



Warm Up

Grade 8



1) Find the missing number (Show your work)

$$14^{\boxed{4}} = 38\,416$$

$$\begin{aligned} 14^1 &= 14 \\ 14^2 &= 196 \\ 14^3 &= 2744 \\ \boxed{14^4 &= 38416} \end{aligned}$$

2) Find the missing number

$$\underline{5}^{\quad} = 15\,625$$

$$\boxed{\quad}^6 = 15\,625$$

$$\begin{aligned} 1^6 &= 1 \\ 2^6 &= 64 \\ 3^6 &= 729 \end{aligned}$$

$$4^6 = 4096$$

$$\boxed{5^6 = 15625}$$

3) Place a <, > or = in the blank between (Show your work)

$$\begin{aligned} \text{a) } 5^7 &\geq 4^8 \\ \downarrow &\quad \downarrow \\ 78\,125 &\quad 65\,536 \\ \text{Bigger} & \end{aligned}$$

$$\begin{aligned} \text{b) } 3^3 &> 5^2 \\ \downarrow &\quad \downarrow \\ 27 &\quad 25 \\ \text{Bigger} & \end{aligned}$$

power / Exponential form 5^3

Expanded

$$5 \times 5 \times 5$$

Standard

$$125$$

Homework Solutions

1. Identify the base of each power.

a) 6^3 6 b) 2^7 2 c) $(-5)^4$ -5 d) 7^0 7

2. Use repeated multiplication to show why 3^5 is not the same as 5^3 .

$$3^5 = 3 \times 3 \times 3 \times 3 \times 3$$

$$= 243$$

$$5^3 = 5 \times 5 \times 5$$

$$= 125$$

Complete this table.

Power	Base	Exponent	Repeated Multiplication	Standard Form
4^4	<u>4</u>	<u>4</u>	<u>$4 \times 4 \times 4 \times 4$</u>	<u>256</u>
10^3	<u>10</u>	<u>3</u>	<u>$10 \times 10 \times 10$</u>	<u>1000</u>
<u>14^2</u>	14	2	<u>14×14</u>	<u>196</u>
<u>1^5</u>	1	<u>5</u>	$1 \times 1 \times 1 \times 1 \times 1$	<u>1</u>
<u>9^4</u>	9	<u>6</u>	<u>$9 \times 9 \times 9 \times 9 \times 9 \times 9$</u>	531 441
<u>5^7</u>	<u>5</u>	<u>7</u>	<u>$5 \times 5 \times 5 \times 5 \times 5 \times 5 \times 5$</u>	<u>78 125</u>

4. Write each product as a power, then evaluate (standard form).

a) 6×6 $6^2 = 36$ b) $3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3$ $3^7 = 2187$
 c) $10 \times 10 \times 10 \times 10$ $10^4 = 10,000$ d) $8 \times 8 \times 8$ $8^3 = 512$

5. Find the missing exponent. (Show work)

a) $7^{\underline{5}} = 16\,807$ b) $2^{\underline{5}} = 32$ c) $2^{\underline{7}} = 128$ d) $3^{\underline{4}} = 81$ e) $9^{\underline{2}} = 81$

