Short Term Math Review Workbook

The Apprentice School
Newport News Shipbuilding

Short Term Math Review
Course Outline

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Notes

STMR – Lesson 1: Order of Arithmetic, Evaluating Expression and Removing Grouping Symbols

Order of Arithmetic

1. $5(-7) + \frac{-16}{+8} - (-2)^6$

2. $(+15) - (-2)^4 - (-6)(-5)$

3. $(+7)(-1) - \frac{+8}{-4} - 3(-8)$

4. $(-6)(-4) - \frac{(-6)(-1)}{-2} + 2(-4)$

5. $(+8)(0) - \frac{(+7)(-1)}{+1} - (-2)^2$

6. $\frac{-10}{-2} - \frac{(0)(-6)}{-2} - (-4)^2$

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

8. $(6 + 1)(-1) - 7(-1)^6 - \frac{-15}{-5}$

9. $\frac{18}{1-10} + \frac{(-4)^2}{-2} - (-8)$

10. $\frac{(-18)^2}{5-9} - (-1)^2 - 4(-9)$

Evaluating Expressions

1. $5mn + 4mn^2 + 8m\text{-}n$ **when** $m = 4$ and $n = -2$.

2. $3x^3 - 6xy - 5xz + 4z - 1$ **when** $x = 2$, $y = -4$, and $z = 7$

Evaluate the following if x = 1, y = -1, z = 2, w = -2, k = 3:

3. $x + y + z$

4. $3z - 2$

5. $5y^2z$

6. $\frac{2w+5k}{y}$

7. $xy + yz + zw$

8. $(x + z)^2$

9. $5x^2y^2z^2$

10. $(x + y)(z + k)$

In problems 1 – 10 simplify by removing grouping symbols

1. $-5t - (-14t + 8s) =$

2. $2a + 5b - (a + 4b) =$

3. $7 - 3x + (-4 - 6x) =$

4. $m - (3m - 2n + p) - m - n + p =$

5. $a - [b - (a + 4)] =$

6. $3 - [x - 4 + (-x - 1) + x] =$

7. $2x - [3x - (x - y) - y] =$

8. $-[(2u + 3c) - u - 3c] =$

9. $3\{2 - 3(2x - 3) - 5[2 - (2x - 1)]\} =$

10. $3 + 2\{5 - 4x[1 - 6(x + 2)]\} =$

Lesson 1 – Solutions: Order of Arithmetic & Evaluating Expressions

Order of Arithmetic

1. -101 **2.** -31 3. 19 **4.** 19

5. 3 **6.** -11 **7.** -12 **8.** -17

9. -2 **10.** -46

Evaluating Expressions

1. 58 **2.** 29 **3.** 2 **4.** 4 **5.** 10

6. -11 **7.** -7 **8.** 9 **9.** 20 **10.** 0

Removing Grouping Symbols

1. 9t - 8s **2.** a + b **3.** 3 - 9x

4. -3m + n **5**. 2a - b + 4 **6.** -x + 8

7. 0 **8.** -u **9.** 12x - 12

10. $48x^2 + 88x + 13$

Notes

STMR – Lesson 2: Laws of Exponents and Polynomial Addition and Subtraction

Laws of Exponents: Use the rules of exponents to simplify completely. Write the answer without zero or negative exponents.

