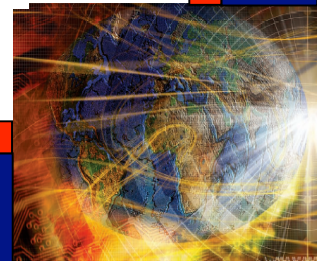


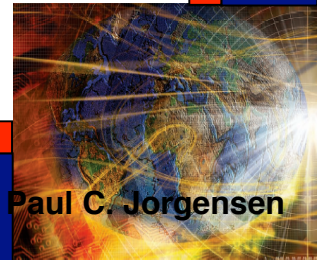
Chapter 2

Examples



Examples

- Triangle problem
- NextDate
- Commission problem
- Simple ATM system
- Currency converter
- Windshield Wiper controller



Triangle Problem

Simple version: The triangle program accepts three integers, a, b, and c, as input. These are taken to be sides of a triangle. The output of the program is the type of triangle determined by the three sides: Equilateral, Isosceles, Scalene, or Not A Triangle.

Improved version: “Simple version” plus better definition of inputs:

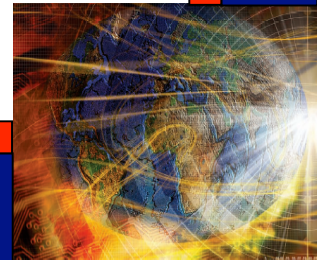
The integers a, b, and c must satisfy the following conditions:

- | | | | |
|-----|---------------------|-----|-------------|
| c1. | $1 \leq a \leq 200$ | c4. | $a < b + c$ |
| c2. | $1 \leq b \leq 200$ | c5. | $b < a + c$ |
| c3. | $1 \leq c \leq 200$ | c6. | $c < a + b$ |

Final Version: “Improved version” plus better definition of outputs:

If an input value fails any of conditions c1, c2, or c3, the program notes this with an output message, for example, “Value of b is not in the range of permitted values.” If values of a, b, and c satisfy conditions c1, c2, and c3, one of four mutually exclusive outputs is given:

1. If all three sides are equal, the program output is Equilateral.
2. If exactly one pair of sides is equal, the program output is Isosceles.
3. If no pair of sides is equal, the program output is Scalene.
4. If any of conditions c4, c5, and c6 is not met, the program output is NotATriangle.



Triangle Problem Discussion

Final Version: “Improved version” plus better definition of outputs:

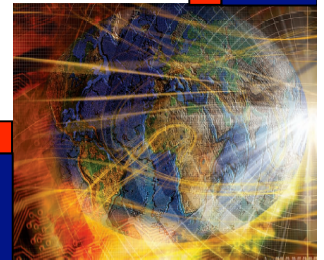
If an input value fails any of conditions c_1 , c_2 , or c_3 , the program notes this with an output message, for example, “Value of b is not in the range of permitted values.” If values of a , b , and c satisfy conditions c_1 , c_2 , and c_3 , one of four mutually exclusive outputs is given:

1. If all three sides are equal, the program output is Equilateral.
2. If exactly one pair of sides is equal, the program output is Isosceles.
3. If no pair of sides is equal, the program output is Scalene.
4. If any of conditions c_4 , c_5 , and c_6 is not met, the program output is NotATriangle.

Problems persist!

What output is expected for the input set (2, 2, 5)?

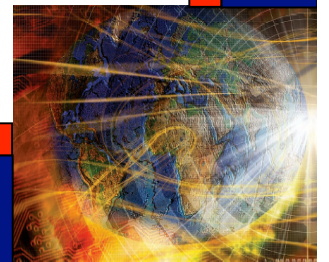
- Isosceles because $a = b$?
- NotATriangle because $c > a+b$?



Triangle Problem Exercise

Fix the “Final Version” (sometimes testers must also be specifiers!)

The Really Final Version: “Improved version” plus better definition of outputs.

