
Answers to Exercises



Chapter 1: Introduction

Learning by Discovery

1. $x = 6$
2. $x = 5$
3. $x = 4$
4. $(x + 2)$ by $(x + 6)$
5. $(x + 3)$ by $(x + 5)$
6. $(2x + 1)$ by $(x + 2)$
7. 18
8. 8
9. 6
10. 16
11. 9
12. 3

Chapter 2: Positive and Negative Numbers

Section 1: Positive and Negative Numbers

3. +11
4. -3
5. -9
6. +10
12. +17
13. 0
14. 0

Section 2: Addition of Signed Numbers

1. 0
2. +14
3. -6
4. -6
5. -2
6. +12
7. -7
8. -7
9. -13
10. -13
11. -1
12. +1
13. -9
14. +9
15. -1
16. +1
17. -1
18. -4
19. +2
20. -5
21. +2
22. -8
23. +2
24. +8
25. +4
26. -4
27. -8
28. +9
29. -1
30. +1

Section 3: Subtraction of Signed Numbers

1. +8
2. -8
3. -2
4. -3
5. -2
6. +8
7. -8
8. +2
9. +17
10. +4
11. +6
12. +2
13. +17
14. -7
15. -16
16. +2
17. -8
18. 0
19. +8
20. -10
21. -4
22. +4
23. +10
24. +3
25. -3
26. -3
27. +3
28. -7
29. +7
30. 12

Section 4: Addition and Subtraction

2. -5
3. +2
4. -5
5. -1
6. +16
7. 0
14. +5
15. -3
16. +4
17. +4

18. +2
19. -2
20. -8
21. +8
22. -8
23. -4
24. -10
25. +4
26. +10
27. -14

Section 5: Multiplication

3. -10
4. +15
5. +12
6. -3
7. +4
8. -4
9. +28
10. +28
11. -28
12. +1
13. -1
14. +1
15. +17
16. -17
17. +0
18. +30
19. -6
20. +15
21. -12
22. -14
23. -14
24. +14
25. -18
26. -18
27. +18
28. +12
29. +9
30. -25

Section 6: Division

1. -6
2. -6
3. +6
4. -2
5. +4
6. +1
7. -1
8. -1

9. -1
10. +1
11. 0
12. 0
13. -2
14. +8
15. -6
16. +2
17. -4
18. -4
19. +4
20. +1
21. -4
22. +3
23. -2
24. +4
25. -5
26. +5

27. $-\frac{8}{3}$ or $-2\frac{2}{3}$

28. $\frac{8}{3}$ or $2\frac{2}{3}$

29. $\frac{3}{2}$ or $1\frac{1}{2}$

30. $-\frac{12}{5}$ or $-2\frac{2}{5}$

Section 7: The Number Line

1. +6
2. -4
3. -1
4. +4
5. -1
6. -5
7. 0
8. -2
9. +4
10. -8

Chapter 3: Symbols and the Order of Operations

Section 1: Rules of Language

4. 7
5. -7
6. -15
7. -3
8. -10
9. 2
10. -12
11. -35
12. 35

Section 2: Order of Operations

1. 3
2. 12
3. 23
4. 11
5. 16
6. -30
7. 47
8. -2
9. -2
10. -13
11. 5
12. 0
13. -1
14. 11
15. -6
16. 16
17. -5
18. 7
19. 17
20. -12
21. 2
22. 26
23. -58
24. 13
25. 9
26. -26

Section 3: Parentheses

1. 9
2. 5
3. -28
4. 14

5. -16
6. -3
7. 24
8. -31
9. 16
10. -16

Section 4: Fractions and Division

1. 2
2. 16
3. 4
4. 3
5. -3
6. 10
7. -4
8. 20
9. -17
10. -34

Review Exercises:

1. -15
2. -19
3. -11
4. 26
5. 17
6. -73
7. 23
8. -30
9. -32
10. -63
11. -13
12. -10
13. -11
14. 2
15. 1

Section 5: Absolute Value

1. 7
2. 12
3. 5
4. 9
5. 3
6. 7
7. 19

8. 2
9. -9
10. -9
11. 36
12. -16
13. -10
14. 36
15. 6
16. 7
17. 3
18. -5

Chapter 4: Multiplication and Division of Fractions

Section 1: Multiplication of Fractions

1. $\frac{1}{8}$
2. $\frac{2}{9}$
3. $\frac{6}{15}$ or $\frac{2}{5}$
4. $\frac{12}{20}$ or $\frac{3}{5}$
5. $\frac{16}{25}$
6. $\frac{10}{24}$ or $\frac{5}{12}$
7. $\frac{15}{36}$ or $\frac{5}{12}$
8. $\frac{3}{12}$ or $\frac{1}{4}$
9. $\frac{15}{32}$
10. $\frac{20}{35}$ or $\frac{4}{7}$

Section 2: Division of Fractions

1. 4
2. 3
3. 6
4. 9
5. $\frac{9}{2}$ or $4\frac{1}{2}$
6. 10
7. $\frac{3}{2}$ or $1\frac{1}{2}$

Section 3: Compound Fractions

4. $\frac{56}{48}$ or $\frac{7}{6}$ or $1\frac{1}{6}$
5. $\frac{48}{56}$ or $\frac{6}{7}$
6. $\frac{56}{3}$ or $18\frac{2}{3}$
7. 8
8. $\frac{8}{9}$

9. 1
10. $\frac{1}{2}$

Chapter 5: Properties

Section 1: Properties of Addition and Multiplication

1. Commutative property of multiplication.
2. Commutative property of addition.
3. Associative property of addition.
4. Associative property of multiplication.
5. Associative property of addition.
6. Commutative property of addition, used twice.
7. Commutative property of multiplication.

Section 2: Distributive Property

1. $(3 \cdot 5) + (3 \cdot 6) = 15 + 18 = 33$
Check: $3 \cdot 11 = 33$
2. $(2 \cdot 1) + (2 \cdot 4) = 2 + 8 = 10$
Check: $2 \cdot 5 = 10$
3. $(4 \cdot 3) - (1 \cdot 3) = 12 - 3 = 9$
Check: $3 \cdot 3 = 9$
4. $(4 \cdot 5) - (4 \cdot 2) = 20 - 8 = 12$
Check: $4 \cdot 3 = 12$
5. $(1 \cdot 3) + (1 \cdot 4) + (2 \cdot 3) + (2 \cdot 4)$
 $= 3 + 4 + 6 + 8 = 21$
Check: $3 \cdot 7 = 21$
6. $(3 \cdot 1) + (3 \cdot 1) + (2 \cdot 1) + (2 \cdot 1)$
 $= 3 + 3 + 2 + 2 = 10$
Check: $5 \cdot 2 = 10$
7. $(8 \div 2) + (10 \div 2) = 4 + 5 = 9$
Check: $18 \div 2 = 9$
8. $(6 \div 3) + (12 \div 3) = 2 + 4 = 6$
Check: $18 \div 3 = 6$
9. $(10 + 3) \cdot (10 + 5)$
 $= (10 \cdot 10) + (10 \cdot 5) + (3 \cdot 10) + (3 \cdot 5)$
 $= 100 + 50 + 30 + 15 = 195$
Check: $13 \cdot 15 = 195$
10. $(10 + 4) \cdot (10 + 6)$
 $= (10 \cdot 10) + (10 \cdot 6) + (4 \cdot 10) + (4 \cdot 6)$
 $= 100 + 60 + 40 + 24 = 224$
Check: $14 \cdot 16 = 224$
11. $(10 + 10 + 1) \cdot (10 + 6)$
 $= (10 \cdot 10) + (10 \cdot 6) + (10 \cdot 10) + (10 \cdot 6)$

$$\begin{aligned} &+ (1 \cdot 10) + (1 \cdot 6) \\ &= 100 + 60 + 100 + 60 + 10 + 6 = 336 \\ &\text{Check: } 21 \cdot 16 = 336 \end{aligned}$$

