Important Concepts . . .

Preview Review

Mathematics   Grade 8   TEACHER KEY
W1 - Lesson 1:   Perfect Squares and
Square Roots

Important Concepts of Grade 8 Mathematics

Materials Required

Protractor
Ruler
Calculator

No Textbook Required

This is a stand-alone course.

Alberta Distance Learning Centre has an Internet site that you may find useful. The address is as follows: **http://www.adlc.ca**

The use of the Internet is optional. Exploring the electronic information superhighway can be educational and entertaining. However, be aware that these computer networks are not censored. Students may unintentionally or purposely find articles on the Internet that may be offensive or inappropriate. As well, the sources of information are not always cited and the content may not be accurate. Therefore, students may wish to confirm facts with a second source.

Preview/Review Concepts
for
Grade Eight Mathematics

Teacher Key

OBJECTIVES

By the end of this lesson, you will be able to:

- Determine the factors of a perfect square

- Identify a perfect square

- Determine the square of a given number

- Estimate approximate square roots with and without technology

GLOSSARY

Factors – the numbers that are multiplied to give a product. A factor of a given number will divide into the given number with no remainder left over. For example, the 4 and 5 are factors of 20.

Non-perfect square – a number that has a non-terminating and non-repeating decimal number as its square root

Perfect square – a number that has a whole number as its square root

Square root – a number that when multiplied by itself results in a specific number

W1 – Lesson 1: Perfect Squares and Square Roots

Materials required:

- Paper, Pencil, Calculator, and Grid paper

Part 1: Perfect Squares

A perfect square is a number that is the product of one number being multiplied by itself. They are called perfect squares because they form a square when they are laid out using algebra tiles.

1 x 1 = 1

2 x 2 = 4

3 x 3 = 9

4 x 4 = 16

The length and width of the squares are identical
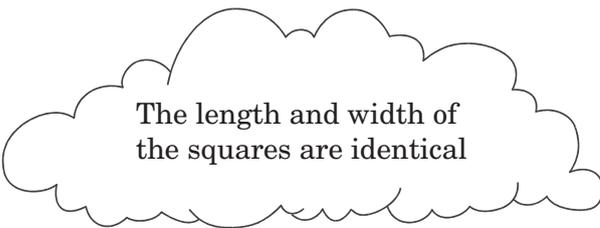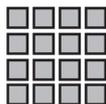
Perfect squares have an odd number of factors.

$12 = 1 \times 12$
$ = 2 \times 6$ not a perfect square –
$ = 3 \times 4$ (even number of factors)

6 factors

$36 = 1 \times 36$
$ = 2 \times 18$
$ = 3 \times 12$
$ = 4 \times 9$
$ = 6 \times 6$

In this example, the number 6 can only be counted once, therefore 36 will have an odd number of factors.

9 factors

Practice Questions

1. Represent the following perfect squares using the grid provided.

    a. 64
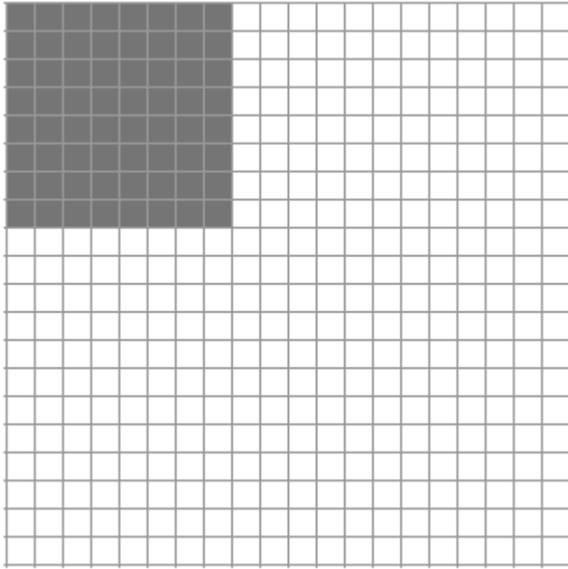
    b. 121
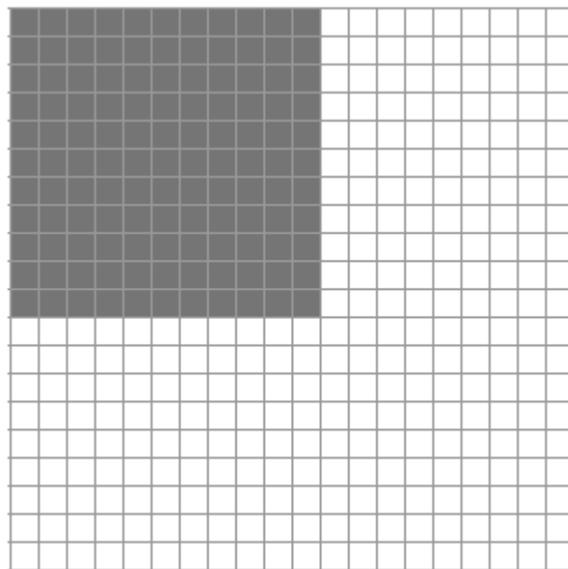
2.   Identify the perfect squares in the following list of numbers. Explain why they are or are not perfect squares.

