



Big idea

In this unit you will learn how to simplify expressions that have variables in both the numerators and the denominators. This is done in preparation for a future unit called Rational Functions where we will learn how to graph rational expressions more complicated than just $f(x) = \frac{1}{x}$.



Feedback & Assessment of Your Success

Date	Pages	Topics	Finished assignment pages?	Summarized notes in a journal?	How many extra practice questions did you try in each topic?	Tentative TEST date: _____
			Made corrections?	Added your own explanations?	Questions to ask the teacher:	
2days	2-8	Factoring some new methods (AP) Journal #1				
1.5days	9-11	Simplify/Multiply/Divide Rational Expressions (MCR) Journal #2,3				
1.5days	12-14	Add/Subtract Rational Expressions (MCR) Journal #4				

ASSIGNMENT Factoring

Common Factoring and Factoring by Grouping (gr10)

1. $16x^2y^2 - 24xy$

2. $-24a^3b^2 + 48a^2b^2 - 4ab$

3. $4s(r + u) - 3(r + u)$

4. $3x(6 - y) + 2(y - 6)$

5. $y^2 + 3y - ay - 3a$

6. $25x^2 - 5x - 15xy + 3y$

Difference of Squares Factoring (gr10) careful! some are impossible to factor over real numbers

7. $4x^2 - 25$

8. $121x^2 - 9y^2$

9. $100r^2 + 81s^2$

10. $25x^2 - 16y$

Trinomial - Criss Cross Factoring (gr10)

11. $2x^2 + 7x + 3$

12. $56x^2 - 9x - 2$

13. $6x^2 - 5xy - 4y^2$

14. $20x^6 - 59x^3y^2 + 42y^4$

15. $6x^2 + 10x - 4$ don't forget to check for common factor first

16. $12c^2 - 26c - 16$

17. $100 - 20x + x^2$

18. $10x^4 - 3x^2 - 18$
factor over both rational & irrational numbers

19. $12r^2 + 7rs - 10s^2$

20. $49x^2 + 70xy + 16y^2$

Mix of Factoring (gr10)

21. $2ax + 4a^2 x^2$

22. $x^3 + x^2 + x + 1$

23. $x^2 - 6$ factor over irrational numbers

24. $x^2 + 100$

25. $400 - 25y^2$

26. $x^4 - 13x^2 + 36$

27. $m^4 - 38m^2n^2 + 72n^4$
factor over both rational & irrational numbers

28. $30x^4 + 87x^2 + 30$

29. $5y^2 - 14y - 3$

30. $81x^4 - 16$

31. $4x^8 - 13x^4 + 9$

32. $2m^2 - 5m + 6$

33. $5r^2s - 7rs + 2s$

34. $8y^2 + 12xy - 8x^2$

35. $16m^2 - 56mn + 49n^2$

36. $x^2 + 3x + xw + 3w$

37. $5x^5 + 30x^3 + 45x$

38. $2x^2 - 7xy + 6y^2$

39. $x^4 - 1$

40. $x^4 + 4x^2 - 45$

factor over both rational & irrational numbers

New types of Factoring (AP)

41. $4^6 - 27x^3$ **Difference of Cubes**

42. $343m^3 + 64n^3$ **Sum of Cubes**

43. $216\tan^3x - 125$

Notation Note: $\sin^2\theta = (\sin\theta)^2$ not $\sin\theta^2$

44. $27x^3 + 8$

45. $\cos^3x - e^{3x}$

46. $3x^4 - 192x$

47. $x^6 - 7x^3 - 8$

48. $-54x^4 - 250x$

49. $(a+b)^2 - c^2$

50. $(5c + 3)^2 - (2c + 1)^2$

51. $16x^2 - 8x + 1 - 9x^6$

52. $(x - y)^2 - 5(x - y) + 6$

53. $200 - 2(6x - 4)^2$

54. $5x^5 - 135x^4 + 5x^3$

55. $4y^4 - 9x^2 - 6x - 1$

56. $1 - x^2 - 2xy - y^2$

57. $(x^2 - x)^2 - 26(x^2 - x) + 120$

58. $(x^2 + x)^2 - 8(x^2 + x) + 12$

59. $x^2 + x + \frac{12}{x^2 + x} - 8$

60. $(x^2 + x) + \frac{24}{x^2 + x} - 14$

Factor without expanding first – think what is in common that you should divide (**AP**)

hint: smallest exponent on the common thing is the one to divide by, also remember if you divide same bases, exponents subtract

