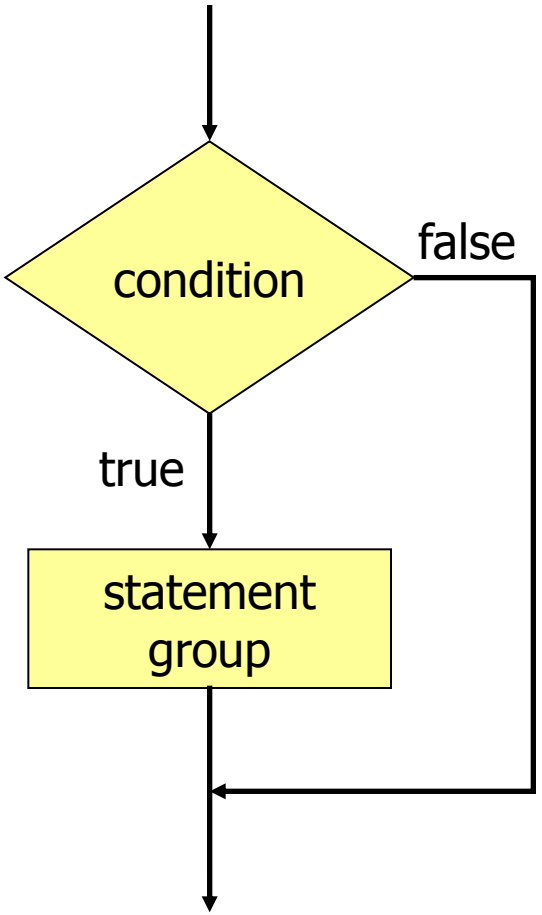
Branches

Branches

- Branches are used to select and execute specific sections of the code while skipping other sections
- Selection of different sections depend on a condition statement
- We will learn:
  - if statement
  - switch statement

Branches: "if" Statement




```
if ( condition ),
    statement 1
    statement 2
    ...
end
```

statement group

Branches: “if” Statement

- Conditions can be:
  - any real value (0 is false, non-zero is true)
  - combination of relational and logical operators
    - e.g. (x > 0) & (x < 10)
  - logical functions
    - isempty(X) % returns 1 if X is an empty array and 0 otherwise
    - isnumeric() %returns 1 if X is numeric and 0 otherwise
    - ischar() %returns 1 if X is char and 0 otherwise
    - isinf(), % returns 1 if given value equals inf
    - isnan() % returns 1 if given value equals NaN

Branching Examples

- Examples:
  - if (r <= 0)
  - disp('Radius must be positive');
    end
  - if ((grade < 0) | (grade > 100))
    disp('Grade must be in [0,100] range');
    end
  - if isinf(result)
    disp('Result is infinite');
    end

Relational Operators

- Relational operators are used to represent conditions
- Result of the condition is either true or false
- In MATLAB:
  - false is represented by 0
  - true is represented by 1 (non-zero)

