CSIT110

Fundamental Programming with Python

If-else

Goh X. Y.

In this lecture

- Indentation
- If-else
- Logical operators
- Arithmetic operators
- Assignment operators

Indentation

```
code
code
keyword_a statement_x:
····code          # 1 level of indentation
····code          # 1 level of indentation
····keyword_b statement_y:
········code        # 2 levels of indentation
········code        # 2 levels of indentation
········code      # 2 levels of indentation
····code          # 1 level of indentation
code            # 0 level of indentation
```

Legend
· is a whitespace

Indentation

```
code
code
keyword_a statement_x:
··code          # 1 level of indentation
··code          # 1 level of indentation
··keyword_b statement_y:
····code            # 2 levels of indentation
····code            # 2 levels of indentation
····code            # 2 levels of indentation
··code          # 1 level of indentation
code            # 0 level of indentation
```

Legend
· is a whitespace

Indentation

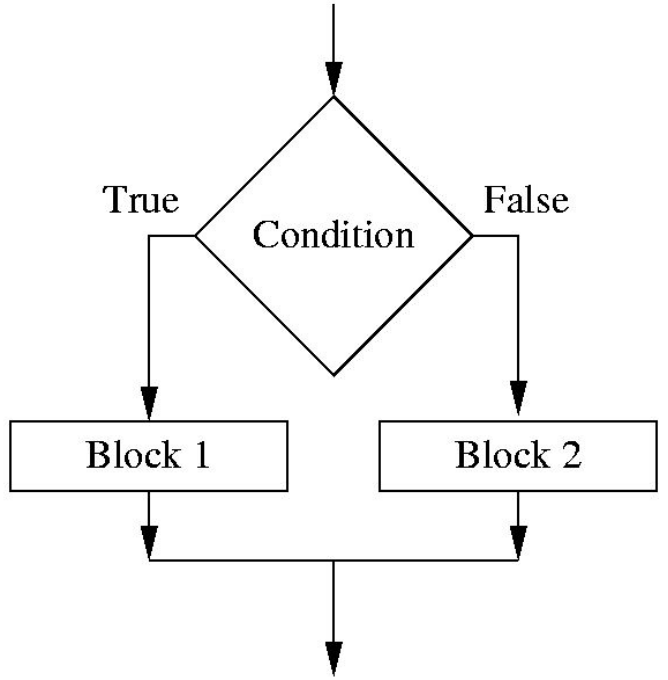
```
code
code
keyword_a statement_x:
-code          # 1 level of indentation
-code          # 1 level of indentation
-keyword_b statement_y:
--code         # 2 levels of indentation
--code         # 2 levels of indentation
--code         # 2 levels of indentation
--code         # 1 level of indentation
code           # 0 level of indentation
```

Legend
– is a Tab

if - else

How does it look like?

```
if (some condition):
    # block statements if condition
    # is True

else:
    # block statements if condition
    # is False
```



Syntax

```
if some condition:
··this is
··a block
··of codes
··that is indented
··by the same amount
··of spaces
else:
··usually
··we use 2, 3 or 4 spaces for
··indentation
```

1. if
2. condition
3. colon :
4. indentation

Syntax

```
if some condition:
··this is
··a block
··of codes
··that is indented
··by the same amount
··of spaces
else:
··usually
··we use 2, 3 or 4 spaces for
··indentation
```

1. if
2. condition
3. colon :
4. indentation

In Python, all the continuous lines indented with same number of spaces form a **block**.

All statements within the block **must be indented the same amount**.

We usually use 2, 3 or 4 spaces for indentation.

Common Mistakes

Forget the colon :

```
if some condition:
    this is
    a block
    of codes
    that is indented
    by the same amount
    of spaces
else:
    usually
    we use 2, 3 or 4 spaces for
    indentation
```

What happens when there is no indent:

```
    ^
IndentationError: expected an indented block
>
```

Wrong indentation,
mix-up between spaces and tabs
mix-up number of spaces

Make your choice of indentation and use it consistently!

