

Key

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Assignment

1. Simplify. State the restrictions on the variables.

a) $\frac{3a^2bc}{10bc^2} + \frac{12a^2b^2c}{6bc}$

$\frac{3a^2bc}{10bc^2} \cdot \frac{6bc}{6bc} = \frac{18a^2bc}{60bc^2}$

$\frac{3}{20bc}, a \neq 0, b \neq 0, c \neq 0$

b) $\frac{8x^2y^3}{-9x^3y} + \frac{-15x^2y}{14y^3} + \frac{7x}{-6xy^4}$

$\frac{-8x^2y^3}{-9x^3y} \times \frac{14y^3}{-15x^2y} = \frac{-112y^4}{135x^3}$

$\frac{-112y^4}{135x^3} \times \frac{-6xy^4}{7x} = \frac{+672xy^8}{945x^4} = \frac{96y^8}{x^3}$

c) $\frac{\frac{2xy}{5x^2y^2}}{\frac{10x^2y}{15y}}$

$\frac{2xy}{5x^2y^2} \cdot \frac{15y}{10x^2y} = \frac{30xy^2}{50x^4y^3}$

$\frac{3}{5x^3y}$

d) $\frac{-5m^3n}{2p} + \left(\frac{8p^3}{10m} + \frac{4p}{15n} \right)$

$\frac{-5m^3n}{2p} \div \left(\frac{8p^3}{10m} \cdot \frac{15n}{4p} \right) = \frac{-5m^3n}{2p} \div \frac{3p^2n}{m}$
 $= \frac{-5m^3n}{2p} \cdot \frac{m}{3p^2n} = \frac{-5m^4}{6p^3}, m \neq 0, p \neq 0, n \neq 0$

2. Simplify. State the nonpermissible values.

a) $\frac{(3x+5)^2}{x^2-49} + \frac{(3x+5)(x+1)}{x-7}$

$\frac{(3x+5)(3x+5)}{(x-7)(x+7)} + \frac{(3x+5)(x+1)}{(3x+5)(x+1)}$

$\frac{3x+5}{(x+7)(x+1)}, x \neq \pm 7, -\frac{5}{3}, -1$

b) $\frac{4y+20}{5y-20} + \frac{2y^2-50}{y^2-16} \cdot 2(y^2-25)$

$\frac{4(y+5)}{5(y-4)} \times \frac{(y-4)(y+4)}{2(y-5)(y+5)}$

$\frac{2(y+4)}{5(y-5)}, y \neq \pm 4, \pm 5$

$$c) \frac{(p-6)(p+2)}{p(p+1)} + \frac{-(p^2-36)}{p^2+p}$$

$$\frac{(p-6)(p+2)}{p(p+1)} \cdot \frac{p(p+1)}{-(p-6)(p+6)}$$

$$\frac{(p+2)}{-(p+6)}, p \neq 0, -1, \pm 6$$

$$d) \frac{\frac{a^2-81}{9a}}{(a-9)^2} = \frac{a^2-81}{9a} \div \frac{(a-9)^2}{1}$$

$$\frac{(a-9)(a+9)}{9a} \times \frac{1}{(a-9)(a-9)}$$

$$\frac{(a+9)}{9a(a-9)}, a \neq 0, 9$$

3. Simplify.

$$a) \frac{a^2-3a-10}{a^2-5a+6} + \frac{a^2+a-30}{a^2+4a-12}$$

$$\frac{(a-5)(a+2)}{(a-3)(a-2)} + \frac{(a+6)(a-5)}{(a+6)(a-5)}$$

$$\frac{a+2}{a-3}, a \neq 3, 2, -6, 5$$

$$b) \frac{x^2+13x+36}{x^2-4} + \frac{x^2-6x-40}{x^2-8x-20}$$

$$\frac{(x+4)(x+9)}{(x-2)(x+2)} + \frac{(x-10)(x+2)}{(x-10)(x+4)}$$

$$\frac{(x+9)}{(x-2)}, x \neq \pm 2, 10$$

$$c) \frac{y^3+4y^2-32y}{y^2-64}$$

$$\frac{y(y^2+4y-32)}{(y-8)(y+8)}$$

$$\frac{y(y+8)(y-4)}{(y-8)(y+8)}$$

$$\frac{y}{y-8}, y \neq \pm 8, 4$$

$$d) \frac{x^2+14x+49}{x^2+5x-14}$$

$$\frac{(x+7)(x+7)}{(x+7)(x-2)}$$

$$x(x+7), x \neq -7, 0, 2$$

414 Rational Expressions and Equations Lesson #6: Division of Rational Expressions

4. Simplify.

a) $\frac{2a^2 - 3a - 9}{8a^2 + 14a + 3} \div \frac{3a^2 - 7a - 6}{8a^2 + 14a + 3}$

