Day 1: Fractions, Factors and Prime Factorization

List the factors of each number.

1. 20  2. 28  3. 50  4. 36  5. 182  6. 200

Give the prime factorization of each number.

7. 75  8. 28  9. 117  10. 220  11. 20  12. 54  13. 147

Write each fraction in lowest terms.

14. \(\frac{6}{12}\)  15. \(\frac{3}{9}\)  16. \(\frac{24}{18}\)  17. \(\frac{35}{14}\)  18. \(\frac{15}{20}\)  19. \(\frac{72}{64}\)  20. \(\frac{175}{490}\)

Perform each operation and simplify the result when possible.

21. \(\frac{1}{2} \div \frac{3}{5}\)  22. \(\frac{3}{4} \div \frac{5}{7}\)  23. \(\frac{4}{3} \div \frac{6}{5}\)  25. \(\frac{10}{3} \div \frac{2}{5}\)  26. \(\frac{7}{2} \div \frac{12}{5}\)  27. \(\frac{3}{5} \div \frac{2}{3}\)  28. \(\frac{21}{35} \div \frac{3}{14}\)

29. \(6 \div \frac{3}{14}\)  30. \(\frac{1}{3} + \frac{1}{5} \div \frac{6}{3}\)  31. \(\frac{1}{6} + \frac{1}{24}\)  32. \(15\frac{5}{6} + 11\frac{5}{8}\)  33. \(\frac{9}{4} - \frac{5}{6}\)

35. \(\frac{5}{14} - \frac{4}{21}\)  36. \(\frac{10}{7} - \frac{5}{28}\)

Day 2: Solving Equations—One Step, Two Step, Variables on Both sides

Solve each equation. Leave answers as a reduced fraction.

1. 2x + 1 = 13  2. 2x - 4 = 16  3. 3x + 1 = 3  4. 8k - 2 = 13  5. 3(x+1) = 15

6. -2(x+5) = 30  7. 2r - 5 = 1 - r  8. 3s - 13 = s - 1  9. 3(2y - 4) - 6 = 3y

10. 2x + (2x - 3) = 5  11. 5(5 - a) = 37 - 2a  12. 4a + 17 = 7(a + 2)

13. 2(a - 5) - (3a + 1) = 0  14. 8(3a - 5) - 4(a + 3) = 12  15. 4(2 - 3t) = -6t + 8

16. 9(x + 2) = -6(4 - x) + 18  17. 3(x + 2) - 2 = -(5 + x) + x

18. \(\frac{x}{2} - \frac{x}{3} = 4\)  19. \(\frac{3 + p}{3} - 4p = 1 - \frac{p + 7}{2}\)  20. \(\frac{4 - t}{2} - \frac{3t}{5} = 2 + \frac{t + 1}{3}\)
Day 3: Working with Like Terms and Factoring out the GCF

Combine the like terms. Write Answers in Descending order. List the degree of the answer.

1. \(16d^2 + 9d^2 - 12d^4 - 8d^3\)
2. \(10 - 15v - 17v^2 + 7 + 13v^2 - 4 + 18v\)
3. \(p + 6 + 2p^2 - 14p^2 + 5 - 3p\)
4. \(19 + 5e - 15\)
5. \(4g + 16 + 12g - 3 + 8\)
6. \(x + 18x^2 + 10 + 7x2 + 9 + 13x - 14x^2\)
7. \(17q + 6 - 11q^2 - 15q\)
8. \(2w^2 - 19w^2 + 5w - 7w + 11w^4 + 4w\)
9. \(17 - 3m - 16m\)
10. \(9a + 14 - 2a - 13\)
11. \(1 - 15 + 10j + 18j^2 + 12 - 8j^2 + 6j\)
12. \(8y + 10y^4 - 4y^3 - 15y^2 - 2y\)
13. \(3t + 17t\)
14. \(9u + 13u^2 - 19 + 14 + 11u^2 - 12u\)
15. \(5b - 18b + 16 - b + 7\)
16. \(6k^2 + 15k - 8 + 9k^2\)
17. \(17t + 5t\)
18. \(a - 12a^2 + 11a - 4a + 13a^2 + 6a^4\)
19. \(16y^2 - 19y + 14 - 10\)
20. \(18e + 2 - 3e + 7 + 11\)

Factor out the GCF.

21. \(-36x^3 + 288x\)
22. \(3x^2 - 3x\)
23. \(-3x^3 - 33x\)
24. \(-15x^2 + 18x\)
25. \(4x^3 - 28x\)
26. \(160x^3 + 100x^2 - 180x\)
27. \(19x^3 - 19x\)
28. \(-6x^3 + 8x\)
29. \(36x^3 - 24x^2 + 8x\)
30. \(-14x^2 + 16x\)
31. \(-16x^4 - 32x^3 - 80x^2\)
32. \(14x^5 - 24x^4\)
33. \(x^3 + 3x\)
34. \(-43x^2 + 387x\)
35. \(-6x^5 + 3x^3\)
36. \(96x^3 - 48x^2 + 60x\)
37. \(33x^2 + 363x\)
38. \(37x^4 - 259x^3 - 222x^2\)
39. \(-396x^3 - 108x^2 + 108x\)
40. \(2x^6 - 4x^5 + 20x^4\)

Day 4: Exponents and order of operations

Evaluate each expression. SHOW EACH STEP WHERE REQUIRED.

1. \((-6)^2\)
2. \(-6^2\)
3. \(3 - 5 \cdot 4\)
4. \(3 \cdot 8^2\)
5. \(8 \cdot 5 - 4 + 2\)
6. \(3^2 - 2^3\)
7. \(-22 - (15 - 3)\)
8. \(-2(9) - 2(5)\)
9. \(100 - 8(10) + 60\)
10. \(200 - (-6 + 5)^3\)
11. \([6(5) - 5(5)]^4\)
12. \((17 - 5 \cdot 2)^3\)
13. \(\frac{5 \cdot 50 - 160}{-9}\)
14. \(\frac{5(68 - 32)}{-9}\)
15. \(\frac{(3 + 5)^2 + 1 - 21}{-2(5 - 8)}\)
16. \(\frac{2[4 - 2(3 - 1)]}{-2(5 - 8)}\)
17. \(\frac{3[-9 + 2(7 - 3)]}{(5 - 8)(7 - 9)}\)
18. \(\frac{(4^3 - 10) + (-4)}{5^3 - (-4)(-5)}\)
19. \(\frac{72 - (2 - 2 \cdot 1)}{10^3 - (90 + 2^2)}\)
20. \(\frac{(6 - 5)^4 - (-21)}{(-9)(-3) - 4^2}\)
21. \(\frac{13^3 - 5^2}{-3(5 - 9)}\)
22. \(-\frac{\left(\frac{40 - 1^3 - 2^4}{3(2 + 5) + 2}\right)}{23. \left(-\frac{8^2 - 10}{2(3)(4) - 5(3)}\right)}\)
Day 5: Finding roots and multiplying binomials

First find the roots of each of the expressions. Leave answers as REDUCED FRACTIONS!!!! Then multiply the pair of binomials.

<table>
<thead>
<tr>
<th>Expression</th>
</tr>
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<tbody>
<tr>
<td>1. (11x + 11) (11x + 10)</td>
</tr>
<tr>
<td>2. (9x + 9) (3x + 3)</td>
</tr>
<tr>
<td>3. (8x + 11) (5x + 11)</td>
</tr>
<tr>
<td>4. (9x + 7) (6x + 4)</td>
</tr>
<tr>
<td>5. (11x + 5) (-11x + 12)</td>
</tr>
<tr>
<td>6. (8x + 11) (-3x + 6)</td>
</tr>
<tr>
<td>7. (6x + 3) (-5x + 2)</td>
</tr>
<tr>
<td>8. (7x + 7) (5x - 4)</td>
</tr>
<tr>
<td>9. (-10x + 11) (7x + 5)</td>
</tr>
<tr>
<td>10. (-9x + 5) (-10x - 6)</td>
</tr>
<tr>
<td>11. (8x - 13) (20x + 11)</td>
</tr>
<tr>
<td>12. (16x - 19) (8x - 8)</td>
</tr>
<tr>
<td>13. (18x - 20) (-12x - 6)</td>
</tr>
<tr>
<td>14. (10x - 11) (-14x + 9)</td>
</tr>
<tr>
<td>15. (-20x - 12) (-19x - 15)</td>
</tr>
<tr>
<td>16. (-14x + 11) (-9x + 19)</td>
</tr>
<tr>
<td>17. (-7x - 11) (19x - 14)</td>
</tr>
<tr>
<td>18. (6x + 7) (20x - 9)</td>
</tr>
<tr>
<td>19. (12x - 13) (-12x + 12)</td>
</tr>
<tr>
<td>20. (16x + 13) (-8x + 15)</td>
</tr>
</tbody>
</table>

Day 6: Factoring trinomials into two binomials and finding roots

Factor each trinomial. Then find the roots.

<table>
<thead>
<tr>
<th>Trinomial</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. (x^2 - 14x + 45)</td>
</tr>
<tr>
<td>2. (x^2 + 17x + 60)</td>
</tr>
<tr>
<td>3. (x^2 - 18x + 80)</td>
</tr>
<tr>
<td>4. (x^2 - 10x + 16)</td>
</tr>
<tr>
<td>5. (x^2 - 6x + 9)</td>
</tr>
<tr>
<td>6. (x^2 - 7x + 6)</td>
</tr>
<tr>
<td>7. (x^2 + 20x + 99)</td>
</tr>
<tr>
<td>8. (x^2 + 3x - 18)</td>
</tr>
<tr>
<td>9. (x^2 - 3x - 88)</td>
</tr>
<tr>
<td>10. (x^2 - 16x + 48)</td>
</tr>
<tr>
<td>11. (x^2 + 11x + 30)</td>
</tr>
<tr>
<td>12. (x^2 - 14x + 33)</td>
</tr>
<tr>
<td>13. (x^2 + x - 30)</td>
</tr>
<tr>
<td>14. (x^2 - 3x - 70)</td>
</tr>
<tr>
<td>15. (x^2 + 8x - 9)</td>
</tr>
<tr>
<td>16. (x^2 - 16x + 55)</td>
</tr>
<tr>
<td>17. (x^2 + 6x - 72)</td>
</tr>
<tr>
<td>18. (x^2 + 5x - 50)</td>
</tr>
<tr>
<td>19. (x^2 + 10x + 24)</td>
</tr>
<tr>
<td>20. (x^2 + 6x - 16)</td>
</tr>
<tr>
<td>21. (x^2 - 5x + 4)</td>
</tr>
<tr>
<td>22. (x^2 - 16x + 60)</td>
</tr>
<tr>
<td>23. (x^2 + 8x - 20)</td>
</tr>
<tr>
<td>24. (x^2 - 4x + 3)</td>
</tr>
</tbody>
</table>
Day 7: Factoring trinomials with leading coefficient not one

Factor each trinomial into two binomials. Then find the roots. If it cannot be factored, write not factorable.

1. $3t^2 + 16t + 5$
2. $6b^2 - 11b - 2$
3. $4n^2 - 26n - 42$
4. $5w^2 - 9w - 2$
5. $4x^2 + 27x + 35$
6. $6y^2 - 11y - 10$
7. $6x^2 - 21x - 9$
8. $3x^2 - 37x + 44$
9. $10x^2 + 17x + 6$
10. $14y^2 - 15y + 4$
11. $4z^2 + 32z + 63$
12. $6t^2 + t - 70$
13. $8b^2 + 2b - 3$
14. $2z^2 + 19z - 10$
15. $12m^2 + 48m + 96$
16. $2x^2 - 9x - 35$
17. $7x^2 - 10x - 3$
18. $3x^2 + 34x + 11$
19. $4x^2 - 21x + 5$
20. $2x^2 - 17x - 19$
21. $5x^2 - 3x - 26$
22. $2x^2 + 19x + 24$
23. $4x^2 - 8x + 3$
24. $8x^2 - 34x + 35$
25. $10x^2 + 3x - 18$
26. $28x^2 - 5x + 1$
27. $24x^2 + 39x + 15$
28. $30x^2 - 87x + 54$
29. $6x^2 - 23x - 18$
30. $18x^2 - 97x - 130$

Day 8: Combining all types of factoring—GCF and Trinomials

Completely factor each trinomial. Factor out a GCF first and then factor the trinomial (if possible). Lastly, find all the roots.

