

## Lesson 12-6: Solving Rational Equations

### Part 1: Solving Rational Equations

1. 010825a, P.I. A.A.26

If  $\frac{5}{n} - \frac{1}{2} = \frac{3}{6n}$ , what is the value of  $n$ ?

[A] 2      [B] -2      [C]  $\frac{2}{7}$       [D] 9

2. 060429b, P.I. A2.A.23

Solve for  $x$  and express your answer in

simplest radical form:  $\frac{4}{x} - \frac{3}{x+1} = 7$

3. 080529b, P.I. A2.A.23

Solve for all values of  $x$ :  $\frac{9}{x} + \frac{9}{x-2} = 12$

4. 060212b, P.I. A2.A.23

What is the solution set of the equation

$$\frac{x}{x-4} - \frac{1}{x+3} = \frac{28}{x^2 - x - 12}?$$

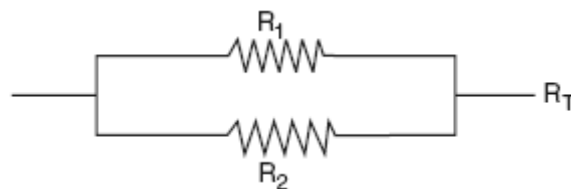
[A] {4,-6}      [B] { }      [C] {-6}      [D] {4}

5. 080125b, P.I. A2.A.23

Working by herself, Mary requires 16 minutes more than Antoine to solve a mathematics problem. Working together, Mary and Antoine can solve the problem in 6 minutes. If this situation is represented by the equation  $\frac{6}{t} + \frac{6}{t+16} = 1$ , where  $t$  represents the number of minutes Antoine works alone to solve the problem, how many minutes will it take Antoine to solve the problem if he works by himself?

6. 080234b, P.I. A2.A.23

Electrical circuits can be connected in series, one after another, or in parallel circuits that branch off a main line. If circuits are hooked up in parallel, the reciprocal of the total resistance in the series is found by adding the reciprocals of each resistance, as shown in the accompanying diagram.



$$\frac{1}{R_1} + \frac{1}{R_2} = \frac{1}{R_T}$$

If  $R_1 = x$ ,  $R_2 = x + 3$ , and the total resistance,  $R_T$ , is 2.25 ohms, find the positive value of  $R_1$  to the nearest tenth of an ohm.

Part 2: Solving Proportions

7. 060612a, P.I. A.A.26

What is the value of  $x$  in the equation

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

[A]  $-\frac{1}{5}$     [B]  $-\frac{5}{4}$     [C]  $-\frac{4}{5}$     [D]  $-5$

8. 080439a, P.I. A.A.26

Solve for all values of  $x$  that satisfy the

equation  $\frac{x}{x+3} = \frac{5}{x+7}$ .

9. 010131a, P.I. A.A.26

Solve algebraically for  $x$ :  $\frac{1}{x} = \frac{x+1}{6}$

10. 080722b, P.I. A.A.26

Solve for all values of  $x$ :  $\frac{2}{x+1} = x$

11. 010224b, P.I. A2.A.23

A rectangle is said to have a golden ratio

when  $\frac{w}{h} = \frac{h}{w-h}$ , where  $w$  represents width

and  $h$  represents height. When  $w = 3$ ,  
between which two consecutive integers will  
 $h$  lie?

12. fall0739ia, P.I. A.A.26

Solve for  $x$ :  $\frac{x+1}{x} = \frac{-7}{x-12}$

[1] D

[4]  $\frac{-3 \pm \sqrt{37}}{7}$  or an equivalent answer, and

appropriate work is shown.

[3] A correct quadratic equation is written and appropriate work is shown, but one computational or simplification error is made.

or [3] An incorrect quadratic equation of equal difficulty is solved appropriately.

[2] A correct quadratic equation is written and appropriate work is shown, but two or more computational or simplification errors are made.

or [2] Appropriate work is shown, but one conceptual error is made.

or [2] A correct quadratic equation is written in standard form, but no further correct work is shown.

[1] An incorrect equation of a lesser degree of difficulty is solved appropriately.

or [1]  $\frac{-3 \pm \sqrt{37}}{7}$  or an equivalent answer, but

no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[2] incorrect procedure.

[4] 3 and  $\frac{1}{2}$ , and appropriate work is shown.

[3] Appropriate work is shown, but one computational error is made.

or [3] Appropriate work is shown, but only one of the values is found.

[2] Appropriate work is shown, but two or more computational errors are made.

or [2] Appropriate work is shown, but one conceptual error is made.

or [2] The correct quadratic equation is written in standard form, but no further correct work is shown.

or [2] An incorrect quadratic equation of equal difficulty is solved appropriately.

