Workshop - 9

Workshop Value: 10 marks (4.4% of your final grade)

Learning Outcomes

Upon successful completion of this workshop, you will have demonstrated the abilities:
- to decipher and identify a problem
- to analyze and decompose a problem
- to identify the required detailed steps to solve a problem
- to identify and assemble mathematical formula to solve a problem
- to communicate the solution to fellow peers and non-technical business persons

Workshop Grading and Promotion Policy

Workshops for this course will be assessed using the following criteria:
- Workshops must be completed before the class time to be graded
- You must successfully complete 9 workshops (if more than 9 are completed, the best 9 will be used)
- Each student is expected to be a presenter of the workshop solution at least once by the end of the term
- Workshop solutions and presentations will be evaluated using the published workshop rubrics

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Workshop Overview

Often, programming solutions must integrate mathematical formulas to perform specific calculations in order to provide solutions to various day-to-day problems. It is important to be able to translate these requirements into a technical process and apply it when and wherever appropriate.

Workshop Details

A solution is needed to calculate total car travel distance and time given a set of directions. Each directional step will include environmental factors that can influence the duration. The solution should accommodate all possible combinations of environmental factors to insure an accurate total duration is calculated.

Travel Time Calculator

Constraints

Time Per Unit Travelled

A single travel unit = 2 kilometers and takes 10 minutes to travel (with 0 people and no wind factor)

Passenger Weight Impact

For each person, increase each unit time by 10.0%

Wind Direction (Terminology)

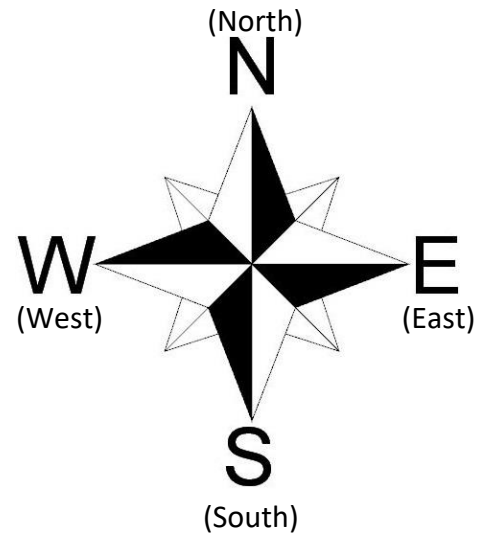(North)

N

←🌬   **E**asterly (blows from the east towards the west)

🌬→   **W**esterly (blows from the west towards the east)

W ——————— E

(West)   (East)

🌬↓   **N**ortherly (blows from the north towards the south)

🌬↑   **S**outherly (blows from the south towards the north)

S

(South)

Wind Force Levels

0 = **no wind**
1 = **weak** wind
2 = **moderate** wind
3 = **strong** wind

Directional Factors

Travel <u>AGAINST</u> the wind: **Increase** each unit time by a factor of the **wind level times 20.0%**
Travel <u>WITH</u> the wind: **Decrease** each unit time by a factor of the **wind level times 30.0%**
Travel <u>PERPENDICULAR</u> to the wind: **Increase** each unit time by a factor of the **wind level times 5.0%**

Your Task

1. Based on any set of directions, define the necessary logic/processes required to calculate:

    *   **[Logic 1] Total travel <u>distance</u>** (based on directions stated)
    *   **[Logic 2] Total <u>time in minutes</u> (and also show this in HH:MM format)** (travel distance, direction, number of passengers and wind conditions are input)
    *   **[Logic 3] Overall <u>average minutes per km</u> travelled** (Travel distance and time for each leg are inputs)

    > **<u>Note</u>**: *There is **no limit** to the number of directions in any given scenario, but there will always be **at least one**.*

Getting Started/Suggestions

-   Slowly develop your solution by limiting the scope of your smaller problems to the scenarios described on the next page. Each scenario focuses on a specific requirement. By the time you get to the final scenario, all the requirements will be addressed.

