



A large auger can fill a grain bin in 5 h less time than a smaller auger. Together they fill the bin in 6 h. How long would it take the larger auger, by itself, to fill the bin?



	Time to fill bin	Fraction done in 1 hour	Fraction done in 6 hours
Small auger	$x$	$\frac{1}{x}$	$\frac{6}{x}$
Large auger	$x-5$	$\frac{1}{x-5}$	$\frac{6}{x-5}$
Together	6 hrs		1

$$x(x-5) \left[ \frac{6}{x} + \frac{6}{x-5} \right] = 1(x)(x-5)$$

$$6(x-5) + 6x = x^2 - 5x$$

$$6x - 30 + 6x = x^2 - 5x$$

$$0 = x^2 - 17x + 30$$

$$0 = (x-15)(x-2)$$

$$x = 15 \text{ or } x = 2$$

**Pre-Calculus 110**  
**Unit 5: Rational Expressions and Equations**

**May 7, 2019: Day #10**

1. Test Friday

## Curriculum Outcomes

**AN4:** Determine equivalent forms of rational expressions (limited to numerators and denominators that are monomials, binomials or trinomials).

**AN5:** Perform operations on rational expressions (limited to numerators and denominators that are monomials, binomials or trinomials).

**AN6:** Solve problems that involve rational equations (limited to numerators and denominators that are monomials, binomials or trinomials).

**AN4:** Determine equivalent forms of rational expressions (limited to numerators and denominators that are monomials, binomials or trinomials).

#### ACHIEVEMENT INDICATORS

§ Compare the strategies for writing equivalent forms of rational expressions to the strategies for writing equivalent forms of rational numbers.

§ Explain why a given value is non-permissible for a given rational expression.

§ Determine the non-permissible values for a rational expression.

§ Determine a rational expression that is equivalent to a given rational expression by multiplying the numerator and denominator by the same factor (limited to a monomial or a binomial), and state the non-permissible values of the equivalent rational expression.

§ Simplify a rational expression.

§ Explain why the non-permissible values of a given rational expression and its simplified form are the same.

**AN5:** Perform operations on rational expressions (limited to numerators and denominators that are monomials, binomials or trinomials).

ACHIEVEMENT INDICATORS

§ Compare the strategies for performing a given operation on rational expressions to the strategies for performing the same operation on rational numbers.

§ Determine the non-permissible values when performing operations on rational expressions.

§ Determine, in simplified form, the sum or difference of rational expressions with the same denominator.

§ Determine, in simplified form, the sum or difference of rational expressions in which the denominators are not the same and which may or may not contain common factors.

§ Determine, in simplified form, the product or quotient of rational expressions.

§ Simplify an expression that involves two or more operations on rational expressions.

**AN6:** Solve problems that involve rational equations (limited to numerators and denominators that are monomials, binomials or trinomials).

ACHIEVEMENT INDICATORS

§ Determine the non-permissible values for the variable in a rational equation.

§ Determine the solution to a rational equation algebraically, and explain the process used to solve the equation.

§ Explain why a value obtained in solving a rational equation may not be a solution of the equation.

§ Solve problems by modeling a situation using a rational equation.

Format:

5 Multiple Choice

5 Open Response

1 Bonus

Total = 25 Marks

Topics:

1. Identifying non-permissible roots  $\frac{3}{x-4}$   $x \neq 4$
2. Simplifying rational expressions  $\frac{x-1}{x-4}$   $\frac{x-1}{4-x} (-1)$
3. Multiplying and dividing rational expressions
4. Adding and subtracting rational expressions
5. Solving rational equations  $\frac{5-9}{1-9} = \frac{-4}{-8} = -1$   $\frac{3-6}{6-3} = \frac{-3}{3} = -1$
6. Identify the error and correct
7. Word Problem  $\frac{10-f}{f-10} = \frac{2}{-2} = -1$



Multiple Choice

9.352-354

#3, 5, 6, 9, 10, 11, 13, 14

15, 20, 22, 23

For #1 to #5, choose the best answer.

1. What are the non-permissible values for the rational expression  $\frac{x(x+2)}{(x-3)(x+1)}$ ?

- A 0 and -2
- B -3 and 1
- C 0 and 2
- D 3 and -1

2. Simplify the rational expression  $\frac{x^2 - 7x + 6}{x^2 - 2x - 24}$  for all permissible values of x.

- A  $\frac{x+1}{x-4}$
- B  $\frac{x-1}{x+4}$
- C  $\frac{x+1}{x+4}$
- D  $\frac{x-1}{x-4}$

3. Simplify  $\frac{8}{3y} + \frac{5y}{4} - \frac{5}{8}$  for all permissible values of y.

- A  $\frac{30y^2 - 15y + 64}{24y}$
- B  $\frac{30y^2 + 79}{24y}$
- C  $\frac{15y^2 + 64}{24y}$
- D  $\frac{5y + 3}{24y}$

4. Simplify  $\frac{3x-12}{9x^2} \div \frac{x-4}{3x}$ ,  $x \neq 0$  and  $x \neq 4$ .

- A  $\frac{1}{x}$
- B  $\frac{16}{3x}$
- C x
- D  $\frac{-12}{x-4}$

5. Solve  $\frac{6}{t-3} = \frac{4}{t+4}$ ,  $t \neq 3$  and  $t \neq -4$ .

- A  $-\frac{1}{2}$
- B -1
- C -6
- D -18

**Short Answer**

6. Identify all non-permissible values.

$$\frac{3x - 5}{x^2 - 9} \times \frac{2x - 6}{3x^2 - 2x - 5} \div \frac{x - 3}{x + 3}$$

