# Precalculus
# Summer Review Packet


"I'll have the math homework."

Name: _____

Solve ***by factoring***:

1. $x^2 + 6x - 16 = 0$

2. $3x^2 - 75 = 0$

3. $3x^2 - 9x - 30 = 0$

4. $5x^2 - 13x = 6$

Simplify.

5. $\sqrt{45}$

6. $\sqrt{y^7}$

7. $\sqrt{75x^8}$

8. $\sqrt{-72x^9y^3}$

9. $-5\sqrt{-81x^3y^8}$

The quadratic formula is $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

For each equation, find the discriminant. Use the discriminant to determine if the equation has two real solutions, one real solution that is repeated twice, or two complex solutions (no real solutions).

10. $0 = 2x^2 + 7x + 5$

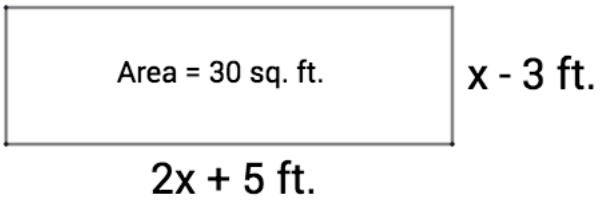
11. $y = 3x^2 + 4x + 2$

Find the solutions for each equation <u>using the quadratic formula.</u>

12. $0 = 3x^2 + x - 14$

13. $6x^2 = 12x - 1$

14. Find the value for x in the rectangle below.




Simplify.

15. $4 + 4i - 2 - 3i$

16. $(3 - 4i)(6 - 2i)$

17. $(3 + 4i)(2 - 3i)(4 - i)$

Rewrite the expressions in rational exponent notation.

18. $\sqrt[3]{x^5}$

Rewrite the expressions in radical notation.

19. $m^{\frac{4}{11}}$

Evaluate the expression without using a calculator. Show some work for credit.

20. $\sqrt[4]{81^3}$

Perform the indicated operation.

21. $x^5 \bullet x^9$

Perform the indicated operation (continued)

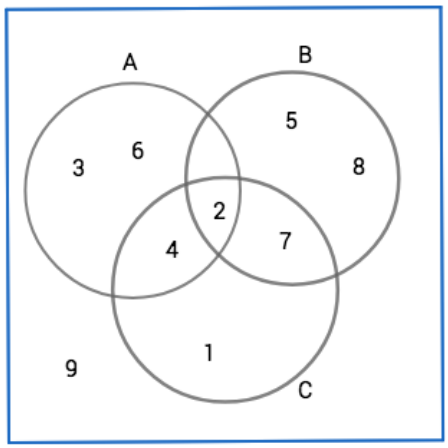
22. $\frac{x^7}{x^2}$

23. $(k^4)^3$

24. $\sqrt[4]{x^6} \bullet \sqrt[3]{x^4}$

25. $\left(\sqrt[7]{x^3}\right)^{\frac{1}{5}}$

26.




a) (A ∩ B) ∪ C _____

b) (B ∪ C)' ∪ A _____

**********

Given: $A = \begin{bmatrix} 8 & -4 & 2 \\ 3 & 1 & -5 \end{bmatrix}$ $B = \begin{bmatrix} -6 & -1 & 0 \\ 1 & 4 & 0 \end{bmatrix}$ $C = \begin{bmatrix} 2 & -3 \\ 0 & 5 \end{bmatrix}$

Find: 27. $5(A - B)$

28. Solve for X: $2X = 3(A + B)$

29. Tony's Tacos offers 3 different shells, 2 different meats, and 5 toppings. A lunch special offers a taco with one shell, one meat, and one topping for one dollar. How many different tacos can be made for the lunch special?

A bag contains donut holes. There are 10 glazed, 6 chocolate, 12 powdered sugar, and 4 plain in the bag. Find the following probabilities.

30. P(glazed) =

31. P(chocolate or powdered sugar) =

32. P(not raspberry) =

33. P(not plain) =

34. P(orange)=

From the bag of donut holes mentioned above, Michael grabs 3 donut holes. Find the following probabilities:

35. P(3 chocolate) =

36. P(2 glazed and 1 plain) =

37. On a particular website, a password is 4 characters long. The first two characters must be letters and the last two must be numbers. It does not matter if you use capital letters or not. How many possible passwords are there? What is the probability of you randomly selecting my password?

There are 4 juniors and 8 seniors in a certain math class. The teacher (a fine gentleman for sure) wants to select 5 students to represent the class at a conference.

38. How many ways can the teacher select 5 students from the group?

39. If the teacher wants to choose a leader, a pencil toter, a sycophant, a chair carrier, and a captain, how many ways can he do that?

40. What is the probability of the teacher choosing 3 juniors and 2 seniors for his group?

Compute the following without using the nCr or nPr buttons on your calculator. As a reminder, the formulas are:

$$nCr = \frac{n!}{(n-r)!r!} \qquad nPr = \frac{n!}{(n-r)!}$$

41. ${}_8P_3$

42. $\dfrac{{}_4C_2 \cdot {}_5C_3}{{}_7C_4}$

For the following questions, use the same chart that we used in class. Remember that $\sigma$ represents standard deviation.

| Number of $\sigma$ | The data point is: |
|---|---|
| 1 or less | normal |
| More than 1, not more than 2 | a bit unusual |
| More than 2, not more than 3 | unusual |

Any data point outside of 3 $\sigma$ is rare.

43. A set of quiz scores with a normal distribution has a mean of 72 and a standard deviation of 12.

    a) How would you describe a score of 97?

    b) How would you describe a score of 38?

44. Another set of scores has a mean of 65 and a standard deviation of 8.

    a) What is the range of *normal* scores?

    b) What are the ranges of scores that would be considered *a bit unusual*?

    c) With respect to the mean, what would the two closest *rare* scores be?

