



Chapter 31



CONDITIONAL STATEMENTS

CONDITIONAL STATEMENTS

CONDITIONAL STATEMENTS in Python always start with the key word "if," followed by the Boolean expression and a colon. The code that runs if the condition is true is added below the first line and indented one tab (or four spaces).

Boolean expressions use ==, !=, <, >, <=, and >=.

if

==

<

>



<=



>=

!=

FOR EXAMPLE, you can write a program that displays a message if a game player has reached the expert level. The code that prints "Skill Level: Expert" will run only if the xp (experience points) is greater than or equal to 90. If the xp is less than 90, nothing happens.

xp = 120

Start with "if."

if xp >= 90:

Add the conditional statement and a colon after it.

print("Skill Level: Expert")

Indent here to show this print() function is the code to run if xp >= 90.

Skill Level: Expert will print because $120 > 90$.

Else Statements

An **ELSE** statement is a statement that runs when the Boolean value is False. To use the else statement, type "else" on a new line. Then, on a new line, indent 1 tab (4 spaces) and add code that will run if the Boolean expression is false. For example, you could say: If xp is greater than or equal to 90, then display "Skill Level: Expert", but if the user's xp is less than 90, display "Skill Level: Novice."

```
xp = 50
```

```
if xp >= 90:
```

```
    print("Skill Level: Expert")
```

```
else:
```

```
    print("Skill Level: Novice")
```

tells what code
should run when the
Boolean expression
is False

The example will display "Skill Level: Novice" because xp is 50, which is not greater than or equal to 90.

Elif

ELIF is used to combine an *else* statement with another conditional statement to check for additional information. Elif is used only after an "if" or another "elif" statement. Next to *elif*, add a Boolean expression and then a colon.



For example, you can add another experience level to the game by adding an *elif* statement to the code.

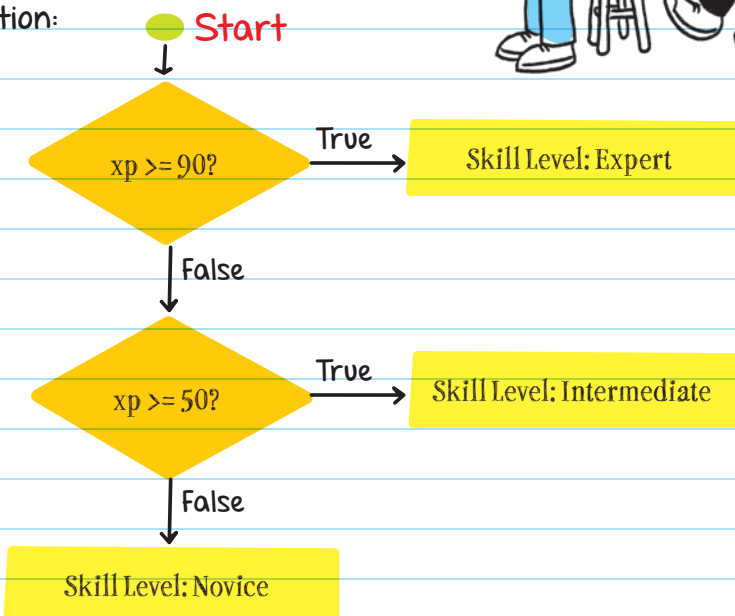
The first condition displays "Skill Level: Expert" if xp is greater than or equal to 90.

You can add an *elif* statement to display "Skill Level: Intermediate" if xp is greater than or equal to 50 and

less than 90. If x_p is less than 50, then the *else* statement will run the code to display "Skill Level: Novice."

```
xp = 50
if xp >= 90:
    print("Skill Level: Expert")
elif xp >= 50:
    print("Skill Level: Intermediate")
else:
    print("Skill Level: Novice")
```

A flowchart of the program shows the different branches for each condition:



Compound Conditional Statements

A **COMPOUND CONDITIONAL STATEMENT** is a conditional statement that contains two Boolean expressions. For example, you could make a game where the player gets bonus points if their score is greater than 50 AND their difficulty setting is set to "hard."

