

**Lesson Objectives**

Estimate square roots and solve problems using square roots

**Additional Examples****Example 1**

Each square root is between two consecutive integers. Name the integers. Explain your answer.

A.  $\sqrt{55}$

Think: What are  squares close to 55?

$7^2 = \text{$

$49 < 55$

$8^2 = \text{$

$64 > 55$

$\sqrt{55}$  is between  and  because  is between  and .

B.  $-\sqrt{90}$

Think: What are perfect  close to 90?

$(-9)^2 = \text{$

$81 < 90$

$(-10)^2 = \text{$

$100 > 90$

$-\sqrt{90}$  is between  and  because  is between  and .

**Example 2**

**You want to sew a fringe on a square tablecloth with an area of 500 square inches. Calculate the length of each side of the tablecloth and the length of fringe you will need to the nearest tenth of an inch.**

Because 500 is between  $22^2$  and  $23^2$ , the square root of 500 is between  and .

Guess 22.5	Guess 22.2	Guess 22.4	Guess 22.3
$22.5^2 = 506.25$	$22.2^2 = 492.84$	$22.4^2 = 501.76$	$22.3^2 = 497.29$
Too high	Too low	Too high	Too low
Square root is between 22 and 22.5	Square root is between 22.2 and 22.5	Square root is between 22.2 and 22.4	Square root is between 22.3 and 22.4

The square root is between 22.3 and 22.4. To round to the nearest tenth, look at the next decimal place. Consider 22.35.

$22.35^2 =$   Too

The square root must be greater than 22.35, so round up.

To the nearest tenth,  $\sqrt{500}$  is about .

The length of each side of the tablecloth is about  in.

The length of a side of the tablecloth is  inches, to the nearest tenth of an inch. Now estimate the length around the tablecloth.

$\cdot$  22.4 =  Perimeter =  $4 \cdot$  side

You will need about  inches of fringe.

**Example 3****Estimate  $\sqrt{141}$  to the nearest hundredth.****Step 1:** Find the value of the whole number.
 $\square < 141 < \square$  Find the perfect squares nearest 141.

 $\square < \sqrt{141} < \square$  Find the square roots of the perfect squares.

 $\square < \sqrt{141} < \square$  The number will be between  $\square$  and  $\square$ .
The whole number part of the answer is  $\square$ .**Step 2:** Find the value of the decimal.
 $141 - 121 = \square$  Find the difference between the given number, 141, and the lower perfect square.

 $144 - 121 = \square$  Find the difference between the greater perfect square and the lower perfect square.
 $\square$ 

Write the difference as a ratio.

 $\square \div \square \approx \square$  Divide to find the approximate decimal value.
**Step 3:** Find the approximate value.
 $\square + \square = \square$  Combine the whole number and decimal.
The approximate value of  $\sqrt{141}$  to the nearest hundredth is  $\square$ .**Example 4****Use a calculator to find  $\sqrt{600}$ . Round to the nearest tenth.**

Using a calculator,  $\sqrt{600} \approx \square$  . . . Rounded,  $\sqrt{600}$  is  $\square$ .

**Check It Out!**

The square root is between two consecutive integers. Name the integers.

1.  $\sqrt{80}$

2. You want to build a fence around a square garden that is 250 square feet. Calculate the length of one side of the garden and the total length of the fence, to the nearest tenth.

3. Estimate  $\sqrt{89}$  to the nearest hundredth.

4. Use a calculator to find  $\sqrt{800}$ . Round to the nearest tenth.



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## Additional Examples

### Example 1

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A.  $\sqrt{55}$

Think: What are  squares close to 55?

$$7^2 = \text{49}$$

$$49 < 55$$

$$8^2 = \text{64}$$

$$64 > 55$$

$\sqrt{55}$  is between  and  because  is between  and .

B.  $-\sqrt{90}$

Think: What are perfect  close to 90?

$$(-9)^2 = \text{81}$$

$$81 < 90$$

$$(-10)^2 = \text{100}$$

$$100 > 90$$

$-\sqrt{90}$  is between  and  because  is between  and .

**Example 2**

You want to sew a fringe on a square tablecloth with an area of 500 square inches. Calculate the length of each side of the tablecloth and the length of fringe you will need to the nearest tenth of an inch.

Because 500 is between  $22^2$  and  $23^2$ , the square root of 500 is between

and .

Guess 22.5	Guess 22.2	Guess 22.4	Guess 22.3
$22.5^2 = 506.25$	$22.2^2 = 492.84$	$22.4^2 = 501.76$	$22.3^2 = 497.29$
Too high	Too low	Too high	Too low
Square root is between 22 and 22.5	Square root is between 22.2 and 22.5	Square root is between 22.2 and 22.4	Square root is between 22.3 and 22.4

The square root is between 22.3 and 22.4. To round to the nearest tenth, look at the next decimal place. Consider 22.35.

$22.35^2 =$   Too

The square root must be greater than 22.35, so round up.

To the nearest tenth,  $\sqrt{500}$  is about .

The length of each side of the tablecloth is about  in.

The length of a side of the tablecloth is  inches, to the nearest tenth of an inch. Now estimate the length around the tablecloth.

$\cdot 22.4 =$   Perimeter =  $4 \cdot \text{side}$

You will need about  inches of fringe.

**Example 3****Estimate  $\sqrt{141}$  to the nearest hundredth.****Step 1:** Find the value of the whole number.

$$\boxed{121} < 141 < \boxed{144} \quad \text{Find the perfect squares nearest 141.}$$

$$\boxed{\sqrt{121}} < \sqrt{141} < \boxed{\sqrt{144}} \quad \text{Find the square roots of the perfect squares.}$$

$$\boxed{11} < \sqrt{141} < \boxed{12} \quad \text{The number will be between } \boxed{11} \text{ and } \boxed{12}.$$

The whole number part of the answer is  $\boxed{11}$ .**Step 2:** Find the value of the decimal.

$$141 - 121 = \boxed{20} \quad \text{Find the difference between the given number, 141, and the lower perfect square.}$$

$$144 - 121 = \boxed{23} \quad \text{Find the difference between the greater perfect square and the lower perfect square.}$$

$$\frac{\boxed{20}}{\boxed{23}} \quad \text{Write the difference as a ratio.}$$

$$\boxed{20} \div \boxed{23} \approx \boxed{0.87} \quad \text{Divide to find the approximate decimal value.}$$

**Step 3:** Find the approximate value.

$$\boxed{11} + \boxed{0.87} = \boxed{11.87} \quad \text{Combine the whole number and decimal.}$$

The approximate value of  $\sqrt{141}$  to the nearest hundredth is  $\boxed{11.87}$ .**Example 4****Use a calculator to find  $\sqrt{600}$ . Round to the nearest tenth.**

Using a calculator,  $\sqrt{600} \approx \boxed{24.49489743} \dots$  Rounded,  $\sqrt{600}$  is  $\boxed{24.5}$ .

**Check It Out!**

The square root is between two consecutive integers. Name the integers.

1.  $\sqrt{80}$

8 and 9

2. You want to build a fence around a square garden that is 250 square feet. Calculate the length of one side of the garden and the total length of the fence, to the nearest tenth.

about 15.8 feet; about 63.2 feet

3. Estimate  $\sqrt{89}$  to the nearest hundredth.

about 9.42

4. Use a calculator to find  $\sqrt{800}$ . Round to the nearest tenth.

28.3