45. Given the data set: 33, 55, 42, 26, 45, 62, 55, 32, 38, 26, 31, 42, 41, 26, 43

An *outlier* is a data point that is greater than or equal to 1.5 times the interquartile range above Q3 or below Q1.

a) From the data set above, what would the closest outlier to Q3 be?

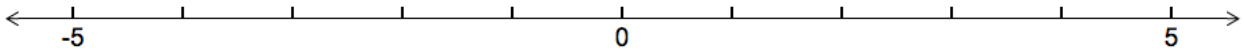
b) Would a data point of 5 be an outlier?

46. Write the following information in set-builder and interval notation.


Set-builder notation: _____ Interval Notation: _____

47. Convert $(-\infty, 7)$ to set-builder notation.

48. Graph the information: $\{x \mid 0 \leq x < 4, x \in \mathbb{Z}\}$




49. Given: $f(x) = 2x^2 + 18x - 14$

Find:

a) $f(3x)$

b) $f(1 + 5m)$

50. Expand: $(2x - 3)^3$

Find the domain of the following functions. Write answers in interval notation.

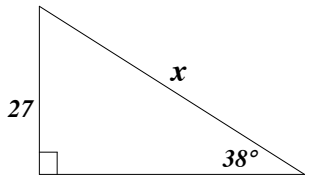
51. $f(x) = 4x^2 - 3x + 5$

52. $g(x) = \frac{5x-4}{3x+12}$

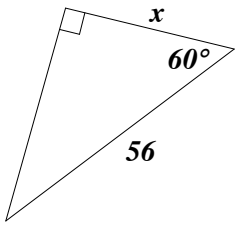
53. $h(m) = \sqrt{7m - 11}$

54. $f(y) = \frac{\sqrt{3y-9}}{\sqrt{5y+25}}$

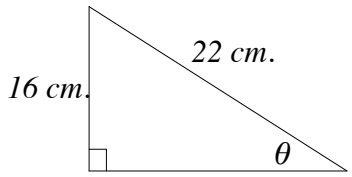
55. Find *x*




56. Find *x*




57. Find $\theta$:




58. In a given right triangle, $\cos\theta = \frac{24}{26}$. What are the sine and tangent of $\theta$?

For the following word problems, draw a picture for each question. Write your equation. Then solve the problem.

59. A depressed flamingo has climbed to the top of the tallest tree in his neighborhood to impress his girlfriend. He spots a fishing hole at an angle of depression of $11°$. He knows that the fishing hole is exactly 325 feet from the base of the tree. When the depressed flamingo falls out of the tree, how far will he fall?

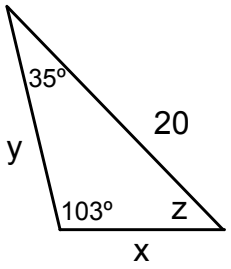
60. If a 5 ft tall man stands 20 feet away from a tree that is 50 feet tall, and looks up at the top of the tree, at what angle of elevation will he be looking?

61. I want to attach a zip line from the top of my barn to the ground. The line will make an angle of $18°$ with the ground and will touch the ground 65 feet from the barn. How long will the zip line be?

Law of Sines: $\frac{SinA}{a} = \frac{SinB}{b} = \frac{SinC}{c}$ Law of Cosines: $a^2 = b^2 + c^2 - 2bcCosA$

Solve the triangles.

62 a.

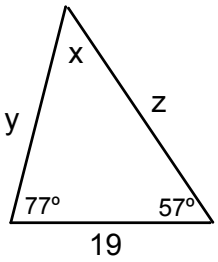



x = _____

y = _____

z = _____

62 b.

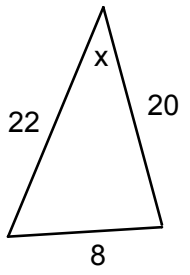



x = _____

y = _____

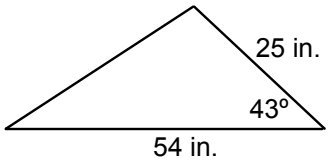
z = _____

63. Find x




x = _____

64. Find the area of the triangle.




A = _____

65. You are walking through the woods and spot an ancient tower perhaps left by a previous civilization (or perhaps it is a cell phone tower). The angle of elevation from where you are standing to the top of the tower is 22º. You walk 55 feet closer and the angle of elevation is 36º. How tall is the tower?

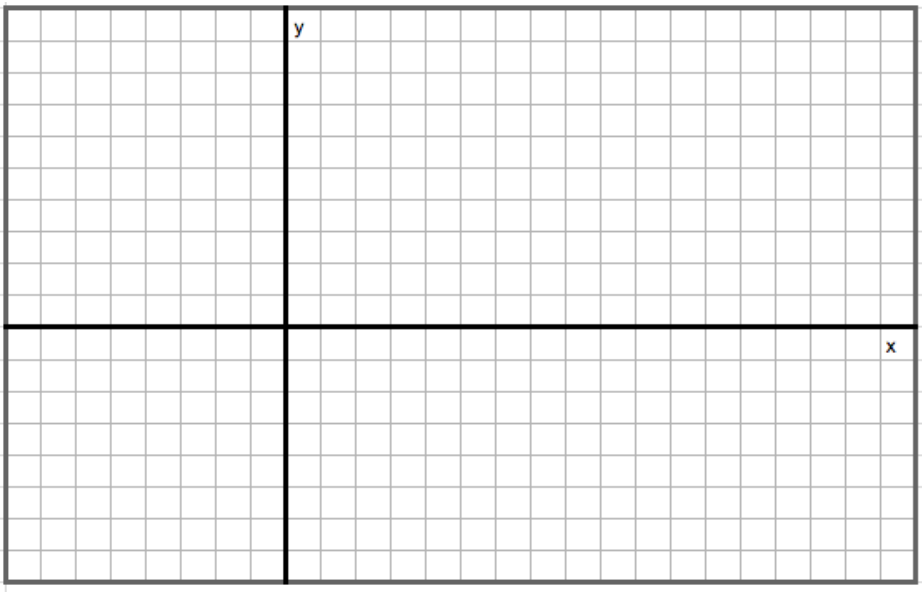
Use the unit circle to determine the following:

