Cyclomatic Complexity

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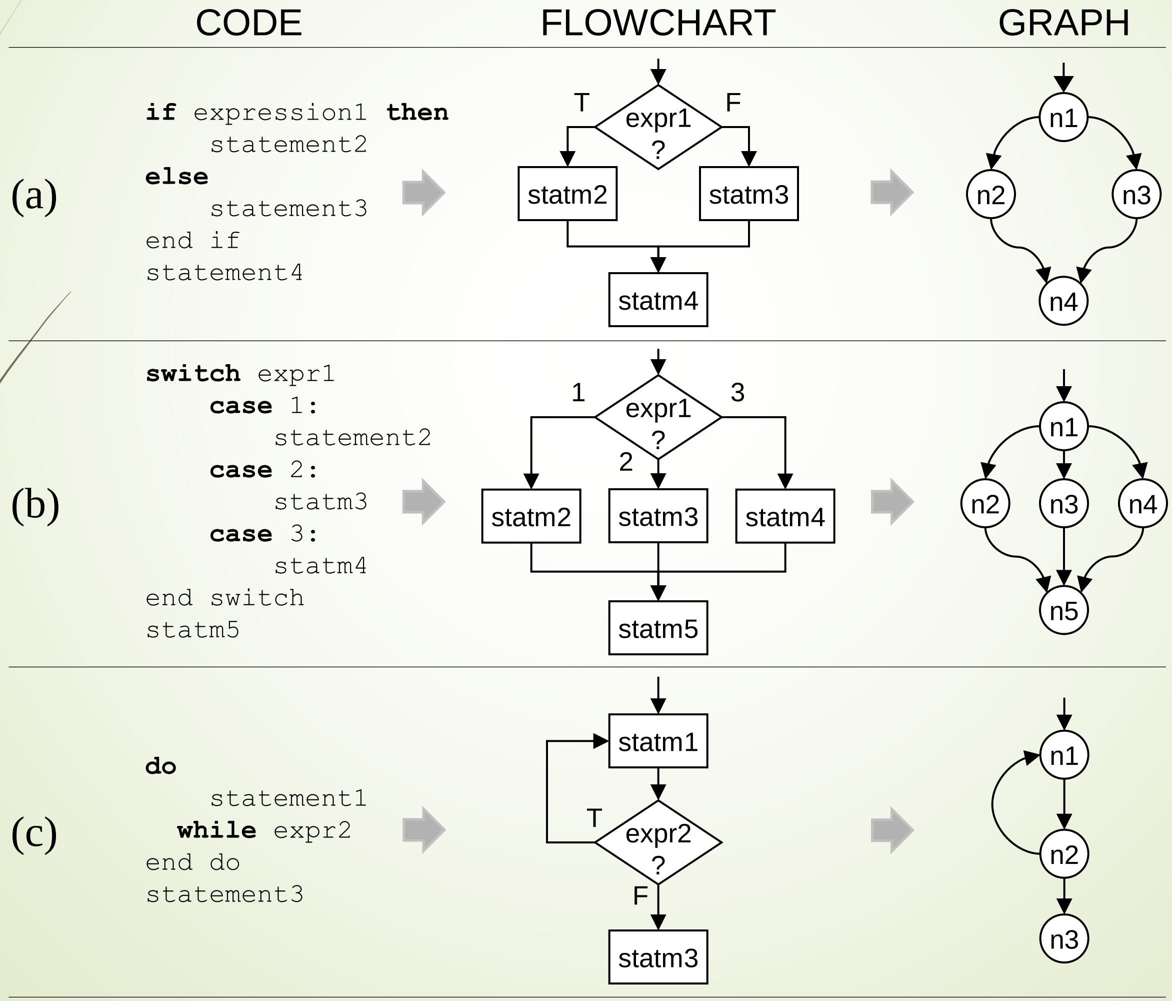
- Invented by **Thomas McCabe (1974)** to measure the complexity of a program's conditional logic
- Cyclomatic complexity of graph G equals #edges - #nodes + 2

$$\mathbf{V(G) = e - n + 2}$$

- Also corresponds to the number of linearly independent paths in a program

Converting Code to Graph



CODE

(a)

```
if expression1 then
    statement2
else
    statement3
end if
statement4
```

