
Total equity = $694.71 / .165
Total equity = $4,210.36

Next, we need to find the long-term debt. The long-term debt ratio is:

Long-term debt ratio = .35 = LTD / (LTD + Total equity)

Inverting both sides gives:

1 / .35 = (LTD + Total equity) / LTD = 1 + (Total equity / LTD)

Substituting the total equity into the equation and solving for long-term debt gives the following:

2.857 = 1 + ($4,210.36 / LTD)
LTD = $4,210.36 / 1.857
LTD = $2,267.12

Now, we can find the total debt of the company:

Total debt = Current liabilities + LTD
Total debt = $1,140 + 2,267.12
Total debt = $3,407.12

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And, with the total debt, we can find the total debt and equity, which is equal to total assets:

Total assets = Total debt + Total equity
Total assets = $3,407.12 + 4,210.36
Total assets = $7,617.48

And finally, we are ready to solve the balance sheet identity as:

Net fixed assets = Total assets − Current assets
Net fixed assets = $7,617.48 − 1,653
Net fixed assets = $5,964.48

16. This problem requires us to work backward through the income statement. First, recognize that Net income $= (1 - T_C)$ EBT. Plugging in the numbers given and solving for EBT, we get:

EBT = $19,382 / (1 - .21)
EBT = $24,534.18

Now, we can add interest to EBT to get EBIT as follows:

EBIT = EBT + Interest
EBIT = $24,534.18 + 3,681

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EBIT = $28,215.18

To get EBITD (earnings before interest, taxes, and depreciation), the numerator in the cash coverage ratio, add depreciation to EBIT:

EBITD = EBIT + Depreciation
EBITD = $28,215.18 + 4,738
EBITD = $32,953.18

Now, we can plug the numbers into the cash coverage ratio and calculate:

Cash coverage ratio = EBITD / Interest
Cash coverage ratio = $32,953.18 / $3,681
Cash coverage ratio = 8.95 times

17. The only ratio given that includes cost of goods sold is the inventory turnover ratio, so it is the last ratio used. Since current liabilities are given, we start with the current ratio:

Current ratio = Current assets/Current liabilities
1.34 = Current assets / $415,000
Current assets = $556,100

Using the quick ratio, we solve for inventory:

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Quick ratio = (Current assets - Inventory) / Current liabilities
Inventory = Current assets − (Quick ratio × Current liabilities)
Inventory = $556,100 − (.86 × $415,000)
Inventory = $199,200

Inventory turnover = COGS / Inventory
10.30 = COGS / $199,200
COGS = $2,051,760

18. The common-size balance sheet answers are found by dividing each category by total assets. For example, the cash percentage for 2022 is:

$23,235 / $683,681 = .0340 or 3.40%

This means that cash is 3.40% of total assets.

The common-base-year answers are found by dividing each category value for 2023 by the same category value for 2022. For example, the cash common-base-year number is found by:

$28,207 / $23,235 = 1.2140

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The common-size and common-base-year balance sheets for the company are:

	2022	Common size	2023	Common size	Common base year
		Assets			
Current assets					
Cash	$23,235	3.40%	$28,207	3.74%	1.2140
Accounts receivable	37,030	5.42%	40,322	5.35%	1.0889
Inventory	30,594	4.47%	71,666	9.50%	2.3425
Total	$90,859	13.29%	$140,19	18.59%	1.5430
Fixed assets					
Net plant and	592,822	86.71%	$614,11	81.41%	1.0359
Total assets	$683,68	100%	$754,31	100.00	1.1033
		Liabilities and Owners' Equity			
Current liabilities					
Accounts payable	$32,682	4.78%	$42,211	5.60%	1.2916
Notes payable	41,265	6.04%	51,753	6.86%	1.2542
Total	$73,947	10.82%	$93,964	12.46%	1.2707
Long-term debt	$56,000	8.19%	$63,000	8.35%	1.1250
Owners' equity					
Common stock	$70,000	10.24%	$70,000	9.28%	1.0000
Accumulated RE	483,734	70.75%	527,350	69.91%	1.0902
Total	$553,73	80.99%	$597,35	79.19%	1.0788
Total L&E	$683,68	100%	$754,31	100.00	1.1033

19. To determine full capacity sales, we divide the current sales by the capacity the company is currently using, so:

$$\text{Full capacity sales} = \$830,000 / .94$$
$$\text{Full capacity sales} = \$882,979$$

The maximum sales growth is the full capacity sales divided by the current sales, so:

$$\text{Maximum sales growth} = (\$882,979 / \$830,000) - 1$$
$$\text{Maximum sales growth} = .0638 \text{ or } 6.38\%$$

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20. To find the new level of fixed assets, we need to find the current percentage of fixed assets to full capacity sales. Doing so, we find:

$$\text{Fixed assets/Full capacity sales} = \$590,000 / \$882,979$$
$$\text{Fixed assets/Full capacity sales} = .6682$$

Next, we calculate the total dollar amount of fixed assets needed at the new sales figure.

Total fixed assets = .6682($910,000)
Total fixed assets = $608,055.42

The new fixed assets necessary is the total fixed assets at the new sales figure minus the current level of fixed assts.

New fixed assets = $608,055.42 − 590,000
New fixed assets = $18,055.42

21. Assuming costs vary with sales and a 20% increase in sales, the pro forma income statement will look like this:

Pro Forma Income Statement

Sales	$ 823,836	
Costs	665,304	
Other expenses	16,824	
EBIT	$ 141,708	
Interest	12,090	
Taxable income		$ 129,618
Taxes (21%)	27,220	
Net income	$ 102,398	

The payout ratio is constant, so the dividends paid this year is the payout ratio from last year times net income, or:

$$\text{Dividends} = (\$27,475 / \$83,740)(\$102,398)$$
$$\text{Dividends} = \$33,597$$

And the addition to retained earnings will be:

Addition to retained earnings = $102,398 − 33,597
Addition to retained earnings = $68,801

The new retained earnings on the pro forma balance sheet will be:

New retained earnings = $166,705 + 68,801
New retained earnings = $235,506

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The pro forma balance sheet will look like this:

Pro Forma Balance Sheet

Assets		Liabilities and Owners' Equity	
Current assets		Current liabilities	
Cash	$ 25,128	Accounts payable	$ 64,548
Accounts receivable	38,364	Notes payable	13,215
Inventory	85,584	Total	$ 77,763
Total	$ 149,076	Long-term debt	$ 127,500
Fixed assets			
Net plant and equipment	$ 410,376	Owners' equity	
		Common stock and paid-in surplus	$ 105,000
		Retained earnings	235,506
		Total	$ 340,506
		Total liabilities and owners' equity	$ 545,769
Total assets	$ 559,452		

So the EFN is:

EFN = Total assets − Total liabilities and equity
EFN = $559,452 − 545,769
EFN = $13,683

22. First, we need to calculate full capacity sales, which is:

Full capacity sales = $686,530 / .80
Full capacity sales = $858,163

The full capacity ratio at full capacity sales is:

Full capacity ratio = Fixed assets/Full capacity sales
Full capacity ratio = $341,980 / $858,163
Full capacity ratio = .39850

The fixed assets required at the projected sales figure is the full capacity ratio times the projected sales level:

Total fixed assets = .39850($823,836) = $328,301

So, EFN is:

EFN = ($149,076 + 328,301) − $545,769 = −$68,393

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Note that this solution assumes that fixed assets are decreased (sold) so the company has a 100% fixed asset utilization. If we assume fixed assets are not sold, the answer becomes:

EFN = ($149,076 + 341,980) − $545,769 = −$54,713

23. The D/E ratio of the company is:

$$D/E = (\$67,005 + 127,500) / \$271,705$$
$$D/E = .7159$$

So the new total debt amount will be:

New total debt = .7159($340,506)
New total debt = $243,758

This is the new total debt for the company. Given that our calculation for EFN is the amount that must be raised externally and does not increase spontaneously with sales, we need to subtract the spontaneous increase in accounts payable. The new level of accounts payable, which is the current accounts payable times the sales growth, will be:

Spontaneous increase in accounts payable = $53,790(.20)
Spontaneous increase in accounts payable = $10,758

This means that $10,758 of the new total debt is not raised externally. So, the debt raised externally, which will be the EFN, is:

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EFN = New total debt − (Beginning LTD + Beginning CL + Spontaneous increase in AP)
EFN = $243,758 − ($127,500 + 67,005 + 10,758) = $38,495

The pro forma balance sheet with the new long-term debt will be:

Pro Forma Balance Sheet

Pro Forma Balance Sheet

Assets		Liabilities and Owners' Equity	
Current assets		Current liabilities	
Cash	$ 25,128	Accounts payable	$ 64,548
Accounts receivable	38,364	Notes payable	13,215
Inventory	85,584	Total	$ 77,763
Total	$ 149,076	Long-term debt	$ 165,995
Fixed assets			
Net plant and equipment	$ 410,376	Owners' equity	
		Common stock and paid-in surplus	$ 105,000
		Retained earnings	235,506

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		Total	$ 340,506
Total assets	$ 559,452	Total liabilities and owners' equity	$ 545,264

The funds raised by the debt issue can be put into an excess cash account to make the balance sheet balance. The excess debt will be:

Excess debt = $584,264 − 559,452 = $24,812

To make the balance sheet balance, the company will have to increase its assets. We will put this amount in an account called excess cash, which will give us the following balance sheet:

Pro Forma Balance Sheet

Assets		Liabilities and Owners' Equity	
Current assets		Current liabilities	
Cash	$ 25,128	Accounts payable	$ 64,548
Excess cash	24,812		
Accounts receivable	38,364	Notes payable	13,215
Inventory	85,584	Total	$ 77,763
Total	$ 173,888	Long-term debt	$ 165,995
Fixed assets			
Net plant and equipment	$ 410,376	Owners' equity	
		Common stock and paid-in surplus	$ 105,000
		Retained earnings	235,506
		Total	$ 340,506
Total assets	$ 584,264	Total liabilities and owners' equity	$ 584,264

The excess cash has an opportunity cost that we discussed earlier. Increasing fixed assets would also not be a good idea since the company already has enough fixed assets. A likely scenario would be the repurchase of debt and equity in its current capital structure weights. The company's debt–assets and equity–assets are:

$$\text{Debt-assets} = .7159 / (1 + .7159) = .42$$
$$\text{Equity-assets} = 1 / (1 + .7159) = .58$$

So, the amount of debt and equity needed will be:

Total debt needed = .42($559,452) = $233,406
Equity needed = .58($559,452) = $326,046

So, the repurchases of debt and equity will be:

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Debt repurchase = ($77,763 + 165,995) − 233,406 = $10,352
Equity repurchase = $340,506 − 326,046 = $14,460

Assuming all of the debt repurchase is from long-term debt, and the equity repurchase is entirely from the retained earnings, the final pro forma balance sheet will be:

Pro Forma Balance Sheet

Assets		Liabilities and Owners' Equity	
Current assets		Current liabilities	
Cash	$ 25,128	Accounts payable	$ 64,548
Accounts receivable	38,364	Notes payable	13,215
Inventory	85,584	Total	$ 77,763
Total	$ 149,076	Long-term debt	$ 155,643
Fixed assets			
Net plant and equipment	$ 410,376	Owners' equity	
		Common stock and paid-in surplus	$ 105,000
		Retained earnings	221,046
		Total	$ 326,046
		Total liabilities and owners' equity	
Total assets	$ 559,452		$ 559,452

Challenge

24. The pro forma income statements for all three growth rates will be:

Pro Forma Income Statement

	15 % Sales Growth	*20% Sales* Growth	*25% Sales* Growth
Sales	$789,510	$823,836	$858,163
Costs	637,583	665,304	693,025
Other expenses	16,123	16,824	17,525
EBIT	$135,804	$141,708	$147,613
Interest	12,090	12,090	12,090
Taxable income	$123,714	$129,618	$135,523
Taxes (21%)	25,980	27,220	28,460
Net income	$97,734	$102,398	$107,063
Dividends	$32,066	$33,597	$35,127
Add to RE	65,667	68,801	71,936

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We will calculate the EFN for the 15% growth rate first. Assuming the payout ratio is constant, the dividends paid will be:

$$\text{Dividends} = (\$27,475 / \$83,740)(\$97,734)$$
$$\text{Dividends} = \$32,066$$

And the addition to retained earnings will be:

$$\text{Addition to retained earnings} = \$97,734 - 32,066$$
$$\text{Addition to retained earnings} = \$65,667$$

The new retained earnings on the pro forma balance sheet will be:

$$\text{New retained earnings} = \$166,705 + 65,667$$
$$\text{New retained earnings} = \$232,372$$

The pro forma balance sheet will look like this:

15% Sales Growth:

Pro Forma Balance Sheet

Assets		Liabilities and Owners' Equity	
Current assets		Current liabilities	
Cash	$ 24,081	Accounts payable $ 61,859	
Accounts receivable	36,766	Notes payable	13,215
Inventory	82,018	Total	$ 75,074
Total	$ 142,865	Long-term debt	$ 127,500
Fixed assets			
Net plant and equipment	$ 393,277	Owners' equity	
		Common stock and paid-in surplus	$ 105,000
		Retained earnings	232,372
		Total	$ 337,372
		Total liabilities and owners'	
Total assets	$ 536,142	equity	$ 539,946

So the EFN is:

$$\text{EFN} = \text{Total assets} - \text{Total liabilities and equity}$$
$$\text{EFN} = \$536,142 - 539,946$$
$$\text{EFN} = -\$3,804$$

At a 20% growth rate, and assuming the payout ratio is constant, the dividends paid will be:

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$$\text{Dividends} = (\$27,475 / \$83,740)(\$102,398)$$
Dividends = $33,597

And the addition to retained earnings will be:

Addition to retained earnings = $102,398 − 33,597
Addition to retained earnings = $68,801

The new retained earnings on the pro forma balance sheet will be:

New retained earnings = $166,705 + 68,801
New retained earnings = $235,506

The pro forma balance sheet will look like this:

20% Sales Growth:

Pro Forma Balance Sheet

Assets		Liabilities and Owners' Equity	
Current assets		Current liabilities	
Cash	$ 25,128	Accounts payable	$ 64,548
Accounts receivable	38,364	Notes payable	13,215
Inventory	85,584	Total	$ 77,763
Total	$ 149,076	Long-term debt	$ 127,500
Fixed assets			
Net plant and equipment	$ 410,376	Owners' equity	
		Common stock and paid-in surplus	$ 105,000
		Retained earnings	235,506
		Total	$ 340,506
		Total liabilities and owners' equity	
Total assets	$ 559,452		$ 545,769

So the EFN is:

EFN = Total assets − Total liabilities and equity
EFN = $559,452 − 545,769
EFN = $13,683

At a 25% growth rate, and assuming the payout ratio is constant, the dividends paid will be:

$$\text{Dividends} = (\$27,475 / \$83,740)(\$107,063)$$
Dividends = $35,127

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And the addition to retained earnings will be:

Addition to retained earnings = $107,063 − 35,127
Addition to retained earnings = $71,936

The new retained earnings on the pro forma balance sheet will be:

New retained earnings = $166,705 + 71,936
New retained earnings = $238,641

The pro forma balance sheet will look like this:

25% Sales Growth:

Pro Forma Balance Sheet

Assets		Liabilities and Owners' Equity	
Current assets		Current liabilities	
Cash	$ 26,175	Accounts payable	$ 67,238
Accounts receivable	39,963	Notes payable	13,215
Inventory	89,150	Total	$ 80,453
Total	$ 155,288	Long-term debt	$ 127,500
Fixed assets			
Net plant and equipment	$ 427,475	Owners' equity	
		Common stock and paid-in surplus	$ 105,000
		Retained earnings	238,641
		Total	$ 343,641
		Total liabilities and owners'	
Total assets	$ 582,763	equity	$ 551,593

So the EFN is:

EFN = Total assets − Total liabilities and equity
EFN = $582,763 − 551,593
EFN = $31,169

25. The pro forma income statements for all three growth rates will be:

Pro Forma Income Statement

	20% Sales Growth	*30% Sales* Growth	*35% Sales* Growth
Sales	$823,836	$892,489	$926,816
Costs	665,304	720,746	748,467
Other expenses	16,824	18,226	18,927
EBIT	$141,708	$153,517	$159,422

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Interest	12,090	12,090	12,090
Taxable income	$129,618	$141,427	$147,332
Taxes (21%)	27,220	29,700	30,940
Net income	$102,398	$111,727	$116,392
Dividends	$33,597	$36,658	$38,188
Add to RE	68,801	75,070	78,204

At a 30% growth rate, and assuming the payout ratio is constant, the dividends paid will be:

$$\text{Dividends} = (\$27,475 / \$83,740)(\$111,727)$$
$$\text{Dividends} = \$36,658$$

And the addition to retained earnings will be:

$$\text{Addition to retained earnings} = \$111,727 - 36,658$$
$$\text{Addition to retained earnings} = \$75,070$$

The new retained earnings on the pro forma balance sheet will be:

$$\text{New addition to retained earnings} = \$166,705 + 75,070$$
$$\text{New addition to retained earnings} = \$241,775$$

The new total debt will be:

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$$\text{New total debt} = .7159(\$346,775)$$
$$\text{New total debt} = \$248,245$$

So, the new long-term debt will be the new total debt minus the new short-term debt, or:

$$\text{New long-term debt} = \$248,245 - 83,142$$
$$\text{New long-term debt} = \$165,103$$

The pro forma balance sheet will look like this:

Sales growth rate = 30% and debt / equity ratio = .7159

Pro Forma Balance Sheet

Assets		Liabilities and Owners' Equity	
Current assets		Current liabilities	
Cash	$ 27,222	Accounts payable	$ 69,927
Accounts receivable	41,561	Notes payable	13,215
Inventory	92,716	Total	$ 83,142
Total	$ 161,499	Long-term debt	$ 165,103

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Fixed assets			
Net plant and equipment	$ 444,574	Owners' equity	
		Common stock and paid-in surplus	$ 105,000
		Retained earnings	241,775
		Total	$ 346,775
Total assets	$ 606,073	Total liabilities and owners' equity	$ 595,020

So the excess debt raised is:

Excess debt = $595,020 − 606,073
Excess debt = −$11,053

And the EFN is:

EFN = $37,603 + 11,053
EFN = $48,656

At a 35% growth rate, and assuming the payout ratio is constant, the dividends paid will be:

Dividends = ($27,475 / $83,740)($116,392)
Dividends = $38,188

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And the addition to retained earnings will be:

Addition to retained earnings = $116,392 − 38,188
Addition to retained earnings = $78,204

The new retained earnings on the pro forma balance sheet will be:

New retained earnings = $166,705 + 78,204
New retained earnings = $244,909

The new total debt will be:

New total debt = .7159($349,909)
New total debt = $250,489

So, the new long-term debt will be the new total debt minus the new short-term debt, or:

New long-term debt = $250,489 − 85,832
New long-term debt = $164,657

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Sales growth rate = 35% and debt / equity ratio =.7159 :

