Lecture Week 8

Graphics and User Interaction (Tkinter)

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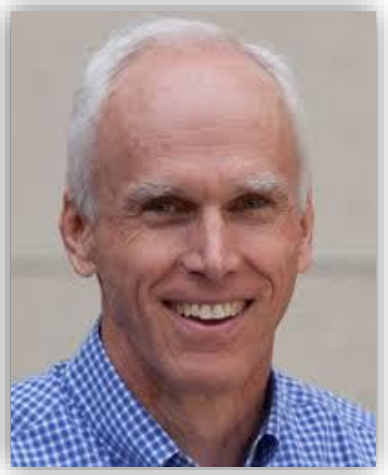
COMP16321
Introduction to Programming 1

Intro

tkinter



- Tkinter is the standard GUI library for Python.
- Tkinter provides a fast and easy way to create GUI applications.
- Tkinter provides a powerful object-oriented interface to the Tk GUI toolkit.
- Tk was developed as a GUI extension for the Tcl scripting language by John Ousterhout (1991)
- bindings for lots of other programming languages have also been developed (Perl, Ada, Ruby, Lisp…)

Steps in creating a GUI

1. Import tkinter (and the widgets that you want)
2. Create a main window (and configure it)
3. Add your widgets
4. Enter a main event loop to manage your triggers (i.e. button press)

Creating a Window

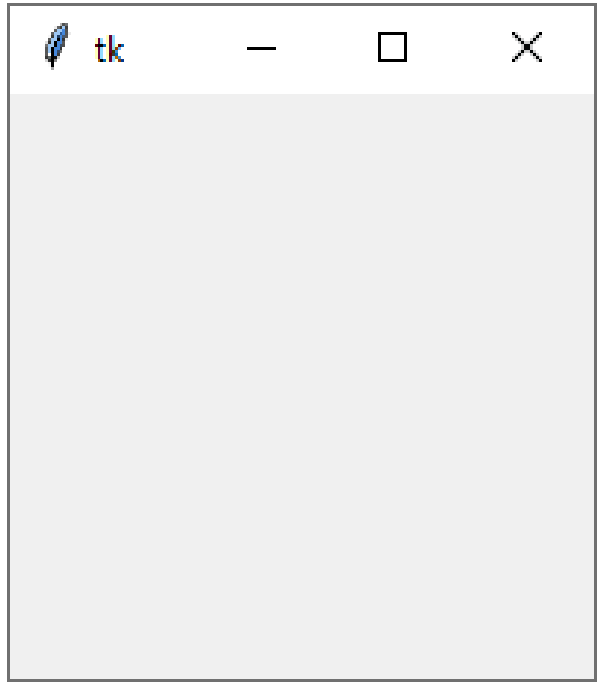
```
from tkinter import Tk

window = Tk()
window.mainloop()
```

We import Tk from the tkinter module

We create an instance of the Tk class

We enter a main loop (this displays the window)



Configuring the Window

We create a new function for the configuration of the window.

```
from tkinter import Tk
# All my functions go here
window = Tk()
configure_window()
# Any code not within a function will go here
# Mostly stuff that will be accessed by more
# than one function
window.mainloop()
```

Configuring the Window

```
def configure_window():
    window.geometry("800x600")
    window.configure(background='#b3ffff')
    window.title("M  A  T  H  S     Q  U  I  Z ")
```

Conclusion

- Imported TkInter
- Created a simple GUI
- Used some methods to change the appearance

- Also, discussed that mainloop is a blocking method

End of Section

Time to take a break! Make a cup of tea, think about what we have discussed. Come back when you are refreshed and ready

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Start of Next Section

Hope that you enjoyed your break (and your tea).
Let's pick up where we left off.