61. $2x^2(x+3) + 4x(x+3)^2$

62. $27(g-h)^3 - 12(h-g)$

63. $(x^2-5)^4(3x^2) - x^3(4)(x^2-5)^3(2x)$

64. $3x^2(2x+5)^{1/2} - x^3(2x+5)^{-1/2}$

65. $3(x^2+4)^{1/3} - 6x^2(x^2+4)^{-2/3}$

66. $(x^2+1)^{-1/2}(x-7)^2 + (x^2+1)^{1/2}(x-7)$

ASSIGNMENT Simplify/Multiply/Divide Rational Expressions (MCR)

1. Do a prime factor tree for 360 and 2100

2. Recall the rules of simplifying fractions. Try to explain how this can be done without a calculator by using the prime factorization. These same steps will apply to rational expressions. (**Rational expressions** are fractions with variables in both numerator and denominator)

3. a) $\frac{360}{2100}$ steps:

b) $\frac{20}{33} \times \frac{11}{50}$ steps:

c) $\frac{63}{40} \div \frac{21}{52}$ steps:

4. $y = \frac{3x}{3x^2 - 6x}$ simplify, then sketch.

5. Note that there are two values of x that make the original expression undefined. Show how these affect the graph you drew. This is why it is very important to state restrictions.

Simplify the rational expressions and state the restrictions

6. $\frac{x^4 + x^3 - 6x^2}{x^3 - 9x}$

7. $\frac{-21x^2y}{6a^2b} \times \frac{15ab^4}{14x^2}$

Simplify the rational expressions and state the restrictions

8.
$$\frac{9-x^2}{x^2-x-12} \times \frac{x^2-4x}{2x-6}$$
 simplify, then sketch.

9.
$$\frac{5a}{12yz^2} \div \frac{15a^5}{18y^2z^5}$$

10.
$$\frac{4x+24}{x^5} \div \frac{x+6}{x^3}$$

11.
$$\frac{x^2+5x+6}{3x+12} \div (x^2-10x-24)$$

12.
$$\frac{x^3+1}{x^3+2x^2-4x-8} \cdot \frac{x^2+4x+4}{x^2-1}$$

13.
$$\frac{x^2+x-6}{x^2+3x-4} \div \frac{x^2+4x+3}{x^2+2x-8}$$

Simplify the rational expressions and state the restrictions

14.
$$\frac{x+4}{x+5} \div \frac{x^2+5x+6}{x^2+7x+10} \div \frac{x+1}{x-1}$$

15.
$$\frac{x-2}{x-6} \div \frac{x^2-x-2}{x^2+2x+1} \div \frac{x+1}{x^2-8x+12}$$

simplify, then sketch.

16.
$$\frac{42x^3y^5}{-12x^4y^2}$$

17.
$$\frac{2x^2-13x+6}{x^2-36}$$

18.
$$\frac{18-2m^2}{m^2-6m+9}$$

19.
$$\frac{2a-a^2}{(3a+4)(a-2)-2(a-2)}$$

ASSIGNMENT Add/Subtract Rational Expressions (MCR)

1. Do prime factors of 24 and 90
2. Steps for LCM/LCD

3. Recall the rules of adding fractions. Try to explain how this can be done without a calculator by using the LCM.
- steps

$$\frac{1}{24} + \frac{7}{90}$$

Find the LCM for the following

4. 420 and 525
5. $42x^3y$ and $70x^2y$ and $45xy^4z$

6. $2x^2(x+2)$ and $6x(x+2)^2(x-3)$
7. $2x^2 - 8x$ and $2x^2 - 7x - 4$

8. $18x^3(x+3)(x+6)$ and $x^2(x+6)^2 + 9x(x+6)$
9. Find LCD, no need to simplify yet
- $$\frac{1}{x^2-4} + \frac{1}{x^2-3x+2}$$

Simplify the rational expressions and state the restrictions

10.
$$\frac{a+7}{2a^2} - \frac{3}{5a}$$

11.
$$\frac{1}{x^2} - \frac{1}{x^2+2x}$$

12.
$$\frac{3x+1}{x^2-5x} + \frac{x+4}{5x-x^2}$$

13.
$$\frac{2}{x^2-2x-24} - \frac{5}{x^2+7x+12}$$

Simplify the rational expressions and state the restrictions

14.
$$\frac{\frac{t}{t+3} - \frac{2}{5}}{t-2}$$

15.
$$y - \frac{x}{\frac{x}{y} + \frac{y}{x}}$$

16.
$$\frac{x^2 - x}{2x^2 + x} - \frac{3x^2 + 1 - 4x}{-3 - 5x + 2x^2}$$

17.
$$\frac{4x}{x^2 - 2x - 3} - \frac{3}{x^2 - 5x + 6}$$