

# Sebastian Mohr - 23141808 - Part I

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## Question 1 - b

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### 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  $x \geq 15$ . This means, that the action  $x < 20$  can also be executed, which makes b true.

### LTL 2

**Statement:** x will always be  $\geq 15$ .

```
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  $\geq 15$ . 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  $\geq 16$ .

```
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  $x \geq 15$ , 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**.