If - else – Example 1

Number of items	Cost
1-50	$3 per item Postage: $10
More than 50	$2 per item Postage: free

If - else – Example 1

Number of items	Cost
1-50	$3 per item Postage: $10
More than 50	$2 per item Postage: free

If the user buys 10 items:

```
Item cost = $3 x 10 = $30
Postage: $10

Total cost: $40
```

If - else – Example 1

Number of items	Cost
1-50	$3 per item Postage: $10
More than 50	$2 per item Postage: free

If the user buys 100 items:

```
Item cost = $2 x 100 = $200
Postage: free

Total cost: $200
```

If - else – Example 1

```
# get the number of items from the user



# calculate the cost
```

If - else – Example 1

```
# get the number of items from the user

item_input = input("Enter the quantity: ")
item_count = int(item_input)

# calculate the cost

if item_count <= 50:
    
    

else:
    
    
```

If - else – Example 1

```
# get the number of items from the user

item_input = input("Enter the quantity: ")
item_count = int(item_input)

# calculate the cost

if item_count <= 50:
    unit_price = 3
    postage = 10
    total_cost = unit_price * item_count + postage
    print(f"Total cost: ${total_cost}")

else:
```

If - else – Example 1

```
# get the number of items from the user

item_input = input("Enter the quantity: ")
item_count = int(item_input)

# calculate the cost

if item_count <= 50:
    unit_price = 3
    postage = 10
    total_cost = unit_price * item_count + postage
    print(f"Total cost: ${total_cost}")
else:
    unit_price = 2
    total_cost = unit_price * item_count

    print("Total cost: ${total_cost}")
```

if - elif - elif - … - else

if - elif - elif - … - else

```
if condition1:
    # condition1 is true
    statement
    statement
    ...
elif condition2:
    # condition1 is false and condition2 is true
    statement
    statement
    ...
elif condition3:
    # condition1 is false, condition2 is false, and condition3 is true
    statement
    statement
    ...
else:
    # all the conditions are false
    statement
    statement
    ...
```

Example 2

Number of items	Cost
1-50	$3 per item Postage: Standard post: $10 Registered post: $15 Express post: $20
More than 50	$2 per item Postage: Standard post: free Registered post: $15 Express post: $20

10 items + Registered Post

```
Item cost = $3 x 10 = $30
Postage: $15
Total cost: $45
```

Example 2

Number of items	Cost
1-50	$3 per item Postage: Standard post: $10 Registered post: $15 Express post: $20
More than 50	$2 per item Postage: Standard post: free Registered post: $15 Express post: $20

100 items + Registered Post

```
Item cost = $2 x 100 = $200
Postage: $15
Total cost: $215
```

Example 2

Number of items	Cost
1-50	$3 per item Postage: Standard post: $10 Registered post: $15 Express post: $20
More than 50	$2 per item Postage: Standard post: free Registered post: $15 Express post: $20

100 items + Standard Post

```
Item cost = $2 x 100 = $200
Postage: free
Total cost: $200
```

Example 2

```
# get the number of items from the user


# get the shipping method Standard/Registered/Express?

# calculate the cost
```

Example 2

```
# get the number of items from the user
item_input = input("Enter the quantity: ")
item_count = int(item_input)

# get the shipping method Standard/Registered/Express?
shipping = input("Shipping method (s/r/e): ")

# calculate the cost
```

Example 2

```
## calculate the cost

# determine the unit price




# determine the postage




# determine the total cost


```

Example 2

```
# determine the unit price

if (item_count <= 50):
    unit_price = 3

else:
    unit_price = 2
```

Example 2

```
# determine the postage
if (shipping == "s"):
    # standard


elif (shipping == "r"):
    # registered post $15
    postage = 15
else:
    # express post $20
    postage = 20
```

