Conditional Execution

CT010-3-1 Python Programming

Topic & Structure of the lesson

Conditional structures in python

- One way decision
- Two way decision
- Multiway decision
- Nested decision
- Try and except block

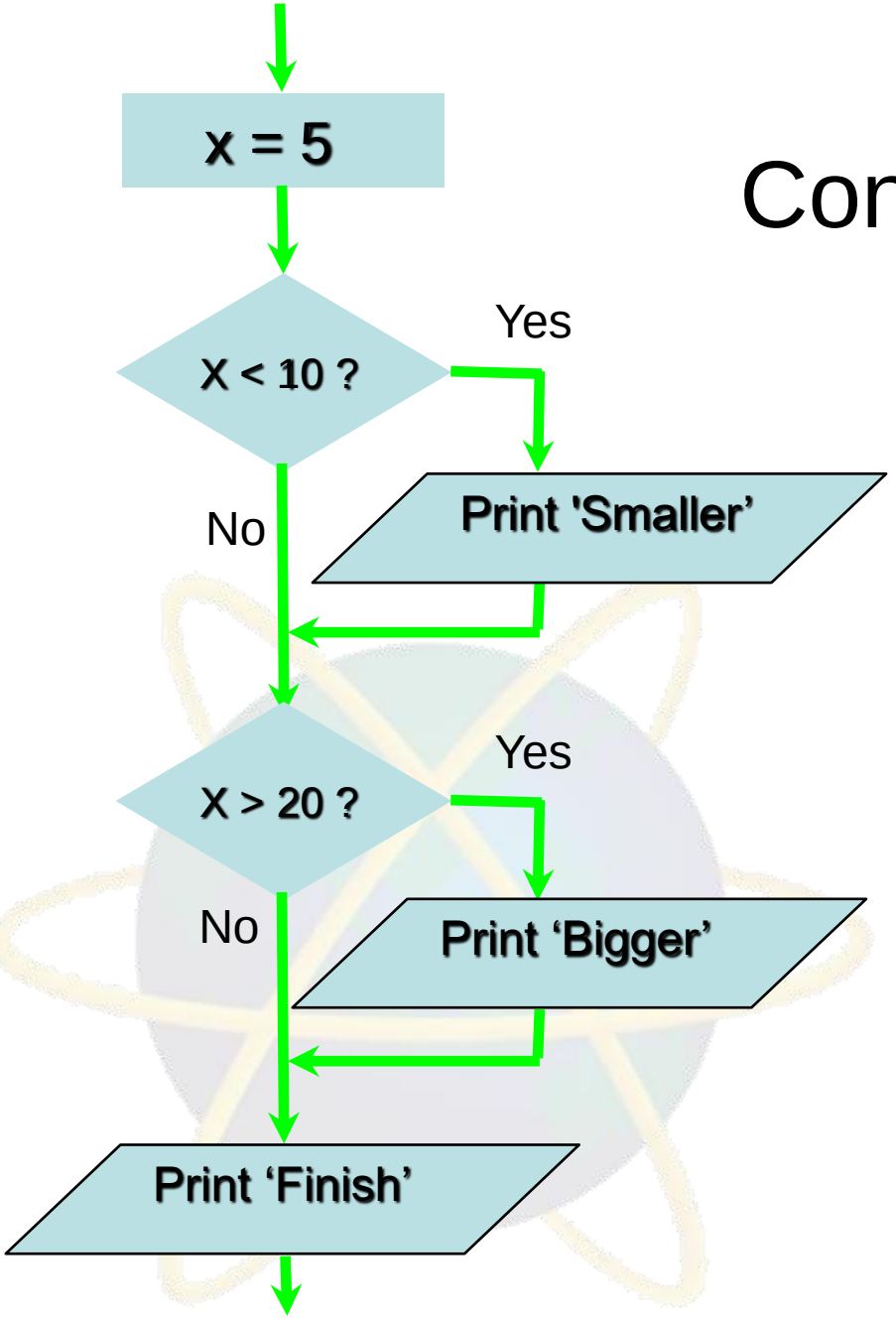
Learning outcomes

- At the end of this lecture you should be able to:
  - Develop a problem-based strategy for creating and applying programmed solutions
  - Create, edit, compile, run, debug and test programs using an appropriate development environment

