1) Robin, Naomi, and Xiaoyu decide to go to Oberweis for ice cream cones, where there are 10 flavors of ice cream to choose from to make a cone. All three plan to get three-scoop ice cream cones.

   a) To Robin, the order of the scoops of ice cream on a cone matter. So to him, chocolate on the top of strawberry is different from strawberry on top of chocolate. How many different three-scoop cones can Robin order if he decides not to repeat a flavor?

   b) Naomi really does not care about the order of the scoops. So to her, chocolate on the top of strawberry is exactly the same as strawberry on top of chocolate. How many different three-scoop cones can Naomi order if she decides not to repeat a flavor?

   c) Xiaoyu is like Robin in feeling that flavors in different order makes for a different cone. How many different three-scoop cones can Xiaoyu get if she is willing to repeat flavors (i.e., she might get three scoops of chocolate or two scoops of vanilla and one of black cherry)?

2) Evaluate using your calculator giving decimal answers:

   a. $\sqrt{1}$ = b. $\sqrt{1+\sqrt{1}}$ = c. $\sqrt{1+\sqrt{1+\sqrt{1}}}$ =

   d. Immediately after you compute part (c), type " $\sqrt{}$ (1 + ans) " and then press ENTER", which will continue the sequence. Continue to press "ENTER" until the result "settles down". Then record the value to 10 significant figures.

   e) Solve: $\sqrt{x+1} = x$. Give both exact and decimal answers.

The Greatest Integer Function (sometimes called the floor function) is a function that returns the greatest integer less than or equal to a number. The symbol $\lfloor x \rfloor$ is sometimes used for this function. So $\lfloor 2.3 \rfloor = 2$, $\lfloor -2.3 \rfloor = -3$, and $\lfloor 5 \rfloor = 5$.

If you imagine a number graphed on a number line, the greatest integer is the in the first integer to the left of the number, unless the number is already an integer, then it is itself.

3) a) Complete the table:

x	0	0.2	0.9	1	1.2	1.9	2	-2.1	-3.9
$\lfloor x \rfloor$									

b) Graph $y = \lfloor x \rfloor$. This type of graph is often called a step function. One end of each 'step' should be an open circle, the other end closed. Clearly indicate this on your graph.

4) $|x - h| < a$ means that the distance between x and h on a number line is less than a.

a. Sketch the region on the number line for $|x - 5| < 3$.

b. Write an expression for the following graph.

5) Given $\begin{cases} x = 4t + 3 \\ y = 2t - 5 \end{cases}$ where $0 \le t \le 5$

a) Find an equation for y in terms of x. (Eliminate the t as if your were solving a system.)

b) Give the restrictions on x and y ($? \le x \le ?, ? \le y \le ?$), given the restriction on t.

c) The graph of these parametric equations is a line segment. Find its length exactly.

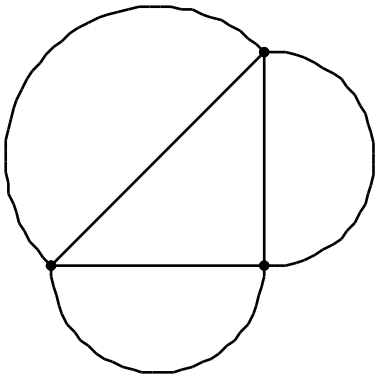
6) The vertex matrix of ΔABC is $\begin{bmatrix} 4 & a & 10 \\ -3 & a+5 & 2 \end{bmatrix}$. Determine a if the area of ΔABC is 100.

7) Write the equation of the line that is:

a) Parallel to $5y + 3x = 12$ which passes through the point (10,-2)

b) Perpendicular to $-2x + 5y + 8 = 0$ which passes through the point (6,–11)

8) Each side of an isosceles right triangle is the diameter of a semicircle. Find the area of the triangle if the sum of the areas of the three semicircles is 200π.

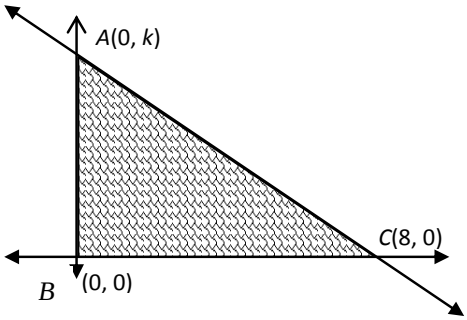


9) On the 25 question AMC 10 exam, you receive 6 points for a correct answer, 1.5 points for a blank response and 0 points for a wrong answer. What is the minimum number of correct answers necessary to score at least 120 points?

