

CHAPTER 8-1

INVERSE VARIATION

1. 010221b

Explain how a person can determine if a set of data represents inverse variation and give an example using a table of values.

[1] _____

2. 010503b

If R varies inversely as S , when S is doubled, R is multiplied by

[A] 2 [B] $\frac{1}{4}$ [C] 4 [D] $\frac{1}{2}$

[2] _____

3. 060508b

In a given rectangle, the length varies inversely as the width. If the length is doubled, the width will

[A] be divided by 2 [B] be multiplied by 2
[C] remain the same
[D] increase by 2

[3] _____

4. 080402b, P.I. A2.A.5

The speed of a laundry truck varies inversely with the time it takes to reach its destination. If the truck takes 3 hours to reach its destination traveling at a constant speed of 50 miles per hour, how long will it take to reach the same location when it travels at a constant speed of 60 miles per hour?

[A] $2\frac{1}{2}$ hours [B] $2\frac{2}{3}$ hours

[C] $2\frac{1}{3}$ hours [D] 2 hours

[4] _____

5. 010624b, P.I. A2.A.5

The time it takes to travel to a location varies inversely to the speed traveled. It takes 4 hours driving at an average speed of 55 miles per hour to reach a location. To the *nearest tenth of an hour*, how long will it take to reach the same location driving at an average speed of 50 miles per hour?

[5] _____

6. 060323b, P.I. A2.A.5

When air is pumped into an automobile tire, the pressure is inversely proportional to the volume. If the pressure is 35 pounds when the volume is 120 cubic inches, what is the pressure, in pounds, when the volume is 140 cubic inches?

[6] _____

7. 080523b, P.I. A2.A.5

Boyle's Law states that the pressure of compressed gas is inversely proportional to its volume. The pressure of a certain sample of a gas is 16 kilopascals when its volume is 1,800 liters. What is the pressure, in kilopascals, when its volume is 900 liters?

[7] _____

8. 060618b, P.I. A2.A.5

According to Boyle's Law, the pressure, p , of a compressed gas is inversely proportional to the volume, v . If a pressure of 20 pounds per square inch exists when the volume of the gas is 500 cubic inches, what is the pressure when the gas is compressed to 400 cubic inches?

[A] 25 lb/in² [B] 50 lb/in²

[C] 16 lb/in² [D] 40 lb/in²

[8] _____

9. 010823b, P.I. A2.A.5

The amount of money each member of a band earns playing at a graduation party varies inversely as the number of members in the band. If the band has five members, each member earns \$70. Write an equation that models the relationship between the number of members in a band, n , and the amount each member earns, d . Use the equation to calculate the amount each member earns if there are four members in the band.

[9] _____

10. 080123b, P.I. A2.A.5

The price per person to rent a limousine for a prom varies inversely as the number of passengers. If five people rent the limousine, the cost is \$70 each. How many people are renting the limousine when the cost *per couple* is \$87.50?

[10] _____

11. 080207b, P.I. A2.A.5

To balance a seesaw, the distance, in feet, a person is from the fulcrum is inversely proportional to the person's weight, in pounds. Bill, who weighs 150 pounds, is sitting 4 feet away from the fulcrum. If Dan weighs 120 pounds, how far from the fulcrum should he sit to balance the seesaw?

[A] 3.5 ft [B] 3 ft [C] 4.5 ft [D] 5 ft

[11] _____

12. 010423b, P.I. A2.A.5

A pulley that has a diameter of 8 inches is belted to a pulley that has a diameter of 12 inches. The 8-inch-diameter pulley is running at 1,548 revolutions per minute. If the speeds of the pulleys vary inversely to their diameters, how many revolutions per minute does the larger pulley make?

[12] _____

CHAPTER 8-3

SOLVING NONLINEAR SYSTEMS

13. 010704b

What is the total number of points of intersection of the graphs of the equations $xy = 12$ and $y = -x^2 + 3$?

[A] 2 [B] 3 [C] 4 [D] 1

[13] _____

MATH TOOLBOX P. 375

RATIONALIZING DENOMINATORS

14. 060305b, P.I. A2.N.5

Which expression is equivalent to $\frac{4}{3+\sqrt{2}}$?

