



# **Programming for Data Science: Conditional Lab**

Instructor: Jakramate Bootkrajang



## Exercise 34: Even or Odd?

*(Solved—13 Lines)*

Write a program that reads an integer from the user. Then your program should display a message indicating whether the integer is even or odd.



## Exercise 35: Dog Years

*(22 Lines)*

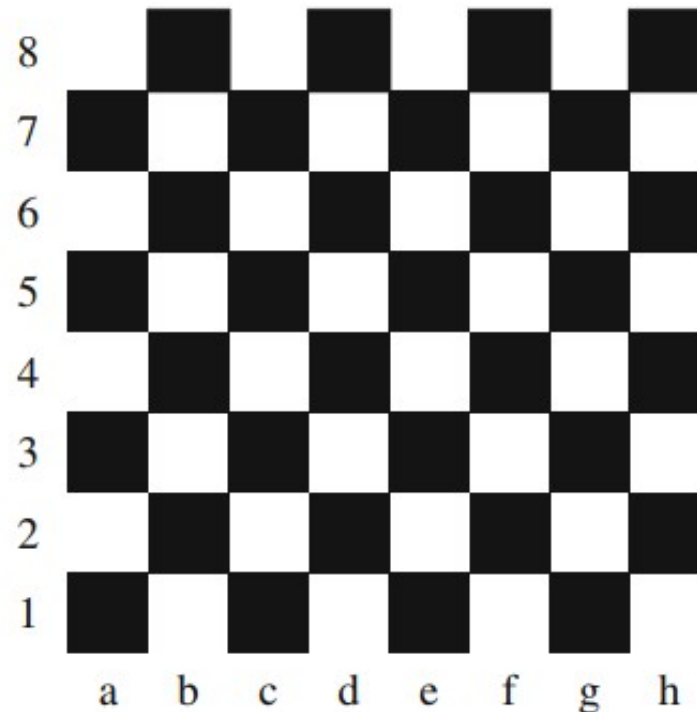
It is commonly said that one human year is equivalent to 7 dog years. However this simple conversion fails to recognize that dogs reach adulthood in approximately two years. As a result, some people believe that it is better to count each of the first two human years as 10.5 dog years, and then count each additional human year as 4 dog years.

Write a program that implements the conversion from human years to dog years described in the previous paragraph. Ensure that your program works correctly for conversions of less than two human years and for conversions of two or more human years. Your program should display an appropriate error message if the user enters a negative number.

## Exercise 45: What Color is that Square?

(22 Lines)

Positions on a chess board are identified by a letter and a number. The letter identifies the column, while the number identifies the row, as shown below:



Write a program that reads a position from the user. Use an if statement to determine if the column begins with a black square or a white square. Then use modular arithmetic to report the color of the square in that row. For example, if the user enters a1 then your program should report that the square is black. If the user enters d5 then your program should report that the square is white. Your program may assume that a valid position will always be entered. It does not need to perform any error checking.

## Exercise 48: Chinese Zodiac

*(Solved—35 Lines)*

The Chinese zodiac assigns animals to years in a 12 year cycle. One 12 year cycle is shown in the table below. The pattern repeats from there, with 2012 being another year of the dragon, and 1999 being another year of the hare.

Year	Animal
2000	Dragon
2001	Snake
2002	Horse
2003	Sheep
2004	Monkey
2005	Rooster
2006	Dog
2007	Pig
2008	Rat
2009	Ox
2010	Tiger
2011	Hare

Write a program that reads a year from the user and displays the animal associated with that year. Your program should work correctly for any year greater than or equal to zero, not just the ones listed in the table.

## Exercise 50: Roots of a Quadratic Function

(24 Lines)

A univariate quadratic function has the form  $f(x) = ax^2 + bx + c$ , where  $a$ ,  $b$  and  $c$  are constants, and  $a$  is non-zero. The roots of a quadratic function can be found by finding the values of  $x$  that satisfy the quadratic equation  $ax^2 + bx + c = 0$ . A quadratic function may have 0, 1 or 2 real roots. These roots can be computed using the quadratic formula, shown below:

$$\text{root} = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

The portion of the expression under the square root sign is called the discriminant. If the discriminant is negative then the quadratic equation does not have any real roots. If the discriminant is 0, then the equation has one real root. Otherwise the equation has two real roots, and the expression must be evaluated twice, once using a plus sign, and once using a minus sign, when computing the numerator.

Write a program that computes the real roots of a quadratic function. Your program should begin by prompting the user for the values of  $a$ ,  $b$  and  $c$ . Then it should display a message indicating the number of real roots, along with the values of the real roots (if any).

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# Reference

- B. Stephenson, The Python Workbook, DOI 10.1007/978-3-319-14240-1\_2