Section 3: Identities and Inverses

1. 3
2. 21
3. 14
4. 8
5. 1
6. -49
7. 12
8. 0
9. 0
10. 17

Section 4: Properties of Zero

1. 0
2. Not defined
3. 0
4. Not defined
5. Not defined
6. Not defined

Chapter 6: Expressions

Section 1: Simple Expressions

1. 9, 6, 4
2. -1, 2, 4
3. 14, 5, -1
4. 0, 0, 0
5. 4, 7, 9
6. 4, -5, -11
7. 12, -3, -13
8. 7, 4, 2
9. 0, 0, 0
10. 5, 5, 5
11. 3, 0, -2
12. -9, -6, -4
13. 0, 3, 5
14. 0, 3, 5
15. 0, -3, -5

Section 2: Multiples of x

1. -12, 0, -15, -18
2. -15, -27, -12, -9
3. 4, 0, 5, 6
4. -3, -11, -1, 1
5. 1, 1, 1, 1
6. 4, 0, 5, 6
7. -1, -13, 2, 5
8. 15, 11, 16, 17
9. 5, 1, 6, 7
10. 5, 17, 2, -1
11. -5, 7, -8, -11
12. 0, 8, -2, -4
13. 4, 28, -2, -8
14. 3, 7, 2, 1
15. 10, 22, 7, 4
16. -6, -14, -4, -2
17. 8, 28, 3, -2
18. 0, -8, 2, 4
19. 0, 20, -5, -10
20. -4, -32, 3, 10

Section 3: Combining Similar Terms

1. $3x$, $-x$, 5
2. 0
3. $4x$, 1, 1
4. 1, -2, x

5. $13x + 1$
6. $10x + 5$
7. $11x + 4$
8. $-x + 1$ or $1 - x$
9. $2x - 4$ or $-4 + 2x$
10. 21, -4
11. 29, -1
12. 48, -7
13. -3, 2
14. 4, -6

Section 4: Expressions and Parentheses

1. $11x - 13$ or $11x + -13$
2. $-x - 2$ or $-x + -2$
3. $13 - 2x$ or $-2x + 13$
4. $2x + 13$
5. 20
6. $4x - 8$, -4
7. $11 - 4x$ or $-4x + 11$, 15
8. x , 256
9. x , -17

Section 5: Expressions Containing Fractions

1. $\frac{3}{4}x$ or $\frac{3x}{4}$
2. $-\frac{x}{4}$ or $\frac{-x}{4}$
3. $\frac{1}{24}x$ or $\frac{x}{24}$
4. $\frac{1}{6}x$ or $\frac{x}{6}$
5. $x + 2$
6. $x + \frac{1}{4}$
7. $3x$
8. x
9. x
10. $20x$
11. $\frac{13x}{15}$
12. $\frac{13x}{6}$
13. $\frac{3x}{2}$

14. $\frac{13x}{6}$

15. $\frac{x}{9}$

16. $\frac{2x}{15}$

17. $2x - \frac{5}{3}$

18. $6x + 3$

Section 6: Properties of Expressions

1. $6x + 30$

2. $-1 - 2x$

3. $22 + x$

4. 0

5. x

6. $-5x - 13$

7. $6x - 20$

8. 0

9. $3x$

10. $2x + 2$

11. $7x$

12. $3x + 2$

13. $3x$

14. $3x - 12$

15. $x + 1$

16. $x - 1$

17. $x + \frac{1}{6}$

18. $-5x$

19. $35x$

20. $35x$

21. $35x$

22. $-35x$

23. 0

24. 0

25. 0

26. $5x - 70$

27. $-12x + 24$

28. $13x - 23$

29. $21x - 84$

30. $-8x + 38$

Chapter 7: Equations

Section 1: Introduction to Equations

1. Expression
2. Expression
3. Equation
4. Equation
5. Equation
6. Expression
7. Equation
8. Expression
9. Expression
10. Expression
11. Equation
12. Equation
13. Expression
14. Equation
15. Equation

Section 2: The Equation Game

1. $x = 5$
2. $x = 8$
3. $x = 8$
4. $x = 7$
6. $x = 7$
7. $x = 9$
8. $x = 5$
9. $x = 4$
10. $x = 6$
11. $x = 5$
12. $x = 12$
13. $x = 7$
14. $x = 9$
15. $x = 13$
16. $x = 21$
17. $x = 7$
18. $x = 8$
19. $x = 8$
20. $x = 9$

Section 3: Equations Using Unknowns

1. $x = 9$
2. $x = -1$
3. $y = -3$
4. $n = 3$
5. $y = 0$

6. $x = 12$
7. $x = 1$
8. $y = -16$
9. $y = -1$
10. $x = 23$
11. $x = -15$
12. $y = 2$
13. $y = 8$
14. $x = 15$
15. $x = 0$
16. $x = 17$
17. $x = 7$
18. $y = -1$
19. $y = -5$
20. $x = -7$
21. $y = -3$
22. $n = -1$
23. $n = 8$
24. $x = 0$
25. $x = -14$

Section 4: Equations with Multiples of Unknowns

1. $x = 4$
2. $x = -7$
3. $x = 2$
4. $x = \frac{9}{5}$ or $1\frac{4}{5}$
5. $y = 2$
6. $n = \frac{5}{6}$
7. $b = 0$
8. $x = 2$
9. $x = 11$
10. $x = \frac{10}{3}$ or $3\frac{1}{3}$
11. $y = 5$
12. $x = 0$
13. $x = -2$
14. $x = -2$
15. $y = 8$
16. $n = \frac{1}{7}$

17. $x = \frac{4}{3}$ or $1\frac{1}{3}$

18. $x = \frac{3}{5}$

19. $x = \frac{1}{2}$

Section 5: Unknowns in More than One Term

1. $x = -11$
2. $x = 3$
3. $y = -3$
4. $n = 1$
5. $y = 0$
6. $x = 2$
7. $z = 4$
8. $x = -3$
9. $x = 7$
10. $x = -2$
11. $y = -2$
12. $x = -5$
13. $x = 3$
14. $x = 0$
15. $x = 5$
16. $x = -4$
17. $x = 0$

Section 6: Equations with Parentheses

1. $x = 6$
2. $x = 0$
3. $x = 4$
4. $x = 4$
5. $x = 0$
6. $x = -3$
7. $x = -2$
8. $y = 0$
9. $y = 8$
10. $x = -1$
11. $x = \frac{1}{2}$
12. $x = 3$
13. $x = 1$
14. $x = 0$
15. $x = \frac{2}{3}$
16. $x = 8$
17. $x = 3$
18. $x = 15$
19. $x = -2$
20. $x = 11$

Section 7: Equations with Fractions or Decimals

1. $x = 24$
2. $x = -8$
3. $x = -2$
4. $x = 1$
5. $x = \frac{21}{4}$ or $5\frac{1}{4}$
6. $x = 12$
7. $x = 6$
8. $x = -2$
9. $x = 15$
10. $x = 12$
11. $x = \frac{12}{7}$ or $1\frac{5}{7}$
12. $x = -3.6$
13. $x = 1.8$
14. $x = 4$
15. $x = 1$
16. $x = 100$
17. $x = 6$
18. $x = 1$
19. $x = 0$
20. $x = 20$

Section 8: Special Solutions

1. x can be any number
2. No solution
3. $x = 3$
4. No solution
5. x can be any number
6. No solution
7. $x = 0$
8. x can be any number
9. x can be any number
10. No solution

Chapter 8: Powers and Roots

Section 1: Introduction to Exponents

1. $5 \cdot 5 \cdot 5 \cdot 5 = 625$
2. $4 \cdot 4 \cdot 4 \cdot 4 \cdot 4 = 1,024$
3. $2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 = 64$
4. $10 \cdot 10 \cdot 10 = 1,000$
5. 4^6
6. 7^3
7. 32^4
8. 0^2
9. $3^3 5^4$
10. 1^{10}
11. -8
12. 16
13. -13
14. 1

