



Warm Up
Grade 8
Friday
Oct. 24, 2014



1) Find the missing number (Show your work)

$$14^{\square} = 38\,416$$

$$\begin{aligned} 14^1 &= 14 \\ 14^2 &= 196 \\ 14^3 &= 2744 \\ 14^4 &= 38\,416 \end{aligned}$$

2) Find the missing number

$$\underline{5}^6 = 15\,625$$

$$\begin{aligned} 1^6 &= 1 & 5^6 &= 15\,625 \\ 2^6 &= 64 \\ 3^6 &= 729 \\ 4^6 &= 4096 \end{aligned}$$

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

$$\text{a) } 5^7 > 4^8$$

\downarrow \downarrow
 78125 65536

$$\text{b) } 3^3 > 5^2$$

\downarrow \downarrow
 27 25

Quiz Time

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	4	4	$4 \times 4 \times 4 \times 4$	256
10^3	10	3	$10 \times 10 \times 10$	1000
14^2	14	2	14×14	196
1^5	1	5	$1 \times 1 \times 1 \times 1 \times 1$	1
9^4	9	6	$9 \times 9 \times 9 \times 9 \times 9 \times 9$	531 441
5^7	5	7	$5 \times 5 \times 5 \times 5 \times 5 \times 5 \times 5$	78 125

4. Write each product as a power, then evaluate (standard form).
 a) 6×6 **$6^2 = 36$** b) $3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3$ **$3^7 = 729$**
 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) $7^{\boxed{5}} = 16807$ b) $2^{\boxed{5}} = 32$ c) $2^{\boxed{7}} = 128$ d) $3^{\boxed{4}} = 81$ e) $9^{\boxed{2}} = 81$

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) $2 \times 2 = 4$
 $2 \times 2 \times 2 = 8$
 $2 \times 2 \times 2 \times 2 = 16$
 $2 \times 2 \times 2 \times 2 \times 2 = 32$
 $2 \times 2 \times 2 \times 2 \times 2 \times 2 = 64$
 $2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 128$

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) $\underline{4}^3 = 64$ b) $\underline{7}^2 = 49$ c) $\underline{1}^5 = 1$ d) $\underline{9}^3 = 729$

7. Evaluate each of the following. What do you notice?
 a) 10^2 b) 10^3 c) 10^5 d) 10^6
 100 1000 100 000 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 $\boxed{<}$ 6^3 b) 4^3 $\boxed{=}$ 2^6 c) 9^3 $\boxed{>}$ 3^5 d) 7^3 $\boxed{<}$ 6^5
 128 216 64 64 729 243 343 7776

What do we notice?

$$3^1 = 3$$

$$10^1 = 10$$

$$12^1 = 12$$

$$17^1 = 17$$

$$27^1 = 27$$

$$99^1 = 99$$

$$x^1 = x$$

$$10^0 = 1$$

$$2^0 = 1$$

$$81^0 = 1$$

$$21^0 = 1$$

$$13^0 = 1$$

$$5^0 = 1$$



$$\begin{array}{l}
 3^0 = 1 \\
 3^1 = 3 \\
 3^2 = 9 \\
 3^3 = 27 \\
 3^4 = 81
 \end{array}$$

Diagram illustrating the relationship between powers of 3:

- Blue arrows pointing down from 3^1 to 3^2 , 3^2 to 3^3 , and 3^3 to 3^4 are labeled $\times 3$.
- Red arrows pointing up from 3^4 to 3^3 , 3^3 to 3^2 , 3^2 to 3^1 , and 3^1 to 3^0 are labeled $\div 3$.

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.

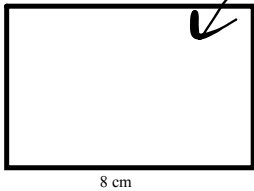
examples: $26^0 = 1$ $147^0 = 1$ $945^0 = 1$

$$\wedge [xyz]^0 = 1$$

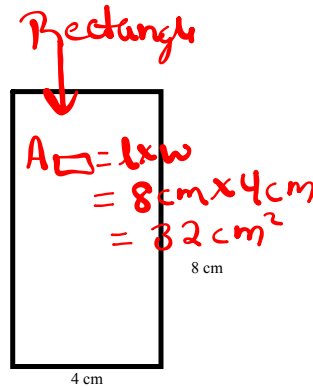
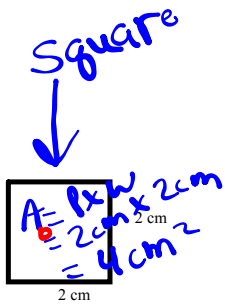
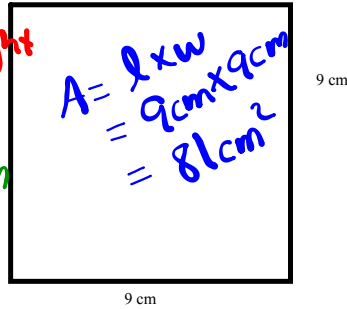
Squares and Perfect Squares

Ex. 1)

What is the area of each below?
Are they squares? Why or why not?