[A] $\frac{12-4\sqrt{2}}{7}$ [B] $\frac{12-4\sqrt{2}}{11}$

[C] $\frac{12+4\sqrt{2}}{7}$ [D] $\frac{12+4\sqrt{2}}{11}$

[14] _____

15. 080606b, P.I. A2.N.5

The expression $\frac{12}{3+\sqrt{3}}$ is equivalent to

[A] $4-2\sqrt{3}$ [B] $2+\sqrt{3}$

[C] $12-\sqrt{3}$ [D] $6-2\sqrt{3}$

[15] _____

16. 080716b, P.I. A2.N.5

The expression $\frac{2}{1-\sqrt{3}}$ is equivalent to

[A] $1+\sqrt{3}$ [B] $-1-\sqrt{3}$

[C] $1-\sqrt{3}$ [D] $-1+\sqrt{3}$

[16] _____

17. 010405b, P.I. A2.N.5

The expression $\frac{7}{2-\sqrt{3}}$ is equivalent to

[A] $\frac{14+\sqrt{3}}{7}$

[B] $\frac{2+\sqrt{3}}{7}$

[C] $14-7\sqrt{3}$

[D] $14+7\sqrt{3}$

[17] _____

18. 010516b, P.I. A2.N.5

The expression $\frac{7}{3-\sqrt{2}}$ is equivalent to

[A] $\frac{21+\sqrt{2}}{7}$

[B] $3+\sqrt{2}$

[C] $\frac{3+\sqrt{2}}{7}$

[D] $3-\sqrt{2}$

[18] _____

19. 080506b, P.I. A2.N.5

The expression $\frac{1}{5-\sqrt{13}}$ is equivalent to

[A] $\frac{5+\sqrt{13}}{-8}$

[B] $\frac{5+\sqrt{13}}{8}$

[C] $\frac{5+\sqrt{13}}{-12}$

[D] $\frac{5+\sqrt{13}}{12}$

[19] _____

20. 010708b, P.I. A2.N.5

The expression $\frac{4}{5-\sqrt{13}}$ is equivalent to

[A] $\frac{5-\sqrt{13}}{3}$

[B] $\frac{5+\sqrt{13}}{3}$

[C] $\frac{2(5-\sqrt{13})}{19}$

[D] $\frac{2(5+\sqrt{13})}{19}$

[20] _____

21. 080420b, P.I. A2.N.5

The expression $\frac{11}{\sqrt{3}-5}$ is equivalent to

[A] $\frac{\sqrt{3}+5}{2}$

[B] $\frac{-\sqrt{3}+5}{2}$

[C] $\frac{-\sqrt{3}-5}{2}$

[D] $\frac{\sqrt{3}-5}{2}$

[21] _____

22. 010613b, P.I. A2.N.5

The expression $\frac{5}{\sqrt{5}-1}$ is equivalent to

[A] $\frac{5}{4}$

[B] $\frac{5\sqrt{5}-5}{6}$

[C] $\frac{5\sqrt{5}-5}{4}$

[D] $\frac{5\sqrt{5}+5}{4}$

[22] _____

23. 060709b, P.I. A2.N.5

The fraction $\frac{3}{\sqrt{6}-1}$ is equivalent to

[A] $3\sqrt{6}+3$

[B] $3\sqrt{6}-3$

[C] $\frac{3\sqrt{6}-3}{5}$

[D] $\frac{3\sqrt{6}+3}{5}$

[23] _____

24. 080307b, P.I. A2.N.5

Which expression is equal to $\frac{2+\sqrt{3}}{2-\sqrt{3}}$?