66. $cos\frac{11\pi}{3}$

67. $tan\frac{35\pi}{6}$

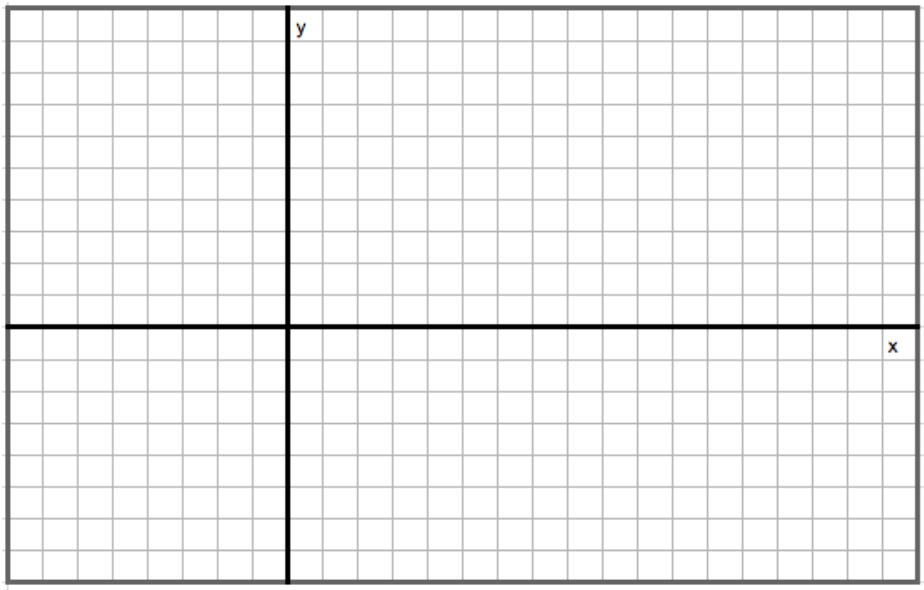
Graph the functions.

68. $y = \cos(x + \pi) - 2$




| x | y |
|---|---|
| | |
| | |
| | |
| | |
| | |
| | |

69. $y = 3\sin\left(2x + \frac{\pi}{3}\right) + 1$




| x | y |
|---|---|
| | |
| | |
| | |
| | |
| | |
| | |

Solve the systems of equations:

70. $5x - 5y - 5z = 35$
$-x + 2y - 3z = -12$
$3x - 2y + 7z = 30$

Solve the following exponential equations:

71. $3^{3x} = 3^{2x-4}$

72. $6^{2x+1} = 36^{3x-3}$

Solve the equations.

73. $\sqrt{4^{2x+4}} = \sqrt{64^{4x-6}}$

74. $\sqrt{m^{4x+2}} = \sqrt[3]{m^{9x-12}}$

Write the following equations in logarithmic form.

75. $4^2 = 16$

76. $m^k = h$

Write the following equations in exponential form.

77. $\log_3 81 = 4$

78. $\ln 27 = 4x$

Solve:

79. $4^{(2x-3)} = 21$

80. $\log_3(5x+3) = \log_3(2x+9)$

81. $9 + 5^{(2x-2)} = 57$

# Precalculus
# Summer Review Packet

## Part A
(The Answer Key)


"I'll have the math homework."

Name: _____

**Solve *by factoring*:**

1. $x^2 + 6x - 16 = 0$

$(x+8)(x-2)=0$

$x+8=0 \quad x-2=0$

$x=-8 \quad x=2$

$(-8, 2)$

2. $3x^2 - 75 = 0$

$3(x^2-25)=0$

$3(x+5)(x-5)=0$

$x+5=0 \quad x-5=0$

$x=-5 \quad x=5$

$(-5, 5)$

3. $3x^2 - 9x - 30 = 0$

$3(x^2-3x-10)=0$

$3(x-5)(x+2)=0$

$x-5=0 \quad x+2=0$

$x=5 \quad x=-2$

$(5, -2)$

4. $5x^2 - 13x = 6$

$5x^2-13x-6=0$

$(5x-15)(5x+2)$

$5x-15=0 \quad 5x+2=0$

$5x=15 \quad 5x=-2$

$x=3 \quad x=\frac{-2}{5}$

$(3, -\frac{2}{5})$

$-30$

$-15 \quad 2$

$-13$

**Simplify.**

5. $\sqrt{45}$

$\sqrt{9}\ \sqrt{5}$

$3\sqrt{5}$

6. $\sqrt{y^7}$

$y^3\sqrt{y}$

7. $\sqrt{75x^8}$

$\sqrt{25}\ \sqrt{3}\ \sqrt{x^8}$

$5\sqrt{3}\ x^4$

$5x^4\sqrt{3}$

8. $\sqrt{-72x^9y^3}$

$\sqrt{-1}\ \sqrt{36}\ \sqrt{2}\ \sqrt{x^9}\ \sqrt{y^3}$

$6x^4yi\ \sqrt{2xy}$

9. $-5\sqrt{-81x^3y^8}$

$-5\ \sqrt{-1}\ \sqrt{81}\ \sqrt{x^3}\ \sqrt{y^8}$

$-5i\ 9x\sqrt{x}\ y^4$

$-45xy^4i\ \sqrt{x}$

The quadratic formula is $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

**For each equation, find the discriminant. Use the discriminant to determine if the equation has two real solutions, one real solution that is repeated twice, or two complex solutions (no real solutions).**