LOGICAL OPERATORS combine multiple Boolean expressions or values that evaluate to one Boolean value.

Python uses three logical operators:

AND: If both expressions are True, then the whole condition is True. If one or both of the expressions are False, then the whole condition is False.

OR: If one or both expressions are True, then the condition is True. It doesn't matter whether the other condition is True or False.

NOT: Switches the expression to its opposite (from True to False and False to True).

When we talk or write about AND, OR, and NOT, we use all caps; however, within Python programs, the words are written in all lowercase.

FOR EXAMPLE, we could display a special message if a player wins on the most difficult setting and their xp is greater than 90.

The compound conditional statement starts with "if", and then we can add a Boolean expression followed by the logical operator "AND" and the other Boolean expression:

xp = 150

difficulty = "Hard"

First Boolean
expression

Second Boolean
expression

```
if xp > 90 and difficulty == "Hard":  
    print("You surpass all expectations!")
```

You surpass all
expectations!

Examples of how logical operators work:

$3 < 4$ and $6 == 6$

True AND True evaluates to True

$4 != 4$ and $6 > 2$

False AND True evaluates to False

$5 == 5$ or $6 < 3$

True OR False evaluates to True

$4 > 12$ or $7 != 7$

False OR False evaluates to False

not($6 < 13$)

True evaluates to False

TRUTH TABLES list all the possible outcomes of logical operators. Truth tables for AND, OR, and NOT:

AND TRUTH TABLE

Boolean 1	AND	Boolean 2	Evaluates to
True	AND	True	True
True	AND	False	False
False	AND	True	False
False	AND	False	False

OR TRUTH TABLE

Boolean 1	OR	Boolean 2	Evaluates to
True	OR	True	True
True	OR	False	True
False	OR	True	True
False	OR	False	False