Example 2

```
# determine the postage
if (shipping == "s"):
    # standard post $10 for 1-50 items, free for > 50 items
    if (item_count <= 50):
        postage = 10
    else:
        postage = 0

elif (shipping == "r"):
    # registered post $15
    postage = 15
else:
    # express post $20
    postage = 20
```

Example 2

```
# determine the postage
if (shipping == "s"):
    # standard post $10 for 1-50 items, free for > 50 items
    if (item_count <= 50):
        postage = 10
    else:
        postage = 0

elif (shipping == "r"):
    # registered post $15
    postage = 15
else:
    # express post $20
    postage = 20
```

Example 2

```
# determine the postage
if (shipping == "s"):
    # standard post $10 for 1-50 items, free for > 50 items
    if (item_count <= 50):
        postage = 10
    else:
        postage = 0

elif (shipping == "r"):
    # registered post $15
    postage = 15
else:
    # express post $20
    postage = 20
```

Example 2

```
# determine the total cost


total_cost = unit_price * item_count + postage


print(f"Total cost: ${total_cost}")
```

Example 2 all together

```
# Get number of items from user
item_input = input("Enter the quantity: ")
item_count = int(item_input)

# Get shipping method - Standard/Registered/Express?
shipping = input("Shipping method (s/r/e): ")

# Determine unit price
if (item_count <= 50):
    unit_price = 3
else:
    unit_price = 2

# Determine postage
if (shipping == "s"):
    # standard post $10 for 1-50 items, free for > 50 items
    if (item_count <= 50):
        postage = 10
    else:
        postage = 0
elif (shipping == "r"):   # registered post $15
    postage = 15
else:                     # express post $20
    postage = 20

# calculate total cost
total_cost = unit_price * item_count + postage
print(f"Total cost: ${total_cost}")
```

Example 3

```
# grade A: 100-80, B: 79-60, C: 59-40, D: 39-0

# ask user to enter the mark


# determine the grade based on mark


# display the mark and grade
```

Example 3

```
# grade A: 100-80, B: 79-60, C: 59-40, D: 39-0

# ask user to enter the mark

mark_input = input("Please enter mark: ")
mark = int(mark_input)

# determine the grade based on mark


# display the mark and grade
```

Example 3

```
# grade A: 100-80, B: 79-60, C: 59-40, D: 39-0

# determine the grade based on mark


if (mark >= 80):
    grade = "A"
elif (mark >= 60):
    grade = "B"
elif (mark >= 40):
    grade = "C"
else:
    grade = "D"
```

Example 3

```
# display the mark and grade

print(f"Mark {mark}, Grade {grade}")
```

Example 3

```
# grade A: 100-80, B: 79-60, C: 59-40, D: 39-0

mark_input = input("Please enter mark: ")
mark = int(mark_input)
if (mark >= 80):
    grade = "A"
elif (mark >= 60):
    grade = "B"
elif (mark >= 40):
    grade = "C"
else:
    grade = "D"
print(f"Mark {mark}, Grade {grade}")
```

mark is greater than or equal to 80

```
Please enter mark: 90
Mark 90, Grade A
```

Example 3

```
# grade A: 100-80, B: 79-60, C: 59-40, D: 39-0

mark_input = input("Please enter mark: ")
mark = int(mark_input)
if (mark >= 80):
    grade = "A"
elif (mark >= 60):
    grade = "B"
elif (mark >= 40):
    grade = "C"
else:
    grade = "D"
print(f"Mark {mark}, Grade {grade}")
```

mark is less than 80 but greater than or equal to 60

```
Please enter mark: 62
Mark 62, Grade B
```

