EINFÜHRUNG IN DIE PROGRAMMIERUNG

EXPRESSIONS, OPERATORS, AND CONDITIONS

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STATEMENTS, EXPRESSIONS, AND OPERATORS

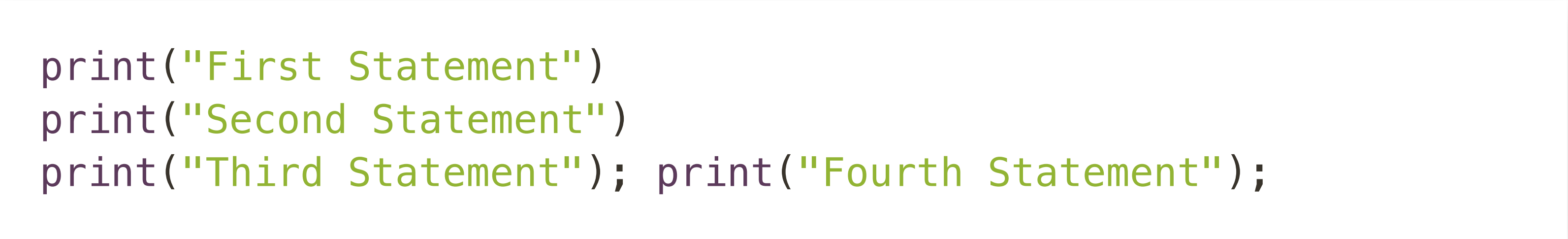
STATEMENTS

- Program execution starts in the first line of the program.
- It runs the series of so-called **statements** in the program
- … and then terminates.

> *A statement is smallest standalone element of an imperative programming language that expresses some action to be carried out. It is an instruction written in a high-level language that commands the computer to perform a specified action. A program written in such a language is formed by a sequence of one or more statements.*
> *(Source: **Wikipedia**)*

STATEMENTS

EXAMPLE



```
print("First Statement")
print("Second Statement")
print("Third Statement"); print("Fourth Statement");
```

EMPTY STATEMENT

Most languages have a way to express an *empty statement*.
Python uses `pass` (**documentation**)

```
pass
```

MULTI-LINE STATEMENT

A terminating backslash allows multi-line statements

- may be useful to increase readability

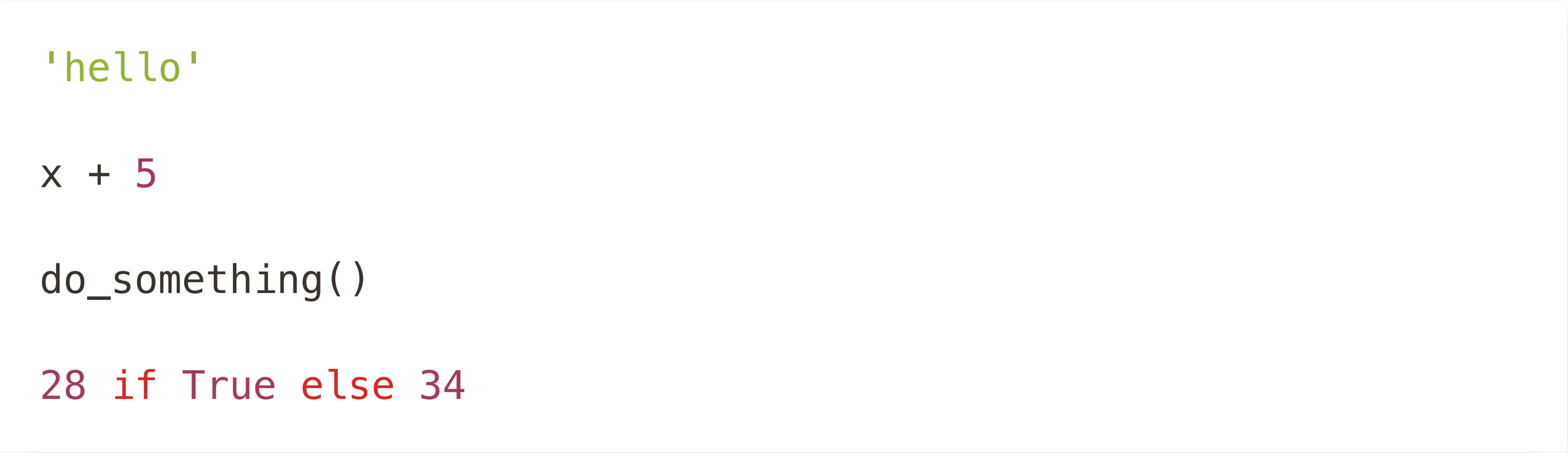
EXAMPLE

```
a = 1 + 2 + 3 + \
    4 + 5 + 6 + \
    7 + 8 + 9
```