(b)

```
switch expr1
    case 1:
        statement2
    case 2:
        statm3
    case 3:
        statm4
end switch
statm5
```

(c)

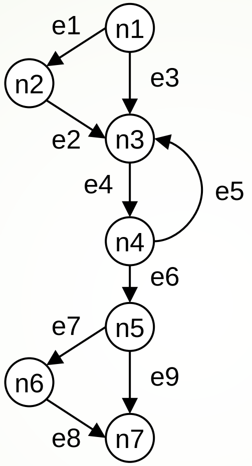
```
do
    statement1
  while expr2
end do
statement3
```

Example Paths

```
if expression1
then
    statement2
end if

do
    statement3
  while expr4
end do

if expression5
then
    statement6
end if
statement7
```



Paths:

P1 = e1, e2, e4, e6, e7, e8

P2 = e1, e2, e4, e5, e4, e6, e7, e8

P3 = e3, e4, e6, e7, e8, e10

P4 = e6, e7, e8, e10, e3, e4

P5 = e1, e2, e4, e6, e9, e10

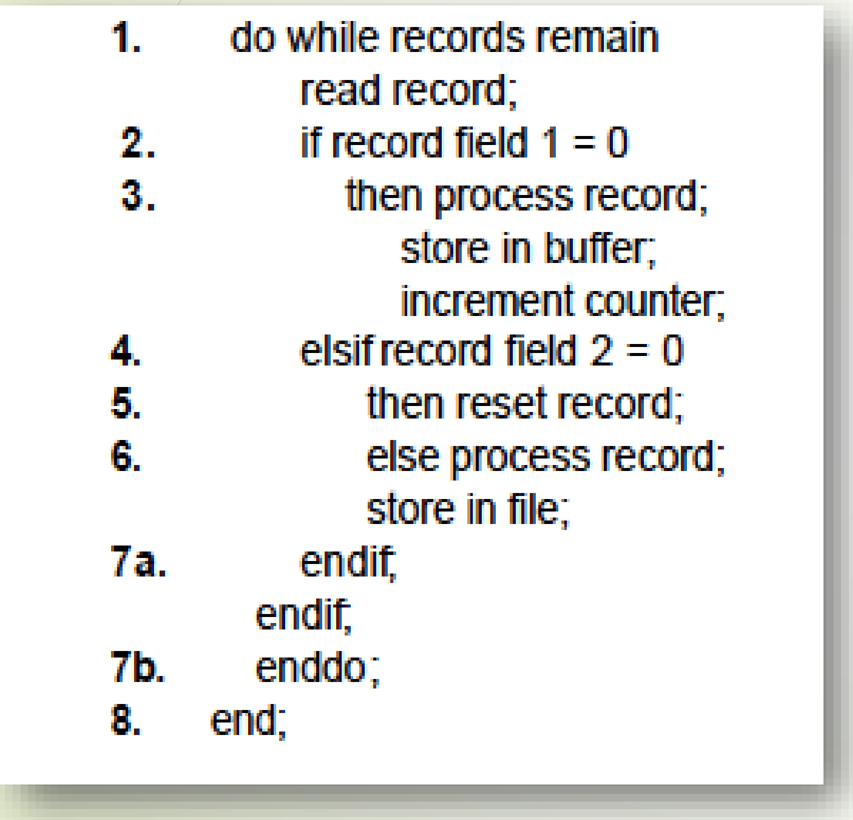
