Review Exercise Set 21

Exercise 1: Simplify.

$$(3x^2)(4x^3y^{-1})^{-2}$$

Exercise 2: Simplify.

$$\frac{\left(2s^3t^{-2}\right)^{-3}}{\left(6s^{-1}t^2\right)^{-2}}$$

Exercise 3: Simplify.

$$\left(\frac{14\,x^4\,y^5\,z^2}{16\,x^3\,y^9\,z^7}\right)^{-2}$$

Exercise 4: How is the number 35,100,000 written in scientific notation?

Exercise 5: How is the number 0.000000000185 written in scientific notation?

Exercise 6: How is the number 1.06×10^{-5} written in decimal notation?

Exercise 7: How is the number 1.6×10^{12} written in decimal notation?

Review Exercise Set 21 Answer Key

Exercise 1: Simplify.

$(3x^2)(4x^3y^{-1})^{-2}$

Distribute the -2 exponent to each term in the parenthesis

$= (3x^2)(4)^{-2}(x^3)^{-2}(y^{-1})^{-2}$
$= (3x^2)(4^{-2})(x^{3*-2})(y^{-1*-2})$
$= (3x^2)(4^{-2})(x^{-6})(y^2)$

Eliminate negative exponents by moving them to the denominator

$$= \frac{3x^2y^2}{4^2x^6}$$

Simplify

$$= \frac{3x^2y^2}{16x^6}$$
$$= \frac{3y^2}{16x^{6-2}}$$
$$= \frac{3y^2}{16x^4}$$

Exercise 2: Simplify.

$$\frac{\left(2s^3t^{-2}\right)^{-3}}{\left(6s^{-1}t^2\right)^{-2}}$$

Eliminate the negative exponents on the outside of the parenthesis by flipping the fraction.

$$= \frac{\left(6s^{-1}t^2\right)^2}{\left(2s^3t^{-2}\right)^3}$$

Exercise 2 (Continued):

Distribute the exponents to each term inside the parenthesis

$$= \frac{(6)^2 \left(s^{-1}\right)^2 \left(t^2\right)^2}{(2)^3 \left(s^3\right)^3 \left(t^{-2}\right)^3}$$
$$= \frac{36\left(s^{-1\times 2}\right)\left(t^{2\times 2}\right)}{8\left(s^{3\times 3}\right)\left(t^{-2\times 3}\right)}$$
$$= \frac{36s^{-2}t^4}{8s^9t^{-6}}$$

Factor and reduce the coefficients

$$= \frac{4\times 9s^{-2}t^4}{4\times 2s^9t^{-6}}$$
$$= \frac{\cancel{4}\times 9s^{-2}t^4}{\cancel{4}\times 2s^9t^{-6}}$$
$$= \frac{9s^{-2}t^4}{2s^9t^{-6}}$$

Reduce the variable terms by subtracting the smaller exponents from the larger ones

$$= \frac{9t^{4-(-6)}}{2s^{9-(-2)}}$$
$$= \frac{9t^{4+6}}{2s^{9+2}}$$
$$= \frac{9t^{10}}{2s^{11}}$$

Exercise 3: Simplify.

$$\left(\frac{14x^4y^5z^2}{16x^3y^9z^7}\right)^{-2}$$

Elliminate the negative exponent outside of the parenthesis by flipping the fraction.

$$=\left(\frac{16x^3y^9z^7}{14x^4y^5z^2}\right)^{2}$$

Factor and reduce the coefficients

$$=\left(\frac{2\times 8x^3y^9z^7}{2\times 7x^4y^5z^2}\right)^{2}$$
$$=\left(\frac{\cancel{2}\times 8x^3y^9z^7}{\cancel{2}\times 7x^4y^5z^2}\right)^{2}$$
$$=\left(\frac{8x^3y^9z^7}{7x^4y^5z^2}\right)^{2}$$

Reduce the variable terms by subtracting the smaller exponents from the larger ones

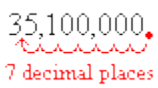
$$=\left(\frac{8y^{9-5}z^{7-2}}{7x^{4-3}}\right)^{2}$$
$$=\left(\frac{8y^4z^5}{7x}\right)^{2}$$

Distribute the exponent to each term in both the numerator and denominator

$$=\frac{\left(8y^4z^5\right)^2}{\left(7x\right)^2}$$
$$=\frac{\left(8\right)^2\left(y^4\right)^2\left(z^5\right)^2}{\left(7\right)^2\left(x\right)^2}$$
$$=\frac{64y^8z^{10}}{49x^2}$$

Exercise 4: How is the number 35,100,000 written in scientific notation?

In order to write the number in scientific notation you want only one non-zero digit to the left of the decimal point. In this problem, we must move the decimal point to the left 7 places in order to get it behind the 3.



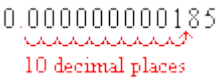
We would now drop all of the trailing zeros after the decimal point to be left with 3.51, which would then be multiplied by 10 raised to the 7th power. We use 7 as the exponent since that is the number of decimal places we moved.

$35{,}100{,}000 = 3.51 \times 10^{7}$

Since we had to move the decimal point to the left the exponent will be positive.

Exercise 5: How is the number 0.000000000185 written in scientific notation?

In this problem, we must move the decimal point to the right 10 places in order to get it behind the first non-zero digit of 1.



This time since we had to move the decimal point to the right the exponent will be negative.

$0.000000000185 = 1.85 \times 10^{-10}$

Exercise 6: How is the number 1.06×10^{-5} written in decimal notation?

In this exercise we are doing the reverse of the process we did in exercises 4 and 5. In exercise 5, we obtained a negative exponent when we moved the decimal point to the right. Since we are now reversing the process we will move the decimal point back to the left when our exponent is negative. So in this problem we need to move the decimal point back to the left 5 places to get the number back in decimal notation.

$1.06 \times 10^{-5} = 0.0000106$

Exercise 7: How is the number 1.6×10^{12} written in decimal notation?

Since we have a positive exponent we must move the decimal point 12 places to the right in order to get it back into decimal notation.

$1.6 \times 10^{12} = 1{,}600{,}000{,}000{,}000$