Key terms you must be able to use

- If you have mastered this topic, you should be able to use the following terms correctly in your assignments and exams:
  - if – else
  - elif
  - try / except

Conditional Steps



Program:

```
x = 5
if x < 10:
   print('Smaller')

if x > 20:
     print('Bigger')

print('Finish')
```

Output:

```
Smaller
Finish
```

Comparison Operators

- Boolean expressions ask a question and produce a Yes or No result which we use to control program flow
- Boolean expressions using comparison operators evaluate to - True / False - Yes / No
- Comparison operators look at variables but do not change the variables

Python	Meaning
<	Less than
<=	Less than or Equal
==	Equal to
>=	Greater than or Equal
>	Greater than
!=	Not equal

Remember: "=" is used for assignment.

http://en.wikipedia.org/wiki/George_Boole

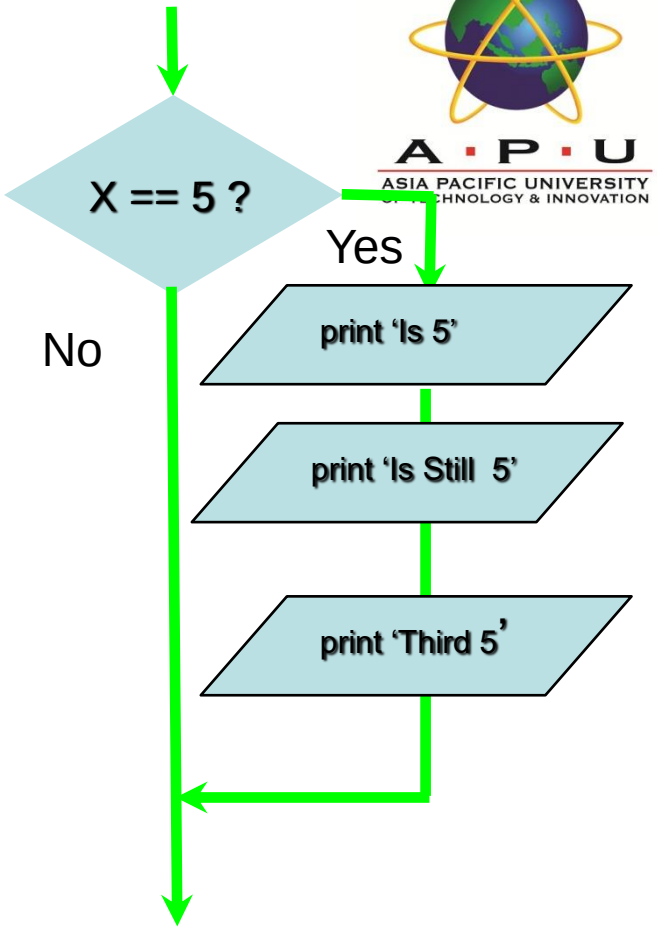
Comparison Operators

```
x = 5
if x == 5 :
    print('Equals 5')
if x > 4 :
   print ('Greater than 4')
if  x >= 5 :
    print('Greater than or Equal 5')
if x < 6 :
    print('Less than 6')
if x <= 5 :
    print('Less than or Equal 5')
if x != 6 :
    print('Not equal 6')
```

```
Equals 5
Greater than 4
Greater than or Equal 5
Less than 6
Less than or Equal 5
Not equal 6
```

```
x = 5
print('Before 5')
if  x == 5 :
    print('Is 5')
    print('Is Still 5')
    print('Third 5')
print('Afterwards 5')
print('Before 6')
if x == 6 :
    print('Is 6')
    print('Is Still 6')
    print('Third 6')
print('Afterwards 6')
```

```
Before 5
Is 5
Is Still 5
Third 5
Afterwards 5
Before 6
Afterwards 6
```