1. $\frac{y^3}{y^2}$

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

3. $b^5 \bullet b^3$

4. $a^{-7} \bullet a^{-3}$

5. $\left(a^9\right)^2$

6. $\left(x^{-7}\right)^{-6}$

7. $(-3)^0$

8. $-(8)^0$

9. $4r^0 - 2^2$

10. $x \cdot x \cdot x \cdot x$

11. $4x + x + 2x + x$

12. $(2x^2)(3x^3)(4x^4)$

13. $(2x^2) + (3x^3) + (4x^4)$

14. $\frac{x^{-4}y^0}{x^{-2}y^{-4}}$

15. $\left(\frac{1}{7}\right)^{-2}$

16. $\left(-3x^{2}y^{-1}\right)^{-4}$

17. $(y^{2} + x^{-2})^{0}$

18. $5 \cdot y^{5} \cdot y \cdot y^{3}$

19. $-15 \cdot a^{5} \cdot y \cdot y^{3}$

20. $(2a^{3}bc^{2})^{4}$

21. $5^{1} + (4z)^{0}$

22. $(2m^{3}n)(n^{3})$

23. $(x^{9}y^{3}) \div (x\, y^{-4})$

24. $\frac{t^{-7} \bullet t^{-2}}{t^{3} \bullet t}$

25. $\left(s^{-9}t^{4}\right)\left(3^{-1}st^{2}\right)$

26. $(2x^{4}y^{2})^{2}(3xy)^{3}$

27. $\frac{a^{4}c^{-4}}{a^{6}c^{-4}}$

28. $\left(\frac{18a^{-5}b^{2}}{2c^{0}}\right)^{2}$

29. $\left(\frac{12a^{2}b^{-3}}{4a^{6}b^{0}}\right)^{-3}$

30. $(m^{3}\cdot n^{5})^{0}$

31. $a^{-2}bc^{-3}$

32. $\frac{25x^{-2}y^{-5}}{15x^{-3}y^{-7}}$

33. $(5a)^{-2}$

34. $-5t^{-5}$

35. $-(-2j^{-2}p)^{4}$

36. $\left(\frac{-12x^{-3}y^{4}}{18x^{-2}z^{-3}}\right)^{-2}$

Adding Polynomials

1. Add: $(x^3 - 3x^2 y - y^3) + (x^3 + y^3 - 5x^2 y) + (-2x^3 - 4xy^2 + 6x^2 y)$

2. Add: $(4abc - 5abd + 6bcd - 7abcd) + (6abc - 7bcd + 8abcd + 9abd)$

3. Add: $(8xy^4 - 4y^5) + (-6x^4 y + 8xy^4) + (-3x^3 y^2 + 7y^5) + (9xy^4 + 4x^4 y - 2x^3 y^2)$

4. Add: $(a^2 - b^2) + (a^2 - 2ab + b^2) + (2a^2 + 3b^2) + (-4a^2 - 6ab - 7b^2) + 10a^2$

5. Add: $(10stu - 11stv + 12tuv) + (8stv + 9tuv) + (2stu + 10stv) + (4stu - tuv)$

6. Add: $(450xyz - 36x^2y + 200xy^2) + (10x^3 - 650y^3 + 140xyz) + (100x^2y + 75xy^2 + 10y^3) + (560x^3 - 100xyz)$

7. Add: $(7aby - 4xy) + (3ax - 4aby) + (4ax - bz - 3ax + aby + 2bz)$

8. Add: $(4uv^2 - 5u^2v) + (tuv - 6uv^2 - 2tuv) + (3u^2v + 10 - 10uv^2 - 5)$

Subtracting Polynomials

1. From $(3abx^2 - 2abxy - 5aby^2)$ subtract $(4abxy + 5aby^2 - 2abx^2)$

2. From the sum of $(0.1x^2 - 2.3y^2 + 4.4xy)$ and $(0.2xy - 2.2x^2)$ take away $(3.3y^2 - 2.4x^2 - xy)$

3. Subtract $(8x^2 - 9x + 2)$ from $(-4x + 2)$.

4. From $(7mn - 11pq)$ take $(9mn + pq)$

5. From $(6xy - 13h)$ take $(10xy + 4k)$

6. From $(a^2 + 2ab + b^2)$ take $(a^2 - 2ab + b^2)$

7. From $(20 - 15axh^2 + t)$ take $(20m^2 + 4t - xh^2)$

Lesson 2 – Solutions: Laws of Exponents and Polynomial Addition and Subtraction

Exponents:

1. y
2. $\frac{1}{y^2}$
3. b^8
4. $\frac{1}{a^{10}}$
5. a^{18}
6. x^{42}
7. 1
8. -1
9. 0
10. x^4
11. $8x$
12. $24x^9$
13. $2x^2 + 3x^3 + 4x^4$
14. $\frac{y^4}{x^2}$
15. 49
16. $\frac{y^4}{81x^8}$
17. 1
18. $5y^9$
19. $-15a^5y^4$
20. $16a^{12}b^4c^8$
21. 6
22. $2m^3n^4$
23. x^8y^7
24. $\frac{1}{t^{13}}$
25. $\frac{t^6}{3s^8}$
26. $108x^{11}y^7$
27. $\frac{1}{a^2}$
28. $\frac{81b^4}{a^{10}}$
29. $\frac{a^{12}b^9}{27}$
30. 1
31. $\frac{b}{a^2c^3}$
32. $\frac{5xy^2}{3}$

33. $\frac{1}{25a^2}$

34. $\frac{-5}{t^5}$

35. $\frac{-16p^4}{j^8}$

36. $\frac{9x^2}{4y^8z^6}$

Adding Polynomials

1. $-2x^2y - 4xy^2$

2. $10abc + 4abd - bcd + abcd$

3. $25xy^4 + 3y^5 - 2x^4y - 5x^3y^2$

4. $10a^2 - 8ab - 4b^2$

5. $16stu + 7stv + 20tuv$

6. $570x^3 + 490xyz + 64x^2y + 275xy^2 - 640y^3$

7. $4aby - 4xy + 4ax + bz$

8. $-12uv^2 - 2u^2v - tuv + 5$

Subtracting Polynomials

1 $5abx^2 - 6abxy - 10aby^2$

2. $0.3x^2 + 5.6xy - 5.6y^2$

3. $-8x^2 + 5x$

4. $-2mn - 12pq$

5. $-4xy - 13h - 4k$

6. $4ab$

7. $20 - 15axh^2 - 3t - 20m^2 + xh^2$

Notes

STMR – Lesson 3: Polynomial Multiplication and Division

In problems 1 – 20, multiply polynomial.

1. $(-2rs)(3rt)(-4st)$

2. $(-5ab^2c)(-2a^3c^2)(-3bc)$

3. $(x - 2y)(2x^2 - 3xy + y^2)$

4. $(x^2 - xy - 3y^2)\,(x^2 - 5y^2)$

5. $(a^2 - 3a + 6)(a^2 + 2a - 5)$

6. $(3x^2 - 5x + 2x^3 - 7)\,(2 + 3x)$

7. $2a\,(4a^2 - 2a + 1)$

8. $5a^2\,(2 - 2a + 3a^2)$

9. $-3ab\,(a - 2b - 3ab)$

10. $4c\,(2ab - 2a + 3b)$

11. $(2x - 3y)\,(2x + y)$

12. $(a - 3b)\,(2a - b)$

13. $(a - 3)\,(2a + 5)$

14. $(2b + x)\,(-b - x)$

15. $(x + 1)(x^2 + x - 1)$

16. $(c - 2)(4 + 2c - c^2)$

17. $(2x - 3y)(4x^2 + 6xy - 9y^2)$

18. $(2x + 1)(1 - 2x + 4x^2)$

19. $(4a - 3b)^2$

20. $(-r^3s)(2p^4rs^2)(-5p^3r^2s^2)$

In problems 21 – 40, divide and write the answer without zero or negative exponents.