[A] $7+4\sqrt{3}$

[B] $\frac{7+4\sqrt{3}}{7}$

[C] $1-4\sqrt{3}$

[D] $\frac{1-4\sqrt{3}}{7}$

[24] _____

25. 080210b, P.I. A2.N.5

Which expression represents the sum of

$$\frac{1}{\sqrt{3}} + \frac{1}{\sqrt{2}}?$$

[A] $\frac{2\sqrt{3} + 3\sqrt{2}}{6}$

[B] $\frac{2}{\sqrt{5}}$

[C] $\frac{\sqrt{3} + \sqrt{2}}{3}$

[D] $\frac{\sqrt{3} + \sqrt{2}}{2}$

[25] _____

CHAPTER 8-4

RATIONAL EXPRESSIONS

26. 060712b, P.I. A.A.16

Which expression is in simplest form?

[A] $\frac{9}{x^2 + 9}$

[B] $\frac{x^2 - 6x + 9}{x^2 - x - 6}$

[C] $\frac{x}{x^2}$

[D] $\frac{x^2 - 4}{x + 2}$

[26] _____

27. 080305b, P.I. A.A.16

Written in simplest form, the expression

$$\frac{x^2 y^2 - 9}{3 - xy} \text{ is equivalent to}$$

[A] -1

[B] $3 + xy$

[C] $\frac{1}{3 + xy}$

[D] $-(3 + xy)$

[27] _____

28. 060504b, P.I. A.A.16

Written in simplest form, the expression

$$\frac{x^2 - 9x}{45x - 5x^2} \text{ is equivalent to}$$

[A] $\frac{1}{5}$

[B] $-\frac{1}{5}$

[C] -5

[D] 5

[28] _____

29. 080619b, P.I. A.A.16

The expression $\frac{3y^2 - 12y}{4y^2 - y^3}$ is equivalent to

[A] $\frac{3}{4} - \frac{12}{y^2}$

[B] $\frac{3}{y}$

[C] $-\frac{3}{y}$

[D] $-\frac{9}{4}$

[29] _____

30. 060325b

Express the following rational expression in

$$\text{simplest form: } \frac{9 - x^2}{10x^2 - 28x - 6}$$

[30] _____

31. 060202b, P.I. A.A.16

For all values of x for which the expression is

$$\text{defined, } \frac{2x + x^2}{x^2 + 5x + 6} \text{ is equivalent to}$$

[A] $\frac{1}{x + 2}$

[B] $\frac{x}{x + 3}$

[C] $\frac{1}{x + 3}$

[D] $\frac{x}{x + 2}$

[31] _____

COMPLEX FRACTIONS

32. 010206b, P.I. A2.A.17

The expression $\frac{\frac{a}{1} - \frac{b}{1}}{\frac{1}{a} + \frac{1}{b}}$ is equivalent to

- [A] $a - b$ [B] $a + b$
[C] ab [D] $\frac{a-b}{ab}$

[32] _____

33. 010312b, P.I. A2.A.17

The fraction $\frac{\frac{x}{y} + x}{\frac{1}{y} + 1}$ is equivalent to

- [A] $2x$ [B] x [C] $\frac{2xy}{1+y}$ [D] $\frac{x^2y}{1+y}$

[33] _____

34. 080706b, P.I. A2.A.17

Which expression is equivalent to the

complex fraction $\frac{\frac{1}{a} - a}{\frac{1}{a} + 1}$?

- [A] $-(1-a)$ [B] -1
[C] $1-a$ [D] $+1$

[34] _____

35. 060317b, P.I. A2.A.17

In simplest form, $\frac{\frac{1}{x^2} - \frac{1}{y^2}}{\frac{1}{y} + \frac{1}{x}}$ is equal to

- [A] $x - y$ [B] $y - x$
[C] $\frac{x-y}{xy}$ [D] $\frac{y-x}{xy}$

[35] _____

36. 010706b, P.I. A2.A.17

The expression $\frac{\frac{1}{3} + \frac{1}{3x}}{\frac{1}{x} + \frac{1}{3}}$ is equivalent to

- [A] 2 [B] $\frac{3x+3}{x+3}$ [C] $\frac{1}{3}$ [D] $\frac{x+1}{x+3}$

[36] _____

37. 060713b, P.I. A2.A.17

The expression $\frac{\frac{1}{3} - \frac{1}{x}}{\frac{3}{x} - 1}$ is equivalent to