One-Way Decisions

Indentation

- Increase indent after an if statement or for statement (after :)
- **Maintain indent to indicate the scope of the block (which lines are affected by the if/for)**
- Reduce indent to *back to* the level of the if statement or for statement to indicate the end of the block
- Blank lines are ignored - they do not affect indentation
- Comments on a line by themselves are ignored w.r.t. indentation

increase / maintain after if or for
decrease to indicate end of block
blank lines and comment lines ignored

```
x = 5
if x > 2 :
    print ('Bigger than 2‘)
    print ('Still bigger‘)
print ('Done with 2‘)

for i in range(5) :
    print(i)
    if i > 2 :
        print('Bigger than 2‘)
    print('Done with i', i)
```

```
x = 5
if x > 2 :
# comments

    print('Bigger than 2‘)
        # doesn’t matter
    print( 'Still bigger‘)
# but can confuse you

print('Done with 2‘)
    # if you don’t line
        # them up
```

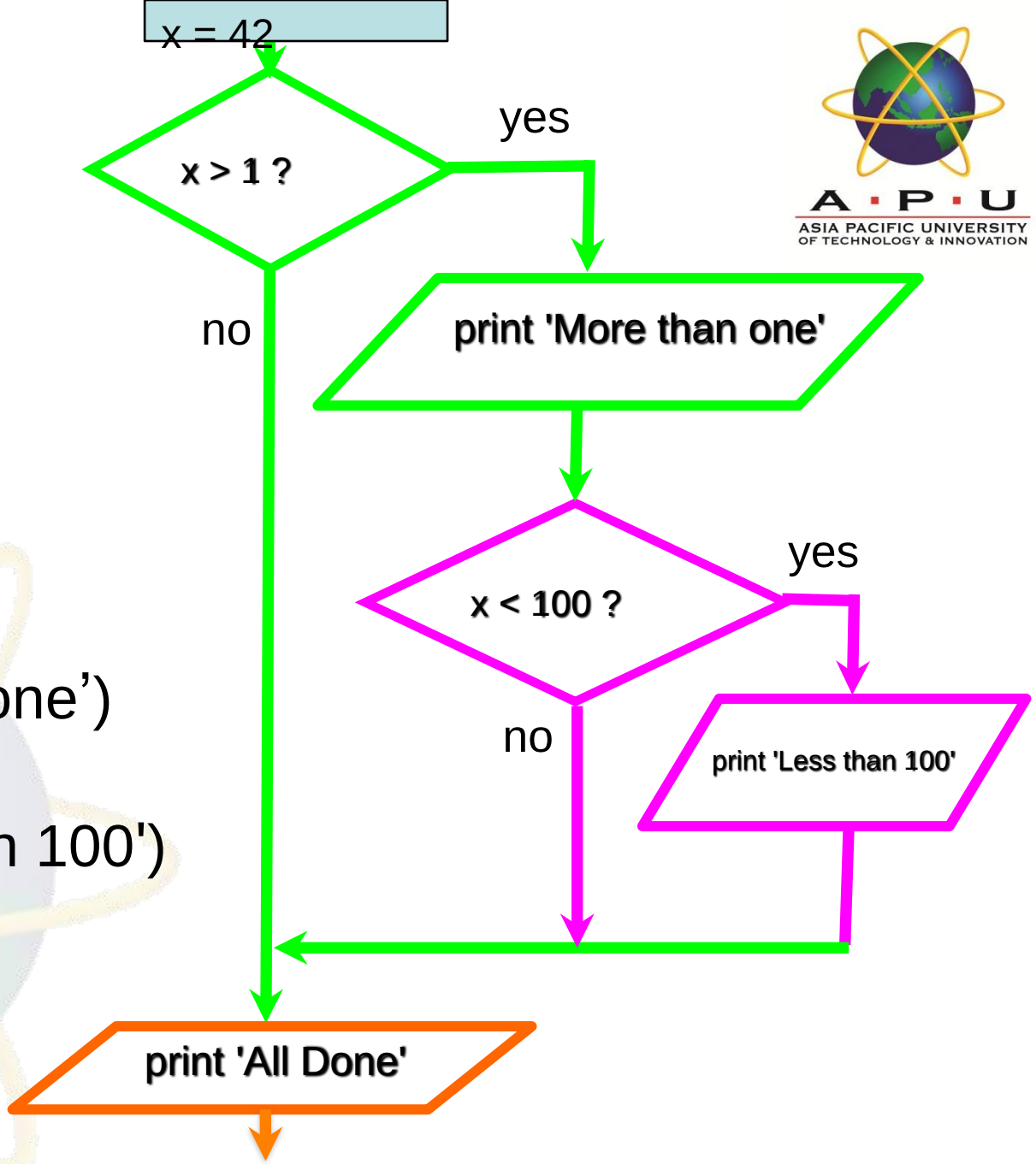
Mental begin/end squares

```
x = 5
if x > 2 :
    print ('Bigger than 2')
    print ('Still bigger')
print ('Done with 2')

for i in range(5) :
    print (i)
    if i > 2 :
        print ('Bigger than 2')
    print ('Done with i', i)
```

```
x = 5
if x > 2 :
# comments

    print ('Bigger than 2')
        # doesn't matter
    print ('Still bigger')
# but can confuse you

print ('Done with 2')
    # if you don't line
        # them up
```

