Name: _____   Section: _____

Inlab 10: Numbers, Balls & Files

You are expected to turn this in to your lab instructor at the start of your next lab period. It is worth approximately 0.5% of your course grade. Recall that you will be allowed to drop two in-lab assignments.

You are to turn in this page and a printout your code from question 4. **_Be sure your name, section number, and uname are at the top of the code (as a comment!)_**

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1) Convert the following decimal numbers to binary in 8-bit 2's complement

11	22	33

-13	-62	-124

2) What is the binary value of the hexadecimal number 0xAB

3) The following program will have different values for w,x,y and z depending upon the value returned from rand(). In the table below, fill in the values that w,x,y and z will have given rand() returning the indicated value.

```
main()
{
        int w, x, y, z;

        w = rand();
        x = w * 4;
        y = x >> 2;
        w = w & 0xF;
        z = w << 1;

        // Point A
}
```

| rand()	w	x	y	z
13				
120				
255				

Which of the following statements is always true (for all possible values returned by rand()?) (circle all correct answers)
 a) $-16 \le z \le 15$
 b) $0 \le w \le 15$
 c) x is 4 times the value of y
 d) y is 8 times the value of z
 e) $y > 0$

4) **Bouncing Rubber Balls**

Programs are often used to simulate the motion of objects - atoms, proteins, stars, galaxies. Here we'll be dealing with rubber balls.

Questions A and B on the next page are based on the following class definitions.
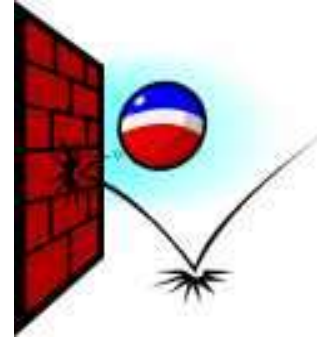
```cpp
class xy
{
  private:
    int x,y;
  public:
    int getx() {return x;};
    int gety() {return y;};
    void set(int new_x, int new_x);
};

class ball
{
  private:
    xy v; // x,y - velocity
    xy p; // x,y - position
  public:
    ball();
    xy get_vel() {return v;};
    xy get_pos() {return p;};
    bool collision(ball b);
    void bounce_x();
};

bool ball::collision(ball b)
{
    int x, y;
    // Here #1

    // check if two balls collide
    if (x == p.getx() and y == p.gety())
        return true;
    else
        return false;
}

void ball::bounce_x()
{
    // Here #2
}
```

a) Write the code that will place the <x,y> position of ball b into the integers x and y at **Here #1**

b) Write the code that will reverse the X velocity of the ball at **Here #2**