

2.4 HOMEWORK HANDOUT : EXPONENT LAWS, PART 2

PART A

1) State the value that should be placed in each box.

a) $(2^3)^5 = 2^{\square}$ b) $(x^5)^3 = x^{\square}$ c) $(3^4)^6 = \square^{24}$ d) $(y^3)^{\square} = y^{18}$

e) $(xy)^4 = x^4y^{\square}$ f) $(3pq)^{\square} = 3^{10}p^{10}q^{10}$ g) $\left(\frac{5}{6}\right)^7 = \frac{5^7}{6^{\square}}$ h) $\left(\frac{a}{b}\right)^{\square} = \frac{a^9}{b^9}$

2) State the value that should be placed in each box.

a) $(x^4y^6)^2 = x^{\square}y^{12}$ b) $(35x^4y^6)^2 = 1225x^{\square}y^{12}$ c) $\left(\frac{x^8}{y^3}\right)^4 = \frac{x^{\square}}{y^{12}}$ d) $\left(\frac{a^2}{b^3}\right)^{\square} = \frac{a^{14}}{b^{21}}$

3) Use at least one exponent rule to find an equivalent/simplified expression.

a) $(6^5)^4$ b) $(x^3)^6$ c) $(xy)^8$ d) $\left(\frac{x}{y}\right)^7$ e) $(2x)^3$ f) $\left(\frac{1}{2}xy\right)^2$
g) $\left(\frac{a}{4}\right)^3$ h) $(x^2y^3)^5$ i) $\left(\frac{x^8}{y^4}\right)^3$ j) $(4^2a^3b^6)^3$ k) $(-2mn^4)^6$ l) $\left(\frac{-5}{p^8}\right)^3$

4) Use at least one exponent rule to find an equivalent/simplified expression and then evaluate for $x = -1$ and $y = 2$.

a) $\left(\frac{x}{y}\right)^3$ b) $(3xy)^4$ c) $(x^2y)^2$ d) $\left(\frac{x^5}{y^3}\right)^2$ e) $\left(\frac{4}{y^2}\right)^3$ f) $\left(\frac{1}{2}x^5y^2\right)^4$

5) Simplify.

a) $x^5(x^4)^2$ b) $(x^2)^3(x^4)^2$ c) $\frac{(k^4)^3}{k^2}$ d) $\frac{(y^3)^5}{(y^2)^3}$ e) $\frac{(a^4a^2)^3}{(a^3a^5)^2}$
f) $\left(\frac{y^9}{y^5}\right)^4$ g) $(5x^4 \times 6x^8)^2$ h) $[(-2a)(5a^9)]^3$ i) $(3x)^2(2x^4)^3$ j) $\frac{(4p^5)^3}{(-2p^3)^4}$

6) Simplify.

a) $x^7 \times x^6 \times y^4 \times y^3$ b) $a^3b^8a^9b^2$ c) $(x^4y^5)(x^2y^3)$ d) $(9x^2y^3)(4x^4y^2)$
e) $(-52ab^2)(3a^9b^{10})$ f) $x^6(xy)^4$ g) $-6m(2n)^3$ h) $(2x)^4(3y)^2$
i) $(3x^4)^2(2y^5)^3$ j) $(2a^2)^4(3a^6b^5)^2$ k) $-3x^2y(-2x^7y^4z^2)^3$ l) $(-2p^2q^3)^4(4p^5q)^3$

7) Simplify.

a) $\frac{x^5y^6}{x^2y^2}$ b) $\frac{38a^2b^4}{2ab}$ c) $\frac{-12xy^6}{3xy^2}$ d) $\frac{(4m^5n^6)^2}{(2m^2n^3)^3}$ e) $\frac{(-2xy^3)^4}{(-2y^4)^3}$ f) $\frac{(-4a^5b^2)^2(2a^3b^2)^3}{(2a^3b)^4}$

PART B

- 8) a) Express 4^3 as a power with a base of 2.
 b) Express 25^4 as a power with a base of 5.
 c) Express 27^2 as a power with a base of 3.

9) Simplify

a) $\left[(x^2)^3\right]^4$ b) $\left(\left((m^2n^3)^2\right)^4\right)^5$ c) $\left[\frac{(a^3)^2}{(b^2)^4}\right]^5$

10) a) Without actually calculating the value of either power, show that 16^3 is equal to 4^6 .

b) Without actually calculating the value of either power, show that 5^{183} is equal to 125^{61} .

11) Kendra needs to quickly determine whether 3^{40} is greater than or less than 4^{30} , but she does not have access to a calculator. How can she use her knowledge that $3^4 = 81$ and $4^3 = 64$ to solve her problem. Which power has the greater value?

ANSWERS

1) a) 15 b) 15 c) 3 d) 6 e) 4 f) 10 g) 7 h) 9

2) a) 8 b) 8 c) 32 d) 7

3) a) 6^{20} b) x^{18} c) x^8y^8 d) $\frac{x^7}{y^7}$ e) $8x^3$ f) $\frac{1}{4}x^2y^2$ g) $\frac{a^3}{64}$ h) $x^{10}y^{15}$ i) $\frac{x^{24}}{y^{12}}$
 j) $4096a^9b^{18}$ k) $64m^6n^{24}$ l) $-\frac{125}{p^{24}}$

4) a) $\frac{x^3}{y^3}; -\frac{1}{8}$ b) $81x^4y^4; 1296$ c) $x^4y^2; 4$ d) $\frac{x^{10}}{y^6}; \frac{1}{64}$ e) $\frac{64}{y^6}; 1$
 f) $\frac{1}{16}x^{20}y^8; 16$

5) a) x^{13} b) x^{14} c) k^{10} d) y^9 e) a^2 f) y^{16} g) $900x^{24}$ h) $-1000a^{30}$
 i) $72x^{14}$ j) $4p^3$

6) a) $x^{13}y^7$ b) $a^{12}b^{10}$ c) x^6y^8 d) $36x^6y^5$ e) $-156a^{10}b^{12}$ f) $x^{10}y^4$
 g) $-48mn^3$ h) $144x^4y^2$ i) $72x^8y^{15}$ j) $144a^{20}b^{10}$ k) $24x^{23}y^{13}z^6$ l) $1024p^{23}q^{15}$

7) a) x^3y^4 b) $19ab^3$ c) $-4y^4$ d) $2m^4n^3$ e) $-2x^4$ f) $8a^7b^6$

8a) 2^6 8b) 5^8 8c) 3^6 9a) x^{24} 9b) $m^{80}n^{120}$ 9c) $\frac{a^{30}}{b^{40}}$

10a) $16^3 = (4^2)^3$ 10b) $5^{183} = 5^{3 \times 61}$
 $= 4^6$ $= (5^3)^{61}$
 $= 125^{61}$

11) 3^{40} can be expressed as $(3^4)^{10}$. 4^{30} can be expressed as $(4^3)^{10}$. Since Kendra knows that $3^4 > 4^3$, she can conclude that $(3^4)^{10} > (4^3)^{10}$. Therefore, 3^{40} is greater than 4^{30} .