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Additional Exercises 7.1**Form I**

The Greatest Common Factor and Factoring by Grouping

Find the greatest common factor of each list of monomials.

1. $10x^2$ and $15x$ 1. _____

2. $12y^3$ and $8y^2$ 2. _____

3. $16a^2$, $24a^3$ and $32a^4$ 3. _____

4. $6x^3y^2$, $15x^2y$ and $21x^4$ 4. _____

Factor the greatest common factor from the polynomial. If there is no factor other than 1 and the polynomial cannot be factored, so state.

5. $5x^2 + 20$ 5. _____

6. $6a^3 + 18a^2$ 6. _____

7. $3y^3 + 5y^2 + 6y$ 7. _____

8. $24x^4 + 18x^2 - 12x$ 8. _____

9. $16x^4y^3 - 20x^3y^2 + 12xy$ 9. _____

10. $4x^5y^2 + 10x^4y^4 - 14x^3y^3$ 10. _____

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Factor out the common binomial factor from each polynomial.

11. $x(y + 14) + 6(y + 14)$

11. _____

12. $a(b - 7) - 3(b - 7)$

12. _____

13. $11(x + 10) - y(x + 10)$

13. _____

Factor by grouping.

14. $xy + 4y + 2x + 8$

14. _____

15. $ab + 3b - 6a - 18$

15. _____

16. $xy - 5y + x - 5$

16. _____

17. $x^3 - 2x^2 + 2x - 4$

17. _____

18. $6ab + 2b + 9a + 3$

18. _____

19. $5xy + 2y - 10x - 4$

19. _____

20. $x^4 - x^3 + 2x - 2$

20. _____

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Additional Exercises 7.1**Form II**

The Greatest Common Factor and Factoring by Grouping

Find the greatest common factor of each list of monomials.

1. $12x^2$ and $20x$ 1. _____

2. $45x^2y^2$ and $36xy$ 2. _____

3. $64a^9b^2$ and $88a^5b^9$ 3. _____

4. $24m^5n^3$, $18m^4n^4$ and $30m^3n^2$ 4. _____

Factor the greatest common factor from the polynomial. If there is no factor other than 1 and the polynomial cannot be factored, so state.

5. $14x^3 + 21x^2$ 5. _____

6. $6x^5 - 5x^7$ 6. _____

7. $24a^9 - 30a^5 + 15a^3$ 7. _____

8. $20x^6y^3 - 44x^5y^4 + 36x^3y^6$ 8. _____

9. $40x^8y^8 - 16x^3y^6 - 20x^6y^4$ 9. _____

10. $15x^6y^5 - 25x^4y^3 + 55x^3y^4 - 60x^2y^4$ 10. _____

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Factor out the common binomial factor from each polynomial.

11. $x(y - 7) - 2(y - 7)$

11. _____

12. $a^2(b + 3) + 4(b + 3)$

12. _____

13. $4a(8 + b) - (8 + b)$

13. _____

Factor by grouping.

14. $x^3 - 2x^2 - 3x + 6$

14. _____

15. $xy + 5y + 4x + 20$

15. _____

16. $b^3 + 2ab^2 + 4b + 8a$

16. _____

17. $6xy + 4y + 15x + 10$

17. _____

18. $14xy - 2x - 21y + 3$

18. _____

19. $4x^4 - 8x^3 - 3x + 6$

19. _____

20. $20a^3 + 15a^2b - 16ab^2 - 12b^3$

20. _____

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Additional Exercises 7.1**Form III**

The Greatest Common Factor and Factoring by Grouping

Find the greatest common factor of each list of monomials.

1. $28x^4$ and $24x^2$ 1. _____

2. $18x^8$, $45x^6$ and $21x^4$ 2. _____

3. $12x^6y^4$, $30x^9y^2$ and $84x^5y^5$ 3. _____

Factor the greatest common factor from the polynomial. If there is no factor other than 1 and the polynomial cannot be factored, so state.

4. $21y^3 - 9y^2 + 12y$ 4. _____

5. $32x^5 + 24x^3y - 96xy^3$ 5. _____

6. $20a^3 - 15a^2 + 5a$ 6. _____

7. $48x^8y^9 + 40x^6y^6 + 64x^4y^3$ 7. _____

8. $16m^3n^3 - 48n^2n - 64mn^2$ 8. _____

Factor out the common binomial factor from each polynomial.