Pro Forma Balance Sheet

Assets		Liabilities and Owners' Equity	
Current assets		Current liabilities	
Cash	$ 28,269	Accounts payable	$ 72,617
Accounts receivable	43,160	Notes payable	13,215
Inventory	96,282	Total	$ 85,832
Total	$ 167,711	Long-term debt	$ 164,657
Fixed assets			
Net plant and equipment	$ 461,673	Owners' equity	
		Common stock and paid-in surplus	$ 105,000
		Retained earnings	244,909
		Total	$ 349,909
		Total liabilities and owners' equity	$ 600,397
Total assets	$ 629,384		

So the excess debt raised is:

Excess debt = $600,397 − 629,384
Excess debt = −$28,986

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At a 35% growth rate, the firm will need funds in the amount of $28,986 in addition to the external debt already raised. So, the EFN will be:

EFN = $37,157 + 28,986
EFN = $66,143

26. We need the ROE to calculate the sustainable growth rate. The ROE is:

ROE = (PM)(TAT)(EM)
ROE = (.062)(1/1.05)(1+.55)
ROE = .0915 or 9.15%

Now we can use the sustainable growth rate equation to find the retention ratio as:

Sustainable growth rate = (ROE × b) / (1 − [ROE × b])
Sustainable growth rate = .12 = (.0915[b]) / (1 − .0915[b])
b = 1.17

This implies the payout ratio is:

Payout ratio = 1 − b
Payout ratio = 1 − 1.17

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Payout ratio = −.17

This answer indicates a dividend payout ratio of negative 17%, which is impossible. So, the growth rate is not consistent with the other constraints. The lowest possible payout rate is 0 (without issuing stock), which corresponds to a retention ratio of 1, or total earnings retention. This problem illustrates a key point we made in the chapter: Sustainable growth analysis forces the user to make internally consistent assumptions.

As an aside, we should note that it is possible to have a retention ratio greater than 1 if the company issues new stock. However, since the growth rate we are evaluating is perpetual, the company would have to issue stock every year, forever. But, doing so violates our underlying assumption that the sustainable growth rate requires no new equity.

The maximum sustainable growth rate for this company is:

Maximum sustainable growth rate = (ROE × b) / (1 − [ROE × b])
Maximum sustainable growth rate = (.0915[1]) / (1 − .0915[1])
Maximum sustainable growth rate = .1007 or 10.07%

27. Assuming that all debt is constant, we know that EFN is:

EFN = Increase in assets − Addition to retained earnings

The increase in assets is the beginning assets times the growth rate, so:

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Increase in assets = $A \times g$

The addition to retained earnings next year is the current net income times the retention ratio, times one plus the growth rate, so:

Addition to retained earnings = (NI × b)(1 + g)

And rearranging the profit margin to solve for net income, we get:

NI = PM(S)

Substituting the last three equations into the EFN equation we started with and rearranging, we get:

EFN = A(g) − PM(S)b(1 + g)
EFN = A(g) − PM(S)b − (PM[S]b)g
EFN = −PM(S)b + (A − PM[S]b)g

28. We start with the EFN equation we derived in Problem 27 and set it equal to zero:

EFN = 0 = −PM(S)b + (A − PM[S]b)g

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Substituting the rearranged profit margin equation into the internal growth rate equation, we have:

$$\text{Internal growth rate} = (\text{PM}[S]b) / (A - \text{PM}[S]b)$$

Since:

$$\text{ROA} = \text{NI} / A$$
$$\text{ROA} = \text{PM}(S) / A$$

We can substitute this into the internal growth rate equation and divide both the numerator and denominator by A. This gives:

$$\text{Internal growth rate} = ([\text{PM}\{S\}b] / A) / ([A - \text{PM}\{S\}b] / A)$$
$$\text{Internal growth rate} = b(\text{ROA}) / (1 - b[\text{ROA}])$$

To derive the sustainable growth rate, we must realize that to maintain a constant D / E ratio with no external equity financing, EFN must equal the addition to retained earnings times the D / E ratio:

$$\text{EFN} = (D / E)(\text{PM}[S]b[1 + g])$$
$$\text{EFN} = A(g) - \text{PM}(S)b(1 + g)$$

Solving for g and then dividing numerator and denominator by A:

$$\text{Sustainable growth rate} = \text{PM(S)}b(1 + D / E) / (A - \text{PM[S]}b[1 + D / E])$$
$$\text{Sustainable growth rate} = (\text{ROA}[1 + D / E]b) / (1 - \text{ROA}[1 + D / E]b)$$
$$\text{Sustainable growth rate} = b(\text{ROE}) / (1 - b[\text{ROE}])$$

29. In the following derivations, the subscript "E" refers to end of period numbers, and the subscript "B" refers to beginning of period numbers. TE is total equity and TA is total assets.

For the sustainable growth rate*:*

$$\text{Sustainable growth rate} = \left(\text{ROE}_E \times b\right) / \left(1 - \text{ROE}_E \times b\right)$$
$$\text{Sustainable growth rate} = \left(\text{NI} / \text{TE}_E \times b\right) / \left(1 - \text{NI} / \text{TE}_E \times b\right)$$

We multiply this equation by:

$$\left(\text{TE}_E / \text{TE}_E\right)$$

$$\text{Sustainable growth rate} = \left(\text{NI} / \text{TE}_E \times b\right) / \left(1 - \text{NI} / \text{TE}_E \times b\right) \times \left(\text{TE}_E / \text{TE}_E\right)$$
$$\text{Sustainable growth rate} = (\text{NI} \times b) / \left(\text{TE}_E - \text{NI} \times b\right)$$

Recognize that the denominator is equal to beginning of period equity, that is:

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$$(TE_E - NI' \ b) = TE_B$$

Substituting this into the previous equation, we get:

$$\text{Sustainable rate} = (NI' \ b) / TE_B$$

Which is equivalent to:

$$\text{Sustainable rate} = (NI / TE_B)' \ b$$

Since $ROE_B = NI / TE_B$

The sustainable growth rate equation is:

$$\text{Sustainable growth rate} = ROE_B' \ b$$

For the internal growth rate:

$$\text{Internal growth rate} = (ROA_E' \ b) / (1 - ROA_E' \ b)$$
$$\text{Internal growth rate} = (NI / TA_E' \ b) / (1 - NI / TA_E' \ b)$$

We multiply this equation by:

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$$(TA_E / TA_E)$$

$$\text{Internal growth rate} = (NI / TA_E' \ b) / (1 - NI / TA_E' \ b)' \ (TA_E / TA_E)$$
$$\text{Internal growth rate} = (NI' \ b) / (TA_E - NI' \ b)$$

Recognize that the denominator is equal to beginning of period assets, that is:

$$(TA_E - NI' \ b) = TA_B$$

Substituting this into the previous equation, we get:

$$\text{Internal growth rate} = (NI' \ b) / TA_B$$

Which is equivalent to:

$$\text{Internal growth rate} = (NI / TA_B)' \ b$$

Since $ROA_B = NI / TA_B$

The internal growth rate equation is:

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Internal growth rate = $ROA_B \times b$

30. Since the company issued no new equity, shareholders' equity increased by retained earnings. Retained earnings for the year were:

Retained earnings = NI − Dividends
Retained earnings = $75,000 − 32,000
Retained earnings = $43,000

So, the equity at the end of the year was:

Ending equity = $265,000 + 43,000
Ending equity = $308,000

The ROE based on the end of period equity is:

ROE = $\$75,000 / \$308,000$
ROE = .2435 or 24.35%

The plowback ratio is:

Plowback ratio = Addition to retained earnings / NI
Plowback ratio = $\$43,000 / \$75,000$
Plowback ratio = .5733 or 57.33% TBEXAM.COM

Using the equation presented in the text for the sustainable growth rate, we get:

Sustainable growth rate = $(ROE \times b) / (1 - (ROE \times b))$
Sustainable growth rate = $(.2435[.5733]) / (1 - .2435[.5733])$
Sustainable growth rate = .1623 or 16.23%

The ROE based on the beginning of period equity is:

ROE = $\$75,000 / \$265,000$
ROE = .2830 or 28.30%

Using the shortened equation for the sustainable growth rate and the beginning of period ROE, we get:

Sustainable growth rate = ROE × b
Sustainable growth rate = .2830 × .5733
Sustainable growth rate = .1623 or 16.23%

Using the shortened equation for the sustainable growth rate and the end of period ROE, we get:

Sustainable growth rate = ROE × b

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Sustainable growth rate = .2435 × .5733
Sustainable growth rate = .1396 or 13.96%

Using the end of period ROE in the shortened sustainable growth rate results in a growth rate that is too low. This will always occur whenever the equity increases. If equity increases, the ROE based on end of period equity is lower than the ROE based on beginning of period equity. The ROE (and sustainable growth rate) in the abbreviated equation is based on equity that did not exist when the net income was earned.

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CHAPTER 4
DISCOUNTED CASH FLOW VALUATION

Answers to Concept Questions

1. Assuming positive cash flows and interest rates, the future value increases and the present value decreases.

2. Assuming positive cash flows and interest rates, the present value will fall and the future value will rise.

3. The better deal is the one with equal installments.

4. Yes, they should. APRs generally don't provide the relevant rate. The only advantage is that they are easier to compute, but, with modern computing equipment, that advantage is not very important.

5. A freshman does. The reason is that the freshman gets to use the money for much longer before interest starts to accrue.

6. It's a reflection of the time value of money. TMCC gets to use the $24,099 immediately. If TMCC uses it wisely, it will be worth more than $100,000 in 30 years.

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7. Oddly enough, it actually makes it more desirable since TMCC only has the right to pay the full $100,000 before it is due. This is an example of a "call" feature. Such features are discussed at length in a later chapter.