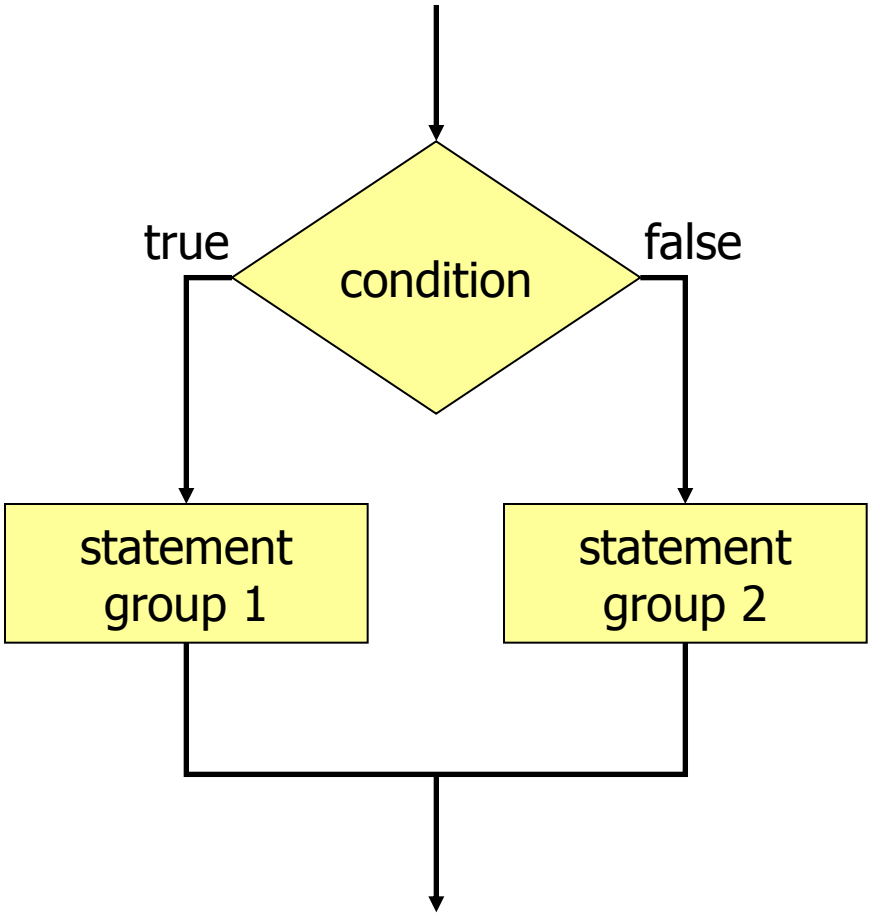
Branching Examples

- Display status of water in a cylinderical tank:

Data validation

```
r = input('Enter the radius of the tank base (in meters):');
if ( r <= 0 ),
    error( 'Radius must be positive' );
end
h = input('Enter the height of the tank (in meters):');
if ( h <= 0 ),
    error( 'Height must be positive' );
end
w = input('Enter the amount of water (in m3):');
if ( w <= 0 ),
    error( 'Amount of water must be positive' );
end
capacity = pi * r^2 * h;
space = capacity - w;
if ( space > 0 ),
    disp( [ 'There is ' num2str(space) ' m3 extra space' ] );
