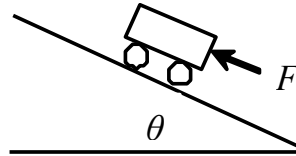# Python Exercise 2

Ramp Angle (15 points)

Suppose you need push a cart on a ramp as shown in the figure below.

Ignoring friction, the force (in Newtons) required to push the cart mass (in kilograms) up a ramp of angle θ (in degrees) is determined by the formula:

$$F = m \times g \times \sin\theta$$

Where g is the acceleration due to gravity, which is a constant 9.8 m/s^2.

Given this information, write a program that prompts the user to enter the Force and mass of the cart. (Store the value of g as a 'constant' in your program) The program should then use the formula to calculate the angle of the ramp. Format your output to 1 decimal place.

Note: The trigonometric functions in the math module returns the values in radians. In addition to the arc sin function (asin), you will need to use the degrees function to convert the angle to degrees.

Sample output:

Enter the mass of the cart (in kg): 100
Enter the force to push the cart (in N): 250
The angle of the ramp is 14.8 degrees

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Perimeter of a triangle (15 points)

Write a program that reads the three edges of a triangle and computes the perimeter if the input is valid. The input is valid **if** the sum of every pair of two edges is greater than the remaining edge. Otherwise (i.e. **else**) print a message stating that the input is invalid and the perimeter cannot be calculated. (Note: This question does NOT require further input validation.)

Sample output (Valid case):

Enter length of edge1: 6.7
Enter length of edge2: 9.2
Enter length of edge3: 11.6
The perimeter is 27.5

Sample output (Invalid case):

Enter length of edge1: 16
Enter length of edge2: 4.5
Enter length of edge3: 23.5
Perimeter cannot be calculated: the input is invalid.

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Wind-Chill Temperature (15 points)

In 2001, the National Weather Service implemented a new wind-chill temperature formula to measure the coldness using temperature and wind speed. The formula is:

$$t_{wc} = 35.74 + 0.6215t_a - 35.75v^{0.16} + 0.4275t_a v^{0.16}$$

where:
      t_{wc} is the wind chill temperature
      t_a is the outside temperature
      v is the wind speed

The formula can only be used for temperatures between -58 degrees Fahrenheit and 41 degrees Fahrenheit, as well as wind speeds greater than or equal to 2mph.

Write a program that:
- asks the user to enter a temperature between -58 degrees Fahrenheit and 41 degrees Fahrenheit.
  - Input validation: If the user enters a temperature not in range, use an if statement or while loop to ask them to re-enter the value.
- asks the user to enter a windchill greater than 2mph.
  - Input validation: If the user enters a wind speed not in range, use an if statement or while loop to ask them to re-enter the value.

The program then calculates the wind-chill temperature using the formula above. Format the output to 3 decimal places.

Sample output (including input validation):

Enter the temperature in Fahrenheit: -60
Temperature must be between -58F and 41F
Please re-enter the temperature in Fahrenheit: 50
Temperature must be between -58F and 41F
Please re-enter the temperature in Fahrenheit: 35
Enter the wind speed miles per hour: -1
Speed must be greater than or equal to 2
Please re-enter the wind speed miles per hour: 5
The wind chill index is 30.600

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Software Sales (15 points)

A software company sells a package that retails for $99. Discounts for quantities are given according to the following table:

Quantity	Discount
10 -19	10%
20 - 49	20%
50 - 99	30%
100 or more	40%

Write a program that asks the user to enter the number of packages purchased. The program should then display the amount of the discount (if any) and the total of the purchase after the discount. (Use appropriate formatting to display currency and percentages in your output.)

Sample output (no discount):

Enter the number of packages purchased: 5
Discount Amount @ 0% : $ 0.00
Total Amount: $ 495.00

Sample output (with a discount):

Enter the number of packages purchased: 45
Discount Amount @ 20% : $ 891.00
Total Amount: $ 3564.00