Rational expressions — Roots to 20

Name: _____ Date: _____

Factor the top and the bottom, then cancel.

1 $\dfrac{x^2 - 18x + 72}{x^2 - 4x - 12}$

① $x^2 - 18x + 72 = (x - 6)(x - 12)$
② $x^2 - 4x - 12 = (x - 6)(x + 2)$
①/② $\dfrac{(x - 6)(x - 12)}{(x - 6)(x + 2)}$
$= \dfrac{(x - 12)}{(x + 2)}$

2 $\dfrac{x^2 - 5x + 4}{x^2 - 11x + 10}$

3 $\dfrac{x^2 - 29x + 208}{x^2 - 21x + 104}$

4 $\dfrac{x^2 - 15x + 36}{x^2 + 10x - 39}$

5 $\dfrac{x^2 + 25x + 154}{x^2 + 19x + 88}$

6 $\dfrac{x^2 + 5x - 234}{x^2 - 31x + 234}$

7 $\dfrac{x^2 + x - 2}{x^2 + 9x - 10}$

8 $\dfrac{x^2 + 2x - 323}{x^2 - 16x - 17}$

Rational × ÷ — Multiplying

Name: _____ Date: _____

Multiply and cancel. Write each answer as one fraction.

1 $\frac{(x-9)}{(x-6)} \times \frac{(x-6)}{(x+2)}$

(x − 6) cancels
(x − 9) / (x + 2)
x ≠ −2, 6

2 $\frac{(x+8)}{(x+9)} \times \frac{(x+9)}{(x+5)}$

3 $\frac{(x+9)}{(x-1)} \times \frac{(x-1)}{(x-6)}$

4 $\frac{(x-6)}{(x-8)} \times \frac{(x-8)}{(x+9)}$

5 $\frac{(x+7)}{(x+4)} \times \frac{(x+4)}{(x+3)}$

6 $\frac{(x+7)}{(x+1)} \times \frac{(x+1)}{(x-8)}$

7 $\frac{(x-7)}{(x+9)} \times \frac{(x+9)}{(x+1)}$

8 $\frac{(x-3)}{(x-1)} \times \frac{(x-1)}{(x+5)}$

Rational × ÷ — Dividing

Name: _____ Date: _____

Divide and cancel. Write each answer as one fraction.

1 $\frac{(x+8)}{(x-6)} \div \frac{(x-8)}{(x-6)}$

$(x + 8)/(x - 6) \times (x - 6)/(x - 8)$
$(x - 6)$ cancels
$(x + 8) / (x - 8)$
$x \neq 6, 8$

2 $\frac{(x+8)}{x} \div \frac{(x-7)}{x}$

3 $\frac{(x+3)}{(x-8)} \div \frac{(x+6)}{(x-8)}$

4 $\frac{(x-6)}{(x+4)} \div \frac{(x+9)}{(x+4)}$

5 $\frac{(x+2)}{(x-3)} \div \frac{(x-2)}{(x-3)}$

6 $\frac{(x-8)}{(x+4)} \div \frac{x}{(x+4)}$

7 $\frac{(x+8)}{(x-9)} \div \frac{(x+4)}{(x-9)}$

8 $\frac{(x-6)}{(x+8)} \div \frac{(x+2)}{(x+8)}$

Rational equations — One fraction

Name: _____ Date: _____

Solve each equation for x.

1. $\frac{21}{(x-1)} = 7$, x = 4

   $x \neq 1$
   $21 = 7(x - 1)$
   $x = 4$
   $x = 4$ and $x \neq 1$

2. $\frac{-60}{(x-3)} = 6$, x = _____

3. $\frac{-18}{(x-2)} = 9$, x = _____

4. $\frac{-49}{(x-3)} = 7$, x = _____

5. $\frac{-16}{(x+7)} = 8$, x = _____

6. $\frac{32}{(x+1)} = 8$, x = _____

7. $\frac{8}{(x+5)} = 8$, x = _____

8. $\frac{-63}{(x-9)} = 9$, x = _____

Rational equations — A fraction on each side

Name: _____ Date: _____

Cross-multiply and solve each equation for x.

