SYSTEM TESTING FOR CONDITIONALS

CSC Software Testing Materials (System Testing: Conditionals)

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TESTING STRATEGIES

- Testing Requirements: Ensure that all of the customer requirements are tested!
- Testing Equivalence Classes
  - Input and/or output space is broken into different equivalence classes
  - Each equivalence class is tested
- Testing Boundary Values: Test program boundaries and values to either side of the boundary

PAYCHECK EXAMPLE

https://pages.github.ncsu.edu/engr-csc-software-development/testing/csc116/system_testing-conditionals

System Testing: Conditionals

Paycheck Requirements

Click here to review Paycheck requirements!

Raleigh's Parks and Recreation Department hires landscapers to care for and maintain the city's parks.

Skill Level

An employee has one of three skill levels; each with a hourly pay rate:

Skill Level	Hourly Pay Rate ($)
Level 1	$19.00
Level 2	$22.50
Level 3	$25.75

Deductions

All employees may opt in for insurance, which results in a deduction from their pay check.

Deduction	Weekly Cost ($)
Option 1 - Medical Insurance	$24.50
Option 2 - Dental Insurance	$15.30
Option 3 - Vision Insurance	$5.25

Employees at skill level 3 may also opt to place up to 6% of their gross pay into a retirement account.

Input

The Paycheck program prompts the user for information about the Employee, including the name, level (1, 2, or 3), hours worked, retirement percent, and whether he or she has medical, dental, and vision insurances. This program assumes a perfect user. There is no error checking for user input based on data type.

Output

The following information is printed about the employee's pay check:

1. employee's name
2. hours worked for a week
3. hourly pay rate
4. regular pay for up to 40 hours worked
5. overtime pay (1.5 pay rate) for hours over 40 worked
6. gross pay (regular + overtime)
7. total deductions
8. net pay (gross pay – total deductions).

If the net pay is negative, meaning the deductions exceeds the gross pay, then an error is printed.

Test Requirements

When testing a program, you should ensure that all of the customer requirements are tested *at least once*. Our Paycheck program has the requirement that if the net pay is negative, meaning the deductions exceeds the gross pay, then an error is printed. The following test case would test that requirement. The bold text in the description shows the values the tester would enter into the Paycheck program at the given prompts.

Test ID	Description	Expected Results	Actual Results
Boundary regular hours, All insurances, Level 1	Preconditions: Paycheck program started Employee Name: **Alice Anderson** Employee Level: **1** Hours Worked: **0** Medical Insurance (Y/N): **Y** Dental Insurance (Y/N): **Y** Vision Insurance (Y/N): **Y**	Error Message	

Skill Level

Our test of the requirements may also satisfy equivalence classes. The test shown in the previous section satisfies the equivalence class for a skill level 1. We can add other tests for skill levels as shown below. Note that to make a complete test execution, we are also providing input for all user input.

Test ID	Description	Expected Results	Actual Results
Mid-range regular hours, Two insurances, Level 1	Preconditions: Paycheck program started Employee Name: **Carol Cole** Employee Level: **1** Hours Worked: **10** Medical Insurance (Y/N): **Y** Dental Insurance (Y/N): **N** Vision Insurance (Y/N): **Y**	Name Hours PayRate Regular OT Gross Deduc. Net Carol Cole 10.00 19.00 190.00 0.00 190.00 29.75 160.25	
Mid-range regular hours, Two insurances, Level 2	Preconditions: Paycheck program started Employee Name: **Carol Cole** Employee Level: **2** Hours Worked: **10** Medical Insurance (Y/N): **Y** Dental Insurance (Y/N): **N** Vision Insurance (Y/N): **Y**	Name Hours PayRate Regular OT Gross Deduc. Net Carol Cole 10.00 22.50 225.00 0.00 225.00 29.75 195.25	
Mid-range regular hours, Two insurances, Level 3, Boundary retirement	Preconditions: Paycheck program started Employee Name: **Carol Cole** Employee Level: **3** Hours Worked: **10** Medical Insurance (Y/N): **Y** Dental Insurance (Y/N): **N** Vision Insurance (Y/N): **Y** Retirement Percentage (0-6): **1**	Name Hours PayRate Regular OT Gross Deduc. Net Carol Cole 10.00 25.75 257.50 0.00 257.50 32.32 225.18	

Insurance

The following two tests also test yes and no for each insurance.