$b^2 - 4ac$

10. $0 = 2x^2 + 7x + 5$

$7^2 - 4(2)(5)$

$49 - 40$

$9$

2 real solutions

11. $y = 3x^2 + 4x + 2$

$b^2 - 4ac$

$4^2 - 4(3)(2)$

$16 - 24$

$-8$

2 complex solutions

Find the solutions for each equation <u>using the quadratic formula.</u>

12. $0 = 3x^2 + x - 14$

$x = \frac{-1 \pm \sqrt{1^2 - 4(3)(-14)}}{2(3)}$

$\frac{-1 \pm \sqrt{1 - (-168)}}{6}$

$\frac{-1 \pm \sqrt{169}}{6}$

$\frac{-1 \pm 13}{6}$

$\frac{-1+13}{6}$ $\quad \frac{-1-13}{6} \rightarrow \frac{-14}{6} = \frac{-7}{3}$

13. $6x^2 = 12x - 1$

$6x^2 - 12x + 1 = 0$

$x = \frac{12 \pm \sqrt{(-12)^2 - 4(6)(1)}}{2(6)}$

$x = \frac{12 \pm \sqrt{144 - 24}}{12}$

$x = \frac{12 \pm \sqrt{120}}{12}$

$\sqrt{120}$

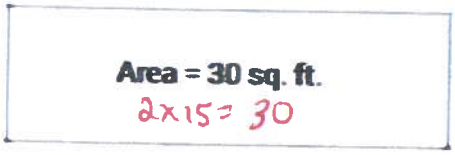
$\sqrt{4}\ \sqrt{30}$

$2\sqrt{30}$

$x = \frac{12 \pm 2\sqrt{30}}{12}$

$x = \frac{6 \pm \sqrt{30}}{6}$

14. **Find the value for x in the rectangle below.**




x - 3 ft.

5-3
(2)

2x + 5 ft.

2(5)+5
(15)

$(x-3)(2x+5) = 30$

$2x^2 - 6x + 5x - 15 = 30$

$2x^2 - x - 15 = 30$

$2x^2 - x - 45 = 0$

$(2x-10)(2x+9) = 0$

-90
-10 9
-1

$2x - 10 = 0$ $\quad$ $2x+9=0$

$2x = 10$ $\quad$ $2x = -9$

$x = 5$ $\quad$ $x = -9/2$ → does not work

Simplify.

15. $4 + 4i - 2 - 3i$

$2 + i$

16. $(3 - 4i)(6 - 2i)$

$18 - 24i - 6i + 8i^2$

$18 - 24i - 6i - 8$

$10 - 30i$

17. $(3 + 4i)(2 - 3i)(4 - i)$

$6 + 8i - 9i - 12i^2$

$6 + 8i - 9i + 12$

$(18 - i)(4 - i)$

$72 - 4i - 18i + i^2$

$72 - 4i - 18i - 1$

$71 - 22i$

**Rewrite the expressions in rational exponent notation.**

18. $\sqrt[3]{x^5}$

$x^{5/3}$

Rewrite the expressions in radical notation.

19. $m^{\frac{4}{11}}$

$\sqrt[11]{m^4}$

Evaluate the expression without using a calculator. Show some work for credit.

20. $\sqrt[4]{81^3}$

$\sqrt[4]{81} = 3$

$3^3 = 27$

Perform the indicated operation.

21. $x^5 \cdot x^9$

$x^{14}$

**Perform the indicated operation (continued)**

22. $\frac{x^7}{x^2}$ $x^5$

23. $(k^4)^3$

$k^{12}$

24. $\sqrt[4]{x^6} \cdot \sqrt[3]{x^4}$

$x^{\frac{6}{4}} \cdot x^{\frac{4}{3}}$

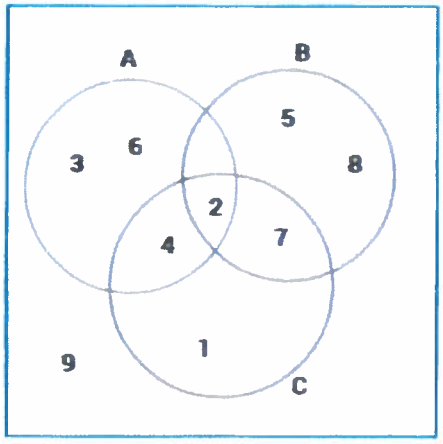
$\frac{6}{4} + \frac{4}{3} = \frac{18+16}{12} = \frac{34}{12} = \frac{17}{6}$

$x^{\frac{17}{6}}$

25. $\left(\sqrt[7]{x^3}\right)^{\frac{1}{5}}$

$\left(x^{\frac{3}{7}}\right)^{1/5} = x^{3/35}$

26.




$A \cap B$ : 2

$C$ : 1, 2, 4, 7

$(B \cup C)'$ : 3, 6, 9

$A$ : 2, 3, 4, 6

a) $(A \cap B) \cup C$ {1,2,4,7}

b) $(B \cup C)' \cup A$ {2,3,4,6,9}

**********

Given: $A = \begin{bmatrix} 8 & -4 & 2 \\ 3 & 1 & -5 \end{bmatrix}$ $B = \begin{bmatrix} -6 & -1 & 0 \\ 1 & 4 & 0 \end{bmatrix}$ $C = \begin{bmatrix} 2 & -3 \\ 0 & 5 \end{bmatrix}$

Find: 27. $5(A - B)$

$A - B = \begin{bmatrix} 14 & -3 & 2 \\ 2 & -3 & -5 \end{bmatrix}$

$5(A-B) = \begin{bmatrix} 70 & -15 & 10 \\ 10 & -15 & -25 \end{bmatrix}$

28. Solve for X: $2X = 3(A + B)$

$2X = 3[A+B]$

$X = \frac{3[A+B]}{2}$

$A+B = \begin{bmatrix} 2 & -5 & 2 \\ 4 & 5 & -5 \end{bmatrix}$

$3[A+B] = \begin{bmatrix} 6 & -15 & 6 \\ 12 & 15 & -15 \end{bmatrix}$

$\frac{3[A+B]}{2} = \begin{bmatrix} 3 & -\frac{15}{2} & 3 \\ 6 & \frac{15}{2} & -\frac{15}{2} \end{bmatrix}$

29. Tony's Tacos offers 3 different shells, 2 different meats, and 5 toppings. A lunch special offers a taco with one shell, one meat, and one topping for one dollar. How many different tacos can be made for the lunch special?

