

rational expressions

denominator restrictions
numerator

Rational Expression
 Numerator → Polynomial
 Denominator → Polynomial
 7x+14

4.6 Problem Solving

Mario drove from Edmonton to Grande Prairie and back, a distance of about 360 km each way. Mario's average speed was 30 km/h greater on his return trip than on his trip out. His total driving time was 10 h. Determine Mario's average speed on each leg of his journey.

Complete the table below. Choose a variable to represent Mario's average speed for one leg of his journey. Write, then solve an equation to solve the problem. Verify the solution.

	Edmonton to Grande Prairie	Grande Prairie to Edmonton
d	360	360
v	x	x+30
t	$\frac{360}{x}$	$\frac{360}{x+30}$

$v = \frac{d}{t}$
 $t = \frac{d}{v}$

$$\frac{360}{x(x+30)} + \frac{360}{(x+30)x} = \frac{10 \cdot x(x+30)}{x(x+30)}$$

$$360x + 10800 + 360x = 10x^2 + 300x$$


$$0 = 10x^2 - 420x - 10800$$

$$0 = 10(x^2 - 42x - 1080)$$

$$0 = 10(x-60)(x+18)$$

x = 60, ~~-18~~

60 km/h there $x \neq 0, -30$
90 km/h back. Restrictions: $x \geq 0$



rational expressions

denominator restrictions
numerator

Rational Expression
 Numerator → Polynomial
 Denominator → Polynomial
 7x+14

Jerome rows his boat 24 km downstream and back to where he began. When the average speed of the current is 2 km/h, Jerome can complete the journey in 9 h. What is Jerome's average rowing speed in still water?

	downstream	upstream
d	24	24
v	x+2	x-2
t	$\frac{24}{(x+2)}$	$\frac{24}{(x-2)}$

$\frac{24}{(x+2)} + \frac{24}{(x-2)} = \frac{9 \cdot (x+2)(x-2)}{(x+2)(x-2)}$

$$24x - 48 + 24x + 48 = 9x^2 - 36$$

$$0 = 9x^2 - 48x - 36$$

$$3(3x^2 - 16x - 12)$$

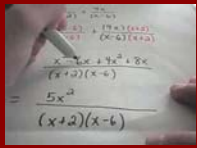
$$3(3x^2 - 18x + 2x - 12)$$

$$3(3x(x-6) + 2(x-6))$$

$$3(x-6)(3x+2) = 0$$

x = 6, ~~-2/3~~

6 km/h in still water



rational expressions

factor, domain, common denominator, numerator, denominator, restrictions, multiply, factors

Rational Expression
 Numerator → Polynomial
 Denominator → Polynomial
 7x + 14

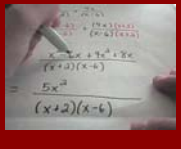
3. On a canoe trip, Patan paddled upstream a distance of 10 km. On the return trip downstream, the average speed of the canoe was 5 km/h greater than its speed upstream. Write, then simplify an expression for Patan's total paddling time in terms of the average speed upstream.

	upstream	downstream
d	10	10
v	x	x + 5
t	$\frac{10}{x}$	$\frac{10}{x+5}$

$\frac{10}{x} + \frac{10}{x+5}$
 $\frac{10(x+5) + 10x}{x(x+5)}$

$\frac{10x + 50 + 10x}{x(x+5)} = \frac{20x + 50}{x(x+5)} = \frac{10(2x+5)}{x(x+5)}$

$x \geq 0 \quad x \neq 0, -5$



rational expressions

factor, domain, common denominator, numerator, denominator, restrictions, multiply, factors

Rational Expression
 Numerator → Polynomial
 Denominator → Polynomial
 7x + 14

A plane travels from Toronto to Vancouver and back, a distance of about 3400 km each way. The plane flies 100 km/h faster on the return trip than it does on the journey out. Write, then simplify an expression for the total flying time in terms of the average speed from Toronto to Vancouver.

	Tor → Van	Van → Tor
d	3400	3400
v	x	x + 100
t	$\frac{3400}{x}$	$\frac{3400}{x+100}$

$\frac{3400}{x} + \frac{3400}{x+100}$

$\frac{3400x + 340000 + 3400x}{x(x+100)}$

$\frac{6800x + 340000}{x(x+100)} = \frac{6800(x+50)}{x(x+100)} \quad x \neq 0, -100$

Pg. 349 # 14, 17, 18.