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!)

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

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>11</td>
<td>22</td>
<td>33</td>
</tr>
<tr>
<td>-13</td>
<td>-62</td>
<td>-124</td>
</tr>
</tbody>
</table>

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.

```c
main()
{
    int w, x, y, z;
    w = rand();
    x = w * 4;
    y = x >> 2;
    w = w & 0xF;
    z = w << 1;
    // Point A
}
```

<table>
<thead>
<tr>
<th>rand()</th>
<th>w</th>
<th>x</th>
<th>y</th>
<th>z</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>120</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>255</td>
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Which of the following statements is always true (for all possible values returned by rand())? (circle all correct answers)

a) -16 ≤ z ≤ 15
d) y is 8 times the value of z
b) 0 ≤ w ≤ 15
e) y > 0
c) x is 4 times the value of y
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_y);
};

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