Section 2: Squares and Second Powers

1. 49
2. 1
3. $\frac{4}{9}$
4. $\frac{9}{25}$
5. $\frac{16}{9}$ or $1\frac{7}{9}$
6. 225
7. $4 \cdot 49 = 196$
8. $14 \cdot 14 = 196$
9. $1 \cdot 4 \cdot 9 \cdot 16 = 576$
10. $52 \cdot 1 = 52$
11. 11^2
12. 15^2
13. 100^2
14. 9^2
15. 12^2
16. 52
17. -46
18. 48
19. 29
20. 72

Section 3: Cubes

1. 8
2. 1
3. 343
4. 9,261
5. $\frac{343}{27} = 12\frac{19}{27}$
6. $4 \cdot 8 = 32$
7. 0
8. 0
9. $\frac{343}{27} \cdot 27 = 343$
10. $9 \cdot 9 = 81$

Section 4: Higher Powers

1. $243 + 16 = 259$
2. $243 \cdot 81 = 19,683$
3. $4 \cdot 4 = 16$
4. $6 \cdot 6 \cdot 6 = 216$
5. $8 \cdot 8 \cdot 25 = 1600$
6. $9 \cdot 9 = 81$
7. $25 \cdot 25 = 625$
8. 2,401
9. -1
10. 1
11. 256
12. 108
13. 1024
14. 128
15. 1024
16. -1024
17. 131
18. 126
19. -124
20. -125

Section 5: Other Exponents

1. 999
2. 1
3. $\frac{1}{216}$
4. 1

5. $\frac{1}{5}$
6. 5
7. 1
8. $\frac{1}{64}$
9. $\frac{1}{625}$
10. 1
11. 1
12. 1
13. Not defined
14. 273
15. 1
16. $\frac{1}{81}$
17. $\frac{1}{9}$
18. $2\frac{1}{2}$ or $\frac{5}{2}$
19. $3\frac{1}{9}$ or $\frac{28}{9}$
20. $16\frac{1}{16}$ or $\frac{257}{16}$

Section 6: Properties of Powers

1. a^{10}
2. x^{14}
3. a^{18}
4. 1
5. $10 \cdot 4 = 40$
6. $\frac{2}{15}$
7. $\frac{27}{125}$
8. $\frac{x}{y^7}$
9. $\frac{72}{25}$
10. x^{-2} or $\frac{1}{x^2}$
11. False
12. True: $(a^3)^3 = (a^3)(a^3)(a^3) = a^9$
13. True: $\sqrt{25 \cdot 4} = \sqrt{25} \cdot \sqrt{4} = 5 \cdot 2$
14. True: $\sqrt{\frac{36}{100}} = \frac{\sqrt{36}}{\sqrt{100}} = \frac{6}{10} = 0.6$
15. False
16. True: $2^5 \cdot 2^{-2} = \frac{2^5}{2^2} = 2^3 = 8$

17. False
18. True: $4^0 = 1$, $3^3 = 27$
19. False
20. True: $(15)^4 = (3 \cdot 5)^4 = 3^4 \cdot 5^4$

Section 7: Simplifying Expressions

1. $x \cdot y^{-5}$ or $\frac{x}{y^5}$
2. $9x^4 y^{-1}$ or $9\frac{x^4}{y}$
3. a
4. $\frac{8m}{n^{10}}$ or $8mn^{-10}$
5. $\frac{5}{4 \cdot 3} = \frac{5}{12}$
6. $\frac{y^2 z^2}{x^2}$ or $x^{-2} y^2 z^2$
7. 10,000
8. $\frac{1}{3^6} = 3^{-6} = \frac{1}{729}$
9. $\frac{-8}{x^9} = -8x^{-9}$
10. $\frac{9}{4}$
11. x^{10}
12. $\frac{1}{x^{10}}$ or x^{-10}
13. $\frac{1}{y^{10}}$ or y^{-10}
14. x^3
15. $\frac{3xy}{4}$
16. $\frac{1}{y}$ or y^{-1}
17. $a^6 b^{10} c^{14}$
18. $a^3 b^5 c^7$
19. $a^9 b^8 c^5$
20. $\frac{a^{10} c^{10}}{b^4}$ or $a^{10} b^{-4} c^{10}$
21. $\frac{x^{24}}{y^4}$ or $x^{24} y^{-4}$
22. 1

Section 8: Roots and Radicals

1. 8
2. 5
3. 10
4. 1
5. 100
6. 1
7. 0
8. -10
9. -5
10. Undefined
11. $5 + 6 = 11$
12. $5 \cdot 6 = 30$
13. $2 \cdot 4 = 8$
14. 8

Section 9: Irrational Numbers

1. irrational
2. integer
3. irrational
4. irrational
5. integer
6. $4\frac{1}{8}$
7. 3
8. $5\frac{1}{10}$
9. $6\frac{1}{6}$
10. $2\frac{1}{2}$
11. $3\frac{1}{2}$

Section 10: Properties of Roots

1. $10 \cdot 4 = 40$
2. $2 \cdot 6 = 12$
3. $3 \cdot 5 = 15$
4. $4 \cdot 7 = 28$
5. $\frac{6}{5}$
6. $\frac{10}{3}$
7. $\frac{7}{9}$
8. $\frac{8}{5}$
9. $2 \cdot 10 = 20$
10. $5 \cdot 10 = 50$

11. $7 \cdot 10 = 70$

12. $9 \cdot 10 = 90$

Chapter 9: Polynomials

Section 1: Using Unknowns

1. $7x$
2. $7x, -2$
3. $4x^2$
4. $3x^2, -6$
5. $6, -2x^2$
6. $2x^2, -3x, 12$
7. $-2x^2, -5x, -1$
8. $-0x^2$
9. $5, -3x^2$
10. $2x, 3$
11. $x^2, -5x, 6$
12. $2x, -x^2, 4$
13. $4x, 3x^2$
14. $2x^2, -7$
15. $3x^2, -5x, 2$

Section 2: Adding and Subtracting Polynomials

1. x
2. $-9x + 5$
3. $-4x^2 + x + 5$ or $5 - 4x^2 + x$
4. $3x^2 + 4x$
5. $-4x^2$
6. $2x^2 - x + 2$
7. $x^2 - 3x - 3$
8. $-3x^2 - x - 2$
9. $x^2 + 5x - 5$
10. $4x + 12$
11. $8x - 8$
12. $3x^2 + 2x + 3$
13. -2
14. $x^2 + 5x - 3$
15. $2x^2 - 3x - 6$
16. $2x^2 - 8x + 3$
17. $4x^2 + 2x - 7$
18. $4x^2 - 3x$
19. $-2x + 4$
20. $-x^2 + 4x + 3$
21. $-4x^2 - 2x$
22. $8x - 5$
23. $5x - 6$
24. $-x^2 + 7x + 3$
25. $x^2 - 5x + 1$

26. $2x^2 - 2x + 3$

Section 3: Multiplying Polynomials

1. $2x - 8$
2. $6x + 3$
3. $-3x + 3$
4. $-2x + 6$
5. $2x + 2$
6. $6x - 2$
7. $3x - 9$
8. $-4x + 10$
9. $10x - 15$
10. $-3x + 15$
11. $-4x + 2$
12. $10x + 15$
13. $-15x + 10$
14. $10 - 6x$
15. $-12 + 4x$
16. $x^2 + 5x + 4$
17. $x^2 + x - 12$
18. $x^2 - 6x + 5$
19. $x^2 + 2x - 15$
20. $x^2 - 6x$
21. $2x^2 - 7x - 4$
22. $-3x^2 + 2x$
23. $2x^2 - 7x + 6$
24. $x^2 - 2x - 15$
25. $x^2 - 8x + 12$
26. $2x^2 + 5x - 3$
27. $2x^2 + x - 6$
28. $-3x + 2x^2$
29. $2x^2 - 3x - 2$
30. $4x^2 + 4x - 3$

Section 4: Special Products

1. $x^2 - 4x + 4$
2. $9x^2 + 6x + 1$
3. 49
4. $4x^2 - 28x + 49$
5. $9x^2$
6. $9x^2 + 12x + 4$