8. The key considerations would be: (1) Is the rate of return implicit in the offer attractive relative to other, similar risk investments? and (2) How risky is the investment; that is, how certain are we that we will actually get the $100,000? Thus, our answer does depend on who is making the promise to repay.

9. The Treasury security would have a somewhat higher price because the Treasury is the strongest of all borrowers.

10. The price would be higher because, as time passes, the price of the security will tend to rise toward $100,000. This rise is just a reflection of the time value of money. As time passes, the time until receipt of the $100,000 grows shorter, and the present value rises. In 2029, the price will probably be higher for the same reason. We cannot be sure, however, because interest rates could be much higher, or TMCC's financial position could deteriorate. Either event would tend to depress the security's price.

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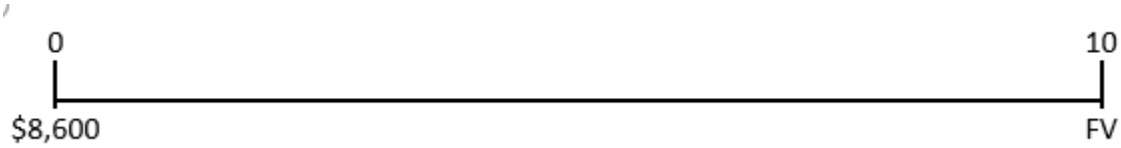
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Solutions to Questions and Problems

NOTE: All-end-of chapter problems were solved using a spreadsheet. Many problems require multiple steps. Due to space and readability constraints, when these intermediate steps are included in this solutions manual, rounding may appear to have occurred. However, the final answer for each problem is found without rounding during any step in the problem.

Basic

1. The time line for the cash flows is:



The simple interest per year is:

$8,600 × .075 = $645

So, after 10 years you will have:

$645 × 10 = $6,450 in interest

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The total balance will be $8,600 + 6,450 = $15,050

With compound interest we use the future value formula:

$$FV = PV(1+r)^t$$
$$FV = \$8,600(1.075)^{10}$$
$$FV = \$17,724.87$$

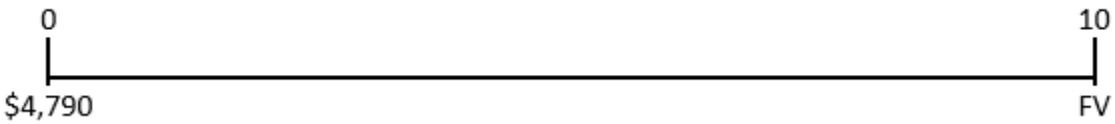
The difference is:

$17,724.87 − 15,050 = $2,674.87

2. To find the FV of a lump sum, we use:

$$FV = PV(1+r)^t$$

The time line for the cash flows is:



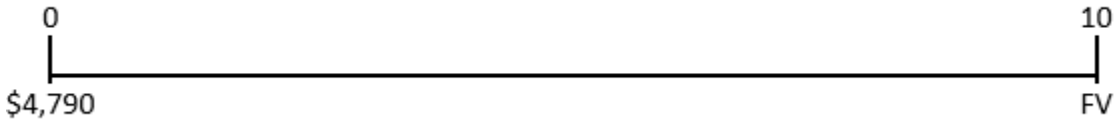
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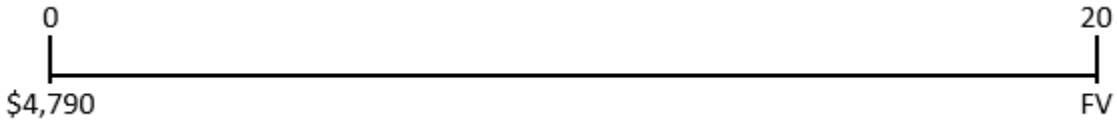
$$FV = \$4,790(1.05)^{10} = \$7,802.41$$

b. The time line for the cash flows is:



$$FV = \$4,790(1.07)^{10} = \$9,422.66$$

c. The time line for the cash flows is:



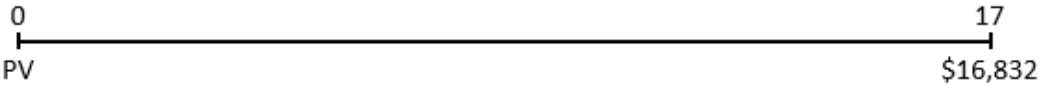
$$FV = \$4,790(1.08)^{20} = \$22,325.98$$

d. Because interest compounds on the interest already earned, the interest earned in part (c) is more than twice the interest earned in Part a. With compound interest, future values grow exponentially.

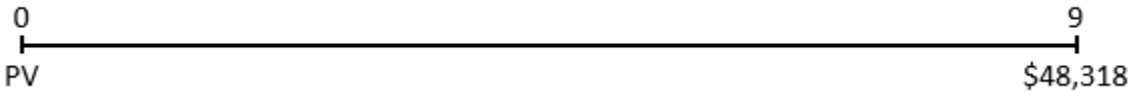
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3. To find the PV of a lump sum, we use:

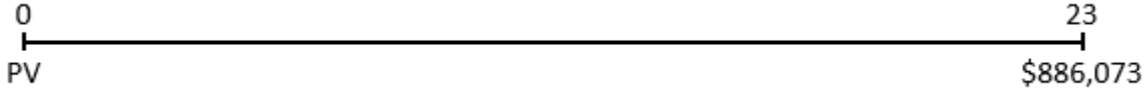
$$PV = FV / (1+r)^t$$



$$PV = \$16,832 / (1.09)^{17} = \$3,889.42$$



$$PV = \$48,318 / (1.07)^{9} = \$26,281.79$$

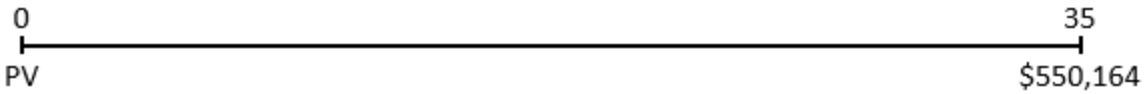


$$PV = \$886,073 / (1.13)^{23} = \$53,292.40$$

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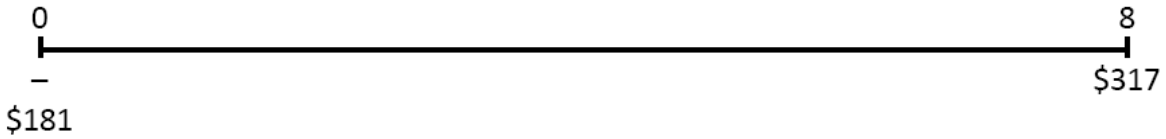
$PV = \$550{,}164 / (1.21)^{35} = \$696.63$

4. We can use either the FV or the PV formula. Both will give the same answer since they are the inverse of each other. We will use the FV formula, that is:

$FV = PV(1+r)^t$

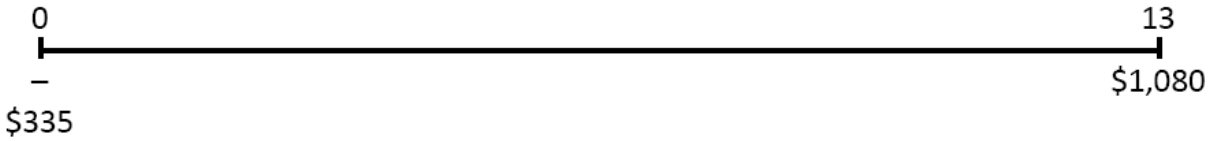
Solving for *r*, we get:

$r = (FV / PV)^{1/t} - 1$

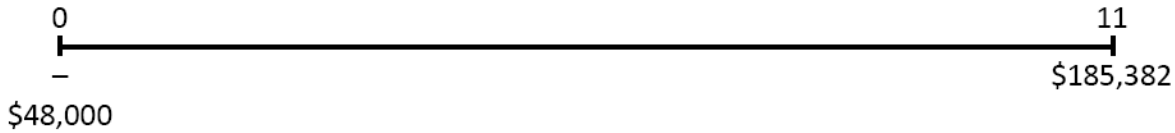


$FV = \$317 = \$181(1+r)^8 \quad r = (\$317 / \$181)^{1/8} - 1 = .0726 \text{ or } 7.26\%$

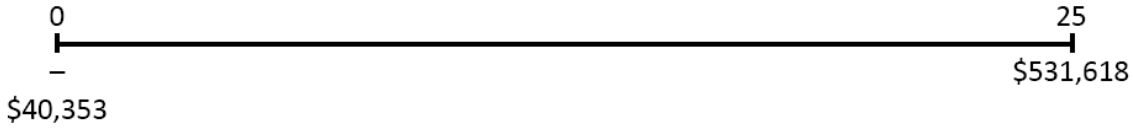
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$FV = \$1{,}080 = \$335(1+r)^{13} \quad r = (\$1{,}080 / \$335)^{1/13} - 1 = .0942 \text{ or } 9.42\%$



$FV = \$185{,}382 = \$48{,}000(1+r)^{11} \quad r = (\$185{,}382 / \$48{,}000)^{1/11} - 1 = .1307 \text{ or } 13.07\%$



$FV = \$531{,}618 = \$40{,}353(1+r)^{25} \quad r = (\$531{,}618 / \$40{,}353)^{1/25} - 1 = .1086 \text{ or } 10.86\%$