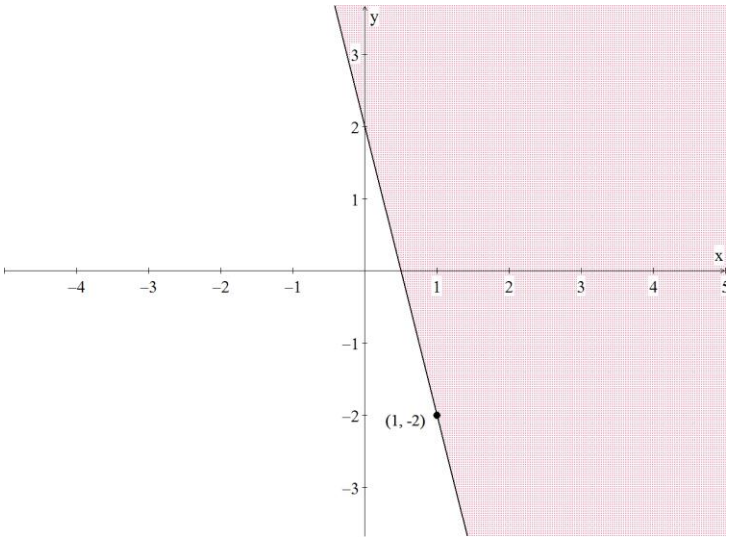
10) Find the area of the triangular region determined by:

$$\begin{cases} x+y=6 \\ 3x-y=2 \\ x=1 \end{cases}$$

11) Find the values of $k>0$ such that the area of Δ ABC is between 15 and 50.

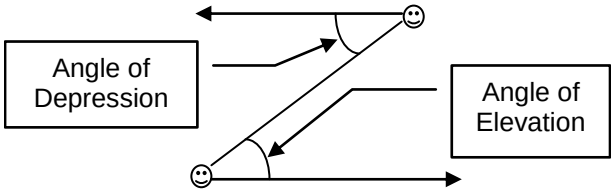


12) Determine the equation of the inequality graphed below.



Angle of Elevation/Depression

The angle of elevation/depression is an angle determined by the object, the observer, and a horizontal line.



13) The Willis Tower (formally Sears Tower) is 1454 feet tall. You are standing down the street from the tower so that the measure the angle of elevation to the top of the tower is 38˚.

a) How far away are you from the base of the tower?

b) Suppose that your measurement is accurate to ± 1^o; that is, your measurement could be as low as 37^o or as high as 39^o. What is the range of your possible distances to the base of the tower? Leave your answer in interval form, rounded to the nearest tenth of a foot.

14) a) If $\frac{15\cdot14\cdot13\cdot12\cdot11\cdot10\cdot9}{1\cdot2\cdot3\cdot4\cdot5\cdot6\cdot7}=\frac{a!}{b!(a-b)!}$, find a and b.

b) Write $12\cdot11\cdot10\cdot9$ as the quotient of two factorials.

Stem Plots

The number of home runs hit by Babe Ruth in each of his 15 years with the New York Yankees (1920 to 1934) is given below.

54 59 35 41 46 25 47 60 54 46 49 46 41 34 22

These data can be displayed in a *stem plot* by writing the tens digit as the *stem* and the ones digit as the *leaves*.

tens digit	ones digit
2	25
3	45
4	1166679
5	449
6	0

Notice that both the stem digits and the leaves are arranged from lowest to highest.

A stem plot gives a good picture of the distribution of the data.

15) The following data consist of the ages of actors and actresses who have won the Academy Awards from 1981 to 2010.

Actors:

37	76	39	53	45	36	62	43	51	32
42	54	52	37	38	32	45	60	46	40
36	47	29	43	37	38	45	50	48	60

Actresses

31	74	33	49	38	61	21	41	26	80
42	29	33	36	45	49	39	34	26	25
33	35	35	28	30	29	61	32	33	45

a) Make a stem plot of actors who have won the Academy Awards from 1981 to 2010.

b) Make a stem plot of actresses who have won the Academy Awards from 1981 to 2010.

16) If $3^x = 43$ and $43^y = 81$, find the value of $x \cdot y$.

17) Given $y = \dfrac{x^2 - x - 56}{x^2 - 25}$, find the set of values of x for which:

(a) $y = 0$ (b) y is "undefined"

18) Given $y = \dfrac{x^2 - 9x - 22}{x^2 - 121}$, find the set of values of x for which:

a) $y = 0$ b) y is "undefined"

Note: This looks like problem 17 but is trickier.