Tamara is flying in a hot air balloon. The hot air balloon is flying at an altitude of 1100 feet. The ground distance to the landing site is 1400 feet.

What is Tamara’s angle of depression to the landing site?

\[
\tan \Theta = \frac{1100}{1400} \quad \tan^{-1} \Theta = 38.157^\circ
\]

What is the actual distance between the hot air balloon and the landing site?

\[
a^2 + b^2 = c^2
\]

\[
(1100)^2 + (1400)^2 = c^2
\]

\[
1210000 + 1960000 = c^2
\]

\[
\sqrt{3170000} = c
\]

\[
c = 1780.4
\]

A submarine must descend 516 meters to explore a shipwreck. The submarine begins a constant descent to the shipwreck so that it will reach the shipwreck after traveling 2976 meters from the point of its initial descent.

3. What angle of descent did the submarine make?

\[
\sin \Theta = \frac{516}{2976}
\]

\[
\sin \Theta = 0.1723
\]

\[
\sin^{-1} \Theta = 10^\circ
\]

4. What horizontal distance did the submarine travel during its descent?

\[
a^2 + 516^2 = (2976)^2
\]

\[
a^2 + 266.256 = 8856.576
\]

\[
a^2 = 8590.320
\]

\[
a = 9.2931
\]

5. \(a = 5.25, b = 25.5, c = 29.25, m = 2.1\)

For each set of measures given, find the measures of the missing sides if \(\triangle ABC \sim \triangle MNO\). Write a proportion:

\[
\frac{2.1}{5.25} = \frac{11}{20.25}
\]

\[
\frac{61.425 = 5.25 \odot}{5.05 = 5.25}
\]

\[
53.55 = 5.25 \odot
\]

\[
10.2 = 11
\]
Write the equation of the axis of symmetry.

6. \( y = 2x^2 + 4x - 6 \)

\[ x = -\frac{b}{2a} \]

\[ x = -\frac{4}{2(2)} = -\frac{4}{4} \]

\[ x = -1 \]

Solve the equation.

7. \((r-3)(r+6) = 0\)

\[ r-3 = 0 \quad \text{or} \quad r+6 = 0 \]

\[ r = 3 \quad \text{or} \quad r = -6 \]

\[ \text{Roots: } 3, -6 \]

8. \(3p(3p-8) - 8 = 9p(p-3) + 4\)

\[ 9p^2 - 24p - 8 = 9p^2 - 27p + 4 \]

\[ 9p^2 - 24p - 8 = 9p^2 - 27p + 4 \]

\[ 24p - 8 = -27p + 4 \]

\[ 3p - 8 = 4 \]

\[ 3p = 12 \]

\[ p = 4 \]

Express the number in the statement in standard notation.

9. In 2002, the United States Postal Service served \( 1.77 \times 10^6 \) new delivery points.

\[ 1,770,000 \text{ new delivery points} \]

10. Reid and Maria both play soccer. This season, Reid scored 4 less than twice the number of goals that Maria scored. The difference in the number of goals they scored was 6. How many goals did each of them score? Write and use a system of equations to solve.

\[ \begin{align*}
R &= 2M - 4 \\
M - R &= 6
\end{align*} \]

\[ \begin{align*}
2M - 4 - M &= 6 \\
M - 4 &= 6 \\
M &= 10
\end{align*} \]

Reid scored 10 more goals.

11. Mrs. Davis went to a produce market to buy bananas and strawberries. She spent $8.00. If the bananas were $0.50 per pound, and the strawberries were 4 times that much, how many pounds of bananas did she buy if she bought 7 pounds of fruit altogether? Write and use a system of equations to solve.

\begin{align*}
\text{Cost} \to 0.5b + 2s &= 8 \\
6 + s &= 7
\end{align*} \]

\[ 6 + s = 7 \]

\[ b = 4 \text{ lbs of bananas} \]

Determine the best method to solve the system of equations. Then solve the system.

12. \(-4x + 5y = 9\)

\[ 4x - 5y = -7 \]

\[ 0 = 2 \]

No Solution

Parallel Lines
Solve the system of equations.

13. \[ y = 4x + 7 \]
\[ 4x - 2y = -6 \]

Solutions: \(-2, -1\)

143. \[-2x - 2y = 10\]
\[-10x + 6y = 2\]

Solutions: \(-2, 3\)

Solve the system of inequalities by graphing.

15. \[ y \geq -2x - 4 \]
\[ y < 3 \]

Simplify. Assume that no denominator is equal to zero.

16. \[ (8h^3i^4)(8h^3i^3) = 8 \cdot 8 \cdot h^3 \cdot i^2 \cdot i^3 = 64h^6i^5 \]

17. \[ (2g^3h^4)^3 = 2^3 \cdot g^9 \cdot h^{12} = 8g^9h^{12} \]

18. \[ \frac{5^{14}}{5^3} = 5^{14-3} = 5^{11} \]

19. \[ \frac{36m^{-3}n^7}{2mn^{-2}p^{-3}} = \frac{18m^{-3-1}n^7}{2mnp^{-3}} = \frac{18m^{-4}10^n}{p^3} \]

20. \[ (-12)^0 = 1 \]
Express the number in scientific notation.