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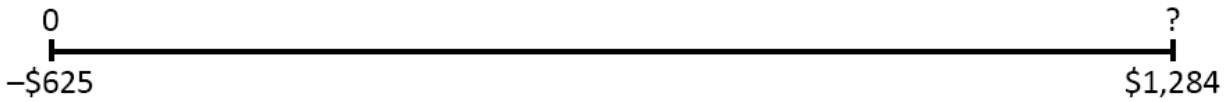
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5. We can use either the FV or the PV formula. Both will give the same answer since they are the inverse of each other. We will use the FV formula, that is:

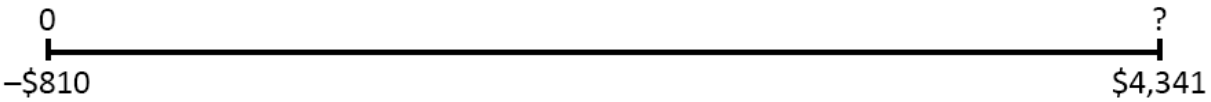
$$FV = PV(1+r)^t$$

Solving for t, we get:

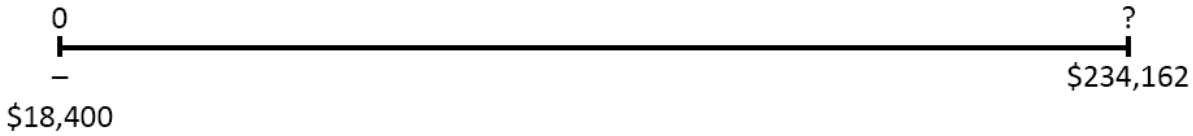
$$t = \ln(FV / PV) / \ln(1+r)$$



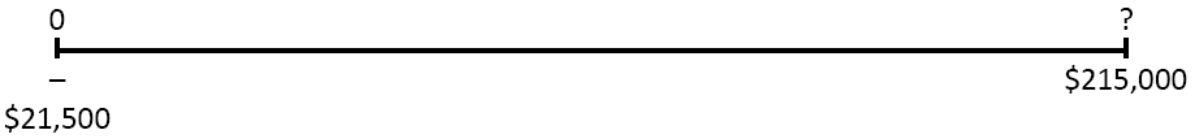
$$FV = \$1,284 = \$625(1.07)^t \quad t = \ln(\$1,284 / \$625) / \ln 1.07 = 10.64 \text{ years}$$



$$FV = \$4,341 = \$810(1.10)^t \quad t = \ln(\$4,341 / \$810) / \ln 1.10 = 17.61 \text{ years}$$



$$FV = \$234,162 = \$18,400(1.08)^t \quad t = \ln(\$234,162 / \$18,400) / \ln 1.08 = 33.05 \text{ years}$$



$$FV = \$215,000 = \$21,500(1.13)^t \quad t = \ln(\$215,000 / \$21,500) / \ln 1.13 = 18.84 \text{ years}$$

6. To find the length of time for money to double, triple, and so on, the present value and future value are irrelevant as long as the future value is twice the present value for doubling, three times as large for tripling, and so on. We can use either the FV or the PV formula. Both will give the same answer since they are the inverse of each other. We will use the FV formula, that is:

$$FV = PV(1+r)^t$$

Solving for t, we get:

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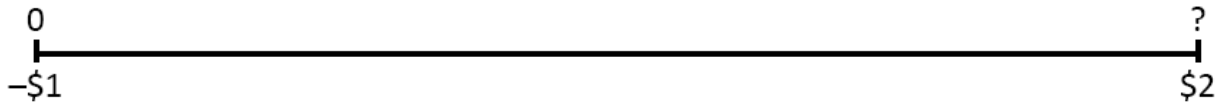
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$t = \ln(FV / PV) / \ln(1 + r)$

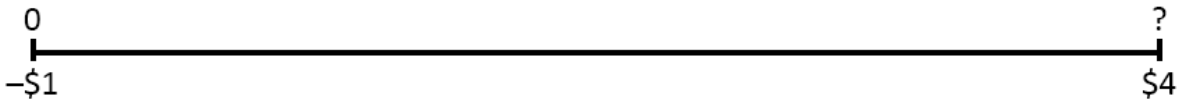
The length of time to double your money is:



$FV = \$2 = \$1(1.043)^t$

$t = \ln 2 / \ln 1.043 = 16.46$ years

The length of time to quadruple your money is:



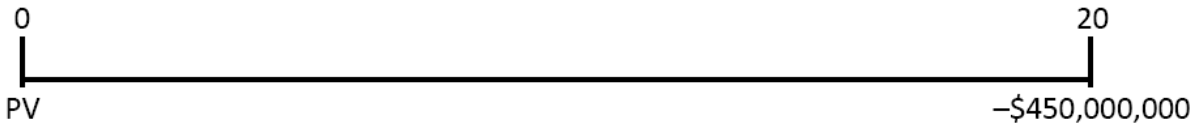
$FV = \$4 = \$1(1.043)^t$

$t = \ln 4 / \ln 1.043 = 32.93$ years

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Notice that the length of time to quadruple your money is twice as long as the time needed to double your money (the slight difference in these answers is due to rounding). This is an important concept of time value of money.

7. The time line is:



To find the PV of a lump sum, we use:

$PV = FV / (1 + r)^t$

$PV = \$450,000,000 / 1.052^{20}$

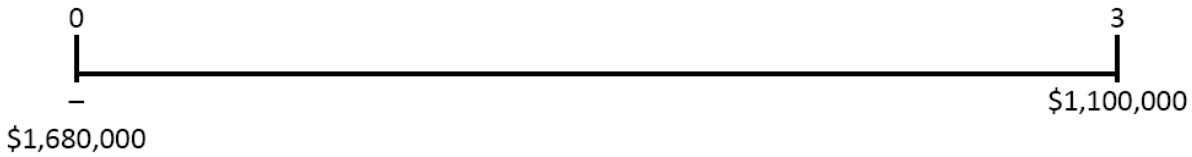
PV = $163,266,738.60

8. The time line is:

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To answer this question, we can use either the FV or the PV formula. Both will give the same answer since they are the inverse of each other. We will use the FV formula, that is:

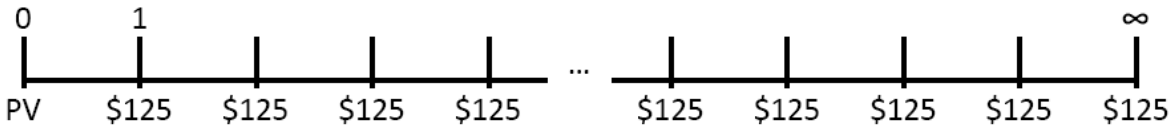
$$FV = PV(1+r)^t$$

Solving for *r*, we get:

$$r = (FV / PV)^{1/t} - 1$$
$$r = (\$1{,}100{,}000 / \$1{,}680{,}000)^{1/3} - 1$$
$$r = -.1317 \text{ or } -13.17\%$$

Notice that the interest rate is negative. This occurs when the FV is less than the PV.

9. The time line is:



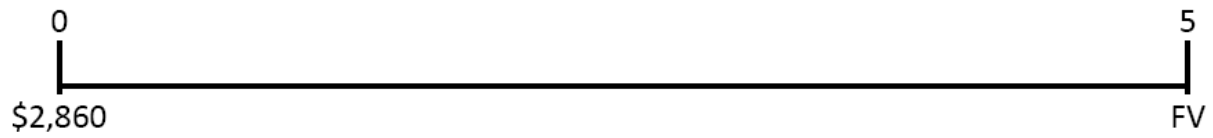
A consol is a perpetuity. To find the PV of a perpetuity, we use the equation:

$$PV = C / r$$
$$PV = \$125 / .029$$
PV = $4,310.34

10. To find the future value with continuous compounding, we use the equation:

$$FV = PVe^{Rt}$$

a.



$$FV = \$2{,}860e^{12(5)} = \$5{,}211.26$$

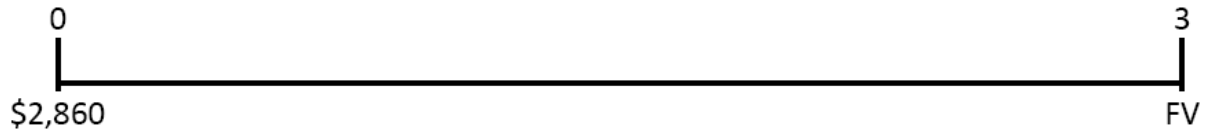
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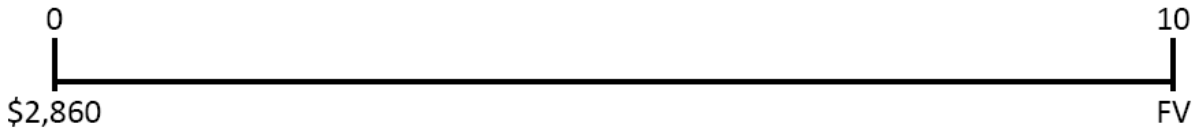
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b.



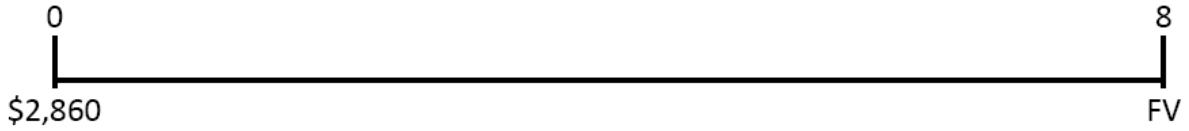
$$FV = \$2,860e^{.07(3)} = \$3,528.32$$

c.