Example 3

```
# grade A: 100-80, B: 79-60, C: 59-40, D: 39-0

mark_input = input("Please enter mark: ")
mark = int(mark_input)
if (mark >= 80):
    grade = "A"
elif (mark >= 60):
    grade = "B"
elif (mark >= 40):
    grade = "C"
else:
    grade = "D"
print(f"Mark {mark}, Grade {grade}")
```

mark is less than 60 but greater than or equal to 40

```
Please enter mark: 45
Mark 45, Grade C
```

Example 3

```
# grade A: 100-80, B: 79-60, C: 59-40, D: 39-0

mark_input = input("Please enter mark: ")
mark = int(mark_input)
if (mark >= 80):
    grade = "A"
elif (mark >= 60):
    grade = "B"
elif (mark >= 40):
    grade = "C"
else:
    grade = "D"
print(f"Mark {mark}, Grade {grade}")
```

mark is less than 40

```
Please enter mark: 15
Mark 15, Grade D
```

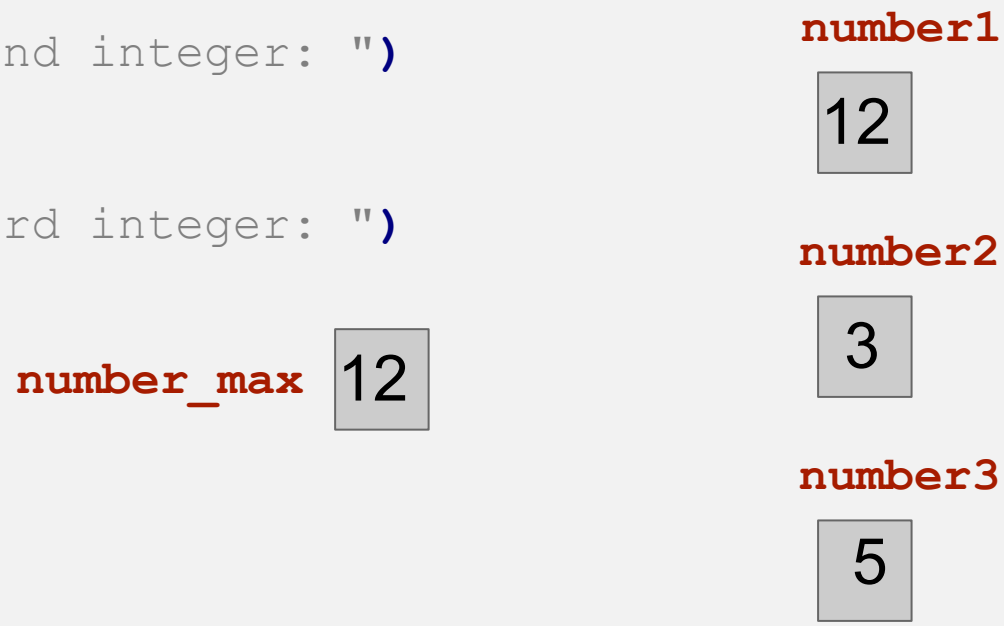
if (alone)

```
if (some condition):
  statements
  ...
```

```
user_input = input("Enter the 1st integer: ")
number1 = int(user_input)

user_input = input("Enter the 2nd integer: ")
number2 = int(user_input)

user_input = input("Enter the 3rd integer: ")
number3 = int(user_input)

number_max = number1
if (number2 > number_max):
    number_max = number2
if (number3 > number_max):
    number_max = number3

print(f"Max of {number1}, {number2}, {number3} is {number_max}")
```

What is this program trying to do?