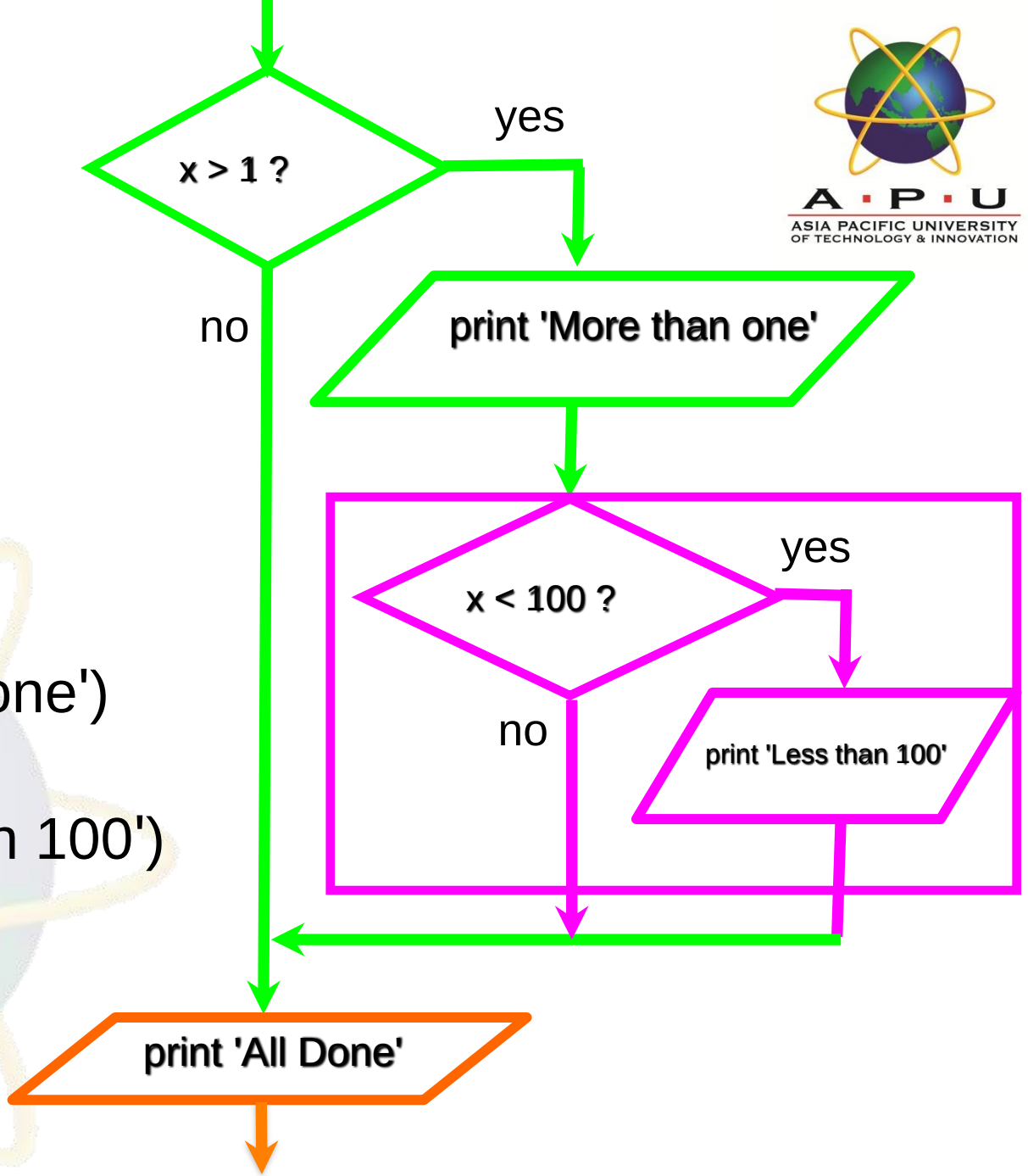
Nested Decisions

```
x = 42

if x > 1 :
    print ('More than one')
    if x < 100 :
        print ('Less than 100')

print ('All Done')
```



