COSC 600 Assignment 1
Due: Sept 24 ~11:55pm (SK time)

General Instructions

- You will create a New Package called assign1SDC XXXXXX where XXXXXX is your assigned SDC Number. All Code for this assignment is to be placed in this package.
- Upon completion of this assignment, you are to submit the source directory, either as is or in a zip file, to your submission directory
- All Programs are to have appropriate comments identifying what the program is doing. Additionally, the programs should include a comment at the beginning of each as per code guidelines
- Follow appropriate conventions, leave good comments, use informative variable names using camelCase, and otherwise follow good programing practice. A significant portion of the marks for the assignment will be from such considerations.
- It is not necessary to do input sanitization.
- This is an **individual assignment** – work must be completed individually.
- Any tools, techniques, etc not covered in class yet are not allowed.

Question 1 - Class Name Q1

Write a program that displays the surface area and volume for two cylinders with radii 8 and 12.3 using the following formulas:

Surface Area $= 2\pi r^2 + 2\pi rh$

Volume = $\pi r^2 h$

Question 2 - Class Name Q2

Write a program that displays the surface area of a pyramid with base length of 75 and side height of 41.7 using the formula

Surface Area = 2 * base * side + base^2

Question 3 - Class Name Q3

Write a program that reads in a double value in pounds and converts it to kilograms. The formula for the conversion is

Kilograms = Pounds * 0.454

Print your result with 2 decimal places.

Question 4 - Class Name Q4

Write a program that acts like a simple finance calculator. The program will prompt the user for a particular operation according to the following list and then prompt the user for any necessary input values. Assume two decimal places for results and use proper types.

Net Income
Break-Even Point
Cash Ratio
Profit Margin
Debt-to-Equity Ratio

Net Income
Equation: Net Income = Revenues – Expenses

Extra FYI:

- Revenues are the sales or other positive cash inflow that comes into your company.
- Expenses are the costs that are associated with making sales.
- By subtracting your expenses from your revenues, you can calculate your net income. This is the money that you have earned at the end of the day. It's possible that this number will be negative when your business is in its beginning stage, so the goal is for your business' net income to become positive, meaning your business is profitable.

Break-Even Point
Equation: Break-Even Point = Fixed Costs / (Sales Price – Variable Cost Per Unit)

Extra FYI:

- Fixed Costs are recurring, predictable costs that you must pay in order to conduct business. These costs include insurance premiums, rent, employee salaries, etc.
- Sales Price is the retail price you sell your products or services for.
- Variable Cost Per Unit is the amount it costs you to make your product.
- If you divide your fixed costs by the sale price of your product, minus the amount it costs to make your product, you'll have a break-even point, which tells you how many units you need to sell in order to cover all of your costs.

Cash Ratio
Equation: Cash Ratio = Cash / Current Liabilities

Extra FYI:

- This gives you an idea of how much cash you currently have on hand.
- Cash is simply the amount of cash you have at your disposal. This can include actual cash and cash equivalents (i.e. highly liquid investment securities).
- Current Liabilities are the current debts the business has incurred.
- This ratio demonstrates how well your business can pay off its current liabilities. In this case, the higher the number, the healthier your company. The ratio is not a money value.

Profit Margin
Equation: Profit Margin = Net Income / Sales x 100

Extra FYI:

- Net Income is the total amount of money your business has made after expenses have been removed.
- Sales are the total amount of sales you've generated.
- When you divide your net income by your sales, you'll get your organization's profit margin. A high profit margin indicates a very healthy company. A low profit margin can reveal how unsuccessful a company might be, but it can also mean that your organization doesn't handle its expenses well. Remember that your net income is made up of your total revenue minus your expenses. If you have high sales revenue, but still have a low profit margin, it might be time to take a look at the figures making up your net income. This is a percentage.

Debt-to-Equity Ratio
Equation: (Debt-to-Equity Ratio = Total Liabilities / Total Equity)

Extra FYI:

- Total Liabilities include all of the costs you must pay to outside parties, such as loan or interest payments.
- Total Equity is how much of the company actually belongs to the owner or other employees. In other words, it's the amount of money the owner has invested in his or her own company.
- A high debt-to-equity ratio illustrates that a high proportion of your company's financing comes from outside sources, such as banks. If you're attempting to secure more financing or looking for investors, a high debt-to-equity ratio might make it more difficult to land funding.

