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MATH501 PA1

Using Java to implement the code, the results are identical to Computer SUN on the textbook. Single-precision epsilon is 2^{-23} which is approximately 0.119×10^{-6} . Double-precision is 2^{-52} which is about 0.222×10^{-15}

Program output:

Single-precision: $k - 1 = 23$

$s = 1.1920929\text{E-}7$

Double-precision: $k - 1 = 52$

$s = 2.220446049250313\text{E-}16$

Code:

```
public class main {

    public static void main(String[] args) {
        singlePrecision();
        doublePrecision();
    }

    private static void singlePrecision() {
        float s = 1.0F;
        for (int k = 1; k <= 100; k++) {
            s = 0.5F * s;
            float t = s + 1.0F;
            if (t <= 1.0F) {
                s = 2.0F * s;
                System.out.println("Single-precision: k - 1 = " + (k - 1));
                System.out.println("s = " + s);
                break;
            }
        }
    }

    private static void doublePrecision() {
        double s = 1.0;
        for (int k = 1; k <= 100; k++) {
            s = 0.5 * s;
            double t = s + 1.0;
            if (t <= 1.0) {
                s = 2.0 * s;
                System.out.println("Double-precision: k - 1 = " + (k - 1));
                System.out.println("s = " + s);
                break;
            }
        }
    }
}
```