



Numbers, Relations & Functions 10

Name _____

Mutilpying Polynomials

Date _____

Find each product.

1) $5(6b + 3)$

$$30b + 15$$

2) $8(6r + 3)$

$$48r + 24$$

3) $2(8x + y)$

$$16x + 2y$$

4) $5mn(3m + 2n)$

$$15m^2n + 10mn^2$$

5) $7(x - 7y)$

$$7x - 49y$$

6) $2mn(8m - 2n)$

$$16m^2n - 4mn^2$$

7) $(4x - 2y)(6x + 6y)$

$$24x^2 + 12xy - 12y^2$$

8) $(6x + 3y)(4x - 7y)$

$$24x^2 - 30xy - 21y^2$$

9) $(2x + 5y)(7x - 8y)$

$$14x^2 + 19xy - 40y^2$$

10) $(3x + 6y)(5x - 8y)$

$$15x^2 + 6xy - 48y^2$$

11) $(5x - 4y)(5x^2 - 4xy + 6y^2)$

12) $(8x - 7y)(6x^2 + 8xy + 3y^2)$

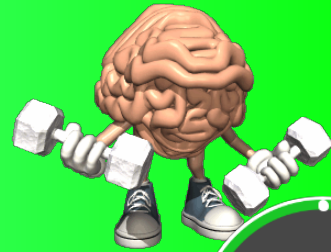
13) $(6a^2 - 2a - 3)(8a + 2)$

14) $(2k^2 + 8k - 2)(7k + 4)$

15) $(7a^2 - 2ab + 2b^2)(a^2 - 2ab - 8b^2)$

16) $(x^2 - 4xy + 2y^2)(x^2 - 2xy - 7y^2)$

Warm Up



Expand and Simplify

$$(x-3)^2 - (x+2)^2$$

$$(x-3)(x-3)$$

$$x^2 - 3x - 3x + 9$$

$$(x^2 - 6x + 9)$$

$$x^2 - 6x + 9$$

$$x^2 - x^2 - 6x - 4x + 9 - 4$$

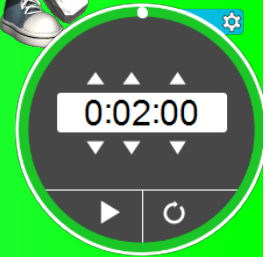
$$-10x + 5$$

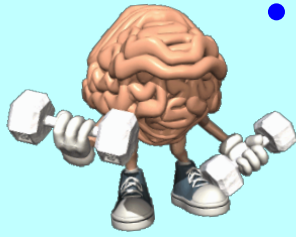
$$-(x+2)(x+2)$$

$$-(x^2 + 2x + 2x + 4)$$

$$-(x^2 + 4x + 4)$$

$$-x^2 - 4x - 4$$





Warm Up

$$1) [(-2)^3 \times (-2)^2] - [(-3)^3 \div (-3)^2]$$

$$\textcircled{2} \quad (-2)^5 - (-3)^1$$

$$\textcircled{1} \quad -32 + (+3)$$

$$-29$$

$$\frac{[(2 \times 2^2)^5 \div (5^6 \div 5^4)^4]^0}{(3^3 \times 3)^2 - (3^6 \div 3^4)^2} = \frac{1}{(3^4)^2 - (3^2)^2}$$

$$= \frac{1}{3^8 - 3^4}$$

$$= \frac{1}{6561 - 81} = \frac{1}{6480}$$

3)