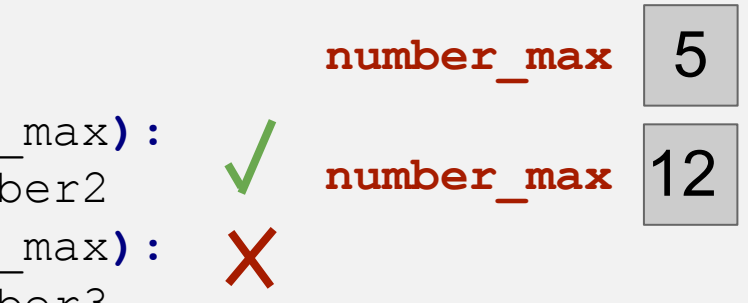
```
user_input = input("Enter the 1st integer: ")
number1 = int(user_input)

user_input = input("Enter the 2nd integer: ")
number2 = int(user_input)

user_input = input("Enter the 3rd integer: ")
number3 = int(user_input)

number_max = number1
if (number2 > number_max):
    number_max = number2
if (number3 > number_max):
    number_max = number3

print(f"Max of {number1}, {number2}, {number3} is {number_max}")
```

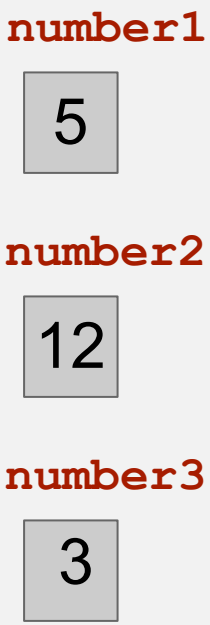


scenario 1

```
Enter the 1st integer: 12
Enter the 2nd integer: 3
Enter the 3rd integer: 5
Max of 12, 3, 5 is 12
```

```
user_input = input("Enter the 1st integer: ")
number1 = int(user_input)

user_input = input("Enter the 2nd integer: ")
number2 = int(user_input)

user_input = input("Enter the 3rd integer: ")
number3 = int(user_input)

number_max = number1
if (number2 > number_max):
    number_max = number2
if (number3 > number_max):
    number_max = number3

print(f"Max of {number1}, {number2}, {number3} is {number_max}")
```