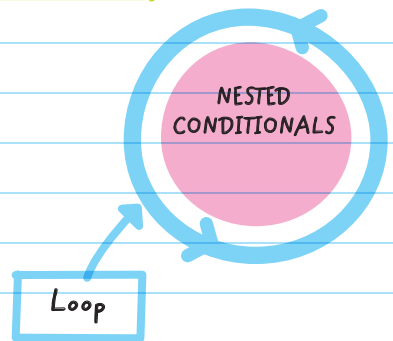
NOT TRUTH TABLE

NOT	Boolean	Evaluates to
NOT	True	False
NOT	False	True

Nested Conditional Statements

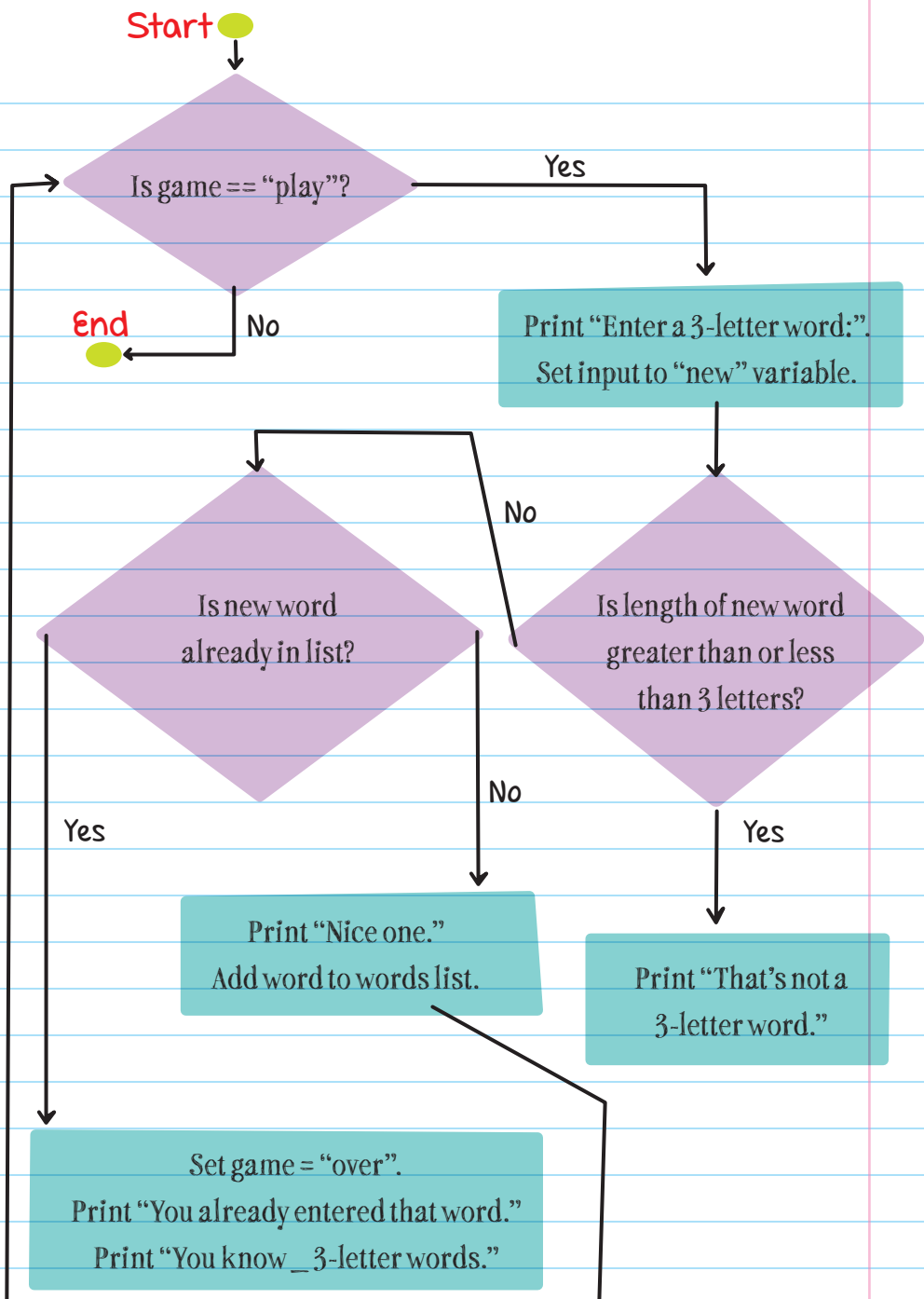
NESTED CONDITIONAL

STATEMENTS can be nested within loops.



FOR EXAMPLE, you could make a game that loops until the game is over. The game play could be controlled using compound and nested conditionals.

Suppose you are creating a game where the user has to enter as many three-letter words as they can. If they repeat a word, the game is over. You can use a flowchart to map out the order and direction of actions.



Using the flowchart as a guide, you can create the program:

```
words = []
```

Creates a blank list called "words"

```
game = "play"
```

Starts a while loop for game play

```
while game == "play":
```

Sets the variable "new" to the user input

```
    new = input("Enter a 3-letter word: ")
```

```
    if len(new) > 3 or len(new) < 3:
```

Checks if the word is 3 letters long

```
        print("That's not a 3-letter word.")
```

Prints if word is not 3 letters long

```
    else:
```

If the word is 3 letters, it moves on to the code below.

```
        if new in words:
```

If the word is already in the list, it breaks out of the loop.

```
            game = "over"
```

```
        print("You already said that word. Game over.")
```

```
    print("You know", len(words), "3-letter words.")
```

If the user enters a word they already used, it prints the game over message.

Tells how many words in the list

else:

`print("Nice one.")`

If the word is unique,
it prints this.

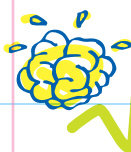
`words.append(new)`

It also adds the word
to the list.

The nested conditional is:

If the word is three letters long AND unique, the game continues.