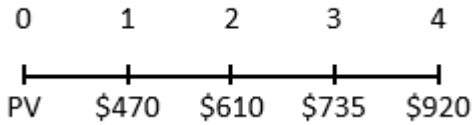
$$FV = \$2,860e^{.05(10)} = \$4,715.34$$

d.



$$FV = \$2,860e^{.11(8)} = \$6,895.17$$

11. The time line is:



To solve this problem, we must find the PV of each cash flow and add them. To find the PV of a lump sum, we use:

$$PV = FV / (1+r)^t$$

$$PV@10\% = \$470/1.10 + \$610/1.10^2 + \$735/1.10^3 + \$920/1.10^4 = \$2,111.99$$

$$PV@18\% = \$470/1.18 + \$610/1.18^2 + \$735/1.18^3 + \$920/1.18^4 = \$1,758.27$$

$$PV@24\% = \$470/1.24 + \$610/1.24^2 + \$735/1.24^3 + \$920/1.24^4 = \$1,550.39$$

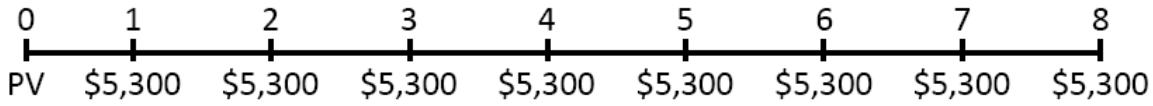
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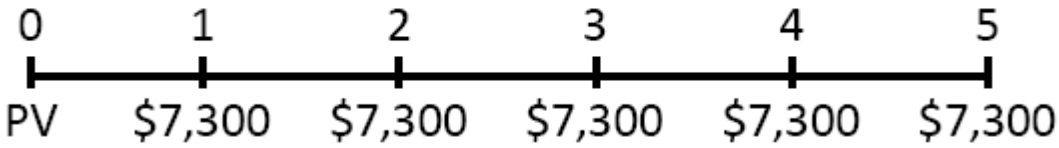
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12. The time lines are:





To find the PVA, we use the equation:

$$PVA = C\left(\frac{1 - \{1/(1+r)^t\}}{r}\right)$$

At a 5% interest rate:

X@5%: $PVA = \$5,300\left(\frac{1 - \{1/1.05\}^8}{.05}\right) = \$34,255.03$

Y@5%: $PVA = \$7,300\left(\frac{1 - \{1/1.05\}^5}{.05}\right) = \$31,605.18$

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And at a 15% interest rate:

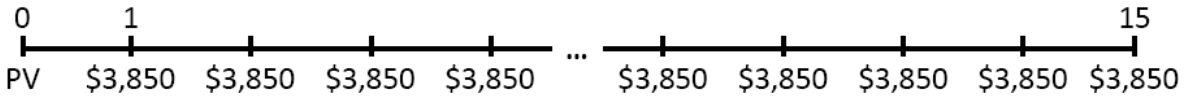
X@15%: $PVA = \$5,300\left(\frac{1 - \{1/1.15\}^8}{.15}\right) = \$23,782.80$

Y@15%: $PVA = \$7,300\left(\frac{1 - \{1/1.15\}^5}{.15}\right) = \$24,470.73$

Notice that the PV of Cash Flow X has a greater PV at an interest rate of 5%, but a lower PV at an interest rate of 15%. The reason is that *X* has greater total cash flows. At a lower interest rate, the total cash flow is more important since the cost of waiting (the interest rate) is not as great. At a higher interest rate, *Y* is more valuable since it has larger cash flows. At a higher interest rate, these bigger cash flows early are more important since the cost of waiting (the interest rate) is so much greater.

13. To find the PVA, we use the equation:

$$PVA = C\left(\frac{1 - \{1/(1+r)^t\}}{r}\right)$$

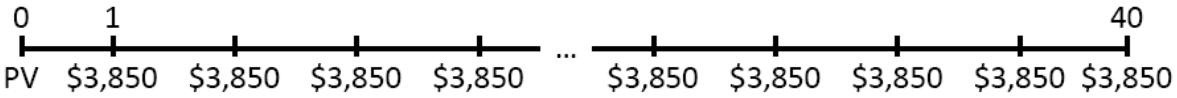


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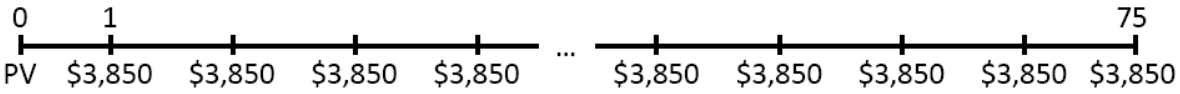
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PVA@15 years: $PVA = \$3,850\left(\left[1 - \{1/1.06\}^{15}\right]/.06\right) = \$37,392.16$



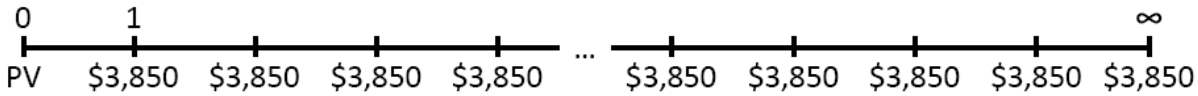
PVA@40 years: $PVA = \$3,850\left(\left[1 - \{1/1.06\}^{40}\right]/.06\right) = \$57,928.24$



PVA@75 years: $PVA = \$3,850\left(\left[1 - \{1/1.06\}^{75}\right]/.06\right) = \$63,355.02$

To find the PV of a perpetuity, we use the equation:

$PV = C/r$

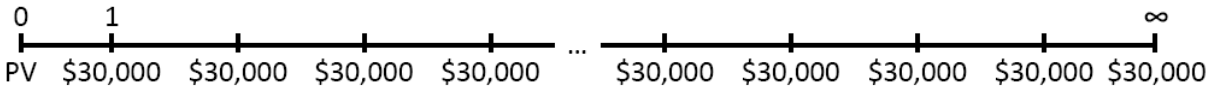


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$PV = \$3,850/.06 = \$64,166.67$

Notice that as the length of the annuity payments increases, the present value of the annuity approaches the present value of the perpetuity. The present value of the 75-year annuity and the present value of the perpetuity imply that the value today of all perpetuity payments beyond 75 years is only $811.65.

14. The time line is:



This cash flow is a perpetuity. To find the PV of a perpetuity, we use the equation:

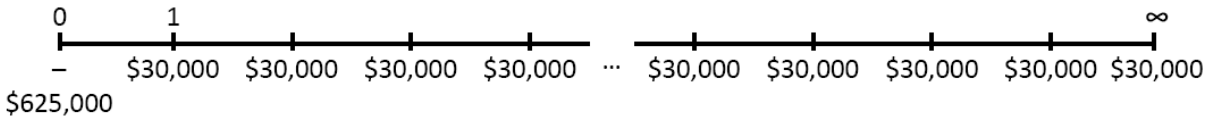
$PV = C/r$
$PV = \$30,000/.043$
PV = $697,674.42

The time line is:

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Here we need to find the interest rate that equates the perpetuity cash flows with the PV of the cash flows. Using the PV of a perpetuity equation:

$$PV = C / r$$
$$\$625,000 = \$30,000 / r$$

We can now solve for the interest rate as follows:

$$r = \$30,000 / \$625,000$$
$$r = .0480 \text{ or } 4.80\%$$

15. For discrete compounding, to find the EAR, we use the equation:

$$EAR = (1 + [APR / m])^m - 1$$

$$EAR = (1 + [.079 / 4])^4 - 1 = .0814 \text{ or } 8.14\%$$

$$EAR = (1 + [.153 / 12])^{12} - 1 = .1642 \text{ or } 16.42\%$$

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$$EAR = (1 + [.114 / 365])^{365} - 1 = .1320 \text{ or } 13.20\%$$

To find the EAR with continuous compounding, we use the equation:

$$EAR = e^q - 1$$
$$EAR = e^{114} - 1$$
$$EAR = .1208 \text{ or } 12.08\%$$

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16. Here we are given the EAR and need to find the APR. Using the equation for discrete compounding:

$$EAR = (1+[APR / m])^m - 1$$

We can now solve for the APR. Doing so, we get:

$$APR = m\left([1+EAR]^{1/m} - 1\right)$$

$$EAR = .142 = (1+[APR / 2])^2 - 1 \qquad APR = 2\left([1.142]^{1/2} - - 1\right) = .1373 \text{ or} 13.73\%$$

$$EAR = .184 = (1+[APR / 12])^{12} - 1 \qquad APR = 12\left([1.184]^{1/12} - 1\right) = .1701 \text{ or} 17.01\%$$

$$EAR = .111 = (1+[APR / 52])^{52} - 1 \qquad APR = 52\left([1.111]^{1/52} - 1\right) = .1054 \text{ or} 10.54\%$$

Solving the continuous compounding EAR equation:

$$EAR = e^q - 1$$

We get:

APR = ln(1 + EAR)
APR = ln(1 + .0890)
APR = .0853 or 8.53%

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17. For discrete compounding, to find the EAR, we use the equation:

$$EAR = (1+[APR / m])^m - 1$$

So, for each bank, the EAR is:

First National: $EAR = (1+[.138/12])^{12} - 1 = .1471 \text{ or} 14.71\%$

First United: $EAR = (1+[.141/2])^2 - 1 = .1460 \text{ or} 14.60\%$

Notice that the higher APR does not necessarily result in a higher EAR. The number of compounding periods within a year will also affect the EAR.

