NAME:_____

DATE:_____

Quiz

Perform the following divisions by applying the laws of exponents. Make sure that your answers contain only positive exponents. Show all of the steps in the solutions. (5 marks each)

1. $\left(-125xy^{-3}x^5\right)^3 \div \left(625y^5x^{-\frac{1}{3}}\right)^{-3}$

$= 5^3 \qquad = 5^4$

$(-1)^3 5^9 x^3 y^{-9} x^{15} \div 5^{-12} y^{-15} x^1$

$\dfrac{(-1) 5^9 x^3 x^{15}}{y^9} \div \dfrac{x}{5^{12} y^{15}}$

$\dfrac{(-1) 5^9 x^{18}}{y^9} \cdot \dfrac{5^{12} y^{15}}{x} = \boxed{- 5^{21} x^{17} y^6}$

2. $\left(-x^4 y^{-3}\right)^{-2} \div \left(x^3 y^2 z^{\frac{1}{3}}\right)^3$

$-1)^{-2} = \dfrac{1}{(-1)^2} = \dfrac{1}{1} = 1$

$(-1)^{-2} x^{-8} y^6 \div x^9 y^6 z^1$

$\dfrac{y^6}{x^8} \cdot \dfrac{1}{x^9 y^6 z} = \boxed{\dfrac{1}{x^{17} z}}$

NAME: Shanna

DATE:

Quiz

Perform the following multiplications by applying the laws of exponents. Make sure that your answers contain only positive exponents. Show all of the steps in the solutions. (5 marks each)

1. $\left(-2x^4 y^{-4}\right)^4 \times \left(16 x^{-3} y^5\right)^{-1}$

$= 2^4$

$(-1)^4 \, 2^4 \, x^{16} \, y^{-16} \cdot 2^{-4} \, x^3 \, y^{-5}$

$\dfrac{(1) \, 2^4 \, x^{16}}{y^{16}} \cdot \dfrac{x^3}{2^4 \, y^5} = \boxed{\dfrac{x^{19}}{y^{21}}}$

2. $\left(x^4 y^{-1} z\right)^{\frac{3}{4}} \times \left(xy^2 z^3\right)^{-3}$

$x^3 \, y^{-\frac{3}{4}} \, z^{\frac{3}{4}} \cdot x^{-3} \, y^{-6} \, z^{-9}$

$\dfrac{x^3 \, z^{\frac{3}{4}}}{y^{\frac{3}{4}}} \cdot \dfrac{1}{x^3 \, y^6 \, z^9} = \dfrac{x^3 \, z^{\frac{3}{4}}}{x^3 \, y^{6+\frac{3}{4}} \, z^9}$

$\dfrac{3}{4} - \dfrac{9}{1} = \dfrac{3}{4} - \dfrac{36}{4} = -\dfrac{33}{4}$

$= \dfrac{z^{\frac{3}{4} - 9}}{y^{6+\frac{3}{4}}}$

$6 + \dfrac{3}{4} = 6\frac{3}{4} = \dfrac{27}{4}$

$= \dfrac{z^{-\frac{33}{4}}}{y^{\frac{27}{4}}} = \boxed{\dfrac{1}{y^{\frac{27}{4}} \, z^{\frac{33}{4}}}}$

NAME: _Shannon_

DATE: _____

Quiz

Simplify the following expressions. Make sure that your answers contain only positive exponents. Show all of the steps in the solution. (5 marks each)

1.

$$\left[\frac{a^3 b^{-4} c^{\frac{2}{3}}}{(8b^3 c^{-1})} \right]^{-2} = \frac{a^{-6} b^8 c^{-\frac{4}{3}}}{2^{-6} b^{-6} c^2} = \frac{2^6 b^8 b^6}{a^6 c^{\frac{4}{3}} c^2} = \boxed{\frac{2^6 b^{14}}{a^6 c^{\frac{10}{3}}}}$$

2^3

$\frac{4}{3} + 2$

$= 1\frac{1}{3} + 2$

$= 3\frac{1}{3} = \frac{10}{3}$

2.

