

Rational Expressions and Equations Lesson #10: Practice Test

Use the following information to answer the next question.

A student made the following four statements regarding rational expressions:

Statement 1: Values of the variable which result in the rational expression not being defined are called nonpermissible values. ✓

Statement 2: Values of the variable which make the numerator equal to zero are restrictions on the variable. ✗

Statement 3: Nonpermissible values are known as the restrictions on the variable.

Statement 4: Nonpermissible values are values of the variable which make the denominator equal to zero.

1. The statement which is false is

- A. Statement 1 B. Statement 2
C. Statement 3 D. Statement 4

2. When simplified, the rational expression $\frac{a^2 + a - 2}{a^2 - 1}$ can be reduced to

- A. $\frac{a-2}{-1}$ B. $\frac{a-2}{a-1}$ $\frac{(a+2)(a-1)}{(a-1)(a+1)}$
 C. $\frac{a+2}{a+1}$ D. $\frac{a-2}{a+1}$ $\frac{(a+2)(a-1)}{(a-1)(a+1)}$

3. The reduced form of $\frac{15 + 2y - y^2}{3y^2 - 16y + 5}$ is

- ~~A.~~ $\frac{3-y}{3y-1}$ $15/16$ $\frac{(3+y)(-5+y)}{(3y-1)(y-5)}$
~~B.~~ $\frac{-3-y}{3y+1}$ $-15/-1$ $\frac{3y^2 - 15y - 1y + 5}{3y(y-5) - 1(y-5)}$ $\frac{-(3+y)}{3y-1}$ ← not a choice
~~C.~~ $\frac{3+y}{3y-1}$ $\frac{(3+y)}{-(3y-1)} = \frac{3+y}{-3y+1}$ $\frac{-3-y}{3y-1}$ ← not a choice
 D. $\frac{3+y}{1-3y}$

4. The expression $\frac{x^2 + 9xy + 20y^2}{x^2 + 5xy}$ can be reduced to

A. $x + 4y$

B. $1 + 4y$

C. $4y$

D. none of the above

$$\frac{(x+4y)(x+5y)}{x(x+5y)}$$

5. The expression $\frac{9v^2 - 6v + 1}{12v^2 - 13v + 3}$ can be reduced to

A. $\frac{3v-1}{4v-3}$

B. $\frac{3v+1}{4v+3}$

C. $\frac{3v-1}{4v+3}$

D. $\frac{3v+1}{4v-3}$

$$\frac{(3v-1)(3v-1)}{(3v-1)(4v-1)}$$

$$\begin{aligned} &9v^2 - 3v - 3v + 1 \\ &3v(3v-1) - 1(3v-1) \\ &(3v-1)(3v-1) \end{aligned}$$

$$\begin{aligned} &12v^2 - 9v - 4v + 3 \\ &3(4v-3) - 1(4v-3) \\ &(3v-1)(4v-3) \end{aligned}$$

6. The restriction(s) on the variable in the division $\frac{x-5}{x-2} \div \frac{x-3}{x-1}$ is/are

A. $x = 1$ only

B. $x = 1$ and $x = 2$ only

C. $x = 1, x = 2,$ and $x = 3$ only

D. $x = 1, x = 2, x = 3,$ and $x = 5$ only

$x \neq 2, 1, 3$

7. Consider the nonpermissible values for the addition $\frac{5y}{6y^2 - 7y - 3} + \frac{4y - 3}{2y^2 - 15y + 18}$.
 The product of the nonpermissible values is

- A. -3
- B. $-\frac{9}{2}$
- C. $-\frac{4}{3}$
- D. 3

Handwritten work for problem 7:

$36 \overline{) 18} \rightarrow -12, -3$
 $6y^2 - 9y + 2y - 3$
 $2y^2 - 12y - 3y + 18$
 $3y(2y-3) + 1(2y-3)$
 $\frac{5y}{(3y+1)(2y-3)} + \frac{4y-3}{(2y-3)(y-6)}$
 $X \neq -\frac{1}{3}, \frac{3}{2}, 6$
 $-\frac{1}{3} \times \frac{3}{2} \times 6 = \boxed{-3}$

8. A simplified form of $\frac{-4}{x-3} + \frac{2}{3-x}$ is

- A. $\frac{2}{x-3}$
- B. $\frac{2}{3-x}$
- C. $\frac{6}{x-3}$
- D. $\frac{6}{3-x}$

Handwritten work for problem 8:

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

9. If the difference $\frac{8}{3a} - \frac{2(3)}{a}$ can be written in the form $\frac{k}{3a}$, then the value of k is

- A. 2
- B. 3
- C. 4
- D. 22

Handwritten work for problem 9:

$$\frac{8-6}{3a} = \frac{2}{3a}$$

1. When simplified, the difference $\frac{4}{x^2 - 49} - \frac{3}{x^2 - 5x - 14}$ can be written in the form $\frac{Ax - B}{(x - 7)(x + 2)(x + C)}$, where A , B , and C are integers.

