

Tartalomjegyzék

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Problem 1 (2.5 point):

Write a `search()` function, which first parameter is an `x` and after that it can have arbitrary many named parameters. (`search(x, **kwargs)`) The function should return `True`, if there exist a key in `kwargs`, for which the corresponding value is `x`. Otherwise it should return `False`.

Examples:

```
search(2, a=1, b=3) -> False
search(2, a=1, b=3, c=2) -> True
```

Problem 2 (3.5 point):

Write a variadic `increasing()` function, which inputs are arbitrary many positive natural numbers, and it returns `True` if the sequence of the numbers contains an increasing subsequence of length 3.

Examples:

```
increasing(1, 2, 1, 2, 4) -> True
increasing(1, 2, 1, 2, 1) -> False
```

Problem 3 (5 point):

Write a `Vector` class. It's parameter should be an arbitrary `n` dimensional vector. (A list of `n` real numbers.)

- a) Write the `__init__` and `__str__` methods! (0.5 point)
- b) Write the `__mul__` method which calculates the dot product of two vectors. (1.5 points)
- c) Write the `norm` method which calculates the length of the vector. (1 points)
- d) Write a test method which returns `True` if the angle between the vector and the `x`-axis is between 0 and 45 degrees. It might be useful to use the `norm` method and to import the `math` package. (2 points)

Example:

```
v1 = Vector([1, 2, 3])
v2 = Vector([1, 0, 1])
print(v1) -> [1, 2, 3]
print(v1*v2) -> 4
print(v2.norm()) -> 1.41
print(v1.test()) -> False
```

Problem 4 (5 point):

Write an iterable Binomial class. Its parameter should be a positive natural number n . With an instance of this class we should be able to iterate the numbers $\binom{n}{k}$ from $k=0$ to $k=n$.

- a) Write the `__init__` method. You should also make an exception, raise an error if the input is not a positive natural number. (1 point)
- b) Write the `bin` method, which input (apart from self) is a k natural number and it returns the value of $\binom{n}{k}$. (1 point)
- c) Write the `__iter__` method. (1 point)
- d) Write the `__next__` method. The iteration should be started with $k=0$. (2 points)

Example:

```
for j in Binom(3):  
    print(j, end=' ')  
Output: 1 3 3 1
```