Uge 5.

Exercise 1: (Topic: at forstå while-løkker.)
Convert the following for-loops into while-loops or the other way.

1.
```
for(int i = 20; i >= 0; i /= 4)
```

2.
```
for(double x = 0.0; Math.sin(x) < 0.707; x += 0.05)
```

3.
```
int i = 0;
while(i*i < 1000)
```

End of Exercise 1

Exercise 2: Boolean expressions: opgave uden hjælpemidler. (15 minutter.)
(Topic: evaluering af udtryk.)

a) Are the following boolean expressions equivalent, that is do they both evaluate to the same truth value for all settings of the values of x, y, z.

```
!(x > 0) && ((z < y) || (y >= 3))
!((x > 0) || (!(z < y) && (y < 3)))
```

b) Given an integer variable k. Write a boolean expression which is true if and only if at least one of the following two cases occurs

- k is divisible by 17 and greater than or equal to 126432
- k is negative and neither divisible by 13 and 15

c) How often is the body of the following while loop executed? Find out before running a program.

```
int i = 2; int z = 0;
while( i < 100 || z < 500){
  z += i;
  i++;
}
```

End of Exercise 2

Exercise 3: Write a program `Triag` with a method

```
public static int computeIndex(int n)
```

The method gets a non-negative integer n as argument and outputs the minimum i such that the i-th *triangular number* T_i is larger than or equal to n. The triangular numbers are defined as follows

$$\begin{aligned} T_0 &= 0 \\ T_i &= T_{i-1} + i, \qquad \text{for } i \geq 1 \end{aligned}$$

End of Exercise 3

Exercise 4: Lav en klasse `GCD` med en offentlig metode `gcd`:

```
  public static int gcd(int a, int b)
```

som tager to heltal som input og giver deres største fællesdivisor som output.
Man kan benytte Euklids algoritme:

$$\begin{aligned} \mathrm{GCD}(a,b) &= \mathrm{GCD}(b, a \bmod b) \\ \mathrm{GCD}(a,0) &= |a| \end{aligned}$$

End of Exercise 4

Exercise 5: Write a class `Finder` which contains a method

```
      public static String find(int k, int n, int b)
```

It is assumed that k and n are non-negative and b is positive. The method computes a sequence of numbers $z_0, z_1, z_2, \ldots$ as follows:

$$\begin{aligned} z_0 &= n \\ z_i &= z_{i-1} + k + (i-1), \text{ for } i > 0 \end{aligned}$$

The method stops when for the first time z_i is divisible by b and returns z_i. In case that an overflow occurs, the methods returns `"Overflow"`. In case of an illegal input, the method returns `"Error"`.

End of Exercise 5

Exercise 6: (topic: tilfældighed)

a) Lav en klasse `PlatEllerKrone` som kan slå plat eller krone med en mønt. Progammet skal også kunne skrive ”P” for plat og ”K” for krone.

b) Lav en metode, der slår plat eller krone ind til der har været krone tre gange i træk. Programmet skal printe resultatet, f.eks:

```
P P K P P P K K P K P K K K
```

c) Udvid dit program til at kunne tælle hvor mange slag den udfører, før den stopper.

End of Exercise 6

Exercise 7: (topic: at læse fra filer.)
Write a program `Cleaner` which reads a file and removes all words with exactly four letters from the text and all punctuation including hyphenation. Line breaks should be kept, also there should be exactly one blank between words. The result should be written to standard output. The program has to contain a method

```
    public static void cleanText(String filename)
```

The file `limerick.txt` is provided as a test, on CodeJudge you also find a short part of Homer’s *Iliad*.

End of Exercise 7

Exercise 8: Denne opgave handler om en gætteleg for to spillere. Spiller A tænker på et tal mellem 1 og 1000. I hver runde gætter spiller B på et tal. Dertil svarer A:

`"tillykke"` hvis det var rigtigt (og så stopper programmet),

`"mere"` hvis tallet er større,

`"mindre"` hvis tallet er mindre.

- Lav et program, hvor computeren er Spiller A, og brugeren er Spiller B. Computerens strategi er at vælge et tilfældigt tal. Hvor hurtigt kan du gætte svaret? Udvid dit program til at tælle hvor mange gæt brugeren har brugt.

- Lav et program hvor brugeren er Spiller A og computeren er Spiller B. Kan du vælge et tal som er svært for dit program at gætte? Hvor hurtigt kan dit program i værste fald gætte svaret?

End of Exercise 8

De næste 3 opgaver hænger emnemæssigt sammen, og handler lidt om håndtering af exceptions og lidt om strukturering af et program.

Exercise 9: Listed below is a small program `Exception1` which contains a method

```
public static char getCharAt(String text, int k)
```

The method returns the k-th character in the String `text`. In case the index k is outside the string (e.g., $k = 12$ in the example below), an exception is thrown.
In the main method, surround each of the three calls to `getCharAt` with a try-catch block. This block should ensure that in case of an exception, the text `ERROR` is printed. Do not change method `getCharAt`.

```
public class Exception1 {
  public static void main(String[] args) {

     System.out.println(getCharAt("DTU-Compute",-1));

    System.out.println(getCharAt("DTU-Compute",6));

    System.out.println(getCharAt("DTU-Compute",12));
  }

  public static char getCharAt(String text, int k) {

                  return text.charAt(k);
  }

}
```

End of Exercise 9

Exercise 10: Listed below is a small program Exception2 which contains a method

```
public static void printCharAt(String text , int k)
```

The method prints the k-th charakter in the String text. In case the index k it outside the string (e.g., $k = 12$), an exception is thrown.

Use a single try-catch block in the method printCharAt to ensure that in case of an exception, the text ERROR is printed error message. Do not change method main.

```
public class Exception2 {
        public static void main(String[] args) {

                printCharAt("DTU-Compute",-1);

                printCharAt("DTU-Compute",6);

                printCharAt("DTU-Compute",12);
        }


        public static void printCharAt(String text, int k) {

                        System.out.println( text.charAt(k) );

        }

}
```

End of Exercise 10

Exercise 11: Listed below is a small program Exception3. Add a method getCharAt(String text,int k) which retunrs the k-th charakter in the String text. If the string is empty or the the index k is ouside the string, the method should throw an IllegalArgumentException with text "Input incorrect".

```
public class Exception3{

        public static void main(String[] args) {


                System.out.println(getCharAt("DTU-Compute", 6));

                System.out.println(getCharAt("DTU-Compute", 12));
        }

        // put method getCharAt here

}
```

This exercise is not on CodeJudge.

End of Exercise 11