7. $x^2 + 8x + 16$
8. $4x^2 - 4x + 1$
9. $x^2 - 18x + 81$
10. $25x^2 + 30x + 9$
11. *No* ($4x^2 + 4x - 15$)
12. $x^2 - 4$
13. *No* ($9x^2 + 24x + 16$)
14. *No* ($15x^2 + 16x - 15$)
15. $9x^2 - 25$
16. $x^2 - 49$
17. *No* ($4x^2 + 4x - 3$)
18. *No* ($2x^2 + x - 1$)
19. $4x^2 - 1$
20. *No* ($6x^2 + 5x - 6$)
21. $25x^2 - 36$
22. $49x^2 - 1$

Chapter 10: Factoring Polynomials

Section 1: Introduction to Rectangles and Factoring

1. $x(x + 4)$
2. $x(x + 5)$
3. $(x + 3)(x + 3)$
4. $(x + 4)(x + 1)$
5. $(x + 5)(x + 3)$
6. $(x + 6)(x + 2)$
7. $(x + 4)(x + 3)$
8. $(x + 7)(x + 2)$
9. $(x + 4)(x + 4)$
10. $(x + 5)(x + 4)$

Section 2: Positive Units, Negative Bars

1. $(x - 3)(x - 1)$
2. $(x - 4)(x - 2)$
3. $(x - 6)(x - 2)$
4. $(x - 4)(x - 3)$
5. $(x - 5)(x - 2)$
6. $(x - 8)(x - 2)$

Section 3: Rectangles Having Negative Units

1. $(x + 6)(x - 1)$
2. $(x - 4)(x + 2)$
3. $(x - 8)(x + 1)$
4. $(x - 12)(x + 1)$
5. $(x - 6)(x + 1)$
6. $(x + 4)(x - 3)$
7. $(x + 9)(x - 1)$
8. $(x - 5)(x + 3)$
9. $(x + 5)(x - 3)$
10. $(x - 8)(x + 2)$

Section 4: Factoring Trinomials with More than One x^2

1. $(2x + 1)(2x + 1)$
2. $(3x + 1)(x + 2)$
3. $(2x + 1)(x + 3)$
4. $(3x + 1)(x + 3)$
5. $(2x + 1)(x + 2)$
6. $(2x + 1)(x + 1)$
7. $(2x + 3)(3x + 1)$
8. $(2x + 1)(3x + 2)$

9. $(2x + 1)(3x + 4)$
10. $(2x + 1)(2x + 3)$
11. $(3x + 4)(4x + 5)$

Section 5: Factoring Using the Grid

1. $(3x + 5)(x + 1)$
2. $(2x + 3)(x + 4)$
3. $(3x + 2)(x + 6)$
4. $(3x + 4)(x + 2)$
5. $(3x + 2)(x + 4)$
6. $(3x + 1)(x + 8)$
7. $(2x + 3)(x + 5)$
8. $(x - 3)(x + 2)$
9. $(x + 6)(x - 3)$
10. $(x - 1)(2x + 5)$
11. $(2x - 3)(x - 2)$
12. $(2x + 3)(2x - 5)$
13. $(2x - 3)(x + 5)$
14. $(2x + 3)(3x - 5)$
15. $(3x - 2)(2x + 5)$
16. $(2x - 3)(x - 5)$
17. $(x + 1)(3x - 5)$
18. $(2x + 3)(x - 2)$
19. $(2x - 1)(3x + 2)$

Section 6: A Shortcut Method

1. $(2x + 3)(x - 5)$
2. $(x + 1)(2x - 5)$
3. $(x - 1)(2x + 5)$
4. $(2x - 3)(x - 2)$
5. $(2x + 3)(2x - 5)$
6. $(2x - 3)(x + 5)$
7. $(2x + 3)(3x - 5)$
8. $(3x - 2)(2x + 5)$
9. $(2x - 3)(x - 5)$
10. $(4x + 3)(3x + 4)$
11. $(10x + 2)(2x - 3)$ or $2(5x + 1)(2x - 3)$
12. $(5x + 1)(3x + 1)$
13. $(5x + 3)(5x + 3)$ or $(5x + 3)^2$
14. $(4x + 3)(3x - 4)$
15. $(x - 1)(3x + 5)$
16. $(2x + 1)(2x + 3)$
17. $(2x - 3)(x + 2)$

Section 7: Recognizing Special Products

1. Yes. $(x + 3)^2$
2. No.
3. No.
4. Yes. $(2x + 5)^2$
5. No.
6. Yes. $(2x - 1)^2$
7. No.
8. No.
9. No.
10. Yes. $(4x - 3)^2$
11. No.
12. Yes. $(2x - 7)^2$
13. DTPS: $(2x + 1)(2x - 1)$
14. Neither
15. PS: $(x + 3)^2$
16. DTPS: $(x + 3)(x - 3)$
17. Neither
18. Neither
19. PS: $(2x - 3)^2$
20. Neither
21. PS: $(4x + 1)^2$
22. DTPS: $(5x + 2)(5x - 2)$
23. Neither
24. PS: $(x - 5)^2$
25. Neither
26. DTPS: $(2x - 5)(2x + 5)$
27. Neither
28. Neither

Section 8: Expressions which Cannot be Factored

1. $3(x + 2)(x + 3)$
2. Not factorable
3. $2(x - 3)(x + 3)$
4. $3(x + 3)^2$
5. Not factorable
6. $(x + 5)(x - 1)$
7. $(3x + 5)(x - 1)$
8. Not factorable
9. Not factorable
10. $2(x + 4)^2$
11. $5(x + 2)(x - 2)$
12. $x(4x - 9)$
13. $3(x^2 + 4)$

14. $x(x + 1)^2$
15. $(x + 5)(x + 1)$
16. $(x + 6)(x - 1)$
17. Not factorable
18. $2x(9x - 4)$

Chapter 11: Quadratic Equations

Section 1: Introduction

1. Expression, Linear.
2. Equation, Quadratic.
3. Expression, Quadratic.
4. Equation, Cubic.

Section 2: The Zero Product Rule

1. $x = 4, 2$
2. $x = 4, 4$
3. $x = 6, 2$
4. $x = 4, 3$
5. $x = 3, 1\frac{1}{2}$
6. $x = 1, \frac{5}{3}$
7. $x = 5, \frac{1}{3}$
8. $x = 4, \frac{3}{2}$
9. $x = 3, \frac{4}{3}$
10. $x = 7, 3$

Section 3: Standard Form

1. $x^2 - 5x + 6 = 0$
2. $x^2 - 7x + 12 = 0$
3. $2x^2 - 11x + 12 = 0$
4. $x^2 - 6x + 8 = 0$
5. $2x^2 + 5x - 7 = 0$
6. $x^2 - 7x - 18 = 0$
7. $3x^2 + 8x + 5 = 0$
8. $x^2 - 10x + 21 = 0$
9. $3x^2 - 16x + 5 = 0$
10. $2x^2 - 9x + 9 = 0$
11. $2x^2 - 2x - 5 = 0$
12. $x^2 - 6x - 8 = 0$
13. $2x^2 + x + 1 = 0$
14. $3x^2 - 3x - 13 = 0$
15. $2x^2 - 4x - 17 = 0$

Section 4: Factoring Quadratic Equations

1. $x = 2, 3$
2. $x = 1, -\frac{7}{2}$
3. $x = 4, 2$
4. $x = -1, -\frac{5}{3}$
5. $x = 4, -2$
6. $x = \frac{3}{2}$
7. $x = -1, -8$
8. $x = -2, -\frac{3}{2}$
9. $x = 3, -5$
10. $x = -\frac{1}{2}, 2$
11. $x = 1, -5$
12. $x = \frac{2}{3}, -\frac{5}{2}$
13. $x = -3, -9$
14. $x = \frac{5}{2}, 3$
15. $x = 9, 7$

Section 5: Completing the Square

1. $x = -7, 1$
2. $x = 5, -1$
3. $x = 1, -9$
4. $x = \frac{10 \pm \sqrt{164}}{2}$ or $5 \pm \sqrt{41}$
5. $x = -2, -10$
6. $x = \frac{-10 \pm \sqrt{28}}{2}$ or $-5 \pm \sqrt{7}$
7. $x = -3 \pm 3\sqrt{2}$
8. $x = -1, -11$
9. $x = 4 \pm \sqrt{19}$
10. $x = 5 \pm 2\sqrt{2}$
11. $x = \frac{3}{2} \pm \frac{\sqrt{29}}{2}$
12. $x = \frac{5}{2} \pm \frac{\sqrt{17}}{2}$