21. $(x^2y - xy^2 - 2xy^3) \div xy$

22. $(14a^3b^3 - 21a^2b^2 - 28ab) \div 7ab$

23. $(30x^3y^4 + 21x^2y^2 - 18x^2y^4 - 15x^2y^5) \div 3x^2y^2$

24. $(42x^3z^2 - 6x^4z) \div (6x^4z)$

25. $(14ax + 28ay + 84az) \div 14a$

26. $(12x^4 - 16x^3y + 20x^5) \div -4x^3$

27. $(-3ab^4 + 6ab^5 - 9ab^6) \div ab^4$

28. $(36x^4y^5 - 16x^3y^6) \div 4x^2y^2$

29. $(8a^3b^3 - 24a^4b^4 + 48a^5b^5) \div -8a^2b^2$

30. $(27m^6n^4 + 36m^4n^6 - 45m^4n^4) \div -9m^2n$

31. $(20x^2y - 30xy + 40xy^2) \div 5xy$

32. $(63c^3d^3 - 49c^2d^2 - 42cd) \div -7cd$

33. $(14a^3b^3 - 21a^2b^2 - 28ab) \div 7ab^4$

34. $(42x^5z^4 - 35x^4z + 7xz) \div -7xz$

35. $(7c^2d^3 - 49c^2d^2 - cd) \div -7c^3d^4$

36. $(x^2yz^3 - 50xyz - 4xy^2) \div 5xy^2z^5$

37. $(m^6n^4 + mn^6 - 45mn) \div m^2n^2$

38. $(-4x^4y^5 - 16x^3y^6) \div 4x^4y^5$

39. $(9a^2b^5 - 21b - 7a^2b^2) \div 3a^2b^2$

40. $(32r^4st^2 - 3r^2st^5) \div 12r^3s^2t$

Lesson 3 – Solutions: Polynomial Multiplication/Division

Polynomial Multiplication

1. $24r^2s^2t^2$

2. $-30a^4b^3c^4$

3. $2x^3 - 7x^2y + 7xy^2 - 2y^3$

4. $x^4 - x^3y - 8x^2y^2 + 5xy^3 + 15y^4$

5. $a^4 - a^3 - 5a^2 + 27a - 30$

6. $6x^4 + 13x^3 - 9x^2 - 31x - 14$

7. $8a^3 - 4a^2 + 2a$

8. $-10a^3 + 10a^2 + 15a^4$

9. $-3a^2b + 6ab^2 + 9a^2b^2$

10. $8abc - 8ac + 12bc$

11. $4x^2 - 4xy - 3y^2$

12. $2a^2 - 7ab + 3b^2$

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

14. $-2b^2 - 3xb - x^2$

15. $x^3 + 2x^2 - 1$

16. $-c^3 + 4c^2 - 8$

17. $8x^3 - 36xy^2 + 27y^3$

18. $8x^3 + 1$

19. $16a^2 - 24ab + 9b^2$

20. $10p^7r^6s^5$

Polynomial Division

21. $x - y - 2y^2$

22. $2a^2b^2 - 3ab - 4$

23. $10xy^2 + 7 - 6y^2 - 5y^3$

24. $\frac{7z}{x} - 1$

25. $x + 2y + 6z$

26. $-3x + 4y - 5x^2$

27. $-3 + 6b - 9b^2$

28. $9x^2y^3 - 4xy^4$

29. $-ab + 3a^2b^2 - 6a^3b^3$

30. $-3m^4n^3 - 4m^2n^5 + 5m^2n^3$

31. $4x - 6 + 8y$

32. $-9c^2d^2 + 7cd + 6$

33. $\frac{2a^2}{b} - \frac{3a}{b^2} - \frac{4}{b^3}$

34. $-6x^4z^3 + 5x^3 - 1$

35. $\frac{-1}{cd} + \frac{7}{cd^2} + \frac{1}{7c^2d^3}$

36. $\frac{x}{5yz^2} - \frac{10}{yz^4} - \frac{4}{5z^5}$

37. $m^4n^2 + \frac{n^4}{m} - \frac{45}{mn}$

38. $-1 - \frac{4y}{x}$

39. $3b^3 - \frac{7}{a^2b} - \frac{7}{3}$

40. $\frac{8rt}{3s} - \frac{t^4}{4rs}$

Notes

STMR – Lesson 4: Conversions and Word Problems

Convert and round decimal answers to the nearest hundredths place.

