Topic 9: Rational expressions and functions

Rational Expression:

The ratio of two polynomials.

Why aren't the expressions below considered rational expressions?

1. $\dfrac{\sqrt{2x+7}}{x^2+3x-1}$

2. $\dfrac{4x^3 - x^2 + 8x - 9}{2 + 5^x}$

because $\sqrt{2x+7}$
isn't a polynomial

because $2 + 5^x$
isn't a polynomial

Simplify without a calculator.

$$\frac{36}{84} = \frac{2 \cdot 2 \cdot 3 \cdot 3}{2 \cdot 2 \cdot 3 \cdot 7}$$

$$= \frac{2 \cdot 2 \cdot 3 \cdot 3}{2 \cdot 2 \cdot 3 \cdot 7} = \boxed{\frac{3}{7}}$$

One method for reducing a ratio is shown. It is the method that will most closely resemble the work that will be done in Topic 9.
Factor numerator and denominator completely (prime factorization). Now cancel all factors that are common to the numerator and denominator.

Simplify each without a calculator. Give answer as a single fraction in reduced form.

1. $\dfrac{14}{15} \cdot \dfrac{20}{21}$

2. $\dfrac{28}{30} \div \dfrac{44}{18}$

To simplify the quotient of two fractions we change the problem into the first fraction multiplied by the reciprocal of the second fraction. Then simplify.

$$\frac{2 \cdot 7 \cdot 2 \cdot 2 \cdot 5}{3 \cdot 5 \cdot 3 \cdot 7}$$

$$= \boxed{\frac{8}{9}}$$

$$= \frac{28 \div 4}{30 \div 6} \cdot \frac{18 \div 6}{44 \div 4}$$

$$= \frac{7}{5} \cdot \frac{3}{11}$$

$$= \boxed{\frac{21}{55}}$$

Two methods for simplifying the product of two fractions are shown here:

1. Write the product of two fractions as a single fraction where all the factors of the two numerators are written in the single numerator and all the factors of the two denominators are written in the single denominator then all common factors are canceled. The remaining factors are multiplied

2. Cancel within the same fraction or cross-cancel using GCF. Then multiply remaining factors.