9. $x^2(x-3) + 6(x-3)$ 9. _____

10. $y(x+7) - (x+7)$ 10. _____

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11. $6x^2(2x-7) + (2x-7)$

11. _____

Factor by grouping.

12. $x^4 - 3x^3 - 4x^2 + 12x$

12. _____

13. $ab - 4b^2 + 6a - 24b$

13. _____

14. $10xy + 16y - 5x - 8$

14. _____

15. $6mn + 2n - 27m - 9$

15. _____

16. $9x^3 - 6x^2 + 15x - 10$

16. _____

17. $20x^4 - 25x^3 + 12x^2 - 15x$

17. _____

18. $12a^3 - 16a^2 - 9a + 12$

18. _____

Solve.

19. The area of a rectangle is $2x^2 + 6xy + 4xy + 12y^2$. The width of the rectangle is $x + 3y$. Write a polynomial for the length of the rectangle.

19. _____

20. The width of a rectangle is $2x + y$. The length of the rectangle is $2x^2 - 5$. Write a polynomial for the area of the rectangle.

20. _____

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Additional Exercises 7.2

Form I

Factoring Trinomials Whose Leading Coefficient is 1

Factor each trinomial, or state that the trinomial is prime.

1. $x^2 + 5x + 4$ 1. _____

2. $x^2 + 7x + 12$ 2. _____

3. $y^2 + 8y + 12$ 3. _____

4. $a^2 - 6a + 8$ 4. _____

5. $x^2 - 8x + 15$ 5. _____

6. $y^2 - 8y + 7$ 6. _____

7. $a^2 + a - 6$ 7. _____

8. $x^2 - 3x - 40$ 8. _____

9. $m^2 - 3m - 4$ 9. _____

10. $a^2 + 4ab - 21b^2$ 10. _____

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11. $a^2 - 6xy - 27y^2$

11. _____

12. $x^2 - 6xy - 27y^2$

12. _____

13. $a^2 - 11a + 30$

13. _____

14. $x^2 + 11x + 28$

14. _____

Factor each trinomial completely.

15. $2x^2 - 4x - 6$

15. _____

16. $3a^2 - 15a + 18$

16. _____

17. $x^3 + 7x^2 + 6x$

17. _____

18. $x^3y + 2x^2y - 35xy$

18. _____

19. $4x^2 - 32x + 48$

19. _____

20. $8a^3 + 56a^2 + 96a$

20. _____

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Additional Exercises 7.2

Form II

Factoring Trinomials Whose Leading Coefficient is 1

Factor each trinomial, or state that the trinomial is prime.

1. $x^2 + 10x + 16$

1. _____

2. $x^2 - 10x + 24$

2. _____

3. $x^2 - x - 30$

3. _____

4. $a^2 + 10a + 21$

4. _____

5. $y^2 + 9y - 36$

5. _____

6. $x^2 - 15x + 54$

6. _____

7. $x^2 + 5x - 36$

7. _____

8. $a^2 + 14a + 33$

8. _____

9. $m^2 + 6m + 10$

9. _____

10. $x^2 - 11x + 10$

10. _____

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11. $y^2 + y - 42$

11. _____

12. $a^2 + 9a + 20$

12. _____

13. $x^2 - 9x - 8$

13. _____

14. $y^2 - 12y + 32$

14. _____

Factor each trinomial completely.

15. $5x^2 + 10x - 15$

15. _____

16. $4x^2 + 28x + 48$

16. _____

17. $x^4 + 2x^3 - 48x^2$

17. _____

18. $2a^3 + 18a^2 + 40a$

18. _____

19. $x^3y^2 + 3x^2y^2 - 40xy^2$

19. _____

20. $6y^3 + 66y^2 + 148y$

20. _____

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Additional Exercises 7.2

Form III

Factoring Trinomials Whose Leading Coefficient is 1

Factor each trinomial, or state that the trinomial is prime.

1. $x^2 + 14x + 45$

1. _____

2. $a^2 - 5a - 24$

2. _____

3. $y^2 + 9y + 14$

3. _____

4. $x^2 - 18x + 32$

4. _____

5. $x^2 - 13x + 12$

5. _____

6. $y^2 - 3y - 88$

6. _____

7. $a^2 + 15ab - 16b^2$

7. _____

8. $x^2 + 3x + 12$

8. _____

9. $y^2 - 16y + 39$

9. _____

10. $a^2 - 25a + 136$

10. _____

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11. $x^2 + 21xy + 54y^2$

11. _____

12. $y^2 - 8y + 12$

12. _____

13. $a^2 - 11a + 28$

13. _____

14. $x^2 - 11xy - 60y^2$

14. _____

Factor each trinomial completely.