21. \(3.14 \times 10^{-6}\) 

Evaluate. Express the result in scientific notation.

22. \((4.6 \times 10^4)(6 \times 10^4)\) 
\[2.76 \times 10^9\] 

23. \(3.9 \times 10^3\) 
\[7.8 \times 10^8\]

Find the degree of the polynomial.

24. \(18a^2b^3 + 13a^4b^3 - 6a^7b^3\) 
\(5+2\) 
\(4+3\) 
\(7\) 
\(16\) 
\(10\th\ degree\) Polynomial

Find the sum or difference.

25. \((7a - 2b^2 - a) + (b - 5 + 6a^2)\) 
\[6a^2 - 2b^2 + 6a + b - 5\]

Find the product.

26. \((12p - 3q^2 - q) + (-q^2 + 8p - 7p^2)\) 
\[-7p^2 - 4q^2 + 20p - q\]

28. \((r - 9)(r + 4)\) 
\[r^2 + 4r - 9r - 36\] 
\[r^2 - 5r - 36\]

Find the factors of the number. Then classify the number as prime or composite.

33. 41 
\[\text{prime}\]

Factor the monomial completely. (Prime factorization)

34. \(70a^2b^2\) 
\[2 \cdot 5 \cdot 7 \cdot a \cdot a \cdot b \cdot b\]
35. Find the GCF for the set of monomials: $40s^3t^2, 96st^2$  
\[ 8st^2 \]

Factor the polynomial.

36. $8g + 16h$  
\[ 8(g+2h) \]

37. $2x^2 - 2x + 4xy - 4y$  
\[ 2(x^2 - x + 2xy - 2y) \]

38. $8b^2 - 200$  
\[ 8(b^2 - 25) \]
\[ 8(b-5)(b+5) \]

39. $x^2 + 14x + 24$  
\[ (x + 12)(x + 2) \]

40. $x^2 - 22x - 23$  
\[ (x - 23)(x + 1) \]

41. $5x^2 + 14x + 8$  
\[ 5(x+2)(x+2) \]
\[ 5(x+2)(x+1) \]

42. $63y^2 - 7$  
\[ 7(9y^2 - 1) \]
\[ 7(3y-1)(3y+1) \]

43. $k^2 + 8k - 84$  
\[ k^2 + 8k - 84 = 0 \]
\[ (k+14)(k-6) = 0 \]
\[ k+14 = 0 \quad k-6 = 0 \]
\[ k = -14 \quad k = 6 \]

Graph the function.

44. $y = x^2 + 3x + 3$  
\[ X = \frac{-b}{2a} = -\frac{3}{2a} \]
\[ X = -1.5 \]

45. $y = 5x^2 - 4$  
\[ x = \frac{-b}{2a} = \frac{-(-4)}{2(5)} \]
\[ x = 0 \]

Find the coordinates of the vertex of the graph of the function.

46. What value is needed to complete the square?

\[ x^2 + 12x + \frac{36}{4} = 4 + \frac{36}{4} \]
\[ \frac{b}{2} = \frac{12}{2} = 6 \]
\[ (6)^2 = 36 \quad c = 36 \]
Solve the equation by using the Quadratic Formula. Round to the nearest tenth if necessary.

47. \(2r^2 - 20r + 21 = 0\)

\[
x = \frac{-20 \pm \sqrt{(-20)^2 - 4(2)(21)}}{2(2)}
\]

\[
x = \frac{-20 \pm \sqrt{400 - 168}}{4}
\]

\[
x = \frac{20 \pm 4\sqrt{41}}{4}
\]

\[
x = 5 \pm \sqrt{41}
\]

\[
x \approx 5.77, 1.19
\]

48. If a quadratic equation has 1 real root, what can you say about the value of its discriminant?

\(b^2 - 4ac = 0\)

Simplify the expression.

49. \(\sqrt{12x^3y^4} = \sqrt{4 \cdot 3 \cdot x^2 \cdot y^2 \cdot y^2 \cdot y^2} = 2x \cdot y \cdot y \cdot y = 2xy^3\)

50. \(\frac{11}{3} \cdot \sqrt{\frac{3}{3}} = \frac{11}{3} \cdot 1 = \frac{11}{3}\)

52. \(8\sqrt{13} - 7\sqrt{13} = \sqrt{13}\)

53. Find the length of the missing side. If necessary, round to the nearest hundredth.

\[
(23)^2 + b^2 = (113)^2
\]

\[
b^2 = (113)^2 - (23)^2
\]

\[
b^2 = 12769 - 529
\]

\[
b^2 = 12240
\]

\[
b = \sqrt{12240}
\]

\[
b \approx 110.63
\]

Determine whether the following side measures form right triangles. Justify your answer.