$$\left[\frac{-3a^3 b^{-2}}{(27^2 a^{-2} b^4)} \right]^{-6} = \left[\frac{27^2 a^{-2} b^4}{-3a^3 b^{-2}} \right]^6 = \frac{3^{36} a^{-12} b^{24}}{(-1)^6 (3)^6 a^{18} b^{-12}}$$

$= \frac{3^{36} b^{24} b^{12}}{(1) 3^6 a^{18} a^{12}} = \frac{3^{36} b^{36}}{3^6 a^{30}}$

$= \boxed{\frac{3^{30} b^{36}}{a^{30}}}$

27^2

$= (3^3)^2$

$= 3^6$

NAME: Shannon
DATE:

Quiz

Perform the following multiplication and division. Make sure that your answers contain only positive exponents. Show all steps in the solutions. (5 marks each)

1.

$$2^2 = \left(\frac{a^3}{4^2}\right)^{-2} \times \left(\frac{16}{a^2}\right)^{-3}$$

$$\frac{a^{-6}}{2^{-8}} \cdot \frac{2^{-12}}{a^{-6}}$$

$$\frac{2^8}{a^6} \cdot \frac{a^6}{2^{12}} = \boxed{\frac{1}{2^4} \quad OR \quad \frac{1}{16}}$$

2.

$$\left(\frac{9}{y^4}\right)^2 \div \left(\frac{y^4}{27}\right)^{-1}$$

$$\frac{3^4}{y^8} \div \frac{y^{-4}}{3^{-3}}$$

$$\frac{3^4}{y^8} \div \frac{3^3}{y^4}$$

$$\frac{3^4}{y^8} \times \frac{y^4}{3^3} = \boxed{\frac{3}{y^4}}$$

NAME: _Shannon_

DATE: _____

Quiz

$\text{let } m = 3$

1. If m is an odd positive integer, determine whether the following statements are true or false by replacing the variable with the number of your choice. (10 marks)

A) $\left(\dfrac{1}{2}\right)^{-m} \le \dfrac{1}{2}$ $\left(\dfrac{1}{2}\right)^{-3} \le \dfrac{1}{2}$ $(2)^3 \le \dfrac{1}{2}$ $8 \le \dfrac{1}{2}$ True ☐ or False ☑	B) $(-2)^{-m} > 0$ $(-2)^{-3} > 0$ $\dfrac{1}{(-2)^3} > 0$ $\dfrac{1}{-8} > 0$ $-\dfrac{1}{8} > 0$ True ☐ or False ☑
C) $\left(-\dfrac{1}{2}\right)^{-m} \le 2$ $\left(-\dfrac{1}{2}\right)^{-3} \le 2$ $(-2)^3 \le 2$ $-8 \le 2$ True ☑ or False ☐	D) $2^m > 1$ $2^3 > 1$ $8 > 1$ True ☑ or False ☐

$$\text{let } a = \tfrac{1}{2}$$

2. If $0 < a < 1$, determine whether the following statements are true or false by replacing the variable with the number of your choice. (10 marks)

A) $\left(-\dfrac{1}{a}\right)^3 > 0$ $\left(\dfrac{-1}{\frac{1}{2}}\right)^3 > 0$ $(-2)^3 > 0$ $-8 > 0$ True ☐ or False ☑	B) $\left(\dfrac{1}{a}\right)^3 > \dfrac{1}{a}$ $\left(\dfrac{1}{\frac{1}{2}}\right)^3 > \dfrac{1}{\frac{1}{2}}$ $2^3 > 2$ $8 > 2$ True ☑ or False ☐
C) $(-a)^{-2} > 0$ $\left(-\dfrac{1}{2}\right)^{-2} > 0$ $(-2)^2 > 0$ $4 > 0$ True ☑ or False ☐	D) $a < a^2 < 1$ $\dfrac{1}{2} < \left(\dfrac{1}{2}\right)^2 < 1$ $\dfrac{1}{2} < \dfrac{1}{4} < 1$ True ☐ or False ☑

NAME: Shannon
DATE:

Quiz

Perform the following multiplication and division by using scientific notation and the laws of exponents. Express your answers in scientific notation. **Show all the steps in the solutions.** (5 marks each)

1. $5 \times 10^{-7} \times 0.000\ 000\ 3$

$$5 \times 10^{-7} \times 3 \times 10^{-7}$$

$$15 \times 10^{-7-7}$$

$$15 \times 10^{-14}$$

$$\boxed{1.5 \times 10^{-13}}$$

2. $\dfrac{0.000\ 004}{5 \times 10^{7}} = \dfrac{4 \times 10^{-6}}{5 \times 10^{7}}$

$$= \frac{4}{5} \times 10^{-6-7}$$

$$= 0.8 \times 10^{-13}$$

$$= \boxed{8 \times 10^{-14}}$$

NAME: _Shannon_

DATE: _____

Quiz

For each question, determine whether or not the two expressions are equivalent by applying the laws of exponents. Show all of the steps in the solutions. (10 marks each)

1. $\left(\dfrac{8}{9}\right)^{-3} \times \left(\dfrac{27}{2}\right)^{4} \times \left(\dfrac{16}{81}\right)^{-3}$ and $\left(\dfrac{2}{3^4}\right)^{-2} \times \left(\dfrac{9}{16}\right)^{3} \times \left(\dfrac{8}{81}\right)^{-4}$

$\left(\dfrac{2^3}{3^2}\right)^{-3} \cdot \left(\dfrac{3^3}{2}\right)^{4} \cdot \left(\dfrac{2^4}{3^4}\right)^{-3}$ $\left(\dfrac{2}{3^4}\right)^{-2} \cdot \left(\dfrac{3^2}{2^4}\right)^{3} \cdot \left(\dfrac{2^3}{3^4}\right)^{-4}$

$\dfrac{2^{-9}}{3^{-6}} \cdot \dfrac{3^{12}}{2^{4}} \cdot \dfrac{2^{-12}}{3^{-12}}$ $\dfrac{2^{-2}}{3^{-8}} \cdot \dfrac{3^{6}}{2^{12}} \cdot \dfrac{2^{-12}}{3^{-16}}$

$\dfrac{3^{12}\,3^{6}\,3^{12}}{2^{9}\,2^{12}\,2^{4}}$ $\dfrac{3^{8} \cdot 3^{6} \cdot 3^{16}}{2^{2} \cdot 2^{12} \cdot 2^{12}}$

$\dfrac{3^{30}}{2^{25}}$ $\neq$ $\dfrac{3^{30}}{2^{26}}$

2. $\left(\dfrac{25}{8}\right)^{-4} \times \left(\dfrac{625}{64}\right)^{3} \times \left(\dfrac{16}{25}\right)^{2}$ and $\left(\dfrac{5}{4}\right)^{-4} \times \left(\dfrac{625}{64}\right)^{3} \times \left(\dfrac{8}{25}\right)^{4}$

$\left(\dfrac{5^2}{2^3}\right)^{-4} \cdot \left(\dfrac{5^4}{2^6}\right)^{3} \cdot \left(\dfrac{2^4}{5^2}\right)^{2}$ $\left(\dfrac{5}{2^2}\right)^{-4} \cdot \left(\dfrac{5^4}{2^6}\right)^{3} \cdot \left(\dfrac{2^3}{5^2}\right)^{4}$

$\dfrac{5^{-8}}{2^{-12}} \cdot \dfrac{5^{12}}{2^{18}} \cdot \dfrac{2^{8}}{5^{4}}$ $\dfrac{5^{-4}}{2^{-8}} \cdot \dfrac{5^{12}}{2^{18}} \cdot \dfrac{2^{12}}{5^{8}}$

$\dfrac{2^{12} \cdot 5^{12} \cdot 2^{8}}{5^{8} \cdot 2^{18} \cdot 5^{4}}$ $\dfrac{2^{8} \cdot 5^{12} \cdot 2^{12}}{5^{4} \cdot 2^{18} \cdot 5^{8}}$