1 $\frac{3}{(x-3)} = \frac{-18}{(x+4)}$, x = 2

$x \neq -4, 3$
$3(x+4) = -18(x-3)$
$x = 2$
$x = 2$ and $x \neq -4, 3$

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

3 $\frac{13}{(x-7)} = \frac{10}{(x-4)}$, x = _____

4 $\frac{6}{(x-5)} = \frac{-8}{(x+2)}$, x = _____

5 $\frac{20}{(x+2)} = \frac{44}{(x+8)}$, x = _____

6 $\frac{5}{(x-9)} = \frac{-30}{(x-2)}$, x = _____

7 $\frac{6}{(x+8)} = \frac{-60}{(x-3)}$, x = _____

8 $\frac{7}{(x+6)} = \frac{-14}{(x-3)}$, x = _____

Power Pack · Rational expressions — Answer key

Rational expressions

1. $(x^2 - 18x + 72) / (x^2 - 4x - 12) = (x - 12) / (x + 2)$
2. $(x^2 - 5x + 4) / (x^2 - 11x + 10) = (x - 4) / (x - 10)$
3. $(x^2 - 29x + 208) / (x^2 - 21x + 104) = (x - 16) / (x - 8)$
4. $(x^2 - 15x + 36) / (x^2 + 10x - 39) = (x - 12) / (x + 13)$
5. $(x^2 + 25x + 154) / (x^2 + 19x + 88) = (x + 14) / (x + 8)$
6. $(x^2 + 5x - 234) / (x^2 - 31x + 234) = (x + 18) / (x - 18)$
7. $(x^2 + x - 2) / (x^2 + 9x - 10) = (x + 2) / (x + 10)$
8. $(x^2 + 2x - 323) / (x^2 - 16x - 17) = (x + 19) / (x + 1)$

Multiplying

1. $(x - 9)/(x - 6) \times (x - 6)/(x + 2) = (x - 9) / (x + 2)$ $(x \neq -2, 6)$
2. $(x + 8)/(x + 9) \times (x + 9)/(x + 5) = (x + 8) / (x + 5)$ $(x \neq -9, -5)$
3. $(x + 9)/(x - 1) \times (x - 1)/(x - 6) = (x + 9) / (x - 6)$ $(x \neq 1, 6)$
4. $(x - 6)/(x - 8) \times (x - 8)/(x + 9) = (x - 6) / (x + 9)$ $(x \neq -9, 8)$
5. $(x + 7)/(x + 4) \times (x + 4)/(x + 3) = (x + 7) / (x + 3)$ $(x \neq -4, -3)$
6. $(x + 7)/(x + 1) \times (x + 1)/(x - 8) = (x + 7) / (x - 8)$ $(x \neq -1, 8)$
7. $(x - 7)/(x + 9) \times (x + 9)/(x + 1) = (x - 7) / (x + 1)$ $(x \neq -9, -1)$
8. $(x - 3)/(x - 1) \times (x - 1)/(x + 5) = (x - 3) / (x + 5)$ $(x \neq -5, 1)$

Dividing

1. $(x + 8)/(x - 6) \div (x - 8)/(x - 6) = (x + 8) / (x - 8)$ $(x \neq 6, 8)$
2. $(x + 8)/x \div (x - 7)/x = (x + 8) / (x - 7)$ $(x \neq 0, 7)$
3. $(x + 3)/(x - 8) \div (x + 6)/(x - 8) = (x + 3) / (x + 6)$ $(x \neq -6, 8)$
4. $(x - 6)/(x + 4) \div (x + 9)/(x + 4) = (x - 6) / (x + 9)$ $(x \neq -9, -4)$
5. $(x + 2)/(x - 3) \div (x - 2)/(x - 3) = (x + 2) / (x - 2)$ $(x \neq 2, 3)$
6. $(x - 8)/(x + 4) \div x/(x + 4) = (x - 8) / x$ $(x \neq -4, 0)$
7. $(x + 8)/(x - 9) \div (x + 4)/(x - 9) = (x + 8) / (x + 4)$ $(x \neq -4, 9)$
8. $(x - 6)/(x + 8) \div (x + 2)/(x + 8) = (x - 6) / (x + 2)$ $(x \neq -8, -2)$

Solving: one fraction

1. $21/(x - 1) = 7 \rightarrow x = 4$ $(x \neq 1)$
2. $-60/(x - 3) = 6 \rightarrow x = -7$ $(x \neq 3)$
3. $-18/(x - 2) = 9 \rightarrow x = 0$ $(x \neq 2)$
4. $-49/(x - 3) = 7 \rightarrow x = -4$ $(x \neq 3)$
5. $-16/(x + 7) = 8 \rightarrow x = -9$ $(x \neq -7)$
6. $32/(x + 1) = 8 \rightarrow x = 3$ $(x \neq -1)$
7. $8/(x + 5) = 8 \rightarrow x = -4$ $(x \neq -5)$
8. $-63/(x - 9) = 9 \rightarrow x = 2$ $(x \neq 9)$

Solving: cross-multiply

1. $3/(x - 3) = -18/(x + 4) \rightarrow x = 2$ $(x \neq -4, 3)$
2. $2/(x - 2) = -7/(x + 7) \rightarrow x = 0$ $(x \neq -7, 2)$
3. $13/(x - 7) = 10/(x - 4) \rightarrow x = -6$ $(x \neq 4, 7)$
4. $6/(x - 5) = -8/(x + 2) \rightarrow x = 2$ $(x \neq -2, 5)$

Power Pack · Rational expressions — Answer key

Solving: cross-multiply

5. $\frac{20}{x+2} = \frac{44}{x+8}$ → $x = 3$ ($x \neq -8, -2$)

6. $\frac{5}{x-9} = \frac{-30}{x-2}$ → $x = 8$ ($x \neq 2, 9$)

7. $\frac{6}{x+8} = \frac{-60}{x-3}$ → $x = -7$ ($x \neq -8, 3$)

8. $\frac{7}{x+6} = \frac{-14}{x-3}$ → $x = -3$ ($x \neq -6, 3$)