Section 6: Equations with More than One x^2

1. -12, 2
2. $\frac{-6 \pm \sqrt{52}}{2} = -3 \pm \sqrt{13}$
3. 2, -10
4. No solution
5. $\frac{8 \pm \sqrt{112}}{4} = 2 \pm \sqrt{7}$
6. 3, 1
7. $\frac{12 \pm \sqrt{84}}{6} = \frac{6 \pm \sqrt{21}}{3}$
8. $\frac{15 \pm \sqrt{153}}{6} = \frac{5 \pm \sqrt{17}}{2}$
9. $\frac{-7 \pm \sqrt{113}}{4}$
10. $\frac{9 \pm \sqrt{161}}{4}$

Section 7: Imaginary Solutions

1. $x = 3 \pm 4i$
2. $x = 5 \pm 3i$
3. $x = -2 \pm i$
4. $x = -4 \pm 2i$
5. $x = -3 \pm i\sqrt{6}$
6. $x = 1 \pm i\sqrt{1}$
7. $x = -6 \pm i$
8. $x = 4 \pm i\sqrt{7}$
9. $x = 2 \pm i\sqrt{7}$
10. $x = -3 \pm i\sqrt{3}$
11. $x = 5 \pm 2i\sqrt{2}$
12. $x = -4 \pm i\sqrt{5}$

Section 8: The Quadratic Formula

1. $x = \frac{5 \pm \sqrt{37}}{2}$
2. $x = \frac{7 \pm \sqrt{63}}{2} = \frac{7 \pm 3\sqrt{7}}{2}$
3. $x = \frac{-3 \pm \sqrt{3}}{2}$
4. $x = \frac{4 \pm \sqrt{14}}{2}$
5. $x = \frac{3 \pm i\sqrt{11}}{2}$
6. $x = \frac{1 \pm i\sqrt{23}}{2}$
7. $x = 2, -\frac{1}{3}$

$$8. x = \frac{6 \pm \sqrt{52}}{10} = \frac{3 \pm \sqrt{13}}{5}$$

$$9. x = 1, \frac{5}{3}$$

$$10. x = 2, 1\frac{1}{2}$$

$$11. x = -3 \pm 2\sqrt{3}$$

$$12. x = -1, -\frac{3}{2}$$

$$13. x = 2 \pm 2i$$

$$14. x = \frac{1}{3}, -1$$

$$15. x = 3 \pm 2i$$

$$16. x = \frac{-2 \pm \sqrt{3}}{2}$$

$$17. x = \frac{1 \pm \sqrt{11}}{2}$$

$$18. x = \frac{-1 \pm \sqrt{57}}{4}$$

$$19. x = 4 \pm 3i$$

$$20. x = 2 \pm i$$

Chapter 12: Rules and Graphs

Section 1: Related Numbers

- Answers: -1, 2, 5, -4, -7, -10
- Answers: 5, 7, 9, 3, 1, -1
- Answers: 4, 3, 2, 5, 6, 7
- Answers: 1, -1, -3, 3, 5, 7
(For exercises 5-12, your answers may be different)
- x : 1, 2, 3, 0, -1, -2
 $-3x$: -3, -6, -9, 0, 3, 6
- x : 1, 2, 3, 0, -1, -2
 $5x - 3$: 2, 7, 12, -3, -8, -13
- x : 1, 2, 3, 0, -1, -2
 $4x - 5$: -1, 3, 7, -5, -9, -13
- x : 1, 2, 3, 0, -1, -2
 $-3x + 2$: -1, -4, -7, 2, 5, 8
- x : 1, 2, 3, 0, -1, -2
 $-5 - x$: -6, -7, -8, -5, -4, -3
- x : 1, 2, 3, 0, -1, -2
 $7 - 2x$: 5, 3, 1, 7, 9, 11
- x : 1, 2, 3, 0, -1, -2
 $3x + 1$: 4, 7, 10, 1, -2, -5
- x : 1, 2, 3, 0, -1, -2
 $-4x$: -4, -8, -12, 0, 4, 8

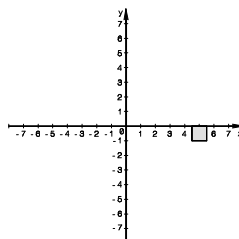
Section 2: Charts, Machines, and a Second Variable

- y 's: 15, 30, 9, 3, -3
- y 's: -1, -5, -3, 11
- y 's: 0, -2, 3, -17
- (2, -15), (2, -12), (2, -22), (2, 0)
- (2, 7), (2, 16), (2, -14), (2, 52)
- (2, 15), (2, 12), (2, 22), (2, 0)
(For exercises 7-15, your answers may be different)
- (0, -17), (1, 0), (-1, -34), (3, 34)
- (0, -17), (1, -16), (-1, -16), (3, -8)
- (0, 17), (1, 16), (-1, 18), (3, 14)
- (0, -3), (1, 0), (-1, -6), (3, 6)
- (0, -4), (1, -1), (-1, -7), (3, 5)
- (0, -5), (1, -1), (-1, -9), (3, 7)
- (0, -1), (1, -2), (-1, 0), (3, -4)
- (0, 1), (1, 0), (-1, 2), (3, -2)
- (0, 7), (1, 7), (-1, 7), (3, 7)
- $x = 2$

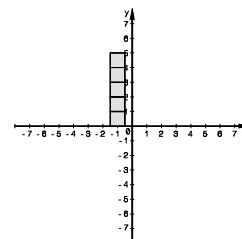
- $x = 21$
- $x = 17$
- $x = -2$
- $x = -2$
- $x = 5$
- $x = 5$
- $x = 5$
- $x = 0$
- $x = -1$

Section 3: Graphs and Coordinates

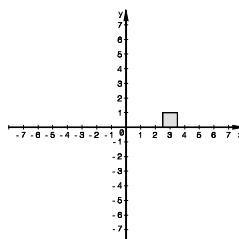
1.



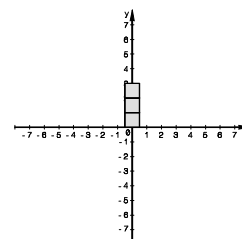
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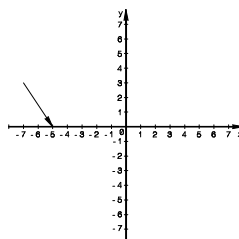
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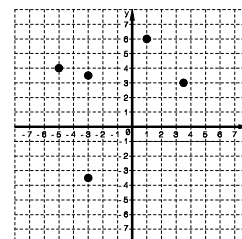
4.



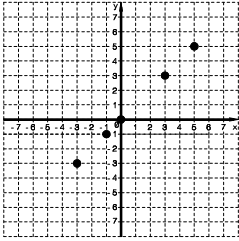
5.



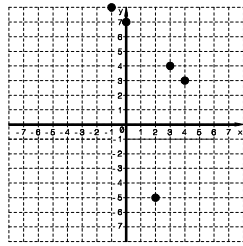
6-10.



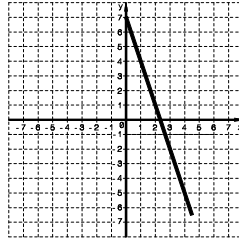
11.



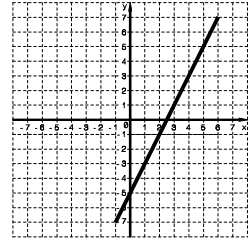
12.



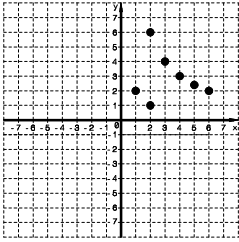
9.