$\frac{2a^2 - 6a + 3a - 9}{2a(a-3) + 3(a-3)}$
 $\frac{8a^2 + 12a + 2a + 3}{4a(2a+3) + 1(2a+3)}$

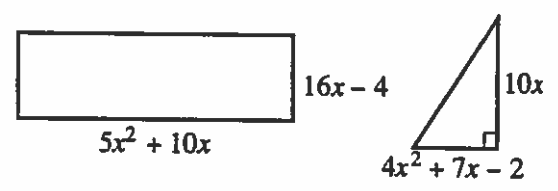
$\frac{(2a+3)(a-3)}{4a+1(2a+3)} \cdot \frac{(4a+1)(2a+3)}{(a-3)(3a+2)}$
 $\frac{2a+3}{3a+2}, a \neq -\frac{1}{4}, -\frac{3}{2}, 3, -\frac{2}{3}$

b) $\frac{x^4 - 5x^2y^2 + 4y^4}{x^2 + 3xy + 2y^2} \div \frac{x^2 - 4xy + 4y^2}{5x - 10y}$

$\frac{(x^2 - 4y^2)(x^2 - y^2)}{(x+2y)(x+y)} \times \frac{5(x-2y)}{(x-2y)(x-2y)}$
 $\frac{(x-2y)(x+2y)(x-y)(x+y) \cdot 5(x-2y)}{(x+2y)(x+y)(x-2y)(x-2y)}$

$5(x-y), x \neq \pm 2y, -y$

5. The rectangle shown has length $5x^2 + 10x$ cm and width $16x - 4$ cm. The triangle has base $4x^2 + 7x - 2$ cm and height $10x$ cm.



Write and simplify an expression that represents the ratio of the area of the rectangle to the area of the triangle.

$A_{rect} = (5x^2 + 10x)(16x - 4)$
 $5x(x+2)4(4x-1)$
 $20(x+2)(4x-1)$

$A_{tri} = \frac{10x(4x^2 + 7x - 2)}{2}$
 $= 5x(4x^2 + 7x - 2)$
 $(4x^2 + 8x - x - 2)$
 $4x(x+2) - 1(x+2)$
 $5x(4x-1)(x+2)$

$\frac{A_{rect}}{A_{tri}} = \frac{20x(x+2)(4x-1)}{5x(4x-1)(x+2)}$
 $= \frac{4}{1}$ or 4 to 1

6. Simplify.

a) $\frac{5 - \frac{1}{a}}{5 + \frac{1}{a}}$

$$\frac{5 - \frac{1}{a}}{5 + \frac{1}{a}} \div \frac{5}{1} + \frac{1}{a} = \frac{5a - \frac{1}{a}}{5a + \frac{1}{a}}$$

$$\frac{5a - 1}{a} \div \frac{5a + 1}{a}$$

$$\frac{5a - 1}{a} \cdot \frac{a}{5a + 1} = \frac{5a - 1}{5a + 1}, a \neq 0, -\frac{1}{5}$$

b) $\frac{8 + \frac{4}{x}}{4 - \frac{1}{x^2}}$

$$\frac{8 + \frac{4}{x}}{4 - \frac{1}{x^2}} \div \frac{4}{1} - \frac{1}{x^2} = \frac{8x + \frac{4}{x}}{4x^2 - \frac{1}{x^2}}$$

$$\frac{8x + 4}{x} \div \frac{4x^2 - 1}{x^2}$$

$$\frac{4(2x + 1)}{x} \cdot \frac{x^2}{(2x - 1)(2x + 1)}$$

$$\frac{4x}{2x - 1}, x \neq 0, \pm \frac{1}{2}$$

c) $\frac{\frac{3}{p^2} - \frac{1}{p^2 - 4}}{1 - \frac{6}{p^2}}$

$$\left(\frac{3}{p^2} - \frac{1}{p^2 - 4}\right) \div \left(1 - \frac{6}{p^2}\right)$$

$$\frac{3p^2 - 12 - p^2}{p^2(p^2 - 4)} \div \frac{p^2 - 6}{p^2}$$

$$\frac{2p^2 - 12}{p^2(p^2 - 4)} \times \frac{p^2}{(p^2 - 6)} = \frac{2(p^2 - 6)}{(p^2 - 4)(p^2 - 6)} = \frac{2}{p^2 - 4}, p \neq \pm 2, \pm \sqrt{6}, \dots$$