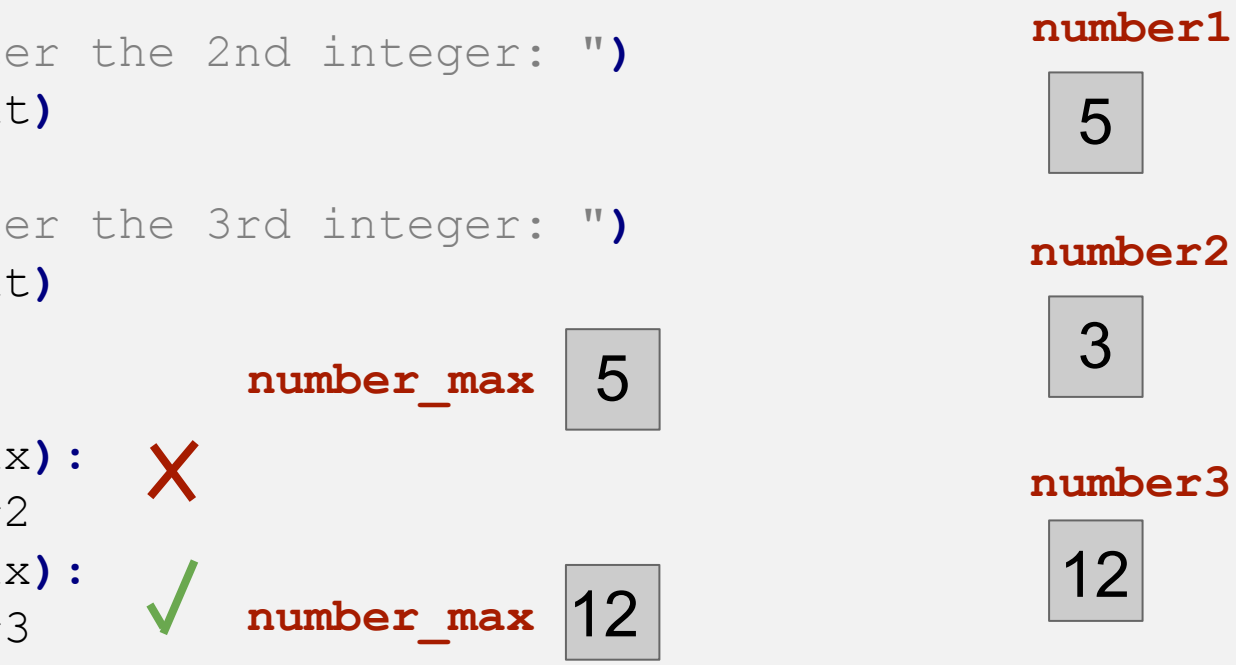




scenario 2

```
Enter the 1st integer: 5
Enter the 2nd integer: 12
Enter the 3rd integer: 3
Max of 5, 12, 3 is 12
```

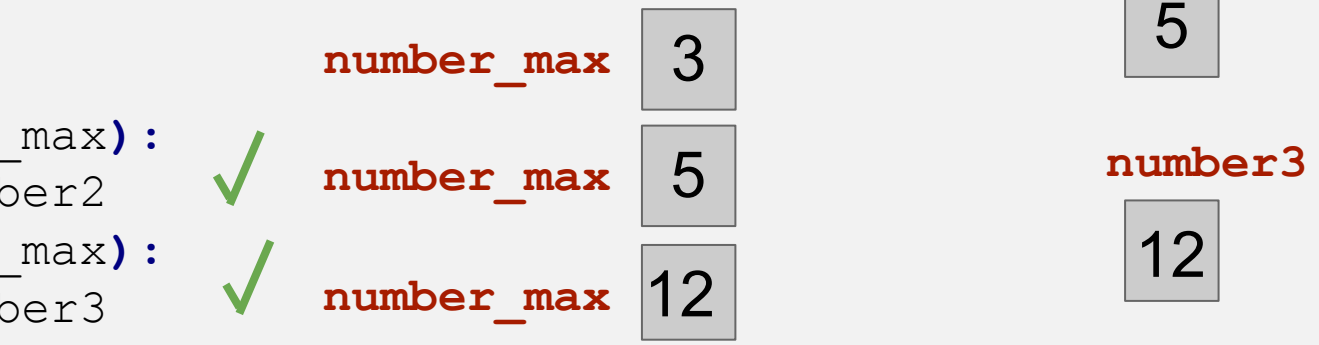
```
user_input = input("Enter the 1st integer: ")
number1 = int(user_input)

user_input = input("Enter the 2nd integer: ")
number2 = int(user_input)

user_input = input("Enter the 3rd integer: ")
number3 = int(user_input)

number_max = number1
if (number2 > number_max):
    number_max = number2
if (number3 > number_max):
    number_max = number3

print(f"Max of {number1}, {number2}, {number3} is {number_max}")
```



scenario 3

```
Enter the 1st integer: 5
Enter the 2nd integer: 3
Enter the 3rd integer: 12
Max of 5, 3, 12 is 12
```

```
user_input = input("Enter the 1st integer: ")
number1 = int(user_input)

user_input = input("Enter the 2nd integer: ")
number2 = int(user_input)

user_input = input("Enter the 3rd integer: ")
number3 = int(user_input)

number_max = number1
if (number2 > number_max):
    number_max = number2
if (number3 > number_max):
    number_max = number3

print(f"Max of {number1}, {number2}, {number3} is {number_max}")
```



scenario 4

```
Enter the 1st integer: 3
Enter the 2nd integer: 5
Enter the 3rd integer: 12
Max of 3, 5, 12 is 12
```

if (alone)

Be very careful!

```
k = 3
if (k==0):
    x = "'x' is a new variable"
print(x)
```

```
Traceback (most recent call last):
  File "<stdin>", line 1, in <module>
NameError: name 'x' is not defined
```

