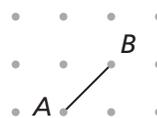


Applications

- Find the area of every square that can be drawn by connecting dots on a 3 dot-by-3 dot grid.
- On dot paper, draw a hexagon with an area of 16 square units.
- On dot paper, draw a square with an area of 2 square units. Write an argument to convince a friend that the area is 2 square units.

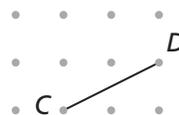
- Consider segment AB at right.

- On dot paper, draw a square with side AB . What is the area of the square?
- Use a calculator to estimate the length of segment AB .

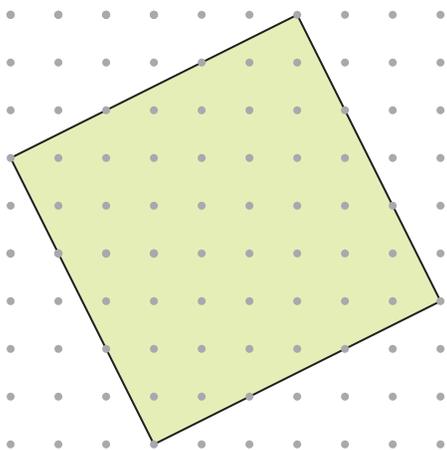


- Consider segment CD at right.

- On dot paper, draw a square with side CD . What is the area of the square?
- Use a calculator to estimate the length of segment CD .



- Find the area and the side length of this square.



For Exercises 7–34, do not use the $\sqrt{\quad}$ key on your calculator.

For Exercises 7–9, estimate each square root to one decimal place.

7. $\sqrt{11}$

8. $\sqrt{30}$

9. $\sqrt{172}$

10. **Multiple Choice** Choose the pair of numbers $\sqrt{15}$ is between.

- A. 3.7 and 3.8 B. 3.8 and 3.9 C. 3.9 and 4.0 D. 14 and 16

Find exact values for each square root.

11. $\sqrt{144}$

12. $\sqrt{0.36}$

13. $\sqrt{961}$

Find the two consecutive whole numbers the square root is between.

Explain.

14. $\sqrt{27}$

15. $\sqrt{1,000}$

Tell whether each statement is true.

16. $6 = \sqrt{36}$

17. $1.5 = \sqrt{2.25}$

18. $11 = \sqrt{101}$

Find the missing number.

19. $\sqrt{\square} = 81$

20. $14 = \sqrt{\square}$

21. $\square = \sqrt{28.09}$

22. $\sqrt{\square} = 3.2$

23. $\sqrt{\square} = \frac{1}{4}$

24. $\sqrt{\frac{4}{9}} = \square$

Find each product.

25. $\sqrt{2} \cdot \sqrt{2}$

26. $\sqrt{3} \cdot \sqrt{3}$

27. $\sqrt{4} \cdot \sqrt{4}$

28. $\sqrt{5} \cdot \sqrt{5}$

Give both the positive and negative square roots of each number.

29. 1

30. 4

31. 2

32. 16

33. 25

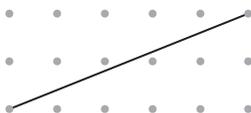
34. 5

Sorry, you can't use my square root key.



35. Find the length of every line segment that can be drawn by connecting dots on a 3 dot-by-3 dot grid.

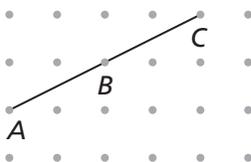
36. Consider this segment.



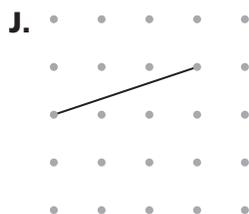
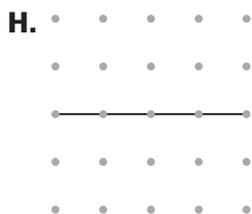
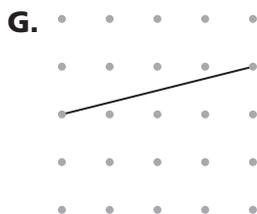
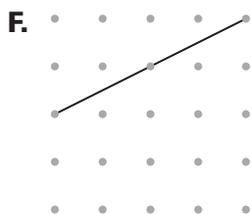
- a. Express the exact length of the segment, using the $\sqrt{\quad}$ symbol.
- b. What two consecutive whole numbers is the length of the segment between?

37. Show that $2\sqrt{5}$ is equal to $\sqrt{20}$ by finding the length of line segment AC in two ways:

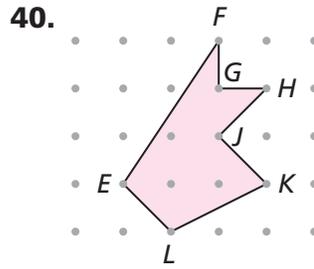
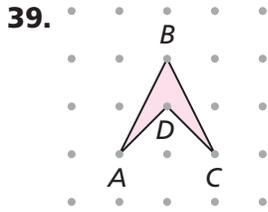
- Find the length of AB . Use the result to find the length of AC .
- Find the length of AC directly, as you did in Problem 2.3.



38. Multiple Choice Which line segment has a length of $\sqrt{17}$ units?



For Exercises 39 and 40, find the length of each side of the figure.