⚠ There must not be *anything* after the \ (e.g., a blank)

EXPRESSION

> *Expressions are representations of value. They are different from statement in the fact that statements do something while expressions are representation of value. For example any string is also an expressions since it represents the value of the string as well. Source:* ***hackerearth***



```
'hello'

x + 5

do_something()

28 if True else 34
```

OPERATORS

> *Operators are used to perform operations on variables and values.*
>
> *Source: **w3schools***

Operators can be used for example in "if statements"

CONDITIONAL EXECUTION:
IF STATEMENT

CONDITIONAL EXECUTION: IF STATEMENT

In the real world, we commonly must evaluate information around us and then choose one course of action or another based on what we observe:

> *If the weather is nice, I need a sun hat otherwise an umbrella.*

Example

```python
nice_weather = True

if nice_weather:
  print("sun hat")
else:
  print("umbrella")
```

IF STATEMENT

`if` statements are used to control the program flow.
Their *body* blocks are only executed when a condition is `True`.

EXAMPLE

```python
x = 1
y = 2

if x < y:
    print("x is smaller than y")
```

INDENTATION

The `if` line is followed by an *indented block*.
This (entire) block is executed only if the condition is true.
Indented blocks: the lines that belong to the block begin with the same number of tab ⇥ or space characters*.

```
if 2 < 1:
    print('this is part of the block')
    print('this is still part of the block')

print('this is not')
```

Output:

```
this is not
```

*: typically 1 tab/4 spaces for the first level, 2 tabs/8 spaces for the second etc.

INDENTATION

The indentation must be the same for the entire block:

```python
if x < y:
    print('this is part of the block')
        print('this is wrong') # syntax error
```

But nested blocks are fine:

```python
if x < y:
    print('the first condition is met')
    if a < b:
        print('both conditions are met')
```

COMPARISON OPERATORS

Comparison operators are used to compare values:

Operator	Meaning	Example
`>`	greater than	`x > y`
`<`	less than	`x < y`
`==`	equal to	`x == y`
`!=`	not equal to	`x != y`
`>=`	greater than or equal to	`x >= y`
`<=`	less than or equal to	`x <= y`

They evaluate to `True` or `False`.

ELSE

You can use `if—else` to run one block if a condition is met, and another if it is not.

```
x = 3
y = 2

if x < y:
    print("x is smaller than y")
else:
    print("x is not smaller than y")
```

SEVERAL CONDITIONS

To check several conditions *one after another* you can use *elif*.
"If none of the previous conditions were true, try this one"

```python
x = 2
y = 2

if x < y:
    print("x is smaller than y")
elif x == y:
    print("x and y are equal")
else:
    print("x is greater than y")
```

LOGICAL OPERATORS

Operators

Operator	Meaning	Example
`and`	True if both the operands are true	`x and y`
`or`	True if either of the operands is true	`x or y`
`not`	True if operand is false (complements the operand)	`not x`

LOGICAL OPERATORS

Which lines will be printed?

```python
a = 3
b = 10
c = 8

if a > c or b > c:
    print('At least one of a or b is greater than c')

if a > c and b > c:
    print('a and b are both greater than c')

if not (a > c) and b > c:
    print('a is not greater than c, but b is')
```