P6 = e4, e5

P7 = e3, e4, e6, e9, e10

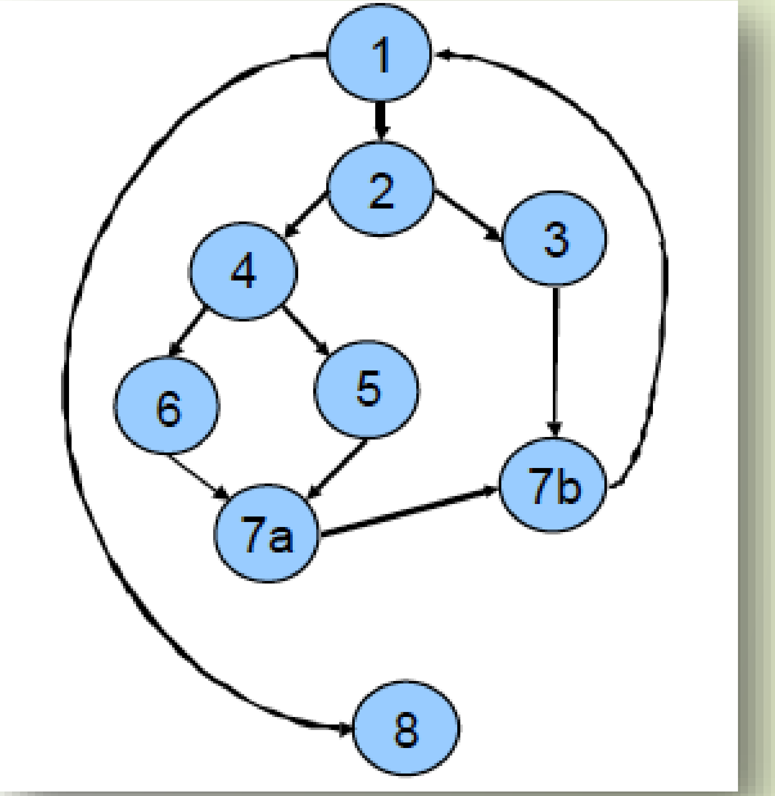
P8 = e1, e2, e4, e5, e4, e6, e9, e10

$$V(G) = e - n + 2 = 9 - 7 + 2 = 4$$

Example 1

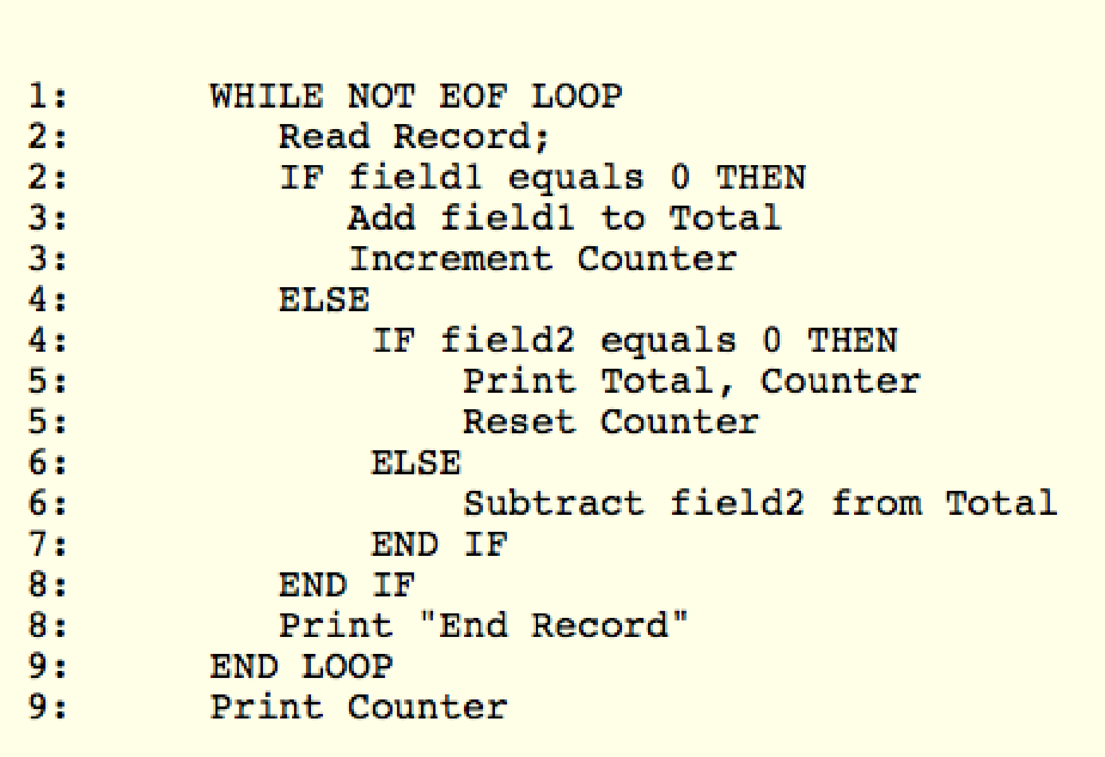


```
1.     do while records remain
           read record;
 2.        if record field 1 = 0
 3.            then process record;
                   store in buffer;
                   increment counter;
4.         elsif record field 2 = 0
5.             then reset record;
6.             else process record;
               store in file;
7a.        endif;
        endif;
7b.     enddo;
8.   end;
```