$3 \cdot 2 \cdot 5 = \boxed{30}$

A bag contains donut holes. There are 10 glazed, 6 chocolate, 12 powdered sugar, and 4 plain in the bag. Find the following probabilities.

32 Donut holes in bag

30. P(glazed) = $\frac{10}{32} = \boxed{\frac{5}{16}}$

31. P(chocolate or powdered sugar) = $\frac{18}{32} = \boxed{\frac{9}{16}}$

32. P(not raspberry) = $\frac{32}{32} = \boxed{1}$

33. P(not plain) = $\frac{28}{32} = \frac{14}{16} = \boxed{\frac{7}{8}}$

34. P(orange)= $\frac{0}{32} = \boxed{0}$

From the bag of donut holes mentioned above, Michael grabs 3 donut holes. Find the following probabilities:

35. P(3 chocolate) =

$$\frac{{}_6C_3}{{}_{32}C_3} = \frac{20}{4960} = \frac{2}{496} = \frac{1}{248}$$

36. P(2 glazed and 1 plain) =

$$\frac{{}_{10}C_2 \cdot {}_4C_1}{{}_{32}C_3} = \frac{45 \cdot 4}{4960} = \frac{180}{4960} = \frac{18}{496} = \boxed{\frac{9}{248}}$$

37. **On a particular website, a password is 4 characters long. The first two characters must be letters and the last two must be numbers. It does not matter if you use capital letters or not. How many possible passwords are there? What is the probability of you randomly selecting my password?**

26 · 26 · 10 · 10

$26^2 \cdot 100$

67,600

$\frac{1}{67{,}600}$

**There are 4 juniors and 8 seniors in a certain math class. The teacher (a fine gentleman for sure) wants to select 5 students to represent the class at a conference.**

38. **How many ways can the teacher select 5 students from the group?**

$_{12}C_5 = 792$

39. **If the teacher wants to choose a leader, a pencil toter, a sycophant, a chair carrier, and a captain, how many ways can he do that?**

$_{12}P_5 = 95{,}040$

40. **What is the probability of the teacher choosing 3 juniors and 2 seniors for his group?**

$$\frac{{}_4C_3 \cdot {}_8C_2}{{}_{12}C_5} = \frac{4 \cdot 28}{792} = \frac{112}{792} = \frac{56}{396} = \frac{28}{198} = \boxed{\frac{14}{99}}$$

**Compute the following without using the nCr or nPr buttons on your calculator. As a reminder, the formulas are:**

$$nCr = \frac{n!}{(n-r)!r!} \qquad nPr = \frac{n!}{(n-r)!}$$

41. ${}_8P_3$

$$\frac{8!}{(8-3)!} = \frac{8!}{5!} = \frac{8\cdot 7\cdot 6\cdot 5!}{5!} = 8\cdot 7\cdot 6 = 42\cdot 8 = 320+16 = \boxed{336}$$

42. $\dfrac{{}_4C_2 \cdot {}_5C_3}{{}_7C_4}$

$$\frac{\frac{4!}{(4-2)!\,2!}\cdot\frac{5!}{(5-3)!\,3!}}{\frac{7!}{(7-4)!\,4!}} = \frac{\frac{4!}{2!2!}\cdot\frac{5!}{2!3!}}{\frac{7!}{3!4!}} = \frac{\frac{4\cdot 3\cdot 2!}{2!2!}\cdot\frac{5\cdot 4\cdot 3!}{2!3!}}{\frac{7\cdot 6\cdot 5\cdot 4!}{3!4!}}$$

$$\frac{\frac{4\cdot 3}{2}\cdot\frac{5\cdot 4}{2}}{\frac{7\cdot 6\cdot 5}{6}} = \frac{6\cdot 10}{35} = \frac{60}{35} = \boxed{\frac{12}{7}}$$

**For the following questions, use the same chart that we used in class. Remember that $\sigma$ represents standard deviation.**

| Number of $\sigma$ | The data point is: |
|---|---|
| 1 or less | normal |
| More than 1, not more than 2 | a bit unusual |
| More than 2, not more than 3 | unusual |

Any data point outside of 3 $\sigma$ is rare.

24 36 48 60 [72] 84 96 108

43. A set of quiz scores with a normal distribution has a mean of 72 and a standard deviation of 12.

a) How would you describe a score of 97?

Unusual

b) How would you describe a score of 38?

Unusual

44. Another set of scores has a mean of 65 and a standard deviation of 8.

a) What is the range of *normal* scores?

57 - 73

b) What are the ranges of scores that would be considered *a bit unusual*?

49 - 56 + 74 - 81

c) With respect to the mean, what would the two closest *rare* scores be?

40 and 90

41 49 57 [65] 73 81 89

$Q_1$ 31 | Med 41 | 45 $Q_3$

26, 26, 26, 31, 32, 33, 38, 41, 42, 42, 43, 45, 55, 55, 62

45. Given the data set: ~~33~~, 55, ~~42~~, ~~26~~, ~~45~~, 62, 55, ~~32~~, 38, ~~26~~, ~~31~~, ~~42~~, ~~41~~, ~~26~~, ~~43~~

An ***outlier*** is a data point that is greater than or equal to 1.5 times the interquartile range above Q3 or below Q1.