1. $2x^2 + 10x + 12$
2. $3y^2 - 21y + 18$
3. $-5a^2 + 25a - 30$
4. $-2b^2 + 20b - 18$
5. $z^3 - 29z^2 + 100z$
6. $m^3 - m^2 - 56m$
7. $12xy - 4x^2y - 72y$
8. $48xy + 6xy^2 + 96x$
9. $-r^2 + 14r - 40$
10. $-y^2 - 2y + 99$
11. $-13yz + y^2 - 14z^2$
12. $2x^2 - 12x + 16$
13. $s^2 + 11s - 26$
14. $x^2 + 14x - 45$
15. $-2x^2 + 42x + 44$
16. $-3ab + a^2 + 2b^2$
17. $d^3 - 11d^2 - 26d$
18. $m^2 + 3mn - 10n^2$
19. $x^3 + 8x^2 + 15x$
20. $2y^2 - 12y + 16$
Day 9: Factoring Unit Test Review

Perform each operation. You must show work and reduce your fractions. Final answers can be either improper fractions or mixed numbers.

1. \( \frac{1}{8} \cdot \frac{7}{8} \)
2. \( \frac{16}{35} + \frac{25}{48} \)
3. \( \frac{1}{3} + \frac{15}{16} \)
4. \( 16 \frac{1}{4} + 5 \)
5. \( \frac{17}{25} - \frac{7}{25} \)
6. \( \frac{8}{11} - \frac{1}{2} \)
7. \( \frac{1}{9} - \frac{3}{6} \)

Solve the following equations. You must show work and reduce your fractions. Final answers can be either improper fractions or mixed numbers.

8. \( 5x + 4 = 14 \)
9. \( 98.6 - t = 129.2 \)
10. \( \frac{n}{5} - 2 = 4 \)
11. \( \frac{b - 5}{4} = 6 \)
12. \( \frac{3(2 - c)}{2} = -\frac{2(2c + 3)}{5} \)

Evaluate each expression. You must show work and reduce your fractions. Final answers can be either improper fractions or mixed numbers.

13. \( 2 + 5 \cdot 3 \)
14. \( 24 - 3(6)(4) \)
15. \( -(6 - 3)^2 \)
16. \( 4^3 + 2(-6 - 2 \cdot 2) \)
17. \( 10 - 5\left[-3 - 2(5 - 7)^3\right] - 5 \)
18. \( \frac{-4(4 + 2) - 4}{-18 + 4(5)} \)

First find the roots. Then multiply.

19. \( (y - 3)(y + 5) \)
20. \( (a + 4)(a - 5) \)
21. \( (2y - 5)(3y + 7) \)
22. \( (3x - 5)(2x + 1) \)

Factor COMPLETELY if possible.

23. \( 2x^2 - 5x - 3 \)
24. \( 10y^2 + 21y - 10 \)
25. \( -9p^2 - 6p + 6p^3 \)
26. \( 4b^2 - 17bc + 4c^2 \)
27. \( 7y^2 + 7y - 18 \)
28. \( 14y^3 + 6y^4 - 40y^2 \)
29. \( 12w^2 - 36w + 27 \)
30. \( 18c^3d^2 - 12c^3d - 24c^2d \)

Combine the like terms. Write the answer in descending order. List the degree of the answer.

31. \( 18d^2 + 4d^2 - 13d^4 - 8d^3 \)
32. \( w^2 - 149w^2 + w - 7w + 11w^4 + w \)
33. \( 19u + 123u^2 - 193 + 14 + 11u^2 - 12u \)
34. \( 19 + e - 15 \)
Day 11: Finding the Slope of a Line and Graphing

1. Find the slope passing through each pair of points (if possible), and then sketch a graph.
   a. (-5, 0) and (2, 2)  
   b. (0, 3) and (5, 3)  
   c. (0, 2) and (1, -2)  
   d. (0, 2) and (3,3)  
   e. (-1, 0) and (2, 0)  
   f. (-3, 3) and (2, -4)  
   g. (2, -3) and (2, 4)  
   h. (5, 2) and (-3, 4)  
   i. (x, y) and (5, -1), where (x, y) is any point. (Can’t graph)  
   j. (-3, 2) and (4, 2)  
   k. (-3, 0) and (5, 3)  
   l. (4, -2) and (-4, -3)  
   m. (2, -1) and (-5, -4)  
   n. (4, 0) and (4, -5)  
   o. (-3, 3) and (-2, -4)  
   p. (-2, -3) and (-5, -6)  
   q. (5, -2) and (-3, 4)  
   r. (-1, 5) and (-5, 5)

Day 12: Finding an Equation of a Line Using the Point-Slope Form

1. Find the equation of the line that passes through the following points. Graph it.
   a. (-3, 4) and (0, 2)  
   b. (1, 3) and (-4, 3)  
   c. (3, -2) and (-1, -4)  
   d. (1, 3) and (4, 3)  
   e. (0, 1) and (2, 3)  
   f. (-4, 3) and (-2, 5)

2. Find the equation of the line that has the following point and slope. Graph it.
   a. (-5, 0); slope of 3  
   b. (0, 3); slope of 5  
   c. (0, 2) slope of -3  
   d. (4, 2); slope of -1  
   e. (-1, -2); slope of 0  
   f. (-3, 3); slope of 1

Day 13: Finding the x and y Intercepts and then Graphing the line

Use the intercept method to graph each equation.

1. 4x + 5y = 20  
2. 3x + 4y = 12  
3. x – y = -3  
4. x – y = 3  
5. 5x + 15y = -15  
6. 8x + 4y = -24  
7. x + 2y = -2  
8. x + 2y = -4  
9. 4x – 3y = 12  
10. 5x – 10y = 20  
11. 3x + y = -3  
12. 2x – y = -2  
13. 9x – 4y = -9  
14. 5x – 4y = -15  
15. 8 = 3x + 4y  
16. 9 = 2x + 3y  
17. 3x = -15 – 5y  
18. x = 5 – 5y  
19. -4x = 8 – 2y  
20. -5x = 10 + 5y  
21. 7x = 4y – 12  
22. 7x = 5y – 15  
23. y – 3x = -4/3  
24. y – 2x = -9/8
Day 14: Polynomials and Functions

Graph each equation on your calculator and determine if it is a function. Answer FUNCTION or NOT A FUNCTION.

1. \( y = 2x + 3 \)
2. \( y = 4x - 1 \)
3. \( y = 2x^2 \)
4. \( y^2 = x + 1 \)
5. \( y = 3 + 7x^2 \)
6. \( y^2 = 3 - 2x \)

Find \( f(3) \) and \( f(-2) \)

7. \( f(x) = 3x \)
8. \( f(x) = -4x \)
9. \( f(x) = 2x - 3 \)
10. \( f(x) = 3x - 5 \)
11. \( f(x) = 7 + 5x \)
12. \( f(x) = 3 + 3x \)
13. \( f(x) = 9 - 2x \)
14. \( f(x) = 12 + 3x \)

Find \( g(2) \) and \( g(-3) \).

14. \( g(x) = x^2 \)
15. \( g(x) = x^3 - 1 \)
16. \( g(x) = (x + 1)^2 \)
17. \( g(x) = 5x^2 + 2x + 2 \)
18. \( g(x) = \frac{1}{x + 3} \)
19. \( g(x) = \frac{3}{x - 4} \)
20. \( g(x) = \frac{x}{x - 3} \)
21. \( g(x) = \frac{x}{x^2 + 2} \)

Day 15: Domain and Range of a Function

Find the domain and range of each function.

1. \( f(x) = x^2 - 3 \)
2. \( f(x) = x^2 + 2 \)
3. \( f(x) = (x - 1)^2 \)
4. \( f(x) = (x + 1)^3 \)
5. \( f(x) = |x| \)
6. \( f(x) = |x| + 1 \)
7. \( f(x) = -3x \)
8. \( f(x) = x^2 - 5 \)
9. \( g(x) = x^3 + 4 \)
10. \( f(x) = (x - 6)^2 \)
11. \( f(x) = -|x| \)
12. \( f(x) = \sqrt{x} \)
13. \( f(x) = (x + 1)^2 - 2 \)
14. \( f(x) = -(x + 1)^2 \)
15. \( f(x) = |x + 2| \)
16. \( f(x) = \frac{1}{4}x + 4 \)
Day 16: Review and Practice Day

Find the slope of the line passing through the two points. Then graph.

1. (2, 0) and (3, 5)  
2. (-3, -8) and (7, -2)  
3. (4, 4) and (-12, -12)  
4. (8, 2) and (-3, 7)  
5. (-12, 7) and (-4, 3)  
6. (-3, -10) and (7, 7)  
7. (7, -1) and (-8, 0)  
8. (4, 3) and (-12, -2)
9-16. Now use the point-slope form to create equations for the above sets of points.

Use the intercept method to graph each equation.

17. 3x + 2y = 6  
18. 4x - 3y = 24  
19. 7x - 3y = 42  
20. 4x - 2y = 13
21. 3x = 2y + 7  
22. 7y = 3x + 12  
23. 4x + 2y = 12  
24. 5x - y = 7

For each of the functions below: (a) Find $f(3)$ and $f(-2)$ and (b) Find the domain and range.

25. $f(x) = 2x + 4$  
26. $f(x) = x^2 - 3$  
27. $f(x) = -x + 2$  
28. $f(x) = |x - 2|$  
29. $f(x) = (x + 1)^2$  
30. $f(x) = -2(x - 1)^2$

Day 18: Quadratic Functions

For the following quadratic functions find the AXIS OF SYMMETRY, VERTEX, X-INTERCEPT(S), Y-INTERCEPT. Then sketch a graph of the equation labeling the critical points found.

1. $f(x) = x^2 + 4x + 4$  
2. $f(x) = x^2 - 6x + 9$  
3. $f(x) = -x^2 + 2x -1$
4. $f(x) = -x^2 - 2x - 1$  
5. $f(x) = x^2 - 2x$  
6. $f(x) = x^2 + x$
7. $f(x) = 4x^2 - 12x + 9$  
8. $f(x) = 3x^2 - 12x + 12$  
9. $f(x) = 2x^2 - 8x + 6$
10. $f(x) = 4x^2 + 4x - 3$  
11. $f(x) = -6x^2 - 12x - 8$  
12. $f(x) = -2x^2 + 8x - 10$
Day 19: Quadratic Functions Applications

Use a graphing calculator to solve each equation. If the answer is not exact, round to the nearest hundredth.

1. \( x^2 + x - 6 = 0 \)  
2. \( 2x^2 - 5x - 3 = 0 \)  
3. \( 0.5x^2 - 0.7x - 3 = 0 \)  
4. \( 2x^2 - 0.5x - 2 = 0 \)

Solve the following. Round answers to the nearest tenth.

5. A fireworks shell is shot straight up with an initial velocity of 120 feet per second. Its height \( s \) after \( t \) seconds is given by the equation \( s = 120t - 16t^2 \). If the shell is designed to explode when it reaches its maximum height, how long after being fired, and at what height, will the fireworks appear in the sky?

6. From the top of a tall building, a ball is thrown straight up with an initial velocity of 32 ft per second. The equation \( s = -16t^2 + 32t + 48 \) gives the height \( s \) of the ball \( t \) seconds after it is thrown. Find the maximum height reached by the ball and the time it takes for the ball to hit the ground.

7. A farmer wants to fence in three sides of a rectangular field with 1000 feet of fence. The fourth side of the rectangle will be a river. If the enclosed area is to be maximum, find the dimensions of the field.

8. The cost \( C \) in dollars of operating a certain concrete-cutting machine is related to the number of minutes \( n \) the machine is run by the function \( C(n) = 2.2n^2 - 66n + 655 \). For what number of minutes is the cost of running the machine minimum? What is the minimum cost?

9. The height (in feet) of the water level in a reservoir over a 1-year period is modeled by the function \( H(t) = 3.3(t - 9)^2 + 14 \) where \( t = 1 \) is January, \( t = 2 \) is February, etc. How low did the water level get that year, and when did it reach its low mark?

10. The function \( N(x) = -0.0534x^2 + 0.337x + 0.97 \) gives the number of active-duty military personnel in the United States Army (in millions) for the years 1965-1972, where \( x = 0 \) is the year 1965, \( x = 1 \) is the year 1966 and so on. For this period, when was the army’s personnel strength level at its highest and what was the number of soldiers? Historically, can you explain why?

Day 20: Critical points and Higher Degree Polynomials

Sketch a curve that matches the roots of the following polynomials. Use the calculator to find the local minimums and maximums. Label the roots and the min/max points on the graph.

1. \( f(x) = 2x(x + 4)(x - 4)(x + 5) \)  
2. \( g(x) = (x - 1)(x - 4)(x + 5) \)  
3. \( h(x) = 3(x + 2)(x + 6) \)  
4. \( f(x) = x^3 + 1 \)  
5. \( f(x) = x^3 + 2 \)  
6. \( f(x) = x^3 + 3x^2 + 2x + 4 \)

Solve the following.