$\dfrac{2^{20}\,5^{12}}{2^{18}\,5^{12}}$ $\dfrac{2^{20}\,\cancel{5^{12}}}{2^{18}\,\cancel{5^{12}}}$

2^{2} 2^{2}

———   4

NAME: _Shannon_____

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Quiz

1. Among the following algebraic expressions, circle those that are equivalent. In the space provided under each expression, show how you arrived at your conclusion. (10 marks)

$\boxed{27a^3}$ $3^3 a^3$	$\boxed{(3a)^3}$ $3^3 a^3$	$\dfrac{3}{-(9a^3)}$ $\dfrac{3}{-3^2 a^3}$ $= \dfrac{1}{-3a^3}$ $= \dfrac{-1}{3a^3}$
$\boxed{\dfrac{1}{(3^3 a^3)^{-1}}}$ $= 3^3 a^3$	$\boxed{\dfrac{3^2}{3^{-1}} a^3}$ $= 3 \cdot 3^2 a^3$ $= 3^3 a^3$	$\dfrac{3a}{a^{-2}}$ $3a \cdot a^2$ $= 3a^3$

2. Among the following algebraic expressions, circle those that are equivalent. In the space provided under each expression, show how you arrived at your conclusion.
(10 marks)

$a^3b^2 \times b^4$	$\left(ab^{-2}\right)^3$	$-a^3b^6$
$a^3 b^6$	$a^3 b^{-6}$ $= \dfrac{a^3}{b^6}$	
$\dfrac{-b^6}{a^{-3}}$ $-a^3b^6$	$\dfrac{-a^3}{\left(b^{-3}\right)^{-2}}$ $\dfrac{-a^3}{b^6}$	$-ab^3 \times a^2b^3$ $-a^3b^6$

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Quiz

Perform the operations indicated in the expressions below and simplify your answers. Show all the steps in the solutions. (5 marks each)

1. $2\sqrt{3} - \sqrt{108} + \sqrt{48}$

$2\sqrt{3} - \sqrt{3 \cdot 36} + \sqrt{16 \cdot 3}$

$2\sqrt{3} - 6\sqrt{3} + 4\sqrt{3}$

0

2. $\sqrt{96} - \sqrt{36} + \sqrt{24}$

$\sqrt{16 \cdot 6} - 6 + \sqrt{4 \cdot 6}$

$4\sqrt{6} - 6 + 2\sqrt{6}$

$6\sqrt{6} - 6$

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Quiz

Perform the operations indicated in the following expressions. Simplify your answers and rationalize the denominators, if necessary. Show all the steps in the solutions.

1. $\dfrac{3\sqrt{48}}{-4\sqrt{72}} = \dfrac{3\sqrt{3 \cdot 16}}{-4\sqrt{2 \cdot 36}}$

$= \dfrac{-12\sqrt{3}}{24\sqrt{2}}$

$= \dfrac{-\sqrt{3}}{2\sqrt{2}} \cdot \dfrac{\sqrt{2}}{\sqrt{2}} = \dfrac{-\sqrt{6}}{4}$
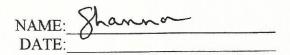
2. $\dfrac{-5\sqrt{27}}{\sqrt{45}} = \dfrac{-5\sqrt{3 \cdot 9}}{\sqrt{5 \cdot 9}}$

$= \dfrac{-15\sqrt{3}}{3\sqrt{5}}$

$= \dfrac{-5\sqrt{3}}{\sqrt{5}} \cdot \dfrac{\sqrt{5}}{\sqrt{5}} = \dfrac{-5\sqrt{15}}{5} = -\sqrt{15}$

Quiz

Perform the operations indicated in the expressions. Simplify your answers and rationalize the denominators, if necessary. Show all the steps in the solutions.

