Sebastian Mohr - 23141808 - Part I

Question 1 - b

LTL 1

Statement: b will be true at some point.

```
ltl p1 {<>(b == true)}
```

This **statement should hold**, because the counter cycles between 15 and 31 as soon as $x >= 15$. This means, that the action $x < 20$ can also be executed, whcih makes b true.

LTL 2

Statement: x will always be >= 15.

```
ltl p2 {[](x >= 15)}
```

As the counter x starts from 0, this statement **should not hold**.

LTL 3

Statement: At some point, x will be 15.

```
ltl p3 {<>(x == 15)}
```

The counter x increases all the time as soon as it's $>= 15$. When it hits 31 it gets reverted to 15, so x will be 15 at some point and therefore the **statement is true**.

LTL 4

Statement: At some point, x will be 16.

```
ltl p4 {<>(x == 16)}
```

The counter x increases all the time and then cycles between 15 and 31, so x will be 16 at some point, and therefore the **statement is true**.

LTL 5

Statement: From some point on, x will always be >= 16.

```
ltl p5 {<>([](x >= 16))}
```

When x reaches 31 it gets reverted to 15, so the statement is not true anymore and **shouldn't hold**.

LTL 6

Statement: x will infinitely often be 16.

```
ltl p6 {[] (<>(x == 16))}
```

The counter can cycle between 15 and 31 as soon as x >= 15, which means it will hit 16 infinitely often, so the **statement should hold**.

LTL 7

Statement: If b will never be true, then x will infinitely often be 16.

```
ltl p7 {[] (b == false -> ([] (<> (x == 16))))}
```

When b is always false, it means that only the second action of the cycle gets executed each time. That means, that once the counter x reaches 15 it will always cycle from 15 to 31. That also means, that x will be 16 infinitely often, which means the**statement should hold**.