1. 4 feet = _____ inches

2. 5 gallons =_____quarts

3. $10560\ \frac{\text{feet}}{\text{min}} =$ _____ $\frac{\text{miles}}{\text{hour}}$

4. 2 inches^2 =_____ centimeters^2

5. 8 Liters =_____ gallons

Conversion factors:

1 mile = 5,280 feet
1 feet^3 = 7.48 gallons
144 inches^2 = 1 feet^2
1 Liter = 1.057 quarts
1 inch = 2.54 centimeters
4 quarts = 1 gallon
1 kilograms = 2.2 pounds
1 mile = 1.609 kilometers
1 ounce = 28.35 grams
2 pints = 1 quart

6. $960 \ \frac{\text{feet}}{\text{hour}} = \_\_\_\_\_ \ \frac{\text{feet}}{\text{minute}}$

7. $3 \ \frac{\text{pints}}{\text{second}} = \_\_\_\_\_ \ \frac{\text{quarts}}{\text{minute}}$

8. 3 miles = _____ inches

9. $22.44 \ \frac{\text{pounds}}{\text{feet}^3} = \_\_\_\_\_ \ \frac{\text{pounds}}{\text{gallons}}$

10. 6.8 feet^2 = _____ inches^2

Conversion Factors:

1 mile = 5,280 feet
1 feet^3 = 7.48 gallons
144 inches^2 = 1 feet^2
1 Liter = 1.057 quarts
1 inch = 2.54 centimeters
4 quarts = 1 gallon
1 kilograms = 2.2 pounds
1 mile = 1.609 kilometers
1 ounce = 28.35 grams
2 pints = 1 quart

11. 10.4 oz = _____ grams

12. 5 inches = _____ centimeters

13. A pump that pumps 45 $\frac{\text{gallons}}{\text{hour}}$ can pump how many $\frac{\text{quarts}}{\text{minute}}$?

14. A sheet of metal weighs 11 pounds. How many kilograms does it weigh?

15. Two cities are 7 miles apart. How many kilometers are they apart?

Conversion Factors:

1 mile = 5,280 feet
1 feet^3 = 7.48 gallons
144 inches^2 = 1 feet^2
1 Liter = 1.057 quarts
1 inch = 2.54 centimeters
4 quarts = 1 gallon
1 kilograms = 2.2 pounds
1 mile = 1.609 kilometers
1 ounce = 28.35 grams
2 pints = 1 quart

Solve for the given variable in the formula, then substitute in the given values. Make sure the units are consistent.

16. Solve for **A** in $T = ph + 2A$. What is **A** in feet^2 if T = 288 inches^2, p = 1 foot, and h = 0.5 feet? Round the answer to the nearest hundredths.

17. Solve for **V** in $W = \frac{V}{LH}$. What is **V** if L = 3.0 feet, W = 1.2 yards, and H = 83 yards?

Conversion Factors:

1 mile = 5,280 feet
1 feet^3 = 7.48 gallons
144 inches^2 = 1 feet^2
1 Liter = 1.057 quarts
1 inch = 2.54 centimeters
4 quarts = 1 gallon
1 kilograms = 2.2 pounds
1 mile = 1.609 kilometers
1 ounce = 28.35 grams
2 pints = 1 quart

Set up the word problem and solve.

18. There are three consecutive integers. The sum of the smallest and the largest is 36. Find the integers.

19. The sum of two numbers is 72. One number is twice the other. What are the numbers?

20. The sum of four angles about a point is 360°. The second is twice the first; the third, three times the second; and the fourth is 10° greater than the first. Find the angles.

21. The length of a rectangle is equal to twice the width. The perimeter is 138 feet. What are the dimensions?

22. Divide (separate) 87 into two parts so that one part is 13 more than the other part.

23. Separate 90 into two parts so that one part is four times the other part

24. The numerator of a fraction is 4 less than the denominator. The reduced fraction is equivalent to $\frac{3}{5}$. What is the fraction?

25. A rectangle has a length which is 4 feet less than three times the width. The perimeter is 224 feet. What are the dimensions?

Lesson 4 – Solutions: Conversions and Word Problems

Conversions

1. 48 inches

2. 20 quarts

3. $120\ \frac{\text{miles}}{\text{hour}}$

4. $12.90\ \text{centimeters}^2$

5. 2.11 gallons

6. $16\ \frac{\text{feet}}{\text{minute}}$

7. $90\ \frac{\text{quarts}}{\text{minute}}$

8. 190080.00 inches

9. $3\ \frac{\text{pounds}}{\text{gallon}}$

10. 979.20 square inches

11. 294.84 grams

12. 12.7 centimeters

13. $3\ \frac{\text{quarts}}{\text{minute}}$

14. 5 kilograms

15. 11.26 kilometers

16. .75 feet^2

17. 99.6 cubic yards

Word Problems

18. 17; 18; 19

19. 24, 48

20. first angle = 35º; second angle = 70º; third angle = 210º; fourth angle = 45º

21. width = 23 feet; length = 46 feet

22. 37; 50

23. 18, 72

24. $\frac{6}{10}$

25. width = 29 feet; length = 83 feet

Notes

Solve the following equations.