Operators for comparisons

Equality

Remember the double equal sign ==

```
if (number1 == 5):
    # number1 is equal to 5
if (number1 == number2):
    # number1 is equal to number2
if (your_answer == "Y"):
    # your_answer is equal to "Y"
if (student_name == "John"):
    # student_name is equal to "John"
```

Inequality

```
if (number1 != 5):
    # number1 is not equal to 5
if (number1 != number2):
    # number1 is not equal to number2
if (your_answer != "Y"):
    # your_answer is not equal to "Y"
if (student_name != "John"):
    # student_name is not equal to "John"
```

Comparison

```
if (number1 < 5):
    # number1 is less than 5
if (number1 <= 5):
    # number1 is less than or equal to 5
if (number1 > 5):
    # number1 is greater than 5
if (number1 >= 5):
    # number1 is greater than or equal to 5
```

Logical AND

```
if ((number1 > 5) and (number1 < 10)):
    # number1 is greater than 5 AND less than 10
if ((age > 40) and (student_type == "Domestic")):
    # age is greater than 40 # AND student_type is equal
    to "Domestic"
```

Logical OR

```
if ((number1 < 1000) or (number1 > 5000)):
    # number1 is less than 1000 # OR greater than 5000
if ((student_type == "Exchange") or (student_type == "Domestic")):
    # student_type is equal to "Exchange" # OR is equal to "Domestic"
```

Logical Negation

```
if (not (number1 == 1000)):
    # number1 is not equal to 1000
```

Operator (other languages)	Operator (Python)
&&	and
||	or
!	not

Other types of operators

Arithmetic operators

Arithmetic operators

+	Addition	3 + 5 = 8 3 + 5.0 = 8.0 1.2 + 3.4 = 4.6
-	Subtraction	5 - 2 = 3 5 - 2.0 = 3.0 6.5 - 1.2 = 5.3
*	Multiplication	5 * 2 = 10 5 * 2.0 = 10.0 6.5 * 1.3 = 8.45

Arithmetic operators

/	Division	10/2 = 5.0 10/4 = 2.5 10/2.0 = 5.0 10.0/1.2 = 8.3333
//	Floor division	10//2 = 5 10//4 = 2 10//2.0 = 5.0 10.0//1.2 = 8.0

What is the difference between Division and Floor division?

Arithmetic operators

/	Division	10/2 = 5.0 10/4 = 2.5 10/2.0 = 5.0 10.0/1.2 = 8.3333
//	Floor division	10//2 = 5 10//4 = 2 10//2.0 = 5.0 10.0//1.2 = 8.0

Note that division of **two** integers give a decimal number

```
10/2 = 5.0
```

So if we want integer result, we should use Floor division

```
10//2 = 5
```

Arithmetic operators

**	Exponent	10**2 = 100
		10**4 = 10000
		1.1**2 = 1.21
		16**0.5 = 4.0
		36**0.5 = 6.0

16**0.5 square root of 16

Arithmetic operators

%	Modulus	15%2 = 1
		124%10 = 4
		28%2 = 0
		37%5 = 2
		-15%2 = 1

when `x` is an odd number: `x%2 = 1`
when `x` is an even number: `x%2 = 0`

to find the last digit of positive integers:

```
124%10 = 4
23%10 = 3
```

Other types of operators

Assignment operators

Assignment operators

```
 +=      x += 2 is the same as x = x + 2
 -=      x -= 2 is the same as x = x - 2
 *=      x *= 2 is the same as x = x * 2
 /=      x /= 2 is the same as x = x / 2
//=    x //= 2 is the same as x = x // 2
**=    x **= 2 is the same as x = x ** 2
 %=      x %= 2 is the same as x = x % 2
```

Problem solving example

A shop sells a product item for $10, but makes a discount that 3 items only cost $20. Write a program to ask the user to enter the number of items they want to buy. Then the program displays the cost.

How much does it cost for 7 items?

How much does it cost for 12 items?

How much does it cost for 14 items?

Any questions?