

**A.REI.A.2: Solving Rationals 1**

- 1 The focal length,  $F$ , of a camera’s lens is related to the distance of the object from the lens,  $J$ , and the distance to the image area in the camera,  $W$ , by the formula below.

$$\frac{1}{J} + \frac{1}{W} = \frac{1}{F}$$

When this equation is solved for  $J$  in terms of  $F$  and  $W$ ,  $J$  equals

- 1)  $F - W$   
 2)  $\frac{FW}{F - W}$   
 3)  $\frac{FW}{W - F}$   
 4)  $\frac{1}{F} - \frac{1}{W}$

- 2 What is the solution set of the equation  $\frac{2}{x} - \frac{3x}{x+3} = \frac{x}{x+3}$ ?

- 1)  $\{3\}$   
 2)  $\left\{\frac{3}{2}\right\}$   
 3)  $\{-2, 3\}$   
 4)  $\left\{-1, \frac{3}{2}\right\}$

- 3 What is the solution set of the equation  $\frac{2}{3x+1} = \frac{1}{x} - \frac{6x}{3x+1}$ ?

- 1)  $\left\{-\frac{1}{3}, \frac{1}{2}\right\}$   
 2)  $\left\{-\frac{1}{3}\right\}$   
 3)  $\left\{\frac{1}{2}\right\}$   
 4)  $\left\{\frac{1}{3}, -2\right\}$

- 4 What is the solution set of the equation  $\frac{3x+25}{x+7} - 5 = \frac{3}{x}$ ?

- 1)  $\left\{\frac{3}{2}, 7\right\}$   
 2)  $\left\{\frac{7}{2}, -3\right\}$   
 3)  $\left\{-\frac{3}{2}, 7\right\}$   
 4)  $\left\{-\frac{7}{2}, -3\right\}$

- 5 What is the solution set of the equation  $\frac{x+2}{x} + \frac{x}{3} = \frac{2x^2+6}{3x}$ ?

- 1)  $\{-3\}$   
 2)  $\{-3, 0\}$   
 3)  $\{3\}$   
 4)  $\{0, 3\}$

- 6 What is the solution set of the equation  $\frac{10}{x^2-2x} + \frac{4}{x} = \frac{5}{x-2}$ ?

- 1)  $\{0, 2\}$   
 2)  $\{0\}$   
 3)  $\{2\}$   
 4)  $\{\}$

- 7 The solution set of  $\frac{x+3}{x-5} + \frac{6}{x+2} = \frac{6+10x}{(x-5)(x+2)}$  is
- 1)  $\{-6\}$   
2)  $\{5\}$   
3)  $\{-6, 5\}$   
4)  $\{-5, 6\}$
- 8 The solution of  $\frac{x}{x+3} + \frac{2}{x-4} = \frac{2x+27}{x^2-x-12}$  is
- 1)  $-3$   
2)  $-7$   
3)  $3$   
4)  $7$
- 9 What is the solution, if any, of the equation  $\frac{2}{x+3} - \frac{3}{4-x} = \frac{2x-2}{x^2-x-12}$ ?
- 1)  $-1$   
2)  $-5$   
3) all real numbers  
4) no real solution
- 10 What is the solution set of the equation  $\frac{4}{k^2-8k+12} = \frac{k}{k-2} + \frac{1}{k-6}$ ?
- 1)  $\{-1, 6\}$   
2)  $\{1, -6\}$   
3)  $\{-1\}$   
4)  $\{1\}$
- 11 To solve the equation  $\frac{7}{x+7} + \frac{4x}{x-7} = \frac{3x+7}{x-7}$ , Joan's first step is to multiply both sides by the least common denominator. Which statement is true?
- 1)  $-14$  is an extraneous solution.  
2)  $7$  and  $-7$  are extraneous solutions.  
3)  $7$  is an extraneous solution.  
4) There are no extraneous solutions.
- 12 To solve  $\frac{2x}{x-2} - \frac{11}{x} = \frac{8}{x^2-2x}$ , Ren multiplied both sides by the least common denominator. Which statement is true?
- 1)  $2$  is an extraneous solution.  
2)  $\frac{7}{2}$  is an extraneous solution.  
3)  $0$  and  $2$  are extraneous solutions.  
4) This equation does not contain any extraneous solutions.
- 13 The solutions to  $x+3 - \frac{4}{x-1} = 5$  are
- 1)  $\frac{3}{2} \pm \frac{\sqrt{17}}{2}$   
2)  $\frac{3}{2} \pm \frac{\sqrt{17}}{2}i$   
3)  $\frac{3}{2} \pm \frac{\sqrt{33}}{2}$   
4)  $\frac{3}{2} \pm \frac{\sqrt{33}}{2}i$
- 14 Solve for  $x$ :  $\frac{1}{x} - \frac{1}{3} = -\frac{1}{3x}$
- 15 Solve algebraically for  $x$ :  $\frac{1}{2x} - \frac{5}{6} = \frac{3}{x}$