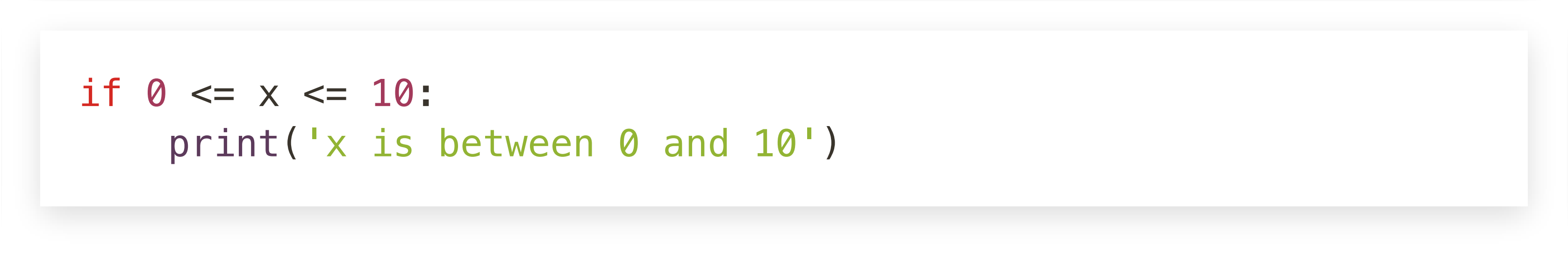
SHORTCUT

Instead of

`a < b and b < c`

you can simply write

`a < b < c`



```python
if 0 <= x <= 10:
    print('x is between 0 and 10')
```

IN OPERATOR

The `in` operator checks if one string is contained in another.

```
>>> s = 'abcde'

>>> 'bc' in s
True

>>> 'cb' in s
False
```

Or in an `if` statement:

```
if 'abc' in s:
    print('Found!')
```

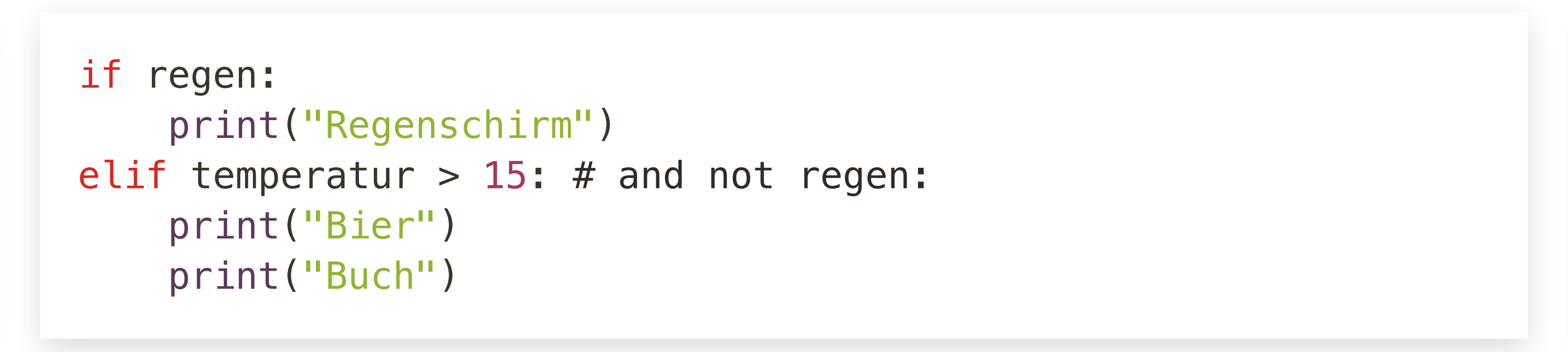
EXERCISES

AUFGABE: BETTY

Hubert führt seinen Hund Betty täglich aus. Wenn es draußen regnet, nimmt er einen Regenschirm mit. Falls die Temperatur über 15°C ist und es nicht regnet, nimmt er sich ein Bier und ein Buch mit. Betty macht ihr Geschäft bei Regen oder wenn es zwischen 22°C und 24°C hat an einem Baum, sonst immer auf einer Wiese. Bei Temperaturen über 10°C und Regen bellt Betty im Schnitt 10 mal, bei Temperaturen unter 5°C 3 mal und wenn es nicht regnet und über 20°C hat 30 mal. An allen anderen Tagen nur einmal.
Welche Utensilien nimmt Hubert mit?
Wo macht Betty ihr Geschäft und wie oft bellt sie?