15. $4x^3 - 8x^2 + 16x$

15. _____

16. $5x^2 - 30x - 80$

16. _____

17. $3a^3 + 27a^2 + 60a$

17. _____

18. $x^4y + 2x^3y - 24x^2y$

18. _____

19. $6y^3 - 30y^2 - 216$

19. _____

20. $8x^3 + 56x^2y + 96xy^2$

20. _____

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Additional Exercises 7.3

Form I

Factoring Trinomials Whose Leading Coefficient is Not 1

Use the method of your choice to factor each trinomial, or state that the trinomial is prime.

1. $2x^2 + 9x + 4$ 1. _____

2. $3x^2 + 16x + 5$ 2. _____

3. $4a^2 + 11a + 6$ 3. _____

4. $3x^2 + 22x - 16$ 4. _____

5. $2y^2 - y - 15$ 5. _____

6. $3x^2 - 14x - 5$ 6. _____

7. $4a^2 - 13a + 10$ 7. _____

8. $6x^2 - 19x + 3$ 8. _____

9. $6y^2 - 13y + 6$ 9. _____

10. $8x^2 + 6x + 1$ 10. _____

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11. $10x^2 - 17x + 3$

11. _____

12. $12y^2 + 4y - 5$

12. _____

13. $16a^2 - 34a - 15$

13. _____

Factor completely.

14. $6x^2 + 26x + 8$

14. _____

15. $24x^2 - 66x + 15$

15. _____

16. $10a^4 + a^3 - 2a^2$

16. _____

17. $8y^3 + 28y^2 + 24y$

17. _____

18. $3x^4 - 4x^3 - 4x^2$

18. _____

19. $8a^3 - 18a^2 - 18a$

19. _____

20. $10x^2 + 45x + 50$

20. _____

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Additional Exercises 7.3

Form II

Factoring Trinomials Whose Leading Coefficient is Not 1

Use the method of your choice to factor each trinomial, or state that the trinomial is prime.

1. $6x^2 + 11x + 3$ 1. _____

2. $4x^2 + 11x + 6$ 2. _____

3. $10x^2 + 27x + 5$ 3. _____

4. $8x^2 - 14x + 5$ 4. _____

5. $12x^2 - 25x + 5$ 5. _____

6. $10x^2 + x - 24$ 6. _____

7. $8x^2 + 33x + 4$ 7. _____

8. $14x^2 + 17x - 6$ 8. _____

9. $6x^2 - 7x - 10$ 9. _____

10. $16x^2 - 8x - 15$ 10. _____

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11. $12x^2 + 52xy - 9y^2$

11. _____

12. $16x^2 + 34x - 15$

12. _____

13. $3x^2 - 5xy - 28y^2$

13. _____

Factor completely.

14. $8a^2 + 12a + 4$

14. _____

15. $18a^2 + 66a - 24$

15. _____

16. $20y^2 - 35y - 10$

16. _____

17. $12x^3 + 18x^2 + 24x$

17. _____

18. $12a^3 - 12a^2 - 45a$

18. _____

19. $32y^3 + 68y^2 - 30y$

19. _____

20. $48x^2 - 40x - 32$

20. _____

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Additional Exercises 7.3**Form III**

Factoring Trinomials Whose Leading Coefficient is Not 1

Use the method of your choice to factor each polynomial, or state that the polynomial is prime.

1. $7x^2 + 18x + 11$ 1. _____

2. $2a^2 - a - 28$ 2. _____

3. $2x^2 + 7x + 1$ 3. _____

4. $15x^2 + 28x + 12$ 4. _____

5. $9x^2 + 14x - 8$ 5. _____

6. $10a^2 + 7a - 12$ 6. _____

7. $24y^2 + 29y - 4$ 7. _____

8. $15x^2 + xy - 2y^2$ 8. _____

9. $x^4 + 7x^3 + 6x^2$ 9. _____

10. $15b^2 + 14b - 8$ 10. _____

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11. $20x^2 + 21x - 27$

11. _____

12. $4x^2 - 14xy - 8y^2$

12. _____

13. $10a^2 - 11a + 18$

13. _____

14. $42x^2 + 35x - 42$

14. _____

15. $12a^2 + 19a + 4$

15. _____

16. $18y^2 - 78y - 60$

16. _____

17. $60x^2 + 35xy + 5y^2$

17. _____

18. $8x^2 - 30x + 25$

18. _____

19. $16x^3y^4 + 40x^2y^5 + 25xy^6$

19. _____

20. The area of a rectangle is $36x^2 + 66x + 30$. If the length is $6x + 6$, express the width as a binomial.

20. _____

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Additional Exercises 7.4
Form I
Factoring Special Forms

Factor each difference of two squares.