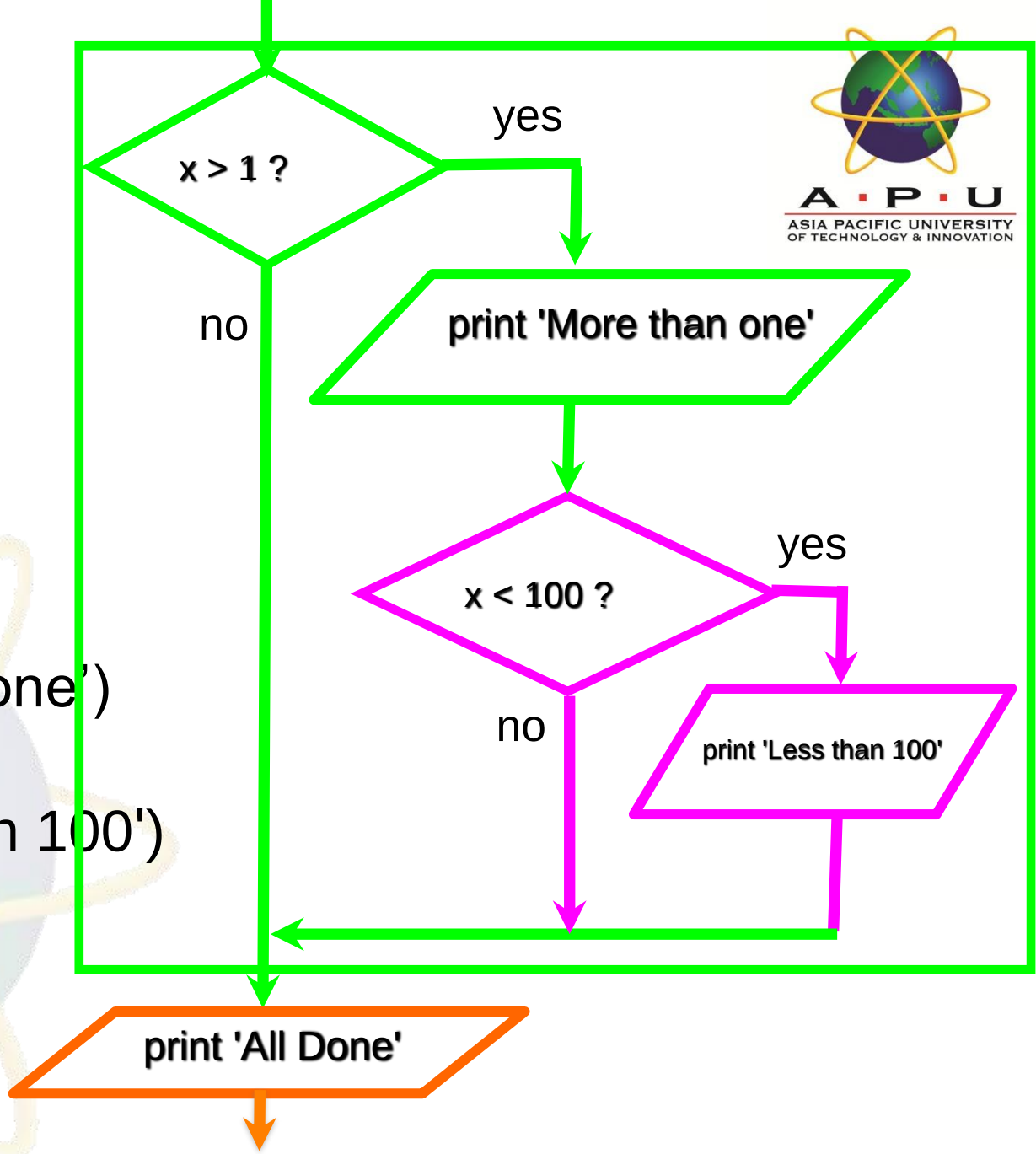
Nested Decisions

```
x = 42

if x > 1 :
    print ('More than one')
    if x < 100 :
        print ('Less than 100')

print ('All Done')
```



