Exercises

1) Calculate the degrees of freedom for a t-test.
2) Calculate the probability density function for a normal distribution.
3) Calculate the cumulative distribution function for a normal distribution.
4) Calculate the inverse of the cumulative distribution function for a normal distribution.
5) Calculate the standard deviation of a list of numbers.
6) Calculate the variance of a list of numbers.
7) Find the maximum value in a list of numbers.
8) Find the minimum value in a list of numbers.
9) Sort a list of numbers in ascending order.
10) Sort a list of numbers in descending order.

Exercises and solution

1) Calculate the degrees of freedom for a t-test.

```
import math


n = 10
df = n − 1
```

2) Calculate the probability density function for a normal distribution.

```
import math

def normal_pdf(x, mu=0, sigma=1):
    return (1 / (math.sqrt(2 * math.pi) * sigma)) * math.exp(-(x - mu)**2 /
(2 * sigma**2))
```

3) Calculate the cumulative distribution function for a normal distribution.

```
import math

def normal_cdf(x, mu=0, sigma=1):
    return (1 + math.erf((x - mu) / math.sqrt(2) / sigma)) / 2
```

4) Calculate the inverse of the cumulative distribution function for a normal distribution.

```
import math

def inverse_normal_cdf(p, mu=0, sigma=1, tolerance=0.00001):
    if mu != 0 or sigma != 1:
        return mu + sigma * inverse_normal_cdf(p, tolerance=tolerance)
```

```python
        low_z, low_p = -10.0, 0
        hi_z, hi_p = 10.0, 1
        while hi_z - low_z > tolerance:
            mid_z = (low_z + hi_z) / 2
            mid_p = normal_cdf(mid_z)
            if mid_p < p:
                low_z, low_p = mid_z, mid_p
            elif mid_p > p:
                hi_z, hi_p = mid_z, mid_p
            else:
                break
        return mid_z
```

5) Calculate the standard deviation of a list of numbers.

```python
import math

def standard_deviation(numbers):
    mean = sum(numbers) / len(numbers)
    variance = sum((x - mean)**2 for x in numbers) / len(numbers)
    return math.sqrt(variance)
```

6) Calculate the variance of a list of numbers.

```python
def variance(numbers):
    mean = sum(numbers) / len(numbers)
    variance = sum((x - mean)**2 for x in numbers) / len(numbers)
    return variance
```

7) Find the maximum value in a list of numbers.

```python
def max_value(numbers):
    return max(numbers)
```

8) Find the minimum value in a list of numbers.

```python
def min_value(numbers):
    return min(numbers)
```

9) Sort a list of numbers in ascending order.

```python
def sort_ascending(numbers):
    return sorted(numbers)
```

10)   Sort a list of numbers in descending order.

```python
def sort_descending(numbers):
    return sorted(numbers, reverse=True)
```