1. $x^2 - 64$

1. _____

2. $a^2 - 1$

2. _____

3. $y^2 - 100$

3. _____

4. $4x^2 - 25$

4. _____

Factor any perfect square trinomials, or state that the polynomial is prime.

5. $x^2 + 10x + 25$

5. _____

6. $y^2 + 6y + 9$

6. _____

7. $a^2 - 8a + 16$

7. _____

8. $a^2 - 20a + 100$

8. _____

Factor each sum or difference of two cubes.

9. $x^3 - 1$

9. _____

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10. $y^3 + 64$

10. _____

11. $x^3 - 8y^3$

11. _____

12. $a^3 + 27b^3$

12. _____

Factor each polynomial completely, or state that the polynomial is prime.

13. $2x^2 - 2$

13. _____

14. $3x^2 - 24x + 48$

14. _____

15. $x^3 - 16x$

15. _____

16. $5y^2 + 20y + 20$

16. _____

17. $7x^2 - 28$

17. _____

18. $100x^2 - 400y^2$

18. _____

19. $4a^2 - 40a + 100$

19. _____

20. $8x^2 + 48x + 72$

20. _____

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Additional Exercises 7.4
Form II
Factoring Special Forms

Factor each difference of two squares.

1. $x^2 - 121$

1. _____

2. $4a^2 - 81$

2. _____

3. $16y^2 - 169$

3. _____

4. $x^2 - 225$

4. _____

Factor any perfect square trinomials, or state that the polynomial is prime.

5. $x^2 - 4x + 4$

5. _____

6. $y^2 + 3y + 9$

6. _____

7. $x^2 - 10xy + 25y^2$

7. _____

8. $4x^2 + 6xy + 9$

8. _____

Factor each sum or difference of two cubes.

9. $x^3 - 1000$

9. _____

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10. $a^3 + 8b^3$ 10. _____

11. $y^3 - 27$ 11. _____

12. $25x^2 + 30xy + 9y^2$ 12. _____

Factor each polynomial completely, or state that the polynomial is prime.

13. $5x^2 - 20$ 13. _____

14. $12x^2 + 60x + 75$ 14. _____

15. $x^2 + 25$ 15. _____

16. $ab^4 - 64a^3b^2$ 16. _____

17. $9y^3 - 9y$ 17. _____

18. $12x^3 + 84x^2 + 147x$ 18. _____

19. $x^4 - 16$ 19. _____

20. $20x^2 - 125$ 20. _____

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Additional Exercises 7.4
Form III
Factoring Special Forms

Factor each difference of two squares.

1. $49x^2 - 64$

1. _____

2. $y^2 + 16$

2. _____

3. $x^2 - 12x + 36$

3. _____

4. $18a^2 - 72$

4. _____

5. $9x^2 - 30x + 25$

5. _____

6. $32x^2 + 48x + 18$

6. _____

7. $a^3 + 125b^3$

7. _____

8. $49x^2 + 14x + 1$

8. _____

9. $4x^3 - 36xy + 81y^2$

9. _____

10. $8 - m^3$

10. _____

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11. $32x^2 - 98$

11. _____

12. $16x^2 + 64y^2$

12. _____

13. $20x^2 + 100xy + 125y^2$

13. _____

14. $54x^4 + 128y^3$

14. _____

15. $25x^2 + 121$

15. _____

16. $16a^3 - 54b^3$

16. _____

17. $81m^2 + 234mn + 169n^2$

17. _____

18. $x^6 - 81y^4$

18. _____

19. $(x+8)^2 - 4$

19. _____

20. $25a^2 + 150a + 225$

20. _____

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Additional Exercises 7.5
Form I
A General Factoring Strategy

Factor each polynomial completely, or state that the polynomial is prime.

