

Really? Really!

Revisited

Surprisingly, it takes about 51 folds to reach this incredible thickness! You can perform this experiment for the first folds, until it becomes impossible to fold the paper. Make sure students realize that they can use trial and error and powers of 2 to get the answer.

Google is derived from the number googol, which is a 1 with 100 zeros following it. This is equivalent to 10^{100} . Despite the original accidental change in spelling (but not pronunciation), the name still elicits the idea of something very large. How large is 10^{100} ? There isn't a googol of anything on the planet! Let's take a look at some surprisingly large and surprisingly small numbers.

Given that 1,000,000 pennies stacked one on top of another reaches about 1 mile high, how high would 1 googol pennies reach?

To get an idea of the "power" of exponents, investigate a famous problem in mathematics.

How many times would you have to fold a piece of paper so it reached from Earth to the Sun, approximately 93 million miles?

1. A ream of paper (500 sheets) is 2 inches thick. What is the thickness of one sheet of paper? **0.004**
2. Take a sheet of paper and fold it as many times as you can. For the rest of the problem you will have to imagine that you could continually fold the piece of paper. **Number of possible folds varies.**
3. Convert 93 million miles into inches. **5,892,480,000,000**
4. Each fold represents a doubling of the previous thickness, so each fold multiplies the paper thickness by 2^x . Use your calculator and trial and error to find the lowest value of x for which the answer exceeds 93 million miles.

How many folds would it take to reach to the sun? **51 folds**

You were probably unable to fold the paper more than six or seven times, so you had to imagine the doubling of the thickness mathematically. After viewing the thickness of the paper after six folds, are you surprised at how few folds it will take the thickness of the paper to reach the sun? The "power" of 2 is amazing!

Applications

1. Nick and Matt are partners in a local health food store. They needed \$73,000 to start the business. They invested in the ratio 3:7, Nick to Matt.
 - a. How much money did each invest? **Nick: \$21,900; Matt: \$51,100**
 - b. What percent of the business was owned by Matt? Round to the nearest tenth of a percent. **70%**
2. Tom purchased shares of DuPont for \$47.65 per share. He plans to sell the shares when the stock price rises 20%. At what price will he sell his shares? **\$57.18**
3. The top three shareholders in a certain corporation each own s shares of stock. The corporation's ownership is represented by a total of x shares of stock. Express the percent of the corporation owned by the top three shareholders algebraically. **$\left(\frac{3s}{x}\right)(100)$**
4. Maribel purchased 2,000 shares of stock for \$25.43 per share. She sold them for \$44.10 per share. Express her capital gain to the nearest tenth of a percent. **73.4%**
5. A local hairstylist bought 450 shares of a cosmetics corporation for \$33.50 per share. He sold the shares for \$39.01 per share.
 - a. What was the percent increase in the price per share? Round to the nearest tenth of a percent. **16.4%**
 - b. What was the total purchase price for the 450 shares? **\$15,075**
 - c. What was the total selling price for the 450 shares? **\$17,554.50**
 - d. What was the percent capital gain for the 450 shares? Round to the nearest tenth of a percent. **16.4%**

