

Essential Ideas

EQUATIONS, IDENTITIES, INEQUALITIES

- Always, sometimes, or never true?
 - $2x + 6 = 2x - 6$
 - $2x + 6 = 2(x + 6)$
 - $2x + 6 = x + 6$
 - $2x + 6 = 2(x + 3)$
- For each equation above, decide which of the two expressions is greater, if they are equal, or if the answer depends on the value of x .
- Solve the inequalities. You may want to use a graph.
 - $3x < 5$
 - $x + 3 < 5$
 - $3x + 3 < 5$
 - $2x + 6 < x + 6$

SOLVING EQUATIONS

Solve these equations.

- $4x + 8 = 9$
 - $-4x + 8 = 9$
 - $4x - 8 = 9$
 - $-4x + 8 = -9$
- $x - 6 = 2(x - 5)$
 - $2x - 12 = 4(x - 5)$
 - $2.5(x - 5) = 2.5x - 12$
- $\frac{1}{3}(4x - 2) = 5$
 - $\frac{4}{5}(8 - 2x) = 16$
 - $\frac{x - 3}{2} = x - 4.3$
- $6 - 3(m - 4) = 3m$
 - $(6 - 3)(n - 4) = 3n$
 - $6 - 2(p + 4) = (8 - p)(2 + 3)$
 - $(6 - x)(x + 4) = (8 - x)(x + 2)$
- $\frac{d + 9}{5} - 3 = 15$
 - $\frac{2d + 6}{5} = \frac{3d - 7}{5}$
 - $\frac{f - 2}{4} = f + 3$

- Solve for y in terms of x .

- $-6x + y = 4$
- $2y + x = 8$

GRAPHS

- Graph these equations on the same axes.
$$y - x = -6 \quad y = 2(x - 5)$$
$$y = 2x - 12 \quad y = 4(x - 5)$$
- Explain how one can use this graph to check the solutions to problem 5.
- Use your graph to solve the compound inequality, $2x - 12 < x - 6 < 2x - 10$. Explain.

WRITING EQUATIONS

- Write an expression telling how much money Bea will have if she
 - starts with \$321 and saves \$9 a week for n weeks;
 - starts with \$321 and saves \$ d a week for n weeks;
 - starts with \$ m and saves \$ d a week for n weeks.
- If Bea starts with \$321, how much must she save each week to reach \$456 in 28 weeks? Write an equation and solve it.


DIFFERENCES AND RATIOS

According to author Glen Rounds, Johnny Inkslinger was Paul Bunyan's accountant. He used a pencil that was "over three feet in diameter and seventy-six feet long — the first one ever used." A typical pencil is a quarter inch in diameter and seven and a half inches long. Most men in those days were probably between 5 feet 6 in. and 6 feet tall.

15. Compared to a normal pencil, Johnny Inkslinger's was
- how much wider?
 - how many times as wide?
 - how much longer?
 - how many times as long?
16. Based on this information, how tall do you think Johnny was? Explain. (Give your answer as a range of probable heights.)

TABLES, GRAPHS, AND EQUATIONS

A telephone company offers two different billing plans. The Community Plan costs \$10.77 a month and allows unlimited local calls. The Thrifty Plan costs \$5.50 a month, but the cost of local calls is 5.5 cents for the first minute, plus 3.5 cents for each additional minute. Both plans cost the same for long distance calls. Which plan should different callers use?

17. Assume that your phone calls last an average of five minutes.
- How much does an average call cost under the Thrifty Plan?
 - Write a formula for the Thrifty Plan. Use y for the cost, x for the number of phone calls.
 - If you make exactly one five-minute call a day, should you use the Thrifty Plan or the Community Plan?
18. Write a formula for the Thrifty Plan. Use y for the cost and x for the number of phone calls. Assume your calls last an average of:
- 1 minute;
 - 3 minutes;
 - 5 minutes;
 - 7 minutes.
19. Make tables to show how many calls a month make it preferable to use the Community Plan, for a customer whose calls last an average of:
- 1 minute;
 - 3 minutes;
 - 5 minutes;
 - 7 minutes.
20. Use a graph to show the costs of both plans for each customer listed in problem 19 as a function of the number of calls made. (Your graph should include five lines.)
- A consumer advocate gives advice to people about which plan to choose. In order to do that, he needs to generalize the information revealed in problems 17-20.
21. He would like to have a formula for the Thrifty Plan in terms of two variables: x for the number of local calls, and t for the average duration of each call. Find such a formula.
22. He would like to know the number of local calls at the "break even" point, where both plans cost roughly the same amount, in terms of t . To figure this out, he sets up an equation, with the formula for the Thrifty Plan on the left, and the cost of the Community Plan (10.77) on the right.
- Solve the equation for x .
 - Check your answers to problem 17 with the formula you found in part (a).
23.  In trying to use the formula from problem 22 he finds that people don't usually know the average duration of their phone calls. To help them figure it out, he asks them for an estimate of the numbers of local calls they make every week that last approximately: one minute, five minutes, ten minutes, and thirty minutes. Given these four numbers, how can he find the average duration of the phone calls?
24. **Project** Keep track of the duration of your phone calls for a week. Figure out which plan would be more suitable for you if you had your own phone.