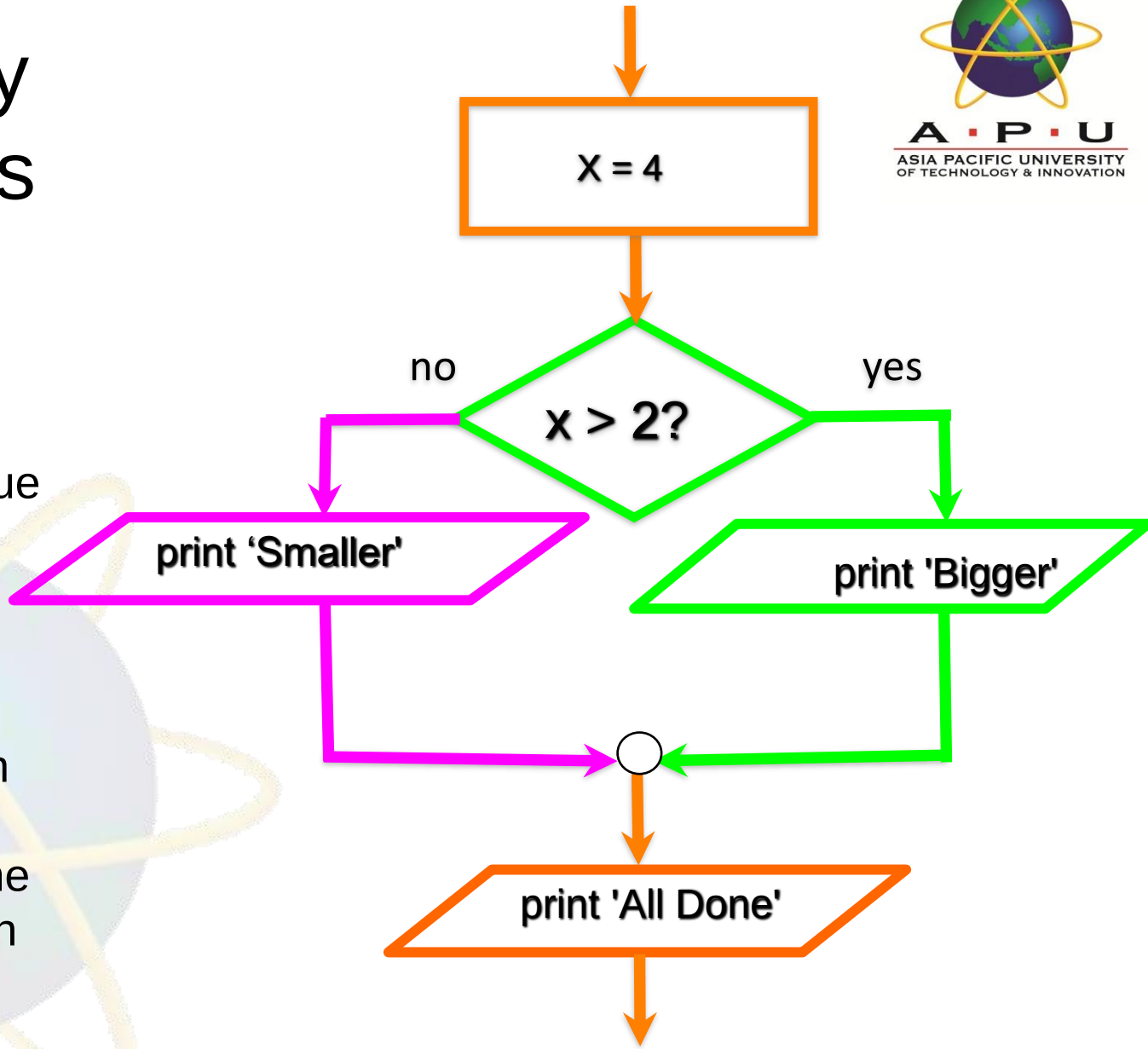
Nested Decisions

```
x = 42

if x > 1 :
    print ('More than one')
    if x < 100 :
        print ('Less than 100')

print ('All Done')
```