54. 5, 24, 57

\[
5^2 + 24^2 = 57^2
\]

\[
25 + 576 = 3329
\]

\[
(57)^2 \neq 3329
\]

55. If you know the measures of both legs, which trigonometric ratio should you use?

\[
\tan \theta = \frac{\text{opposite}}{\text{adjacent}}
\]

56. If you are using the tangent ratio, which sides of the right triangle are given to you?
57. Find the \( \cos 46^\circ \) \[ 0.6947 \]

Solve the right triangle. State the side lengths to the nearest tenth and the angle measures to the nearest degree.

58.

59. \( a = 19.95, \ m = 5.7, \ n = 6.3, \ o = 11.8 \)

For each set of measures given, find the measures of the missing sides if \( \triangle ABC \sim \triangle MNO \).
Find the distance between the pair of points whose coordinates are given. Express as a decimal approximation rounded to the nearest hundredth if necessary.

\[ d = \sqrt{(x_2-x_1)^2 + (y_2-y_1)^2} \]

60. \( (11, 7), (16, 6) \)

\[ d = \sqrt{(11-16)^2 + (7-6)^2} \]
\[ = \sqrt{(-5)^2 + (1)^2} \]
\[ = \sqrt{25+1} \]
\[ = \sqrt{26} \]
\[ \approx 5.099 \]

Use the graph below to determine the number of solutions the system has.

61. \( 12x - 3y = 3 \)
\[ y = 4x - 1 \]
\[ \] Infinite Solutions

62. \( y = -3 \)
\[ x = 4 \]
\[ \] One Solution

63. \( y = 4x - 1 \)
\[ y = -2x + 5 \]
\[ \] One Solution

64. \( y = -2x \)
\[ y = -2x + 5 \]
\[ \] No Solution

65. \( y = -2x \)
\[ x = 4 \]
\[ \] One Solution
66. \( y = 2^x - 1 \)

67. \( y(\frac{1}{3})^x \)

68. At a pep rally, t-shirts are launched by cheerleaders using a sling-shot that releases 6 feet above the ground. The t-shirts have an initial upward velocity of 36 feet per second. How long is a t-shirt in the air if a student in the stands catches it on its way down 24 feet above the gym floor? 

\( h = -16t^2 + 36t + 6 \)

\( h = -16t^2 + vt + s \) where \( h \) is the height in feet, \( t \) is the time in seconds, \( v \) is the initial upward velocity in feet per second, and \( s \) is the starting height of the object in feet.

69. A coin has a value of $1.23 in 2000. Its value has been increasing at a rate of 9% per year. Predict the value of the coin in 2020.

\[ y = a(1+r)^t \]

\( a = \text{original value} \)
\( r = \text{rate as a decimal} \)
\( t = \text{time elapsed} \)

\[ y = 1.23(1+0.09)^{20} \]

\[ y = 1.23(1.09)^{20} \]

\[ y = 6.89 \]

\[ $6.89 \]

The value of the coin is $6.89 in 2020.

70. A car was purchased for $17,000. It depreciates at a rate of 12% per year. How much will it be worth in 8 years?

\[ y = a(1-r)^t \]

\( a = \text{original value} \)
\( r = \text{rate as a decimal} \)
\( t = \text{time elapsed} \)

\[ y = 17000(1-0.12)^8 \]

\[ y = 17000 (0.88)^8 \]

\[ y = 6113.79 \]

\[ y = $6113.79 \]
71. Steve deposits $4500 in an account that pays 3.25% interest compounded monthly for 5 years. What will the account be worth in 5 years if he makes no deposits and no withdrawals?

\[ A(t) = P \left(1 + \frac{r}{n}\right)^{nt} \]

\[ A(5) = 4500 \left(1 + \frac{0.0325}{12}\right)^{12 \times 5} \]

\[ = 4500 \left(1 + \frac{0.0325}{12}\right)^{5 	imes 12} \]

\[ = \frac{5292.85}{5292.85} \]

\[ = \frac{5292.85}{5292.85} \]

Determine whether each sequence is geometric. If it is, state the common ratio and list the next two terms in the sequence.

72. 2, 6, 18, 54, ...  
   \[ x^3 \times x^3 \]

73. 5, 10, 15, 20, ...
   \[ x^2 \]

74. -8, 16, -32, 64, ...
   \[ -2 \times -2 \]

75. 4, 8, 24, 48, ...
   \[ x^2 \times x \times x \]

76. 896, 224, 56, 14, ...
   \[ \frac{224}{896} = 0.25 \]

77. 50, 35, 20, 5, ...
   \[ \frac{35}{50} = 0.7 \]

78. Find the 7th term of a geometric sequence where \(a_1 = 7\) and \(r = 4\). Use the formula or the nth term.

\[ a_n = a_1 \cdot r^{n-1} \]

\[ a_7 = 7 \cdot 4^{7-1} \]

\[ a_7 = 7 \cdot 4^6 \]

\[ = 7 \cdot 4096 \]

\[ = 28672 \]

\[ a_7 = 28,672 \]