7. To make boxes, a manufacturer cuts equal-sized squares from each corner of a 10in x 12in piece of cardboard and then folds up the sides. The polynomial \( 4x^3 - 44x^2 + 120x \) gives the volume (in cubic inches) of the resulting box when a square with sides \( x \) inches long is cut from each corner. Find the length of the cut to maximize the volume of the box and tell what the maximum volume is.

8. The polynomial \(-0.0000001s^4 + 0.0066667s^2 + 400\) approximates the length of a cable between the two vertical towers of a suspension bridge, where \( s \) is the sag in the cable. Estimate the length of the cable if the sag is 24.6 ft.
Day 21: Composition of functions

Find \((f \circ g)(x)\) and \((g \circ f)(x)\) for each of the following

1. \(f(x) = 3x; \ g(x) = 4x\)
2. \(f(x) = 2x + 1; \ g(x) = x - 3\)
3. \(f(x) = 3x - 2; \ g(x) = 2x^2 + 1\)
4. \(f(x) = x^2 - 1; \ g(x) = x^2 - 4\)
5. \(f(x) = 2x - 1; \ g(x) = x^2 + 1\)
6. \(f(x) = \frac{1}{x}; \ g(x) = \frac{1}{x^2}\)

Find \((f \circ g)(2)\) and \((g \circ f)(-3)\) for each of the following

7. \(f(x) = x; \ g(x) = 4x\)
8. \(f(x) = 3x + 3; \ g(x) = 2x - 3\)
9. \(f(x) = 3x - 1; \ g(x) = x^2 + 1\)
10. \(f(x) = 2x^2 - 1; \ g(x) = x^2 + 1\)
11. \(f(x) = x - 1; \ g(x) = x^2 + 5\)
12. \(f(x) = \frac{3}{x}; \ g(x) = \frac{1}{x^2}\)

Day 22: Inverse of Functions

Find the inverse of each function and express it using the \(f^{-1}(x)\) notation.

1. \(f(x) = 2x + 4\)
2. \(f(x) = 5x - 1\)
3. \(f(x) = \frac{x + 4}{5}\)
4. \(f(x) = \frac{x - 4}{5}\)
5. \(f(x) = \frac{2}{x - 3}\)
6. \(f(x) = \frac{4}{x}\)
7. \(f(x) = x^3 + 8\)
8. \(f(x) = \sqrt[3]{x}\)
9. \(f(x) = (x + 10)^3\)
10. \(f(x) = 2x^3 - 3\)
11. \(f(x) = \sqrt[3]{x} + 4\)
12. \(f(x) = \frac{3}{x^3} - 1\)

Use composition to determine if each pair of functions are inverses.

13. \(f(x) = 2x + 9; \ f^{-1}(x) = \frac{x - 9}{2}\)
14. \(f(x) = 5x - 1; \ f^{-1}(x) = \frac{x + 1}{5}\)
15. \(f(x) = \frac{2}{x - 3}; \ f^{-1}(x) = \frac{2}{x} + 3\)
16. \(f(x) = \sqrt[3]{x - 6}; \ f^{-1}(x) = x^3 - 6\)
Day 23 and 24: Polynomials Unit Test Review

Find the slope of the line passing through the given points when possible.

1. (2, 4) and (1, 3)  
2. (1, 3) and (2, 5)  
3. (3, 4) and (2, 7)  
4. (3, 6) and (5, 2)  
5. (-1, -2) and (-10, -5)  
6. (5, 7) and (-4, 7)  
7. (-1, -12) and (6, -12)  
8. (8, -4) and (8, -3)

Write an equation of the line that passes through the two given points. Write your answer in slope-intercept form. Sketch a graph of the line that is represented by the equation.

9. (1, 7) and (-2, 1)  
10. (-2, 2) and (2, 8)  
11. (-4, 3) and (2, 0)  
12. (-1, -4) and (1, -2)  
13. (5, 1) and (-5, 0)  
14. (-3, 0) and (3, 1)  
15. (-8, 2) and (-8, 17)  
16. (2/3, 2) and (0, 2)

Find the x- and y-intercepts of each of the following equations. List your answers in coordinate form. Sketch a graph of the line that is represented by the equation.

17. 3 – 5y = 15  
18. x – y = 20  
19. 2y = x + 20  
20. 2x + y = -6  
21. 4x + y = -4  
22. 3x + 4y = 16  
23. 10x = 5y = 5  
24. 4x – 2y = 6

For each of the following functions, find f(2) and f(-3). Then list the domain and range.

25. f(x) = x^2 + 2  
26. f(x) = |x – 7|  
27. f(x) = x^4 – x^2  
28. f(x) = \frac{6}{x – 3}

Find the ROOTS, AXIS OF SYMMETRY and VERTEX of each of the following quadratic functions. Then sketch a graph.

29. f(x) = x^2 – 2x – 3  
30. f(x) = 2x^2 – 13x + 15  
31. f(x) = 3x^2 – 4x + 1  
32. f(x) = x^2 – 6x + 8

Find \((f \circ g)(x)\) and \((g \circ f)(x)\) for each of the following

33. f(x) = 2x; g(x) = x + 1  
34. f(x) = x^2 + 2; g(x) = 2x + 1

Find the inverse of each of the following functions. USE PROPER NOTATION.

35. f(x) = 2x + 4  
36. g(x) = x – 1  
37. f(x) = x^2 + 3  
38. g(x) = \frac{6}{\sqrt{x – 3}}
Day 26: Right Triangle Trigonometry

Find the measure of each of the other two sides of right triangle ABC, with the measure of angle C being 90°. Round answers to the nearest tenth.

1. B = 45°, a = 7.3  
2. A = 36°, c = 18.3  
3. B = 34°, b = 16.3  
4. A = 63°, c = 15.1

5. B = 78°, a = 12.9  
6. A = 53°, a = 38.7  
7. B = 18°, b = 9.6  
8. A = 15°, b = 37.3

Find the measure of each acute angle of the right triangle ABC, with the measure of angle C being 90°. Round answers to the nearest tenth.

9. c = 8.6, b = 4.9  
10. b = 12.7, a = 9.7  
11. b = 14.6, c = 20.6  
12. a = 9.1, c = 12.3

13. c = 18.6, a = 14.1  
14. a = 15.1, b = 7.6

15. A ladder leans against a building. The top of the ladder reaches a point on the building that is 9 m above the ground. The foot of the ladder is 4 m from the building. Find to the nearest thousandth of a degree the measure of the angle that the ladder makes with the level ground.

16. From the top of a lighthouse 48 m high, the angle of depression of a boat at sea measures 23°. Find, to the nearest meter, the distance from the boat to the foot of the lighthouse.

17. From an airplane 925 m above sea level, the angle of depression of a ship measures 42°. Find to the nearest meter the distance to the ship from the point at sea directly below the plane.

18. At a point on the ground 8 m from the foot of a cliff, the angle of elevation of the top of a cliff measures 38°. Find the height of the cliff to the nearest meter.

19. From a point on the ground, the angle of elevation of a kite measures 47°. The kite is attached to a rope 86 m long. Find to the nearest meter how high the kite is in the air.

20. Find BC below.

\[ \text{Diagram with labels and measurements} \]
Day 27: Vectors with Right Triangle Trig

1) An airplane travels at 400 km/hr west and a wind comes from the south at 40 km/hr.
   a) Draw a vector diagram for the situation:
   b) Find the resultant vector that shows the actual speed the plane is traveling. Then find the actual
      bearing the plane is traveling.
   c) What bearing must the plane take off at in order to compensate for the wind?

2) An airplane is flying to the east at 50 km/hr. The plane encounters a wind blowing to the south at 37
   km/hr.
   a) Draw a vector diagram of this situation.
   b) How much is the airplane’s velocity affected by the wind?
   c) How much is the airplane’s bearing affected by the wind?

3) Two children are playing with a red wagon. One child pulls the front of the wagon with a force of 32 N
   at a bearing of 270°. The other child pushes on the side of the wagon with a force of 38 N at a bearing
   of 0°. What is the resultant force on the wagon and at what bearing is it applied?

4) Without current, a ferry can cruise at 30 km/hr. While crossing an ocean channel, the ferry encounters a
   current of 5 km/hr at a right angle to its motion.
   a) What is the ferry’s resultant velocity?
   b) How many degrees off of its original course does the current push the ferry?

5) Commercial airliners fly at an altitude of about 10 km. They start descending toward the airport when
   they are still far away so that they will not have to dive at a steep angle.
   a) If the pilot wants the plan’s path to make a 3° angle with the ground, how far from the airport
      must the pilot start descending?
   b) If the pilot starts descending 300 km from the airport, what angle will the plane’s path make with
      the horizontal?

6) A submarine at the surface of the ocean makes an emergency dive, its path making an angle of 21° with
   the surface.
   a) If it goes for 300 meters along its downward path, how deep will it be? What horizontal distance
      is it from its starting point?
   b) How many meters must it go along its downward path to reach a depth of 1000 meters?

7) A windshield wiper arm 30.5 cm long pivots at point C with a given diagram and sweeps our an an
   angle of 110°. Find the farthest distance between where the ends of the wiper travel.
Day 28: Vectors with Right Triangle Trig

Solve the following problems. Draw a diagram to assist you.

1. An airplane is at an elevation of 35000 ft when it begins its approach to the airport. Its angle of decent is 6°.
   (a) What is the distance between the airport and the point on the ground directly below the airplane?
   (b) What is the approximate air distance between the plane and the airport?

2. A lighthouse keeper observes that there is a 3° angle of depression between the horizontal and the line of ship to a ship. If the keeper is 19 m above water, how far is the ship from the shore?

3. A student looks out of a second story school window and sees the top of the school flagpole at an angle of elevation of 22°. The student is 18 ft above the ground and 50 ft from the flagpole. Find the height of the flagpole.

4. From a ship off-shore, the angle of elevation of a hill is 1.1°. After the ship moves inland at 4.5 knots for 20 minutes, the angle of elevation is 1.4°. How high is the hill? (1 knot = 1 nautical mile per hour = 6080 feet per hour)

5. From a point 1.5 miles from a launch pad at Cape Canaveral, an observer sights a space shuttle at an angle of elevation 10° moments after it is launched. After 10 seconds, the angle of elevation is 50°.
   (a) How far does the space shuttle travel vertically during the 10-second interval?
   (b) What is the average speed of the space shuttle during that time interval (in m/hr)?

6. An airplane at an elevation of 30,000 ft begins to descend toward the runway on which it will land. Let d be the horizontal distance between the plane and the runway. Let X be the plane’s angle of descent.
   (a) Express X as a function of d.
   (b) Suppose that the horizontal distance between the airplane and the runway is 60 miles. Find to the nearest tenth the angle at which the airplane must descend in order to land on the runway. (1 mi = 5280 feet)

Day 29: Law of Cosines

Use the LAW OF COSINES to solve each of the following triangles. Round to the nearest tenth.

1. A = 40°, b = 6.74 in, c = 5.92 in
2. B = 35°, a = 5.78 yd, c = 4.87 yd
3. C = 45.7°, b = 8.94 km, a = 7.23 km
4. A = 67.3°, b = 37.9 m, c = 40.8 m
5. A = 81°, b = 143 cm, c = 89.6 cm
6. a = 2 ft, b = 3 ft, c = 4 ft
7. a = 3 m, b = 4 m, c = 6 m
8. a = 9.3 cm, b = 5.7 cm, c = 8.2 cm
9. a = 28 ft, b = 47 ft, c = 58 ft
10. a = 189 yd, b = 214 yd, c = 325 yd
Day 30: Law of Cosines Applications

1. Use the law of the cosines to find the missing side:

   a. \[ \triangle \text{with sides 9cm, 8cm, and 95°} \]
   
   b. \[ \angle \text{with sides 40°, 45°, and 22°} \]

2. Find the measure of missing angle using inverse trig functions:

   \[ \triangle \text{with sides 4.8cm, 5cm, and 7.5cm} \]

3. Consider an airplane that flies 75 km at a bearing of 35°, then 100 km at a bearing of 95°. Determine the magnitude and bearing of the resultant using the law of the cosines: (YOU MUST DRAW A DIAGRAM)

4. Adam flies an emergency helicopter out of Rollostan Hospital. The patient is located 50 km west of Adam. He can travel at 200 km/hr. The wind begins blowing at a bearing of 45° at 20 km/hr. At what bearing should Adam fly to get to the patient?
   
   a. What is the maximum (ground) speed that Adam can travel due to the wind?
   
   b. How long will it take Adam to reach the patient?
   
   c. When Adam returns with the patient to Rollostan Hospital, what is the maximum (ground) speed he can travel if the wind continues to blow?
   
   d. How long will it take Adam to return to the hospital?

