1) In how many different ways can you form a numeral between 300 and 799 using only the digits 2, 3, 5, 6, 7, 8 if:

   a) any digit may appear more than once?

   b) no digit may be repeated?

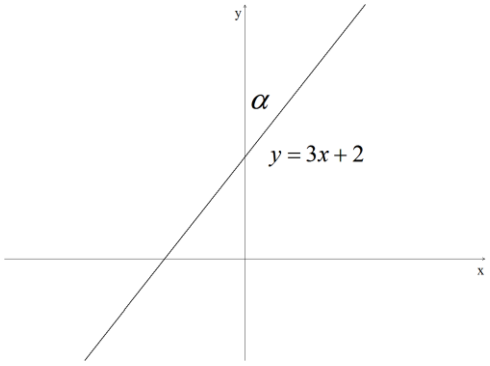
   c) any digit may appear more than once and the numeral must be even?

   d) no digit may be repeated and the numeral must be even?

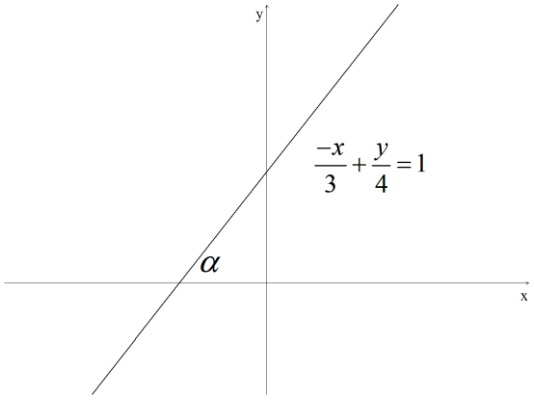
2) a) Expand and compute $\sum_{n=1}^{5}(n!)$ b) Solve for x: $\sum_{n=1}^{5}(nx+n^2)=100$

3) Find the measure of angle α to the nearest degree.

   a)



   b)



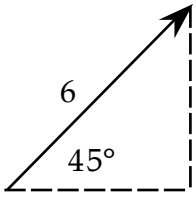
4) The dimensions of a rectangle are $x+7$ and $18-2x$.

   a) What are the restrictions on x in order for the rectangle to exist?
   b) What limitations does this place on the perimeter?

5) Solve $\begin{vmatrix} 2x & 5 & 2 \\ -x & 1 & x \\ 3 & 1 & -1 \end{vmatrix} = 12x-12$.

6) A vector is a quantity that has both size (magnitude) and direction. Velocity and force are examples of vectors. It is often helpful and easier when working with vectors to write them in terms of the horizontal component and the vertical component, usually indicated as an ordered pair $\langle h, v \rangle$. Notice that these components are related to the cosine and sine of the direction angle. When drawing vectors we put an arrow on the "terminal" end of the segment to indicate its direction, such as:

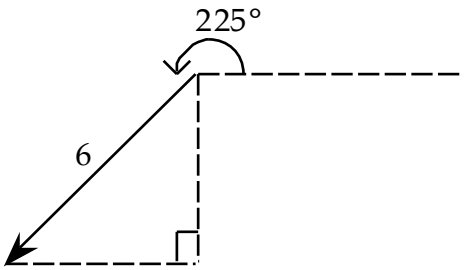
Example 1: A force of 6 newtons at 45° is represented by:



$\vec{v} = \langle 6\cos 45°, 6\sin 45° \rangle$ or

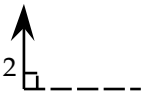
$\vec{v} = \langle 3\sqrt{2}, 3\sqrt{2} \rangle$

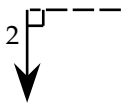
Example 2: A force of 6 newtons at 225° is represented by:



$\vec{v} = \langle 6\cos 225°, 6\sin 225° \rangle$ or

$\vec{v} = \langle -3\sqrt{2}, -3\sqrt{2} \rangle$

Example 3: This vector  is 2 units at 90° or $\vec{v} = \langle 0, 2 \rangle$

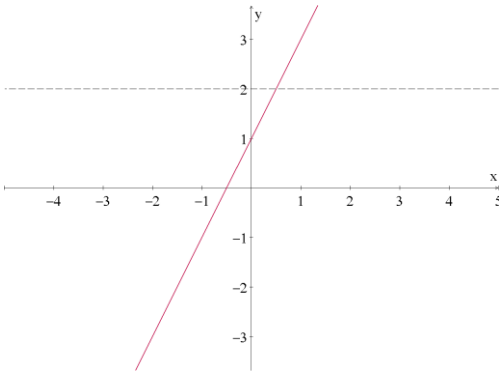
Example 4: This vector  is 2 units at 270° or $\vec{v} = \langle 0, -2 \rangle$

a) Convert a vector of 60 mph at an angle of 60° into exact horizontal and vertical components (an ordered pair of vectors, using the $\langle h, v \rangle$ notation).

b) Convert a vector of 500 mph at 135° into horizontal and vertical components to 4 significant figures.