$45 - 31 = 14$

a) From the data set above, what would the closest outlier to Q3 be?

$14 \times 1.5 = 21$ $45 + 21 = \boxed{66}$

b) Would a data point of 5 be an outlier?

$Q_1 = 31$

$31 - 21 = 10$

YES

46. Write the following information in set-builder and interval notation.


Set-builder notation: $\{x \mid x < 1, x \in \mathbb{R}\}$ Interval Notation: $(-\infty, 1)$

47. Convert $(-\infty, 7)$ to set-builder notation.

$\{x \mid x < 7, x \in \mathbb{R}\}$

**48. Graph the information: $\{x \mid 0 \le x < 4, x \in \mathbb{Z}\}$**


49. Given: $f(x) = 2x^2 + 18x - 14$

Find:

a) $f(3x)$

$2(3x)^2 + 18(3x) - 14$

$2(9x^2) + 54x - 14$

$18x^2 + 54x - 14$

b) $f(1 + 5m)$

$2(1+5m)^2 + 18(1+5m) - 14$

$2(1 + 10m + 25m^2) + 18 + 90m - 14$

$2 + 20m + 50m^2 + 18 + 90m - 14$

$50m^2 + 110m + 6$

50. Expand: $(2x - 3)^3$

$(2x-3)(2x-3)$

$(4x^2 - 12x + 9)(2x - 3)$

$8x^3 - 24x^2 + 18x - 12x^2 + 36x - 27$

$8x^3 - 36x^2 + 54x - 27$

(or)

$(a+b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$

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

$= 8x^3 - 36x^2 + 54x - 27$

**Find the domain of the following functions. Write answers in interval notation.**

51. $f(x) = 4x^2 - 3x + 5$

$(-\infty, \infty)$

52. $g(x) = \frac{5x-4}{3x+12}$

$3x + 12 = 0$

$3x = -12$

$x = -4$

cannot be $-4$

$(-\infty, -4) \cup (-4, \infty)$

53. $h(m) = \sqrt{7m - 11}$

$7m - 11 \geq 0$

$7m \geq 11$

$m \geq \frac{11}{7}$

$\left[\frac{11}{7}, \infty\right)$

54. $f(y) = \frac{\sqrt{3y-9}}{\sqrt{5y+25}}$

$3y - 9 \geq 0$

$3y \geq 9$

$y \geq 3$

$5y + 25 = 0$

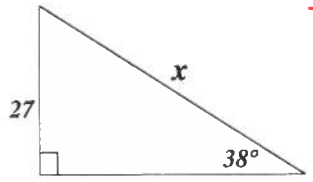
$5y > -25$

$y > -5$

$[3, \infty)$

# SOH CAH TOA

55. Find $x$



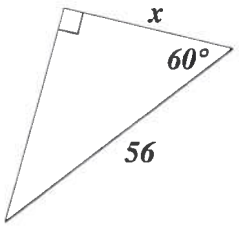

$\sin\theta = \frac{opp}{hyp}$

$\sin 38 = \frac{27}{x}$

$\frac{27}{\sin 38} = x$

$43.86 = x$

56. Find $x$



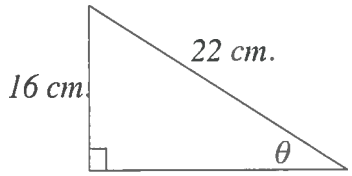

$\cos\theta = \frac{Adj}{Hyp}$

$\cos 60 = \frac{x}{56}$

$56\cos 60 = x$

$28 = x$

57. Find $\theta$:



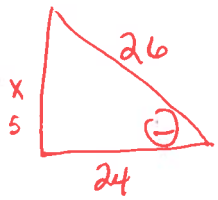

$\tan\theta = \frac{opp}{Adj}$

$\tan\theta = \frac{16}{22}$

$\tan^{-1}\left(\frac{16}{22}\right) = \theta$

$36.03 = \theta$

58. In a given right triangle, $\cos\theta = \frac{24}{26}$. What are the sine and tangent of $\theta$?




$26^2 - 24^2 = x^2$

$5 = x$

$\sin\theta = \frac{5}{26}$

$\cos\theta = \frac{24}{26} = \frac{12}{13}$

$\tan\theta = \frac{5}{24}$

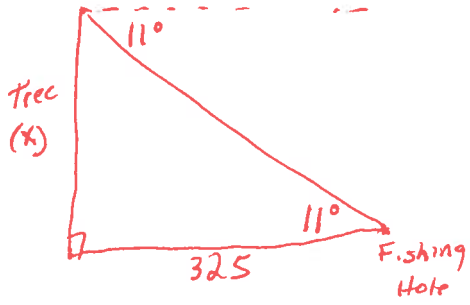
$\csc\theta = \frac{26}{5}$

$\sec\theta = \frac{13}{12}$

$\cot\theta = \frac{24}{5}$

For the following word problems, draw a picture for each question. Write your equation. Then solve the problem.

59. A depressed flamingo has climbed to the top of the tallest tree in his neighborhood to impress his girlfriend. He spots a fishing hole at an angle of depression of $11°$. He knows that the fishing hole is exactly 325 feet from the base of the tree. When the depressed flamingo falls out of the tree, how far will he fall?



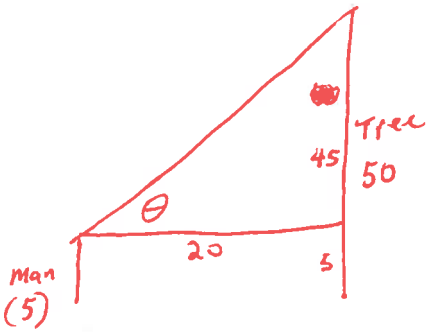

$\tan\theta = \frac{opp}{adj}$

$\tan 11° = \frac{x}{325}$

$325 \tan 11 = x$

$63.17 = x$

60. If a 5 ft tall man stands 20 feet away from a tree that is 50 feet tall, and looks up at the top of the tree, at what angle of elevation will he be looking?