7. Simplify. State the nonpermissible values.

a) $\frac{a - 1}{a + 4} + \frac{a^2 + 6a + 5}{a^2 - 1} \times \frac{a^2 + 3a - 4}{a^2 - 2a + 1}$

$$\frac{(a - 1)}{a + 4} \cdot \frac{(a - 1)(a + 1)}{(a + 5)(a + 1)} \cdot \frac{(a + 4)(a - 1)}{(a - 1)(a - 1)}$$

$$\frac{a - 1}{a + 5}, a \neq -5, -4, \pm 1$$

b) $\frac{a - 1}{a + 4} + \left(\frac{a^2 + 6a + 5}{a^2 - 1} \times \frac{a^2 + 3a - 4}{a^2 - 2a + 1}\right)$

$$\frac{a - 1}{a + 4} \div \left[\frac{(a + 5)(a + 1)}{(a - 1)(a + 1)} \times \frac{(a + 4)(a - 1)}{(a - 1)(a - 1)}\right]$$

$$\frac{a - 1}{a + 4} \times \frac{(a - 1)(a - 1)}{(a + 5)(a + 4)}$$

$$= \frac{(a - 1)^3}{(a + 4)^2(a + 5)}, a \neq \pm 1, -4, -5$$

8. Simplify $\left(\frac{x}{x + 1} \times \frac{3}{3 - x}\right) - \left(\frac{1}{x + 1} + \frac{2}{x - 3}\right) \cdot \frac{1}{x + 1} \times \frac{x - 3}{2}$

$$2 \cdot \frac{3x}{(x + 1)(3 - x)} - \left(\frac{(x - 3)(3 - x)}{2(x + 1)}\right)$$

$$\frac{6x - (3x - x^2 - 9 + 3x)}{2(x + 1)(3 - x)} = \frac{x^2 + 9}{2(x + 1)(3 - x)}, x \neq -1, 3$$

Multiple Choice

9. Consider the division $\frac{a^2 - a - 12}{a^2 - 4a + 4} \div \frac{a^2 - 10a + 24}{a^2 - a - 2}$. The number of nonpermissible values is

$(a-4)(a-6)$
 $(a-2)(a-2)$ $(a-2)(a+1)$

- A. 2
- B. 3
- C. 4**
- D. more than 4

Numerical Response

10. When simplified, the complex fraction $\frac{10x^2 - x - 3}{2x^2 - 5x - 3} \div \frac{5x - 3}{2x^2 - 18}$ reduces to a linear expression of the form $Ax + B$. The value of $A + B$ is _____.

(Record your answer in the numerical response box from left to right.)

$\frac{10x^2 - x - 3}{2x^2 - 5x - 3} \times \frac{2x^2 - 18}{5x - 3}$
 $\frac{(5x-3)(2x+1) \cdot 2(x-3)(x+3)}{(2x+1)(x-3) \cdot 5x-3}$
 $2(x+3) = \underline{2x+6}$

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-30
 $10x^2 - x - 3$
 $10x^2 + 5x - 6x - 3$
 $5x(2x+1) - 3(2x+1)$
 $2x^2 - 5x - 3$
 $2x^2 - 6x + x - 3$
 $2x(x-3) + 1(x-3)$

Answer Key

- 1. a) $\frac{3}{20bc}, a \neq 0, b \neq 0, c \neq 0$ b) $-\frac{32y^8}{45x^3}, x \neq 0, y \neq 0$ c) $\frac{3}{5x^3y}, x \neq 0, y \neq 0$
- d) $-\frac{5m^4}{6p^3}, m \neq 0, n \neq 0, p \neq 0$
- 2. a) $\frac{3x+5}{(x+7)(x+1)}, x \neq \pm 7, -\frac{5}{3}, -1$ c) $\frac{-p-2}{p+6}, p \neq \pm 6, -1, 0$ d) $\frac{a+9}{9a(a-9)}, a \neq 9, 0$
- 3. a) $\frac{a+2}{a-3}, a \neq -6, 2, 3, 5$ b) $\frac{x+9}{x-2}, x \neq \pm 2, -4, 10$
- c) $\frac{y}{y-8}, y \neq \pm 8, 4$ d) $x(x+7), x \neq -7, 0, 2$
- 4. a) $\frac{2a+3}{3a+2}, a \neq -\frac{3}{2}, -\frac{2}{3}, -\frac{1}{4}, 3$ b) $5(x-y), x \neq \pm 2y, -y$
- 5. 4 to 1 6. a) $\frac{5a-1}{5a+1}, a \neq 0, -\frac{1}{5}$ b) $\frac{4x}{2x-1}, x \neq \pm \frac{1}{2}, 0$ c) $\frac{2}{p^2-4}, p \neq \pm 2, \pm \sqrt{6}, 0$
- 7. a) $\frac{a-1}{a+5}, a \neq -5, -4, \pm 1$ b) $\frac{(a-1)^3}{(a+4)^2(a+5)}, a \neq -5, -4, \pm 1$
- 8. $\frac{x^2+9}{2(x+1)(3-x)}, x \neq -1, 3$ 9. C 10.

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