1. $7x + 4 = x + 12$

2. $2x – (x - 1) = 6$

3. $(x - 3)(x - 4) = x^2 + 4$

4. $\frac{b}{2} - \frac{b}{3} = 1$

5. $\frac{x + 5}{3} = 0$

6. $\frac{1}{6a} + \frac{1}{3a} = \frac{1}{4}$

7. $x - 4 - \frac{24 - 2x}{14} = 0$

8. $\frac{4s - 3}{7} - \frac{2s - 6}{4} = \frac{3}{2}$

9. $x - 4 + 42 = 2x + 4$

10. $\frac{1}{3}(x - 1) + \frac{1}{4}(x + 4) - \frac{1}{5}(x + 1) = 2$

11. $5a + 7 - a = 2a + 15$

12. $4k + 3k - 4 = 16 - k + 4$

13. $(x + 5) - (x - 7) + x = 10$

14. $\frac{x}{2} - \frac{40}{x} = \frac{x - 4}{2}$

15. $\frac{x - 10}{x} = \frac{3}{5}$

16. $(x+1)^2 - x^2 = 23$

17. $\frac{2x - 11}{3} - \frac{3x - 10}{4} + 2 = 0$

18. $\frac{2x + 5}{7} - 3 = \frac{3x - 2}{5}$

19. $\frac{x + 5}{14} + \frac{x - 5}{4} = 2$

20. $\frac{3}{2}(a - 1) - \frac{1}{3}(5 - a) = 2\frac{1}{3} - 3(a - 3)$

Lesson 5 - Solutions: Solving Equations

1. $\frac{4}{3}$
2. 5
3. $\frac{8}{7}$
4. 6
5. -5
6. 2
7. 5
8. 6
9. 34
10. 4
11. 4
12. 3
13. -2
14. 20
15. 25
16. 11
17. 10
18. -6
19. 9
20. 3

Notes

Solve the following equations.

1. $y = ax + b$ **Solve for a**

2. $Ax + By + C = O$ **Solve for B**

3. $M = \frac{1}{6}bh$ **Solve for h**

4. $L = a + (n - 1)d$ **Solve for n**

5. $F = \frac{9}{5}C + 32$ **Solve for C**

6. $v^2 = v_o^2 + 2gh$ **Solve for g**

7. $F = \frac{Wv^2}{gR}$ **Solve for g**

8. $s = v_0 t + \frac{1}{2}at^2$ **Solve for a**

9. $\frac{p_1 V_1}{T_1} = \frac{p_2 V_2}{T_2}$ **Solve for V_1**

10. $Ft = mv_2 - mv_1$ **Solve for v_1**

11. $A = \frac{1}{2}(a + b)$ **Solve for a**

12. $A = P(1 + rt)$ **Solve for P**

13. $l = a(1 - e^2)$. **Solve for a**

14. $V = \frac{1}{3}\pi r^2 h$ **Solve for h**

15. $C = \frac{5}{9}(F - 32)$ **Solve for F**

16. $\frac{m+4}{7} = b-1$ **Solve for *m***

17. $P = \frac{H}{FM} - ac$ **Solve for H**

18. $B = \frac{m+ d}{k}$ **Solve for m**

19. $mgh = \frac{1}{2}mv^2 + Fs$ **Solve for s**

20. $r = \frac{ms}{t}$ **Solve for s**

Lesson 6 – Solutions: Manipulating Formulas

1. $a = \frac{y - b}{x}$

2. $B = \frac{-Ax - C}{y}$

3. $h = \frac{6M}{b}$

4. $n = \frac{L - a + d}{d}$

5. $C = \frac{5}{9}(F - 32)$

6. $g = \frac{v^2 - v_0^2}{2h}$

7. $g = \frac{Wv^2}{FR}$

8. $a = \frac{2s - 2v_0 t}{t^2}$

9. $\frac{T_1 p_2 V_2}{T_2 p_1} = V_1$

10. $\frac{Ft - mv_2}{-m} = v_1$

11. $2A - b = a$

12. $P = \dfrac{A}{1 + rt}$

13. $\dfrac{\ell}{1 - e^2} = a$

14. $h = \dfrac{3V}{\pi r^2}$

15. $F = \dfrac{9C + 160}{5}$

16. $m = 7b - 11$

17. $H = FM(P + ac)$

18. $m = Bk - d$

19. $s = \dfrac{2mgh - mv^2}{2F}$

20. $s = \dfrac{rt}{m}$

Notes

STMR – Lesson 7: Factoring and Simplifying Algebraic Fractions

In problems 1 – 20, factor completely.

1. $64x^2 - 25$

2. $21x^2 + xy - 2y^2$

3. $3x^3 - 27x^4y^3$

4. $x^2 + 16$

5. $15x^2y^4 - 3xy^3 + 6xy^2$

6. $100ab^2 - 4ad^2$

7. $2x^2 - 10x - 28$

8. $2r^2 - 5r + 2$

9. $x^2y^2 + 5xy - 14$

10. $x^4 - 81$

11. $4z^6 - z^4$

12. $9a^4b^3 + 6a^3b^2 - 3ab^2$

13. $4x^2 + 36$

14. $10x^2 - 29x + 21$

15. $4y^2 - 4xy - 15x^2$

16. $mn^2 - 6mn + 9m$

17. $25x^2 - 10xy + y^2$

18. $6x^2 - 7x - 3$

19. $8x - 12$

20. $25 - 9z^4$

In problems 21 – 30, simplify the algebraic fractions by factoring.

