# Just In Time Quick Check
## Standard of Learning (SOL) AII.3c

| **Strand:** Equations and Inequalities |
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### Standard of Learning (SOL) AII.3c
*The student will solve equations containing rational algebraic expressions.*

### Grade Level Skills:
- Solve rational equations with real solutions containing factorable algebraic expressions algebraically and graphically. Algebraic expressions should be limited to linear and quadratic expressions.
- Solve equations and verify algebraic solutions using a graphing utility.

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## Just in Time Quick Check Teacher Notes

### Supporting Resources:
- VDOE Mathematics Instructional Plans (MIPS)
  - AII.3a – Rational Equations (Word)/PDF Version
- VDOE Word Wall Cards: Algebra II (Word) | (PDF)
  - Parent Functions (Rational)
  - Discontinuity (e.g., asymptotes)
  - Discontinuity (e.g., removable or point)
  - Inverse Variation
- Desmos Activity
  - Solving Rational Equations

Supporting and Prerequisite SOL: AII.1a, AII.1c, AII.6a, AII.6b, A.2a, A.2b, A.2c, A.4a, A.4b, 8.17

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# SOL AII.3c - Just in Time Quick Check

1. Student A was asked to solve the equation $\frac{-x+4}{2-x} + 4x = \frac{2x+1}{2x+3}$. Their work is shown below.

$$\frac{-x+4}{2-x} + 4x = \frac{2x+1}{2x+3}$$

$$\frac{4}{2} + 4x = \frac{1}{3}$$

$$2 + 4x = \frac{1}{3}$$

$$4x = \frac{1}{3} - 2$$

$$4x = -\frac{5}{3}$$

$$x = -\frac{5}{12}$$

Describe and correct the errors made.

2. Solve the equation $\frac{2x}{3x^2} + \frac{7x}{4} = 5$. Show your work/thinking.

3. Find the solution for the following equation $\frac{x-3}{x^2-5x+6} + \frac{x-3}{2x-6} = 1$. Show your work/thinking.

4. Find the solution for the equation: $\frac{6}{x-1} = \frac{4}{x-2} + \frac{2}{x+1}$. Show your work/thinking.

# SOL AII.3c - Just in Time Quick Check Teachers Notes
## Common Errors/Misconceptions and their Possible Indications

1. Student A was asked to solve the equation $\frac{-x+4}{2-x} + 4x = \frac{2x+1}{2x+3}$. Their work is shown below.

$$\frac{-x+4}{2-x} + 4x = \frac{2x+1}{2x+3}$$

$$\frac{4}{2} + 4x = \frac{1}{3}$$

$$2 + 4x = \frac{1}{3}$$

$$4x = \frac{1}{3} - 2$$

$$4x = -\frac{5}{3}$$

$$x = -\frac{5}{12}$$

Describe and correct the errors made.

*A common error some students may make is to cancel terms rather than common factors. This may indicate that a student does not understand that terms may only be canceled when written as a monomial expression and binomial expressions may not be canceled unless it is a common factor. Teachers may have students solve simpler rational problems involving monomial expressions and binomial expressions to ensure they understand when and how to properly cancel factors. For example, provide students with problems similar to $\frac{6x^2y}{3x(x+2)}$, $\frac{2x+4}{(x+2)}$, $\frac{x-3}{x^2-9}$, and $\frac{x}{x^2+2x}$ to ensure that students understand when monomial and binomial factors can be canceled.*

2. Solve the equation $\frac{2x}{3x^2} + \frac{7x}{4} = 5$. Show your work/thinking.

*A common error some students may make is to combine the denominators of two fractions without first finding a common denominator writing $\frac{9x}{3x^2+4} = 5$. This may indicate that some students do not understand that the fractions must be rewritten as equivalent fractions using common denominators before combining and writing as one fraction. Students may also not understand how to find the least common multiple of different denominators. Teachers may want to provide additional practice combining rational numbers that do not have common denominators, for example, $\frac{1}{4x} + \frac{9}{x-1}$. Students may benefit from using the Solving Rational Equations Desmos activity in the supporting resources with practice on the least common denominator and verifying solutions by graphing.*

3.  Find the solution for the following equation: $\frac{x-3}{x^2-5x+6} + \frac{x-3}{2x-6} = 1$.  Show your work/thinking.

*A common error some students may make is to simplify the rational expression and think the LCD is x-2.  Other students may simplify correctly and identify the LCD, but not multiply both sides of the equation by the LCD, therefore setting the equation equal to 1.  This may indicate that some students do not know how to correctly identify and/or multiply by the LCD.  Teachers may wish to use algebra tiles to model how 2 and x-2 are different values and both must be included as part of the LCD. Some students may also benefit from the visual of using an equation mat to indicate how the equation is unbalanced if they do not multiply both sides by the LCD.  Teachers may wish to have students create a graphic organizer including questions like:  What factors do we need in every denominator?  What do we need to multiply by the first denominator to get the common factors?  What do we need to multiply by the second denominator to get the common factors?  Teachers could also encourage students to use Desmos to graph their simplified expressions and the given expression to determine if they are equivalent.*

4.  Find the solution for the equation: $\frac{6}{x-1} = \frac{4}{x-2} + \frac{2}{x+1}$.  Show your work/thinking.

*A common error students may make is to fail to check extraneous solutions. This type of error may indicate that some students assume that all answers found are actual solutions to a problem. Teachers may want to use Desmos to show students where asymptotes exist and how to graphically identify extraneous solutions.  Students may benefit from exploring how the restricted domain values might impact extraneous solutions, $x \neq -1, x \neq 1,\ x \neq 2$. It may beneficial for students to create a graphic organizer to include checking solutions as a final step.*