Flowcharts and Design Structures

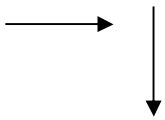
INTROUCTION

Flowcharting is the first formal design tool that we will use. It is a symbol-oriented design system that identifies the type of statement by the shape of the symbol containing the statement. If a picture is really worth a thousand words, flowcharts should save us a lot of time writing. The computer industry has agreed on the symbols to be used and that agreement is an ANSI (American National Standards Institute) standard. If you buy a flowcharting template (you don't need to rush out and get one for this text), it should say that it conforms to the ANSI standard.

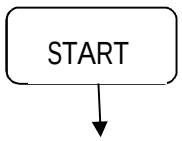
Once we have created our list of tasks and subtasks, our informal design, we can convert those tasks to symbols in the flowchart. Generally, the lowest level of our subtasks (sub-sub—sub-subtasks?) will each become one symbol in the flowchart. These symbols are connected by flow lines that show the flow of control through the program.

The primary flowcharting symbols are :

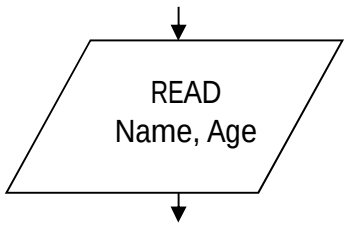
FLOW LINES – These are the left to right or top to bottom lines connecting the symbols. These lines show the flow of control through the program. Some designers prefer to include an arrowhead on all flow lines. Since the general direction of the flow is either down or to the right, some designers include an arrowhead only when the flow is an exception, that is, when it flows up or to the left. Your instructor may have a preference for your work. Most symbols in a flowchart will have one flow line entering the symbol and one flow line exiting. There are a few exceptions to this rule that are described below.



TERMINAL SYMBOL- This oval always begins (with START written inside) and ends (with STOP written inside) the flowchart. As you will soon see, it can also be used to indicate the beginning and end of a subsection within the flowchart, known as a module. The terminal symbol will have only one flow line since a Start will have an exit flow line but no entering flow line and a Stop will have an entering flow line, but no exit.

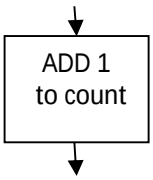


INPUT/OUTPUT SYMBOL – This parallelogram is used for both input (READs) and output (WRITEs) so you must be sure to label the particular use. You should also get in the habit of being specific about what is being read or written. For example, don't say READ Record, say READ Name, Address. Input (read) means the program is receiving

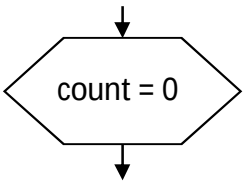


data from an "external source," something connected to the computer but not part of the main processing/memory core. The input could come from a keyboard, a disk drive, a tape file, and so on. The received values are stored in memory. Output (write) indicates the program is sending data from memory t an external device like a printer, a monitor screen, or a disk drive.

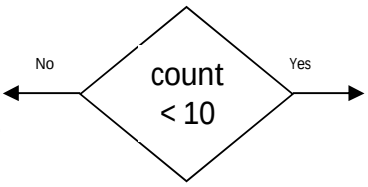
PROCESS SYMBOL – This rectangle is used primarily for calculations and initialization of memory locations. An initialization process means to assign a starting value to a location in memory, like count = 0. A calculation means to perform some calculation and assign the result of the calculation to a location in memory. The calculation could be as simple as ADD 1 to count, or very complex.



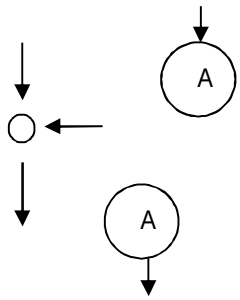
PREPARATION SYMBOL – This symbol is used for any initialization done, usually at the beginning of a program. Anything done in a preparation symbol could be shown in a process box.



DECISION SYMBOL- The diamond either asks a Yes/No question OR makes a True/False statement. There will always be two exits from a decision symbol, one labeled Yes or True and the other labeled No or False. Be sure you include your labels. *This is the only symbol that can have two exits.*



CONNECTOR – This symbol can be used any time multiple flow lines are being joined, although some people prefer to just connect the lines rather than include the connector symbol. As you will see below, it can be very useful to indicate the end of a "structure" where lines join. Another use of the connector is to avoid long flow lines by writing a letter or number within the circle where the branch would begin, omitting the flow line, and including the same letter or number within the connector where the flow line would otherwise end. You can use the connector in the same fashion to indicate a flow from one page to another.



You can see that writing space in a flowchart symbol is often limited. "Year-to-Date Gross Pay" or "Name of Program Design Student" would be difficult value descriptions to fit in a symbol. "Name" "Age," and "Count" are short enough descriptions to fit in the symbol. You will probably be tempted to use very short descriptions of the values referred to. A certain amount of abbreviation is acceptable, but be sure that your design is still meaningful to other possible readers.