-   **<u>Each direction/step</u>** will include the following information:
    *   Number of travel units
    *   Travel direction (east, west, north, south)
    *   Environmental factors such as:
        *   Number of people/passengers
        *   Wind force factor (no wind, mild, moderate, strong)
        *   Wind direction (easterly, westerly, northerly, southerly)

-   **<u>Constraints</u>** to consider:
    *   Number of units to travel
    *   Number of people/passengers
    *   Wind force level
    *   Wind direction
    *   Travel direction (vs. wind direction)

-   **<u>Unit testing</u>**
    *   Use the worksheet to help you track the values
    *   Create additional test cases to test your logic thoroughly (perhaps multiple directions)
    *   Have all members of the group independently test your solution and see you all get the same (and correct) answer

2. Develop the necessary pseudo code and flowchart that illustrate and communicate the defined solution.

3. Presenter will prepare a video explaining the problem and solution in non-technical terms and arguing why this is an excellent solution.

Unit Test Scenario - 1

Leaving from point A, you travel east 12 km to point B alone in the car on a nice sunny day with no wind.

Directional Step #	Units to Travel	Travel Direction	Number of People	Wind Force	Wind Direction	Base Unit Time (+ min.)	People Time (+ min.)	Wind Time (+/- min.)	Direction Time (min.)	Total Distance (km)
1										

Unit Test Scenario - 2

Leaving from point A, you travel south 21 km to point B with two (2) passengers and a weak northerly wind.

Directional Step #	Units to Travel	Travel Direction	Number of People	Wind Force	Wind Direction	Base Unit Time (+ min.)	People Time (+ min.)	Wind Time (+/- min.)	Direction Time (min.)	Total Distance (km)
1										

Unit Test Scenario - 3

Leaving from point A, you travel west 4 km to point B with two (2) passengers and a strong westerly wind.

Directional Step #	Units to Travel	Travel Direction	Number of People	Wind Force	Wind Direction	Base Unit Time (+ min.)	People Time (+ min.)	Wind Time (+/- min.)	Direction Time (min.)	Total Distance (km)
1										

Unit Test Scenario - 4

Leaving from point A, you travel north 11 km to point B with one (1) passenger and a moderate easterly wind.

Directional Step #	Units to Travel	Travel Direction	Number of People	Wind Force	Wind Direction	Base Unit Time (+ min.)	People Time (+ min.)	Wind Time (+/- min.)	Direction Time (min.)	Total Distance (km)
1										

Final Test Scenario

1. Depart alone, travel west 17 km, **weather conditions**: weak westerly wind
2. Pick-up 2 passengers, travel north 15 km, **weather conditions**: moderate southerly wind
3. Travel east 9.5 km, **weather conditions**: strong easterly wind
4. Drop-off 1 passenger, travel north 7 km, **weather conditions**: moderate easterly wind
5. Drop-off 1 passenger, travel east 34 km, **weather conditions**: strong westerly wind
6. Pick-up 3 passengers, travel south 52.5 km, **weather conditions**: no wind (destination reached)

Directional Step #	Units to Travel	Travel Direction	Number of People	Wind Force	Wind Direction	Base Unit Time (+ min.)	People Time (+ min.)	Wind Time (+/- min.)	Direction Time (min.)	Accum. Time (min.)	Accum. Distance (km)
1											
2											
3											
4											
5											
6											

Minutes expressed as Hours and Minutes (HH:MM): _____

Average minutes per kilometer travelled: _____

Task	Subtask	Member(s)	Marks	Comments
Pseudocode	Logic 1	1	40%	
	Logic 2	2	40%	
	Logic 3	3	40%	
	Combined	1-3	60%	
FlowChart	Logic 1	4	40%	
	Logic 2	5	40%	
	Logic 3	6	40%	
	Combined	4-6	60%	
Video	Presentation	3 or 6	100%	Members rotate weekly