- [A] $-\frac{1}{3}$ [B] $\frac{1}{3}$ [C] -3 [D] 3

[37] _____

38. 080323b, P.I. A2.A.17

Express in simplest form: $\frac{\frac{x}{4} - \frac{4}{x}}{1 - \frac{4}{x}}$

[38] _____

39. 060415b, P.I. A2.A.17

The expression $\frac{\frac{1}{x} + \frac{1}{y}}{\frac{1}{x^2} - \frac{1}{y^2}}$ is equivalent to

[A] $y - x$ [B] $\frac{xy}{y - x}$

[C] $\frac{y - x}{xy}$ [D] $\frac{xy}{x - y}$

[39] _____

40. 080220b, P.I. A2.A.17

Which expression is equivalent to the

complex fraction $\frac{\frac{x}{x+2}}{1 - \frac{x}{x+2}}$?

[A] $\frac{2x}{x+2}$ [B] $\frac{x}{2}$ [C] $\frac{2}{x}$ [D] $\frac{2x}{x^2+4}$

[40] _____

41. 080513b, P.I. A2.A.17

When simplified, the complex fraction

$\frac{1 + \frac{1}{x}}{\frac{1}{1-x}}$, $x \neq 0$, is equivalent to

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

[41] _____

42. 080425b, P.I. A2.A.17

Express in simplest form: $\frac{\frac{1}{r} - \frac{1}{s}}{\frac{r}{r^2} - 1}$

[42] _____

43. 010629b, P.I. A2.A.17

Simplify completely: $\frac{\frac{1-m}{m}}{m - \frac{1}{m}}$

[43] _____

44. 010826b, P.I. A2.A.17

Express in simplest form: $\frac{x - \frac{4}{x}}{\frac{2+x}{x}}$

[44] _____

45. 060628b, P.I. A2.A.17

Simplify for all values of a for which the

expression is defined: $\frac{1 - \frac{2}{a}}{\frac{4}{a^2} - 1}$

[45] _____

46. 060112b, P.I. A2.A.17

In a science experiment, when resistor A and resistor B are connected in a parallel circuit,

the total resistance is $\frac{1}{\frac{1}{A} + \frac{1}{B}}$. This complex

fraction is equivalent to

[A] $\frac{AB}{A+B}$ [B] $A+B$ [C] AB [D] 1

[46] _____

MULTIPLICATION AND DIVISION OF RATIONALS

47. 060124b, P.I. A.A.18

A rectangular prism has a length of $\frac{2x^2 + 2x - 24}{4x^2 + x}$, a width of $\frac{x^2 + x - 6}{x + 4}$, and a

height of $\frac{8x^2 + 2x}{x^2 - 9}$. For all values of x for which it is defined, express, in terms of x , the volume of the prism in simplest form.

[47] _____

48. 080117b, P.I. A.A.18

If the length of a rectangular garden is represented by $\frac{x^2 + 2x}{x^2 + 2x - 15}$ and its width is represented by $\frac{2x - 6}{2x + 4}$, which expression represents the area of the garden?

[A] $\frac{x}{x + 5}$ [B] x

[C] $\frac{x^2 + 2x}{2(x + 5)}$ [D] $x + 5$

[48] _____

49. 060727b, P.I. A2.A.16

If $f(x) = \frac{3x^2 - 27}{18x + 30}$ and $g(x) = \frac{x^2 - 7x + 12}{3x^2 - 7x - 20}$, find $f(x) \div g(x)$ for all values of x for which the expression is defined and express your answer in simplest form.

[49] _____

50. 010434b, P.I. A.A.18

Express in simplest form:

$$\frac{4x + 8}{x + 1} \cdot \frac{2 - x}{3x - 15} \div \frac{x^2 - 4}{2x^2 - 8x - 10}$$

[50] _____

51. 010733b, P.I. A.A.18

Perform the indicated operations and simplify completely:

$$\frac{x^2 - 9}{x^2 - 5x} \cdot \frac{5x - x^2}{x^2 - x - 12} \div \frac{x - 4}{x^2 - 8x + 16}$$

[51] _____

CHAPTER 8-5

ADDITION AND SUBTRACTION OF RATIONALS

52. 060524b, P.I. A2.A.16

Express in simplest form: $\frac{1}{x} + \frac{1}{x + 3}$

[52] _____

53. 010315b, P.I. A2.A.16

What is the sum of $\frac{3}{x - 3}$ and $\frac{x}{3 - x}$?