169   45   72   100   49   56

**169 - this is a perfect square because it has an odd number of factors**

**45 - this is a non-perfect square because it has an even number of factors**

**72- this is a non- perfect square because it has an even number of factors**

**100- this is a perfect square because it has an odd number of factors**

**49- this is a perfect square because it has an odd number of factors**

**56- this is a non- perfect square because it has an even number of factors**

Part 2: Square Roots

In the previous examples involving counting factors of numbers, you looked at the factors of perfect squares. You understand that perfect squares have an odd number of factors. Since 6 is multiplied by itself to get 36, 6 is the square root of 36.

A square root is the number being multiplied by itself that results in a specific number.

The symbol that represents a square root is $\boxed{\sqrt{}}$.

You can calculate the square root of a number mentally or using a calculator. When asked to find the square root of a given number, ask yourself "What number do I multiply by itself to result in a product of the given number?"

Or press the $\boxed{\sqrt{}}$ on your calculator and then type in the number.

Example 1

What is the square root of 25? This is expressed mathematically as $\sqrt{25}$.

Mentally:

"What number is multiplied by itself to result in a product of 25?"
The answer is 5.

Calculator:

Type in $\boxed{\sqrt{}}\,\boxed{2}\,\boxed{5}$ or $\boxed{2}\,\boxed{5}\,\boxed{\sqrt{}}$ depending on your calculator.

The screen will show an answer of 5.

Example 1

1. $\sqrt{400}$

   $\sqrt{400} = 20$

2. $\sqrt{289}$

   $\sqrt{289} = 17$

3. $\sqrt{225}$

   $\sqrt{225} = 15$

Determine the square of the following numbers.

4. 11

   $11^2 = 121$

5. 16

   $16^2 = 256$

6. 9

   $9^2 = 81$

Part 3: Approximate Square Roots

Only perfect squares will have square roots that are whole numbers.
Non-perfect squares will have squares roots that are decimal numbers. The number 30 is

a non-perfect square because when you type in $\boxed{\sqrt{}}\,\boxed{3}\,\boxed{0}$ into your calculator, the following number will appear, 5.477225575... This decimal does not terminate or repeat, it will go on forever. In these cases, you must approximate the answer. A reasonable answer for the square root of 30 is 5.47.

$$\sqrt{30} \approx 5.47$$

This symbol means "approximately."
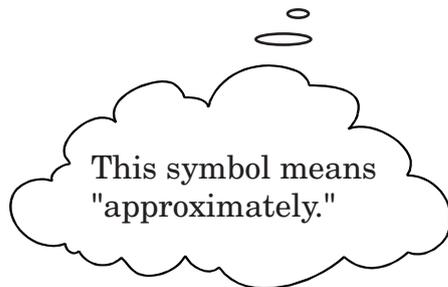
You can also approximate square roots without using a calculator.

For example, the $\sqrt{15}$ can be determined using your knowledge of other commonly used perfect squares. The number 15 is in between the perfect squares 9 and 16.
The square root of 9 is 3.
The square root of 16 is 4.

This tells you that the square root of 15 is somewhere between 3 and 4. Since 15 is closer to 16 than it is to 9, the square root of 15 will be closer to 4.

A good estimate is 3.9. Thus, $\sqrt{15} \approx 3.9$.

Practice Questions

Approximate the square roots of the following numbers using a calculator. Round your answer to the nearest hundredth.

