

## Non-assessed Exercise

### Bounded Model Checking

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1. Consider the program below, which uses integer variables  $i$ ,  $j$  and  $x$ . Assume that the initial values of variables can be arbitrary, if not specified.

```
x := 0;
for (i := 1; i ≤ 10; i++) {
    j++;
    if (i < 4) {
        x += i * i;
    } else {
        x += i * i * j++;
    }
}
assert x < 100;
```

Demonstrate the application of bounded model checking to verify the correctness of this program (where correctness here means that the assertion is never violated). You should illustrate each of the following steps of the process:

- control flow simplification;
- loop unwinding (assume an unrolling depth of just 1);
- conversion to single static assignment form;
- conversion to conjunctive normal form (CNF).

Explain the outcome of this process, i.e., what we can conclude about the correctness and how confident we can be about this conclusion.