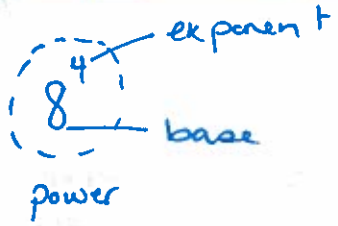
Unit 2: Powers and Exponents

A: Using Exponents to Describe Numbers



8^4 means multiply the base, (8) by itself 4 times.

→ Exponential Form

→ writing repeated multiplication using a base & power.

$3 \times 3 \times 3 \times 3$

$= 3^4$ exponential form.

Positive Powers

e.g. 8^2 4^3 6^6

$= 8 \times 8$ $= 4 \times 4 \times 4$ $= 6 \times 6 \times 6 \times 6 \times 6 \times 6$

$= 64$ $= 64$ $= 46\,656$.

* use calculator or repeated multiplication.

Negative Powers

Three types.

1. Inside Brackets.

$(-4)^4$ $(-3)^2$ $(-6)^8$

exponent applies to both the sign & base.

$(-4)^4 = -4 \times -4 \times -4 \times -4$
$= 256$

* use brackets on calculator

Try -4^4 w/out brackets on calculator.

$(-3)^2 = -3 \times -3$
$= +9$

$(-6)^8 = 1\,679\,616.$

2. Outside Brackets

$-4^4 \qquad -3^2 \qquad -6^8$ sign is not included in exponent answer will always be negative.

$-4^4 = -4 \times 4 \times 4 \times 4$
$= -256$ ✱ don't use brackets on your calculator.

$-3^2 = -3 \times 3$
$= -9$

$-6^8 = -1{,}679{,}616$

3. Combination

$-(-4)^4 \qquad -(-3)^3 \qquad -(-6)^8$ Do bracketed part 1st.

$= -(256) \qquad = -(-27) \qquad = -(1679616)$

$= -256 \qquad = 27 \qquad = -1679616.$

Examples:

1. Write each expression as a power. Identify the base & the exponent in each power, then evaluate.

a) $2 \times 2 \times 2 \times 2$

$= 2^4 \qquad = 16$

base = 2
exp = 4

b) $4 \times 4 \times 4 \times 4 \times 4$

$= 4^5 \qquad = 1024$

base = 4
exp = 5

c) 26

$= 26^1 \qquad = 26$

base = 26
exp = 1

2. Evaluate each power.

a) 10^2

$= 100$

b) 16^3

$= 4096$

c) $(-18)^2$

$= 324$

d) -16^2

$= -256$

e) $-(-6)^7$

$= -(-279936)$

$= +279936$

f) $(-2) \times (-2) \times (-2)$

$= (-2)^3$

$= -8$

g) $-(2 \times 2 \times 2 \times 2)$

$= -(2)^4$

$= -16$

3. Does $(-5)^4 \neq -5^4$?

$-5 \times -5 \times -5 \times -5 \neq -5 \times 5 \times 5 \times 5$

$25 \times 25 \neq -25 \times 25$

$625 \neq -625$

Assignment. Pg. 97 #4–13