[A] -1 [B] $\frac{x + 3}{x - 3}$ [C] 0 [D] 1

[53] _____

54. 080505b, P.I. A2.A.16

What is the sum of $(y - 5) + \frac{3}{y + 2}$?

[A] $y - 5$ [B] $\frac{y^2 - 7}{y + 2}$

[C] $\frac{y - 2}{y + 2}$ [D] $\frac{y^2 - 3y - 7}{y + 2}$

[54] _____

55. 080733b, P.I. A2.A.16

Express in simplest form:

$$\frac{2x}{x^2 - 4} \div \frac{4}{x^2 - 4x + 4} + \frac{12}{x^2 - 4} \cdot \frac{2 - x}{3}$$

[55] _____

CHAPTER 8-6

SOLVING RATIONALS

56. 080722b, P.I. A.A.26

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

[56] _____

57. 080529b, P.I. A2.A.23

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

[57] _____

58. 060429b, P.I. A2.A.23

Solve for x and express your answer in simplest radical form: $\frac{4}{x} - \frac{3}{x+1} = 7$

[58] _____

59. 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} [B] {4,-6} [C] {-6} [D] { }

[59] _____

60. 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?

[60] _____

61. 080125b, P.I. A2.A.23

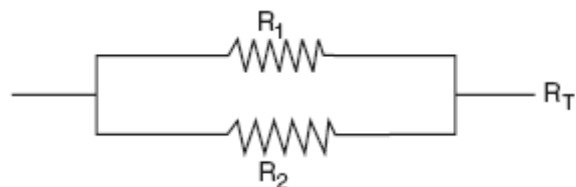
Working by herself, Mary requires 16 minutes more than Antoine to solve a mathematics problem. Working together, Mary and Antoine can solve the problem in 6 minutes. If this situation is represented by the equation $\frac{6}{t} + \frac{6}{t+16} = 1$, where t represents the

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?

[61] _____

62. 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.

[62] _____

[2] An explanation is given that indicates that a set of data can represent inverse variation if the product of two variables is constant, and a correct table of values is shown.

[1] The rule for direct rather than inverse variation is stated, but an appropriate equation and table of values are shown.

or [1] An example of inverse variation is shown, but no explanation of why it is an inverse variation is given.

or [1] An explanation is given that indicates that a set of data can represent inverse variation, but no table of values is shown.

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

[1] incorrect procedure.

[2] D

[3] A

[4] A

[2] 4.4, 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] Only the constant of variation, 220, is found.

or [1] 4.4, but no work is shown.

[0] Direct variation is used.

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

[5] obviously incorrect procedure.

[2] 30, and appropriate work is shown.

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

or [1] 30, but no work is shown.

[0] Direct variation is used to find a solution.

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

[6] obviously incorrect procedure.

[2] 32, and appropriate work is shown.

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

or [1] Only the constant of variation, 28,800, is found.

or [1] 32, but no work is shown.

[0] Direct variation is used.

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

[7] obviously incorrect procedure.

[8] A

[2] $nd = 350$ or an equivalent equation and \$87.50, and appropriate work is shown, such as the equation $350 = 4d$.

[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] A correct equation is written, but no further correct work is shown.

or [1] \$87.50, 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

[9] incorrect procedure.

[2] 8, and appropriate work is shown, such as $5(70) = 43.75x$.

[1] 4, and \$87.50 is used instead of \$43.75 per person.

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

or [1] 8, 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

[10] incorrect procedure.

[11] D

- [2] 1,032, 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] 1,032, but no work is shown.
 [0] Direct variation is used instead of inverse variation.
 or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[12] D

[14] A

[15] D

[16] B

[17] D

[18] B

[19] D

[20] B

[21] C

[22] D

[23] D

[24] A

[25] A

[26] A

[27] D

[28] B

[29] C

- [2] $\frac{-x-3}{10x+2}$ or an equivalent answer in simplest form, and appropriate work is shown.