5. Find the length needed to build the bridge in the following picture:

   \[ \triangle \text{with sides 15km and 30°} \]
Day 31: Law of Cosines Applications

Use the LAW OF COSINES to solve the following problems.

1. An airplane flies 50 km at a bearing of 20°, then 120 km at a bearing of 80°. Determine the magnitude and bearing of the resultant vector.

2. Two airplanes have elevations of 23,000 ft and 18,000, respectively. Both are flying toward an airport control tower. From the tower, the angle of elevation of the higher plane is 4° and the angle of elevation of the lower airplane is 2.5°. How far apart (in MILES) are the airplanes?

3. Two ships leave a harbor together, traveling on courses that have an angle of 136° between them. If they each travel 402 miles, how far apart are they?

4. Pearl took a plane from A to B, a distance of 350 miles. Then her plane continued from B to C, a distance of 400 miles. Finally, she returned to A, a distance of 300 miles. If A and B are on an east-west line (A is east of B), find the bearing from A to C (assume that C is north of the line from A to B).

5. Airports A and B are 450 km apart, on and east-west line. Tom flies in a northeast direction from A to airport C. From C he flies 359 km on a bearing of 128.6° to B. How far is C from A?

6. The sides of a parallelogram are 4.0 cm and 6.0 cm. One angle is 58° while another is 122°. Find the lengths of the diagonals of the figure.
Day 32: Review and Practice Day

Find all of the missing sides and angles of the following right triangles. Assume that angle C is the right angle. Round answers to the nearest tenth.

1. $A = 28^\circ$, $c = 17.4 \text{ ft}$
2. $B = 46^\circ$, $c = 29.7 \text{ m}$
3. $B = 73^\circ$, $b = 128 \text{ in}$
4. $a = 76.4 \text{ yd}$, $b = 39.3 \text{ yd}$
5. $a = 958 \text{ m}$, $b = 489 \text{ m}$
6. $a = 18.9 \text{ cm}$, $c = 46.3 \text{ cm}$

Use the LAW OF COSINES to find the missing sides and angles of the following triangles. Round answers to the nearest tenth.

7. $a = 18.92 \text{ in}$, $b = 24.35 \text{ in}$, $c = 22.16 \text{ in}$
8. $a = 15$, $250 \text{ m}$, $b = 17$, $890 \text{ m}$, $c = 27$, $840 \text{ m}$
9. $B = 52.5^\circ$, $a = 7598 \text{ in}$, $c = 6973 \text{ in}$
10. $C = 25^\circ$, $a = 251.3 \text{ m}$, $b = 318.7 \text{ m}$

Solve #11—15 (story problems) using right triangle trig or the law of cosines. Round answers to the nearest tenth.

11. The angle of elevation from a sailboat to the top of a 121 foot lighthouse on the shore is $16^\circ$. How far is the sailboat from shore?
12. A lighthouse 55 meters above sea level spots a distress signal from a sailboat. The angle of depression to the sailboat is $21^\circ$. How far away is the sailboat from the base of the lighthouse?
13. Chip Woodman, the foreman at a paper plant, must make an estimate of the volume of a conical wood chip pile. The distance from the tip of the cone to the edge of the base (the slant height) is 304 feet and forms an angle of $54^\circ$ with the ground. (a) What is the height of the cone? (b) What is the area of the base? (c) What is the volume of the cone?
14. Two ships leave the same port at 8 am. One sails on a bearing of 45 degrees. Its speed is 12 knots. The other ship sails on a bearing of 160 degrees at 14 knots. How many nautical miles apart are the ships at 11 am?
15. A triangular plot of land has two sides with lengths of 400 ft and 600 feet that intersect at an angle of 47 degrees. Find the perimeter of the triangle.

Day 34: Law of Sines

Solve each triangle. Round answers to the nearest tenth.

1. $A = 51^\circ$, $B = 46^\circ$, $c = 14 \text{ m}$
2. $B = 57^\circ$, $C = 38^\circ$, $a = 32 \text{ cm}$
3. $A = 46.5^\circ$, $B = 53^\circ$, $b = 87.3 \text{ mm}$
4. $A = 60^\circ$, $b = 48^\circ$, $b = 32.9 \text{ in}$
5. $A = 27^\circ$, $C = 115.5^\circ$, $c = 76 \text{ ft}$
6. $B = 124^\circ$, $C = 18.6^\circ$, $c = 94.6 \text{ m}$
7. $A = 68.41^\circ$, $B = 54.23^\circ$, $a = 12.75 \text{ in}$
8. $C = 74.08^\circ$, $B = 69.38^\circ$, $c = 45.38 \text{ m}$
9. $A = 87^\circ$, $b = 75.9 \text{ yd}$, $C = 74.3^\circ$
10. $b = 38.6^\circ$, $a = 19.7 \text{ cm}$, $C = 92^\circ$
11. $B = 21^\circ$, $C = 103^\circ$, $AC = 132 \text{ ft}$
12. $A = 35.3^\circ$, $B = 53^\circ$, $AC = 675 \text{ ft}$
Day 35: Law of Sines Applications

Solve the following using the LAW OF SINES. Round answers to the nearest tenth.

1. A ship passes by buoy B, which is known to be 3000 yd from peninsula . The ship is steaming east along line BE and angle PBE is measured as 28 degrees. After 10 minutes, the ship is at S and angle PSE is measured as 63 degrees.
   (a) How far from the peninsula is the ship when it is at S?
   (b) If the ship continues east, what is the closes it will get to the peninsula?
   (c) How fast (in yd/min) is the ship traveling?
   (d) Ship speeds are often given in knots, where 1 knot is 6080 feet per hour. Convert your answer in part (c) in knots.

2. From points P and Q, 180 m apart, a tree at T is sighted on the opposite side of a deep ravine. From point P, a compass indicates that the angle between the north-south line and line of sight to the tree is 27 degrees and that the angle between the north-south line from P to Q is 78 degrees. From point Q, the angle between the north-south line and the line of sight to the tree is 43 degrees.
   (a) How far from P is the tree?
   (b) How far is P the point on PQ that is closest to the tree?

3. A ship is sailing due north. The captain notices that the bearing of a lighthouse 12.5 km away is 39 degrees. Later on, the captain notices that the bearing of the lighthouse becomes 136 degrees. How far did the ship travel between the two observations of the lighthouse?

4. Kaitlyn and Alexandra have walkie talkie radios that have a range of 5 miles. Kaitlyn walked 3.5 miles at a bearing of 270 degrees. Alexandra walked 2 miles at a bearing of 160°.
   (a) Draw out below the situation with a resultant vector.
   (b) Will they still be in radio contact? (Use law of the cosines)
   (c) At what bearing should Alexandra walk to find Kaitlyn given that Kaitlyn stays where she is? (Use law of the sines)

5. To estimate the height of Moosylvania Mountain, Eric and Kevin use a clinometer to find that the mountain peak is up 15 degrees. When they move 2 miles closer, the new clinometer reading is 20 degrees. (MAKE A DIAGRAM).
   (a) How tall is the mountain peak? (Use law of sines and basic triangle info)
   (b) How far are they from the base of the mountain? (Use right angle trig)

6. A pilot approaching a 10000 foot runway finds the angles of depression of the ends of the runway are 12 degrees and 15 degrees. How far is the plane from the nearer end of the runway?
Day 36: Law of Sines Applications

1. A pine tree stands on an 18 degree slope. From a point 20 m down the slope the angle of elevation of the top of the tree is 32 degrees. How tall is the tree?

2. From the top of a building 24 m high the angle of elevation of a weather balloon is 54 degrees, and from the bottom of the building the angle is 62 degrees. How high above the ground is the balloon?

3. The skipper of a sailboat 6 km from the nearer of two towers on shore finds that the angle between the lines of sight to the towers is 35 degrees. If the towers are 10 km apart, how far is the boat from the farther tower?

4. A guy wire bracing a transmission tower makes an angle of 53 degrees with the ground. It is to be replaced by a wire 30 m long from the same point on the ground and reaching 10 m further up the tower. What angle will this new wire make with the ground?

5. If points A and B at the top of two support towers for a bridge are sighted from points C and D on the shore. The angles of elevation are as follows: C to A is 26 degrees, C to B is 50 degrees, D to B is 20 degrees. Also, C and D are 1.25 km apart. Assuming the two towers are the same height, how far apart are A and B?

Day 37: Vector Components

1. Describe the components of a vector with a magnitude of 75 km/hr and a bearing of 50 degrees.

2. The forces represented by the following vectors, where direction is measured counterclockwise from the positive x-axis, are acting simultaneously on an object: 20 N @ 45°, 15 N @ 105°, 35 N @ 200°, and 45 N @ 300°. (a) What is the sum of the x-components of this vector? (b) What is the sum of the y-components of this vector? (c) If you assume that your starting point is at (0, 0) on a coordinate system, what would the endpoint coordinates be?

3. In an orienteering competition, participants race across an unfamiliar course using a map and compass to navigate between checkpoints. During one race, your path can be described by the following vectors: 350 paces at a bearing of 35 degrees, 1250 paces at a bearing of 275 degrees, 1000 paces at a bearing of 140 degrees. What is the change of position (resultant vector—magnitude and bearing)?

4. The instructions in a treasure hunt include the following vectors: 50 m at a bearing of 30 degrees, 14 m at a bearing of 260 degrees, 15 m at a bearing of 175 degrees, and 25 m at a bearing of 105 degrees. (a) What is the sum of the x-components of these vectors? (b) What is the sum of the y-components of these vectors? (c) What is the magnitude and bearing of the resultant vector?
Day 38 and 39: Vectors Unit Test Review

Solve each of the following right triangles. Angle C is the right angle. Round answers to the nearest tenth.

1. \( A = 28^\circ, c = 17.4 \text{ ft} \)
2. \( B = 46^\circ, c = 29.7 \text{ m} \)
3. \( B = 73^\circ, b = 128 \text{ in} \)
4. \( A = 61^\circ, b = 39.2 \text{ cm} \)
5. \( A = 48.2^\circ, b = 79.8 \text{ in} \)
6. \( B = 24^\circ, b = 698 \text{ mm} \)
7. \( a = 75.3 \text{ yd}, b = 39.3 \text{ yd} \)
8. \( a = 958 \text{ mm}, b = 489 \text{ mm} \)
9. \( a = 18.9 \text{ cm}, b = 46.3 \text{ cm} \)

Solve each of the following problems.

10. A 39.4 m fire-truck ladder is leaning against a wall. Find the distance the ladder goes up the wall if it makes an angle of 43 degrees with the ground.

11. A swimming pool is 50 ft long and 4 ft deep at one end. If it is 12 ft deep at the other end, find the total distance along the bottom.

12. A guy wire 87. m long is attached to the top of a tower that is 69.4 m high. Find the angle that the wire makes with the ground.

13. Suppose the angle of elevation of the sun is 28.4 degrees. Find the length of a shadow cast by a man 6 ft tall.

14. Find the angle of elevation of the sun if a 53.9 ft flagpole casts a shadow 74.6 ft long.

15. The angle of depression from the top of a building to a point on the ground is 34.84 degrees. How far is the point on the ground from the top of a building if the building is 368 m high?

16. Priscilla drives her Wrangler up a straight road inclined at an angle of 4 degrees with the horizontal. She starts at an elevation of 684 ft above sea level, and drives 3 miles along the road. What is her final altitude?

Use the LAW OF COSINES to complete the triangles. Round answers to the nearest tenth.

17. \( a = 18.9 \text{ m}, b = 24.3 \text{ m}, c = 22.2 \text{ m} \)
18. \( B = 52^\circ, a = 7600 \text{ mi}, c = 7000 \text{ mi} \)
19. \( a = 28 \text{ ft}, b = 47 \text{ ft}, c = 58 \text{ ft} \)
20. \( C = 25^\circ, a = 251 \text{ m}, b = 319 \text{ m} \)

Use the LAW OF SINES to complete the triangles. Round answers to the nearest tenth.

21. \( A = 39.7^\circ, C = 30.3^\circ, b = 39.74 \text{ cm} \)
22. \( C = 72^\circ, B = 42.5^\circ, a = 2.614 \text{ in} \)
23. \( B = 43^\circ, C = 102^\circ, b = 3974 \text{ ft} \)
24. \( A = 18.75^\circ, B = 51.5^\circ, c = 2798 \text{ yd} \)
Solve using whatever trigonometry is possible. Round answers to the nearest tenth.