21. $\dfrac{8 - x}{x^2 - 64}$

22. $\dfrac{2x^3 - 16x^2 + 32x}{6x - 24}$

23. $\dfrac{xy - 3y^2}{x^2 - xy - 6y^2}$

24. $\dfrac{(2x + 3)^2}{8x^2 - 18}$

25. $\dfrac{2x^2+7x-15}{x^2+6x+5}$

26. $\dfrac{2r^2-rs-6s^2}{3r^2-12s^2}$

27. $\dfrac{4y^3+4y^2-4y}{9y^2+9y-9}$

28. $\dfrac{(2x+1)^2}{(2x+1)(x-7)}$

29. $\dfrac{x^2-7x-30}{100-x^2}$

30. $\dfrac{y^2-x^2}{x^2-2xy+y^2}$

Lesson 7 – Solutions: Factoring and Simplifying Algebraic Fractions

Factor

1. $(8x-5)(8x+5)$
2. $(3x+y)(7x-2y)$
3. $3x^3(1-9xy^3)$
4. prime
5. $3xy^2(5xy^2-y+2)$
6. $4a(5b-d)(5b+d)$
7. $2(x+2)(x-7)$
8. $(2r-1)(r-2)$
9. $(xy+7)(xy-2)$
10. $(x^2+9)(x+3)(x-3)$
11. $z^4(2z^2-1)(2z^2+1)$
12. $3ab^2(3a^3b+2a^2-1)$
13. $4(x^2+9)$
14. $(2x-3)(5x-7)$
15. $(2y+3x)(2y-5x)$
16. $m(n-3)(n-3)$
17. $(5x-y)(5x-y)$
18. $(3x+1)(2x-3)$
19. $4(2x-3)$
20. $(5-3z^2)(5+3z^2)$

Simplifying algebraic fraction by factoring

21. $\dfrac{-1}{x+8}$
22. $\dfrac{x(x-4)}{3}$
23. $\dfrac{y}{x+2y}$
24. $\dfrac{(2x+3)}{2(2x-3)}$
25. $\dfrac{2x-3}{x+1}$
26. $\dfrac{2r+3s}{3(r+2s)}$
27. $\dfrac{4y}{9}$
28. $\dfrac{(2x+1)}{(x-7)}$
29. $-\dfrac{x+3}{(10+x)}$
30. $-\dfrac{y+x}{x-y}$

Notes

Apprentice School - Math Placement Test Review
Sample Problems and Answers

Evaluate the following expressions:

1) $6y^2 - 3xy + 2x$ for x = 1 and y = -2

2) $\frac{4pq - 2q + p}{2}$ for p = -3 and q = -1

3) $\frac{2w + 5k}{y}$ for y = -1, w = -2, and k = 3

Simplify by applying the rules governing order of operation:

4) $(3)(-10) + (-12)(5) =$

5) $-1^2 - (12 \div 6 \bullet 2) =$

6) $(-6)(-4) - \frac{(-6)(-1)}{-2} + 2(-4) =$

Remove all grouping symbols and simplify:

7) 3 - [x - 4 + (-x - 1) + x] =

8) 2x - [3x - (x - y) - y] =

9) - [(2u + 3c) - u - 3c] =

Write without zero or negative exponents:

10) $-3x^{-4} =$

11) $\left(\frac{1}{5}\right)^{-1} =$

12) $4x^{-1}y^2z^0 =$

Simplify and write without zero or negative exponents:

13) $\left(-2x^2y^{-3}\right)^3 =$

14) $\left(\dfrac{14k^2mn^4 - 35m^4n^2 + 7km^2n}{-7km^2n}\right) =$

15) $\left(\dfrac{14a^{-2}b^{-7}c^0}{21a^{-3}b^{-7}}\right)^2 =$

Perform the following operations:

16) **Add:** $(6x^4 - 7x^3 + 8x^2 - 9x + 5) + (-5x^4 + 8x^3 - 7x^2 + 9x - 4)$

17) **Add:** $(x^3 - 3x^2y - y^3) + (-x^3 + y^3 - 5x^2y) + (-2x^3 - 4xy^2 + 6x^2y)$

18) **Add:** $(12a + 12) + (-a - 4) + (10a - 5) + (-19a + 14)$

19) **From** $(7mn - 11pq)$ **take** $(9mn + pq)$

20) **Subtract** $(2mn^2 - 3m^2n^2 + 7m^2n - 8mn - 6)$ **from** $(4m^2n^2 + 8mn^2 - 10)$

21) **From** $(8x^3 - 10y^3 + 11z^3 - 12xyz)$ **take** $(-13x^3 + 14y^3 - 15z^3)$

Multiply the following:

22) $(3x + y)^2$

23) $3ab^2(-6a + 2b)$

24) $(2t + 5s)(3t - 8s)$

Solve the equations:

25) $7 + (5x - 12) = 72 - 12x - 2(x + 10)$

26) $\dfrac{7}{3} = -\dfrac{2}{5b} + \dfrac{5}{4b}$

27) $(x - 3)(x + 4) = x^2 + 4$

Solve for the given variable:

28) $y = mx + b$ Solve for m

29) $L = a + (n - p)d$ Solve for n

30) $C = \frac{5}{9}(F - 32)$ Solve for F

Write an equation and solve:

31) The length of a rectangular sheet of metal is 12 inches less than twice the width. If the perimeter is 66 inches, what is the width?

32) The length of a rectangle is 7 inches less than three times the width. If the perimeter is 50 inches, what are its dimensions?

33) The length of a rectangle is 6 inches greater than its width. If the perimeter is 44 inches, what are its dimensions?

34) One number is 9 more than 3 times another. If their sum is 53, what is the smaller number?

35) The sum of two numbers is 82. The larger number is 17 less than twice the smaller number. What are the numbers?

36) A pipe that is 56 meters long is cut into two parts such that the first part is 16 more than the second. Find the length of the two parts.

37) Given the formula: $t = \frac{s}{v}$, find the value for **s** if it is known that $v = 38\frac{\text{kilometers}}{\text{hour}}$, and $t = 38\,\text{minutes}$. Make sure the units are consistent.

