

COMP20220 Programming II (Conversion)

Practical 1

1 Instructions

Create a new package named `practicalX_12345678`, where **X** is the practical number (for this week, the number is 1) and 12345678 is your student number. Save your code in this package.

Submit solutions to **questions 1, 2, and 3**. Create a new class for each question and name the classes as follows: `Q1.java`, `Q2.java`, and `Q3.java`.

Upload your solutions to Moodle:

- Right-click on the package name and select *Export*. A dialogue box will appear – select *Next*.
- You will then be asked to specify the name of the archive file which will be created – use the following naming convention: `practicalX_12345678.zip`, where **X** is the practical number and 12345678 is your student number. Select *Finish*.
- Upload the zip file using the link on Moodle.

The submission deadline is **5pm Tuesday, 30th January**. Please note this is a firm deadline – model solutions will be released on Moodle at this time.

2 Questions

Q1 Write a program that reads in the radius and length of a cylinder and computes the area and volume using the following formulas:

$$area = \pi * (radius)^2$$

$$volume = area * length$$

Q2 Write a program that reads the subtotal and the gratuity rate, then computes the gratuity and total. For example, if the user enters 10 for subtotal and 15 percent for gratuity rate, the program displays \$1.50 as gratuity and \$11.50 as total.

Q3 Write a program that reads an integer between 0 and 999 (inclusive) and adds all the digits in the integer. For example, if an integer is 932, the sum of all its digits is 14. Hint: Use the % operator to extract digits, and use the / operator to remove the extracted digit. For instance, $932 \% 10 = 2$ and $932 / 10 = 93$.

Q4 The U.S. Census Bureau projects population based on the following assumptions:

- One birth every 7 seconds,
- One death every 13 seconds, and
- One new immigrant every 45 seconds.

Write a program to prompt the user to enter a number of years and displays the population after this number of years. Assume the current population is 312,032,486 and one year has 365 days.

Q5 Body Mass Index (BMI) is a measure of health on weight. It can be calculated by taking your weight in kilograms and dividing by the square of your height in meters. Write a program that prompts the user to enter a weight in pounds and height in inches and displays the BMI. Note that one pound is 0.45359237 kilograms and one inch is 0.0254 meters.

Q6 Write a program that prompts the user to enter two points (x_1, y_1) and (x_2, y_2) and displays their distance between them. The formula for computing the distance is $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$. Note that you can use `Math.pow(a, 0.5)` or `Math.sqrt(a)` to compute \sqrt{a} .

Q7 How cold is it outside? The temperature alone is not enough to provide the answer. Other factors including wind speed, relative humidity, and sunshine play important roles in determining coldness outside. In 2001, the National Weather Service (NWS) implemented the new wind-chill temperature to measure the coldness using temperature and wind speed. The formula is:

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

where t_a is the outside temperature measured in degrees Fahrenheit and v is the wind speed measured in miles per hour. t_{wc} is the wind-chill temperature. The formula cannot be used for wind speeds below 2 mph or temperatures below -58°F or above 41°F .

Write a program that prompts the user to enter a temperature between -58°F and 41°F and a wind speed greater than or equal to 2 and displays the wind-chill temperature. Use `Math.pow(a, b)` to compute $v^{0.16}$.

Q8 Write a program that prompts the user to enter the distance to drive, the fuel efficiency of the car in miles per gallon, and the price per gallon, and displays the cost of the trip.