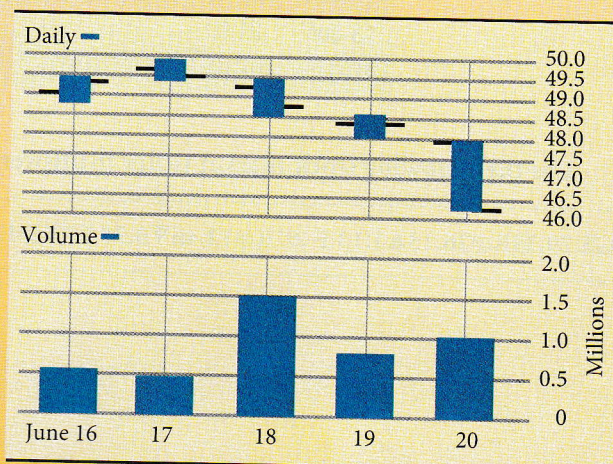
6. Deanna purchased \$24,000 worth of stock and paid her broker a 1% broker fee. She sold the stock when it increased to \$29,100 3 years later and used a discount broker who charged \$35 per trade. Compute her net proceeds after the broker fees were taken out. **\$4,825**
7. Bootle Corp paid Leslie a quarterly dividend payment for \$828. Leslie owns 450 shares of Bootle. What was the quarterly dividend for one share of Bootle? **\$1.84**
8. Aaron owned x shares of a corporation and received an annual dividend of y dollars. Express the quarterly dividend for one share algebraically. **$\frac{y}{4}$**
9. Zyco Corp pays an annual dividend of \$2.10 per share. On Tuesday it closed at \$72 per share with a net change of +0.95. The dividend remained at \$2.10 for several months.
 - a. What was the yield on Tuesday? Round to the nearest tenth of a percent. **2.9%**
 - b. At what price did Zyco close on Monday? **\$71.05**
 - c. What was the yield at Monday's close? Round to the nearest tenth of a percent. **3%**
10. Use the table below to answer a-h.
 - a. What was the difference between the 52-week high and the 52-week low for one share of AT&T? **\$6.53**
 - b. What was the difference between the day's high and low for one share of Southern Copper? **\$0.01**
 - c. Which stock had a close that was furthest from the day's low? **JPM**
 - d. Determine the close on March 2 for JPMorgan Chase. **\$56.34**
 - e. How many shares of ITT were traded on March 3? **140,460**
 - f. What was the percent net change from March 2 to March 3 for AT&T? Round to the nearest hundredth of a percent. **-0.03%**
 - g. Which stock had a day's high that was approximately 30% less than its 52-week high? **Southern Copper**
 - h. On March 2, there were 19,987,655 shares of JPM traded. What was the difference in the number of shares traded from March 2 to March 3? **1,000,125**

Market Data, As of the Close on March 3

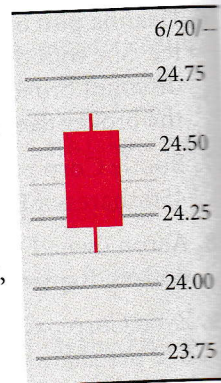
Symbol	Stock	52-Week High	52-Week Low	Last	Change	Sales Volume	High	Low
SCCO	Southern Copper	29.53	19.90	22.06	-1.79	1,823.7	22.07	22.06
T	AT&T	37.50	30.97	37.12	-0.01	22,009	37.50	37.06
ESI	ITT Ed Services	7.95	1.93	2.95	-0.03	140.46	3.11	2.92
JPM	JP Morgan Chase & Co.	70.61	57.07	57.45	+1.11	20,987.78	58.11	57.14

11. Use the stock bar chart to answer the questions below.

- a. What was the day's open on June 17? **\$49.60**
- b. What was the approximate difference between the day's high and low on June 18? **\$1.00**
- c. On what day was the close also the day's low? **June 20**
- d. Write the approximate volume for June 19. **750,000**



12. Use the candlestick chart to answer the questions below.
- What was the approximate low on June 20? **\$24.13**
 - What was the approximate high on this date? **\$24.63**
 - What was the difference between the opening price and the closing price? **approx. \$0.33**
 - What does the red candlestick color indicate?
The opening price was greater than the closing price.



13. Lea owns 800 shares of ABC Inc. On April 6, the corporation instituted a 5-for-2 stock split. Before the split, each share was worth \$42.60.
- How many shares did Lea hold after the split? **2,000**
 - What was the post-split price per share? **\$17.04**
 - Show that the split was a monetary nonevent for Lea.
Pre-split and post-split market values = \$34,080
14. Gene owns 1,200 shares of YXX Corp. The company instituted a 1-for-10 reverse stock split on November 7. The pre-split market price per share was \$1.20.

