

Advanced Algebra
Chapter 9 Test Review

Name Key hr

Variation. Solve the variation problems below.

1. Suppose that y varies inversely with the square of x , and $y = 50$ when $x = 4$. Find y when $x = 5$.

$$y = \frac{k}{x^2} \quad 50 = \frac{k}{4} \quad 200 = k$$

$$y = \frac{200}{x^2} \quad y = \frac{200}{5^2} \quad y = \frac{200}{25} \quad y = 8$$

2. Suppose that d varies jointly with r and t , and $d = 110$ when $r = 55$, $t = 2$. Find r when $d = 40$, $t = 3$.

$$d = krt \quad 110 = k(55)(2) \quad 110 = k(110) \quad 1 = k$$

$$d = 1rt \quad 40 = 1(r)(3) \quad 40 = 3r \quad \frac{40}{3} = r \quad 13\frac{1}{3} = r$$

3. A concrete supplier sells premixed concrete by the truckload. The area that the concrete will cover varies inversely to the depth of the concrete. If the concrete will cover 600 sq. ft. for a depth of $\frac{1}{2}$ ft., what will be the depth of the concrete if it covers an area of 200 sq. ft.?

$$a = \frac{k}{d} \quad 600 = \frac{k}{\frac{1}{2}} \quad 300 = k$$

$$a = \frac{300}{d} \quad \frac{200}{1} = \frac{300}{d} \quad 200d = 300 \quad d = 1.5 \text{ ft}$$

4. Suppose y varies directly with x , and $y = 1$ when $x = 3$. Find x when $y = 4.5$.

$$y = kx \quad 1 = k(3) \quad \frac{1}{3} = k$$

$$y = \frac{1}{3}x \quad \frac{3}{1} 4.5 = \frac{1}{3}x \cdot \frac{3}{1} \quad 13.5 = x$$

5. Suppose that y varies directly with x and inversely with the square of z , and $x = 48$ when $y = 8$ and $z = 3$. Find x when $y = 12$ and $z = 2$.

$$y = \frac{kx}{z^2} \quad 8 = \frac{k(48)}{3^2} \quad 8 = \frac{48k}{9} \quad 72 = 48k \quad 1.5 = k$$

$$y = \frac{1.5x}{z^2} \quad 12 = \frac{1.5x}{2^2} \quad 12 = \frac{1.5x}{4} \quad 48 = 1.5x \quad 32 = x$$

RATE OF WORK

6. Chad can paint a room in 2 hours. Cassie can paint the same size room in 3 hours. How long will it take Chad and Cassie to paint the room together?

	Amt. complete in 1 hr. alone	Time together	Portion completed
Chad	$\frac{1}{2}$	\bullet	$\frac{x}{2}$
Cassie	$\frac{1}{3}$	\bullet	$\frac{x}{3}$

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

$$\text{LCD} = 6 \quad 6\left(\frac{3x}{6} + \frac{2x}{6}\right) = 6$$

$$3x + 2x = 6 \quad 5x = 6$$

$$x = 1.2 \text{ hrs}$$

Simplify. State any restrictions on the variables.

7. $\frac{20 + 40x}{20x}$

$$\frac{20(1 + 2x)}{20x} = \frac{(1 + 2x)}{x}$$

$$20x \neq 0 \quad x \neq 0$$

8. $\frac{2y}{y^2 + 6y} = \frac{2y}{y(y + 6)}$

$$\frac{2}{(y + 6)}$$

$$y \neq 0 \quad y + 6 \neq 0 \quad y \neq -6$$

9. $\frac{x^2 + 13x + 40}{x^2 - 2x - 35} = \frac{(x + 8)(x + 5)}{(x - 7)(x - 5)}$

$$\frac{(x + 8)}{(x - 7)}$$

$$x + 5 \neq 0 \quad x - 7 \neq 0 \quad x \neq -5 \quad x \neq 7$$

Simplify. State any restrictions on the variables.

