



Essential Ideas

DISTANCE

- On the number line, what is the distance between:
a. 12 and -34? b. 12 and 34?
c. 12 and x ?
- On the number line, what points are at distance 7.5 from 6.89?
- On the number line, what point is halfway between:
a. 12 and -34? b. 12 and 34?
c. 12 and x ?
- (5, 6) is the midpoint of a segment from what point to:
a. (7, -8)? b. (-9.1, 2.34)?
- What is the biggest possible difference between taxicab and Euclidean distance between two geoboard pegs on a 10-by-10 geoboard? (Give a decimal approximation.)
- On graph paper, show as many points as possible that are at distance 10 from the origin, using
a. taxicab distance;
b. Euclidean distance.
- What is the distance from (5, 6) to:
a. (7, -8)? b. (-9.1, 2.34)?

THE PYTHAGOREAN THEOREM

- How long is the diagonal of a square if the side of the square is
a. 10? b. x ?
- How long is the side of a square if the diagonal is
a. 10? b. x ?

- How long is the other leg of a right triangle, if the first leg is half the hypotenuse, and the hypotenuse is
a. 10? b. x ?



FROM ONE POINT TO ANOTHER

- Given the two points (1, 2.3) and (-4.5, 6), find
a. the taxicab distance between them;
b. the slope of the line that joins them;
c. the Euclidean distance between them.

SQUARE ROOTS

- Explain why $\sqrt{-4}$ is not a real number.
- Is $\sqrt{-x}$ a real number? Explain.
- a. Give three values of x for which $-x$ represents a positive number.
b. Make a table of values and graph $y = \sqrt{-x}$.
c. What is the domain of $y = \sqrt{-x}$?
- Hal noticed something interesting. He saw that if he squared a number and took its square root, he would get back the same number. Jacob said he could find many numbers for which that wouldn't work. Can you? List some.
- Ruth thought you could write:
 $-\sqrt{25} = \sqrt{-25}$ and $-\sqrt{-25} = \sqrt{25}$.
Explain why she is wrong.
- Which is greater? Explain.
a. $\sqrt{80}$ or $8\sqrt{10}$
b. $\sqrt{40} + \sqrt{40}$ or $\sqrt{80}$
c. $\sqrt{63} - \sqrt{28}$ or $\sqrt{63 - 28}$
d. $\frac{\sqrt{4}}{\sqrt{9}}$ or $\sqrt{\frac{4}{9}}$

MULTIPLYING AND DIVIDING

18. What is the area of a rectangle having sides
- 3 and $\sqrt{6}$?
 - $\sqrt{3}$ and $\sqrt{6}$?
 - $4\sqrt{3}$ and $5\sqrt{6}$?
 - $(4 + \sqrt{3})$ and $5\sqrt{6}$?
19. A rectangle has area $8\sqrt{7}$. Give three possibilities for the sides.
20.  A rectangle has area $15 + 6\sqrt{7}$. Give three possibilities for the sides.
21. Write without radicals in the denominator.
- $\frac{2}{\sqrt{3}}$
 -  $\frac{4}{\sqrt{5} + 6}$

ADDING AND SUBTRACTING

22. True or False? Explain.
- $36 + 64 = 100$
 - $\sqrt{36 + 64} = \sqrt{100}$
 - $\sqrt{36} + \sqrt{64} = \sqrt{100}$
 - $\sqrt{36 + 64} = \sqrt{36} + \sqrt{64}$
23. Simplify, then add or subtract.
- $\sqrt{8} + \sqrt{72}$
 - $\sqrt{20} - \sqrt{5}$
 - $\sqrt{30} - \sqrt{36} + \sqrt{120} + \sqrt{121}$
 - $15 - \sqrt{15} + 60 - \sqrt{60}$


THE MIDPOINT OF GROWTH

24. Joel invested \$200 in 1970 and forgot about it. In the year 2010 he discovered that he had \$5227 in the account. How much did he have in the account in 1990 if he was getting
- simple interest?
 - compound interest?

RADICAL RULES

25. If a and b are nonnegative, write an expression equivalent to each of the following. Explain each rule with an example.

- $\sqrt{a}\sqrt{a}$
- $\sqrt{a}\sqrt{b}$
- a/\sqrt{a}
- \sqrt{a}/\sqrt{b}

26. Simplify.
- $\sqrt{2^9}$
 - $\sqrt{2^{10}}$
27.  Simplify $\sqrt{2^n}$ assuming n is
- even;
 - odd.

SIMILAR FIGURES

28. Assume you want to use a copy machine to blow up a picture from a 3-inch-by-5-inch index card to 4-inch-by-6-inch card.
- What percent setting should you use so that you get as large an image as possible, but one which does not extend beyond the edge?
 - How much is the area increased at that setting?
29. Answer the questions in problem 28 about blowing up a picture from a 3-inch-by-5-inch size to an 8.5-inch-by-11-inch size.
30. Assume you want to use a copy machine to reduce an image so its area gets divided by two. What percent setting should you use?

Assume that the amount of material needed to make clothes is proportional to the surface area, while the amount of food needed is proportional to the volume.

- How many times as much material would be needed to dress a five-foot Alice as a ten-inch Alice?
- How many times as much food would be needed to feed a five-foot Alice as a ten-inch Alice?