

1. There are 2 rational expressions, P/Q and R/S , where $Q = x^2 - 9$, $R = x + 1$, and $S = x^2 + x - 6$.
If $P/Q \div R/S = A/B$, where $A = 4x^2 - 13x + 10$, determine an expression for P and B .

$$\frac{P}{Q} \div \frac{R}{S} = \frac{A}{B}$$

$$\begin{aligned} & 4x^2 - 13x + 10 \\ & = 4x^2 - 8x - 5x + 10 \\ & = 4x(x-2) - 5(x-2) \\ & = (x-2)(4x-5) \end{aligned} \quad \begin{array}{c|c|c} M & A & W \\ \hline 40 & -13 & -5, -8 \end{array}$$

$$\frac{P}{x^2-9} \div \frac{(x+1)}{x^2+x-6} = \frac{4x^2-13x+10}{B}$$

$$\begin{aligned} \frac{P}{(x-3)(x+3)} \div \frac{(x+1)}{(x-2)(x+3)} &= \frac{(x-2)(4x-5)}{B} \\ \frac{P}{\cancel{(x-3)(x+3)}} \cdot \frac{\cancel{(x-2)(x+3)}}{(x+1)} &= \frac{(x-2)(4x-5)}{B} \end{aligned}$$

$$\begin{aligned} \therefore P &= 4x-5 \\ B &= (x-3)(x+1) \end{aligned}$$

2. Rowing at 8 km/h in still water, Rina and Bhanu take 16 hours to row 39 km down a river and 39 km back. Find the speed of the current.

Let "c" be the speed of the current.

	Distance	Speed	Time
down (faster)	39	$8+c$	$\frac{39}{8+c}$
up (slower)	39	$8-c$	$\frac{39}{8-c}$

$$\text{Total time} = \text{Time}_{\text{down}} + \text{Time}_{\text{up}}$$

$$16 = \frac{(8-c)39}{(8-c)(8+c)} + \frac{(8+c)39}{(8+c)(8-c)}$$

$$\text{LCD } (8+c)(8-c)$$

$$16 = \frac{39(8-c)}{(8-c)(8+c)} + \frac{39(8+c)}{(8-c)(8+c)}$$

$$16 = \frac{312 - 39c + 312 + 39c}{64 - c^2}$$

$$16 \overset{(64-c^2)}{=} \frac{624}{64-c^2} \cdot (64-c^2)$$

$$1024 - 16c^2 = 624$$

$$1024 - 624 = 16c^2$$

$$\frac{400}{16} = \frac{16c^2}{16}$$

$$\begin{aligned} & \sqrt{25} = \sqrt{c^2} \\ & c = \pm 5 \end{aligned}$$

\therefore The speed of the current is 5 km/h

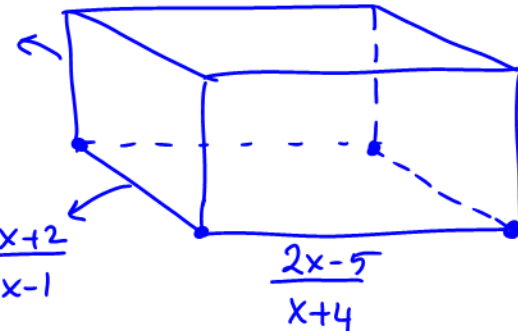
3. A rectangular prism has $length = \frac{2x-5}{x+4}$, $width = \frac{3x+2}{3x-1}$ and $height = \frac{x+4}{3x+1}$ all in metres.

- a) Determine a simplified expression for the volume of the rectangular prism. Express your answer as a quotient of two polynomials in standard (not factored) form, and state any restrictions.
b) Determine the volume when $x = 4$ metres.