else
    disp( 'Tank is full' );
end
```

Branches: "if-else" Statement




```
if ( condition )
    statement 1
    statement 2
    ...
else
    statement 1
    statement 2
    ...
end
```

statement group 1

statement group 2

Branching Examples

- Example: Assigning letter grades

Range	Grade
$100 \geq \text{grade} > 95$	A
$95 \geq \text{grade} > 86$	B
$86 \geq \text{grade} > 76$	C
$76 \geq \text{grade} > 66$	D
$66 \geq \text{grade} > 0$	F

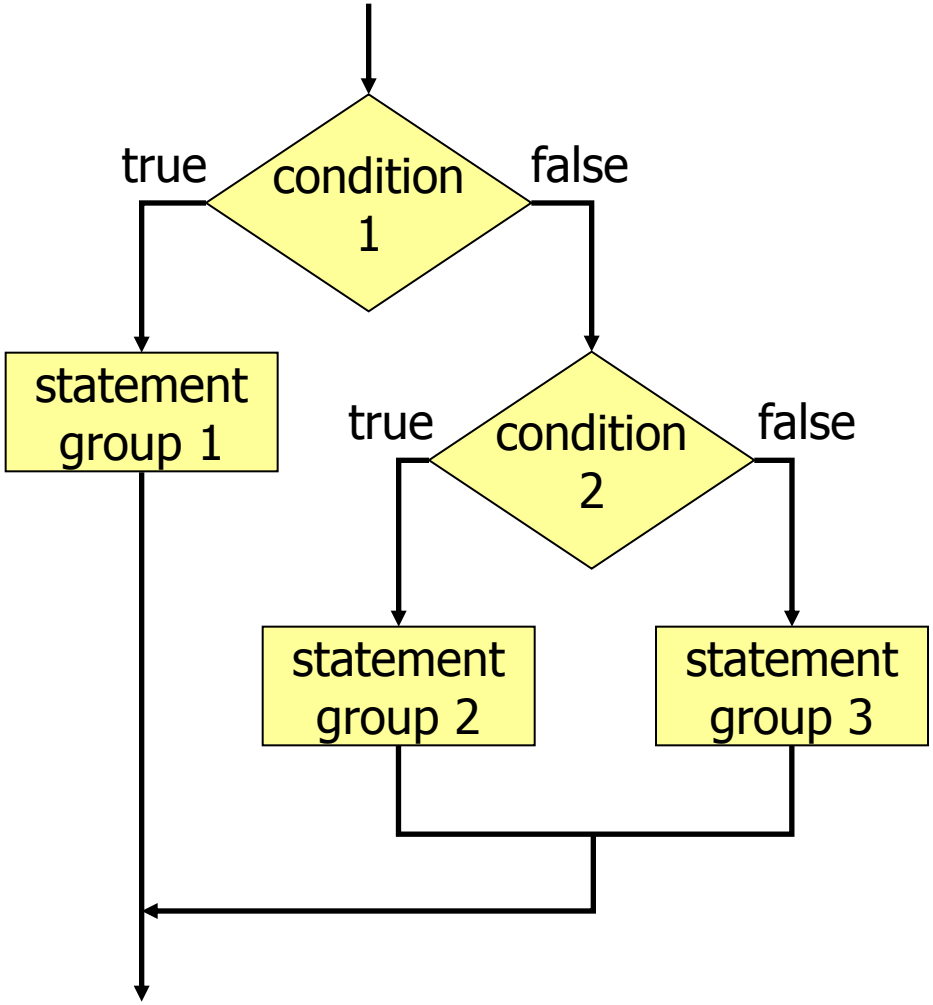
How can we compute the letter corresponding to a given numeric grade?