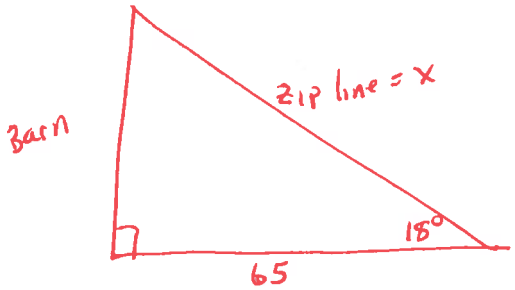

$\tan\theta = \frac{opp}{adj}$

$\tan^{-1}\left(\frac{opp}{adj}\right) = \theta$

$\tan^{-1}\left(\frac{45}{20}\right) = \theta$

$66.04 = \theta$

61. I want to attach a zip line from the top of my barn to the ground. The line will make an angle of $18°$ with the ground and will touch the ground 65 feet from the barn. How long will the zip line be?




$\cos\theta = \frac{adj}{hyp}$

$\cos 18° = \frac{65}{x}$

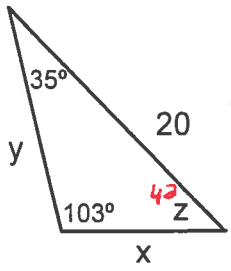
$\frac{65}{\cos 18°} = x$

$68.35 = x$

Law of Sines: $\frac{SinA}{a} = \frac{SinB}{b} = \frac{SinC}{c}$ Law of Cosines: $a^2 = b^2 + c^2 - 2bcCosA$

Solve the triangles.

62 a.




x = 11.77

y = 13.73

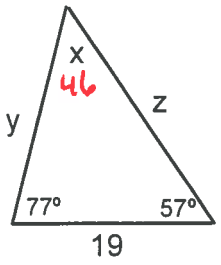
z = 42

$\frac{Sin\,103}{20} = \frac{Sin\,35}{x} = \frac{Sin\,42}{y}$

$\frac{20\,Sin\,35}{Sin\,103} = x$

$\frac{20\,Sin\,42}{Sin\,103} = y$

62 b.




x = 46

y = 22.15

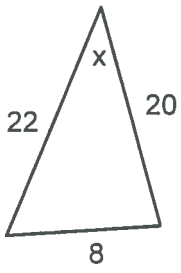
z = 25.73

$\frac{Sin\,46}{19} = \frac{Sin\,57}{y} = \frac{Sin\,77}{z}$

63. Find x

Law of Cosines

$8^2 = 22^2 + 20^2 - 2(22)(20)\cos A$

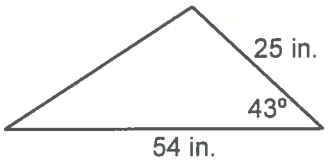



x = 21.2

64. Find the area of the triangle.

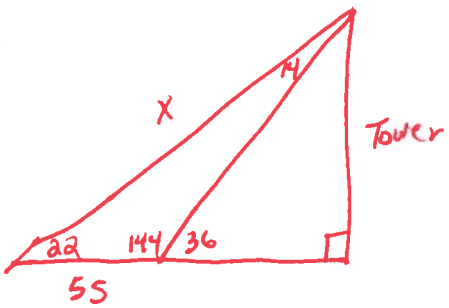
$A = \frac{1}{2} b h$ $\quad b = 54$ $\quad h = 25 \sin 43$

$A = \frac{1}{2}(54)(25 \sin 43)$




A = 460.35

65. You are walking through the woods and spot an ancient tower perhaps left by a previous civilization (or perhaps it is a cell phone tower). The angle of elevation from where you are standing to the top of the tower is 22°. You walk 55 feet closer and the angle of elevation is 36°. How tall is the tower?




$\frac{\sin 144}{x} = \frac{\sin 14}{55}$

$x = 133.63$

$133 \sin 22 = \text{Tower}$

$50.06 = \text{Tower}$

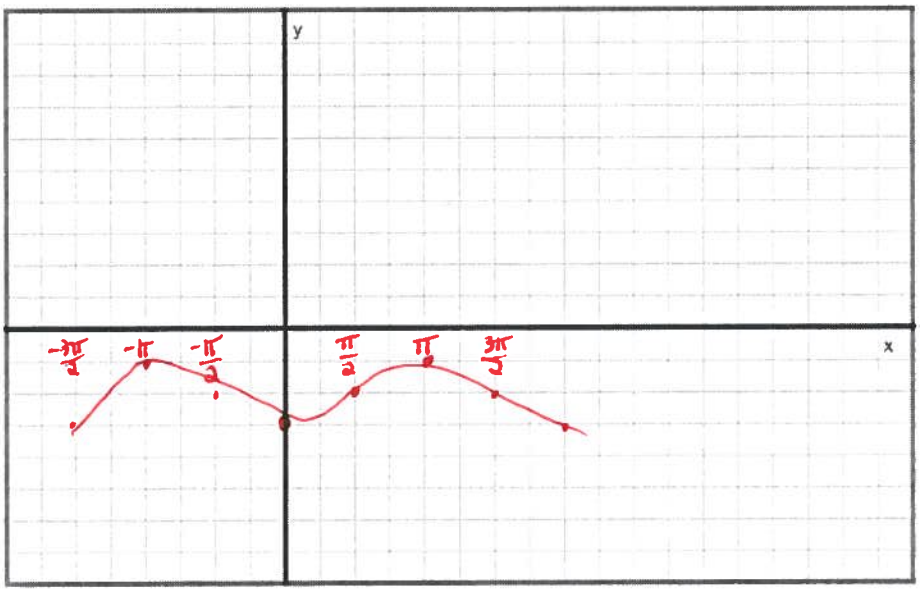
Use the unit circle to determine the following:

66. $\cos\frac{11\pi}{3}$ = $= \cos\frac{5\pi}{3} = \frac{1}{2}$

67. $\tan\frac{35\pi}{6}$ $\frac{-\sqrt{3}}{3}$

Graph the functions.