$$10. \frac{y^2 - 2y}{y^2 + 7y - 18} \cdot \frac{y^2 - 81}{y^2 - 11y + 18}$$

$$\frac{y(y-2)}{(y+9)(y-2)} \cdot \frac{(y-9)(y-9)}{(y-9)(y-2)} = \boxed{\frac{y}{(y-2)}}$$

$$\begin{array}{l} y+9 \neq 0 \\ y \neq -9 \end{array} \quad \begin{array}{l} y-2 \neq 0 \\ y \neq 2 \end{array} \quad \begin{array}{l} y-9 \neq 0 \\ y \neq 9 \end{array}$$

$$11. \frac{x^2 + 10x + 16}{x^2 - 6x - 16} \div \frac{x+8}{x^2 - 64}$$

$$\frac{(x+8)(x+2)}{(x-8)(x+2)} \div \frac{(x+8)}{(x+8)(x-8)} \quad \text{mult by reciprocal}$$

$$\frac{(x+8)(x+2)}{(x-8)(x+2)} \cdot \frac{(x+8)(x-8)}{(x+8)} = \boxed{(x+8)}$$

$$\begin{array}{l} x-8 \neq 0 \\ x \neq 8 \end{array} \quad \begin{array}{l} x+2 \neq 0 \\ x \neq -2 \end{array} \quad \begin{array}{l} x+8 \neq 0 \\ x \neq -8 \end{array}$$

Simplify. You do NOT need to state restrictions.

$$12. \frac{4}{x^2 - 25} + \frac{6}{x^2 + 6x + 5}$$

$$\frac{(x+1)}{(x+1)} \cdot \frac{4}{(x+5)(x-5)} + \frac{6}{(x+1)(x+5)} \cdot \frac{(x-5)}{(x-5)}$$

$$\text{LCD: } (x+5)(x-5)(x+1)$$

$$\frac{4x+4}{(x+1)(x+5)(x-5)} + \frac{6x-30}{(x+1)(x+5)(x-5)}$$

$$\boxed{\frac{10x-26}{(x+1)(x+5)(x-5)}}$$

$$13. \frac{3y}{3y} \cdot \frac{3}{7x^2y} + \frac{4}{21xy^2} \cdot \frac{x}{x}$$

$$\text{LCD: } 21x^2y^2$$

$$\frac{9y}{21x^2y^2} + \frac{4x}{21x^2y^2}$$

$$\boxed{\frac{4x+9y}{21x^2y^2}}$$

$$14. \frac{(x+2)}{(x+2)} \cdot \frac{xy-y}{x-2} + \frac{-y}{x+2} \cdot \frac{(x-2)}{(x-2)}$$

$$\text{LCD: } (x-2)(x+2)$$

$$\frac{x^2y - xy + 2xy - 2y}{(x+2)(x-2)} + \frac{-xy + 2y}{(x+2)(x-2)}$$

$$\boxed{\frac{x^2y}{(x+2)(x-2)}}$$

Solve. Check your solutions. You do NOT need to state restrictions.

$$15. \frac{2}{6x+2} \cdot \frac{x}{3x^2+11}$$

$$2(3x^2+11) = x(6x+2)$$

$$6x^2 + 22 = 6x^2 + 2x$$

$$22 = 2x$$

$$\boxed{11 = x}$$

check:

$$\frac{2}{6(11)+2} = \frac{11}{3(11)^2+11}$$

$$\frac{2}{68} = \frac{11}{374}$$

$$\frac{1}{34} = \frac{1}{34} \quad \checkmark$$

$$16. \frac{7}{x^2-5x} + \frac{2}{x} = \frac{3}{2x-10}$$

$$\text{LCD: } 2x(x-5)$$

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

$$\frac{14}{2x(x-5)} + \frac{4x-20}{2x(x-5)} = \frac{3x}{2x(x-5)} \quad 2x(x-5)$$

$$14 + 4x - 20 = 3x$$

$$4x - 6 = 3x$$

$$-6 = -1x$$

$$\boxed{6 = x}$$

check:

$$\frac{7}{6^2-5(6)} + \frac{2}{6} = \frac{3}{2(6)-10}$$

$$\frac{7}{6} + \frac{2}{6} = \frac{3}{2}$$

$$\frac{9}{6} = \frac{3}{2}$$

$$\frac{3}{2} = \frac{3}{2} \quad \checkmark$$

ASSIGNMENT: pg 528-529 (30-31, 34-35, 38-40) & pg 515 (32)

pg 528) 30) $\frac{x^2 - 2x - 24}{x^2 + 7x + 12} \cdot \frac{x^2 - 1}{x - 6} = \frac{(x-6)(x+4)}{(x+4)(x+3)} \cdot \frac{(x+1)(x-1)}{(x-6)} = \boxed{\frac{(x+1)(x-1)}{(x+3)}}$

