**ML #5: Square, Square roots, Cubes, and Cube Roots, (Math 7 Plus)**

**In Search of Perfect Squares**

1. Use your Geoboard paper to model each square and complete the table below.

|  |  |  |
| --- | --- | --- |
| SIDE LENGTH | AREA | PERIMETER |
| 5 units |  |  |
| 8 units |  |  |
|  | 49 square units |  |
|  | 4 square units |  |
|  |  | 12 units |
|  |  | 24 units |

1. Now try to complete the following table, without drawing the squares.

|  |  |  |
| --- | --- | --- |
| SIDE LENGTH | AREA | PERIMETER |
| 4 units |  |  |
| 14 units |  |  |
| 13 units |  |  |
|  | 81 square units |  |
|  | 100 square units |  |
|  |  | 4 units |
|  |  | 44 units |
| 15 units |  |  |
| 12 units |  |  |

1. A number is called a **“perfect square”** if it represents the area of a square whose side length is a whole number. For example, 25 is a perfect square, because 25 square units represent the area of a square with a side length of 5 units.

Which column shows perfect squares?

1. List the first 15 perfect squares in order from least to greatest.

1, 4, \_\_\_\_, \_\_\_\_, \_\_\_\_, \_\_\_\_, \_\_\_\_, \_\_\_\_, \_\_\_\_, \_\_\_\_, \_\_\_\_, \_\_\_\_, \_\_\_\_, \_\_\_\_, \_\_\_\_

1. **Squares and Square Roots**
* A **perfect square** has two identical integer factors.
* **For example:** 25 = 5 • 5 = 52 **or**25 = (−5)(−5) = (−5)2
* Since 52 = 25 and (−5)2 = 25, both 5 and −5 (can be written as ±5) are the **square roots** of 25.

**Identify the square roots of the following perfect squares**

1. The square roots of 16 are \_\_\_ and \_\_\_\_ because ( )2 and ( )2 = \_\_\_\_
2. The square roots of 81 are \_\_\_ and \_\_\_\_ because ( )2 and ( )2 = \_\_\_\_
3. The square roots of 4 are \_\_\_ and \_\_\_\_ because ( )2 and ( )2 = \_\_\_\_
4. The square roots of 169 are \_\_\_\_ and \_\_\_\_ because ( )2 and ( )2 = \_\_\_\_
5. The square roots of 36 are \_\_\_\_ and \_\_\_\_ because ( )2 and ( )2 = \_\_\_\_
6. The square roots of 9 are \_\_\_\_ and \_\_\_\_ because ( )2 and ( )2 = \_\_\_\_
7. The square roots of 1 are \_\_\_\_ and \_\_\_\_ because ( )2 and ( )2 = \_\_\_\_
8. The square roots of 225 are \_\_\_\_ and \_\_\_\_ because ( )2 and ( )2 = \_\_\_\_
9. The square roots of 144 are \_\_\_\_ and \_\_\_\_ because ( )2 and ( )2 = \_\_\_\_
10. The square roots of 49 are \_\_\_\_ and \_\_\_\_ because ( )2 and ( )2 = \_\_\_
11. The square roots of 100 are \_\_\_\_ and \_\_\_ because ( )2 and ( )2 = \_\_\_
12. The square roots of 196 are \_\_\_\_ and \_\_\_ because ( )2 and ( )2 = \_\_\_
13. The square roots of 25 are \_\_\_\_ and \_\_\_\_ because ( )2 and ( )2 = \_\_\_
14. The square roots of 64 are \_\_\_\_ and \_\_\_\_ because ( )2 and ( )2 = \_\_\_
15. The square roots of 121 are \_\_\_ and \_\_\_\_ because ( )2 and ( )2 = \_\_\_
* When you press the  key on a calculator, only the positive square root appears.

This is called the ***principal square root*** of the number.

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* Use the principal square root when evaluating an expression.

**Simplify each expression**

**1.** $\sqrt{49}$ + 10 **2.** 30 − $\sqrt{16}$ **3.** $\sqrt{150-29}$

**4.** $\frac{\sqrt{225}}{5}$ **5.** 3$\sqrt{196}$

**Solve the following problems involving square roots**

 **1.** What is the length of a square tablecloth that has an area of 3600 square centimeters?

 **2.** A square chessboard has an area of 144 square inches. How long is each side of the board?

 **3.** Your bedroom is a perfect square. If you had to order 225 square feet of carpet to cover the floor, how long is each side of your bedroom?

1. **CUBE ROOTS**
* A **perfect cube** has three identical integer factors.

**For example:** 8 = 2 • 2 • 2 = 23 **and** *-*8 = -2 • -2 • -2 = -23  or (-2) 3

* Therefore, 2 is the **cube root** of 8 and -2 is the **cube root** of -8,

or rather $\sqrt[3]{8}=2 and \sqrt[3]{-8}= -2$

**Identify the cube root of the following perfect cubes**

1. The cube root of 27 is \_\_\_\_ because ( )3 = \_\_\_\_\_
2. The cube root of -27 is \_\_\_\_ because ( )3 = \_\_\_\_\_
3. The cube root of 216 is \_\_\_\_ because ( )3 = \_\_\_\_\_
4. The cube root of -216 is \_\_\_\_ because ( )3 = \_\_\_\_\_
5. The cube root of 1 is \_\_\_\_ because ( )3 = \_\_\_\_\_
6. The cube root of -1 is \_\_\_\_ because ( )3 = \_\_\_\_\_
7. The cube root of -125 is \_\_\_\_ because ( )3 = \_\_\_\_\_
8. The cube root of 125 is \_\_\_\_ because ( )3 = \_\_\_\_\_
9. The cube root of -64 is \_\_\_\_ because ( )3 = \_\_\_\_\_
10. The cube root of 64 is \_\_\_\_ because ( )3 = \_\_\_\_\_

**Simplify each expression**

**1.** $\sqrt[3]{27} $+ 15 **2.** 20 − $\sqrt[3]{125}$ **3.** $\sqrt[3]{\frac{1}{64}}$ **4.** $\frac{\sqrt[3]{-216}}{3}$

**Solve the following problems involving cube roots**

1. What is the side length of a cube that has a volume of 27 cubic centimeters? Show why your answer is correct.

Why would it be unrealistic to ask this same question for a cube with a volume of -27 cubic centimeters?

1. You have a gift box that is a perfect cube. Its volume is 8 cubic inches. How much wrapping paper do you need to cover the box? Give an explanation for your answer.

Would this gift box likely be able to hold Hershey’s kisses or a large birthday cake? Justify your answer.