Area_□ = base x height
l x w
= 8cm x 5cm
= 40cm²



base x Height

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

(a) 18 cm²
base x height
1 x 18
2 x 9
3 x 6
base ≠ height
does not equal

(b) 25 cm²
1 x 25
5 x 5
base = height
so
square

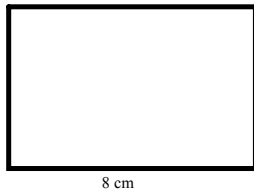
(c) 100 cm²
1 x 100
2 x 50
4 x 25
5 x 20
10 x 10
base = height
square

(d) 60 cm²
1 x 60
2 x 30
3 x 20
4 x 15
5 x 12
6 x 10
Not a square

You will form a square if 2 of the factors are the same, for example an area of 25 cm² forms a square because 25 = 5 x 5

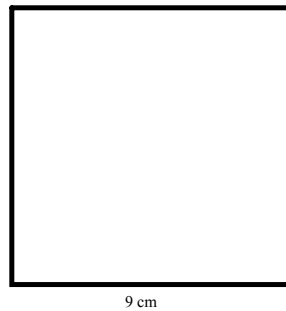
Squares and Perfect Squares

What is the area of each below?
Are they squares? Why or why not?



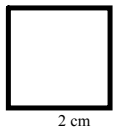
$$\begin{aligned} A &= L \times W \\ &= 8 \times 5 \\ &= 40 \text{ cm}^2 \end{aligned}$$

Not a square,
sides are not equal



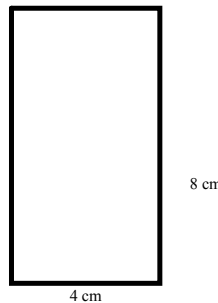
$$\begin{aligned} A &= L \times W \\ &= 9 \times 9 \\ &= 81 \text{ cm}^2 \end{aligned}$$

Square, all
sides are
equal



$$\begin{aligned} A &= L \times W \\ &= 2 \text{ cm} \times 2 \text{ cm} \\ &= 4 \text{ cm}^2 \end{aligned}$$

Square all sides
equal



$$\begin{aligned} A &= L \times W \\ &= 8 \text{ cm} \times 4 \text{ cm} \\ &= 32 \text{ cm}^2 \end{aligned}$$

Not a square,
sides are
not equal

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

- (a) 18 cm^2 (b) 25 cm^2 (c) 100 cm^2 (d) 60 cm^2

a) No, there is no number you can multiply by itself to get 18

b) Yes, forms a square, $5 \times 5 = 25$

c) Yes because $10 \times 10 = 100$

d) No, can not form a square, there is no number you multiply by itself to get 60

