

2.1 Powers and Exponents

Difference Between a Subscript and a Superscript

A subscript can be a letter or number that appears smaller than the normal sized text and appears slightly below the text. A superscript can be a letter or number that appears smaller than the normal sized text and appears slightly above the text. Superscripts are commonly used in math to represent exponents. Subscripts are commonly used in formulas to label different variables.

Examples

$$x_2 \quad H_2O \quad 12^5 \quad (y_2 - y_1)^2$$

Notes labeling different parts

$$3^3 = 27$$

Class Notes – Expand each expression.

| | | |
|-------------------------|-----------------|-----------------|
| LP#1 5^4 | 2^6 | 7^3 |
| LP#2 $8^2 \cdot 3^4$ | $2^4 \cdot 2^2$ | $6^3 \cdot 4^2$ |

Class Notes – Condense each expression using exponents.

| | | |
|---|---|---|
| LP#3 $5 \cdot 5 \cdot 5 \cdot 7 \cdot 7$ | $4 \cdot 4 \cdot 10 \cdot 10 \cdot 10 \cdot 10$ | $3 \cdot 2 \cdot 3 \cdot 2 \cdot 3$ |
| LP#4 $x \cdot y \cdot x \cdot x \cdot y \cdot x$ | $a \cdot a \cdot b \cdot b \cdot c \cdot a$ | $5 \cdot m \cdot m \cdot 5 \cdot 5 \cdot n$ |

Class Notes – Evaluate the following expressions. Let $w = 2$, $x = 3$, and $y = 4$.

| | | |
|---------------|-------|-------|
| LP#5 9^x | 6^y | y^x |
|---------------|-------|-------|

| | | |
|-------------------|-------------|--------------------|
| LP#6 $x + 5^w$ | $2^x + 3^y$ | $50 - w^y$ |
| LP#7 $5y^2$ | vs $(5y)^2$ | $4x^2$ vs $(4x)^2$ |

Class Notes – Evaluate the following expressions. Let $x_1 = 5$, $x_2 = 9$, $y_1 = 4$, and $y_2 = 12$.

| | | |
|---------------------|-----------------|-----------------------|
| LP#8 $(x_1)^4$ | $(y_1)^3$ | $x_2 - x_1$ |
| LP#9 $y_2 + y_1$ | $(y_2 - y_1)^2$ | $\frac{x_2 + x_1}{2}$ |

Review – Evaluate the following expressions. Let $w = 2$, $x = 3$, and $y = 4$.

| | | |
|---------------|-------------------|---------------------|
| R#1 11^x | $(y - w)^5$ | y^y |
| R#2 w^y | $w^2 + x^2 - y^2$ | $\frac{w + y^x}{2}$ |

Evaluate the following expressions. Let $x_1 = 5$, $x_2 = 9$, $y_1 = 4$, and $y_2 = 12$.

| | | | |
|------------------|-------------|-----------------|-----------------------|
| R#3 $(x_2)^4$ | $y_2 - y_1$ | $(x_2 - x_1)^2$ | $\frac{y_2 + y_1}{2}$ |
|------------------|-------------|-----------------|-----------------------|

Homework

Evaluate the following expressions. Let $w = 2$, $x = 3$, and $y = 4$.

- 1) 15^w 2) 10^y 3) x^x 4) $w^2 - y^2$ 5) $(y - w)^x$
- 6) $6w^2$ 7) $(6w)^2$ 8) $10x^3$ 9) $(10x)^3$ 10) $2w^3 + (4x)^2$
- 11) $4x^2 + (3w - y)^3$ 12) $\frac{w^3 + y}{6}$ 13) $9x^2$ 14) $\frac{w^2 + 10}{7}$ 15) $2(w + y)^3$

Evaluate the following expressions. Let $x_1 = 3$, $x_2 = 7$, $y_1 = 6$, and $y_2 = 10$.

- 16) $(x_1)^4$ 17) $(x_2)^4$ 18) $(y_1)^3$ 19) $x_2 - x_1$ 20) $y_2 - y_1$
- 21) $y_2 + y_1$ 22) $x_2 + x_1$ 23) $(y_2 - y_1)^2$ 24) $(x_2 - x_1)^2 - (y_2 - y_1)^2$
- 25) $(x_2 - x_1)^2$ 26) $\frac{x_2 + x_1}{2}$ 27) $\frac{y_2 + y_1}{2}$ 28) $\frac{x_2 + x_1}{2} - \frac{y_2 + y_1}{2}$

Synthesis

- 29) If the measure of a side of a square is represented by b , represent the perimeter and area of the square in terms of b .

Evaluate:

- 30) $\sqrt{9^2}$ 31) $\sqrt{49^2}$ 32) $\sqrt{25^2}$ 33) $\sqrt{16^2}$ 34) $\sqrt{81^2}$
- 35) $\sqrt{36^2}$ 36) $\sqrt{144^2}$ 37) $\sqrt{100^2}$ 38) $\sqrt{121^2}$ 39) $\sqrt{64^2}$
- 40) Let $x_1 = 2$, $x_2 = 5$, $y_1 = 7$, and $y_2 = 11$. Find d , if $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
- 41) Let $x_1 = 5$, $x_2 = 11$, $y_1 = 6$, and $y_2 = 14$. Find d , if $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
- 42) Let $x_1 = 1$, $x_2 = 6$, $y_1 = 5$, and $y_2 = 17$. Find d , if $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$