a) $7 \times 7 = 49$

$$7 \times 7 \times 7 = 343$$

$$7 \times 7 \times 7 \times 7 = 2401$$

$$7 \times 7 \times 7 \times 7 \times 7 = 16807$$

b) $2 \times 2 = 4$

$$2 \times 2 \times 2 = 8$$

$$2 \times 2 \times 2 \times 2 = 16$$

$$2 \times 2 \times 2 \times 2 \times 2 = 32$$

$$2 \times 2 \times 2 \times 2 \times 2 \times 2 = 64$$

c) $2 \times 2 = 4$

$$2 \times 2 \times 2 = 8$$

$$2 \times 2 \times 2 \times 2 = 16$$

$$2 \times 2 \times 2 \times 2 \times 2 = 32$$

$$2 \times 2 \times 2 \times 2 \times 2 \times 2 = 64$$

$$2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 128$$

d) $3 \times 3 = 9$

$$3 \times 3 \times 3 = 27$$

$$3 \times 3 \times 3 \times 3 = 81$$

e) $9 \times 9 = 81$

6. Find the missing base.

a) 4³ = 64 b) 7² = 49 c) 1⁵ = 1 d) 9³ = 729

7. Evaluate each of the following. What do you notice?

a) 10^2

$$100$$

b) 10^3

$$1000$$

c) 10^5

$$100\,000$$

d) 10^6

$$1\,000\,000$$

The exponent on the 10 is the number of zeros that appear in standard form

8. Place a <, > or = in the box. (Show your calculations)

a) 2^7 < 6^3

$$128 \quad 216$$

b) 4^3 = 2^6

$$64 \quad 64$$

c) 9^3 > 3^5

$$729 \quad 243$$

d) 7^3 < 6^5

$$343 \quad 7776$$

Quiz Time

What do we notice?

$$3^1 = 3$$

$$10^1 = 10$$

$$12^1 = 12$$

$$17^1 = 17$$

$$27^1 = 27$$

$$99^1 = 99$$

$$10^0 = 1$$

$$2^0 = 1$$

$$81^0 = 1$$

$$21^0 = 1$$

$$13^0 = 1$$

$$5^0 = 1$$



Exponents

Whenever you have an exponent of 2, it is said to be squared. 3^2 might be read as 3 squared.

Whenever you have an exponent of 3, it is said to be cubed. 5^3 might be read as 5 cubed.

If the base is raised to the exponent 1, then the answer will always be the base itself.

examples: $15^1 = 15$

$24^1 = 24$

$6\,893^1 = 6\,893$

If the base is raised to the exponent 0, then the answer will always be 1.

examples: $26^0 = 1$

$147^0 = 1$

$945^0 = 1$

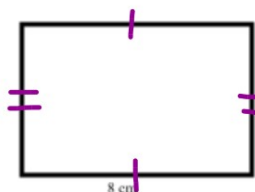
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Squares and Perfect Squares

Ex. 1)

What is the area of each below?

Are they squares? Why or why not?

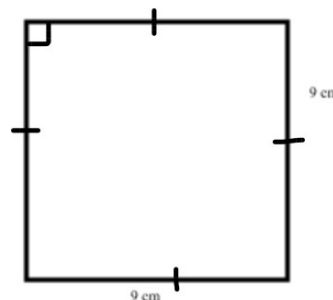


$$A_{\square} = L \times w$$

$$= 8 \text{ cm} \times 5 \text{ cm}$$

$$= 40 \text{ cm}^2$$

Rectangle

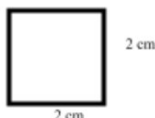


$$A_{\square} = L \times w$$

$$= 9 \times 9$$

$$= 81 \text{ cm}^2$$

Square



$$A = L \times w$$

$$= 2 \text{ cm} \times 2 \text{ cm}$$

$$= 4 \text{ cm}^2$$

Square



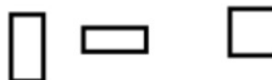
$$A = l \times w$$

$$= 4 \text{ cm} \times 8 \text{ cm}$$

$$= 32 \text{ cm}^2$$

Rectangle

Ex 2) Can you form squares with the following areas?

(a) 18 cm^2

1×18 (Rec)
 2×9 (Rec)
 3×6 (Rec)

18 is NOT
 a perfect
 square #.

(b) 25 cm^2

1×25 (Rec)
 5×5 (sq) Rec
 ↓ square
 25 is a perfect
 square #

(c) 100 cm^2

1×100 (Rec)
 2×50 (Rec)
 4×25 (Rec)
 5×20 (Rec)
 10×10 (Square)

Means
 100 is a perfect
 square #

(d) 60 cm^2

1×60 Rec
 2×30 Rec
 3×20 Rec
 4×15 Rec
 5×12 Rec
 6×10 Rec

60 is NOT
 a perfect square
 #

How do you know if a given area will make a square?

