

Lesson 18: Overcoming a Second Obstacle in Factoring—What If There Is a Remainder?

Classwork

Opening Exercise

Write the rational number $\frac{13}{4}$ as a mixed number.

Example 1

a. Find the quotient by factoring the numerator.

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

b. Find the quotient.

$$\frac{x^2 + 3x + 5}{x + 2}$$

Example 2

a. Find the quotient by factoring the numerator.

$$\frac{x^3 - 8}{x - 2}$$

b. Find the quotient.

$$\frac{x^3 - 4}{x - 2}$$

Exercises 1–10

Find each quotient by inspection.

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

2. $\frac{2x-7}{x-3}$

3. $\frac{x^2-21}{x+4}$

Find each quotient by using the reverse tabular method.

4. $\frac{x^2+4x+10}{x-8}$

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

6. $\frac{x^2-2x-19}{x-1}$

Find each quotient by using long division.

7. $\frac{x^2-x-25}{x+6}$

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

9. $\frac{4x^3+5x-8}{2x-5}$

Rewrite the numerator in the form $(x - h)^2 + k$ by completing the square. Then find the quotient.

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

Mental Math

$\frac{x^2 - 9}{x + 3}$	$\frac{x^2 - 4x + 3}{x - 1}$	$\frac{x^2 - 16}{x + 4}$	$\frac{x^2 - 3x - 4}{x + 1}$
$\frac{x^3 - 3x^2}{x - 3}$	$\frac{x^4 - x^2}{x^2 - 1}$	$\frac{x^2 + x - 6}{x + 3}$	$\frac{x^2 - 4}{x + 2}$
$\frac{x^2 - 8x + 12}{x - 2}$	$\frac{x^2 - 36}{x + 6}$	$\frac{x^2 + 6x + 8}{x + 4}$	$\frac{x^2 - 4}{x - 2}$
$\frac{x^2 - x - 20}{x + 4}$	$\frac{x^2 - 25}{x + 5}$	$\frac{x^2 - 2x + 1}{x - 1}$	$\frac{x^2 - 3x + 2}{x - 2}$
$\frac{x^2 + 4x - 5}{x - 1}$	$\frac{x^2 - 25}{x - 5}$	$\frac{x^2 - 10x}{x}$	$\frac{x^2 - 12x + 20}{x - 2}$
$\frac{x^2 + 5x + 4}{x + 4}$	$\frac{x^2 - 1}{x - 1}$	$\frac{x^2 + 16x + 64}{x + 8}$	$\frac{x^2 + 9x + 8}{x + 1}$

Problem Set

1. For each pair of problems, find the first quotient by factoring the numerator. Then, find the second quotient by using the first quotient.

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|----|--------------------------------|--------------------------------|
| a. | $\frac{3x - 6}{x - 2}$ | $\frac{3x - 9}{x - 2}$ |
| b. | $\frac{x^2 - 5x - 14}{x - 7}$ | $\frac{x^2 - 5x + 2}{x - 7}$ |
| c. | $\frac{x^3 + 1}{x + 1}$ | $\frac{x^3}{x + 1}$ |
| d. | $\frac{x^2 - 13x + 36}{x - 4}$ | $\frac{x^2 - 13x + 30}{x - 4}$ |

Find each quotient by using the reverse tabular method.

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|----|-------------------------------------|----|-------------------------------|
| 2. | $\frac{x^3 - 9x^2 + 5x + 2}{x - 1}$ | 3. | $\frac{x^2 + x + 10}{x + 12}$ |
| 4. | $\frac{2x + 6}{x - 8}$ | 5. | $\frac{x^2 + 8}{x + 3}$ |

Find each quotient by using long division.

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|-----|----------------------------------|-----|---|
| 6. | $\frac{x^4 - 9x^2 + 10x}{x + 2}$ | 7. | $\frac{x^5 - 35}{x - 2}$ |
| 8. | $\frac{x^2}{x - 6}$ | 9. | $\frac{x^3 + 2x^2 + 8x + 1}{x + 5}$ |
| 10. | $\frac{x^3 + 2x + 11}{x - 1}$ | 11. | $\frac{x^4 + 3x^3 - 2x^2 + 6x - 15}{x}$ |

12. Rewrite the numerator in the form $(x - h)^2 + k$ by completing the square. Then, find the quotient.

$$\frac{x^2 - 6x - 10}{x - 3}$$