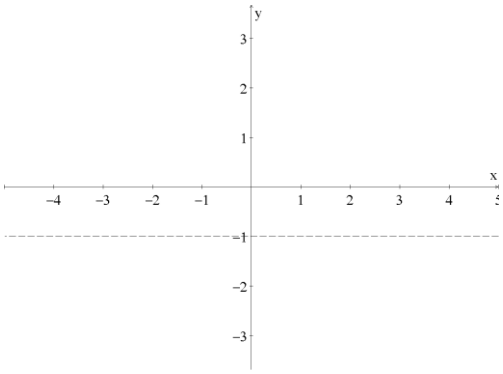
c) Find the magnitude and direction of a vector whose components are $\langle 20, -20 \rangle$.

7)

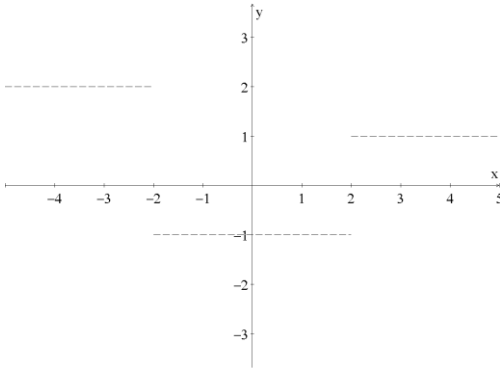


The graph above is the graph of $y = 2x + 1$. The dashed graph is a plot of the slope the line at each point of the line, that is, the slope is constantly 2 at each point. Below, the dashed graphs represent the slope of another graph at each point. Draw a possible graph with these slopes. Note: there is more than one correct solution for each graph.

a)



b)



8) If a point is randomly chosen from inside the square with vertices at (0,0), (6,0), (6,6) and (0,6), what is the probability that it will satisfy the inequality $y \le -\frac{1}{3}x + 6$?

9)

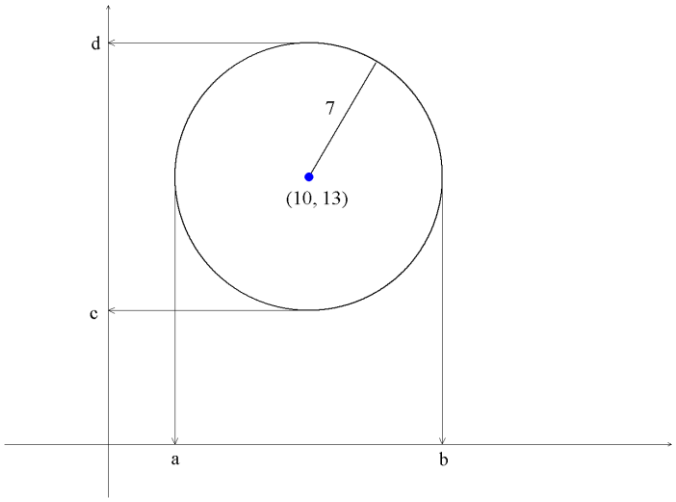
There are infinitely many points on a circle.

a) State the interval of a and b.

[The projection of the circle onto the x-axis]

b) State the interval of c and d.

[The projection of the circle onto the y-axis]



10) $A(x) = |3x + 9|$. Graph $A(x)$ labeling important points.

11) The symbol ${}_nC_r$, read "n choose r" is the "combination of n things taken r at a time." It tells how many unordered groups of size r can be made from n items.

Define: ${}_nC_r = \dfrac{n!}{r!(n-r)!}$ Example: ${}_6C_4 = \dfrac{6!}{4!2!} = 15$

Find, (showing work!)

a) ${}_{10}C_6$ b) ${}_9C_3$ c) ${}_{158}C_{152}$

12) Jennifer and Brianna leave at the same time going to the store 23 miles away. Jennifer is walking at 4 mph, Brianna is riding a bicycle at 10 mph. Obviously, Brianna arrived at the store first, but she forgot why she was there, so she turned around, rode back until she met Jennifer. Where did they meet (how far from the store)?

13) At a local race track the distance per lap is 2 miles. Pete drives his car at a constant rate of 140 mph. Chuck drives his car at a constant rate of 170 mph. How long will it be before Chuck gains 3 laps in relation to Pete?

14) Solve each: a) $5x^2 - 40x - 140 = 0$ by completing the square.

b) $3x^2 = -7x + 8$ by the quadratic formula.

15) Find all x for which $\sqrt{7-3x} + \sqrt{4x+7}$ is a real number. Write answer in interval notation.