$$\begin{aligned} a) V &= \frac{(2x-5)}{\cancel{(x+4)}} \cdot \frac{(3x+2)}{(3x-1)} \cdot \frac{\cancel{(x+4)}}{(3x+1)} \\ &= \frac{(2x-5)(3x+2)}{(3x-1)(3x+1)} \\ &= \frac{6x^2 + 4x - 15x - 10}{9x^2 - 1} \\ &= \frac{6x^2 - 11x - 10}{9x^2 - 1} \end{aligned}$$

$$x \neq -4, -\frac{1}{3}, \frac{1}{3}$$

$$\frac{x+4}{3x+1}$$



$$\begin{aligned} b) V(4) &= \frac{6(4)^2 - 11(4) - 10}{9(4)^2 - 1} \\ &= \frac{6 \cdot 16 - 44 - 10}{9 \cdot 16 - 1} \end{aligned}$$

$$\begin{aligned} &= \frac{96 - 54}{144 - 1} \\ &= \frac{42}{143} \end{aligned}$$

4. There are 2 rational expressions, P/Q and R/S , where $Q = x^2 - 9$, $R = x + 1$, and $S = x^2 + x - 6$. If $P/Q + R/S = A/B$, where $A = 4x^2 - 12x + 5$, determine an expression for P and B .

$$\frac{P}{Q} + \frac{R}{S} = \frac{A}{B}$$

$$\frac{P}{x^2-9} + \frac{(x+1)}{x^2+x-6} = \frac{4x^2-12x+5}{B}$$

$$\frac{P}{(x-3)(x+3)} + \frac{(x+1)}{(x-2)(x+3)} = \frac{(2x-1)(2x-5)}{B}$$

$$\frac{P(x-2)}{(x-3)(x+3)(x-2)} + \frac{(x+1)(x-3)}{(x-2)(x+3)(x-3)} = \frac{(2x-1)(2x-5)}{B}$$

$$\frac{P(x-2) + x^2 - 2x - 3}{(x-3)(x+3)(x-2)} = \frac{(2x-1)(2x-5)}{B}$$

$$P(x-2) + x^2 - 2x - 3 = 4x^2 - 12x + 5$$

$$P(x-2) = 4x^2 - 12x + 5 - x^2 + 2x + 3$$

$$\frac{P(x-2)}{(x-2)} = \frac{3x^2 - 10x + 8}{(x-2)} \rightarrow \text{let's factor it to see if we can simplify}$$

$$\therefore P = \frac{(3x-4)(x-2)}{(x-2)}$$

$$P = (3x-4)$$

* Rough Work

$$\frac{4x^2 - 12x + 5}{4} \quad \begin{array}{c|c|c} M & A & N \\ \hline 20 & -12 & -2, -10 \end{array}$$

$$\begin{aligned} &= \frac{(4x-2)(4x-10)}{4} \\ &= \frac{2(2x-1)(2)(2x-5)}{4} \\ &= (2x-1)(2x-5) \end{aligned}$$

** LCD

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

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

$$\begin{aligned} ** & \frac{3x^2 - 10x + 8}{3} \quad \begin{array}{c|c|c} M & A & N \\ \hline 24 & -10 & 6, -4 \end{array} \\ &= \frac{(3x-4)(3x-6)}{3} \end{aligned}$$

$$= \frac{(3x-4)(3)(x-2)}{3}$$

$$= (3x-4)(x-2)$$

5. On the 42 km go-kart course, Arshia drives 0.4 km/h faster than Sarah, but has engine trouble and stops for $\frac{1}{2}$ hour. She arrives 15 minutes after Sarah at the end of the course. How fast did each girl drive?

PRACTICE

1. An open cardboard box with a square base with a side of x cm has a volume of 100 cm^3 .
 - a. Express the height of the box, h , in terms of x .
 - b. Express the surface area of the 5 sides of the box in terms of x .

2. A rectangular board has an area of 6000 cm^2 and a width of w cm.
 - a) Write an expression for the length of the board.
 - b) Write an expression for the perimeter of the board.
 - c) If the width is increased by x cm, write an expression for the new perimeter of the board.
 - d) Write an expression for the change in perimeter ($P_2 - P_1$).

3. One lap of a motorcycle race is 650 m. At the start of the race, Genna sets off 4 seconds after Tom does, but she drives her motorcycle 5 m/s faster and finishes the lap 2.5 seconds sooner than he does. Find their speeds.

4. Marissa and Jovanna enter a 200-km bike race. Marissa cycles 5 km/h faster than Jovanna, but her bicycle gets a flat tire, which takes $\frac{1}{2}$ hour to repair. If the 2 girls finish the race in a tie, how fast was each girl cycling?