16 Solve algebraically for  $n$ :  $\frac{2}{n^2} + \frac{3}{n} = \frac{4}{n^2}$

17 Solve for all values of  $p$ :  $\frac{3p}{p-5} - \frac{2}{p+3} = \frac{p}{p+3}$

18 Solve algebraically for all values of  $x$ :  $\frac{8}{x+5} - \frac{3}{x} = 5$

19 Algebraically solve for  $x$ :  $\frac{7}{2x} - \frac{2}{x+1} = \frac{1}{4}$

20 Algebraically solve for  $x$ :  $\frac{-3}{x+3} + \frac{1}{2} = \frac{x}{6} - \frac{1}{2}$

21 Solve for  $x$  algebraically:  $\frac{1}{x-6} + \frac{x}{x-2} = \frac{4}{x^2 - 8x + 12}$

22 Markus is a long-distance walker. In one race, he walked 55 miles in  $t$  hours and in another race walked 65 miles in  $t + 3$  hours. His rates are shown in the equations below.

$$r = \frac{55}{t} \quad r = \frac{65}{t+3}$$

Markus walked at an equivalent rate,  $r$ , for each race. Determine the number of hours that each of the two races took.

23 A formula for work problems involving two people is shown below.

$$\frac{1}{t_1} + \frac{1}{t_2} = \frac{1}{t_b}$$

$t_1$  = the time taken by the first person to complete the job

$t_2$  = the time taken by the second person to complete the job

$t_b$  = the time it takes for them working together to complete the job

Fred and Barney are carpenters who build the same model desk. It takes Fred eight hours to build the desk while it only takes Barney six hours. Write an equation that can be used to find the time it would take both carpenters working together to build a desk. Determine, to the *nearest tenth of an hour*, how long it would take Fred and Barney working together to build a desk.

## A.REI.A.2: Solving Rationals 1

### Answer Section

1 ANS: 3

$$\frac{1}{J} = \frac{1}{F} - \frac{1}{W}$$

$$\frac{1}{J} = \frac{W-F}{FW}$$

$$J = \frac{FW}{W-F}$$

REF: 081617aai

2 ANS: 4

$$\frac{2}{x} = \frac{4x}{x+3}$$

$$2x+6 = 4x^2$$

$$4x^2 - 2x - 6 = 0$$

$$2(2x^2 - x - 3) = 0$$

$$(2x-3)(x+1) = 0$$

$$x = \frac{3}{2}, -1$$

REF: 061809aai

3 ANS: 3

$$\frac{2}{3x+1} = \frac{1}{x} - \frac{6x}{3x+1} - \frac{1}{3} \text{ is extraneous.}$$

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

$$6x^2 + 2x = 3x + 1$$

$$6x^2 - x - 1 = 0$$

$$(2x-1)(3x+1) = 0$$

$$x = \frac{1}{2}, -\frac{1}{3}$$

REF: 011915aai

4 ANS: 4

$$x(x+7) \left[ \frac{3x+25}{x+7} - 5 = \frac{3}{x} \right]$$

$$x(3x+25) - 5x(x+7) = 3(x+7)$$

$$3x^2 + 25x - 5x^2 - 35x = 3x + 21$$

$$2x^2 + 13x + 21 = 0$$

$$(2x+7)(x+3) = 0$$

$$x = -\frac{7}{2}, -3$$

REF: fall1501aii

5 ANS: 3

$$\frac{x+2}{x} + \frac{x}{3} = \frac{2x^2+6}{3x} \quad 0 \text{ is extraneous.}$$

$$\frac{x^2+3x+6}{3x} = \frac{2x^2+6}{3x}$$

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

$$x^2-3x = 0$$

$$x(x-3) = 0$$

$$x = 0, 3$$

REF: 012309aii

6 ANS: 4

$$x(x-2) \left( \frac{10}{x^2-2x} + \frac{4}{x} = \frac{5}{x-2} \right) \quad 2 \text{ is extraneous.}$$

$$10 + 4(x-2) = 5x$$

$$10 + 4x - 8 = 5x$$

$$2 = x$$

REF: 081915aii

7 ANS: 1

$$\frac{(x+3)(x+2)}{(x-5)(x+2)} + \frac{6(x-5)}{(x+2)(x-5)} = \frac{6+10x}{(x-5)(x+2)} \quad 5 \text{ is extraneous.}$$

$$x^2 + 5x + 6 + 6x - 30 = 10x + 6$$

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

$$(x+6)(x-5) = 0$$

$$x = -6, 5$$

REF: 062319aai

8 ANS: 4

$$\frac{x(x-4)}{(x+3)(x-4)} + \frac{2(x+3)}{(x-4)(x+3)} = \frac{2x+27}{(x-4)(x+3)} \quad -3 \text{ is extraneous.}$$

$$x^2 - 4x + 2x + 6 = 2x + 27$$

$$x^2 - 2x + 6 = 2x + 27$$

$$x^2 - 4x - 21 = 0$$

$$(x-7)(x+3) = 0$$

$$x = 7, -3$$

REF: 082405aai

9 ANS: 1

$$\frac{2(x-4)}{(x+3)(x-4)} + \frac{3(x+3)}{(x-4)(x+3)} = \frac{2x-2}{x^2-x-12}$$