Simplify the following using laws of exponents

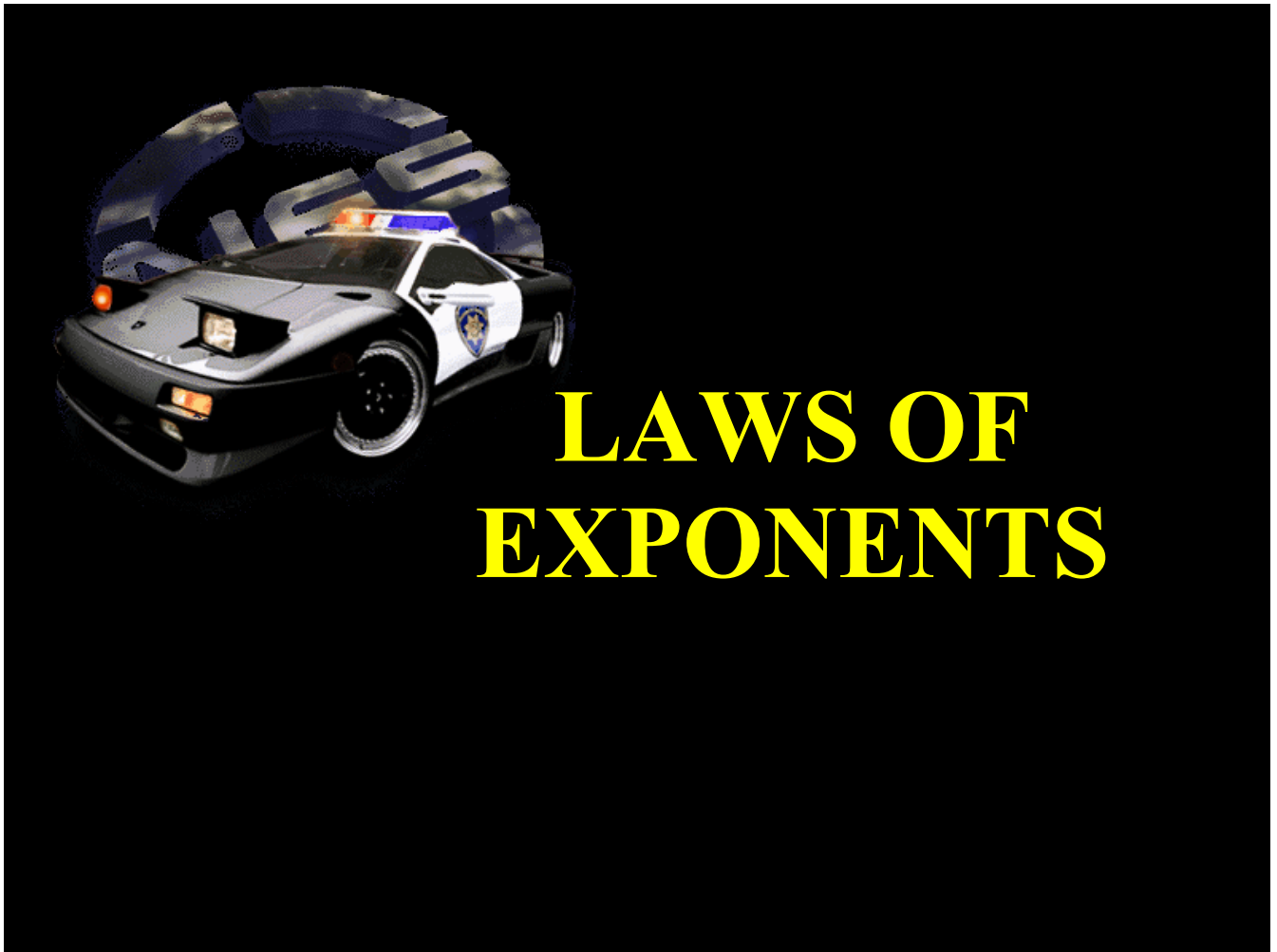
$$a) (3xy^2)^4$$

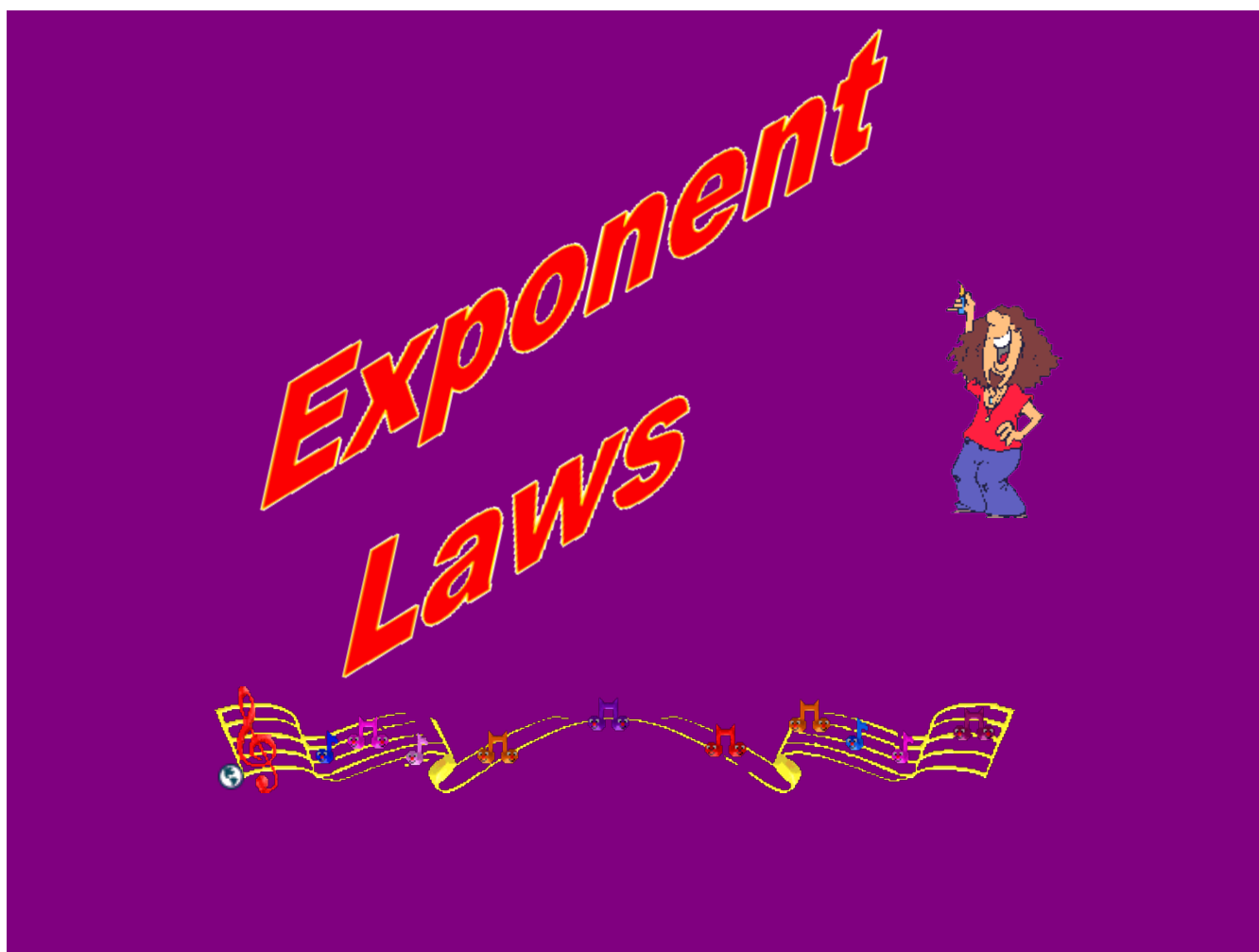
$$= 3^4 x^4 y^8$$

$$= 81x^4y^8$$

$$b) \frac{(12r^{12}t^3)}{(3r^{10}t^2)}$$

$$= 4r^2t^1$$





Laws Of Exponents



Law #1: Product Rule

$$b^m \times b^n = b^{m+n}$$

- when multiplying powers with the same base you add the exponents

•Exercise:

Simplify the following using the laws of exponents

a) $3^2 \times 3^4$

b) $4^3 \times 3^4$

c) $(q^7)(q)$

d) $p \times p^3 \times p^2$

e) $(2x^3)(4x^2)$

f) $(3z^3)(6z^{12})$

Law #2: Quotient Rule

$$b^m \div b^n = b^{m-n}$$

- when dividing powers with the same base you subtract the exponents

Exercise:

Simplify the following using exponent laws

a) $5^{23} \div 5^{12}$

b) $\frac{x^{34}}{x^{19}}$

c) $c^3 \div c^2$

d) $\frac{12x^3}{4x}$

e) $\frac{25c^{30}}{5c^{23}}$

Law #3: Power Rule

when raising a power to another power...MULTIPLY the exponents."

$$(b^m)^n = b^{mn}$$

Law #4: Power of Product

when a product is raised to a power, each of the factors are raised to the power."

$$(ab)^m = a^m b^m$$

- when brackets are involved you must multiply the exponents

Exercise:

Simplify the following using Laws of Exponents

a) $(m^3)^4$

b) $(x^2y^4)^3$

c) $(2d^3)^3$

d) $(2m^4n)^2(m^3n^2)$

$$2^2 m^8 n^2$$

$$(4m^8n^2) (m^3n^2)$$

$$4m^{11}n^4$$

Law #5: Power of Quotient Rule

when a quotient is raised to a power, both the divisor and the dividend are raised to the power."