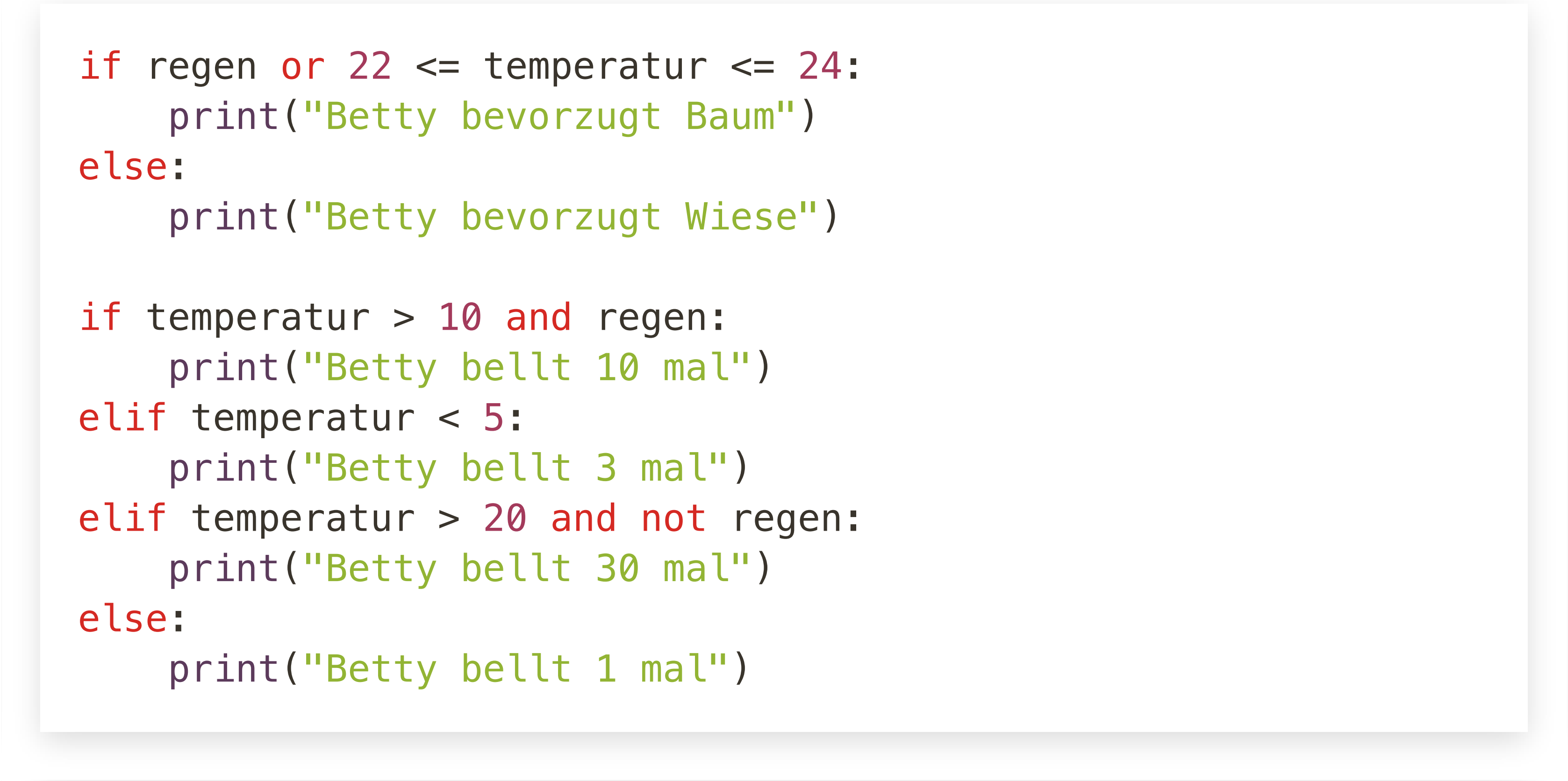
```
import random
regen = (1 == random.randrange(2))
temperatur = random.randrange(30)
```

LÖSUNG



```
if regen:
    print("Regenschirm")
elif temperatur > 15: # and not regen:
    print("Bier")
    print("Buch")
```

LÖSUNG



```python
if regen or 22 <= temperatur <= 24:
    print("Betty bevorzugt Baum")
else:
    print("Betty bevorzugt Wiese")

if temperatur > 10 and regen:
    print("Betty bellt 10 mal")
elif temperatur < 5:
    print("Betty bellt 3 mal")
elif temperatur > 20 and not regen:
    print("Betty bellt 30 mal")
else:
    print("Betty bellt 1 mal")
```