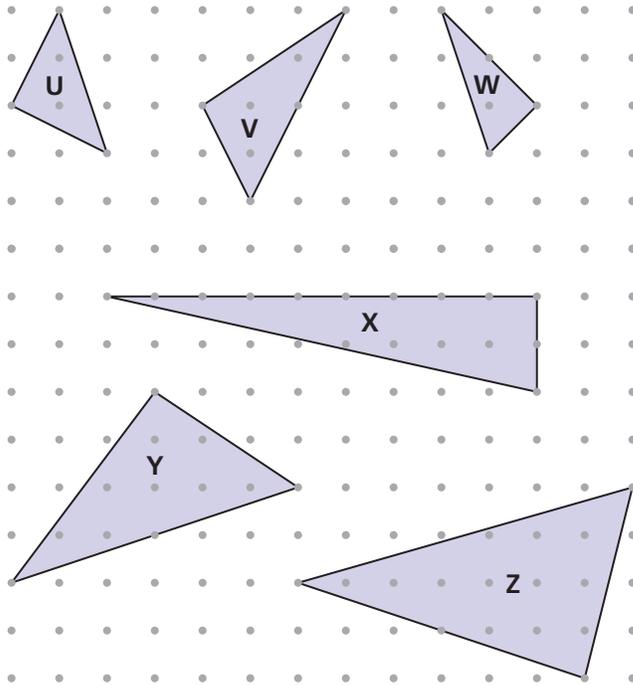


41. Put the following set of numbers in order on a number line.

- | | | | | | |
|-----|----------------|-----------------|---------------|----------------|------------|
| 2.3 | $2\frac{1}{4}$ | $\sqrt{5}$ | $\sqrt{2}$ | $\frac{5}{2}$ | $\sqrt{4}$ |
| 4 | -2.3 | $-2\frac{1}{4}$ | $\frac{4}{2}$ | $-\frac{4}{2}$ | 2.09 |

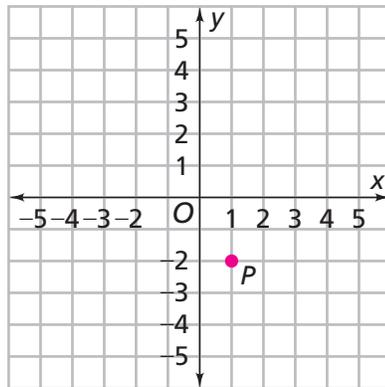
Connections

42. a. Which of the triangles below are right triangles? Explain.



b. Find the area of each right triangle.

- 43.** Refer to the squares you drew in Problem 2.1.
- Give the perimeter of each square to the nearest hundredth of a unit.
 - What rule can you use to calculate the perimeter of a square if you know the length of a side?
- 44.** On grid paper, draw coordinate axes like the ones below. Plot point P at $(1, -2)$.

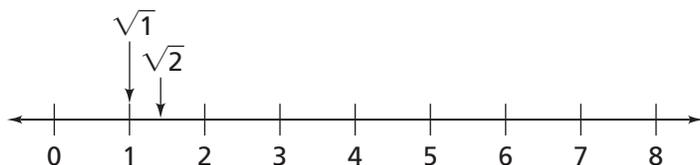


- Draw a square $PQRS$ with an area of 10 square units.
- Name a vertex of your square that is $\sqrt{10}$ units from point P .
- Give the coordinates of at least two other points that are $\sqrt{10}$ units from point P .

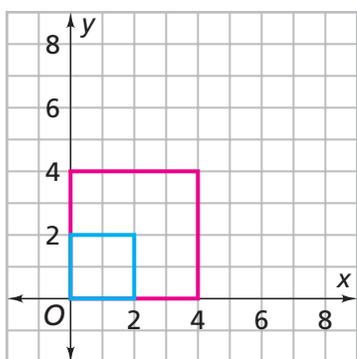


P needs to be a vertex of the square.

- 45.** In Problem 2.3, you drew segments of length 1 unit, $\sqrt{2}$ units, 4 units, and so on. On a copy of the number line below, locate and label each length you drew. On the number line, $\sqrt{1}$ and $\sqrt{2}$ have been marked as examples.



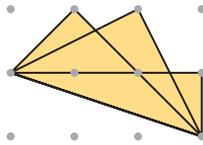
- 46.** In Problem 2.1, it was easier to find the “upright” squares. Two of these squares are represented on the coordinate grid.



- Are these squares similar? Explain.
- How are the coordinates of the corresponding vertices related?
- How are the areas of the squares related?
- Copy the drawing. Add two more “upright” squares with a vertex at $(0, 0)$. How are the coordinates of the vertices of these new squares related to the 2×2 square? How are their areas related?

Extensions

47. On dot paper, draw a non-rectangular parallelogram with an area of 6 square units.
48. On dot paper, draw a triangle with an area of 5 square units.
49. Dalida claims that $\sqrt{8} + \sqrt{8}$ is equal to $\sqrt{16}$ because 8 plus 8 is 16. Is she right? Explain.
50. The drawing shows three right triangles with a common side.



- a. Find the length of the common side.
- b. Do the three triangles have the same area? Explain.

We know that $\sqrt{5} \cdot \sqrt{5} = \sqrt{5 \cdot 5} = \sqrt{25} = 5$. Tell whether each product is a whole number. Explain.

51. $\sqrt{2} \cdot \sqrt{50}$
52. $\sqrt{4} \cdot \sqrt{16}$
53. $\sqrt{4} \cdot \sqrt{6}$