$$2x - 8 + 3x + 9 = 2x - 2$$

$$3x = -3$$

$$x = -1$$

REF: 011717aai

10 ANS: 3

$$\frac{4}{k^2 - 8k + 12} = \frac{k(k-6) + (k-2)}{k^2 - 8k + 12} \quad k = 6 \text{ is extraneous}$$

$$4 = k^2 - 6k + k - 2$$

$$0 = k^2 - 5k - 6$$

$$0 = (k-6)(k+1)$$

$$k = 6, -1$$

REF: 082218aai

11 ANS: 3

$$(x^2 - 49) \left( \frac{7}{x+7} + \frac{4x}{x-7} = \frac{3x+7}{x-7} \right)$$

$$7(x-7) + 4x(x+7) = (3x+7)(x+7)$$

$$7x - 49 + 4x^2 + 28x = 3x^2 + 21x + 7x + 49$$

$$4x^2 + 35x - 49 = 3x^2 + 28x + 49$$

$$x^2 + 7x - 98 = 0$$

$$(x+14)(x-7) = 0$$

$$x = -14, 7$$

REF: 012422aii

12 ANS: 1

$$\frac{2x}{x-2} \left( \frac{x}{x} \right) - \frac{11}{x} \left( \frac{x-2}{x-2} \right) = \frac{8}{x^2 - 2x}$$

$$2x^2 - 11x + 22 = 8$$

$$2x^2 - 11x + 14 = 0$$

$$(2x-7)(x-2) = 0$$

$$x = \frac{7}{2}, 2$$

REF: 061719aii

13 ANS: 1

$$x - \frac{4}{x-1} = 2 \quad x = \frac{3 \pm \sqrt{(-3)^2 - 4(1)(-2)}}{2(1)} = \frac{3 \pm \sqrt{17}}{2}$$

$$x(x-1) - 4 = 2(x-1)$$

$$x^2 - x - 4 = 2x - 2$$

$$x^2 - 3x - 2 = 0$$

REF: 011812aii

14 ANS:

$$\frac{1}{x} - \frac{1}{3} = -\frac{1}{3x}$$

$$\frac{3-x}{3x} = -\frac{1}{3x}$$

$$3-x = -1$$

$$x = 4$$

REF: 061625aii

15 ANS:

$$6x\left(\frac{1}{2x} - \frac{5}{6} = \frac{3}{x}\right)$$

$$3 - 5x = 18$$

$$-15 = 5x$$

$$-3 = x$$

REF: 012526aii

16 ANS:

$$\frac{3}{n} = \frac{2}{n^2} \quad 0 \text{ is an extraneous solution.}$$

$$3n^2 = 2n$$

$$3n^2 - 2n = 0$$

$$n(3n - 2) = 0$$

$$n = 0, \frac{2}{3}$$

REF: 062227aii

17 ANS:

$$\frac{3p}{p-5} = \frac{p+2}{p+3}$$

$$3p^2 + 9p = p^2 - 3p - 10$$

$$2p^2 + 12p + 10 = 0$$

$$p^2 + 6p + 5 = 0$$

$$(p+5)(p+1) = 0$$

$$p = -5, -1$$

REF: 081733aii



18 ANS:

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

$$8x - 3x - 15 = 5x^2 + 25x$$

$$0 = 5x^2 + 20x + 15$$

$$0 = x^2 + 4x + 3$$

$$0 = (x+3)(x+1)$$

$$x = -3, -1$$

REF: 062430aii

19 ANS:

$$\frac{7}{2x} - \frac{2}{x+1} = \frac{1}{4}$$

$$\frac{7x+7-4x}{2x^2+2x} = \frac{1}{4}$$

$$2x^2 + 2x = 12x + 28$$

$$x^2 - 5x - 14 = 0$$

$$(x-7)(x+2) = 0$$

$$x = 7, -2$$

REF: 061926aii

20 ANS:

$$-6(x+3)\left(\frac{-3}{x+3} - \frac{x}{6} + 1 = 0\right)$$

$$18 + x(x+3) - 6(x+3) = 0$$

$$18 + x^2 + 3x - 6x - 18 = 0$$

$$x^2 - 3x = 0$$

$$x(x-3) = 0$$

$$x = 0, 3$$

REF: 081829aii

21 ANS:

$$\frac{x-2}{(x-6)(x-2)} + \frac{x(x-6)}{(x-6)(x-2)} = \frac{4}{(x-6)(x-2)}. \text{ 6 is extraneous.}$$

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

$$x^2-5x-6=0$$

$$(x-6)(x+1)=0$$

$$x=6,-1$$

REF: 082334aii

22 ANS:

$$\frac{55}{t} = \frac{65}{t+3}$$

$$65t = 55t + 165$$

$$10t = 165$$

$$t = 16.5$$

$$t+3 = 19.5$$

REF: 082431aii

23 ANS:

$$\frac{1}{8} + \frac{1}{6} = \frac{1}{t_b}; \quad \frac{24t_b}{8} + \frac{24t_b}{6} = \frac{24t_b}{t_b}$$

$$3t_b + 4t_b = 24$$

$$t_b = \frac{24}{7} \approx 3.4$$

REF: 011827aii