AUFGABE: BMI-RECHNER

Body Mass Index

Männlich: Untergewicht < 20, Übergewicht > 25

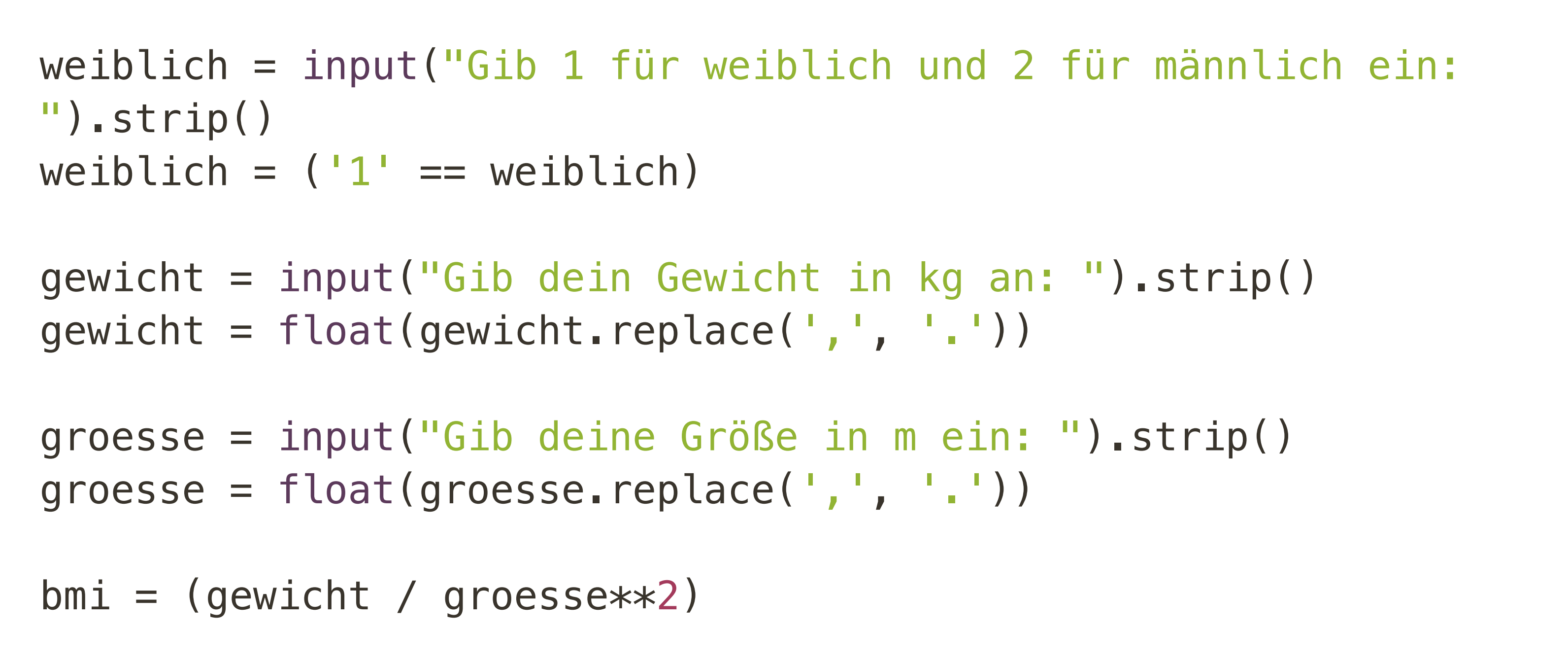
Weiblich: Untergewicht < 19, Übergewicht > 24

BMI = Gewicht[kg] / (Größe[m] ** 2)

Ausgabe:

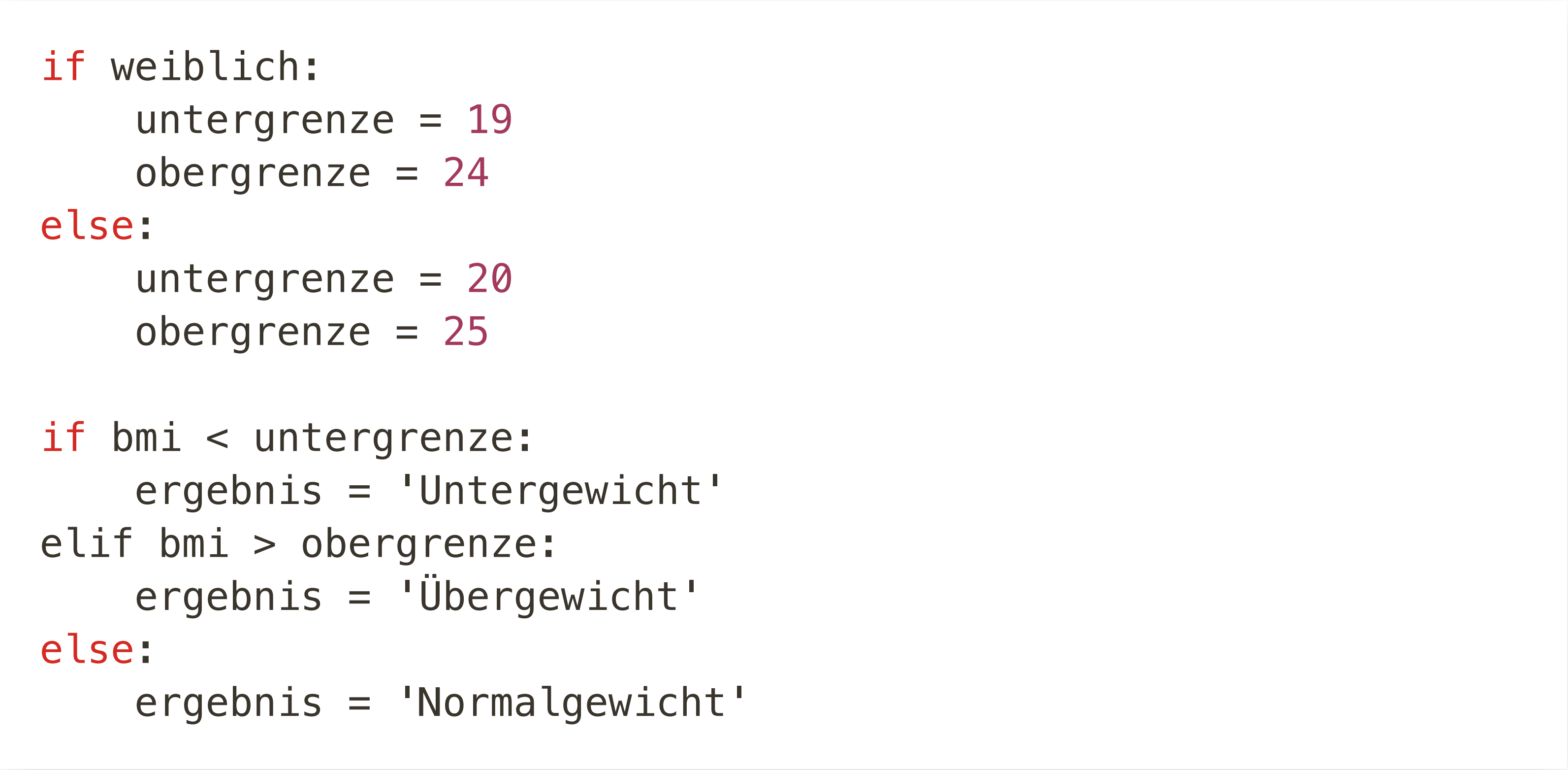
Bei einem Gewicht von {gewicht} auf eine Körpergröße von {groesse} haben Sie einen BMI Index von: {bmi} -> Unter/Normal/Über - Gewicht.

LÖSUNG



```
weiblich = input("Gib 1 für weiblich und 2 für männlich ein:
").strip()
weiblich = ('1' == weiblich)

gewicht = input("Gib dein Gewicht in kg an: ").strip()
gewicht = float(gewicht.replace(',', '.'))

groesse = input("Gib deine Größe in m ein: ").strip()
groesse = float(groesse.replace(',', '.'))

bmi = (gewicht / groesse**2)
```

LÖSUNG



```python
if weiblich:
    untergrenze = 19
    obergrenze = 24
else:
    untergrenze = 20
    obergrenze = 25

if bmi < untergrenze:
    ergebnis = 'Untergewicht'
elif bmi > obergrenze:
    ergebnis = 'Übergewicht'
else:
    ergebnis = 'Normalgewicht'
```

LÖSUNG

```python
print(
    f"Bei einem Gewicht von {gewicht} auf eine Körpergröße von
{groesse} haben "
    f"Sie einen BMI Index von: {bmi} -> {ergebnis}."
)
```

AUFGABE

Write a Python program to calculate the price for a hairdresser visit.

- Use ***input*** to ask the user for all necessary information.