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

$$5^2 = 25$$

$$5^2 = 5 \times 5 = 25$$



25 is a square number
or Perfect Square

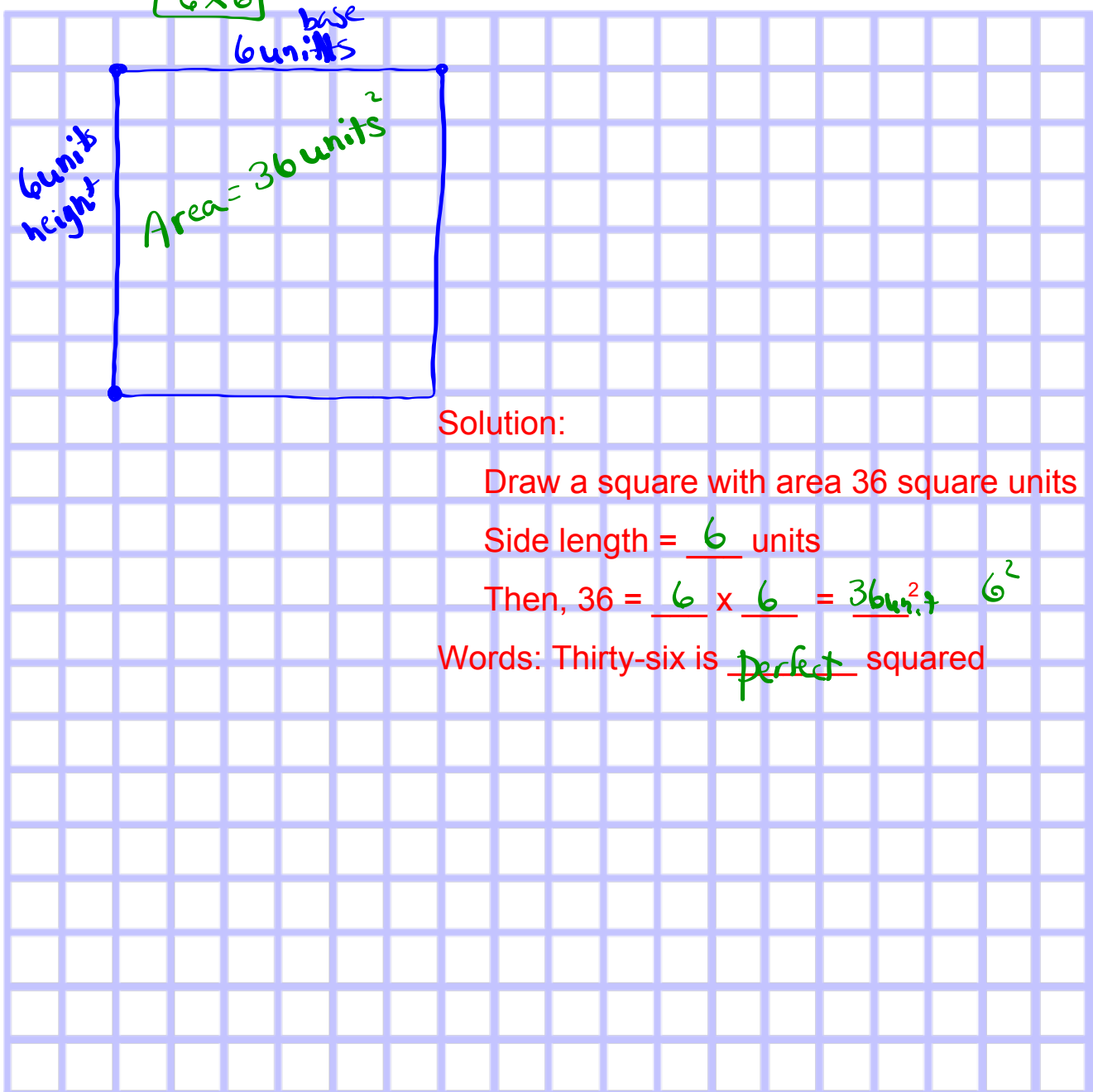
use graph paper

Example 4:

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

$$\begin{array}{l}
 b \times h \\
 1 \times 36 \\
 2 \times 18 \\
 3 \times 12 \\
 4 \times 9 \\
 \boxed{6 \times 6}
 \end{array}$$

$$\begin{array}{l}
 \text{base} = 6 \text{ units} \\
 \text{height} = 6 \text{ units}
 \end{array}$$



Solution:

Draw a square with area 36 square units

Side length = 6 units

$$\text{Then, } 36 = \underline{6} \times \underline{6} = \underline{36 \text{ units}^2} \quad 6^2$$

Words: Thirty-six is perfect 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 x 1 =	1
2	2 x 2 =	4
3	3 x 3 =	9
	4 x 4 =	16
	5 x 5 =	25
	6 x 6 =	36
	7 x 7 =	49
	8 x 8 =	64
	9 x 9 =	81
	10 x 10 =	100
	11 x 11 =	121
12	12 x 12 =	144
	13 x 13 =	169
	14 x 14 =	196
	15 x 15 =	225

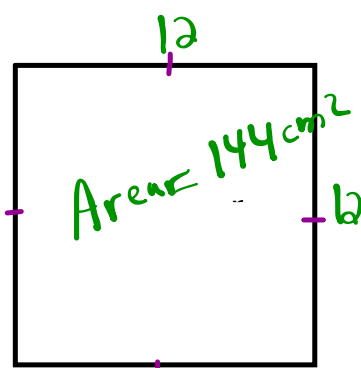
Perfect Squares
 1, 4, 9, 16
 25, 36, 49
 64, 81, 100
 121, 144, 169
 196, 225



on test
on assessment

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)



$$\text{Side length} = 12 \text{ cm}$$

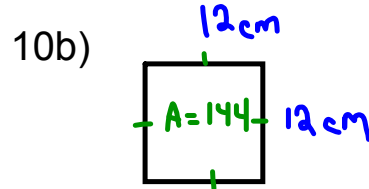
$$\begin{aligned} \text{Perimeter} &= \text{side} + \text{side} + \text{side} + \text{side} \\ &= 4 \times \text{side} \\ &= 4 \times 12 \text{ cm} \\ &= 48 \text{ cm} \end{aligned}$$

Class/Homework

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(if you don't have graph paper write out factors)



Attachments

WS 2.3 Powers (Sept. 6 Homework).pdf

WS 2.3 Powers Soutions pdf.pdf