1. $x^2 - 64$ 1. _____

2. $8x^2 + 10x - 3$ 2. _____

3. $a^2 - 14a + 14$ 3. _____

4. $3x^2 - 18$ 4. _____

5. $10x^2 + 17x + 3$ 5. _____

6. $x^2 + 9x + 14$ 6. _____

7. $x^4 + 4x^3 - 12x^2$ 7. _____

8. $xy + 5y - 4x - 20$ 8. _____

9. $2a^2 + 4a + 2$ 9. _____

10. $y^3 - 5y^2 - 24y$ 10. _____

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11. $6m^2 + 17m + 12$

11. _____

12. $4x^2 - 64$

12. _____

13. $x^3 - 8x^2 + 4x - 32$

13. _____

14. $14x^2 - 7x - 105$

14. _____

15. $2y^3 - 16$

15. _____

16. $16a^2 + 9b^2$

16. _____

17. $4x^5 - 8x^3$

17. _____

18. $30x^3y - 9x^2y - 12xy$

18. _____

19. $40x^3 - 5$

19. _____

20. $4x^2y^2 + 16y^2 - 32x^2 - 128$

20. _____

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Additional Exercises 7.5
Form II
A General Factoring Strategy

Factor each polynomial completely, or state that the polynomial is prime.

1. $y^3 - 64$ 1. _____

2. $3x^2 - 75$ 2. _____

3. $16x^2 - 16x - 60$ 3. _____

4. $x^2y - 4x^2 + 6y - 24$ 4. _____

5. $21x^2 - 52x + 32$ 5. _____

6. $36x^2 - 25y^2$ 6. _____

7. $4a^3 + 256$ 7. _____

8. $5x^3y - 4xy^2$ 8. _____

9. $6x^2 + 84x + 294$ 9. _____

10. $12x^2 + 41x + 24$ 10. _____

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11. $48y^3 - 6$

11. _____

12. $18xy - 12x + 45y - 10$

12. _____

13. $16a^2 + 81$

13. _____

14. $a^3b^2 + 2a^2b^3 + ab^4$

14. _____

15. $48x^2 - 64x - 35$

15. _____

16. $4x^2 + 8x + 25$

16. _____

17. $3a^3 - 375b^3$

17. _____

18. $16x^4 - 81$

18. _____

19. $18x^3 + 12x^2 + 2x$

19. _____

20. $x^3y^3 - 3xy^3 + 4x^3 - 12x$

20. _____

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Additional Exercises 7.5
Form III
A General Factoring Strategy

Factor each polynomial completely, or state that the polynomial is prime.

1. $a^4 - 81$ 1. _____

2. $18x^2 + 9x - 35$ 2. _____

3. $8y^3 - 125$ 3. _____

4. $12x^2y^2 + 9x^2 - 8y^2 - 6$ 4. _____

5. $44a^2 + 44a - 33$ 5. _____

6. $64y^2 - 25$ 6. _____

7. $5x^2y + 14x^2y - 24xy$ 7. _____

8. $40a^2b + 32a^2 - 50ab^2 - 40ab$ 8. _____

9. $36y^2 - 84y + 49$ 9. _____

10. $81x^4 - 625$ 10. _____

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11. $45a^2 - 120a + 80$

11. _____

12. $16x^2 + 20xy + 25y^2$

12. _____

13. $18x^3y^2 - 25x^2y^3 - 50xy^4$

13. _____

14. $54a^3 + 16$

14. _____

15. $25y^2 - 100$

15. _____

16. $10x^2 - 21x - 108$

16. _____

17. $x^6 - y^6$

17. _____

18. $45x^2 + 162x - 72$

18. _____

19. $a^6 - 8b^6$

19. _____

20. $16a^{10} + 9b^{10}$

20. _____

Additional Exercises 7.6
Form I
Solving Quadratic Equations by Factoring

Solve each equation using the zero product principle.

1. $(x - 9)(x + 7) = 0$ 1. _____

2. $(y + 12)(y + 8) = 0$ 2. _____

3. $(3x + 1)(2x - 1) = 0$ 3. _____

4. $x(x - 5) = 0$ 4. _____

5. $x(x + 3)(5x - 4) = 0$ 5. _____

Use factoring to solve each quadratic equation.

