

## Percent Increase

You will need:

graph paper



## AN ALGEBRA TUTOR'S SALARY

Bea did so well in algebra that she got a job as an algebra tutor. Her starting salary, as she had no experience, was \$10 per week.

- As Bea got more experience, her salary increased. She got a raise of \$1 per week. Copy and complete the table for the first ten weeks that Bea worked.

Weeks	Salary	Amount increase	Percent increase
0	\$10		
1	\$11	\$1	10
2	\$12	\$1	9
3	\$13	\$1	8.33

- Explain how to calculate the number in the last column.
  - Explain why the number in the last column decreases each week.
- Compare Bea's original salary with her salary for the tenth week.
  - What was the total amount of increase in her salary?
  - What percent of her original salary is this total increase? (This is the total *percent increase*.)
  - What percent of her original salary is her salary in the tenth week? (Your answer should be a number greater than 100. Why?)

Abe also got a job as an algebra tutor. He heard that Bea was getting a weekly raise of \$1. Since \$1 is 10% of \$10, Abe asked for a weekly raise of 10%. The first week Bea and Abe both got the same raise.

- Copy and complete the table for the first ten weeks that Abe worked.

Weeks	Salary	Amount increase	Percent increase
0	\$10		
1	\$11	\$1	10
2	\$12.10	\$1.10	10
3	\$13.31	\$1.21	10

- Explain how to calculate the numbers in the third column of the table above.
  - Explain why the numbers in the third column increase each week.
- Repeat problem 3 for Abe's salary.
- On the same pair of axes, make graphs of Abe's and Bea's weekly salaries as a function of weeks of experience.
- Each week's salary for Bea can be obtained from the previous week's salary by *adding* a number. Find this number and use it to write an equation that gives Bea's salary ( $S$ ) as a function of weeks of experience ( $W$ ).
  - Each week's salary for Abe can be obtained from the previous week's salary by *multiplying* by a number. Find this number, experimenting with your calculator if necessary, and use it to write an equation that gives Abe's salary as a function of weeks of experience.

9.  Write each equation you wrote on the graphs it belongs to.
- a. Write each equation you wrote on the graphs it belongs to.
- b. Compare the graphs. Which is straight? Which is curved?
- c. Which function describes linear growth? Which describes exponential growth?
10. Repeat the analysis you did for Abe's and Bea's salaries if Bea's raise were \$2 and Abe's raise were 20%.

#### EQUATIONS WITH PERCENTS

A state has 5% sales tax. If you paid \$12.60 for something, including tax, what was the price without tax? If the price without tax is  $x$ , and the increase due to tax is 0.05 of  $x$ , then

$$x + 0.05x = \$12.60.$$

11.  Remember that  $x$  can be written  $1x$ .
- a. Combine like terms on the left side of the equation. (Or factor out the  $x$ .)
- b. Then solve for  $x$ .
12. Solve for  $x$ .
- a.  $1.2x = 240$
- b.  $x + 0.4x = 18.2$
- c.  $x + 0.06x = 23.85$
- d.  $1.7x = 78.2$
13. Solve for  $x$ .
- a.  $(1.10)(1.10)x = 67.76$
- b.  $(1.10)(1.10)(1.10)x = 13.31$

The Skolar family eat out once a month. Usually they take turns figuring out the tip, also called the *gratuity*.

14. At one restaurant, they ordered food totaling \$35.95 and received a bill for the total amount they owed. The total was \$43.86, and the bill said "tax and gratuity included." Sue wrote this equation.

$$35.95 + p(35.95) = 43.86$$

- a. Explain the equation. What does  $p$  represent?
- b. Solve for  $p$ . Is your answer reasonable? Discuss.
15. Another night the Skolar family had \$23.00 to buy dinner. Assuming they'd need 25% of the cost of the dinner to cover the tax and tip, Michael wrote this equation.

$$d + 0.25d = 23.00$$

- a. Explain the equation. What does  $d$  represent?
- b. Solve for  $d$ .
16. Now assume the Skolars had \$23.00 for their meal and needed only 20% of the cost of the dinner to cover the tax and tip. How much can their actual food order be? Write and solve the equation.

#### EQUATIONS AND THE PRICE OF WIDGETS

17. A certain retail store sells widgets at the wholesale price, plus a 35% markup. If the wholesale price is  $W$ , what is the retail price of the widget? Express your answer as a function of  $W$  in two ways: as an addition and as a multiplication.

18. The wholesale cost of widgets went up by 8.5%. If the old wholesale price was  $W$ , express as a function of  $W$ ,
- the new wholesale price;
  - the new retail price;
  - the retail price including a 5% sales tax.
19. 💡 After the price increase in the wholesale cost a certain customer purchased a widget at the retail store for \$15.71, including tax.
- What was the wholesale price on that widget?
  - How much would the customer have saved by buying a widget before the wholesale price increase?

**REVIEW** SOLVING EQUATIONS

20. Solve for  $x$ .

- $\frac{3^x}{3^2} = 3^5$
- $\frac{10^{2x-5}}{10^2} = 10^5$
- $\frac{p^{x-3}}{p^2} = p^6$

**REVIEW** EQUATIONS AND INEQUALITIES

Use the techniques you have learned to solve these equations and inequalities. You can use trial and error, the cover-up method, tables, graphs, or the Lab Gear. Show your work.

- $5y > 2y + 57$
- $3s + 7 = 4 + 3s$
- $3(m + 4) + 3(m - 4) = 54$
- $7 + y = 7y$
- $\frac{10x + 4}{6} + 7 = -4$
- $\frac{4x}{5} = 2 - x$
- $\frac{3}{3x} = \frac{7}{4x - 2}$
- $(2p + 3)^2 = (4p - 2)(p - 8)$
- $(2p - 1)(3p + 2) = (6p - 1)(p + 1)$
- $\frac{x}{x + 1} = 2$
- 💡  $\frac{5}{x} + \frac{x}{5} = 2$