Question 5 - Class Name Q5

Write a program that reads in a four-digit number and sums up all the digits in the number. For example, 4351 would add up to 13 (Hint: you'll need to use the modulus operation for this).

Question 6 - Class Name Q6

Write a program which will calculate the compound interest of an investment given a set of parameters:

P = principal amount of investment
T = number of years
R = interest rate → convert to decimal rate *r*
n = number of compounding frequencies per year. n would be 1 for annually, 4 for quarterly and 12 for monthly. For this question, assume monthly.

Your program will prompt the user to input P, T and R and calculate and output the resulting compound interest.

Compound Interest = $P\left(1+\frac{r}{n}\right)^{nT}$

Make sure your program provides the outputted compound interest in proper currency form.

Question 7 - Class Name Q7

Write a program that gives the total tax owing on a purchase you make. This calculation is subject to the following conditions:

1. Taxes are paid at a rate of 5% for GST and 6% PST.
2. Some individuals are GST Exempt and food is PST exempt.

Your program should ask for:

1. the total purchase price of items you are purchasing
2. whether the purchase is made for an individual who is GST exempt
3. if the purchase is for food.

Your program will then output the amount for each of the two taxes, the total taxes and the overall total (purchase + all taxes).

Question 8 - Class Name Q8

Zeller's congruence is an algorithm developed by Christian Zeller to calculate the day of the week. The formula is

$$h=\left(q+\frac{26(m+1)}{10}+k+\frac{k}{4}+\frac{j}{4}+5j\right)\%7$$

where

- ⇒ **h** is the day of the week (0=Saturday, 1=Sunday, 2=Monday, 3=Tuesday, 4=Wednesday, 5=Thursday, and 6=Friday).
- ⇒ **q** is the day of the month.
- ⇒ **m** is the month (3=March, 4=April, ..., 12=December). January and February are counted as months 13 and 14 of the previous year.
- ⇒ **j** is year/100
- ⇒ **k** is the year of the century (i.e., year % 100).

So if the user entered January 12, 2000
The variables q, m, j and k would be 12, 13, 19, 99 respectively, and your program would produce Wednesday (4) as a result. Try doing this calculation on paper yourself as a practice exercise before you start.

Write a program to prompt the user to enter a date by providing the month, date and year and have your program output the day of the week. The difficulty here is getting your formula set up properly in code. Operator precedence is very important.

Question 9 - Class Name Q9

Late fees at a library are calculated based on the type of item borrowed and the number of days late. Additionally, all items have a max fine amount of $10. The per-day fines for books are as follows:

Item type	Fine/day
Regular item	50¢
Reserved item	$1
Special item	$2

So if a reserved item is returned 5 days late, the fine is $5. If a special item were 10 days late, the fine would be $10.
Write a program that will prompt for a type of item and number of days late and then calculate the fine that is to be paid.

Question 10 - Class Name Q10

Write a program that prompts the user to enter an integer and determines whether it is divisible by both 4 and 9, and whether it is divisible by 4 or 9 (either but not both). Two sample runs of the program might look like

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Enter an Integer:  12
12 is Not Divisible by both 4 and 9.
12 is Divisible by one of 4 or 9
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Question 11 – Class Name Q11

Write a program which simulates a card drawing game. The computer will 'draw' one card and the player will draw one card. The highest draw wins. In the case of a tie, the house (computer) wins. Each card draw is assumed to be random.

The cards
Cards are divided into 4 suits (hearts, spades, clubs and diamonds). Each suit has 13 cards numbered from 2 to 10 plus a jack, queen, king and ace. Each card has a value. Cards 2-10 have their face value (ie. 8 of spades counts 8). Jack, Queen and King don't have a value per se but have increasing priority. ie. a jack is higher than a ten but a queen is higher than a jack. An ace is considered the highest card. Hint: You might find it useful to view the deck as 0-12, 13-25, 26-38, 39-51 for the four suits. Also, each card only exists once in a deck so if one player draws a particular card, the other player can't draw that card.

For each draw, your program will determine who wins based on comparing the cards. **However**, its not enough to simply determine winners and losers. Your program also has to state what card each player drew and then declare the winner. No marks will be awarded without this!