18. The cost of a case of wine is 10% less than the cost of 12 individual bottles, so the cost of a case will be:

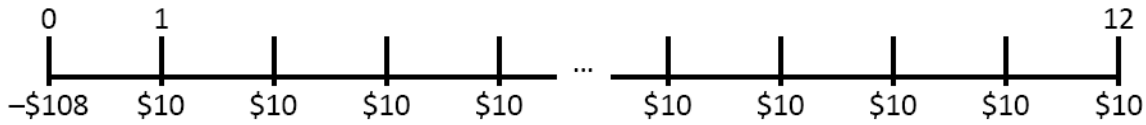
Cost of case = (12)($10)(1 − .10)
Cost of case = $108

Now, we need to find the interest rate. The cash flows are an annuity due, so:

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$$PVA = (1+r)C\left(\left[1 - \{1/(1+r)^t\}\right]/r\right)$$
$$\$108 = (1+r)\$10\left(\left[1 - \left[1/(1+r)^{12}\right]\right]/r\right)$$

Solving for the interest rate, we get:

r = .0198 or 1.98% per week

So, the APR of this investment is:

APR = .0198(52)
APR = 1.0277 or 102.77%

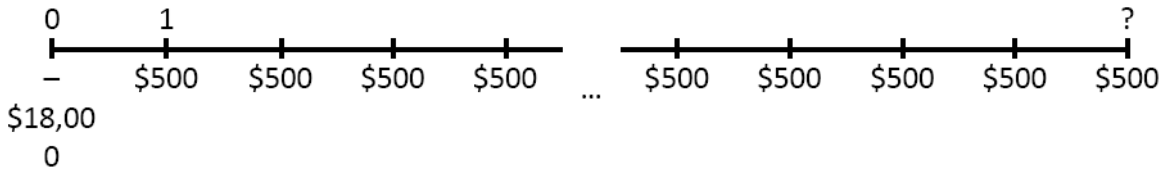
And the EAR is:

$$EAR = (1+.0198)^{52} - 1$$
EAR = 1.7668 or 176.68%

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The analysis appears to be correct. He really can earn about 177% buying wine by the case. The only question left is this: Can you really find a fine bottle of Bordeaux for $10?

19. The time line is:



Here we need to find the length of an annuity. We know the interest rate, the PVA, and the payments. Using the PVA equation:

$$PVA = C\left(\left[1 - \{1/(1+r)^t\}\right]/r\right)$$
$$\$18,000 = \$500\left(\left[1 - \{1/1.018\}^t\right]/.018\right)$$

Now we solve for t:

$$1/1018^t = 1 - (\$18000/\$500)(018)$$
$$1/1.018^t = .352$$

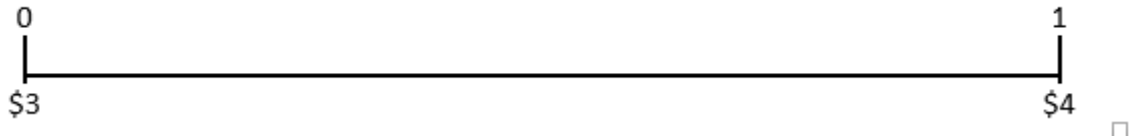
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$1.018^t = 1/.352 = 2.841$
$t = \ln 2.841 / \ln 1.018$
t = 58.53 months

20. The time line is:



Here, we are trying to find the interest rate when we know the PV and FV. Using the FV equation:

FV = PV(1 + r)
\$4 = \$3(1 + r)
$r = 4/3 - 1 = .3333$ or 33.33% per week

The interest rate is 33.33% per week. To find the APR, we multiply this rate by the number of weeks in a year, so:

APR = (52)33.33% = 17.3333 or 1,733.33%

And using the equation to find the EAR:

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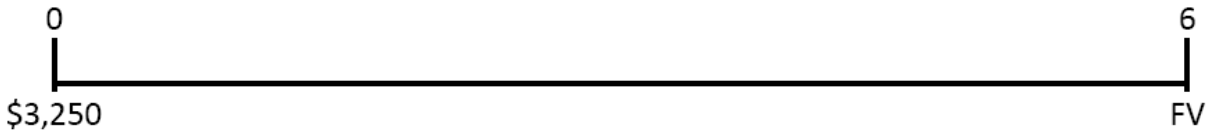
$EAR = (1+[APR/m])^m - 1$
$EAR = (1+.3333)^{52} - 1 = 3,139,165.1569$ or 313,916,515.69%

Intermediate

21. To find the FV of a lump sum with discrete compounding, we use:

$FV = PV(1+r)^t$

a.



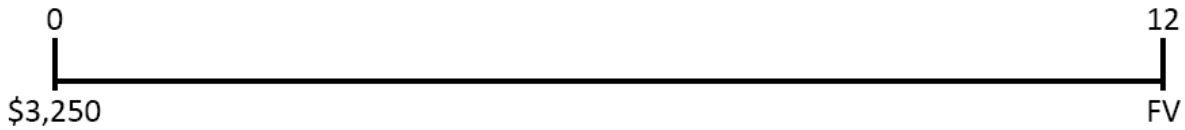
$FV = \$3,250(1.054)^6 = \$4,455.81$

b.

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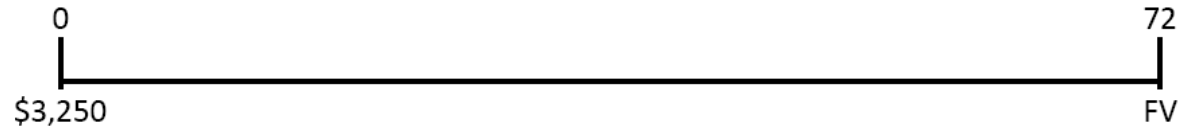
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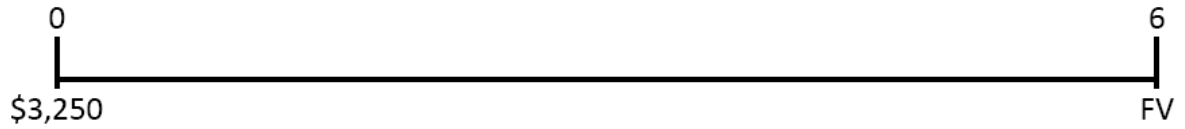
$$FV = \$3,250(1+.054/2)^{12} = \$4,474.34$$

c.



$$FV = \$3,250(1+.054/12)^{72} = \$4,490.34$$

d.



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To find the future value with continuous compounding, we use the equation:

$$FV = PVe^{rt}$$
$$FV = \$3,250e^{.054(6)} = \$4,493.60$$

e. The future value increases when the compounding period is shorter because interest is earned on previously accrued interest. The shorter the compounding period, the more frequently interest is earned, and the greater the future value, assuming the same stated interest rate.

22. The total interest paid by First Simple Bank is the interest rate per period times the number of periods. In other words, the interest paid by First Simple Bank over 10 years will be:

.064(10) = .64

First Complex Bank pays compound interest, so the interest paid by this bank will be the FV factor of $1 minus the initial investment of $1, or:

$(1+r)^{10}$ - 1

Setting the two equal, we get:

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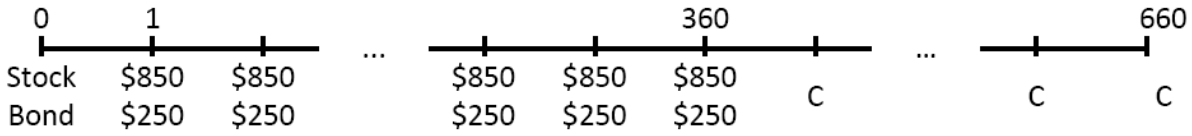
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$(.064)(10) = (1+r)^{10} - 1$

$r = 1.64^{1/10} - 1 = .0507$ or 5.07%

23. Although the stock and bond accounts have different interest rates, we can draw one time line, but we need to remember to apply different interest rates. The time line is:



We need to find the annuity payment in retirement. Our retirement savings ends, and the retirement withdrawals begin, so the PV of the retirement withdrawals will be the FV of the retirement savings. So, we find the FV of the stock account and the FV of the bond account and add the two FVs.

Stock account:

$FVA = \$850\left(\frac{\{1+(.11/12)\}^{360} - 1}{[.11/12]}\right)$

FVA = $2,383,841.78

Bond account:

$FVA = \$250\left(\frac{\{1+(.06/12)\}^{360} - 1}{[.06/12]}\right)$

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FVA = $251,128.76

So, the total amount saved at retirement is:

$2,383,841.78 + 251,128.76 = $2,634,970.54

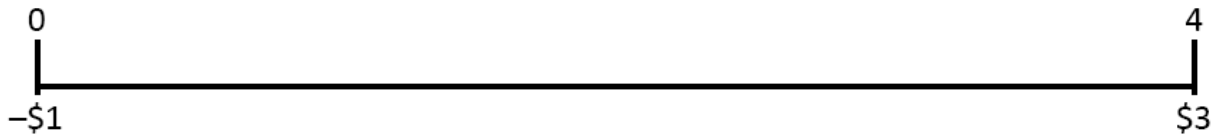
Solving for the withdrawal amount in retirement using the PVA equation gives us:

$PVA = \$2,634,970.54 = \$C\left(\frac{1 - 1/\{1+(.05/12)\}^{300}}{[.05/12]}\right)$