6. $x^2 - 5x + 4 = 0$ 6. _____

7. $3x^2 - 10x - 8 = 0$ 7. _____

8. $x^2 - x = 20$ 8. _____

9. $x^2 + 4x = 12$ 9. _____

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10. $6x^2 = 2 - x$ 10. _____

11. $y^2 = 49$ 11. _____

12. $3x^2 - 27x + 60 = 0$ 12. _____

13. $8x^2 - 28x = 120$ 13. _____

14. $2x(x - 5) = 12$ 14. _____

15. $18y^2 - 30y = 0$ 15. _____

16. $9x^2 = 12x - 4$ 16. _____

Solve.

17. The width of a rectangle is 6 meters less than the length. The area of the rectangle is 40 square meters. Find the dimensions of the rectangle. 17. _____

18. An object is thrown upward from the top of a 160 foot building with an initial velocity of 48 feet per second. The height h of the object after t seconds is given by the quadratic equation $h = -16t^2 + 48t + 160$. How long will it take for the object to hit the ground? 18. _____

Additional Exercises 7.6
Form II
Solving Quadratic Equations by Factoring

Solve each equation using the zero product principle.

1. $(x - 7)(x - 10) = 0$ 1. _____

2. $(y + 4)(y + 12) = 0$ 2. _____

3. $(5x - 4)(x + 9) = 0$ 3. _____

4. $x(x + 6)(x - 7) = 0$ 4. _____

5. $4x(x + 3)(4x - 7) = 0$ 5. _____

Use factoring to solve each quadratic equation.

6. $y^2 - 9y + 8 = 0$ 6. _____

7. $4x^2 + 13x - 12 = 0$ 7. _____

8. $5x^2 - 23x = 10$ 8. _____

9. $4x^2 - 25 = 0$ 9. _____

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10. $3x^2 - 20x = 7$ 10. _____

11. $2x(4x + 13) = 7$ 11. _____

12. $3x^2 = 14x + 80$ 12. _____

13. $25y^2 + 25y + 6 = 0$ 13. _____

14. $24x^2 + 42x = 0$ 14. _____

15. $x^3 + 15x = 8x^2$ 15. _____

16. $4x(x^2 + 2) = 9x^2$ 16. _____

Solve.

17. The length of a rectangle is 8 inches less than twice the width. If the area of the rectangle is 90 square inches, what are the dimensions of the rectangle? 17. _____

18. A window washer accidentally drops a bucket from the top of a 64 foot building. The height h of the bucket after t seconds is given by the quadratic equation $h = -16t^2 + 64$. When will the bucket hit the ground? 18. _____

Additional Exercises 7.6
Form III
Solving Quadratic Equations by Factoring

Solve each equation using the zero product principle.

1. $(7x + 4)(x - 2) = 0$ 1. _____

2. $(x - 8)(3x - 10) = 0$ 2. _____

3. $x(3x + 15) = 0$ 3. _____

4. $y(y + 17) = 0$ 4. _____

5. $x(5x - 1)(x - 8) = 0$ 5. _____

Use factoring to solve each quadratic equation.

6. $5x^2 - 4x - 9 = 0$ 6. _____

7. $x^2 - 24x = 25$ 7. _____

8. $13y^2 - 6y = 0$ 8. _____

9. $16x^2 = 25$ 9. _____

Name _____ Date _____

10. $4x^2 = 20x - 25$ 10. _____

11. $16x^3 + 28x^2 = 30x$ 11. _____

12. $x(3x - 5) = 28$ 12. _____

13. $x(5x + 8) = 4$ 13. _____

14. $3x^3 - 75x = 0$ 14. _____

15. $y(2y + 5) = 2(36 - y)$ 15. _____

16. $5x(x - 5) = 3(x + 4)$ 16. _____

Solve.

17. The length of a rectangle is 6 feet less than twice the width. If the area of the rectangle is 216 square feet, find the dimensions of the rectangle. 17. _____

18. If the sides of a square are increased by 2 meters, the area becomes 64 square meters. Find the length of a side of the original square. 18. _____

19. A window washer accidentally drops a bucket from the top of a 100 foot tall building. The height h of the bucket after t seconds is given by $h = -16t^2 + 100$. How long will it be before the bucket hits the ground? 19. _____

20. Each cycle of a screen saver program generates and then erases numbers of little animated figures called *froobies*. The formula $P = -2x^2 + 106x - 674$ models the population, P , of froobies after x minutes within a cycle. How many minutes into a cycle will the *froobie* population first reach 118? 20. _____