

## *What is a Company?*

### *Lesson Summary*

*What is a Company?* compares prominent corporations to help students learn about the many facets of public and private companies.

### *Lesson Objectives*

- Identify and describe the terms: company, partnership, and corporation.
- Explain the characteristics, advantages, and disadvantages of various types of companies.
- Explain how companies are formed.
- Describe the benefits of forming a business to manufacture and sell a product.

### *NCTM Standards*

9C - Recognize and apply mathematics in contexts outside of mathematics.

### *Mathematical Strands*

	<b>Thinking Algebraically</b>	Students use information from a chart to evaluate investment decisions. Students will explain their thinking.	
	<b>Interpreting Statistics</b>	Students evaluate profits and profit trends presented in a table to make decisions about potential investments. Students should use their reasoning skills to make arguments both for and against each company presented.	
	<b>Communicating Quantitative Information</b>	Students synthesize large amounts of information organized within charts into a coherent, persuasive presentation.	
	<b>Tackling Complex Problems</b>	Students work through problems involving interest rates. Students reason about what decision is the right one for a company to make and use their skills to gain fluency in working with simple and compound interest.	

## THINKING ALGEBRAICALLY

Some years are better than others for companies to go public. It depends on how much money they think they will generate by going public and how much it would cost them to borrow that money from a bank, versus selling shares of their company. This is a mock list of interest rates from the past seven years.

2000	2001	2002	2003	2004	2005	2006
8.5%	9.5%	4.75%	4.25%	4.00%	5.25%	7.25%

Is it better to have a higher interest rate when a company borrows money or to have a lower interest rate? Why?

In which three years would it have cost companies the most to borrow money? In which three years would it have cost the least? How do you know?

Write a formula that expresses the interest,  $i$ , that a company will pay on a one-year loan,  $l$ , at a specified interest rate,  $r$ .

If a company needed to borrow \$14,500,000, how much more would it pay in one year of simple interest if it borrowed the money in 2001 as opposed to 2002? Make sure you show your calculations.

If a company needed to borrow \$155,000,000, how much more money would it cost in one year of simple interest if it borrowed the money in 2003 versus 2004? Make sure you show your calculations.

## INTERPRETING STATISTICS

Below are the profiles of three companies that are thinking of going public. Each company sells high-end fashion accessories. Based on the information provided, give reasons why a venture capitalist might invest in the company.

	Company A	Company B	Company C
Profits 2002	\$635,000	-	\$1,199,000
Profits 2003	\$654,000	-	\$1,103,000
Profits 2004	\$719,000	-	\$1,048,000
Profits 2005	\$848,000	-	\$1,017,000
Profits 2006	\$992,000	\$2,881,000	\$1,220,000
Company founded in:	Dec. 2000	Nov. 2005	May 1988
Average units sold per day	460	320	830
Average units on hand	670	2,960	870

Write a summary about profit trends you see above.

Generally, companies do not want to have too much inventory on hand. For each company, express the number of units sold per day as a percentage of the number of units on hand.

Given the information you've extracted from the chart above, what company would you invest in as a venture capitalist?

## COMMUNICATING QUANTITATIVE INFORMATION

Universal Power Group Corporation, based in Texas, was trying to decide whether to go public in 2006. Pretend you were a junior sales analyst at the company and are invited to give your opinion about what the company should do.

*In order to make your recommendations, make notes next to each chart, and state what information is presented and how this information might inform your boss of the decision he needs to make.*

Identify the most important piece of information in your opinion, and make a graphical representation of that information to present to your boss.

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### *Universal Power Group Company Profile*

**Company Overview:** Universal Power Group (UPG) gives customers a charge. The company primarily distributes batteries and electrical parts to manufacturers and retailers in the U.S. Its products include lithium and nickel-cadmium batteries for such applications as cell phones, camcorders, and motorcycles. UPG also supplies electronic components and other hardware used in security systems. Products include alarm kits, sirens, and intercoms. Its Mobility division sells electric scooters. UPG's top customer is Brink's Home Security (56% of sales); other clients include Bass Pro Shops and The SCOOTER Store. Zunicom owns 40% of UPG. (*Hoover's*, February 2008 <[http://hoovers.com/universal-power-group/--ID\\_\\_153621--/free-co-profile.xhtml](http://hoovers.com/universal-power-group/--ID__153621--/free-co-profile.xhtml)>)