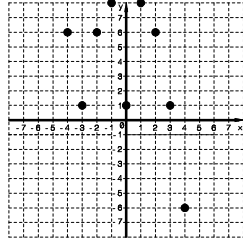
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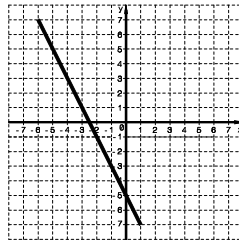
13.



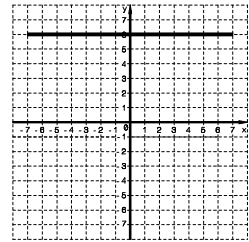
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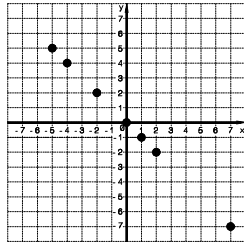
11.



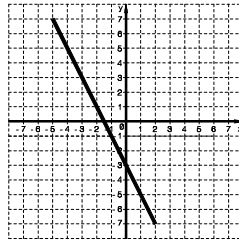
12.



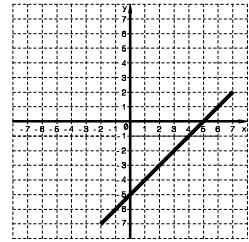
15.



13. $y = -2x - 3$



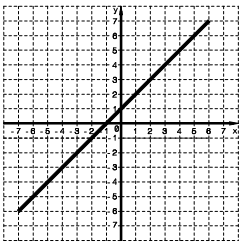
14. $y = x - 5$



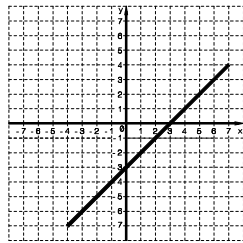
Section 4: Graphs of Lines

1. Linear
2. Linear
3. Linear
4. Linear
5. Not linear (has x^2)
6. Linear ($0x^2 = 0$, rule is actually $y = 2x + 1$)

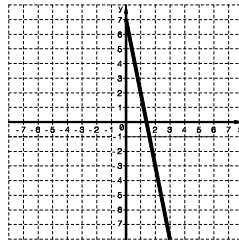
7.



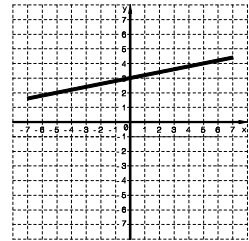
8.



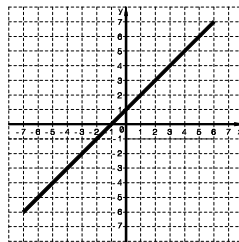
15. $y = -5x + 7$



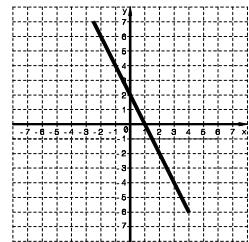
16. $y = \frac{1}{5}x + 3$



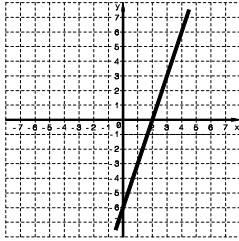
17. $y = x + 1$



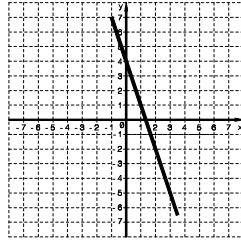
18. $y = -2x + 2$



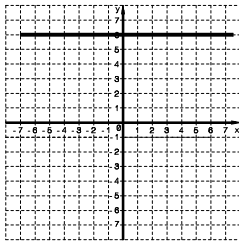
19. $y = 3x - 6$



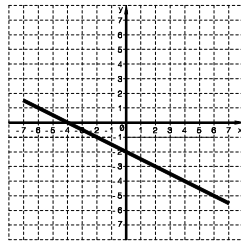
20. $y = -3x + 4$



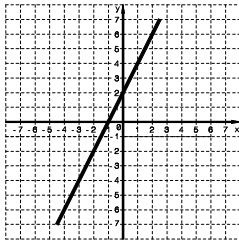
21. $y = 6$



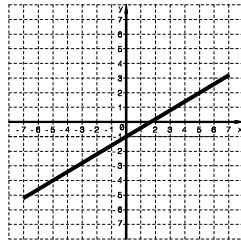
22. $y = -\frac{1}{2}x - 2$



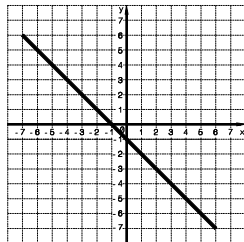
23. $y = 2x - 2$



24. $y = \frac{3}{5}x - 1$



25. $y = -x - 1$



Section 5: Slopes and Intercepts

1. $-\frac{1}{3}$

2. $\frac{5}{3}$

3. -1

4. $\frac{7}{6}$ or $1\frac{1}{6}$

5. 1

6. 0

7. -1

8. $-\frac{3}{5}$

9. Slope -1 , x intercept -7 , y intercept -7

10. Slope -3 , x intercept -4 , y intercept -12

11. Slope 2 , x intercept $-\frac{3}{2}$, y intercept 3

12. x intercept 6 , y intercept -6

13. x intercept -1 , y intercept -2

14. x intercept 6 , y intercept 2

15. -3

16. $\frac{1}{2}$

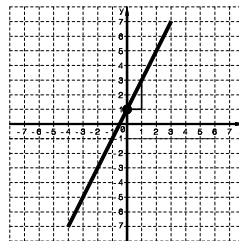
17. 2

18. -1

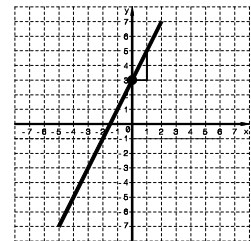
19. $\frac{10}{3}$ or $3\frac{1}{3}$

Section 6: Graphing with Slopes and Intercepts

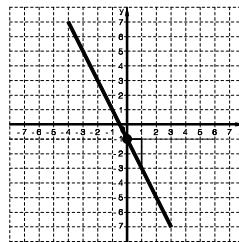
1.



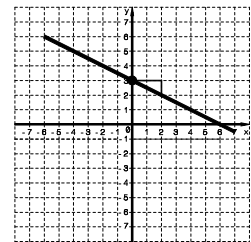
2.



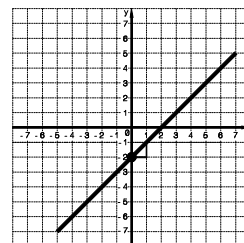
3.



4.



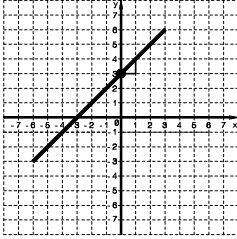
5.



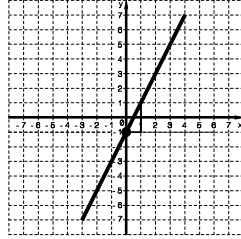
6. $y = \frac{1}{2}x + 3$

7. $y = -x + 7$

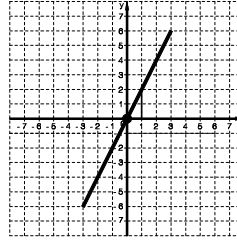
8. $y = x + 3$



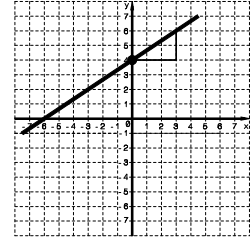
9. $y = 2x - 1$



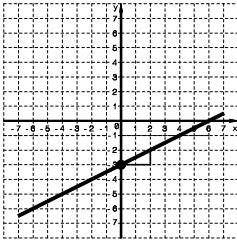
16. $y = 2x$



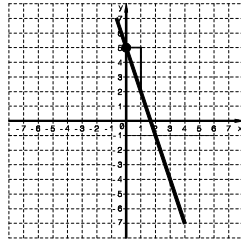
17. $y = \frac{2}{3}x + 4$



10. $y = \frac{1}{2}x - 3$



11. $y = 3x + 5$



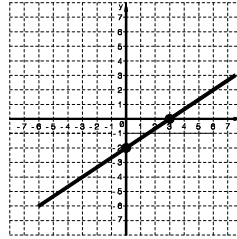
18. Slope is 0

19. Slope is not defined

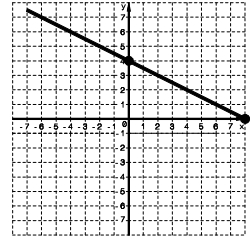
20. Slope is not defined

Section 7: Graphing With Two Intercepts

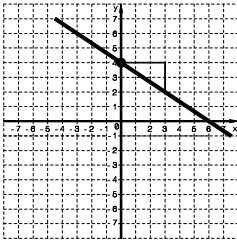
1.



