Exercise Solutions

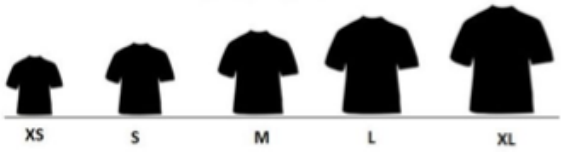
1. Story Variables (VELA project, http://csforall.sri.com/)

a)

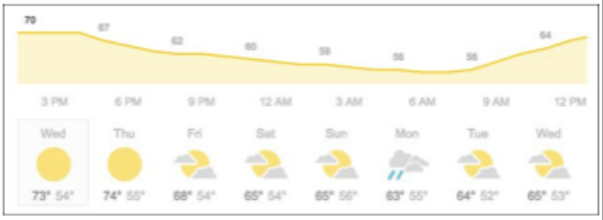
What do these stories have in common?

Story 1
"Excuse me --- last week I bought one of these pens here for $1.50. Are you really telling me they now cost $3?"

Story 2
"We sell t-shirts in all sizes - extra-small (XS), small (S), medium (M), large (L), and extra-large (XL)"



Story 3
"Here is the temperature forecast for the next few hours today and for the rest of the week."



Story 4
"I watched the basketball game last night. At halftime we were tied, but in the end they beat us, 34-30."

Answer:
They all have something that changes over time

b) What is a variable?

A variable is something that stores a data value and can be manipulated over the duration of a program.

c) Fill out the following table about variables in these stories (try a couple of stories, then discuss as a group)

Story	Describe a specific element or quantity in the story that is changing	What would be a good, meaningful name for the variable	What are some of the ***specific values*** of the variable within the story?	How would you describe ***all possible values*** the variable might take?
1 	Price of a pen	Pen price, cost, price, cost in dollars, dollar cost	$1.50 (Last week) $3.00 (Now)	Any monetary value. But probably not more than a million dollars!
2 	How big the t-shirts are	Size, Shirt size	XS, S, M, L, XL	Any valid size described using letters or numbers or a combination, like 8P or 10T
3	Maximum and minimum temperature for different days of the week, Temperature for different times during the day today	Temperature, Weather, Maximum temperature, Minimum temperature	“73”, “65”, “58”, “63”, etc. - values for temperature “Sunny”, “Cloudy”, “Partially cloudy” - values for weather	Any reasonable value for temperature, or any feasible weather conditions like “stormy”, “snowy”, “rainy”, etc.
4 	Our team’s score and other team’s score	Team A score, Team B score Home score, Opponent score	0,0 (at start of game) Same scores (Home score = Opponent score) (at halftime) 34,30 (at end of game)	Scores can be positive whole numbers
5. Mario Game or another video game	Lives, Level, Position	Number of lives Current level X position Y position	N/A	Lives: Positive whole number Current Level: World (Number) - (Number) X Position:

				Integer Y Position: Integer

2. A day has 86,400 seconds (24×60×60). Given a number of seconds in the range of 0 to 1,000,000 seconds, your program should print the time as days, hours, minutes, and seconds for a 24 hour clock. For example, 70,000 seconds is 0 days, 19 hours, 26 minutes, and 40 seconds. Your program should have user input that is the number of seconds to convert, and then use that number in your calculations. If your results are W, X, Y, and Z, then your output should be displayed as :

   ```
   The time is W days, X hours, Y minutes, and Z seconds.
   ```

Write an algorithm in pseudocode for the program above. Imagine how a sample run of your program would look like.

Pseudocode:

```
Declare 'numberOfSeconds' variable and read the user input
Declare variables 'numberOfDays', 'numberOfHours' and
'numberOfMinutes'
numberOfDays = numberOfSeconds/86,400 then update: numberOfSeconds
= numberOfSeconds % 86,400
numberOfHours = numberOfSeconds/3600 then update: numberOfSeconds =
numberOfSeconds % 3600
numberOfMinutes = numberOfSeconds/60 then update: numberOfSeconds =
numberOfSeconds % 60
Print "The time is " + numberOfDays + " days, " + numberOfHours + "
hours, " + numberOfMinutes + " minutes, and " + numberOfSeconds + "
seconds."
```

Sample Run:

```
User input: 500000

Output: The time is 5 days, 18 hours, 53 minutes, and 20 seconds.
```

3. Write an algorithm in pseudocode for the following program. The program will start by asking the user to enter 10 characters. Letters ‘a’, ‘e’, ‘i’, ‘o’, ‘u’ in the English alphabet are vowels. The program should count and display the total number of vowels among the 10 characters entered by the user. For example, if the user entered *ILoveSadie*, then the program should display: `You entered 6 vowels`

Pseudocode:

```
Ask user to input 10 characters
Read 10 characters
Declare and set numberOfVowelsSeen to zero
For each character input by user
    If character is a vowel
        Increment numberOfVowelsSeen by one
Print “You entered “ + numberOfVowelsSeen + “ vowels”
```

4. Spot the errors

a)

```
#include <iostream>
using namespace std;

int Main()
{
      cout << "Hello, World!" << endl;
```

```
      return 0;
}
```

b)

```
#include <iostream>
using namespace std;

int main
{
      cout << "Hello, World!" << endl;
      return 0;
}
```

c)

```
#include <iostream>
using namespace std;

int main()
{
      cout << "Hello, World! << endl;
      return 0;
}
```

d)

```
#include <IOstream>
using namespace std;

int main()
{
      cout << "Hello, World!" << endl
      return 0;
}
```

e)

```
#include <iostream>
using namespace std;
```

```
int main()
{
      cout << "Hello, World!" < endl;
      return 0;
}
```