The value of $A + B + C$ is _____.

(Record your answer in the numerical response box from left to right.)

2	1		
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$$\frac{4(x+2)}{(x-7)(x+7)} - \frac{3(x+7)}{(x-7)(x+2)}$$

$$\frac{4x+8 - 3x-21}{(x-7)(x+2)(x+7)}$$

$$\frac{x-13}{(x-7)(x+2)(x+7)}$$

$A = 1, B = 13, C = 7$

$$1 + 13 + 7 = 21$$

10. $\frac{6x}{x^2 - 8x + 16} - \frac{2}{x - 4}$ can be simplified to

A. $\frac{6x - 2}{(x - 4)^2}$

B. $\frac{4x - 8}{(x - 4)^2}$

C. $\frac{4x - 4}{(x - 4)^2}$

D. $\frac{4x + 8}{(x - 4)^2}$

$$\frac{6x}{(x-4)(x-4)} - \frac{2(x-4)}{(x-4)}$$

$$6x - 2x + 8 = 4x + 8$$

$$\frac{4x+8}{(x-4)(x-4)} - \frac{4(x+2)}{(x-4)(x-4)}$$

Use the following information to answer the next question.

A student determines that the dimensions of the door to the conference hall can be written as rational expressions. Expressions for the length and width of the door are shown.

$\frac{x^2 + 12x + 35}{2x + 1}$
 $\frac{2x^2 + 7x + 3}{x + 5}$

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

11. The area of the door to the conference hall can be expressed as a quadratic expression $Ax^2 + Bx + C$. The value of $A + B + C$ is

- A. 30
- ~~B. 31~~
- C. 32**
- D. 33

$$\frac{(2x+1)(x+3)}{(x+5)} \cdot \frac{(x+7)(x+5)}{(2x+1)}$$

$$(x+3)(x+7)$$

$$1x^2 + 10x + 21$$

$$1 + 10 + 21 = 32$$

12. The product $\left(\frac{2x^3 - 50x}{5x^2 - 30x + 25}\right)\left(\frac{5x - 5x^2}{x^3 + 5x^2}\right)$ can be reduced to an integer n . The value of n is

- A. 2
- B. -2**
- C. 10
- D. -10

$$\frac{2x(x^2-25)}{5(x^2-6x+5)} \cdot \frac{5x(-1+x)}{x^2+5x}$$

$$\frac{2x(x-5)(x+5)}{5(x-5)(x-1)} \cdot \frac{5x(-1+x)}{x(x+5)}$$

$$\frac{2x(-1+x)}{5(x-1)}$$

$$\frac{2x(-1+x)}{5(x-1)}$$

-2

Numerical Response

2. When divided, $\frac{16x^2 + 8x + 1}{x^2 + 6x - 27} + \frac{8x^2 + 22x + 5}{2x^2 - x - 15}$ can be written in the form $\frac{ax + b}{cx + d}$.

$\begin{array}{r} 4x + 22 \\ -30x - 1 \\ \hline -65 \end{array}$

Write the value of a in the first box.
Write the value of b in the second box.
Write the value of c in the third box.
Write the value of d in the fourth box.

(Record your answer in the numerical response box from left to right.)

4	1	1	9
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$$\frac{(4x+1)(4x+1)}{(x+9)(x-3)} \cdot \frac{(2x+5)(x-3)}{(4x+1)(2x+5)}$$

$$\frac{4x+1}{1x+9}$$

$$8x^2 + 20x + 2x + 5$$

$$4x(2x+5) + 1(2x+5)$$

$$2x^2 - 6x + 5x - 15$$

$$2x(x-3) + 5(x-3)$$

13. For the appropriate restrictions, the expression $\left(\frac{\frac{1}{a^2 - 36}}{\frac{1}{a - 6}} \right)$ can be written as

A. $a - 6$

B. $a + 6$

C. $\frac{1}{a - 6}$

D. $\frac{1}{a + 6}$

$$\frac{1}{(a-6)(a+6)} \cdot \frac{a+6}{1}$$

14. The simplified form of $\left(6 - \frac{2}{x}\right) + \left(9 - \frac{1}{x^2}\right)$ is

The value of n is

A. $\frac{2}{x+3}$

B. $\frac{2x}{1+3x}$

C. $\frac{2x}{1-3x}$

D. $\frac{2}{x(1+3x)}$

$$\frac{6x-2}{x} \div \frac{9x^2-1}{x^2}$$

$$\frac{2(3x-1)}{\cancel{x}} \cdot \frac{x^2}{(3x-1)(3x+1)}$$

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

NUMERICAL RESPONSE

3. Two numbers differ by three and their quotient is $\frac{3}{4}$. The larger number is _____.

(Record your answer in the numerical response box from left to right.)

