CSE 331 – Section 1 – Code Reasoning

1. Fill in the blanks using **forward** reasoning.

```
// {x >= 0 /\ y >= 0}
y = 16;
// {x >= 0 /\ y = 16}
x = x + y
// {x >= 16 /\ y = 16}
x = sqrt(x)
// {x >= 4 /\ y = 16}
y = y - x
// {x >= 4 /\ y = 16 - x} => { x >= 4 /\ y <= 12 }
```

2. Fill in the blanks using **forward** reasoning.

```
// {true}
if (x>0) {
        // {x > 0}
        abs = x
        // {x > 0 /\ abs = x}
}
else {
        // {x <= 0}
        abs = -x
        // {x <= 0 /\ abs = -x}
}
// {(x > 0 /\ abs = x) \/ (x <= 0 /\ abs = -x)} => { abs = | x | }
```

3. Fill in the blanks using **backwards** reasoning.

```
// {x + 3 * b – 4 > 0}
a = x + b;
// {a + 2 * b – 4 > 0}
c = 2 * b - 4
// {a + c > 0}
x = a + c
// {x > 0}
```

4. Fill in the blanks using **backwards** reasoning.

```
// {y > 15 || (y <= 5 /\ y + z > 17)}
if (y > 5) {
        // {y > 15}
        x = y + 2
        // {x > 17}
}
else {
        // {y + z > 17}
        x = y + z;
        // {x > 17}
}
//{x > 17}
```

5. Additional **backward** reasoning practice problems.

   a.
   ```
   // {x – 1 != 0}
   x = x - 2;
   // {x + 1 != 0}
   z = x + 1;
   // { z != 0 }
   ```

   b.
   ```
   // {3 * y > 0}
   x = 2 * y;
   // {x + y > 0}
   z = x + y;
   // { z > 0 }
   ```

   c.
   ```
   // {v + 1 < 0 \/ -2 * w < 0}
   w = 2 * w;
   // {v + 1 < 0 \/ -w < 0}
   z = -w;
   // {v + 1 < 0 \/ z < 0}
   y = v + 1;
   // {y < 0 \/ z < 0}
   x = min(y, z);
   // { x < 0 }
   ```

6. For each pair of statements, circle the **strongest** option.

a.	"I attend CSE331 sections."	"I attend CSE331 sections on Thursdays."	
b.	"y > 23"	"y >= 23"	
c.	"y = 23"	"y >= 23"	
d.	"y < 0.00023"	"y < 0.23"	
e.	"y is prime"	"y <= 17"	incomparable