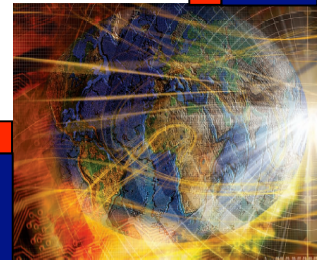


NextDate

NextDate is a function of three variables: month, date, and year. It returns the date of the day after the input date. The month, date, and year variables have integer values subject to these conditions:

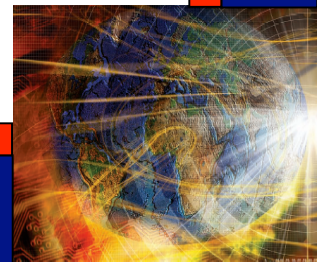
- c1. $1 \leq \text{month} \leq 12$
- c2. $1 \leq \text{day} \leq 31$
- c3. $1812 \leq \text{year} \leq 2012$

If any of conditions c1, c2, or c3 fails, **NextDate** produces an output indicating the corresponding variable has an out-of-range value — for example, “Value of month not in the range 1..12”. Because numerous invalid day–month–year combinations exist, **NextDate** collapses these into one message: “Invalid Input Date.”



The Commission Problem

A rifle salesperson in the former Arizona Territory sold rifle locks, stocks, and barrels made by a gunsmith in Missouri. Locks cost \$45, stocks cost \$30, and barrels cost \$25. The salesperson had to sell at least one complete rifle per month, and production limits were such that the most the salesperson could sell in a month was 70 locks, 80 stocks, and 90 barrels. After each town visit, the salesperson sent a telegram to the Missouri gunsmith with the number of locks, stocks, and barrels sold in that town. At the end of a month, the salesperson sent a very short telegram showing –1 locks sold. The gunsmith then knew the sales for the month were complete and computed the salesperson's commission as follows: 10% on sales up to (and including) \$1000, 15% on the next \$800, and 20% on any sales in excess of \$1800. The commission program produced a monthly sales report that gave the total number of locks, stocks, and barrels sold, the salesperson's total dollar sales, and, finally, the commission.



The Simple ATM System

(see description in text)

WELCOME
to the

Simple
Automatic Teller
Machine

Please Insert your
card for service

Receipts

ID Card

B1

1

2

3

B2

4

5

6

B3

7

8

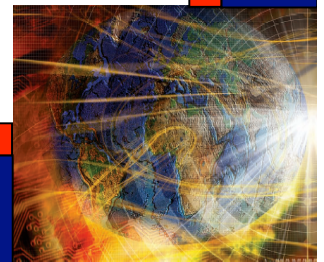
9

0

CANCEL

Cash Dispensing Door

Deposit Envelope Door



The Currency Converter

(see description in text)

Currency Converter

U. S. Dollar amount

Equivalent in ...

☐ Brazil

☐ Canada

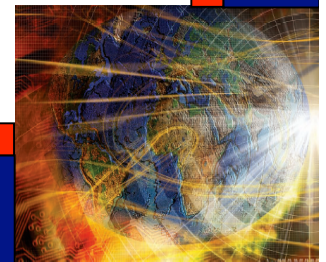
☐ European Community

☐ Japan

Compute

Clear

Quit



The Saturn Windshield Wiper Controller

The windshield wiper on some Saturn automobiles is controlled by a lever with a dial. The lever has four positions, OFF, INT (for intermittent), LOW, and HIGH, and the dial has three positions, numbered simply 1, 2, and 3. The dial positions indicate three intermittent speeds, and the dial position is relevant only when the lever is at the INT position. The decision table below shows the windshield wiper speeds (in wipes per minute) for the lever and dial positions.

c1. Lever	OFF	INT	INT	INT	LOW	HIGH
c2. Dial	n/a	1	2	3	n/a	n/a
a1. Wiper speed is...	0	4	6	12	30	60