Branching Examples

```
if ( grade > 95 )
    disp( 'Grade is A' );
else
    if ( grade > 86 )
        disp( 'Grade is B' );
    else
        if ( grade > 76 )
            disp( 'Grade is C' );
        else
            if ( grade > 66 )
                disp( 'Grade is D' );
            else
                disp( 'Grade is F' );
            end
        end
    end
end
```

nested if statements

Branches: "if-elseif-else" Statement




```
if ( condition1 )
    statement group1
elseif ( condition2 )
    statement group2
elseif ( condition3 )
    statement group3
else
    statement group4
end
```

condition 1 is false, condition 2 is true

condition 1 & 2 are false, condition 3 is true

condition 1 & 2 & 3 are false

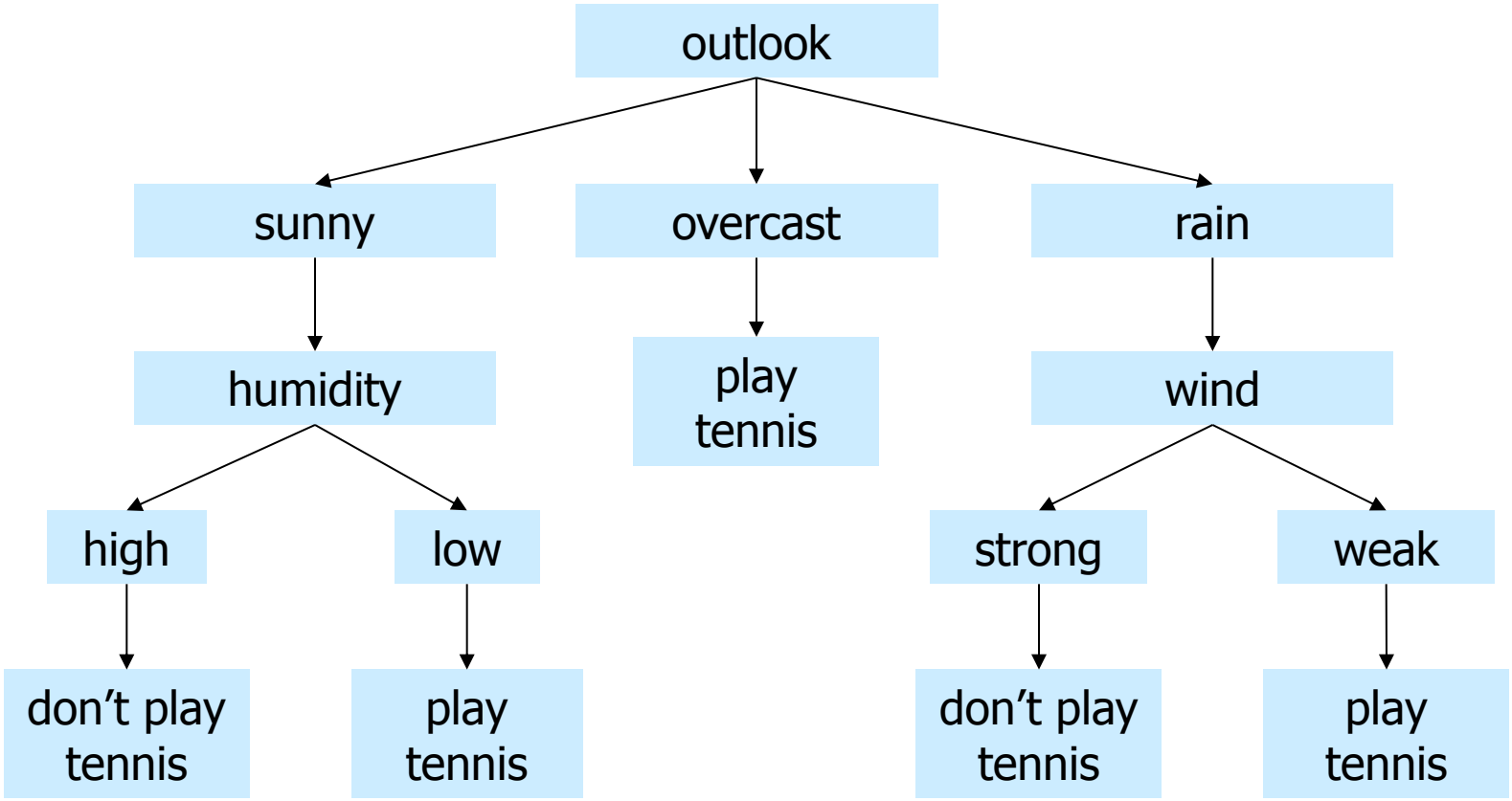
Branching Examples

- Letter grade example:

```
if ( grade > 95 )
    disp( 'Grade is A' );
elseif ( grade > 86 )
    disp( 'Grade is B' );
elseif ( grade > 76 )
    disp( 'Grade is C' );
elseif ( grade > 66 )
    disp( 'Grade is D' );
else
    disp( 'Grade is F' );
end
```

Branching Examples

- Example: Decision for playing tennis



Branching Examples

```
outlook = input( 'How is the outlook? (o)vercast, (s)unny, (r)ainy: ', 's' );
if ( outlook == 'o' )
    disp( 'You can play tennis' );
elseif ( outlook == 's' )
    humidity = input( 'How is humidity? (h)igh, (l)ow: ', 's' );
    if ( humidity == 'h' )
        disp('I do not recommend you play tennis' );
    elseif ( humidity == 'l' )
        disp( 'You can play tennis' );
    else
        disp( 'Invalid humidity info' );
    end
elseif ( outlook == 'r' )
    wind = input( 'How is the wind? (s)trong, (w)eak: ', 's' );
    if ( wind == 's' )
        disp( 'I do not recommend you play tennis' );
    elseif (wind == 'w' )
        disp( 'You can play tennis' );
    else
        disp( 'Invalid wind info' );
    end
else
    disp( 'Invalid outlook info' );
end
```

Branching Examples

```
outlook = input( 'How is the outlook? (o)vercast, (s)unny, (r)ainy: ', 's' );
if ( outlook == 'o' )
disp( 'You can play tennis' );
elseif (outlook == 's')
humidity = input( 'How is humidity? (h)igh, (l)ow: ', 's' );
if ( humidity == 'h' )
disp('I do not recommend you play tennis' );
elseif ( humidity == 'l' )
disp( 'You can play tennis' );
else
disp( 'Invalid humidity info' );
end
elseif ( outlook == 'r' )
wind = input( 'How is the wind? (s)trong, (w)eak: ', 's' );
if ( wind == 's' )
disp( 'I do not recommend you play tennis' );
elseif (wind == 'w' )
disp( 'You can play tennis' );
else
disp( 'Invalid wind info' );
end
else
disp( 'Invalid outlook info' );
end
```

indentation is important for understandability