Test ID	Description	Expected Results	Actual Results
Mid-range regular hours, Two insurances, Level 1	Preconditions: Paycheck program started Employee Name: **Danny D David** Employee Level: **1** Hours Worked: **20** Medical Insurance (Y/N): **Y** Dental Insurance (Y/N): **Y** Vision Insurance (Y/N): **N**	Name Hours PayRate Regular OT Gross Deduc. Net Danny D David 20.00 19.00 380.00 0.00 380.00 39.80 340.20	
Boundary regular hours, One insurance, Level 1	Preconditions: Paycheck program started Employee Name: **Ellen Edwards** Employee Level: **1** Hours Worked: **39** Medical Insurance (Y/N): **N** Dental Insurance (Y/N): **N** Vision Insurance (Y/N): **Y**	Name Hours PayRate Regular OT Gross Deduc. Net Ellen Edwards 39.00 19.00 741.00 0.00 741.00 5.25 735.75	

Hours Worked

Considering the possible equivalence classes for hours worked other tests of the requirements. For the Paycheck program, we would want at least one middle test that would result in each class. Tests for these equivalence classes are shown below.

Test ID	Description	Expected Results	Actual Results
Mid-range regular hours, Two insurances, Level 1	Preconditions: Paycheck program started Employee Name: **Danny D David** Employee Level: **1** Hours Worked: **20** Medical Insurance (Y/N): **Y** Dental Insurance (Y/N): **Y** Vision Insurance (Y/N): **N**	Name Hours PayRate Regular OT Gross Deduc. Net Danny D David 20.00 19.00 380.00 0.00 380.00 39.80 340.20	
Mid-range overtime hours, No insurance, Level 1	Preconditions: Paycheck program started Employee Name: **Hilda Henderson** Employee Level: **1** Hours Worked: **50** Medical Insurance (Y/N): **N** Dental Insurance (Y/N): **N** Vision Insurance (Y/N): **N**	Name Hours PayRate Regular OT Gross Deduc. Net Hilda Henderson 50.00 19.00 760.00 285.00 1045.00 0.00 1045.00	

Test Boundary Values

The input for hours worked for the Paycheck program has two boundaries. We want to test the boundary of 0 and the values to either side. We also want to test the boundary of 40. Some tests for the boundary are shown below.

Test ID	Description	Expected Results	Actual Results
Boundary regular hours, Two insurances, Level 3, Boundary retirement	Preconditions: Paycheck program started Employee Name: **Bob Baker** Employee Level: **3** Hours Worked: **1** Medical Insurance (Y/N): **N** Dental Insurance (Y/N): **Y** Vision Insurance (Y/N): **Y** Retirement Percentage (0-6): **1**	Name Hours PayRate Regular OT Gross Deduc. Net Bob Baker 1.00 25.75 25.75 0.00 25.75 20.80 4.95	
Boundary regular hours, One insurance, Level 3, Boundary retirement	Preconditions: Paycheck program started Employee Name: **Ellen Edwards** Employee Level: **3** Hours Worked: **39** Medical Insurance (Y/N): **N** Dental Insurance (Y/N): **N** Vision Insurance (Y/N): **Y** Retirement Percentage (0-6): **5**	Name Hours PayRate Regular OT Gross Ellen Edwards 39.00 25.75 1004.25 0.00 948.79	
Boundary regular hours, One insurance, Level 3, Boundary retirement	Preconditions: Paycheck program started Employee Name: **Frank Frankenstein** Employee Level: **3** Hours Worked: **40** Medical Insurance (Y/N): **Y** Dental Insurance (Y/N): **N** Vision Insurance (Y/N): **N** Retirement Percentage (0-6): **6**	Name Hours PayRate Regular OT Gross Deduc. Net Frank Frankenstein 40.00 25.75 1030.00 0.00 1030.00 86.30 943.70	
Boundary overtime hours, One insurance, Level 3, Mid-range retirement	Preconditions: Paycheck program started Employee Name: **George George** Employee Level: **3** Hours Worked: **41** Medical Insurance (Y/N): **N** Dental Insurance (Y/N): **Y** Vision Insurance (Y/N): **N** Retirement Percentage (0-6): **2**	Name Hours PayRate Regular OT Gross Deduc. Net George George 41.00 25.75 1030.00 38.62 1068.62 36.67 1031.95	