CHECK YOUR KNOWLEDGE

1. Label each of the following with the type of conditional statement it represents (if, if/else, if/elif/else):

- | | | |
|----|---|--|
| A. | <pre>if at_dance == True: print("Dance the night away.") elif busy != True: print("Go to the dance.") else: print("Stay home.")</pre> | |
| B. | <pre>if hands != "sweaty": print("hold") else: print("wipe hands")</pre> | |
| C. | <pre>if courage > 50: print("Say hello to your crush.") elif courage < 10: print("Don't make eye contact.") else: print("Smile at your crush.")</pre> | |

```
D. if breath != "sweet" and crush_distance < 10:  
    print("Go brush your teeth, now!")
```

```
E. if crush == "at movies" or friends == "at  
    movies":  
    print("Go to the movies.")  
    else:  
    print("Stay home and chill.")
```



2. Write the output for each of the following programs:

A. `num = 3`
`if num >= 3:`
 `print("Greater than 3")`

B. `shape = "square"`
`if shape == "circle":`
 `print("you win")`
`else:`
 `print("no such luck")`

C. `color1 = "red"`
`color2 = "blue"`
`if color1 == "red" and`
`color2 == "yellow":`
 `print("orange")`
`elif color1 == "red" and`
`color2 == "blue":`
 `print("purple")`
`else:`
 `print("green")`

D. `fact = not(5 == 4)`
`print(fact)`

3. What does the AND logical operator do?

4. Mark each compound conditional statement as True or False:

A. You live on planet Earth AND the moon:

B. You can breathe air OR breathe water:

C. Not(You are human):

D. Spider-Man is real OR Batman is real:

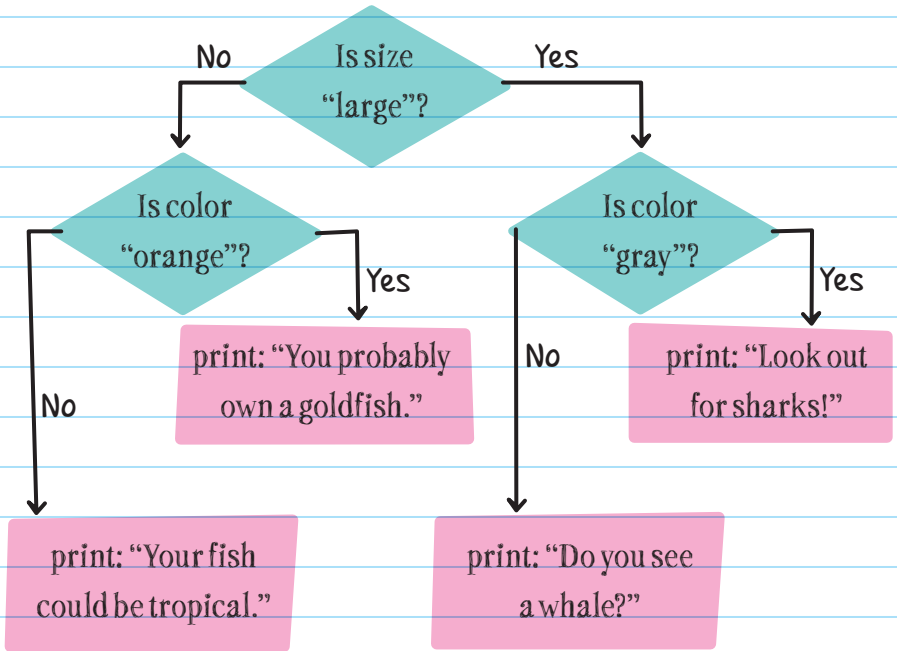
5. Draw a flowchart for each of the following descriptions.

A. A program that first asks if the user wants to watch a Harry Potter movie. If they do, suggest which Harry Potter film they should watch based on if the user likes young Harry (movies 1 or 2) or older Harry (movies 3 to 7).

B. A program that first asks if the user likes hats. If they don't like hats, tell the user to try out visors. If they do like hats, and if they like plain things, suggest baseball caps; otherwise, suggest top hats.

C. A program that first asks if the user likes to be bored. If the user likes to be bored, suggest that they do nothing. If they don't like being bored, ask if they like to read. If they like to read, ask if they like to read a lot. If they like to read a lot, suggest that they read a novel; otherwise, tell them to read a magazine.