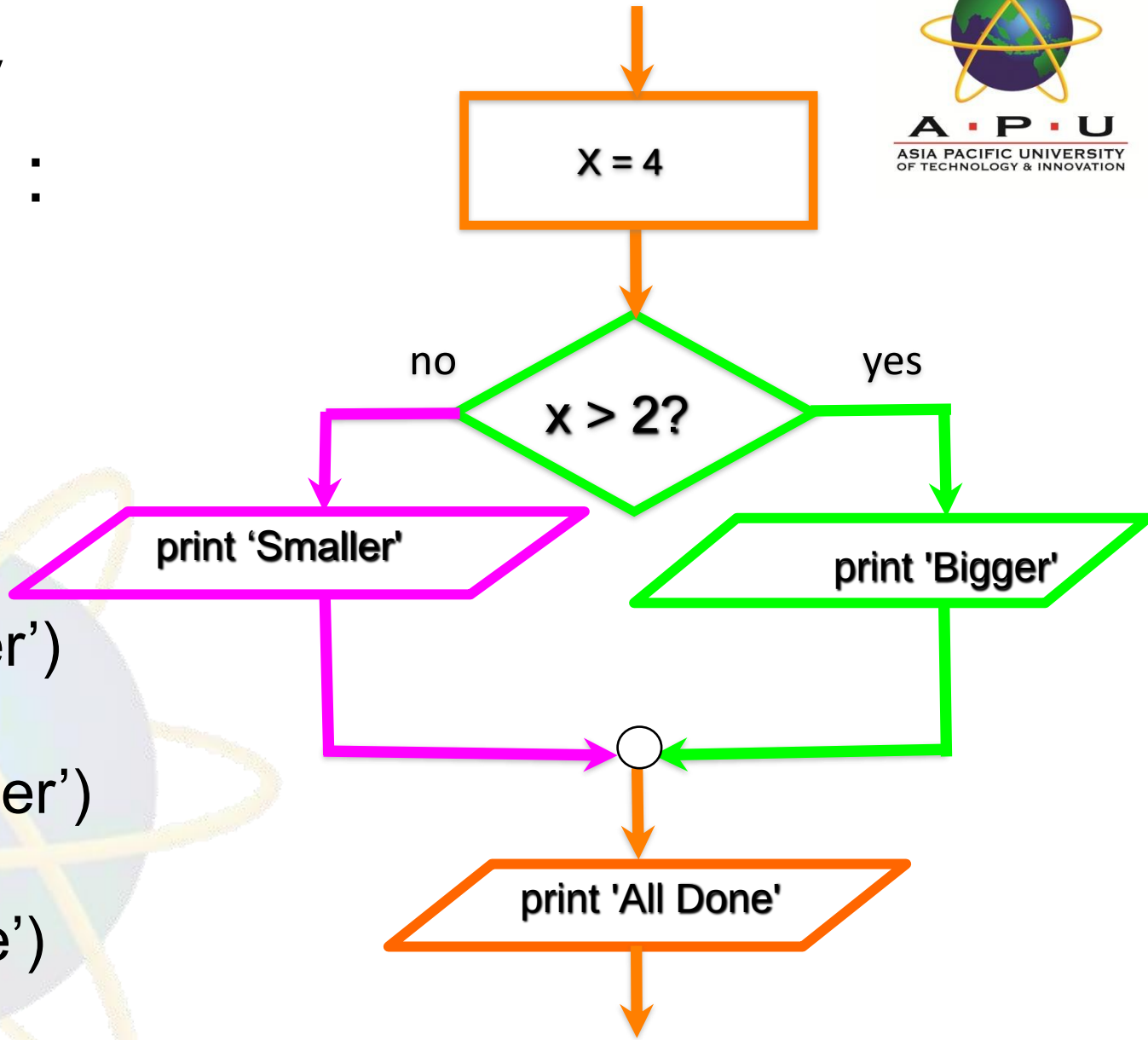
Two Way Decisions

- Sometimes we want to do one thing if a logical expression is true and something else if the expression is false
- It is like a fork in the road - we must choose one or the other path but not both