$x+4 \neq 0 \quad x+3 \neq 0 \quad x-6 \neq 0$
 $\boxed{x \neq -4} \quad \boxed{x \neq -3} \quad \boxed{x \neq 6}$

31) $\frac{4x^2 - 2x}{x^2 + 5x + 4} \div \frac{2x}{x^2 + 2x + 1} = \frac{2x(2x-1)}{(x+4)(x+1)} \div \frac{2x}{(x+1)(x+1)} = \frac{2x(2x-1)}{(x+4)(x+1)} \cdot \frac{(x+1)(x+1)}{2x} = \boxed{\frac{(2x-1)(x+1)}{(x+4)}}$

$x+4 \neq 0 \quad x+1 \neq 0 \quad 2x \neq 0$
 $\boxed{x \neq -4} \quad \boxed{x \neq -1} \quad \boxed{x \neq 0}$

34) $\frac{3x}{x^2 - 4} + \frac{6}{x+2}$

$\frac{3x}{(x+2)(x-2)} + \frac{6}{x+2} \cdot \frac{(x-2)}{(x-2)}$

LCD: $(x+2)(x-2)$

$\frac{3x}{(x+2)(x-2)} + \frac{6x-12}{(x+2)(x-2)}$

$\boxed{\frac{9x-12}{(x+2)(x-2)}}$

35) $\frac{1}{x^2 - 1} - \frac{2}{x^2 + 3x}$

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

LCD: $x(x+1)(x-1)(x+3)$

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

$\frac{x^2 + 3x + -2x^2 + 2}{x(x+1)(x-1)(x+3)} = \boxed{\frac{-x^2 + 3x + 2}{x(x+1)(x-1)(x+3)}}$

38) $\frac{1}{x} \neq \frac{5}{x-4}$

$5x = x - 4$

$4x = -4$

$\boxed{x = -1}$

check:

$\frac{1}{-1} = \frac{5}{-1-4}$

$-1 = \frac{5}{-5}$

$-1 = -1 \checkmark$

39) $\frac{x}{x} \cdot \frac{2}{x+3} + \frac{-1}{(x+3)} = \frac{-6}{x(x+3)}$

LCD: $x(x+3)$

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

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

$x - 3 = -6$

$x = -3 \leftarrow \text{extraneous}$

check:

$\frac{2}{-3+3} - \frac{1}{-3} = \frac{-6}{-3(-3+3)}$

$\frac{2}{0} + \frac{1}{3} = \frac{-6}{0} \text{ undefined!}$

$\boxed{\text{No sol.}}$

40) $\frac{1}{x} \cdot \frac{1}{2} + \frac{x}{x} \cdot \frac{x}{6} = \frac{6}{6} \cdot \frac{18}{x}$

LCD = $6x$

$\frac{3x}{6x} + \frac{x^2}{6x} = \frac{108}{6x}$

$3x + x^2 = 108$

$x^2 + 3x - 108 = 0$

$(x+12)(x-9) = 0$

$\boxed{x = -12 \quad x = 9}$

$\frac{1}{2} + \frac{-12}{6} = \frac{18}{-12}$

$\frac{1}{2} + -2 = -1.5 \checkmark$

$\frac{1}{2} + \frac{9}{6} = \frac{18}{9}$

$\frac{1}{2} + 1.5 = 2 \checkmark$

32)

	Amt complete in 1 day alone	Time together	Portion Completed
Amita	$\frac{1}{4}$	\bullet X	$= \frac{X}{4}$
Fran	$\frac{1}{6}$	\bullet X	$= \frac{X}{6}$

$$\frac{3}{3} \cdot \frac{X}{4} + \frac{2}{2} \frac{X}{6} = 1 \cdot \frac{12}{12}$$

$$LCD = 12$$

$$\cancel{12} \left(\frac{3X}{\cancel{12}} + \frac{2X}{\cancel{12}} = \frac{12}{\cancel{12}} \right) \cancel{12}$$

$$3X + 2X = 12$$

$$5X = 12$$

$$X = 2 \frac{2}{5} \text{ days}$$