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

$$\frac{x}{x+3} = \frac{3(x+3)}{4}$$

$$4x = 3x+9$$

$$x = +9$$

$$x = 9,$$

numbers 9, 12

15. In solving the rational equation $\frac{4x}{3x+4} - \frac{10}{x+6} = 0$, an equation which appears is

A. $4x^2 - 6x + 40 = 0$

B. $4x^2 - 6x - 40 = 0$

C. $12x^2 + 6x - 60 = 0$

D. $12x^2 + 6x + 60 = 0$

$$4x(x+6) = 10(3x+4)$$

$$4x^2 + 24x = 30x + 40$$

$$4x^2 - 6x - 40$$

Numerical Response

4. The formula $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$, concerning resistance in an electrical circuit, is used in Physics. If $R = 3$ ohms and R_1 is 8 ohms more than R_2 , the value of R_1 is _____.

(Record your answer in the numerical response box from left to right.)

1	2		
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$$\frac{1}{3} = \frac{1}{x+8} + \frac{1}{x}$$

$$x(x+8) = 3x + 3(x+8)$$

$$x^2 + 8x = 3x + 3x + 24$$

$$x^2 + 2x - 24 = 0$$

$$R_1 = 4 + 8$$

$$(x+6)(x-4)$$

$$x = -6, 4$$

Numerical Response

5. Govinda has a cardiovascular routine where he walks for 3 km, runs for $7\frac{1}{2}$ km and then walks for an additional 4 km. He runs $2\frac{1}{2}$ times as fast as he walks, and the total time taken for his routine is 2 hours. His walking speed, to the nearest km/h, is _____.

(Record your answer in the numerical response box from left to right.)

5			
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	d	s	t
walk	7	x	$\frac{7}{x}$
run	7.5	2.5x	$\frac{7.5}{2.5x}$

$$\frac{7(2.5)}{x} + \frac{7.5}{2.5x} = 2(2.5x)$$

$$17.5 + 7.5 = 5x$$

$$25 = 5x$$

$$5 = x$$

$$\begin{array}{r} 3 \\ 2.5 \\ \hline 7 \\ 17.5 \\ \hline 2.5 \\ \hline 20 \\ \hline 50 \end{array}$$

Written Response - 5 marks

A plane flew from Red Deer to Winnipeg, a flying distance of 1260 km. On the return journey, due to a strong head wind, the plane travelled 1200 km in the same time it took to complete the outward journey. On the outward journey, the plane was able to maintain an average speed 20 km/hr greater than on the return journey.

- If the average speed of the plane from Red Deer to Winnipeg is x km/hr, state an expression for the average speed of the plane from Winnipeg to Red Deer in km/hr.

$$x + 20$$

- Calculate the average speed of the plane from Winnipeg to Red Deer.

	d	s	t
RD-Win	1260	$x + 20$	$\frac{1260}{x + 20}$
Win-RD	1200	x	$\frac{1200}{x}$

$$\frac{1260}{x + 20} = \frac{1200}{x}$$

$$1260x = 1200x + 24000$$

$$60x = 24000$$

$$x = 400$$

$$\text{Win - Red Deer} = \underline{400 \text{ km/hr}}$$

not 1200 because have to fly all way to Red Deer; 1200 km is only part of distance.

- Calculate the total flying time for the round trip.

$$\frac{1260}{400} + \frac{1260}{400} = 6 \text{ hrs } 15 \text{ mins}$$

6 hrs 9 mins

Answer Key

1. B 2. C 3. D 4. D 5. A 6. C 7. A 8. A
 9. A 10. D 11. C 12. B 13. D 14. B 15. B

Numerical Response

1.

2	1		
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2.

4	1	1	9
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3.

1	2		
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4.

1	2		
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5.

5			
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Written Response

1. • $(x - 20)$ km/hr
 • 400 km/h
 • 6 hours 9 minutes