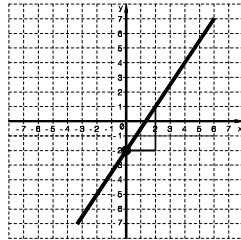
2.



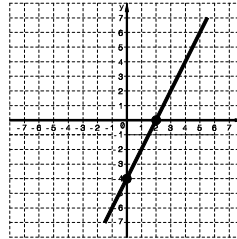
12. $y = -\frac{2}{3}x + 4$



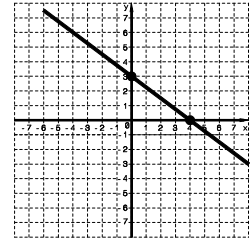
13. $y = \frac{3}{2}x - 2$



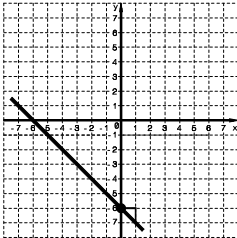
3.



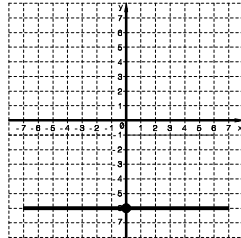
4.



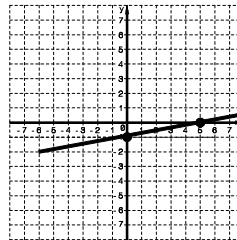
14. $y = -x - 6$



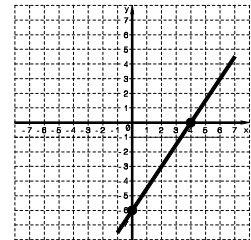
15. $y = -6$



5.

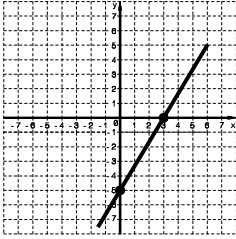


6.

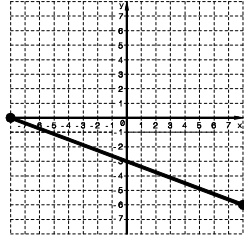


Section 8: Summary

7.



8.



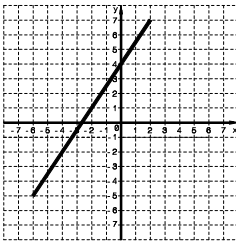
9.



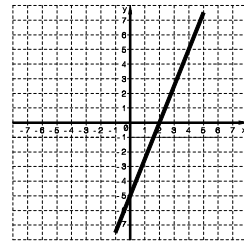
10.



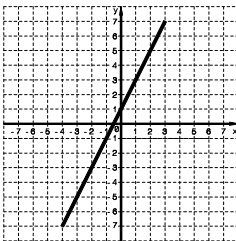
11. $y = \frac{3}{2}x + 4$



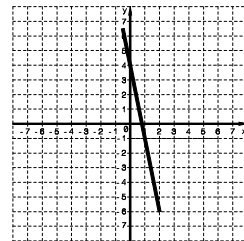
12. $y = 2x - 5$



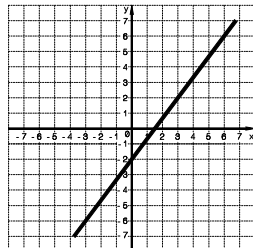
13. $y = 2x + 1$



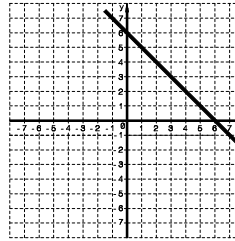
14. $y = -5x + 4$



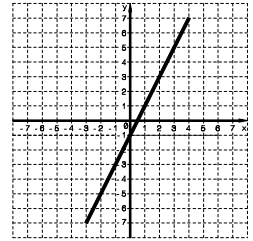
15. $y = \frac{4}{3}x - 2$



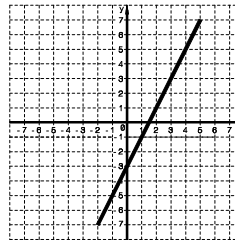
1.



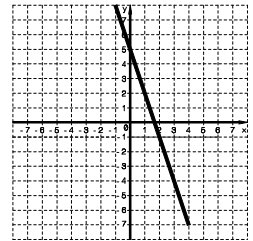
2.



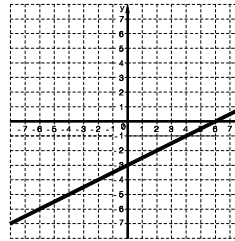
3.



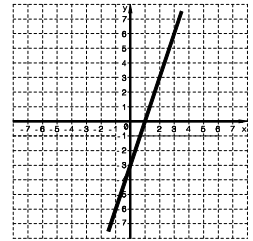
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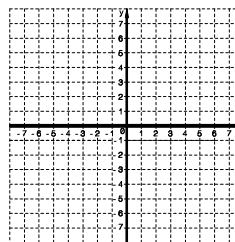
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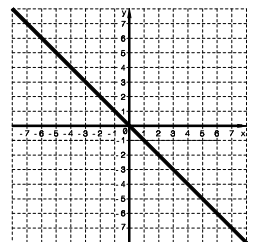
6.



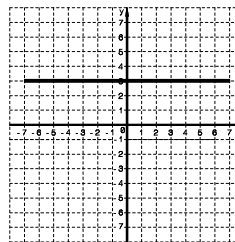
7.



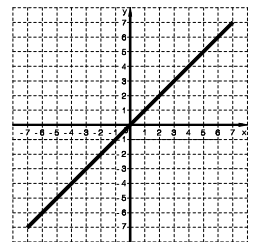
8.



9.



10.



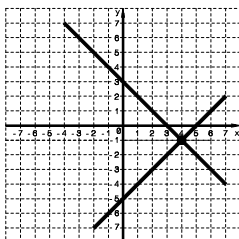
Chapter 13: Systems of Equations

Section 1: Equations and Solutions

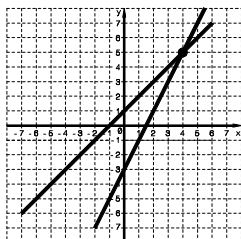
- (4, 5), (1, 2), (3, 4), etc.
- (0, -3), (2, 1), (5, 7), etc.