38) Given the formula: $A = \frac{1}{2}bh$, find the value for **h** if it is known that $A = 90\,\text{square feet}$, and $b = 36\,\text{inches}$. Make sure the units are consistent.

39) Determine the volume of a rectangular container that measures 5 feet long (L), 9 feet wide (W), and 14 yards high (H). The formula is $V = LHW$, Make sure the units are consistent.

Convert to the given units:

40) **Convert** 234.7 millimeters **to** meters

41) **Convert** 6.8 square feet **to** square inches

42) **Convert** $50\frac{\text{miles}}{\text{hour}}$ **to** $\frac{\text{feet}}{\text{seconds}}$ (Hint *1 mile = 5280 feet*).

Factor completely:

43) $9a^4b^3 + 6a^3b^2 - 3ab^2$

44) $2y^2 - 14$

45) $27a^5b^3c^4 + 18a^4b^2c - 3a^3b$

46) $x^2 - 49$

47) $64y^2 - 81$

48) $9a^4 - 25b^2$

49) $15x^2 + 11x + 2$

50) $4x^2 - 11x + 6$

51) $-7 - 5x + 2x^2$

Simplify the algebraic fractions

52) $\frac{x - y}{x^2 - 2xy + y^2}$

53) $\frac{3 - f}{f^2 - 9}$

54) $\frac{3x - 9}{x^2 - 9}$

ANSWERS

1) 32 **2)** $\frac{11}{2}$ **3)** -11 **4)** -90 **5)** -5 **6)** 19 **7)** $-x + 8$

8) 0 **9)** -u **10)** $\frac{-3}{x^4}$ **11)** 5 **12)** $\frac{4y^2}{x}$ **13)** $\frac{-8x^6}{y^9}$

14) $\frac{-2kn^3}{m} + \frac{5m^2n}{k} - 1$ **15)** $\frac{4a^2}{9}$ **16)** $x^4 + x^3 + x^2 + 1$

17) $-2x^3 - 2x^2y - 4xy^2$ **18)** 2a + 17 **19)** -2mn - 12pq

20) $7m^2n^2 - 7m^2n + 6mn^2 + 8mn - 4$ **21)** $21x^3 - 24y^3 + 26z^3 - 12xyz$

22) $9x^2 + 6xy + y^2$ **23)** $-18a^2b^2 + 6ab^3$ **24)** $6t^2 - st - 40s^2$

25) $x = 3$ **26)** $b = \frac{51}{140}$ **27)** $x = 16$

28) $m = \frac{y - b}{x}$ **29)** $n = \frac{L - a}{d} + p$ **30)** $F = \frac{9C + 160}{5}$

31) 15 inches long **32)** 8 inches wide by 17 inches long

33) 8 inches wide by 14 inches long **34)** 11

35) 33 and 49 **36)** 20 meters and 36 meters

37) $24.0\overline{6}$ kilometers or $26\frac{3}{50}$ kilometers **38)** 60 feet or 720 inches

39) 1890 cubic feet or 70 cubic yards **40)** .2347 m

41) 979.20 square inches **42)** $73.\overline{3}\frac{\text{feet}}{\text{seconds}}$ or $73\frac{1}{3}\frac{\text{feet}}{\text{seconds}}$

43) $3ab^2(3a^3b + 2a^2 - 1)$ **44)** $2\left(y^2 - 7\right)$ **45)** $3a^3b\left(9a^2b^2c^4 + 6abc - 1\right)$

46) $(x - 7)(x + 7)$ **47)** $(8y - 9)(8y + 9)$ **48)** $\left(3a^2 - 5b\right)\left(3a^2 + 5b\right)$

49) $(3x + 1)(5x + 2)$ **50)** $(4x - 3)(x - 2)$ **51)** $(2x - 7)(x + 1)$

52) $\frac{1}{x - y}$ **53)** $\frac{-1}{f + 3}$ **54)** $\frac{3}{x + 3}$

Notes

Notes

Key Concepts

Lesson 1:

Order of Operations:

1. Evaluate any expressions enclosed within **parentheses** or other symbols of grouping. Evaluate the inner most set of grouping symbols first.

2. Evaluate all **exponents**.

3. Evaluate all **multiplications** and **divisions** as they occur in order from left to right.

4. Evaluate all **additions** and **subtractions** as they occur in order from left to right.

Mnemonic: PEMDAS

Lesson 2:

Laws of Exponents	**Rule**
1. $a^m a^n = a^{m+n}$	Product Rule
2. $(a^m)^n = a^{m \cdot n}$	Power Rule
3. $(ab)^m = a^m b^m$	Product to a Power
4. $\frac{a^n}{a^m} = a^{n-m}$ if $a \neq 0$	Quotient Rule
5. $\left(\frac{a}{b}\right)^p = \frac{a^p}{b^p}$ if $b \neq 0$	Quotient to a Power Rule
6. $a^{-n} = \frac{1}{a^n}$ and $\frac{1}{a^{-n}} = a^n$	Negative Exponent Rule
7. $\frac{a^n}{a^n} = a^{n-n} = a^0 = 1$ If $a \neq 0$; But 0^0 is undefined.	Zero Exponent Rule

Lesson 3:

Mnemonic for multiplying two binomials: FOIL

F = First
O = Outer
I = Inner
L = Last

Key Concepts

Lesson 4:
Word Problems:

	Statement	Algebra
1.	Twice as much as the unknown	2x
2.	Two less than the unknown	x - 2
3.	Five more than the unknown	x + 5
4.	Three more than twice the unknown	2x + 3
5.	A number decreased by 7	x - 7
6.	Ten decreased by the unknown	10 - x
7.	Sum of a number and 20	x + 20
8.	Product of a number and 3	3x
9.	Quotient of a number and 8	$\frac{x}{8}$
10.	Three is 4 more than a number	$3 = x + 4$

Lesson 5:
Solving Equations:

Steps for Solving Linear Equations.

