Code:

import java.lang.Math;

class floats {

    public static void main(String[] args) {

        System.out.println("Calculating Std. Devation with floats");

        float num1 = (float) 10000.1; //These numbers change depending on what numbers from table we are using

        float num2 = (float) 10000.2;

        float num3 = (float) 10000.3;

        float A;

        float B;

        float squared\_sum = SquaredSum(num1, num2, num3);

        float sumA = Sum(num1, num2, num3);

        float average = Average(num1, num2, num3);

        float x1 = num1 - average;

        float x2 = num2 - average;

        float x3 = num3 - average;

        float x1\_squared = x1 \* x1;

        float x2\_squared = x2 \* x2;

        float x3\_squared = x3 \* x3;

        float sumB = Sum(x1\_squared, x2\_squared, x3\_squared);

        A = ((float) 0.5) \* (squared\_sum - ((sumA \* sumA)/3));

        B = ((float) 0.5) \* (sumB);

        System.out.println(squared\_sum);

        System.out.println((sumA\*sumA)/3);

        System.out.println(sumB);

        System.out.println("-----------Answers-----------");

        System.out.print("Sigma A: ");

        System.out.println(A);

        System.out.print("Sigma B: ");

        System.out.println(B);

    }

    public static float Sum(float num1, float num2, float num3)

    {

        float result;

        result = num1 + num2 + num3;

        return result;

    }

    public static float SquaredSum(float num1, float num2, float num3)

    {

        float result;

        num1 = num1 \* num1;

        num2 = num2 \* num2;

        num3 = num3 \* num3;

        result = num1 + num2 + num3;

        return result;

    }

    public static float Average(float num1, float num2, float num3)

    {

        float result;

        float sum;

        sum = num1 + num2 + num3;

        result = sum/3;

        return result;

    }

}

Table and Answer:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **x1** | **x2** | **x3** | **sigma A** | **sigma B** | **Correct** |
| 1.1 | 1.2 | 1.3 | 0.01 | 0.01 | 0.01 |
| 10.1 | 10.2 | 10.3 | 0.01 | 0.01 | 0.01 |
| 100.1 | 100.2 | 100.3 | 0.01 | 0.01 | 0.01 |
| 1000.1 | 1000.2 | 1000.3 | -0.125 | 0.01 | 0.01 |
| 10000.1 | 10000.2 | 10000.3 | -32 | 0.01 | 0.01 |

|  |
| --- |
| **Answer:** |
| Sigma B is the correct form of computation. The two computations differ because sigma B computes variance correctly by finding the difference between each number and the mean then squaring them all to make sure the answer will be positive. The answer needs to be positive because variance cannot be negative. The reason why Sigma A eventually computes a negative variance is because the squared sum of the three numbers eventually gets bigger than the sum of each number squared. This results in receiving a negative variance using sigma A with bigger numbers since the squared sum (bigger number) is subtracted from the sum of each number squared (smaller number). Therefore, Sigma A and Sigma B differ because sigma A eventually outputs a negative variance that is very wrong while sigma B always outputs the correct positive variance. The difference happens in the final two rows of the table because those numbers tend to be much bigger and contain more significant figures. |