#### Basic Information

2005 Sales (million)	\$81.3
1-Year Sales Growth	21.0%
2005 Net Income (million)	\$1.1
1-Year Net Income Growth	184.9%
2005 Employees	65

#### Annual Income (in millions)

<i>Year</i>	<i>Revenue</i>	<i>Gross Profit</i>	<i>Operating Income</i>	<i>Total Net Income</i>
Dec 05	\$81.3	\$10.3	\$2.4	\$1.1
Dec 04	\$67.2	\$8.8	\$1.2	\$0.4
Dec 03	\$58.7	\$9.1	\$1.9	\$0.9

## COMMUNICATING QUANTITATIVE INFORMATION

### Comparison to the Industry and the Market

	<i>Universal Power Group</i>	<i>Industry</i>	<i>Market</i>
<i>Price/Sales Ratio</i>	0.38	0.56	2.24
<i>Price/Earnings Ratio</i>	16.11	15.83	19.23
<i>Price/Book Ratio</i>	7.19	2.15	2.18
<i>Price/Cash Flow Ratio</i>	77.51	13.53	13.68

### Universal Power Group's Top Competitors

	Universal Power Group	Arrow Electronics	Avnet	Interstate Battery
<i>Annual Sales(millions)</i>	\$81.3	\$11,164.2	\$14,253.6	\$754.9
<i>Employees</i>	65	11,400	--	1,251
<i>Market Cap (millions)</i>	\$0.0	\$4,243.8	\$4,091.9	\$0.0

Hoover's. January 2007 <[http://www.hoovers.com/universal-power-group/--ID\\_\\_153621,ticker\\_\\_--/free-co-fin-factsheet.xhtml](http://www.hoovers.com/universal-power-group/--ID__153621,ticker__--/free-co-fin-factsheet.xhtml)>

## What is a Company?

### ANSWER KEY

*Please Note: 1. Prices included in lesson are not representative of actual market data and are for instructional purposes only. 2. Discrepancies may occur between student responses and the answer keys as a result of how far calculations were taken past the decimal point. In most instances, numbers were rounded from the thousandth or ten thousandth place.*

Some years are better than others for companies to go public. It depends on how much money they think they will generate by going public and how much it would cost them to borrow that money from a bank, versus selling shares of their company. This is a mock list of interest rates from the past seven years.

2000	2001	2002	2003	2004	2005	2006
8.5%	9.5%	4.75%	4.25%	4.00%	5.25%	7.25%

1. Is it better to have a higher interest rate when a company borrows money or to have a lower interest rate? Why?

*Answer: When a company borrows money it is better to have a low interest rate. The lower the interest rate, the less amount of money the company has to pay back as interest on the loan.*

2. In which three years would it have cost companies the most to borrow money? In which three years would it have cost the least? How do you know?

*Answer: The cost of borrowing money would have been greatest in 2000, 2001, and 2006 and lowest in 2002, 2003, and 2004. We know this because of the highs and lows of the interest rates.*

3. Write a formula that expresses the interest,  $i$ , that a company will pay on a one-year loan,  $l$ , at a specified interest rate,  $r$ .

*Answer: The formula for finding the interest on a loan is:  $i = r \times l$   
Assume a company takes a loan of \$100.00 for one year at an interest rate of 5%. The interest it must pay on that loan is:  $i = 0.05 \times \$100.00 = \$5.00$*

## THINKING ALGEBRAICALLY

4. If a company needed to borrow \$14,500,000, how much more would it pay in one year of simple interest if it borrowed the money in 2001 as opposed to 2002? Make sure you show your calculations.

*Answer: Interest paid in 2001 =  $\$14,500,000 \times 0.095 = \$1,377,500.00$*

*Interest paid in 2002 =  $\$14,500,000 \times 0.0475 = \$688,750.00$*

*Difference =  $\$1,377,500.00 - \$688,750.00 = \$688,750.00$*

*It would cost \$688,750.00 more to borrow the money in 2001 than in 2002.*

5. If a company needed to borrow \$155,000,000, how much more money would it cost in one year of simple interest if it borrowed the money in 2003 versus 2004? Make sure you show your calculations.

