1-3 Reteaching

A number that is the product of some other number with itself, or a number to the second power, such as $9 = 3 \times 3 = 3^2$, is called a perfect square. The number that is raised to the second power is called the square root of the product. In this case, 3 is the square root of 9. This is written in symbols as $\sqrt{9} = 3$. Sometimes square roots are whole numbers, but in other cases, they can be estimated.

Problem

What is an estimate for the square root of 150?

There is no whole number that can be multiplied by itself to give the product of 150.

10× 10 = 100
11× 11 = 121
12× 12 = 144
13× 13 = 169

You cannot find the exact value of $\sqrt{150}$, but you can estimate it by comparing 150 to perfect squares that are close to 150.

150 is between 144 and 169, so $\sqrt{150}$ is between $\sqrt{144}$ and $\sqrt{169}$.

The square root of 150 is between 12 and 13. Because 150 is closer to 144 than it is to 169, we can estimate that the square root of 150 is slightly greater than 12.

Exercises

Find the square root of each number. If the number is not a perfect square, estimate the square root to the nearest integer.

1. 100 **2.** 49 **3.** 9

4. 25 **5.** 81 **6.** 169

7. 15 **8.** 24 **9.** 40

10. A square mat has an area of 225 cm^2. What is the length of each side of the mat?

(1) 10, (2) 7, (3) 3, (4) 5, (5) 9, (6) 13, (7) 4, (8) 5, (9) 6, (10) 15 cm

The real numbers can be separated into smaller, more specific groups, called subsets. Each of these subsets has certain characteristics. For example, a rational number can be expressed as a fraction of two integers, with the denominator of the fraction not equal to 0. Irrational numbers cannot be expressed as a fraction of two integers.

Every real number belongs to at least one subset of the real numbers. Some real numbers belong to multiple subsets.

Problem

To which subsets of the real numbers does 17 belong?

17 is a natural number, a whole number, and an integer.

But 17 is also a rational number because it can be written as $\frac{17}{1}$, a fraction of two integers with the denominator not equal to 0.

A number cannot belong to both the subset of rational numbers and the subset of irrational numbers, so 17 is not an irrational number.

Exercises

List the subsets of the real numbers to which each of the given numbers belongs.

11. 5

12. 116

13. $\sqrt{3}$

14. 17.889

15. –25

16. –68

17. $\frac{-17}{20}$

18. 0

19. $\sqrt{16}$

20. $\sqrt{20}$

21. $\sqrt{6.25}$

22. $\frac{77}{10}$

(11) natural, whole, integer, rational, real, (12) natural, whole, integer, rational, real, (13) irrational, real, (14) rational, real, (15) integer, rational, real, (16) integer, rational, real, (17) rational, real, (18) whole, integer, rational, real, (19) natural, whole, integer, rational, real, (20) irrational, real, (21) rational, real, (22) rational, real

Lesson 1-3 Additional Practice

Find the square roots of each number.

1. 25 **2.** $\frac{4}{9}$ **3.** $\frac{25}{36}$ **4.** 0.81

Estimate each square root. Round to the nearest integer.

5. $\sqrt{23}$ **6.** $\sqrt{85}$ **7.** $\sqrt{231}$ **8.** $\sqrt{97}$

Name the subset(s) of the real numbers to which each number belongs.

9. $\sqrt{77}$ **10.** 4 **11.** $\frac{2}{3}$ **12.** 0

Order the numbers in each exercise from least to greatest.

13. $\sqrt{33}, \frac{25}{4}, 4.8, \sqrt{18}$ **14.** $\frac{69}{7}, \sqrt{69}, -9, \sqrt{79}$

Is each statement *true* or *false*? If the statement is false, give a counterexample.

15. The product of a rational number and an integer is not an integer.

16. The quotient of two integers is an integer.

17. The sum of two rational numbers is a rational number.

(1) ± 5, *(2)* $\pm\frac{2}{3}$, *(3)* $\pm\frac{5}{6}$, *(4)* ± 0.9, *(5) 5, (6) 9, (7) 15, (8) 10, (9) irrational, real, (10) natural, whole, integer, rational, real, (11) rational, real, (12) natural, whole, integer, rational, real, (13)* $\sqrt{18}, 4.8, \sqrt{33}, \frac{25}{4}$, *(14)* $-9, \sqrt{69}, \sqrt{79}, \frac{69}{7}$, *(15) false,* $\frac{1}{2} \times 2 = 1$, *(16) false,* $\frac{1}{2} = 0.5$, *(17) true*