- How many shares did Gene hold after the split? **120**
- What was the post-split price per share? **\$12.00**
- Show that the split was a monetary nonevent for Gene.
Pre-split and post-split market values = \$1,440

15. Use the table of closing prices for Microsoft. Round answers to the nearest cent.
- Determine the 3-day simple moving averages. **See margin.**
 - Determine the 10-day simple moving averages. **See margin.**

ANSWERS

15a. 3-day averages: 28-May: 28.22; 29-May: 28.31; 30-May: 28.27; 2-Jun: 28.14; 3-Jun: 27.81; 4-Jun: 27.55; 5-Jun: 27.72; 6-Jun: 27.78; 9-Jun: 27.83; 10-Jun: 27.70; 11-Jun: 27.57; 12-Jun: 27.75; 13-Jun: 28.14; 16-Jun: 28.75

15b. 10-day averages: 6-Jun: 27.97; 9-Jun: 27.94; 10-Jun: 27.89; 11-Jun: 27.78; 12-Jun: 27.77; 13-Jun: 27.85; 16-Jun: 27.96

Date	Close	3-day Average	10-day Average
23-May	28.05		
27-May	28.44		
28-May	28.18		
29-May	28.31		
30-May	28.32		
2-Jun	27.80		
3-Jun	27.31		
4-Jun	27.54		
5-Jun	28.30		
6-Jun	27.49		
9-Jun	27.71		
10-Jun	27.89		
11-Jun	27.12		
12-Jun	28.24		
13-Jun	29.07		
16-Jun	28.93		

Use the following stock market ticker to answer Exercises 16 and 17.

GE 29.39K@26.13▲1.13 F .67K@12.46▼0.38 C3K@42.15▲ 1.47 T 1.6K@37.12▼1.08

16. Nick bought some shares of Ford Motor Co (F).
- How many shares did Nick buy? **670**
 - How much did each share cost? **\$12.46**
 - What was the value of Nick's trade? **\$8,348.20**
17. Patrick sold his shares of AT&T (T).
- How many shares did he sell? **1,600**
 - For how much did each share sell? **\$37.12**
 - Based on Patrick's sale, what was the closing price of T on the previous trading day? **\$38.20**
18. The stock in a real-estate corporation was selling for \$78 per share with an annual dividend of \$1.86. It underwent a 3-for-2 split.
- What was the value of one share of the stock after the split? **\$52**
 - What was the annual dividend after the split? **\$1.24**
19. A stock that was selling for x dollars per share underwent a y -for- p split. It was originally paying an annual dividend of d dollars per share. Express the annual dividend after the split algebraically. $\frac{pd}{y}$
20. Suki purchased \$9,600 worth of stock and paid her broker a 1.75% broker fee. She had an immediate need for cash and was forced to sell the stock when it was worth \$8,800. She used a discount broker who charged \$32.50 per trade. Compute Suki's net loss after the broker fees were taken out. **\$1,000.50**
21. Use the following 25 consecutive days' closing prices for AT&T to determine linear, quadratic, cubic, and quartic regression equations. Starting with 1/27 as day 1, 1/28 as day 2, etc., use the ordered pairs (1, 35.48), (2, 35.53) . . . in the form (day number, closing price). What trends do you see? What are your predictions for the closing price on the 26th trading day? [See margin.](#)

Date	Closing Price
1/27	35.48
1/28	35.53
1/29	36.06
2/1	36.18
2/2	36.06
2/3	36.72
2/4	36.53
2/5	36.88
2/8	37.11
2/9	36.65
2/10	36.43
2/11	36.21
2/12	36.47
2/16	36.65
2/17	36.64
2/18	36.99
2/19	36.57
2/22	36.86
2/23	36.74
2/24	37.1
2/25	37.37
2/26	37.13
2/29	36.95
3/1	37.39
3/2	37.69

21. Linear: $y = 0.0603x + 35.871$

Quadratic: $y = -0.0009x^2 + 0.0839x + 35.765$

Cubic: $y = 0.0006x^3 - 0.026x^2 + 0.3498x + 35.133$

Quartic: $y = -0.00004x^4 + 0.0026x^3 - 0.0598x^2 + 0.5544x + 34.831$

Although the closing prices fluctuate, generally there is an increasing trend in those prices.

Predictions for day 26:

Linear: \$37.44

Quadratic: \$37.34

Cubic: \$37.20

Quartic: \$36.24