$$\left(\frac{a}{b}\right)^n = \left(\frac{a^n}{b^n}\right)$$

$$\left(\frac{x^2}{y^3}\right)^4 = \frac{x^8}{y^{12}}$$

Law #6: Zero Rule

$$b^0 = 1$$

- any power raised to the exponent 0 (zero) is equal to 1

Law #7: Negative Reciprocals

$$b^{-m} = \frac{1}{b^m}$$

Examples:

$$6^{-2} = \frac{1}{6^2}$$

$$a^{-2} b^3 = \frac{b^3}{a^2}$$

$$2x^3 y^{-2} = \frac{2x^3}{y^2}$$

$$\frac{x^3}{y^2} = x^3 y^{-2}$$

Extended Laws of Exponents

Date _____

Simplify. Your answer should contain only positive exponents.

1) $4a^2 \cdot 5a^2$

2) $3b \cdot 8b^3$

3) $7x^3 \cdot x^2$

4) $5x \cdot 8x^3$

5) $\frac{a^4}{3a^3}$

6) $\frac{5n^2}{8n^4}$

7) $\frac{2n^4}{8n}$

8) $\frac{7r}{6r}$

9) $(8n)^4$

10) $(7k)^3$

11) $(6k)^2$

12) $(5x^2)^4$

13) $4b^{-1} \cdot 2b^{-2}$

14) $4m \cdot 3m^{-4}$

15) $6x^{-3} \cdot 3x^3$

16) $7v \cdot 8v^2$

17) $\frac{6n^3}{2n^3}$

18) $\frac{2x^2}{2x^3}$

19) $\frac{5x^3}{3x^4}$

20) $\frac{5b^{-4}}{4b^{-1}}$

21) $(2m^{-2})^4$

22) $(4x^2)^{-2}$

23) $(8n^{-4})^4$

24) $(6x^{-4})^3$

25) $\frac{3r^3 \cdot 2r}{(2r)^{-4}}$

26) $\frac{2v^2}{(3vv^3)^3}$

27) $\frac{x^2 \cdot 3x^4}{(2x^{-4})^{-2}}$

28) $\frac{3n^{-4} \cdot 2n^4}{(3n)^4}$

29) $\frac{(2n^{-3})^3 \cdot n^3}{3n^{-3}}$

30) $\left(\frac{2v^2 \cdot 4v^{-2}}{2v^2}\right)^2$

31) $\left(\frac{3p^3 \cdot p^2}{3p^3}\right)^{-2}$

32) $\frac{3a^{-1} \cdot 4a}{a^4}$

33) $\frac{2n^3}{4n^3 \cdot (n^4)^2}$

34) $\frac{p \cdot p^3 \cdot 2p}{(4p^4)^4}$

35) $\frac{(x^2)^3}{x^2 \cdot x^2}$

36) $\frac{(3n^4)^2}{3n^2 \cdot 3n^2}$

37) $\left(\frac{3n^2}{3n^2 \cdot n}\right)^4$

38) $\frac{x^2}{(2x^3 \cdot x^4)^4}$

Answers to Extended Laws of Exponents (ID: 1)

1) $20a^4$

5) $\frac{a}{3}$

9) $4096n^4$

13) $\frac{8}{b^3}$

17) 3

21) $\frac{16}{m^8}$

25) $96r^8$

29) $\frac{8}{3n^3}$

33) $\frac{1}{2n^8}$

37) $\frac{1}{n^4}$

2) $24b^4$

6) $\frac{5}{8n^2}$

10) $343k^3$

14) $\frac{12}{m^3}$

18) $\frac{1}{x}$

22) $\frac{1}{16x^4}$

26) $\frac{2}{27v^{10}}$

30) $\frac{16}{v^4}$

34) $\frac{1}{128p^{11}}$

38) $\frac{1}{16x^{26}}$

3) $7x^5$

7) $\frac{n^3}{4}$

11) $36k^2$

15) 18

19) $\frac{5}{3x}$

23) $\frac{4096}{n^{16}}$

27) $\frac{12}{x^2}$

31) $\frac{1}{p^4}$

35) x^2

4) $40x^4$

8) $\frac{7}{6}$

12) $625x^8$

16) $56v^3$

20) $\frac{5}{4b^3}$

24) $\frac{216}{x^{12}}$

28) $\frac{2}{27n^4}$

32) $\frac{12}{a^4}$

36) n^4