You will form a square if 2 of the factors are the same, for example an area of 25 cm^2 forms a square because $25 = 5 \times 5$

Notes

"To Square a number" - Multiplying a number by itself

Example: "The square of 5" is $5 \times 5 = 25$

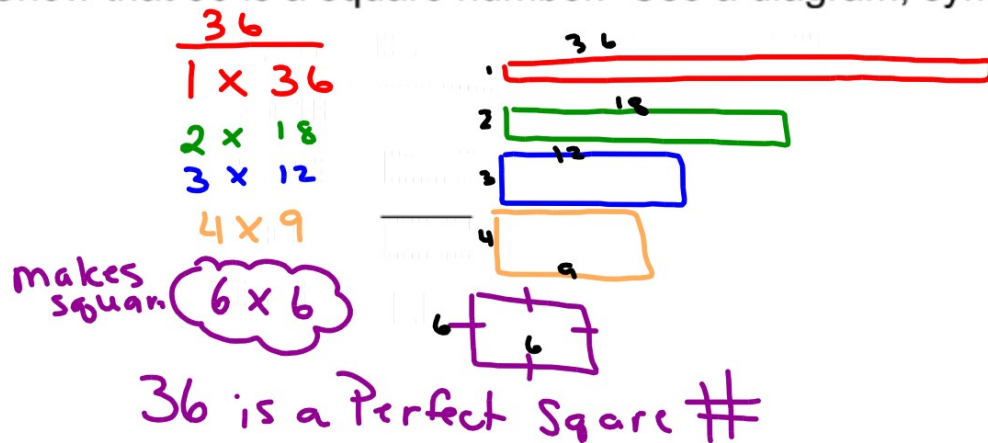
Thus

$$5^2 = 25$$

25 is a square number
or Perfect Square

Example 4:

Show that 36 is a square number. Use a diagram, symbols and words.



Solution:

Draw a square with area 36 square units

Side length = ____ units

Then, $36 = \underline{\quad} \times \underline{\quad} = \underline{\quad}^2$

Words: Thirty-six is _____ squared

NOTES:

How can you find all of the perfect squares of the numbers between 1 and 250?

Multiply the same numbers to get a perfect square.

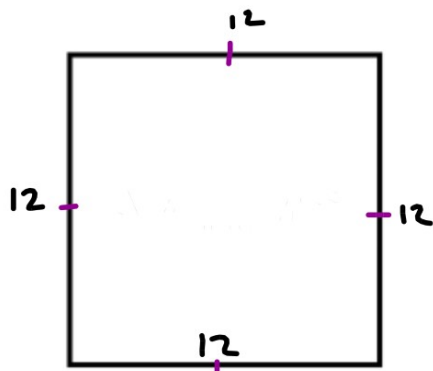
Side length	L x W	Perfect Square (Area)
1	$1 \times 1 =$	1
2	$2 \times 2 =$	4
3	$3 \times 3 =$	9
4	$4 \times 4 =$	16
5	$5 \times 5 =$	25
6	$6 \times 6 =$	36
7	$7 \times 7 =$	49
8	$8 \times 8 =$	64
9	$9 \times 9 =$	81
10	$10 \times 10 =$	100
11	$11 \times 11 =$	121
12	$12 \times 12 =$	144
13	$13 \times 13 =$	169
14	$14 \times 14 =$	196
15	$15 \times 15 =$	225



Ex. 5) A square has area of 144 cm^2 . Find the perimeter of the square.

(Always include a diagram...doesn't have to be on graph paper if it doesn't ask for graph paper...so sketch)

$$A = 144 \text{ cm}^2 \rightarrow \text{Side} = 12 \text{ cm}$$



$$\begin{aligned} \text{Perimeter} &= \text{Side} + \text{Side} + \text{Side} + \text{Side} \\ &= 4 \times \text{Side for Square} \\ &= 4 \times 12 \text{ cm} \\ &= 48 \text{ cm} \end{aligned}$$