25. A wheelchair ramp must rise 30 in to meet the front door of a public library. If the ramp’s angle of elevation is not to exceed 8 degrees, what is the minimum horizontal length of the ramp?

26. A submarine dives at an angle of 16 degrees with horizontal. If it takes 4 min to dive from the surface to a depth of 300 ft, how fast does it move along its path downward. First give your answer in feet/second and then change it to knots (1 knot = 6080 feet per hour).

27. A ship is steaming north at 6 knots when the captain sights a small island at a bearing of 15 degrees. After 10 minutes, the bearing is 28 degrees. How far away is the island at this moment?

28. A sailboat leaves its dock and proceeds east for 2 miles. It then changes course to 205 degrees until it is due south of its dock. How far south is this?

29. Two ships, A and B, leave port at the same time. Ship A proceeds at 12 knots on a bearing of 40 degrees, while ship B proceeds at 9 knots on a course of 115 degrees. After 2 hours, ship A loses power and radios for help. How far and on what bearing must ship B travel to reach ship A?

30. An airplane flies on a course of 110 degrees at a speed of 1200 km/hr. How far east and how far south of the starting point will the plane be after two hours?

31. The following forces act on the same object: 25N @ 150°, 25N @120°, 15N at 300°, 45N @ 0°
(Directions are in bearing notation)
Find the magnitude and BEARING of the resultant vector.

Day 41: Simplifying Square Roots

Express each square root in its simplest form.

1. \( \sqrt{50} \)  2. \( \sqrt{84} \)  3. \( \sqrt{126} \)  4. \( \sqrt{12} \)  5. \( \sqrt{18} \)  6. \( \sqrt{24} \)

7. \( \sqrt{32} \)  8. \( \sqrt{40} \)  9. \( \sqrt{48} \)  10. \( \sqrt{60} \)  11. \( \sqrt{75} \)  12. \( \sqrt{83} \)

Express each product in its simplest form.

13. \( (\sqrt{3})(\sqrt{2}) \)  14. \( (\sqrt{5})^2 \)  15. \( (2\sqrt{3})^2 \)  16. \( (3\sqrt{2})^2 \)

17. \( (4\sqrt{3})^2 \)  18. \( (2\sqrt{3})(\sqrt{2}) \)  19. \( (3\sqrt{6})(2\sqrt{3}) \)  20. \( (7\sqrt{3})(8\sqrt{3}) \)

21. \( (5\sqrt{5})^2 \)  22. \( (4\sqrt{3})(3\sqrt{4})(\sqrt{2}) \)  23. \( (7\sqrt{2})^2 (4\sqrt{3}) \)  24. \( (2\sqrt{3})^2 (2\sqrt{3}) \)
Day 42: Simplifying Square Roots with the Distance Formula and Solving Radical Equations

Find the distance between the two points:

1. (-2, 7) and (1, 4)  
2. (8, -2) and (4, -5)  
3. (-3, 6) and (-3, 2)  
4. (-5, 2) and (3, -7)  
5. (-1, 0) and (-4, -5)  
6. (-2, -3) and (-6, 4)  
7. (7, -2) and (3, -2)  
8. (-4, -1) and (2, -1)  
9. (-3, 5) and (-5, -5)  
10. (2, -3) and (4, -8)  

Solve each equation. Write all apparent solutions. Cross out those that are extraneous.

11. \(\sqrt{5x - 6} = 2\)  
12. \(\sqrt{7x - 10} = 12\)  
13. \(\sqrt{6x - 1} = 2\)  
14. \(\sqrt{6x + 13} - 2 = 5\)  
15. \(2\sqrt{4x + 1} = \sqrt{x + 4}\)  
16. \(\sqrt{3(x + 4)} = \sqrt{5x - 12}\)  
17. \(x = \frac{\sqrt{12x - 5}}{2}\)  
18. \(x = \frac{\sqrt{16x - 12}}{2}\)  
19. \(\sqrt{x + 2} - \sqrt{4 - x} = 0\)  
20. \(\sqrt{6 - x} - \sqrt{2x + 3} = 0\)  
21. \(\sqrt{y + 2} = 4 - y\)  
22. \(\sqrt{2r - 3} = r - 9\)

Day 43: Special Right Triangles

GET THE PHOTOCOPY FROM MR. LAMB

Day 44: Rationalizing the Denominator

Simplify each Radical Expression. REMEMBER: There should be no square roots in the denominator. Also, remember to simplify any of the square roots as well as reduce your fractions.

1. \(\frac{1}{\sqrt{3}}\)  
2. \(\frac{2}{\sqrt{2}}\)  
3. \(\frac{6}{\sqrt{12}}\)  
4. \(\sqrt{\frac{11}{6}}\)  
5. \(\sqrt{\frac{3}{\sqrt{8}}}\)  
6. \(\frac{\sqrt{5}}{\sqrt{10}}\)  
7. \(\frac{2\sqrt{3}}{5\sqrt{2}}\)  
8. \(\frac{4}{\sqrt{6}}\)  
9. \(\left(\frac{6}{\sqrt{12}}\right)\left(\sqrt{2}\right)\left(\frac{\sqrt{2}}{4}\right)\)  
10. \(\frac{2}{\sqrt{8}}\)  
11. \(\frac{\sqrt{6}}{\sqrt{3}}\)  
12. \(\frac{1}{\sqrt{3}}\)  
13. \(\left(\frac{12}{\sqrt{3}}\right)^2\)  
14. \(\left(\frac{8}{\sqrt{12}}\right)\left(\frac{4}{\sqrt{12}}\right)\)  
15. \(\frac{5}{\sqrt{25}}\)  
16. \(\frac{2}{\sqrt{24}}\)  
17. \(\frac{7}{\sqrt{98}}\)
Day 45: Review and Practice Day

Rewrite each radical expression in simplest terms.

1. \( \sqrt{1500} \)  
2. \( \sqrt{168} \)  
3. \( \sqrt{484} \)  
4. \( \sqrt{72} \)  
5. \( \sqrt{48} \)

6. \( \sqrt[5]{500} \)  
7. \( (25\sqrt{200})(2\sqrt{2})^3 \)  
8. \( (25\sqrt{3})^2 \)  
9. \( (\sqrt{500})^6 \)

Find the distance between the two points. Leave answers in simplified radical form.

10. (-1, 0) and (-4, -5)  
11. (-2, -3) and (-6, 4)

Find the missing sides of the right triangles.

12. 

13. 

Simplify the following:

14. \( \left( \frac{1}{\sqrt{3}} \right)^2 \left( \frac{3}{\sqrt{8}} \right)^2 \)  
15. \( \frac{6}{\sqrt{12}} \)  
16. \( \frac{\sqrt{5}}{\sqrt{10}} \)

17. \( \left( \frac{8}{\sqrt{12}} \right)^2 \left( \frac{4}{\sqrt{12}} \right)^2 \)  
18. \( \left( \frac{8}{\sqrt{24}} \right) \left( \frac{4}{\sqrt{8}} \right) \)  
19. \( \left( \frac{1}{\sqrt{54}} \right) \left( \frac{1}{\sqrt{3}} \right) \)

20. \( \left( \frac{3}{\sqrt{51}} \right) \left( \frac{2}{\sqrt{6}} \right) \)  
21. \( \left( \frac{9}{\sqrt{6}} \right)^2 \left( \frac{1}{\sqrt{3}} \right)^3 \)
Day 46: Imaginary and Complex Numbers

Simplify each of the following:

1. $i^4$  
2. $i^8$  
3. $i^{20}$  
4. $i^{35}$  
5. $i^{204}$  
6. $i^{38}$  
7. $i^{102}$  
8. $i^{2007}$  
9. $(2 + 6i) + (5 - 4i)$  
10. $(5 - 2i) - (6 - 3i)$  
11. $\sqrt{-4} + \sqrt{-16} + \sqrt{-1}$  
12. $\frac{\sqrt{-12}}{\sqrt{3}}$  
13. $(3 + i)(3 - i)$  
14. $(9 + i)(3 - i)$  
15. $(2 + i)(3 - i)$  
16. $(2 + 3i)(4 - 2i)$  
17. $(2 + 4i)(-1 + 3i)$  
18. $i(3 - 4i)(2 + 3i)$  
19. $i(2 + 6i)^2$  
20. $(\sqrt{6} - i)(\sqrt{6} + i)$

Day 47: Complex Numbers and Fractions

Simplify Each Expression.

1. $(8 + 2i)(-1 + 5i)$  
2. $(-6 - 2i)(15 + 3i)$  
3. $(10 + i)(10 - i)$  
4. $i(7 - 12i)$  
5. $-3i(i - 1)$  
6. $(4 + i)(6 - i)$  
7. $(i - 3)(i - 2)$  
8. $(8 - 5i)(3 - 4i)$  
9. $(7 + 6i)^2$  
10. $\frac{1 + i}{1 - i}$  
11. $\frac{4}{6 - 5i}$  
12. $\frac{12 - i}{5 + 2i}$  
13. $\frac{5 + 4i}{1 - 2i}$  
14. $\frac{4 - 3i}{2 + i}$  
15. $\frac{(1 - i)^2}{(1 - i)^2}$  
16. $\frac{1 + i}{1 - i}$  
17. $\frac{4}{6 - 5i}$  
18. $\frac{12 - i}{5 + 2i}$  
19. $\frac{5 + 4i}{1 - 2i}$  
20. $\frac{4 - 3i}{2 + i}$  
21. $\frac{(1 - i)^2}{(1 - i)^2}$
Day 48: Graphing Complex Numbers as Vectors

Graph each of the following complex numbers.

1. \(-2 + 3i\)  
2. \(-4 + 5i\)  
3. \(8 - 5i\)  
4. \(6 - 5i\)  
5. \(2 - 2i\)  
6. \(-4i\)  
7. \(3i\)  
8. \(10 + 2i\)  

Find the resultant of each of the following pairs of complex numbers by graphing (add them). Then list the resultant below the graph:

9. \(2 - 3i, -1 + 4i\)  
10. \(-4 + 5i, 2 + i\)  
11. \(-5 + 6i, 3 - 4i\)  
12. \(8 - 5i, -6 + 3i\)  
13. \(-2, 4i\)  
14. \(5, -4i\)  
15. \(2 + 6i, -2i\)  
16. \(4 - 2i, 5\)  
17. \(7 + 6i, 3i\)  
18. \(-5 - 8i, -1\)

Day 49: Radical Unit Test Review

Express each square root in its simplest form.

1. \(\sqrt{18}\)  
2. \(\sqrt{126}\)  
3. \(\sqrt{84}\)  
4. \(\sqrt{12}\)  
5. \(\sqrt{50}\)  
6. \(\sqrt{44}\)  

13. \((\sqrt{3})(\sqrt{2})\)  
14. \((\sqrt{5})^2\)  
15. \((2\sqrt{3})^2\)  
16. \((3\sqrt{2})^3\)  
17. \((4\sqrt{3})^2\)  
18. \((2\sqrt{3})(\sqrt{2})\)  
19. \((3\sqrt{12})(2\sqrt{3})\)  
20. \((7\sqrt{3})(8\sqrt{3})\)  
21. \((5\sqrt{5})^2\)  

22. \(\frac{2\sqrt{3}}{5\sqrt{2}}\)  
23. \(\frac{4}{\sqrt{8}}\)  
24. \(\left(\frac{6}{\sqrt{24}}\right)\left(-\frac{5\sqrt{6}}{\sqrt{2}}\right)\)  

Find the distance between the two points:

25. \((-8, 28)\) and \((2, 8)\)  
26. \((8, -2)\) and \((4, -5)\)  
27. \((-3, 6)\) and \((-3, 2)\)  
28. \((3, -7)\) and \((5, -2)\)
Find the missing side(s) of the right triangles using either Pythagorus’ Theorem or your knowledge of special right triangles. Then find the sine, cosine and tangent of angle $A$.

### Graphs

29. $\triangle ABC$

30. $\triangle ABC$

31. $\triangle ABC$

### Simplify each expression.

32. $(6 - i)(6 + i)$
33. $(8 + 3i)(2 - 5i)$
34. $(7 + 3i)(7 - 3i)$
35. $(5 - 2i)(-1 + 3i)$
36. $(4 - 5i)^2$
37. $(4 + 7i)^3$
38. $\frac{1}{2 + 5i}$
39. $\frac{5 + i}{5 - i}$
40. $\frac{3 + i\sqrt{2}}{7 - i\sqrt{2}}$
41. $\frac{1}{4 - 3i}$
42. $\frac{2 + i\sqrt{5}}{3 - i\sqrt{5}}$
43. $\left(\frac{4}{6 + 3i}\right)^2$

### Graph each of the following:

44. $7 + 4i$
45. $6 - 3i$
46. $(6 + 3i) + (5 - 2i)$
47. $(2 - 7i) - (4 - 7i)$
Day 51: Radian Measurement

Convert each degree measure to radians. Leave answers in terms of $\pi$.

