

i Forside**UNIVERSITY OF OSLO****Faculty of mathematics and natural sciences****Mid term exam IN1900, IN-KJM1900, IN-GEO1900****Date: Oktober 6, 2026, 9:00-11:00****Attachments: None****Permitted aids: None. A calculator is available in Inspira.**

- The exam set consists of 20 multiple choice questions. The maximum score is 25.
- All code in the exam is written in Python 3.
- Most of the questions have one correct answer. Correct answer gives 1 point, wrong answer gives 0 points.
- Question 10, 18 and 20 have multiple answers. Each correct answer gives 0.5 points, and 0 points is given for a wrong answer or if no answer is given. Maximum 2.5 points for question 10, 3.5 points for question 18, and 2 points for question 20.
- There are no negative points for wrong answers, so all questions should be answered.

1 Hva skrives ut?

What is printed in the terminal window when the following code is run?

```
y = 4
z = y
y = 3
print('z =', z)
```

Select one alternative:☐ 3☐ An error message☐ z = 4☐ z = 3☐ 4

Maximum marks: 1

2 Hva skrives ut?

What is printed when this code is run?

```
s = 0
for i in range(1,9,2):
    s += 1
print(s)
```

Select one alternative:

☐ 5

☐ 9

☐ 4



☐ 8

Maximum marks: 1

3 Hva skrives ut?

What is printed when the following code is run?

```
F = 80
C = (F-32)*5.0/9
print(type(F),type(C))
```

Select one alternative:

☐ <class 'int'> <class 'float'>



☐ <class 'int'> <class 'int'>

☐ 80, 26.666

☐ <class 'float'> <class 'float'>

Maximum marks: 1

4 Lister

Which of the following expressions does **not** result in a list of length 5?

Select an alternative:

- ☐ [0]*5
- ☐ list(range(2))+list(range(3))
- ☐ [2,3]+[0,2,3]
- ☐ [e**2 for e in range(1,5)]



Maximum marks: 1

5 Hva skrives ut?

What is printed in the terminal window when the following code is run?

```
def length(a):
```

```
    r = 0
```

```
    for e in a:
```

```
        r += 1
```

```
    return r
```

```
b = list(range(5))
```

```
print(len(b) == length(b))
```

Select one alternative:

- ☐ 6
- ☐ 5
- ☐ 0
- ☐ True
- ☐ False



Maximum marks: 1

6 Hva skrives ut?

What is printed by the following code?

```
dt = 0.1  
time = [k*dt for k in range(3,10)]  
print(time[2])
```

Select one alternative:

- ☐ An error message
- ☐ 0.4
- ☐ 6
- ☐ 0.6
- ☐ 0.5



Maximum marks: 1

7 Hva skrives ut?

What is printed in the terminal window when the following code is run?

```
def fibonacci(N = 3):  
    x0 = 1  
    x1 = 1  
    for n in range(2, N+1):  
        x0, x1 = x1, x0 + x1  
    return n, x1
```

```
print(fibonacci(N=2))
```

Select an alternative:

- ☐ (2,2)
- ☐ [0,1,1,2,3]
- ☐ [0,1,1,2]
- ☐ (1,1,2,3)



Maximum marks: 1

8 Hva skrives ut?

What is printed in the terminal window when the following code is run?

```
def piecewise(z):
```

```
    if z < 0:
```

```
        return -z
```

```
    elif z < 1:
```

```
        return 0
```

```
    else:
```

```
        return z-1
```

```
print(piecewise(-1), piecewise(1))
```

Select one alternative:

☐ An error message

☐ 1 0



☐ -1 0

☐ 0 0

Maximum marks: 1

9 Hva skrives ut?

What is printed when the following code is run?

```
def pow(a,b):  
    return a**b
```

```
z = 3
```

```
def g(z):  
    return 2*z
```

```
z = 2
```

```
print(z, pow(2,g(z)))
```

Select one alternative:

- ☒ 2 16
- ☐ An error message
- ☐ 2 32
- ☐ 3 32
- ☐ 3 64



Maximum marks: 1

10 Lister og boolske uttrykk

What is the value of the boolean expressions when the following code has been run?

```
def multiply(a,b):
    return [a*b_i for b_i in b]
```

```
x = [0,1,2,3,4]
y = multiply(2,x)
z = 2*x
```

Please match the values:

	Undefined/gives error	False	True
len(y) == len(z)	☐	☒	☐
z[-1] == 8	☐	☒	☐
y == z	☐	☒	☐
y[-1] > z[-1]	☐	☐	☒
y[0] == z[0]*2	☐	☐	☒

0.5 points for each correct answer. Maximum 2.5 points on the question.