*Answer: Interest paid in 2003 =  $\$155,000,000 \times 0.0425 = \$6,587,500$*

*Interest paid in 2004 =  $\$155,000,000 \times 0.040 = \$6,200,000$*

*Difference =  $\$6,587,500 - \$6,200,000 = \$387,500$*

*It would cost \$387,500.00 more to borrow the money in 2003 than in 2004.*

## INTERPRETING STATISTICS

Below are the profiles of three companies that are thinking of going public. Each company sells high-end fashion accessories. Based on the information provided, give reasons why a venture capitalist might invest in the company.

	Company A	Company B	Company C
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Company founded in:	Dec. 2000	Nov. 2005	May 1988
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1. Write a summary about profit trends you see above.

*Answers will vary. Possible answers may include:*

*Company A had steady increases in profit.*

*Company B had only one year of profit because it was founded in 2005.*

*Company C had three years of declining profits from 2002 through 2005. However, it had an increase in 2006.*

2. Generally, companies do not want to have too much inventory on hand. For each company, express the number of units sold per day as a percentage of the number of units on hand.

*Answer:*

*Company A:  $(460 \div 670) \times 100\% = 0.6865 \times 100\% = 68.66\%$*

*Company B:  $(320 \div 2,960) \times 100\% = 0.108 \times 100\% = 10.81\%$*

*Company C:  $(830 \div 870) \times 100\% = 0.954 \times 100\% = 95.40\%$*

3. Given the information you've extracted from the chart above, what company would you invest in as a venture capitalist?

*Answer will vary. Possible answers may include:*

*Company A has had steady profit increases the last four years. Growth and expansion could help put this company ahead of the other two.*

*Company B had a huge profit in its first year of business*

*Company C had a turnaround year in 2006. It did a great job managing inventory, which could indicate excellent managers for this company.*

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- In order to make your recommendations, make notes next to each chart, and state what information is presented and how this information might inform your boss of the decision he needs to make.
- Identify the most important piece of information in your opinion, and make a graphical representation of that information to present to your boss.

*Answers will vary. Possible points to be made:*

*UPG would be attractive to investors because it is a great, small company that has room for a lot of growth. Its annual sales are much lower than the top competitors. Also, making a favorable impression is their revenue, gross profit, and total net income have all increased between 2003 & 2005.*

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## TACKLING COMPLEX PROBLEMS

### Working with Interest

A promising, young company decided that it wanted to expand. Instead of going public, it decided to borrow the \$4,600,000 needed to expand its business. It took out a seven-year loan in 2007, with an interest rate of 5%.

For each formula presented below,  $I$  is the value of the money the company needs to repay at the end of the  $t$  year loan, with an interest rate of  $r$ , if it initially borrowed  $P$  dollars.

1. Assume the company could make one lump payment at the end of the loan's term. If interest were compounded annually, how much money would it owe the bank? Use the formula:  $I = P(1 + r)^t$

*Answer:*

$$I = \$4,600,000(1.05)^7 = \$6,472,661.94$$

2. Assume the company could make one lump payment at the end of the loan's term. If the interest were compounded quarterly, how much money would it owe the bank?

$$I = P\left(1 + \frac{r}{4}\right)^{4t}$$

*Answer:*

$$I = \$4,600,000 (1 + (.05/4))^{4(7)}$$

$$I = \$4,600,000 (1.0125)^{28}$$

$$I = \$6,513,564.60$$

3. Assume the company could make one lump payment at the end of the loan's term. If the interest were compounded continuously, how much money would it owe the bank?  $I = Pe^{rt}$

*Answer:*

$$I = \$4,600,000 (e^{.05(7)}) \quad \text{Note: } e = 2.7182818$$

$$I = \$4,600,000 (e^{.35}) \quad I = \$6,527,710.72$$

4. For each of the above scenarios, calculate how much additional money (interest) the company will have to pay back to the bank.

*Answer:*

$$\#1 = \$1,872,661.94$$

$$\#2 = \$1,913,564.60$$

$$\#3 = \$1,927,710.72$$

5. In which of the above scenarios does the company pay back the least amount of money?

*Answer:*

*In the first scenario, the company pays the least amount of interest on the seven-year loan.*