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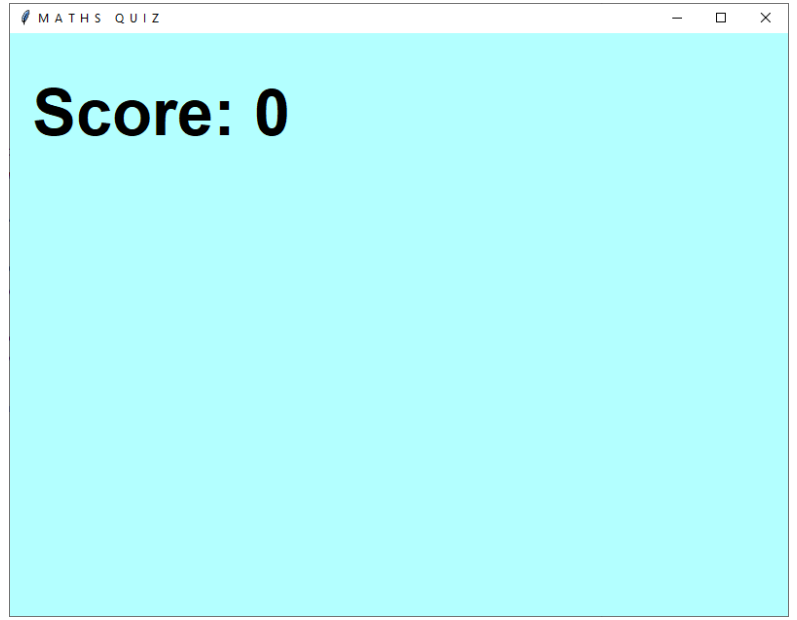
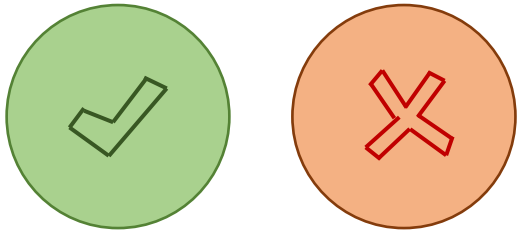
The Global Stuff



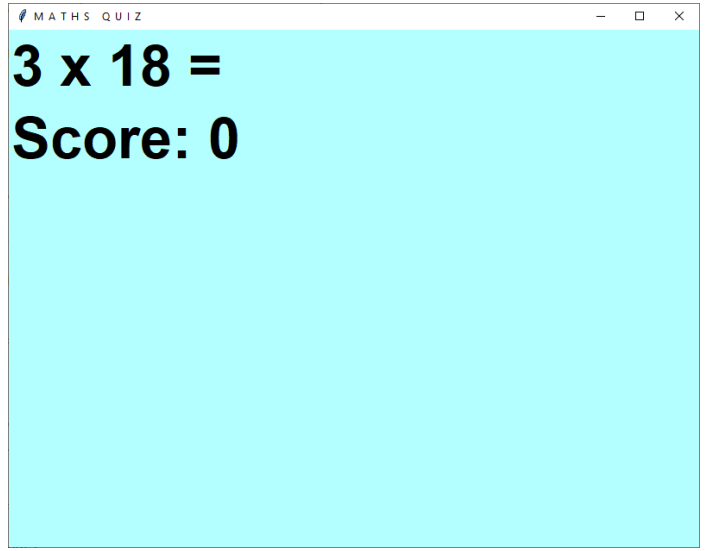

```
user_answer = IntVar()
btn = None
current_score = 0
score = Label(window, text="Score: 0", font=("Arial
Bold",50), background='#b3ffff')
score.grid(column=2, row=8, columnspan=4, sticky="E")
correct=PhotoImage(file="correct.png")
incorrect=PhotoImage(file="incorrect.png")
```



Next we create a game loop

```
def game_loop():
    num1 = rand(1,20)
    num2 = rand(1,20)
    operator = rand(0,2)
    display_question(num1, num2, operator)
```

Then display the question




```
def display_question(num1, num2, operator)
  operators = ["+", "x", "-"]
  question = str(num1) + " " +
   operators[operator] + " " + str(num2) + " ="
  question = Label(window, text=question,
   font=("Arial Bold",50), background='#b3ffff')
  question.grid(column=1, row=1, columnspan=6,
   sticky="W")
```

Back to the game loop

```
def game_loop():
  num1 = rand(1,20)
  num2 = rand(1,20)
  operator = rand(0,2)
  display_question(num1, num2, operator)
  answer = calculate_answer(num1, num2, operator)
```