7. If both rational expressions are defined and equivalent, what is the value of  $k$ ?

$$\frac{2x^2 + kx - 10}{2x^2 + 7x + 6} = \frac{2x - 5}{2x + 3}$$

8. Add or subtract as indicated. Give your answer in simplest form.

$$\frac{5y}{6} + \frac{1}{y - 2} - \frac{y + 1}{3y - 6}$$

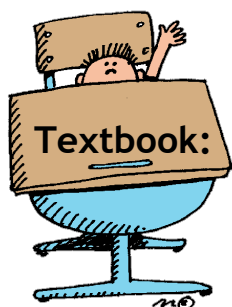
11. Solve  $2 - \frac{5}{x^2 - x - 6} = \frac{x + 3}{x + 2}$ . Identify all non-permissible values.

**13.** A plane is flying from Winnipeg to Calgary against a strong headwind of 50 km/h. The plane takes  $\frac{1}{2}$  h longer for this flight than it would take in calm air. If the distance from Winnipeg to Calgary is 1200 km, what is the speed of the plane in calm air, to the nearest kilometre per hour?

Solve each rational equation. Identify all non-permissible values.

$$\frac{3}{x+2} + \frac{5}{x-3} = \frac{3x}{x^2 - x - 6} - 1$$

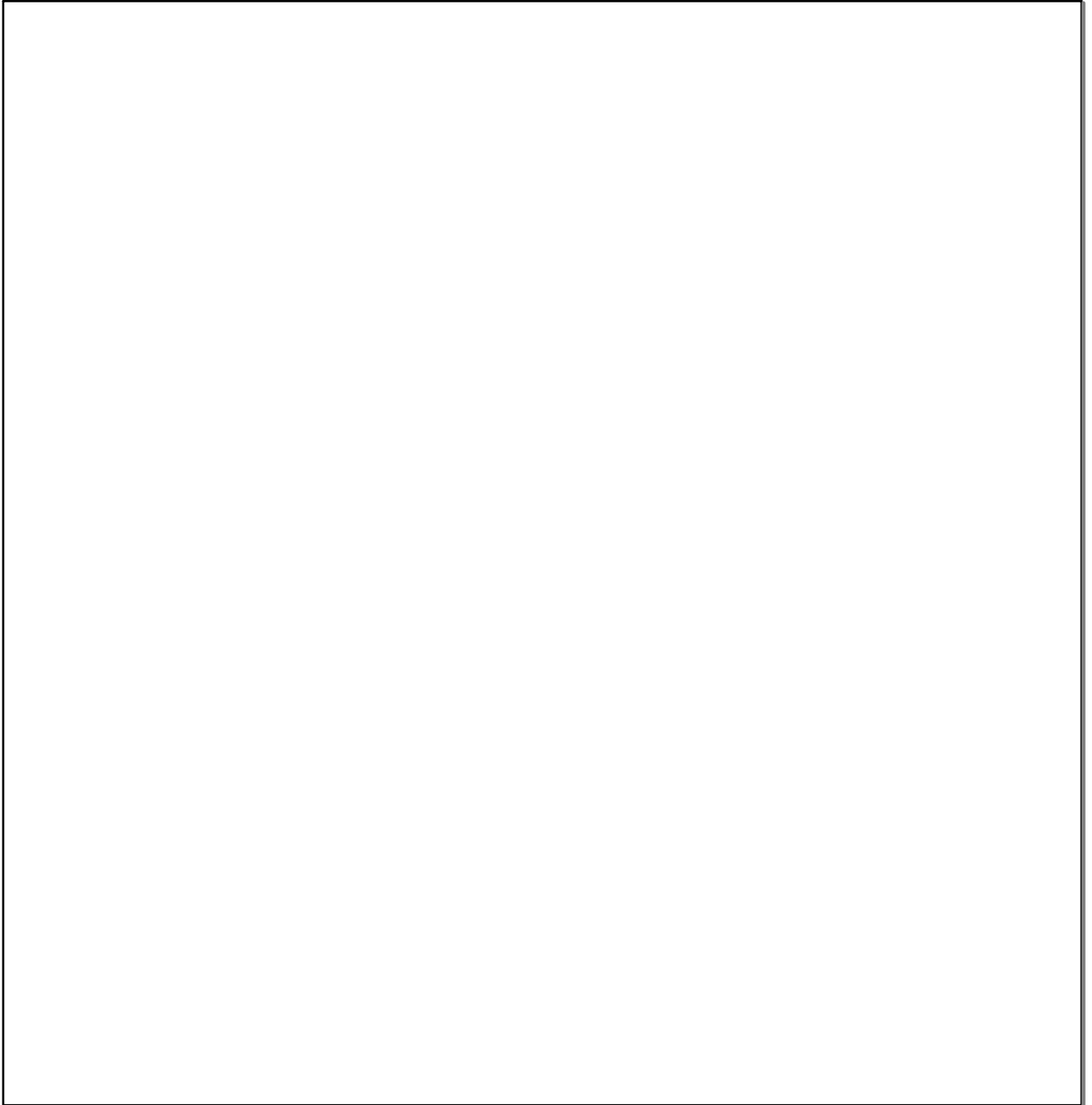
$$\frac{3m}{m-3} + 2 = \frac{3m-1}{m+3}$$



**Minimum Preparation:**

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# 3, 5, 6b, 9, 10, 11, 13, 14, 15, 20, 22, 23



## Attachments

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Standard Form Demor.GSP

Warm ups.notebook