$C = \$2,634,970.54/171.0600$

C = $15,403.78 withdrawal per month

24. The time line is:



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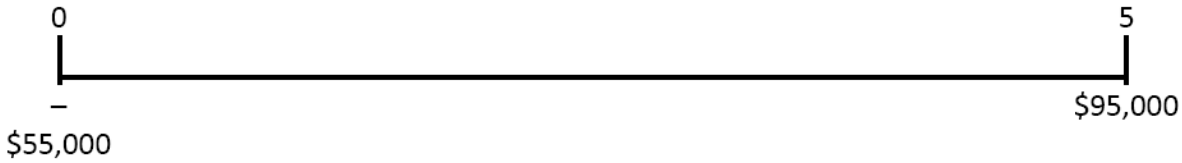
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Since we are looking to triple our money, the PV and FV are irrelevant as long as the FV is three times as large as the PV. The number of periods is four, the number of quarters per year. So:

$$FV = \$3 = \$1(1+r)^{(12/3)}$$
$$r = .3161 \text{ or } 31.61\%$$

25. Here, we need to find the interest rate for two possible investments. Each investment is a lump sum, so:

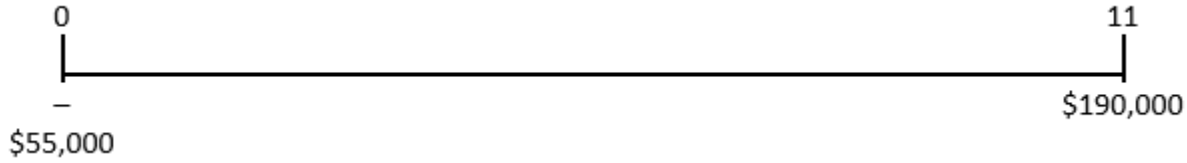
G:



$$PV = \$55,000 = \$95,000/(1+r)^5$$
$$(1+r)^5 = \$95,000/\$55,000$$
$$r = 1.7273^{1/5} - 1 = .1155, \text{ or } 11.55\%$$

H:

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$$PV = \$55,000 = \$190,000/(1+r)^{11}$$
$$(1+r)^{11} = \$190,000/\$55,000$$
$$r = 3.4545^{1/11} - 1 = .1193, \text{ or } 11.93\%$$

26. This is a growing perpetuity. The present value of a growing perpetuity is:

$$PV = C/(r-g)$$
$$PV = \$175,000/(.11-.034)$$
$$PV = \$2,302,631.58$$

It is important to recognize that when dealing with annuities or perpetuities, the present value equation calculates the present value one period before the first payment. In this case, since the first payment is in 3 years, we have calculated the present value 2 years from now. To find the value today, we can discount this value as a lump sum. Doing so, we find the value of the cash flow stream today is:

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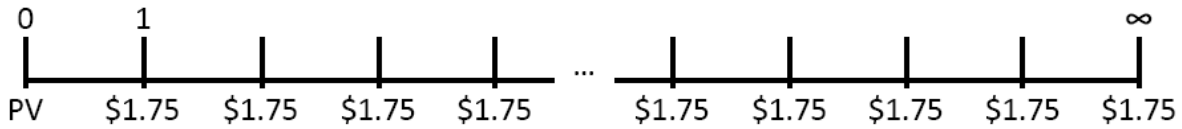
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$$PV = FV / (1+r)^t$$
$$PV = \$2,302,631.58 / (1+.11)^2$$
$$PV = \$1,868,867.44$$

27. The dividend payments are made quarterly, so we must use the quarterly interest rate. The quarterly interest rate is:

$$\text{Quarterly rate} = \text{Stated rate} / 4$$
$$\text{Quarterly rate} = .043 / 4$$
$$\text{Quarterly rate} = .0108$$

The time line is:

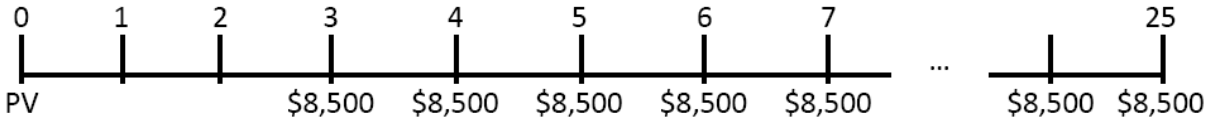


Using the present value equation for a perpetuity, we find the value today of the dividends paid must be:

$$PV = C / r$$
$$PV = \$1.75 / .0108$$
$$PV = \$162.79$$

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28. The time line is:



We can use the PVA annuity equation to answer this question. The annuity has 23 payments, not 22 payments. Since there is a payment made in Year 3, the annuity actually begins in Year 2. So, the value of the annuity in Year 2 is:

$$PVA = C\left(\left\{1 - \left\{1/(1+r)^t\right\}\right\}/r\right)$$
$$PVA = \$8,500\left(\left\{1 - \left\{1/(1+.068)^{23}\right\}\right\}/.068\right)$$
$$PVA = \$97,472.22$$

This is the value of the annuity one period before the first payment, or Year 2. So, the value of the cash flows today is:

$$PV = FV / (1+r)^t$$

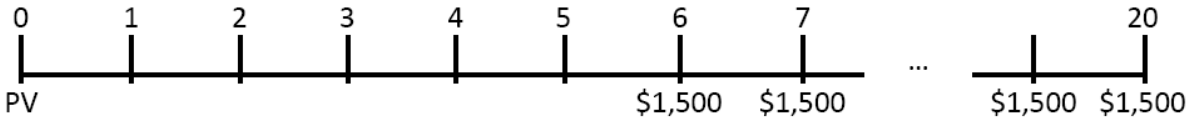
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$$PV = \$97,472.22 / (1+.068)^2$$
$$PV = \$85,455.17$$

29. The time line is:



We need to find the present value of an annuity. Using the PVA equation, and the 11% interest rate, we get:

$$PVA = C\left(\left\{1 - \{1/(1+r)^t\}\right\}/r\right)$$
$$PVA = \$1,500\left(\left\{1 - \{1/(1+.11)^{15}\}\right\}/.11\right)$$
$$PVA = \$10,786.30$$

This is the value of the annuity in Year 5, one period before the first payment. Finding the value of this amount today, we find:

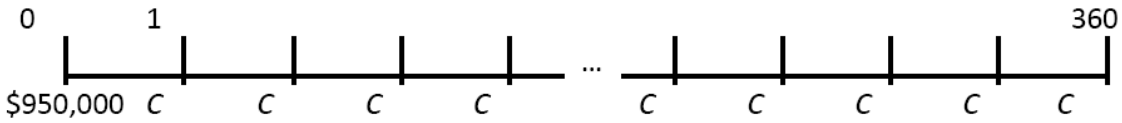
$$PV = FV / (1+r)^t$$
$$PV = \$10,786.30 / (1+.08)^5$$
$$PV = \$7,340.98$$

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30. The amount borrowed is the value of the home times one minus the down payment, or:

Amount borrowed = $950,000(1 − .20)
Amount borrowed = $760,000

The time line is:



The monthly payments with a balloon payment loan are calculated assuming a longer amortization schedule, in this case, 30 years. The payments based on a 30-year repayment schedule would be:

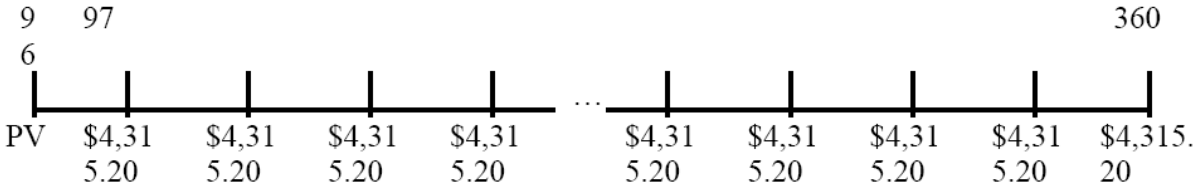
$$PVA = \$950,000 = C\left(\left\{1 - \{1/(1+.055/12)^{360}\}\right\}/[.055/12]\right)$$
$$C = \$4,315.20$$

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Now, at Year 8 (Month 96), we need to find the PV of the payments which have not been made. The time line is:

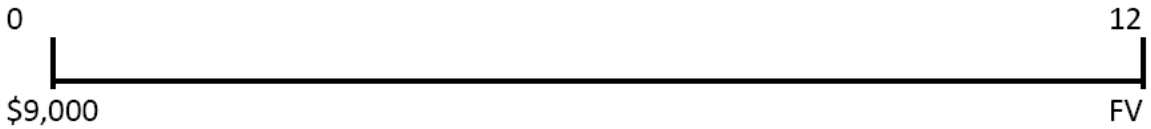


The balloon payment will be:

$$PVA = \$4,315.20\left(\left\{1 - \left\{1/(1+.055/12)^{22(12)}\right\}\right\}/[.055/12]\right)$$

PVA = $659,968.23

31. The time line is:



Here we need to find the FV of a lump sum, with a changing interest rate. We must do this problem in two parts. After the first 6 months, the balance will be:

$$FV = \$9,000(1+[.0125/12])^{6}$$

FV = $9,056.40

This is the balance in 6 months. The FV in another 6 months will be:

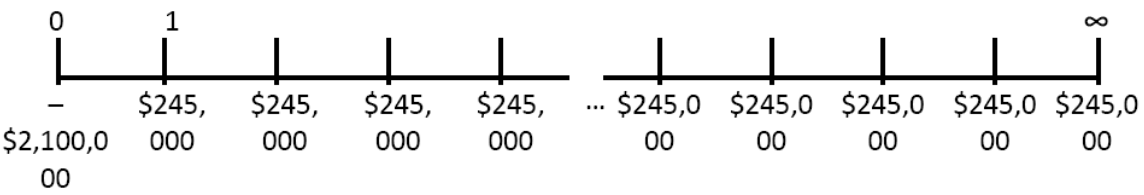
$$FV = \$9,056.40(1+[.178/12])^{6}$$

FV = $9,892.90

The problem asks for the interest accrued, so, to find the interest, we subtract the beginning balance from the FV. The interest accrued is:

Interest = $9,892.90 − 9,000
Interest = $892.90

32. The time line is:



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