Calculate the Answer

```
def calculate_answer(num1, num2, operator):
    if operator == 0:
        return num1 + num2
    elif operator == 1:
        return num1 * num2
    else:
        return num1 - num2
```

Back to the game loop

```
def game_loop():
  num1 = rand(1,20)
  num2 = rand(1,20)
  operator = rand(0,2)
  display_question(num1, num2, operator)
  answer = calculate_answer(num1, num2, operator)
  answers = add_incorrect_answers(answer)
```

Generate Some Incorrect Answers

```
answers = []
answers.append(answer)
for i in range(4):
      while True:
            r = rand(-6, 6)
            ans = answer + r
            if ans not in answers:
                  answers.append(ans)
                  break
return answers
```

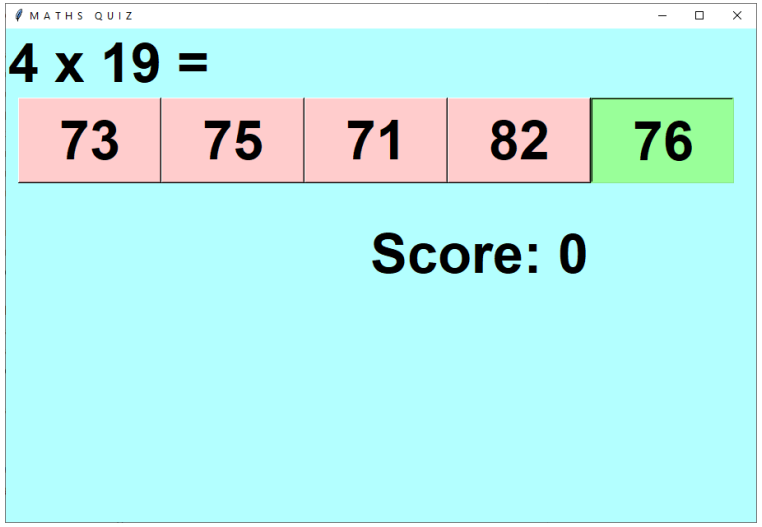
Back to the game loop

```
def game_loop():
  num1 = rand(1,20)
  num2 = rand(1,20)
  operator = rand(0,2)
  display_question(num1, num2, operator)
  answer = calculate_answer(num1, num2, operator)
  answers = add_incorrect_answers(answer)
  create_answer_radiobuttons(answers)
```

create_answer_radiobuttons

```
def create_answer_radiobuttons(answers):
    ans = []
    for i in range(len(answers)):
        ans.append(Radiobutton(window, text=answers[i],
                               value=answers[i],
                               font=("Arial Bold",50),
                               indicatoron=0,
                               variable=user_answer,
                               bg='#ffcccc’,
                               selectcolor='#99ff99’,
                               width=4))
...
```

create_answer_radiobuttons




```
def create_answer_radiobuttons(answers):
    ...
    shuffle(ans)
    padding = Label(window, text=" ", font=("Arial Bold",25),
                    background='#b3ffff')
    padding.grid(column=1, row=3)
    for i in range(5):
        ans[i].grid(column=i+2, row=3)
    padding.grid(column=1, row=4)
```

End of Section

Don’t take a break!

Stewart messed up big time! No it wasn't OBS – It was his code ☺

Do you know where he messed up? Try to figure it out before continuing.
Message on the forum if you worked it out. Just don’t tell his boss!