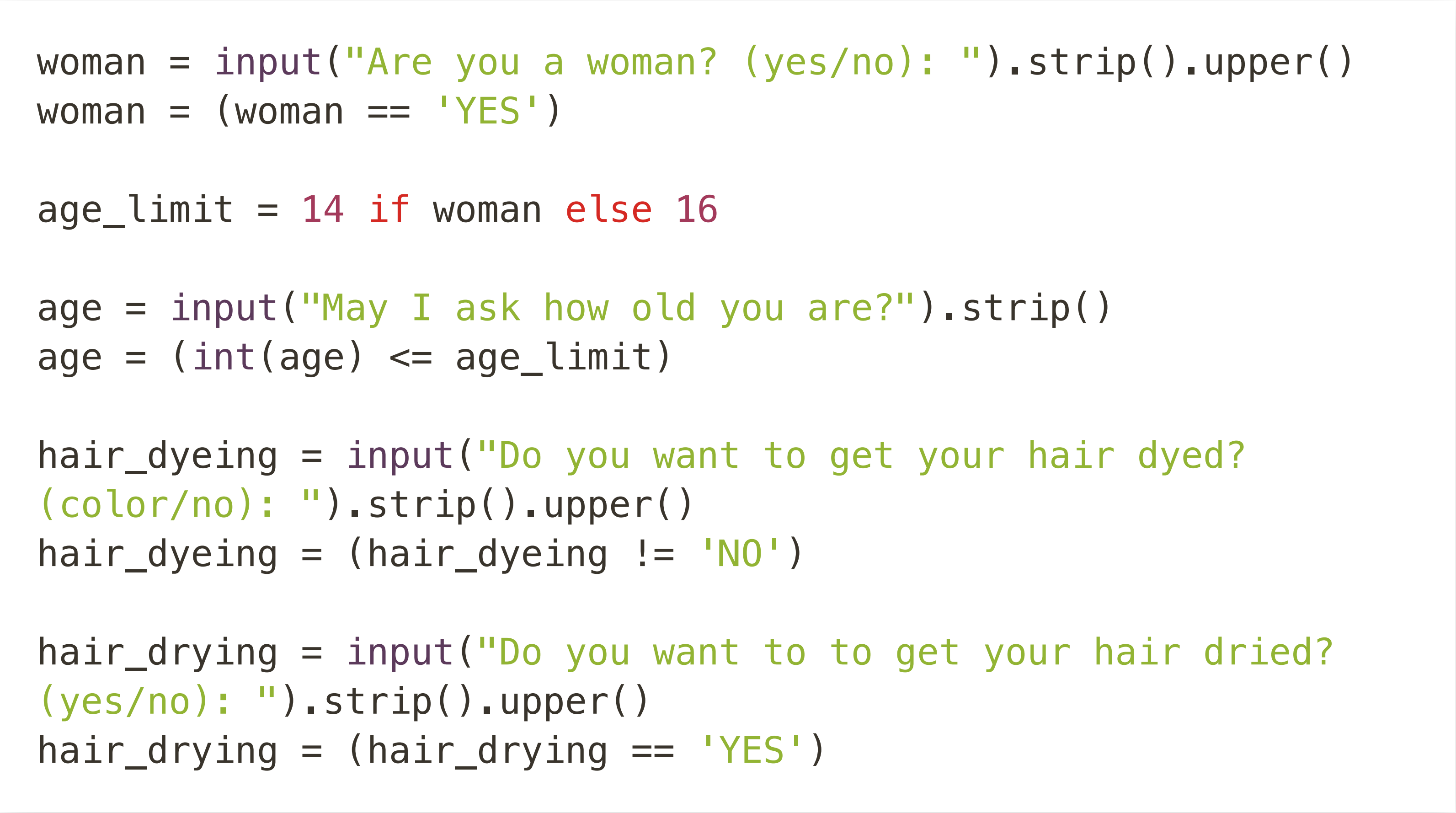
The base price depends on gender and age:

- Haircut for men at the age of 14 and under: 10€
- Haircut for men over 14: 15€
- Haircut for women at the age of 16 and under: 12€
- Haircut for women over 16: 20€

Additional services:

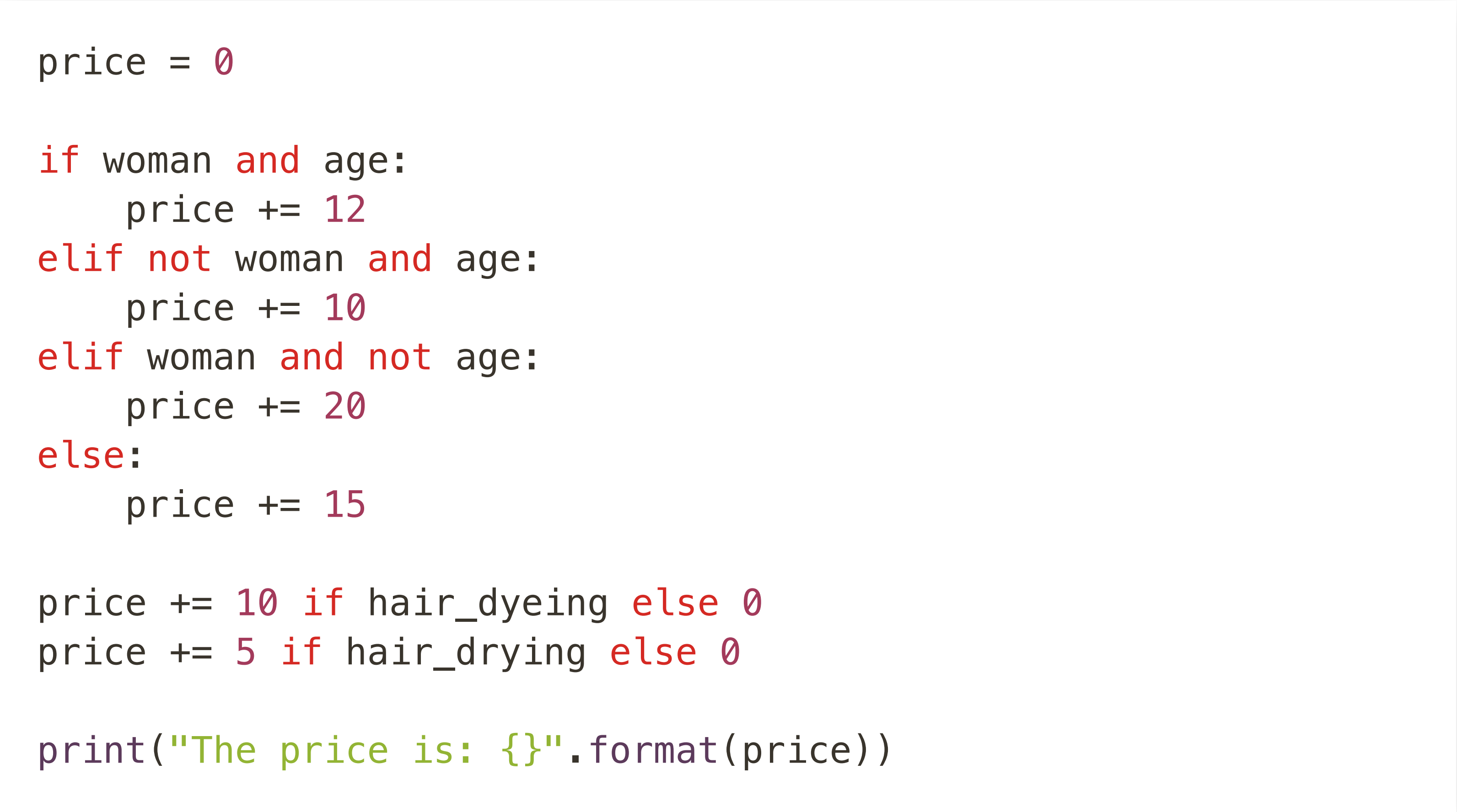
- Dyeing hair: 10€
- Hair drying: 5€

LÖSUNG



```
woman = input("Are you a woman? (yes/no): ").strip().upper()
woman = (woman == 'YES')

age_limit = 14 if woman else 16

age = input("May I ask how old you are?").strip()
age = (int(age) <= age_limit)

hair_dyeing = input("Do you want to get your hair dyed?
(color/no): ").strip().upper()
hair_dyeing = (hair_dyeing != 'NO')

hair_drying = input("Do you want to to get your hair dried?
(yes/no): ").strip().upper()
hair_drying = (hair_drying == 'YES')
```

LÖSUNG



```python
price = 0

if woman and age:
    price += 12
elif not woman and age:
    price += 10
elif woman and not age:
    price += 20
else:
    price += 15

price += 10 if hair_dyeing else 0
price += 5 if hair_drying else 0

print("The price is: {}".format(price))
```