[1] Appropriate work is shown, but one conceptual error and one computational error are made.

or [1] An incorrect equation of a lesser degree of difficulty is solved appropriately.

or [1] 3 and  $\frac{1}{2}$  but no work is shown.

[0] 3 or  $\frac{1}{2}$ , but no work is shown.

or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an

[3] obviously incorrect procedure.

[4] C

[2] 8 or an equivalent answer, and appropriate work is shown.

[1] The denominators are cleared correctly, such as  $6(t+16) + 6t = t(t+16)$ , but the factoring is incorrect, or one error is made using the quadratic formula.

or [1] The denominators are not cleared correctly, but an equation of equal difficulty is solved.

or [1] 8 or an equivalent answer, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[5] incorrect procedure.

- [6] 3.5, and appropriate work is shown.  
[5] Appropriate work is shown, but one computational or rounding error is made.  
[4] A substitution error is made, resulting in an incorrect quadratic equation of equal difficulty, but the incorrect equation is solved appropriately.  
[3] A correct substitution is made, resulting in the correct quadratic equation in standard form, but the equation is not solved.  
[2] A substitution error is made, resulting in an incorrect equation of equal difficulty, and one computational or rounding error is made.  
[1] 3.5, but no work is shown.  
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
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- [7] C

- [4] 3 and  $-5$ , and appropriate work is shown, such as  $x(x + 7) = 5(x + 3)$  or trial and error with at least three trials and appropriate checks for each solution.  
[3] Appropriate work is shown, but one computational or factoring error is made.  
or [3] Appropriate work is shown, but only one correct solution is found.  
or [3] The trial-and-error method is used to find both correct solutions, but only two trials and appropriate checks are shown for each solution.  
[2] Appropriate work is shown, but two or more computational or factoring errors are made.  
or [2] A correct quadratic equation is written and factored, but no further correct work is shown.  
or [2] The trial-and-error method is attempted and at least six systematic trials and appropriate checks are shown, but neither solution is found.  
[1] A correct quadratic equation is written, but no further correct work is shown.  
or [1] 3 and  $-5$ , but no work or only one trial with an appropriate check is shown.  
[0] 3 or  $-5$ , but no work or only one trial with an appropriate check is shown.  
or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
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[4] 2 and -3, and a correct quadratic equation is shown, such as  $x(x + 1) = 6$ , and solved algebraically.

[3] The student shows a correct quadratic equation but makes one algebraic error and carries it to solution or no solution for the equation generated.

or [3] Correct work is shown, but only one root is found as the answer.

[2] A correct quadratic equation is used, but two or more errors are made.

or [2] An incorrect quadratic equation of equal difficulty is shown and solved appropriately.

[1] The student cross multiplies but produces only a linear equation that is solved appropriately.

or [1] 2 and -3, but no algebraic work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[9] incorrect procedure.

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[2] 1 and -2, and appropriate work is shown.

[1] Appropriate work is shown, but one computational error is made.

or [1] Appropriate work is shown, but one conceptual error is made.

or [1] Appropriate work is shown, but only one value is found.

or [1] 1 and -2, but no work is shown.

[0] 1 or -2, but no work is shown.

or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an

[10] obviously incorrect procedure.

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[2] 1 and 2,  $1 < h < 2$ , or  $1 < 1.854 < 2$ , and appropriate work is shown.

[1]  $\frac{3}{h} = \frac{h}{3-h}$  is shown, but one

computational error is made.

or [1] The positive root, 1.854, is obtained from the quadratic, but the two correct consecutive integers are not stated.

or [1] 1 and 2, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[11] incorrect procedure.

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[4] 6 and  $-2$ , and appropriate work is shown, such as an algebraic solution or trial and error with at least three trials and appropriate checks.

[3] Appropriate work is shown, but one computational or factoring error is made.

or [3] Appropriate work is shown, but only one solution is found.

[2] The correct quadratic equation is written in standard form.

or [2] Appropriate work is shown, but two or more computational or factoring errors are made.

or [2] Appropriate work is shown, but one conceptual error is made.

or [2] The trial-and-error method is used to find at least one solution, but only two trials and appropriate checks are shown.

or [2] The trial-and-error method is attempted and at least six systematic trials and appropriate checks are shown, but no solution is found.

or [2] An incorrect quadratic equation of equal difficulty is solved appropriately.

[1]  $x^2 - 11x - 12 = -7x$ , but no further correct work is shown.

or [1] 6 and  $-2$ , but no work or only one trial with an appropriate check is shown.

or [1] An incorrect equation of a lesser degree of difficulty is solved appropriately.

or [1] Appropriate work is shown, but one conceptual error and one computational or factoring error are made.

[0] 6 or  $-2$ , but no work is shown.

or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an

[12] obviously incorrect procedure.