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Start of Next Section

I knew it was an infinite loop! Somewhere…

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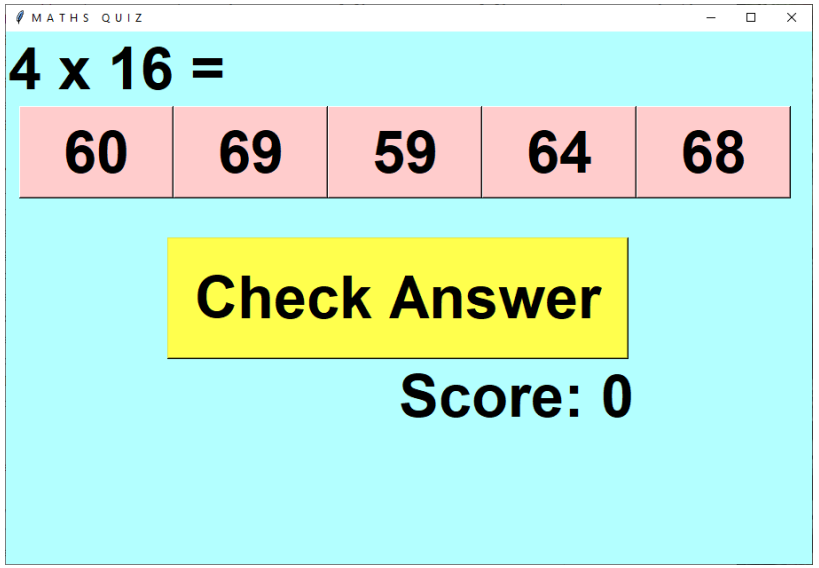
Back to the game loop

```
def game_loop():
    num1 = rand(1,20)
    num2 = rand(1,20)
    operator = rand(0,2)
    display_question(num1, num2, operator)
    answer = calculate_answer(num1, num2, operator)
    answers = add_incorrect_answers(answer)
    create_answer_button(answer)
```

create_answer_button

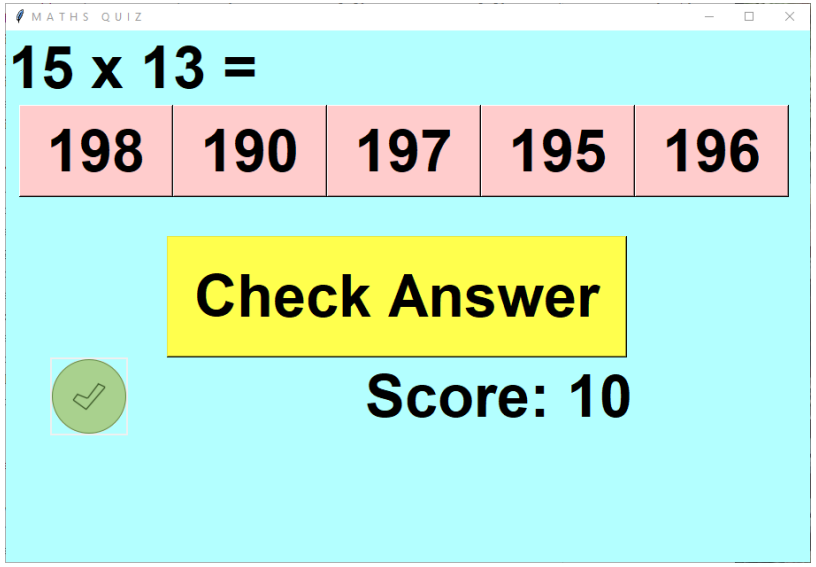
```
def create_answer_button(answer):
    global btn
    btn = Button(window, text="Check Answer",
                 command=lambda:clicked(answer),
                 background='#ffff4d', font=("Arial Bold",50) )
    btn.grid(column=0, row=5, columnspan = 7)
```