Maximum marks: 2.5

11 Hva er riktig?

One of the following statements is correct. Which one?

Select one alternative:

- ☐ A while-loop usually gives shorter and simpler code than a for-loop.
- ☐ A function must always include exactly one return-statement.
- ☐ An if-statement in the code must always be followed by 'else'.
- ☒ A for-loop can always be written as a while-loop.



Maximum marks: 1

12 Hvilken linje mangler?

Which line needs to be inserted for the test to pass?

```
def odd_sum(n):  
    # Insert missing line here  
    return sum(s)  
  
def test_odd_sum():  
    expected = 1 + 3 + 5  
    computed = odd_sum(5)  
    msg = f'expected {expected}, got {computed}'  
    assert expected == computed, msg  
  
test_odd_sum()
```

The function **sum**, which is used inside **odd_sum**, is a built-in function in Python. It takes a list, array, or similar object as argument, and returns the sum of its elements.

Select one alternative:

- ☒ s = range(1, n+1, 2) 
- ☐ s = range(1, n+1)
- ☐ s = range(n+1, 2)
- ☐ s = range(0, n+1, 2)

Maximum marks: 1

13 Hvilket funksjonskall?

The function below implements Newton's method for solving equations on the form $f(x) = 0$. The arguments are as follows:

- f : the function $f(x)$
- df : the derivative $f'(x)$
- x : start value (first guess) for the solution

```
def Newton(f, df, x, tol = 1e-7):
    while abs(f(x)) > tol:
        x = x - f(x)/df(x)
    return x, f(x)
```

We want to use the function to solve the equation

$$x^2 - 2 = 0$$

Which function call is correct?

(Note: Newton's method (chapter 11) is not part of the curriculum for the midterm exam.

However, answering this question only requires general understanding of functions, not Newton's method itself.)

Select one alternative:

- ☐ $x_0, f = \text{Newton}(f(x) = x^{**}2-2, df(x) = 2*x, 2.0)$
- ☐ $x_0, f = \text{Newton}(x^{**}2-2, 2*x, 2.0, 1e-4)$
- ☐ $x_0, f = \text{Newton}(f = x^{**}2-2, df = 2*x, 2.0)$
- ☐ $x_0, f = \text{Newton}(\text{lambda } x: x^{**}2-2, \text{lambda } x: 2*x, 2.0)$



Maximum marks: 1

14 Hvilken linje mangler?

We want the code below to print out values of t and $N(t)$ in two columns. The line that defines the for-loop is missing (before the print statement).

```
from math import exp
def N(t):
    return 50000/(1+9*exp(-0.2*t))
```

```
t = [i*4 for i in range(13)]
pop = [N(t_) for t_ in t]
```

```
##Missing line goes here
print(f'{t:5.1f} {n:8.2f}')
```

Which line must be added to define the for-loop correctly?

Select one alternative:

- ☐ for t, n in t, N:
- ☐ for t, N(t) in zip(t, pop):
- ☒ for t, n in zip(t, pop):
- ☐ for t, N(t) in t:



Maximum marks: 1

15 Hvilken kode er riktig?

The file 'messy_records.txt' contains years, times, and names for world records on 100 meter dash:

```
2007 9.74 Asafa Powell
1996 9.84 Donovan Bailey
2008 9.69 Usain Bolt
1991 9.86 Carl Lewis
1994 9.85 Leroy Burrell
1999 9.79 Maurice Greene
2009 9.58 Usain Bolt
2002 9.78 Tim Montgomery
2005 9.77 Asafa Powell
```

We want to write a Python program which reads such a file and prints the line with the lowest time (the current world record). For the lines above the program shall print the line

```
2009 9.58 Usain Bolt
```

The code below is meant to solve this task, but the contents of the for-loop is missing.

with open('messy_records.txt') as infile:

```
    fastest = 100.0
    for line in infile:
        #Missing lines
        #go here
```

print(record)

Which of the following alternatives needs to be added inside the for-loop for the code to work. You can assume that all the alternatives have the right indentation to fit inside the for-loop.