1. $\sqrt{55} \approx$

   $\sqrt{55} \approx 7.42$

2. $\sqrt{92} \approx$

   $\sqrt{92} \approx 9.59$

3. $\sqrt{76} \approx$

   $\sqrt{76} \approx 8.72$

Determine the two numbers in which the square root of the following numbers falls in between.

4. $\sqrt{61}$ is in between ___**7**___ & ___**8**___

5. $\sqrt{35}$ is in between ___**5**___ & ___**6**___

6. $\sqrt{84}$ is in between ___**9**___ & ___**10**___

Lesson 1: Assignment

1. Express the following numbers as perfect squares on the grid provided:

    a. 49
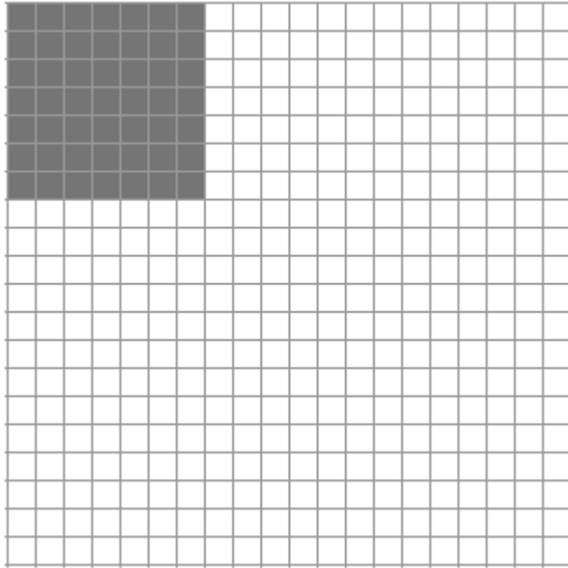
    b. 144
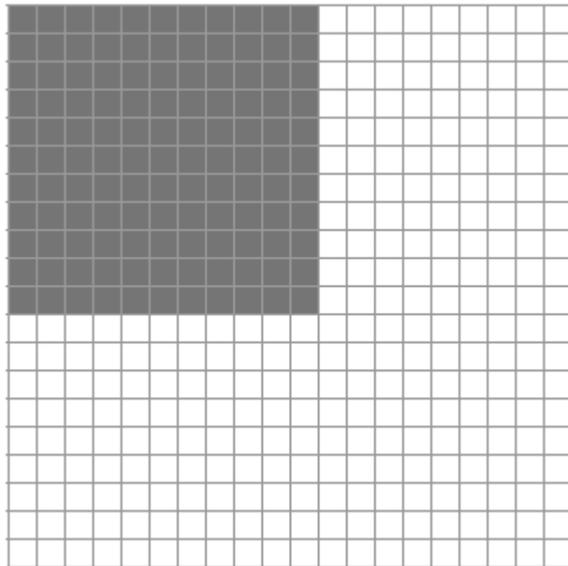
2. Determine which of the following numbers are prefect squares using their factors as a guide.

196   27   100   63   50

__196- this is a perfect square because it has an odd number of factors__

__27- this is a non- perfect square because it has an even number of factors__

__100- this is a perfect square because it has an odd number of factors__

__63- this is a non- perfect square because it has an even number of factors__

__50- this is a non- perfect square because it has an even number of factors__

3. Determine the square root of the following numbers

a. $\sqrt{529}$

     $\sqrt{529} = 23$

b. $\sqrt{961}$

     $\sqrt{961} = 31$

c. $\sqrt{784}$

     $\sqrt{784} = 28$

d. $\sqrt{121}$

     $\sqrt{121} = 11$

4. Determine the square of the following numbers.

    a. 6 $6^2 = 36$

    b. 25 $25^2 = 625$

    c. 100 $100^2 = 10000$

    d. 14 $14^2 = 196$

5. Use your calculator to find the square roots of the following numbers. Round the answer to the nearest tenth.

    a. $\sqrt{117} \approx$ $\sqrt{117} \approx 10.8$

    b. $\sqrt{285} \approx$ $\sqrt{285} \approx 16.9$

    c. $\sqrt{3030} \approx$ $\sqrt{3030} \approx 55.0$

    d. $\sqrt{99} \approx$ $\sqrt{99} \approx 9.9$

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