

## Fractional Equations

Solve the following fractional equations and list the solutions as well as the extraneous solutions

1.  $\frac{x}{3} + \frac{x+1}{2} = x$  LCD: 6

$$2x + 3(x+1) = 6x$$

$$2x + 3x + 3 = 6x$$

$$5x + 3 = 6x$$

$$-5x \quad -5x$$

$$3 = x$$

3.  $2 + \frac{4}{x-4} = \frac{x}{x-4}$  LCD:  $x-4$

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

$$2x - 8 + 4 = x$$

$$2x - 4 = x$$

$$-x \quad -x$$

$$x - 4 = 0$$

$$x = 4$$

No Solution  
4 is an extraneous solution

5.  $\frac{5}{x} + \frac{x+13}{8} = \frac{6x}{8}$

FI: 6  
FD: x  
LCD: 6x

$$30 = x(x+13)$$

$$30 = x^2 + 13x - 30$$

$$0 = x^2 + 13x - 30$$

$$(x+15)(x-2)$$

$$x = -15 \quad x = 2$$

2.  $\frac{1}{2} + \frac{2x}{3} = \frac{15x-3}{2x}$  LCD: 21

$$3 + 14x = 15x - 3$$

$$-14x \quad -14x$$

$$3 = x - 3$$

$$+3 \quad +3$$

$$6 = x$$

4.  $\frac{4x}{x-3} = 2 + \frac{12}{x-3}$  LCD:  $x-3$

$$4x = 2(x-3) + 12$$

$$4x = 2x - 6 + 12$$

$$4x = 2x + 6$$

$$-2x \quad -2x$$

$$2x = 6$$

$$x = 3$$

No Solution  
3 is an extraneous solution

6.  $\frac{1}{m+10} + \frac{1}{5} = \frac{3}{m+10}$

FI: 5  
FD: m+10  
LCD: 5(m+10)

$$5 + (m+10) = 15$$

$$5 + m + 10 = 15$$

$$m + 15 = 15$$

$$-15 \quad -15$$

$$m = 0$$

7.  $\frac{x}{x-1} = \frac{2}{x} + \frac{1}{x-1}$   
 FI:  $x$   
 F2:  $x-1$   
 LCD:  $x(x-1)$

$x^2 = 2(x-1) + x$   
 $x^2 = 2x - 2 + x$

$x^2 = 3x - 2$   
 $-3x + 2$   
 $x^2 - 3x + 2 = 0$   
 1 is an extraneous solution

$(x-2)(x-1) = 0$   
 $x=2$  or  $x=1$   
 LCD between 2 and 6 is 6  
 FI: 6  
 F2:  $x+3$

$-18 + 3(x+3) = x(x+3) - 3(x+3)$   
 $-18 + 3x + 9 = x^2 + 3x - 3x - 9$   
 $3x - 9 = x^2 - 9$   
 $-3x + 9$   
 $0 = x^2 - 3x$   
 $0 = x(x-3)$   
 $x=0$  or  $x=3$

11.  $\frac{3x+25}{x+7} - 5 = \frac{3}{x}$   
 FI:  $x$   
 F2:  $x+7$   
 LCD:  $x(x+7)$

$x(3x+25) - 5x(x+7) = 3(x+7)$   
 $3x^2 + 25x - 5x^2 - 35x = 3x + 21$   
 $-2x^2 - 10x = 3x + 21$   
 $+2x^2 + 10x$   
 $-2x^2 - 10x = 3x + 21$   
 $+2x^2 + 10x$   
 $-2x^2 - 10x = 3x + 21$   
 $+2x^2 + 10x$

$0 = 2x^2 + 13x + 21$  PT  
 $x^2 + 13x + 42$   
 $(x+7)(x+6)$   
 $0 = (2x+7)(x+3)$   
 $2x+7=0$  or  $x+3=0$   
 $x = -\frac{7}{2}$  or  $x = -3$

8.  $\frac{2}{x} - \frac{3x}{x+3} = \frac{x}{x+3}$   
 FI:  $x$   
 F2:  $x+3$

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

$0 = 4x^2 - 2x - 6$   
 $0 = 2x^2 - x - 3$  PT  
 $x^2 - x + 2$   
 $(x-4)(x+3)$

10.  $\frac{x+2}{x-2} = \frac{-3}{x}$   
 FI:  $x$   
 F2:  $x-2$   
 LCD:  $x(x-2)$

$x(x+2) = -3(x-2)$   
 $x^2 + 2x = -3x + 6$   
 $+3x - 6$   
 $x^2 + 5x - 6 = 0$   
 $(x+6)(x-1) = 0$   
 $x = -6$  or  $x = 1$

12.  $\frac{3p}{p-5} - \frac{2}{p+3} = \frac{p}{p+3}$   
 FI:  $p-5$   
 F2:  $p+3$

$3p(p+3) - 2(p-5) = p(p-5)$   
 $3p^2 + 9p - 2p + 10 = p^2 - 5p$   
 $3p^2 + 7p + 10 = p^2 - 5p$   
 $-p^2 + 5p$       $-p^2 + 5p$

$\frac{2p^2 + 12p + 10}{2} = \frac{0}{2}$   
 $p^2 + 6p + 5 = 0$   
 $(p+5)(p+1) = 0$   
 $p = -5$  or  $p = -1$

$(x-2)(2x+3) = 0$   
 $x=2$  or  $2x+3=0$   
 $-3 - 3$   
 $2x = -3$   
 $x = -\frac{3}{2}$