1. $315^\circ$  
2. $225^\circ$  
3. $15^\circ$  
4. $-45^\circ$  
5. $-90^\circ$  
6. $-180^\circ$  
7. $135^\circ$

8. $-225^\circ$  
9. $-120^\circ$  
10. $300^\circ$  
11. $360^\circ$  
12. $-240^\circ$  
13. $210^\circ$  
14. $-210^\circ$

Convert each radian measure to degrees.

15. $-\frac{\pi}{2}$  
16. $\frac{4\pi}{3}$  
17. $-\frac{3\pi}{4}$  
18. $-\frac{\pi}{6}$  
19. $-\frac{5\pi}{6}$  
20. $-2\pi$  
21. $\frac{5\pi}{4}$

22. $-\pi$  
23. $-\frac{3\pi}{2}$  
24. $\frac{2\pi}{3}$  
25. $\frac{7\pi}{6}$  
26. $-\frac{\pi}{4}$  
27. $\frac{7\pi}{4}$  
28. $\frac{11\pi}{6}$

Day 52: Arc Length

Solve the following problems

1. A sector of a circle has a radius of 6 cm and a central angle of $0.5$ radians. Find its arc length.

2. A sector of a circle has radius of 5 cm and a central angle of $3$ radians. Find its arc length.

3. A sector of a circle has arc length of 11 cm and central angle of $2.2$ radians. Find its radius.

4. A sector of a circle has arc length of $2$ cm and central angle of $0.4$ radians. Find its radius.

5. A sector of a circle has central angle of $30^\circ$ and arc length of $3.5$ cm. Find its radius.

6. A can of radius 5 cm has a point on its surface that has moved 5 cm.
   a. How many radians has it moved?
   b. What if it moved 10 cm?
   c. 12 cm?
   d. 45.5 cm?

7. If you live on the equator you are approximately 4000 miles from the axis of the earth.
   a. How far do you travel in a day?
   b. How far do you travel in an hour?

8. Does everyone on the earth travel the same distance in a day? Why or why not.

9. The planet Gehrkenite has a diameter of 95000 km.
   a. What is its distance any point on its equator travels in a Gehrkenite day?
   b. How far would you travel if you were on the Gehrkenite North Pole?

10. How far does a Ferris wheel travel if it moved $\frac{1}{4}$ of a turn and its radius is 40 feet?

11. If a wheel of radius 20 inches spins 100 times as it travels, how far has it traveled?
12. A wheel of radius 13 cm has a point on its outside edge that has traveled 100 cm.
   a. How many radians has it moved?
   b. Approximately how many turns is this?

13. A radian measure of 5 radians results in a distance traveled by an object of 45 cm.
   a. What is the distance of this object from the center of the circle (radius)?
   b. What if it travels 55 cm?
   c. 100 cm?
   d. 500 cm?

14. A bike wheel when it completely spins moves the bike forward 163.36 inches. What is the radius of the wheel?

15. Ashleigh and Jessica are on a Merri-Go-Round. Ashleigh is 4 m from the center and Jessica is 2 m from the outside. How far does each travel in 6 revolutions?

16. If they can do 6 revolutions in 15 seconds.
   a. What is each person’s speed in m/s?
   b. What about in radians per second?

Day 53: Sectors of Circles

Find the area of each of the sectors, given the radius of the circle and the measure of the angle between radii.

1. \( r = 7, \ \theta = \frac{\pi}{8} \)
2. \( r = 10, \ \theta = \frac{5\pi}{12} \)
3. \( r = 3, \ \theta = \frac{\pi}{3} \)
4. \( r = 15, \ \theta = \frac{5\pi}{6} \)
5. \( r = 24, \ \theta = \frac{3\pi}{4} \)
6. \( r = 12, \ \theta = \frac{2\pi}{3} \)
7. \( r = 22, \ \theta = 48^\circ \)
8. \( r = 6, \ \theta = 54^\circ \)
9. \( r = 9, \ \theta = 112^\circ \)
10. \( r = 8, \ \theta = 120^\circ \)
11. \( r = 16, \ \theta = 81^\circ \)
12. \( r = 4, \ \theta = 165^\circ \)

13. A sector of a circle has a radius of 6 cm and central angle of 0.5 radians. Find its area.

14. A sector of a circle has a radius of 5 cm and a central angle of 3 radians. Find its area.

15. A sector of a circle has arc length of 11 cm and a central angle of 2.2 radians. Find its area.

16. A sector of a circle has arc length 2 cm and central angle 0.4 radians. Find its area.

17. A sector of a circle has an area of 25 cm\(^2\) and central angle of 0.5 radians. Find its radius and arc length.

18. A sector of a circle has an area of 90 cm\(^2\) and central angle of 0.2 radians. Find its radius and arc length.

19. A sector of a circle has a central angle of 24\(^\circ\) and arc length 8.4 cm. Find its area to the nearest tenth.

20. A sector of a circle has a central angle of 30\(^\circ\) and arc length of 3.5 cm. Find its area to the nearest tenth.
Day 54: Arc Length and Sector Applications

1. The diameter of the moon is about 3500 km. Its apparent size is about 0.0087 radians. About how far is it from earth?

2. At its closest approach, Mars is about \((5.6 \times 10^7)\) km from Earth and its apparent size is about 0.00012 radians. What is the approximate diameter of Mars?

3. A compact disc player uses a laser to read music from a disc. The player varies the rotational speed of the disc depending on the position of the laser. When the laser is at the outer edge of the disc, the player spins the disc at the slowest speed, 200 rpm.
   a. At the slowest speed, through how many degrees does the disc turn in a minute?
   b. Through how many radians does it turn in a minute?
   c. If the diameter of the disc is 11.9 cm, find the approximate distance that a point on the outer edge travels at the slowest speed in 1 minute.

4. To make a clay vase, an artist uses a potter’s wheel that has a diameter of 13 in and spins at 120 rpm. Find the approximate distance traveled in 1 minute by a point on the outer edge of the wheel.

5. The moon and the sun have approximate the same apparent size for viewers on Earth. The distances from earth to the moon and to the sun are about \((4 \times 10^5)\) km and \((1.5 \times 10^8)\) km respectively. The diameter of the moon is about 3500 km. What is the approximate diameter of the sun?

6. A cow at point C is tethered to a post alongside a barn 10 m wide and 30 m long. If the post is 10 m from a corner of the barn and if the rope is 30 m long, find the cow’s total grazing area to the nearest square meter.

7. What is the apparent size of an object 1 cm long held 80 cm from your eyes?

8. You are traveling in a car toward a certain mountain at a speed of 80 km/h. The apparent size of the mountain is \(0.5^\circ\). Fifteen minutes later the same mountain has an apparent size of \(1^\circ\). About how tall is the mountain?

9. A ship is approaching a lighthouse known to be 20 m high. The apparent size of the lighthouse is 0.005 radians. Ten minutes later the lighthouse has an apparent size of 0.010 radians. What is the approximate speed of the ship in km/h?
Day 55: Linear and Angular Velocity

Find the LINEAR VELOCITY of a point on a circle, given the radius of the circle and the angular velocity.

1. \( r = 9 \text{ in}; \omega = \frac{2\pi}{3} \text{ radians/min} \)
2. \( r = 12 \text{ cm}; \omega = \frac{5\pi}{6} \text{ radians/min} \)
3. \( r = 18 \text{ cm}; \omega = 40^\circ/\text{sec} \)
4. \( r = 15 \text{ cm}; \omega = 75^\circ/\text{sec} \)
5. \( r = 8 \text{ m}; \omega = 2.5 \text{ rpm} \)
6. \( r = 21 \text{ ft}; \omega = \frac{4}{3} \text{ rpm} \)

Find the ANGULAR VELOCITY of each wheel, given its radius and linear velocity.

7. \( r = 24 \text{ in}; v = 48 \text{ in/sec} \)
8. \( r = 18 \text{ cm}; v = 108 \text{ cm/sec} \)
9. \( r = 2 \text{ ft}; v = 30 \text{ mph} \)

10. A bicycle with wheels 28 in. in diameter travels 30 mph. How fast are the wheels turning in rpm

11. A hammer thrower whirls an iron ball at the end of a handle that is 1 m long. If he can whirl it at 1½ revolutions per second, how fast is the ball traveling when it leaves his hand?

12. Two pulleys with radii of 4 in. and 6 in are connected by a belt. If the smaller pulley is turning at 10 revolutions per minute, what is the linear velocity of the belt? What is the angular velocity of the larger pulley?

Day 56: Linear and Angular Velocity Applications

1. A railroad track is laid along the arc of a circle of radius 1800 ft. The circular part of the track intercepts a central angle of 40°. How long (in seconds) will it take a point on the front of a train traveling 30 mpm to go around this portion of the track?

2. Two pulleys of diameter 4 m and 2 m respectively, are connected by a belt. The larger pulley rotates 80 times per minute. Find the speed of the belt (linear velocity) and the angular velocity of the small pulley.

3. The earth revolves on its axis once every 24 hours. Assuming the earth’s radius is 6400 km, find the:
   a. angular velocity of the earth in radians per day and radians per hour.
   b. linear velocity at the North or South Pole.
   c. linear velocity at Quito, Ecuador, a city on the equator.
   d. linear velocity at Salem, Oregon (halfway from the equator to the North Pole)

4. The second hand on a clock makes one revolution per minute. What is the linear velocity, in centimeters per second, of a point on the tip of the second hand, if the second hand is 9 cm from the center to the tip.

5. A Merry-Go-Round travels at an angular velocity of 6 rpm. What is the linear velocity, in feet per minute, of a person that is sitting 5 feet from the center of the Merry-Go-Round?

6. A bicycle wheel is 24 inches in diameter. If the bicycle is traveling at 15 miles per hour, what is the angular velocity, in revolutions per minute, of the wheel?

7. A figure skater is spinning with his arms outstretched at an angular velocity of 8 radians per second.
   a. What is the angular velocity of the spin, in revolutions per minute?
   b. His fingertip travels in a circular motion with a radius of 90 cm. What is the linear velocity of the fingertip, in meters per second?
Day 57: Review and Practice Day

Solve the following problems.

1. A sector of a circle has a radius of 10 cm and a central angle of 1.5 radians. Find its arc length.
2. A sector of a circle has radius of 8 cm and a central angle of 2 radians. Find its arc length.
3. A sector of a circle has arc length of 11 cm and central angle of 1.2 radians. Find its radius.
4. A sector of a circle has arc length of 4 cm and central angle of 0.4 radians. Find its radius.
5. A sector of a circle has central angle of 38° and arc length of 13.5 cm. Find its radius.
6. How far does a Ferris wheel travel if it moved \(\frac{1}{4}\) of a turn and its radius is 30 feet?

Find the area of each of the sectors, given the radius of the circle and the measure of the angle between radii.

7. \(r = 3\), \(\theta = \frac{2\pi}{3}\)
8. \(r = 12\), \(\theta = \frac{5\pi}{12}\)
9. \(r = 3\), \(\theta = \frac{\pi}{2}\)
10. \(r = 8\), \(\theta = 150°\)
11. \(r = 16\), \(\theta = 181°\)
12. \(r = 7\), \(\theta = 165°\)

13. A sector of a circle has a radius of 3 cm and central angle of 2.5 radians. Find its area.
14. A sector of a circle has a radius of 5 cm and a central angle of 2 radians. Find its area.

Find the linear velocity of a point on a circle, given the radius of the circle and the angular velocity.

15. \(r = 7\text{ in}; \omega = \frac{\pi}{3}\) radians/min
16. \(r = 2\text{ cm}; \omega = \frac{7\pi}{6}\) radians/min
17. \(r = 16\text{ cm}; \omega = 50°/\text{sec}\)

Find the angular velocity of each wheel, given its radius and linear velocity.

18. \(r = 12\) in; \(v = 24\) in/sec
19. \(r = 16\) cm; \(v = 118\) cm/sec
20. \(r = 2\) ft; \(v = 30\) mph

21. A bicycle with wheels 20 in. in diameter travels 40 mph. How fast are the wheels turning in rpm

22. A hammer thrower whirls an iron ball at the end of a handle that is 1.5 m long. If he can whirl it at \(2\frac{1}{2}\) revolutions per second, how fast is the ball traveling when it leaves his hand?
Day 59: Unit-Circle—Sine and Cosine Functions

Use your Unit Circle to find the EXACT value of each of the following.