Alternative A:

```
    words = line.split()
    if words[0] < fastest:
        fastest = t
        record = line
```

Alternative B:

```
    words = line.split()
    t = float(words)
    if t == fastest:
        fastest = t
        record = line
```

Alternative C:

```
    t = float(line.split()[1])
    if t < fastest:
        fastest = t
        record = line
```

Alternative D:

```
t = float(line.split()[1])
```

```
if t < fastest:
```

```
    record = t
```

Select one alternative:

- ☐ Alternative C is correct.
- ☐ Alternative D is correct.
- ☐ Alternative B is correct.
- ☐ Alternative A is correct.



Maximum marks: 1

16 Hva skrives ut?

What is printed in the terminal window when this code is run?

```
numbers = [3, 5, 2, 4, 1]
```

```
n = len(numbers)
for i in range(n):
    for j in range(n-1):
        if numbers[j] > numbers[j+1]:
            tmp = numbers[j]
            numbers[j] = numbers[j+1]
            numbers[j+1] = tmp
```

```
print(numbers)
```

Select one alternative:

- ☐ IndexError: list index out of range
- ☐ [3, 5, 2, 4, 1]
- ☐ 5
- ☐ [5, 4, 3, 2, 1]
- ☐ [1, 2, 3, 4, 5]



Maximum marks: 1

17 Hva skrives ut?

What is printed when the following code is run?

```
import sys
try:
    v0 = float(sys.argv[1])
    g = float(sys.argv[2])
except IndexError:
    print('Please provide two command line arguments')
    exit()
except ValueError:
    print('The arguments must be numbers')
    exit()

t = 2.0
print(v0*t-0.5*g*t**2)
```

The code is in a file ball.py, and is run with as follows:

Terminal> python ball.py v0=5 g=9.81

Select one alternative:

- ☐ IndexError: list index out of range
- ☐ Please provide two command line arguments
- ☒ The arguments must be numbers
- ☐ 1.2342



Maximum marks: 1

18 Hvilke hører sammen?

We have two lists: $\mathbf{x} = [-2, 0, 1]$ and $\mathbf{y} = [1, 2, [1, 2], [2], [[2], [1]], [[2]]]$. To the left of the table below are seven expressions, and at the top of the table are six possible results of evaluating these expressions. Match the correct result to each expression.

Please match the values:

	1	2	-2	[2]	[1]	[[2]]
y[1]	☐	☒	☐	☐	☐	☐
x.index(y[0])	☐	☒	☐	☐	☐	☐
y[x[-1]]	☐	☒	☐	☐	☐	☐
y[x[0]+1]	☐	☐	☐	☐	☐	☒
x[-3]	☐	☐	☒	☐	☐	☐
x[y[1]:]	☐	☐	☐	☐	☒	☐
x[y[-2][0][-1]]	☒	☐	☐	☐	☐	☐

Maximum marks: 3.5

19 Hva skrives ut?

What is printed when the following code is run?

```
import numpy as np
```

```
a = np.linspace(1, 3, 5)
```

```
b = a + 1.0
```

```
print(b)
```

Select one alternative:

☐ [1. 1.5 2. 2.5 3.]

☐ An error message

☐ [1. 1.5 2. 2.5 3. 1.]

☐ [2. 2.5 3. 3.5 4.]



Maximum marks: 1

20 **Løkker**

Assume that this code is run.

```
year = 2002
years1 = []
years2 = []
```

```
while year <= 2023:
    years1.append(year)
    year += 1
```

```
for year in range(2002,2023):
    years2.append(year)
```

What are the values of the boolean expressions?

Please match the values:

	False	True
len(years1) == len(years2)	☐ ✓	☐
years1[0] == years2[0]	☐	☐ ✓
years1[-1] == years2[-1]	☐ ✓	☐
years1[1] == years2[1]	☐	☐ ✓

Maximum marks: 2