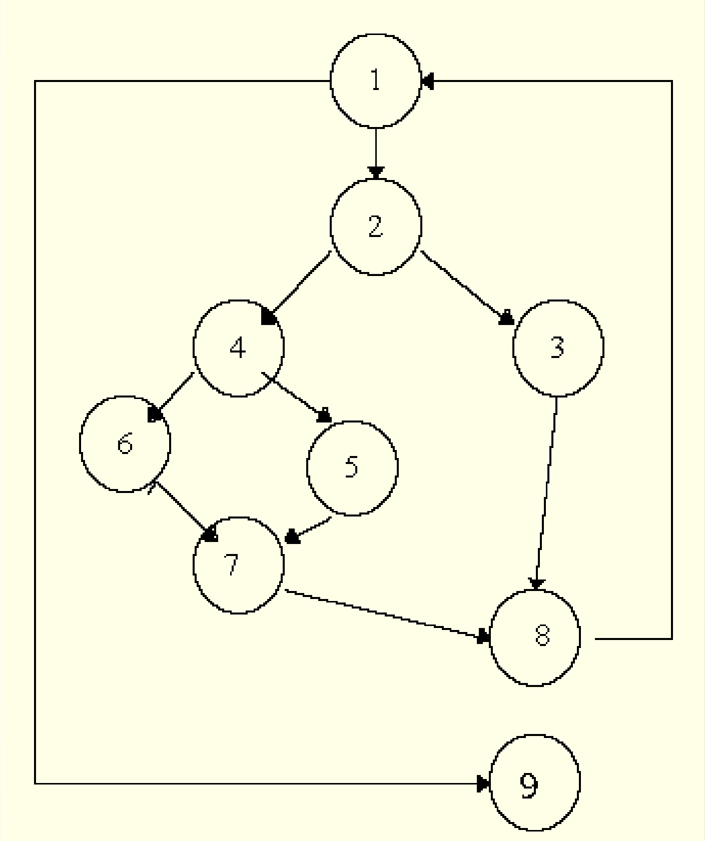


V= e-n+2 = 11-9+2=4

Example 2



```
1:      WHILE NOT EOF LOOP
2:         Read Record;
2:         IF field1 equals 0 THEN
3:            Add field1 to Total
3:            Increment Counter
4:         ELSE
4:             IF field2 equals 0 THEN
5:                 Print Total, Counter
5:                 Reset Counter
6:             ELSE
6:                 Subtract field2 from Total
7:             END IF
8:         END IF
8:         Print "End Record"
9:      END LOOP
9:      Print Counter
```



V=e-n+2=11-9+2=4