68. $y = \cos(x + \pi) - 2$




| x | y |
|---|---|
| $-\pi$ | $-1$ |
| $-\frac{\pi}{2}$ | $-2$ |
| $0$ | $-3$ |
| $\frac{\pi}{2}$ | $-2$ |
| $\pi$ | $-1$ |
| $\frac{3\pi}{2}$ | $-2$ |

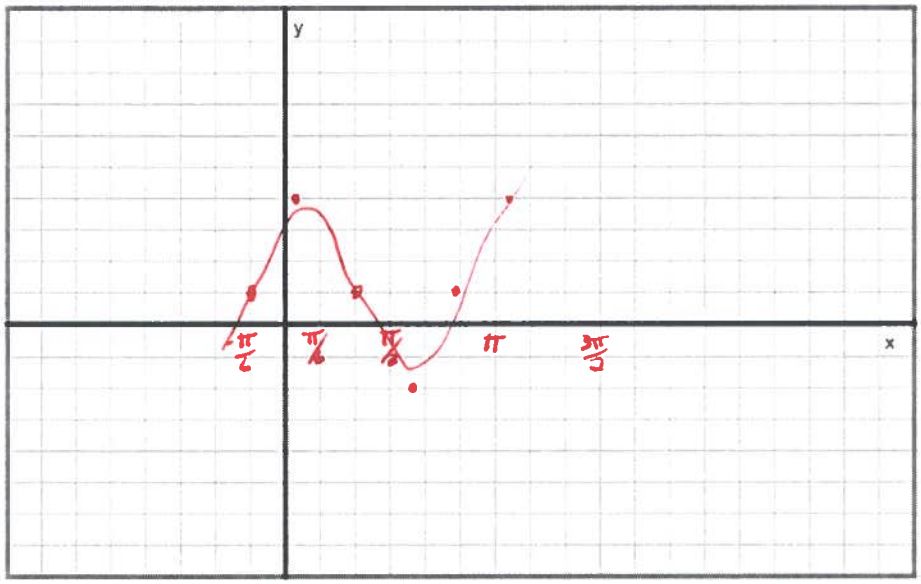
Per = $2\pi$ $\frac{2\pi}{4} = \frac{\pi}{2}$

Phase Shift = $-\pi$

Min = $-3$

Max = $-1$

69. $y = 3\sin\left(2x + \frac{\pi}{3}\right) + 1$




| x | y |
|---|---|
| $-\pi/6$ | 1 |
| $\pi/12$ | 4 |
| $\pi/3$ | 1 |
| $7\pi/12$ | -2 |
| $5\pi/6$ | 1 |
| $13\pi/12$ | 4 |

Per = $\frac{2\pi}{2} = \pi$ $\quad \frac{\pi}{4}$

Phase Shift $\frac{-\frac{\pi}{3}}{2} = -\frac{\pi}{6}$

Min = -2

Max = 4

Write the following equations in logarithmic form.

75. $4^2 = 16$

$\log_4 16 = 2$

76. $m^k = h$

$\log_m h = k$

Write the following equations in exponential form.

77. $\log_3 81 = 4$

$3^4 = 81$

78. $\ln 27 = 4x$

$e^{4x} = 27$

Solve:

79. $4^{(2x-3)} = 21$

$\ln 4^{2x-3} = \ln 21$

$(2x-3)\ln 4 = \ln 21$

$2x - 3 = \frac{\ln 21}{\ln 4}$

$2x - 3 = 2.196$

$2x = 5.196$

$x = 2.598$

80. $\log_3(5x+3) = \log_3(2x+9)$

$5x + 3 = 2x + 9$

$3x = 6$

$x = 2$

81. $9 + 5^{(2x-2)} = 57$

$5^{(2x-2)} = 48$

$\ln 5^{2x-2} = \ln 48$

$(2x-2)\ln 5 = \ln 48$

$2x - 2 = \frac{\ln 48}{\ln 5}$

$x = 2.2$

Solve the systems of equations:

70. $5x - 5y - 5z = 35$
$-x + 2y - 3z = -12$
$3x - 2y + 7z = 30$

$x = 7$
$y = -1$
$z = 1$

Solve the following exponential equations:

71. $3^{3x} = 3^{2x-4}$

$3x = 2x - 4$
$x = -4$

72. $6^{2x+1} = 36^{3x-3}$

$6^{2x+1} = 6^{2(3x-3)}$
$2x+1 = 2(3x-3)$
$2x+1 = 6x - 6$
$1 = 4x - 6$
$7 = 4x$
$\frac{7}{4} = x$

Solve the equations.

73. $\sqrt{4^{2x+4}} = \sqrt{64^{4x-6}}$

$4^{2x+4} = 64^{4x-6}$
$4^{2x+4} = 4^{3(4x-6)}$
$2x+4 = 3(4x-6)$
$2x+4 = 12x - 18$
$4 = 12x - 18$
$22 = 10x$
$\frac{22}{10} = x = \frac{11}{5}$

74. $\sqrt{m^{4x+2}} = \sqrt[3]{m^{9x-12}}$

$m^{\frac{1}{2}(4x+2)} = m^{\frac{1}{3}(9x-12)}$
$m^{2x+1} = m^{3x-4}$
$2x+1 = 3x-4$
$5 = x$