clicked

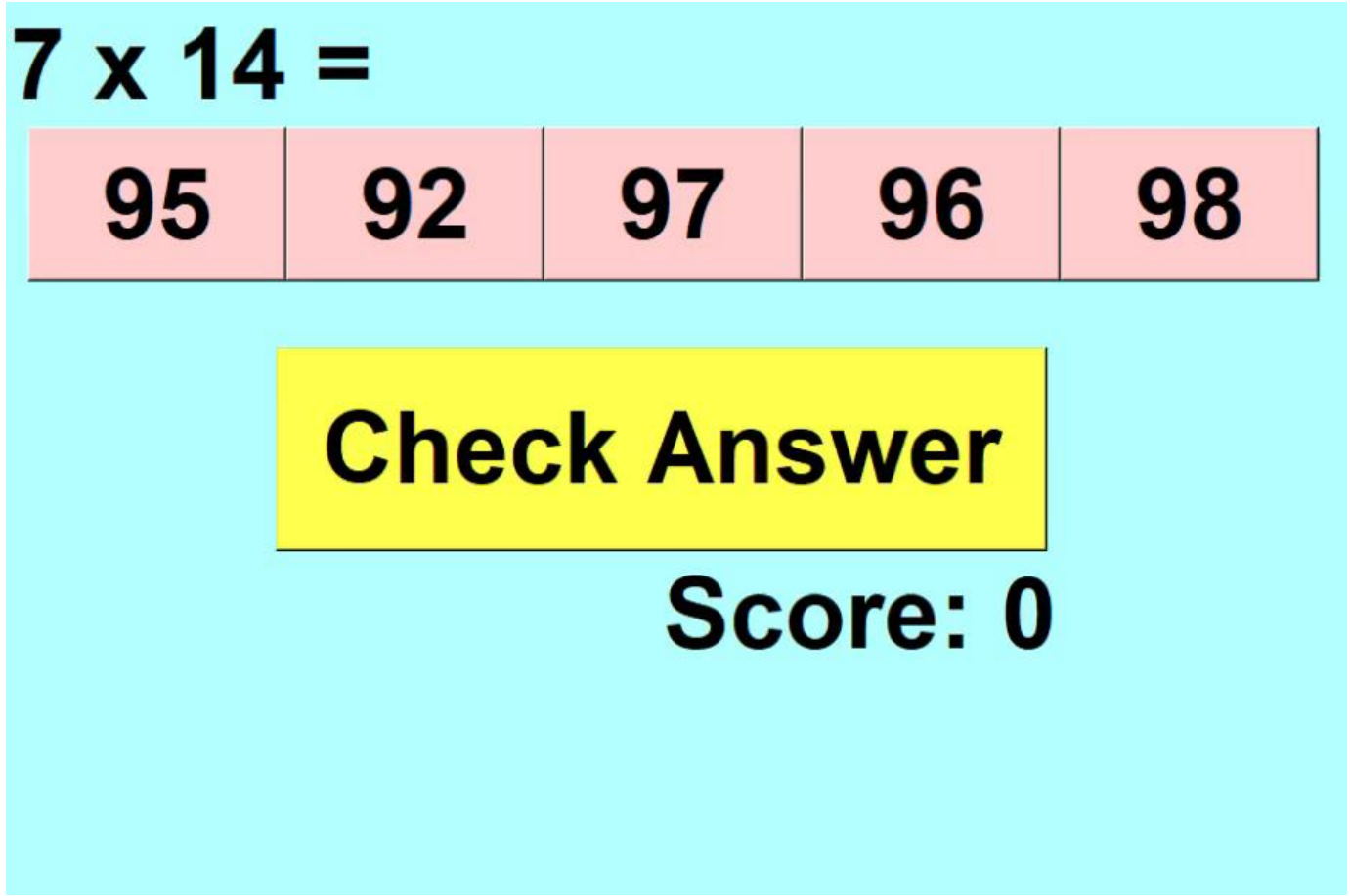
```
def clicked(answer):
    if (user_answer.get() == answer):
        btn.configure(text=" Correct ")
        ans_label = Label(window,image=correct)
        global current_score
        current_score += 10
        score.config(text="Score: "+
                     str(current_score))
...
```

clicked




```
...
    else:
        ans_label = Label(window,image=incorrect)
        btn.configure(text="Incorrect")
    ans_label.grid(column=1, row=8, columnspan=2)
    window.after(1000, game_loop)
```

The final Game



Summary

- Introduced the tkinter library
- Created a simple maths game consisting of a Tk root object (the window)
  - The game will generate a random question, i.e. 3 x 20 =
  - The game will calculate the correct answer and four incorrect answers
  - The user selected an answer and clicked a button to check
  - If the user was correct the score will increased
- Add various widgets to the window
  - Labels
  - Radio Button
  - Standard Button
  - An image

We will build on our knowledge of tkinter in the labs where you create a simple OXO game.

In the live coding session we will create a simple Simon memory game.