1. $\dfrac{-3\sqrt{6}}{2\sqrt{5}+5} \dfrac{(2\sqrt{5}-5)}{(2\sqrt{5}-5)} = \dfrac{-6\sqrt{30}+15\sqrt{6}}{4\sqrt{25}-25}$

$$= \dfrac{-6\sqrt{30}+15\sqrt{6}}{20-25}$$

$$= \dfrac{-6\sqrt{30}+15\sqrt{6}}{-5}$$

$$= \boxed{\dfrac{6\sqrt{30}-15\sqrt{6}}{5}}$$

2. $\dfrac{3\sqrt{12}}{4\sqrt{3}-3} \dfrac{(4\sqrt{3}+3)}{(4\sqrt{3}+3)} = \dfrac{12\sqrt{36}+9\sqrt{12}}{16\sqrt{9}-9}$

$$= \dfrac{72+9\sqrt{3\cdot4}}{48-9}$$

$$= \dfrac{72^{\div3}+18^{\div3}\sqrt{3}}{39^{\div3}}$$

$$= \boxed{\dfrac{24+6\sqrt{3}}{13}}$$

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Quiz

Perform the operations indicated in the expressions below and simplify your answers.
Show all the steps in the solutions. (5 marks each)

1. $(3\sqrt{2}+4)\cdot(\sqrt{2}-1)$

$$3\sqrt{4} - 3\sqrt{2} + 4\sqrt{2} - 4$$

$$6 - 3\sqrt{2} + 4\sqrt{2} - 4$$

$$\boxed{2 + \sqrt{2}}$$

2. $(2\sqrt{2}+3)\cdot(-2\sqrt{8}-6)$

$$-4\sqrt{16} - 12\sqrt{2} - 6\sqrt{8} - 18$$

$$-16 - 12\sqrt{2} - 6\sqrt{2\cdot4} - 18$$

$$-16 - 12\sqrt{2} - 12\sqrt{2} - 18$$

$$\boxed{-24\sqrt{2} - 34}$$

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Quiz

1.   Determine whether or not the following two expressions are equivalent. Show all
     the steps in the solution. (10 marks)

$$\left(2\sqrt{3}+3\right)\left(6\sqrt{6}-3\right) \quad \text{and} \quad 3\sqrt{3}\left(3\sqrt{2}-2\right)+3\sqrt{2}\left(3\sqrt{3}+12\right)-9$$

$$12\sqrt{18} - 6\sqrt{3} + 18\sqrt{6} - 9 \qquad\qquad 9\sqrt{6} - 6\sqrt{3} + 9\sqrt{6} + 36\sqrt{2} - 9$$

$$12\sqrt{2\cdot9} - 6\sqrt{3} + 18\sqrt{6} - 9 \qquad\qquad 18\sqrt{6} - 6\sqrt{3} + 36\sqrt{2} - 9$$

$$36\sqrt{2} - 6\sqrt{3} + 18\sqrt{6} - 9$$

Answer: The two expressions are thus equivalent.

Yes   ☑

No   ☐

2. Determine whether or not the following two expressions are equivalent. Show all the steps in the solution. (10 marks)

$$(3-3\sqrt{6})\cdot(5\sqrt{6}+5) \qquad \text{and} \qquad (2\sqrt{6}+25)(-\sqrt{24}-100)$$

$$15\sqrt{6}+15-15\sqrt{36}-15\sqrt{6} \quad \vdots \quad 2\sqrt{6}+25-\sqrt{4\cdot6}-100$$

$$15\sqrt{6}+15-90-15\sqrt{6} \quad \vdots \quad 2\sqrt{6}+25-2\sqrt{6}-100$$

$$-75 \qquad\qquad\qquad\qquad -75$$

Answer: The two expressions are thus equivalent.

Yes ☑ ✓

No ☐

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EXPONENTS AND RADICALS

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Quiz

1.   Match each expression in the left-hand column with the equivalent expression in the right-hand column. In the space under each expression on the left, show how you arrived at your answers. (10 marks)

A) $2\sqrt{2} - \sqrt{2}$

$1\sqrt{2}$ or $\sqrt{2}$

B) $\dfrac{3}{4}\sqrt{48}$

$\dfrac{3}{4}\sqrt{16 \cdot 3}$

$3\sqrt{3}$

C) $\dfrac{3^{\frac{3}{2}}}{3^{1}} = 3^{\frac{3}{2}} - 3^{\frac{2}{2}} = 3^{\frac{1}{2}}$

