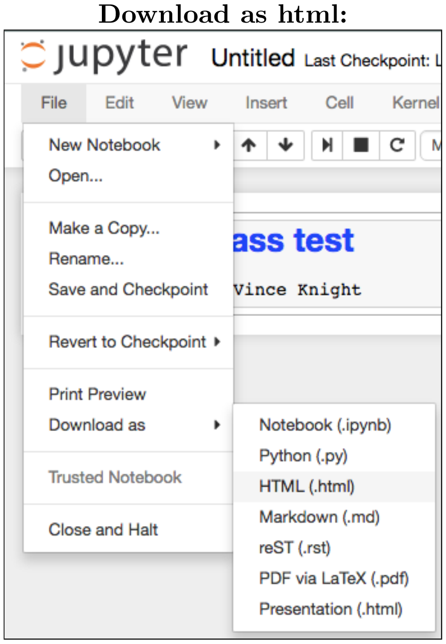
MOCK — MAT1003: Computing for Mathematics — Class test

The instructions on this page are just for your information. This is not a marked exercise. Do not attempt to hand it in.

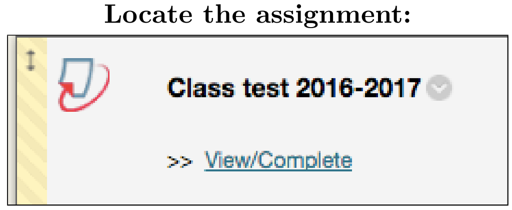
Instructions

- You have 40 minutes to carry out the 3 questions on the reverse page;
- You are allowed access to the internet and any books/notes you may have with you. However, YOU ARE NOT PERMITTED TO COMMUNICATE WITH ANY OTHER STUDENT. As such you are simply not allowed to log in to an email client, facebook etc... If you are caught using any site that an invigilator suspects you may be able to use to communicate with another student you will be asked to stop working on this class test and reported.
- Write all attempts in a single Jupyter notebook. You will submit an html version of the notebook. When you are ready to submit: in Jupyter click on `File > Download as > HTML` to download an html version of your notebook.
- To submit you will use learning central: `https://learningcentral.cf.ac.uk/`. Find the module **"MA1003 Computing For Mathematics"**, within there find the **"Assessment"** folder and then the **"Class test 2016–2017"** assignment. Then click on **"View/Complete"** and follow the instructions to submit an html version of your notebook. Please see this video which shows how to submit: `https://vimeo.com/114969438`.

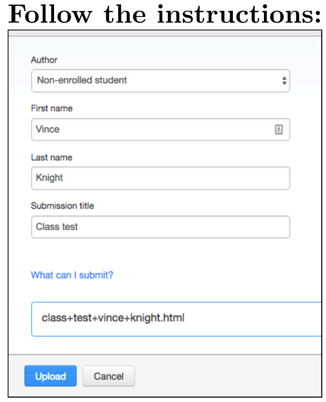
Download as html:



Locate the assignment:



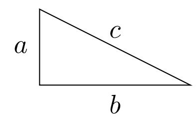
Follow the instructions:



Questions

1. **Write code to** verify that the sum of the first 10 positive integers that are divisible by 10 and 11 is 6050. [20]

2. The following code snippet is attempting to define a function that gives the length c of the hypotenuse of a triangle with sides of length a and b:



$$c = \sqrt{a^2 + b^2}$$

It has errors/bugs in it.

```
import mat
def hyp(a)
    return math.sqrt(a + b ** 2
```

(a) **Find and fix** all the errors/bugs. [20]

(b) **Use this to verify that** the triangle with sides of length 76 and 57 has hypotenuse of length: 95. [10]

3. This question aims to approximate π using the Euler Convergence Transformation which states that:

$$\frac{\pi}{2} = \sum_{k=0}^{\infty} \frac{2^k (k!)^2}{(2k+1)!}$$

(a) **Write a function** that gives p_k, the kth term of the above sum:

$$p_k = \frac{2^k (k!)^2}{(2k+1)!}$$

(Hint: you may use the `math` library for the factorial function.)

[10]

(b) **Write a function** that gives the following expression:

$$\sum_{k=0}^{n} p_k$$

[15]

(c) **Use the previous steps** to verify the following approximations of π:

n	$\pi \approx 2\sum_{k=0}^{n} p_k$
0	2.0
1	2.666...
2	2.933...
3	3.048...
4	3.098...

[10]

(d) **Write the first 50 approximations** of π to a file called `pi.csv`.

[15]