

Technical HW 2 Solutions

Problem 1:

Write a C++ program that inputs the x and y values for two separate points in 2-d space from the user, and computes the midpoint, slope, and y-intercept, and prints them all to the screen. The program should also then print the equation for the line between them like "y = 0.4x + 0.1", and the equation for the line perpendicular to it that passes through the first point. This should be input as "x1 y1 x2 y2".

Given two points (x_1, y_1) and (x_2, y_2) , the equations you need are:

1. Line : $y = mx + b$, slope $m = (y_2 - y_1)/(x_2 - x_1)$, intercept $b = y_1 - mx_1$.
2. Midpoint: $((x_2 + x_1)/2, (y_2 + y_1)/2)$.
3. Inverse line: $y' = -x/m - b'$ intercept $b' = y_1 - x_1/m$

The six cases your code should have handled are (~4.2 points each):

$$\begin{aligned}(-1, -1), (1, 1) &\rightarrow y = x, y' = -x - 2, y_{int} = 0, (x_{mid}, y_{mid}) = (0, 0) \\(1, -1), (1, 1) &\rightarrow x = 1, y' = -1, \text{no } y_{int}, (x_{mid}, y_{mid}) = (1, 0) \\(1, 1), (1, -1) &\rightarrow x = 1, y' = 1, \text{no } y_{int}, (x_{mid}, y_{mid}) = (1, 0) \\(-1, -1), (1, 2) &\rightarrow y = 1.5x + 0.5, y' = -0.667x - 1.333, y_{int} = 0.5, (x_{mid}, y_{mid}) = (0, 0.5) \\(1, 1), (1, 1) &\rightarrow \text{NA} \\(1, -1), (1, 1.00005) &\rightarrow x = 1, y' = -1, \text{no } y_{int}, (x_{mid}, y_{mid}) = (1, 0)\end{aligned}$$

Problem 2:

Given the following declarations:

`int i1 = 2, i2 = 5, i3 = -3;`

`double d1 = 2.0, d2 = 5.0, d3 = -0.5;`

Evaluate each of the following C++ expressions..

Remembering the order of operations and int versus float casting, the values are:

<code>i1 + (i2 * i3)</code>	-13
<code>i1 * (i2 + i3)</code>	4
<code>i1 / (i2 + i3)</code>	1
<code>i1 / i2 + i3</code>	-3
<code>3 + 4 + 5 / 3</code>	8
<code>(3 + 4 + 5) / 3</code>	4
<code>d1 + (d2 * d3)</code>	-0.5
<code>d1 + d2 * d3</code>	-0.5
<code>d1 / d2 - d3</code>	0.9
<code>d1 / (d2 - d3)</code>	0.363636
<code>d1 + d2 + d3 / 3</code>	6.83333
<code>(d1 + d2 + d3) / 3</code>	2.16667
<code>d1 + d2 + (d3 / 3)</code>	6.83333
<code>3 * (d1 + d2) * (d1 - d3)</code>	52.5

Problem 3:

Assume you are programming an automatic food dispensing machine. Your company offers one of three entrees for lunch:

- e1. Veggie burger: \$7*
- e2. Falafel wrap: \$6*
- e3. Salami sandwich: \$9*

They also offer one of three sides :

- s1. French fries. \$2*
- s2. Hummus with pita chips. \$3*
- s3. Celery and carrots \$2*

There are eight choices for beverages:

- b1. Tap Water. Free of charge.*
- b2. Sparkling water. \$2*
- b3. Domestic beer. \$4.*
- b4. Imported beer. \$6.*
- b5. Red wine. \$7.*
- b6. White wine. \$7.*
- b7. Coffee. \$1.*
- b8. Tea. \$1.*

The food dispensing machine should input the items desired from the command line (for example, "e1 s2 b5" would be a Veggie burger with Hummus and Pita Chips, with red wine), and compute the price.

However, certain combinations are on special, so the price is discounted. A veggie burger and fries, plus any non-alcoholic drink (b1,b2,b7,b8) is \$8. A Falafel wrap plus hummus with pita chips, and any hot beverage (Coffee or Tea) is \$7. A salami sandwich with any side and any alcoholic beverage is \$13.

Write a program that will give the correct price for any combination, including the specials. It should recognize the specials as they are input to the menu, in any order (so, "b8 s2 e2" should be priced as a special).

Your program needed to handle these cases:

- e1 b5 s2 (\$17)
- b7 e1 s1 (\$8)
- b8 s2 e2 (\$7)
- e3 b3 s3 (\$13)