$= \sqrt{3}$

D) $\dfrac{2}{\sqrt{3}} \cdot \dfrac{\sqrt{3}}{\sqrt{3}} = \dfrac{2\sqrt{3}}{3}$

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1) $3\sqrt{3}$

2) 2

3) $\dfrac{2\sqrt{3}}{3}$

4) $\sqrt{2}$

5) $2\sqrt{3}$

6) $\sqrt{3}$

Answers:

A)   ___4___

B)   ___1___

C)   ___6___

D)   ___3___

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DATE: _____

2.

Match each expression in the left-hand column with the equivalent expression in the right-hand column. In the space under each expression on the left, show how you arrived at your answers. (10 marks)

| A) | $2\sqrt{3} \times -3\sqrt{3} = -6\sqrt{9}$ |
| | $\sout{\sqrt{8}}\qquad -18$ |

| | | 1) | $\dfrac{\sqrt{3}}{6}$ |
| | | 2) | -18 |

| B) | $\dfrac{1}{2\sqrt{3}}\ \dfrac{\sqrt{3}}{\sqrt{3}} = \dfrac{\sqrt{3}}{6}$ |

		3)	$\dfrac{\sqrt{2}}{4}$
		4)	$-6\sqrt{3}$
		5)	$2\sqrt{2}$

C)	$\dfrac{1}{2^{\frac{-3}{2}}}\qquad 2^{\frac{3}{2}}$
	$\sqrt[2]{2^3} = \sqrt{8}$
	$= 2\sqrt{2}$

| | | 6) | $\dfrac{\sqrt{6}}{3}$ |

D)	$\dfrac{\sqrt{18}}{3\sqrt{3}}\ \dfrac{\sqrt{3}}{\sqrt{3}} = \dfrac{\sqrt{54}}{3\sqrt{9}} = \dfrac{\sqrt{6\cdot 9}}{9}$
	$= \dfrac{3\sqrt{6}}{9}$
	$= \dfrac{\sqrt{6}}{3}$

Answers:

A) _2_

B) _1_

C) _5_

D) _6_

Quiz

1. Determine whether or not the following two expressions are equivalent by converting them to exponential form. Show all the steps in the solution. (5 marks)

$$b \sqrt[4]{\left(\frac{1}{b}\right)^{-5}} \qquad \text{and} \qquad \left(b^3\right)^{\frac{1}{4}} \cdot \sqrt[4]{b^6}$$

$$b \cdot \left(\frac{1}{b}\right)^{-\frac{5}{4}} \qquad\qquad b^{\frac{3}{4}} \cdot b^{\frac{6}{4}}$$

$$b^1 \cdot b^{\frac{5}{4}} \qquad\qquad\qquad b^{\frac{9}{4}}$$

$$b^{\frac{4}{4}} \cdot b^{\frac{5}{4}}$$

$$b^{\frac{9}{4}}$$

Answer: The two expressions are thus equivalent.

Yes ☑ ✓

No ☐

2. Determine whether or not the following two expressions are equivalent by converting them to exponential form. Show all the steps in the solution.

$$b^{\frac{5}{2}}\sqrt{b} \qquad \text{and} \qquad \left(\frac{1}{b}\right)^{\frac{-3}{2}} \bullet \sqrt[3]{b^2}$$

$$b^{\frac{5}{2}} \cdot b^{\frac{1}{2}}$$

$$b^{\frac{6}{2}}$$

$$b^3$$

$$b^{\frac{3}{2} \cdot \frac{3}{3}} \quad b^{\frac{2}{3} \cdot \frac{2}{2}}$$

$$b^{\frac{9}{6}} \cdot b^{\frac{4}{6}}$$

$$b^{\frac{13}{6}}$$

$$b^{2\frac{1}{6}} = b^{\frac{13}{6}}$$

$$b^{\frac{3}{2}} \cdot b^{\frac{2}{3}}$$

Answer: The two expressions are thus equivalent.

Yes ☐

No ☑