1. If fractions exist, multiply all terms on both sides by the lowest common denominator (LCD) of all the fractions.

2. Remove any parentheses.

3. Collect like terms if possible. Simplify.

4. Add or subtract terms on both sides of the equation to get all terms with the variable on one side of the equation and the constants terms on the opposite side of the equation.

5, Divide both sides of the equation by the coefficient of the variable.

6. Simplify the solution (if possible).

7. Check the answer.

Key Concepts

Lesson 6:

Manipulating Formulas:

1. If fractions exist, multiply all terms on both sides by the lowest common denominator (LCD) of all the fractions. The LCD may contain a variable.

2. Remove any parentheses.

3. Collect like terms if possible. Simplify.

4. Add or subtract terms on both sides of the equation to get all terms containing the variable that you are trying to solve for on one side of the equation and the terms that do not contain that variable on opposite side of the equation.

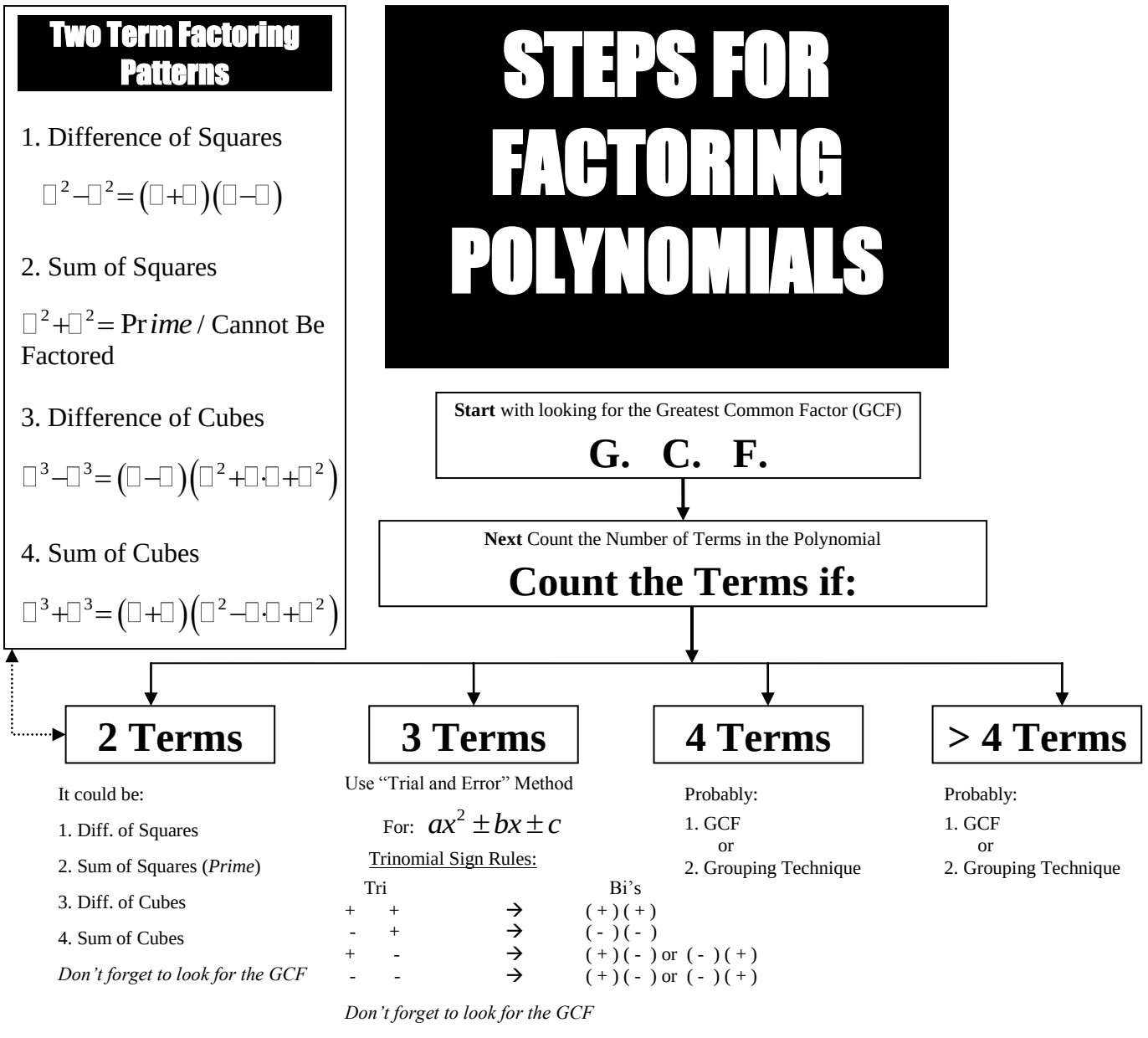
5, Divide both sides of the equation by the coefficient of the desired variable.

6. Simplify the solution (if possible).

7. Check the answer

Key Concepts

Lesson 7:
Factoring:



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