[1] Either the numerator or the denominator is factored completely.

or [1] Appropriate work is shown, but $\frac{3-x}{x-3} = -1$ is not recognized.

or [1] $\frac{-x-3}{10x+2}$ or an equivalent answer in simplest form, 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.

[30] _____

[31] B

[32] A

[33] B

[34] C

[35] D

[36] D

[37] A

- [2] $\frac{x+4}{4}$, 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] $\frac{x+4}{4}$, 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.

[38] _____

[39] B

[40] B

[41] C

[2] $-\frac{s}{r(r+s)}$ or $-\frac{s}{r^2+rs}$, 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 the answer is not expressed in simplest form.

or [1] $-\frac{s}{r(r+s)}$ or $-\frac{s}{r^2+rs}$, 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

[42] incorrect procedure.

[4] $\frac{-1}{m+1}$ or $\frac{1}{-m-1}$, and appropriate work is shown.

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

[2] 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.

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

or [1] $\frac{-1}{m+1}$ or $\frac{1}{-m-1}$, 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

[43] incorrect procedure.

[2] $x - 2$, 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] $x - 2$, 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

[44] incorrect procedure.

[4] $\frac{-a}{2+a}$ or $\frac{a}{-2-a}$, and appropriate work is shown.

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

[2] 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, such as not recognizing that -1 is a factor.

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

or $\frac{-a}{2+a}$ or $\frac{a}{-2-a}$, 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

[45] incorrect procedure.

[46] A

[2] $4(x - 2)$ or $4x - 8$, and appropriate work is shown.

[1] The problem is factored correctly but not reduced to simplest form.

or [1] Only two of the expressions are factored correctly, but an appropriate answer is found.

or [1] $4(x - 2)$ or $4x - 8$, but no work is shown.

[0] Only the formula for volume is shown.

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

[47] obviously incorrect procedure.

[48] A

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

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

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

or [2] Appropriate work is shown, but one conceptual error is made, such as failing to multiply by the reciprocal of $g(x)$ or trying to solve for x .

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

or [1] $\frac{x+3}{2}$, 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

[49] incorrect procedure.

[6] $-\frac{8}{3}$, and appropriate work is shown.

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

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

[3] Appropriate work is shown, but one conceptual error is made, such as not factoring out -1 when canceling out $2 - x$.

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

[1] $-\frac{8}{3}$, 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

[50] incorrect procedure.

[6] $-(x-3)$, $-x+3$, or $3-x$, and appropriate work is shown.

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

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

or [4] $x-3$, and appropriate work is shown.

[3] Appropriate work is shown, but three or more computational, factoring, or simplification errors are made.

or [3] Appropriate work is shown, but one conceptual error is made, such as not multiplying by the multiplicative inverse.

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

[1] $-(x-3)$, $-x+3$, or $3-x$, 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

[51] incorrect procedure.

[2] $\frac{2x+3}{x(x+3)}$ or $\frac{2x+3}{x^2+3x}$, and appropriate work is shown.

[1] Appropriate work is shown, but one computational error is made or the answer is not simplified completely.

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

or [1] $\frac{2x+3}{x(x+3)}$ or $\frac{2x+3}{x^2+3x}$, 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

[52] incorrect procedure.

[53] A

[54] D

[6] $\frac{x-4}{2}$, and appropriate work is shown.

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

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

or [4] Appropriate work is shown, but -1 is not factored out.

[3] Appropriate work is shown, but one conceptual error is made, such as not following the correct order of operations.

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

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

or [1] Appropriate work is shown, but two conceptual errors are made.

or [1] $\frac{x-4}{2}$, 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

[55] incorrect procedure.

[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

[56] obviously 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

[57] obviously incorrect procedure.

[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

[58] incorrect procedure.

[59] C

[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

[60] incorrect procedure.

[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

[61] 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

[62] incorrect procedure.