Section 2: Solving by Graphing

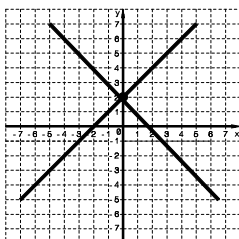
1. (4, -1)



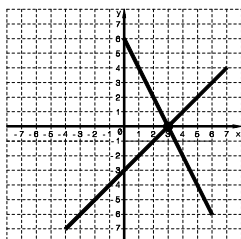
2. (4, 5)



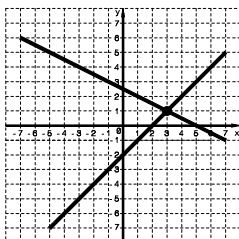
3. (0, 2)



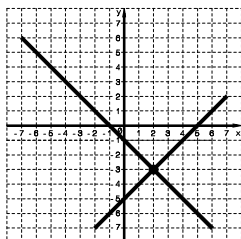
4. (3, 0)



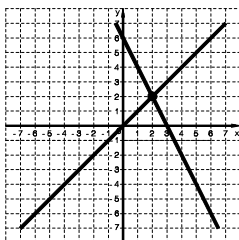
5. (3, 1)



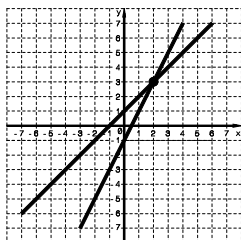
6. (2, -3)



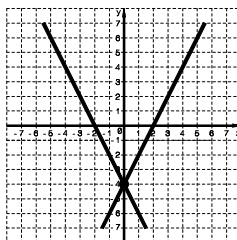
7. (2, 2)



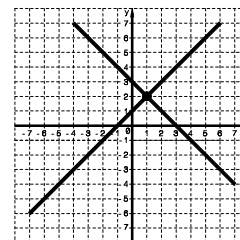
8. (2, 3)



9. (0, -4)



10. (1, 2)



Section 3: The Substitution Method

- (7, 1)
- (-1, 4)
- (6, 1)
- (0, 6)
- (2, 7)
- (-6, 1)
- (1, 1)
- (2, 4)
- (3, 2)
- (1, -3)
- (-1, 1)
- (-8, 23)
- (4, 3)
- $\left(\frac{1}{2}, \frac{1}{3}\right)$
- (0, 0)

Section 4: The Addition Method

- (4, 0)
- (1, 2)
- (3, 2)
- (3, 0)
- $\left(2\frac{2}{5}, 4\frac{1}{5}\right)$
- (-1, 5)
- (2, -3)
- (2, 1)
- (3, 4)
- (5, -7)
- (3, 4)
- (2, -2)
- (6, 2)
- (9, 11)

15. (3, 1)
16. (2, -2)
17. (5, 1)
18. (2, 2)

Section 5: Choosing a Method

1. (-4, -7)
2. (2, 1)
3. (0, 1)
4. (-2, 2)
5. (-4, 7)
6. (-3, -1)
7. (1, 2)
8. (3, 2)
9. (5, -7)
10. (-5, -2)
11. $\left(\frac{1}{2}, \frac{1}{3}\right)$
12. (-1, -2)
13. (1, -2)
14. (1, 3)
15. (-1, -2)
16. (1, 2)

Section 6: Special Cases

1. (-10, 21)
2. $\left(2, -\frac{5}{2}\right)$
3. (8, 6)
4. (4, -3)
5. (-10, 3.1)
6. (4, -3)
7. (10, 12)
8. (25, 6)
9. Inconsistent (parallel)
10. (-3, 2)
11. Dependent (coinciding)
12. Inconsistent (parallel)
13. Dependent (coinciding)
14. (1, 2)

Chapter 14: Rational Expressions

Section 2: Simplifying Rational Expressions

- 2
- $\frac{1}{3}$
- $\frac{3}{2}$
- $\frac{x-4}{3}$
- $\frac{1}{3}$
- $\frac{2}{x}$
- $1 + \frac{3}{x+2}$
- $1 + \frac{-2}{x-1}$
- $1 + \frac{-3}{x+5}$
- $1 + \frac{8}{2x-5}$
- $3 + \frac{4}{x-3}$
- $2 + \frac{2}{x+2}$
- $\frac{2}{x-2}$
- $\frac{x+1}{x-5}$
- $\frac{3(x-4)}{(x+2)(x+3)}$ (Does not reduce)
- $\frac{x+5}{3}$
- $\frac{2x+3}{x-5}$
- $\frac{3}{x-7}$
- $\frac{(x+4)(x-3)}{(3x-1)(x+2)}$ (Does not reduce)
- $\frac{x}{x+5}$

Section 3: Division Using Chips

- $x + 4 + \frac{-12}{x+2}$
- $x - 6 + \frac{9}{x+1}$
- $2x + 9 + \frac{21}{x-3}$
- $3x - 3 + \frac{-2}{x+1}$
- $x - 2 + \frac{-4}{x-2}$
- $2x + 10 + \frac{15}{x-2}$
- $x - 8 + \frac{25}{x+3}$
- $2x - 11 + \frac{55}{x+5}$

Section 4: Long Division

- $x + 5 + \frac{5}{x-2}$
- $2x - 9 + \frac{26}{x+3}$
- $x + 6 + \frac{-4}{x+1}$
- $3x + 12 + \frac{53}{x-4}$
- $x - 4 + \frac{8}{x+2}$
- $5x + 32 + \frac{149}{x-5}$
- $x + 1 + \frac{8}{x-3}$
- $2x - 13 + \frac{65}{x+5}$
- $x - 4 + \frac{2}{x+1}$
- $3x - 10 + \frac{41}{x+4}$

Section 5: Multiplication

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

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

4. $\frac{5}{x+3}$

5. $\frac{x}{3(x-4)}$

6. $\frac{1}{(x-2)(x-2)}$

7. $\frac{x-1}{(x-2)(x-3)}$

8. $\frac{x-1}{x+6}$

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

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

Section 6: Division

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

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

3. $\frac{(x+6)^2}{3(x+2)(x+1)}$

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

5. $\frac{x-2}{3x(x+2)}$

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

7. $\frac{x+1}{(x+4)(x+2)}$

8. $\frac{2x+3}{x}$

9. 1

10. $\frac{(x+5)(x+3)}{3(x-4)}$

Section 7: Addition

1. $\frac{11}{12}$

2. $\frac{1}{10}$

3. $\frac{2}{21}$

4. $\frac{4}{3}$

5. $\frac{2x+9}{3x}$

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

7. $\frac{3x^2+4x-2}{(x-2)(x+1)}$

8. $\frac{5x-24}{40}$

9. $\frac{13x-15}{6(x+3)}$

10. $\frac{x^2+8x-37}{(x-5)(x+2)}$

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

12. $\frac{5x-4}{x(x+6)}$

13. $\frac{x+2}{(x-2)^2}$

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

15. $\frac{7(x-1)}{(x+5)(x-2)}$

16. -1

Section 8: Summary

1. $\frac{x^2+24}{8x}$

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

3. $\frac{x+3}{3}$

4. $\frac{-x+9}{x(x-4)}$

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

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

7. $\frac{1}{(x+1)(x+3)}$

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

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

10. $\frac{x^2-6x-7}{(x+3)(x-1)}$

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

12. $\frac{3x^2-2x-15}{x(x-5)}$

Appendices

Appendix 1: Division of Fractions, Part 2

1. $\frac{9}{8}$
2. $\frac{1}{8}$
3. $\frac{2}{12}$ or $\frac{1}{6}$
4. $\frac{3}{6}$ or $\frac{1}{2}$
5. 2

Appendix 2: Mixed Numbers

1. $\frac{15}{8}$ or $1\frac{7}{8}$
2. $\frac{28}{9}$ or $3\frac{1}{9}$
3. $\frac{49}{12}$ or $4\frac{1}{12}$
4. 6
5. $\frac{2}{12}$ or $\frac{1}{6}$
6. $\frac{2}{20}$ or $\frac{1}{10}$
7. $\frac{6}{20}$ or $\frac{3}{10}$
8. $\frac{10}{20}$ or $\frac{1}{2}$
9. $\frac{10}{12}$ or $\frac{5}{6}$
10. $\frac{20}{20}$ or 1

Appendix 3: The Function Game

1. Answers: 10, 17, -4
2. Answers: 5, 11, -1, 1
3. Answers: -10, 0, -10, -18
4. Rule: $5x$
5. Rule: $x + 16$
6. Rule: $x^2 - 1$
7. x 's: 17, -1, 4
8. x 's: 0, 4, $\frac{1}{3}$, $\frac{2}{3}$
9. x 's: 1, -3, 5, -7
10. Rule: $14 - x$ x 's: 11, 2 answers: 14

11. Rule: $7x$ x 's: 3 answers: 21, 14

12. Rule: $\frac{1}{2}x + 3$ x 's: 1 answers: 4, $\frac{9}{2}$

Appendix 4: Functions and Maps

1. y 's: 75, 75, 300, 27, 3, 3
2. y 's: 4, 10, 7, -14
3. y 's: 0, 0, 0, 0, 0
7. Function
8. Not a Function
9. Not a Function
10. Function
11. Not a Function