1. \( \sin 180^\circ \)     2. \( \cos 180^\circ \)     3. \( \sin 270^\circ \)     4. \( \cos 270^\circ \)     5. \( \sin (-90^\circ) \)     6. \( \cos(-90^\circ) \)     7. \( \sin 360^\circ \)

8. \( \cos 360^\circ \)     9. \( \sin (-\pi) \)     10. \( \cos \pi \)     11. \( \sin \frac{3\pi}{2} \)     12. \( \cos \frac{\pi}{2} \)     13. \( \cos 2\pi \)     14. \( \sin 3\pi \)

15. \( \sin \frac{7\pi}{4} \)     16. \( \sin \frac{-\pi}{6} \)     17. \( \cos \frac{3\pi}{2} \)     18. \( \cos \left( -\frac{\pi}{3} \right) \)     19. \( \sin \frac{5\pi}{2} \)     20. \( \cos \frac{7\pi}{4} \)

Day 60: Graphing the Sine and Cosine Functions

Graph the following functions over the interval \(-2\pi \leq x \leq 2\pi\). Identify the amplitude and period.

1. \( y = 2 \cos x \)     2. \( y = 3 \sin x \)     3. \( y = \frac{2}{3} \sin x \)     4. \( y = \frac{3}{4} \cos x \)

5. \( y = -\cos x \)     6. \( y = -\sin x \)     7. \( y = -2 \sin x \)     8. \( y = -3 \cos x \)

9. \( y = \sin \left( \frac{1}{2} x \right) \)     10. \( y = \sin \left( \frac{2}{3} x \right) \)     11. \( y = \sin (3x) \)     12. \( y = \cos (2x) \)

13. \( y = -2 \cos (3x) \)     14. \( y = -5 \cos (2x) \)     15. \( \frac{1}{2} \sin (3x) \)     16. \( y = \frac{2}{3} \cos \left( \frac{1}{2} x \right) \)

Day 61 and 62: Amplitude and Period of Sine and Cosine Functions

Write an equation of the **sine** function with each given amplitude and period.

1. \( \text{amp} = 3, \text{period} = 4 \)     2. \( \text{amp} = \frac{2}{3}, \text{period} = \pi \)     3. \( \text{amp} = 2, \text{period} = 3 \)

Write an equation of the **cosine** function with each given amplitude and period.

4. \( \text{amp} = \frac{1}{3}, \text{period} = \pi \)     5. \( \text{amp} = 4, \text{period} = 2\pi \)     6. \( \text{amp} = \frac{3}{4}, \text{period} = 2 \)

Find the amplitude and period of each function. Then sketch the graph.

7. \( y = 2 \cos x \)     8. \( y = -\sin 2x \)     9. \( y = 4 \cos \frac{\pi}{3} x \)     10. \( y = \frac{2}{3} \sin \frac{\pi}{6} x \)
Day 63 and 64: Radian/Sectors Unit Test Review

Convert the following radian measurements to degree measurements.

1. \( \pi \)  
2. \( -\frac{5\pi}{2} \)  
3. \( \frac{7\pi}{3} \)  
4. \( -\frac{11\pi}{6} \)  
5. \( -\frac{\pi}{4} \)  
6. \( \frac{7\pi}{4} \)  
7. \( \frac{11\pi}{6} \)

Convert the following degree measurements to radian measurements.

8. \(-215^\circ\)  
9. \(-220^\circ\)  
10. \(540^\circ\)  
11. \(-360^\circ\)  
12. \(240^\circ\)  
13. \(225^\circ\)  
14. \(-197^\circ\)

Answer the following:

15. A sector of a circle has a radius of 6 cm and a central angle of 3.5 radians. Find its arc length and area.

16. A sector of a circle has radius of 5 cm and a central angle of \( \frac{\pi}{4} \) radians. Find its arc length and area.

17. A sector of a circle has arc length of 11 cm and central angle of \( \frac{3\pi}{2} \) radians. Find its radius and area.

18. A sector of a circle has arc length of 12 cm and central angle of 0.4 radians. Find its radius and area.

Find the LINEAR VELOCITY of a point on a circle, given the radius of the circle and the angular velocity.

15. \( r = 5\text{in}; \omega = \frac{2\pi}{3} \) radians/min  
16. \( r = 8\text{cm}; \omega = \frac{\pi}{6} \) radians/min  
17. \( r = 6\text{cm}; \omega = 40^\circ/\text{sec} \)

Find the ANGULAR VELOCITY of each wheel, given its radius and linear velocity.

18. \( r = 2 \text{in}; v = 14 \text{in/sec} \)  
19. \( r = 26 \text{cm}; v = 18 \text{cm/sec} \)  
20. \( r = 21 \text{ft}; v = 30 \text{mph} \)

Use your Unit Circle to find the EXACT value of each of the following.

21. \( \sin 120^\circ \)  
22. \( \cos 180^\circ \)  
23. \( \sin 225^\circ \)  
24. \( \cos 210^\circ \)  
25. \( \sin 90^\circ \)  
26. \( \cos(-90^\circ) \)  
27. \( \sin 720^\circ \)

28. \( \cos \frac{7\pi}{4} \)  
29. \( \cos \frac{-\pi}{6} \)  
30. \( \sin \frac{3\pi}{2} \)  
31. \( \sin \left( -\frac{\pi}{3} \right) \)  
32. \( \cos \frac{5\pi}{2} \)  
33. \( \sin \frac{7\pi}{4} \)

Graph the following functions over the interval \(-2\pi \leq x \leq 2\pi\). Identify the amplitude and period.

34. \( y = 3 \cos x \)  
35. \( y = 3 \sin (2x) \)  
36. \( y = \frac{2}{3} \sin (3x) \)  
37. \( y = \frac{3}{4} \cos x \)

Write and equation for both the SINE and COSINE function given the below information. Then sketch a graph of each equation.

1. \( \text{amp} = 2, \text{period} = \frac{\pi}{2} \)  
2. \( \text{amp} = \frac{1}{3}, \text{period} = \pi \)  
3. \( \text{amp} = 4, \text{period} = 3 \pi \)
Day 66: Exponential Growth and Decay

Complete the charts. Assume each item grows exponentially.

<table>
<thead>
<tr>
<th>Item</th>
<th>Annual Inc.</th>
<th>Cost Now</th>
<th>Cost in 10 yrs</th>
<th>Cost in 20 yrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Airplane Ticket</td>
<td>15%</td>
<td>$300</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Swim Suit</td>
<td>8%</td>
<td>$35</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Jar of Mustard</td>
<td>7%</td>
<td>$1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. College Tuition</td>
<td>12%</td>
<td>$8000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Complete the chart. Assume each item decays exponentially.

<table>
<thead>
<tr>
<th>Item</th>
<th>Annual Dec.</th>
<th>Value Now</th>
<th>Value in 3 years</th>
<th>Value in 6 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. Farm Tractor</td>
<td>25%</td>
<td>$65000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Industrial Equipt.</td>
<td>10%</td>
<td>$200,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Value of the dollar</td>
<td>6%</td>
<td>$1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Car</td>
<td>11%</td>
<td>$10,000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

9. The value of a new car decreases 20% each year. Complete the table. The value \( V(t) \) of the care is in dollars and its age \( t \) is in years. Give each value to the nearest hundred. Using the values in your table, make a graph to show the relationship between \( V(t) \) and \( t \).

<table>
<thead>
<tr>
<th>( t )</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>( V(t) )</td>
<td>10,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

10. The value in dollars of a car \( t \) years from now is \( V(t) = 12,500 \ (0.85)^t \).
   a. What is the annual rate of depreciation, the rate at which the car loses value?
   b. In how many years will the value of the car be approximately half of what it is now?

11. If grocery prices increase 1% per month for a whole year, how much would groceries that cost $100 at the beginning of the year cost at the end of the year?

12. The costs of goods and services in an urban area increased 1.5% last month. At this rate, what will be the annual rate of increase?

13. According to legend Manhattan Island was purchased in 1626 for trinkets worth about $24. If the $24 had been invested instead at a rate of 6% interest per year, what would be the value of the money in 1996? Compare this with a recent total of $34,000,000,000 in assessed values for Manhattan Island.

14. Give a general expression for the value of a piece of property \( t \) years from now if its current value is $150,000 and property values are increasing at a rate of 9% a year.
Day 67: Rules of Exponents

Simplify the following.

1. \[\frac{(-3z^4)(2)^5}{-9z^3}\]  
2. \[\frac{(-5x^2)(4x^3)^5}{-9x^3}\]  
3. \[\frac{(-3h^6k^4)}{-3h^3k^3}\]  
4. \[\frac{(-3w^2)(-2)^4}{w^6}\]  
5. \[\frac{(4f^6n^2)^4}{(-6f^3)(9f^4n^2)}\]  
6. \[\frac{(-12q^4u^2)(-8q^3)}{(4q^2)(4q^2u^6)}\]  
7. \[\frac{(-5r^4x^5)(-3)^2}{10r^4}\]  
8. \[\frac{-4q^5}{(2q^2r^5)(-7q^6)}\]  
9. \[\frac{(-3z^4)(2)^5}{-9z^3}\]

10. \((-11m^4)(-6m^3p^3)\)  
11. \((-2f^3)(-3f^4s^3)\)
12. \((10v^2)(v^2k^6)\)
13. \((-5x^6h^4)(10x^6n^6)\)
14. \((-5f^2)(f^3c^3)\)
15. \((-12b^3z^4)(-11b^5z^5)\)
16. \((7w^6m^2)(9w^3m^3)\)
17. \((-6t^5)(-5t^6x^3)\)
18. \((4r^5e^4)(3r^4)\)

Day 68: Rules of Exponents

Simplify the following.

<p>| | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ((-z^5u^5)^3)</td>
<td>2. ((-m^3)^4)</td>
<td>3. ((-f^5)^3)</td>
<td>4. ((-e^6)^2)</td>
<td>5. ((b^{-6})^4)</td>
<td>6. ((w^{-2})^2)</td>
</tr>
<tr>
<td>7. ((-1^{-3})^3)</td>
<td>8. ((-a^{-3})^3(-a^6c^6)^2)</td>
<td>9. ((v^{-2})^3(-2v^{-2})^5)</td>
<td>10. ((4t^{-6})^5(t^{-2}o^{-2})^2)</td>
<td>11. ((4n^{-2}1.3)^3(-n^{-3})^3(-n^2)^2)</td>
<td>12. ((r^{-2}z^{-2})^3(r^{-5})^3(-r^{-3}z^3)^5)</td>
</tr>
<tr>
<td>13. ((-c^5)^2(-2c^{-4}m^4)^3)</td>
<td>14. ((-4q^{-5})^3(-q^{-4}s^{-4})^5)</td>
<td>15. ((-5u^{-3}j^{-3})^4(-u^{-4}j^4)^5)</td>
<td>16. ((-1^{-2})^4(t^{-4})^4)</td>
<td>17. ((5g^{-3})^5(g^{-4}r^4)^5)</td>
<td>18. ((-i^{-5}q^{-5})^3(-i^3q^{-3})^3(-i^{-3}q^3))</td>
</tr>
<tr>
<td>19. ((-v^{-6}p^{-6})^3(-3v^{-4}p^{-4})^4(-v^{-5}p^5)^5)</td>
<td>20. ((-d^{-6})^3(-2d^4n^{-4})^2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Day 69: Exponential Functions

Find \( f(-2), f(-1), f(0), f(1) \) and \( f(2) \). Graph each function. Label the three points accurately.

1. \( f(x) = 5^x \)  
2. \( f(x) = 6^x \)  
3. \( f(x) = \left(\frac{1}{4}\right)^x \)  
4. \( f(x) = \left(\frac{2}{5}\right)^x \)

5. \( f(x) = 3^x - 2 \)  
6. \( f(x) = 2^x + 1 \)  
7. \( f(x) = 3^{x-1} \)  
8. \( f(x) = 3^{x+1} \)

Solve the following problems. Assume there were no additional deposits or withdrawals.

9. An initial deposit of $10,000 earns 8% interest, compounded quarterly. How much will be in the account after 10 years?

10. An initial deposit of $10,000 earns 8% interest, compounded monthly. How much will be in the account after 10 years?

11. How much more interest could $1000 earn in 5 years compounded quarterly, if the annual interest rate were 5 ½ % instead of 5%?

12. Which is a better investment: 5.25% compounded monthly or 5.35% compounded annually?

13. If $1 had been invested July 4, 1776 at 5% interest compounded annually, what would it be worth on July 4, 2076?

14. $10,000 is invested in each of two accounts, both paying 6% annual interest. in the first account, interest compounds quarterly, and the second account compounds interest daily. Find the difference between the accounts after 20 years.