6. Write a program for the following flowchart.



7. What would the program in question 6 print if the variable "color" had the value "orange" and the variable "size" had the value "small"?

CHECK YOUR ANSWERS



1.

A.	if/elif/else
B.	if/else
C.	if/elif/else
D.	if
E.	if/else

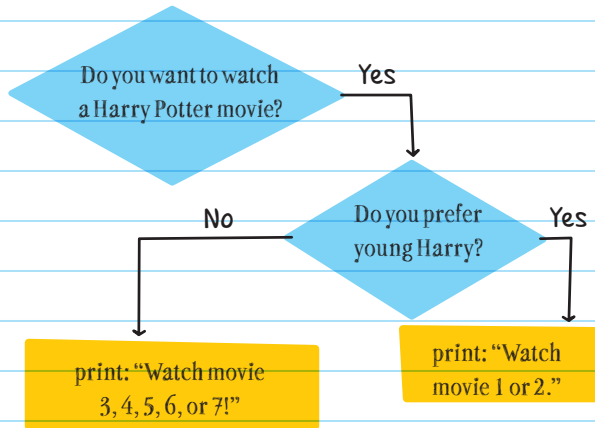
2.

A.	Greater than 3
B.	no such luck
C.	purple
D.	True

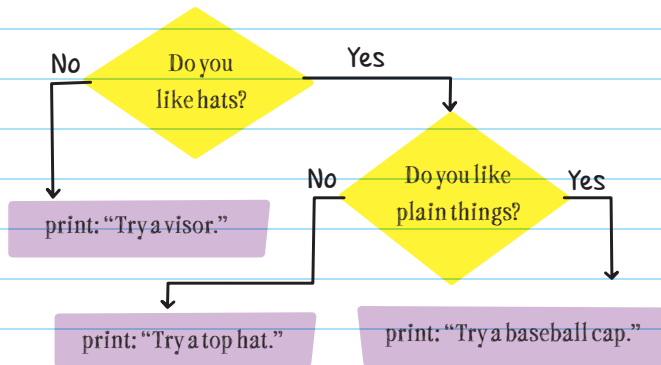
3. The AND operator combines two Boolean expressions to make a compound conditional statement. A compound conditional statement that uses AND is True only if both Boolean expressions within the statement are True.

4. A. False
B. True
C. False
D. False

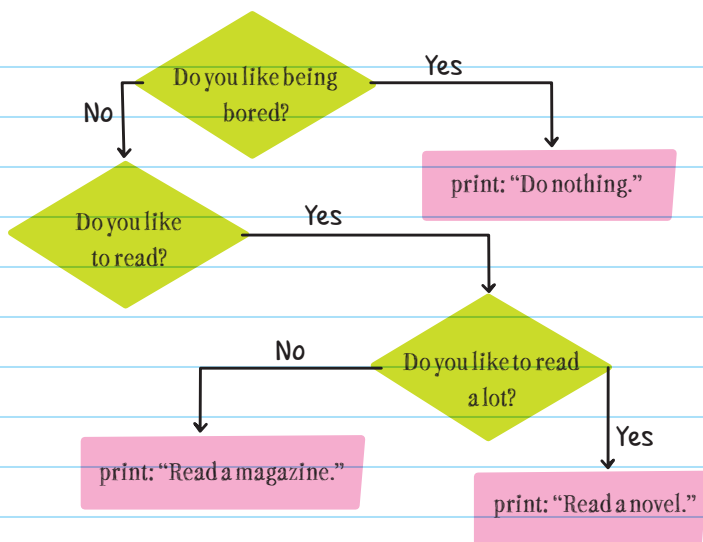
5. A.



B.



C.



6. if size == "large":

 if color == "gray":

 print("Look out for sharks!")

 else:

 print("Do you see a whale?")

else:

 if color == "orange":

 print("You probably own a goldfish.")

 else:

 print("Your fish could be tropical.")

7. You probably own a goldfish.