15. A colony of 6 million bacteria is growing in a culture medium. The population \( P \) after \( t \) hours is given by the formula \( p = (6 \times 10^6)(2.3)^t \). Find the population after 4 hours.

16. A small business purchased a computer for $4700. It is expected that its value each year will be 75% of its value in the preceding year. If the business disposes of the computer after 5 years, find its salvage value (value after 5 years).

17. In 1803, the United States negotiated the Louisiana Purchase with France. The country doubled its territory by adding 827,000 square miles of land for $15 million. If the land appreciated at a rate of 6% each year, what would the value be in 2009?
Day 70: Base-e Exponential Functions

Solve the following.

1. An initial investment of $5000 earns 8.2% interest, compounded continuously. What will the investment be worth in 12 years?

2. An initial investment of $2000 earns 8% interest, compounded continuously. What will the investment be worth in 15 years?

3. An initial deposit of $5000 grows at an annual rate of 8.5% for 5 years. Compare the final balances resulting from annual compounding and continuous compounding.

4. An initial deposit of $30,000 grows at an annual rate of 8% for 20 years. Compare the final balances resulting from annual compounding and continuous compounding.

5. An account now contains $11,180 and has been accumulating interest at 7% annual interest, compounded continuously, for 7 years. Find the initial deposit.

6. An account now contains $3,610 and has been accumulating interest at 8% annual interest, compounded continuously. How much was in the account 4 years ago?

7. The population of the Earth is approximately 6.1 billion people and is growing at an annual rate of 1.4%. What will the world population be in 30 years?

Find $f(-2), f(-1), f(0), f(1)$ and $f(2)$. Graph each function. Label the three points accurately.

8. $f(x) = e^x + 1$
9. $f(x) = e^x - 2$
10. $f(x) = e^{x+3}$
11. $f(x) = e^{x-5}$
12. $f(x) = -e^x$
13. $f(x) = -e^x + 1$
14. $f(x) = 2e^x$
15. $f(x) = \frac{1}{2} e^x$
Day 71: Review and Practice Day

Solve the following:

1. How long will it take the population of Mexico to double if the growth rate is currently 1.43%?

2. The number of ants in a colony is estimated to be 800. If the ant population is expected to triple every 14 days, how long will it take for the population to reach 1 million?

Use your properties of exponents to simplify the following.

3. \((-4x^3)^2(3x^{-2})\)

4. \(\frac{(-2)^3 x^4 (yz)^2}{3^2 xy^3 z}\)

5. \(\frac{4x^{-2}(yz)^{-1}}{2^3 xy^3 z}\)

6. \(\frac{x^5 y^{-8}}{x^7 y^4} \cdot \left(\frac{x^4 y^2}{8xy}\right)^2\)

7. \(\frac{(-3)^3 x^4 (y^2 z)^2}{3^2 xy^3 z}\)

8. \(\frac{(-2)^5 x^{-4} (y^{-2} z)^2}{4^2 x^{-3} y^{-3} z}\)

9. \(\frac{(3y^6 d^{-6})^3 (5y^3)}{-5y^6 d^4}\)

10. \(\frac{(-3a^3)^4(-3a^5)}{(-6a^4 j^3)(-3a^5)}\)

11. \(\frac{-7e^4 x^{-3}}{(-2e^4)^4 (-e^5 x^2)}\)

Solve the following:

12. How much will $10,500 become if it earns 9% annual interest, compounded quarterly, for 60 years?

13. The value (in dollars) of a certain model car is given by the function \(V(t) = 12,000(10^{-0.155t})\), where \(t\) is the number of years from the present. What will the value of the car be in five years?

14. The average interest rate on a 30-year fixed-rate home mortgage for the years 1980—1996 can be approximated by the function \(r(t) = 13.9e^{-0.035t}\), where \(t\) is the number of years since 1980. To the nearest hundredth of a percent, what does this model predict was the 30-year fixed rate in 1995?

15. As of July 2003, the population of the United States was estimated to be 290,340,000, with an annual growth rate of 0.92%. If the growth rate remains the same, how large will the population be in 50 years?

16. A radioactive dye is injected into a patient as part of a test to detect heart disease. The amount of dye remaining in his bloodstream \(t\) hours after the injection is given by the function \(f(t) = 10e^{-0.27t}\).

   a. How can you tell from the function that the amount of dye in the bloodstream is decreasing?

   b. When will the dye be out of his system?
Day 73: Logarithms

Write each equation in exponential form.

1. \( \log_3 81 = 4 \)  
2. \( \log_7 7 = 1 \)  
3. \( \log 10 = 1 \)  
4. \( \log 100 = 2 \)
5. \( \log_4 \frac{1}{64} = -3 \)  
6. \( \log_6 \frac{1}{36} = -2 \)  
7. \( \log_3 \frac{1}{81} = -4 \)

Write each equation in logarithmic form.

8. \( 8^2 = 64 \)  
9. \( 10^3 = 1000 \)  
10. \( 4^{-2} = \frac{1}{16} \)  
11. \( 3^{-4} = \frac{1}{81} \)
12. \( \left( \frac{1}{2} \right)^{-5} = 32 \)  
13. \( \left( \frac{1}{3} \right)^{-3} = 27 \)  
14. \( x^y = z \)  
15. \( m^n = p \)

Evaluate each expression.

16. \( \log_2 8 \)  
17. \( \log_3 9 \)  
18. \( \log_4 16 \)  
19. \( \log_6 216 \)
20. \( \log_2 \frac{1}{32} \)  
21. \( \log_3 \frac{1}{81} \)  
22. \( \log_3 \frac{1}{10} \)  
23. \( \log 1,000,000 \)

Solve for x.

24. \( \log_8 x = 2 \)  
25. \( \log_7 x = 0 \)  
26. \( \log_5 x = -2 \)  
27. \( \log_3 x = -4 \)
28. \( \log_2 \frac{1}{64} = -3 \)  
29. \( \log_4 8 = x \)  
30. \( \log_2 32 = x \)

Day 74: Base-e logarithms

Evaluate each expression without using a calculator.

1. \( \ln 3 \)  
2. \( \ln e^2 \)  
3. \( \ln e^6 \)  
4. \( \ln e^4 \)  
5. \( \ln \frac{1}{e} \)  
6. \( \ln \frac{1}{e^3} \)

Use a calculator to find each value. Express all answers to the nearest thousandth.

7. \( \ln 35.15 \)  
8. \( \ln 0.675 \)  
9. \( \ln 0.00465 \)  
10. \( \ln 378.96 \)  
11. \( \ln 2.7 \)  
12. \( \ln 1.72 \)

Solve each equation. Express all answers to the nearest thousandth.

13. \( \ln x = 1.4023 \)  
14. \( \ln x = 4.24 \)  
15. \( \ln x = -3.71 \)  
16. \( 1.001 = \ln x \)
17. \( \ln x = 2.6490 \)  
18. \( \ln x = 0.926 \)  
19. \( \ln x = -0.28 \)  
20. \( \ln x = -0.001 \)
Day 75: Properties of Logarithms

Write each expression in terms of $\log M$ and $\log N$ using properties of logs.

1. $\log(MN)^2$
2. $\log\left(\frac{M}{N^2}\right)$
3. $\log\sqrt[3]{\frac{M}{N}}$
4. $\log M^{\frac{2}{3}}N$
5. $\log M^2\sqrt{N}$
6. $\log\frac{1}{M}$

Write each expression as a rational number or as a single logarithm.

7. $\log 2 + \log 3 + \log 4$
8. $\log 8 + \log 5 - \log 4$
9. $\frac{1}{2}\log 6 + \log 5$
10. $\log_2 48 - \frac{1}{3}\log_2 27$
11. $\log A + 2\log B - 3\log C$
12. $5(\log A + \log B) - 2\log C$

Express $y$ in terms of $x$.

13. $\log y = 2\log x$
14. $\log y = 3\log x + \log 5$
15. $\ln y - \ln x = 2\ln 7$
16. $\log y = -\log x$
17. $\log y + \frac{1}{2}\log x = \log 3$
18. $\log y = 2\log x + \log 2$

Day 76: Logarithmic Change of Bases

Use the change of base formula to find each logarithm to the nearest thousandth.

1. $\log_3 7$
2. $\log_{\frac{3}{5}} 7$
3. $\log_7 3$
4. $\log_{\frac{2}{7}} 6$
5. $\log_{\frac{5}{8}} 8$
6. $\log_{\frac{10}{9}} 10$

Solve each equation. Leave answers in simplified radical form when possible.

7. $3^x = 12$
8. $2^x = 100$
9. $(1.06)^x = 3$
10. $10^x = 3$
11. $10^x = 8.1$

12. The population of Kenya reached 25,000,000 people in 1990. When will it reach 50,000,000 people? Assume an annual rate of increase of 4.1%

13. An investment is made at 7% annual interest and compounded daily. How long does it take to triple the investment?

14. A $10,000 certificate of deposit at a certain bank will double in value in 9 years.
   a. Give a formula for the accumulated amount t years after the investment is made.
   b. How long does it take for the money to triple in value?

15. Tell how long it takes for $100 to become $1000 if it is invested at 8% interest and compounded:
   a. Annually
   b. Quarterly
   c. Daily
Day 77: Exponential and Logarithmic Equations

Solve each equation. Round to the nearest thousandth.

1. \(2^{x-2} = 64\)
2. \(3^{-3x+1} = 243\)
3. \(5^{4x} = \frac{1}{125}\)
4. \(2^{x^2-2x} = 8\)
5. \(3^{x^2+4x} = \frac{1}{81}\)

6. \(4^x = 5\)
7. \(13^{x-1} = 2\)
8. \(2^{x+1} = 3^x\)
9. \(7^{x^2} = 10\)
10. \(8^{x^2} = 9^x\)

11. \(e^{3x} = 9\)
12. \(e^{-0.2t} = 14.2\)
13. \(\log(x + 2) = 4\)
14. \(\log (7 - x) = 2\)
15. \(\ln x = 1\)

16. \(\ln (x + 1) = 3\)
17. \(\ln (3x + 1) = \ln (x + 7)\)
18. \(\ln (x^2 + 4x) = \ln (x^2 + 16)\)

19. \(\log (3 - 2x) - \log (x + 24) = 0\)
20. \(\log (3x + 5) - \log (2x + 6) = 0\)
21. \(\log \frac{4x + 1}{2x + 9} = 0\)

22. \(\log \frac{2 - 5x}{2(x + 8)} = 0\)
23. \(\log x^2 = 2\)
24. \(\log x^3 = 3\)
25. \(\log x + \log (x - 48) = 2\)

26. \(\log x + \log (x + 9) = 1\)
27. \(\log (x + 90) = 3 - \log x\)
28. \(\log (x - 90) = 3 - \log x\)
Day 78 and 79: Exponential and Logarithm Unit Test Review

Solve the following problems.

1. The half-life of tritium is 12.4 years. How long will it take for 25% of a sample of tritium to decompose?

2. In two years, 20% of a radioactive element decays. Find its half-life.

3. If $10,500 accumulates interest at an annual rate of 9%, compounded continuously, how much will be in the account in 60 years?

4. How much will $10,000 become if it earns 9% annual interest, compounded quarterly, for 18 years?

Simplify the following.

5. $(a^2b^3)(a^3b^3)$

6. $(u^3v^5)(u^4v^5)$

7. $\left(\frac{a}{b}\right)^3$

8. $\left(\frac{x^2}{y^4}\right)^5$

9. $\frac{(6k)^7}{(6k)^4}$

10. $\frac{(a^2b)^{15}}{(a^3b^9)}$

11. $\frac{(r^4s^3)^4}{(rs)^3}$

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

Find the value.

13. $\log_3 9$

14. $\log_y \frac{1}{81}$

15. $\log \frac{1}{2}$

16. $\log 1000$

17. $\ln e$

18. $\ln e^2$

19. $\ln \frac{1}{e^3}$

20. $\ln 1$

Solve each equation for $x$. Round to the nearest thousandth.

21. $\log_2 x = 5$

22. $\log_3 x = -4$

23. $\log x = 2$

24. $\log_9 x = 3$

25. $5^{x+2} = 625$

26. $2^{x^2 + 4x} = \frac{1}{8}$

27. $x^3 = 3^{x-1}$

28. $3^x = 7$

29. $\log(x - 4) = 2$

30. $\ln(2x - 3) = \ln(15)$

31. $\log x + \log(29 - x) = 2$

32. $\frac{\log(7x - 12)}{\log x} = 2$

33. $\log(x + 2) + \log(x - 1) = 2$

34. $\log x + \log(x - 5) = \log 6$

35. $\log 3 - \log(x - 1) = -1$