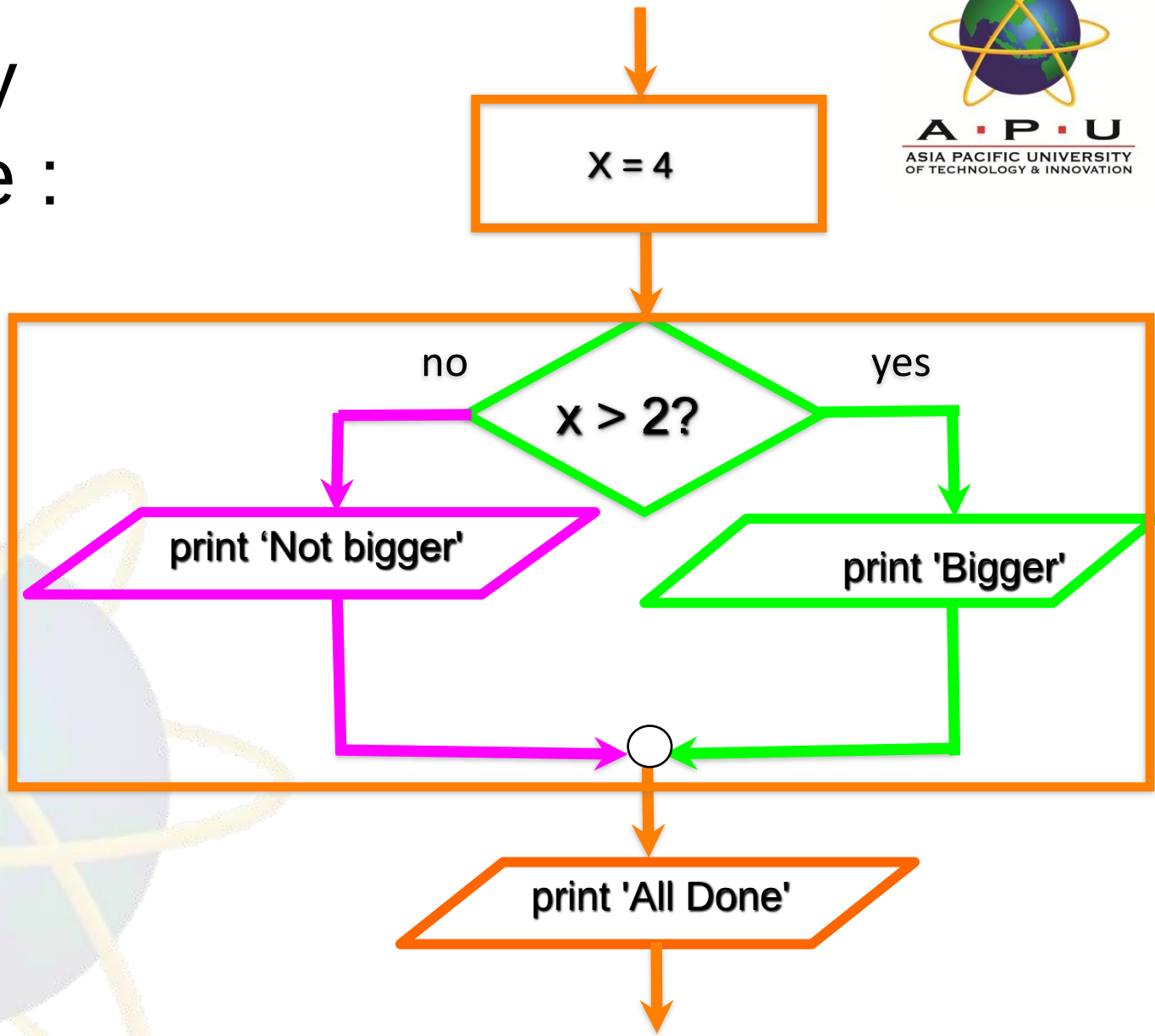
Two-way using else :

```
x = 4

if x > 2 :
    print ('Bigger')
else :
    print ('Smaller')

print ('All Done')
```



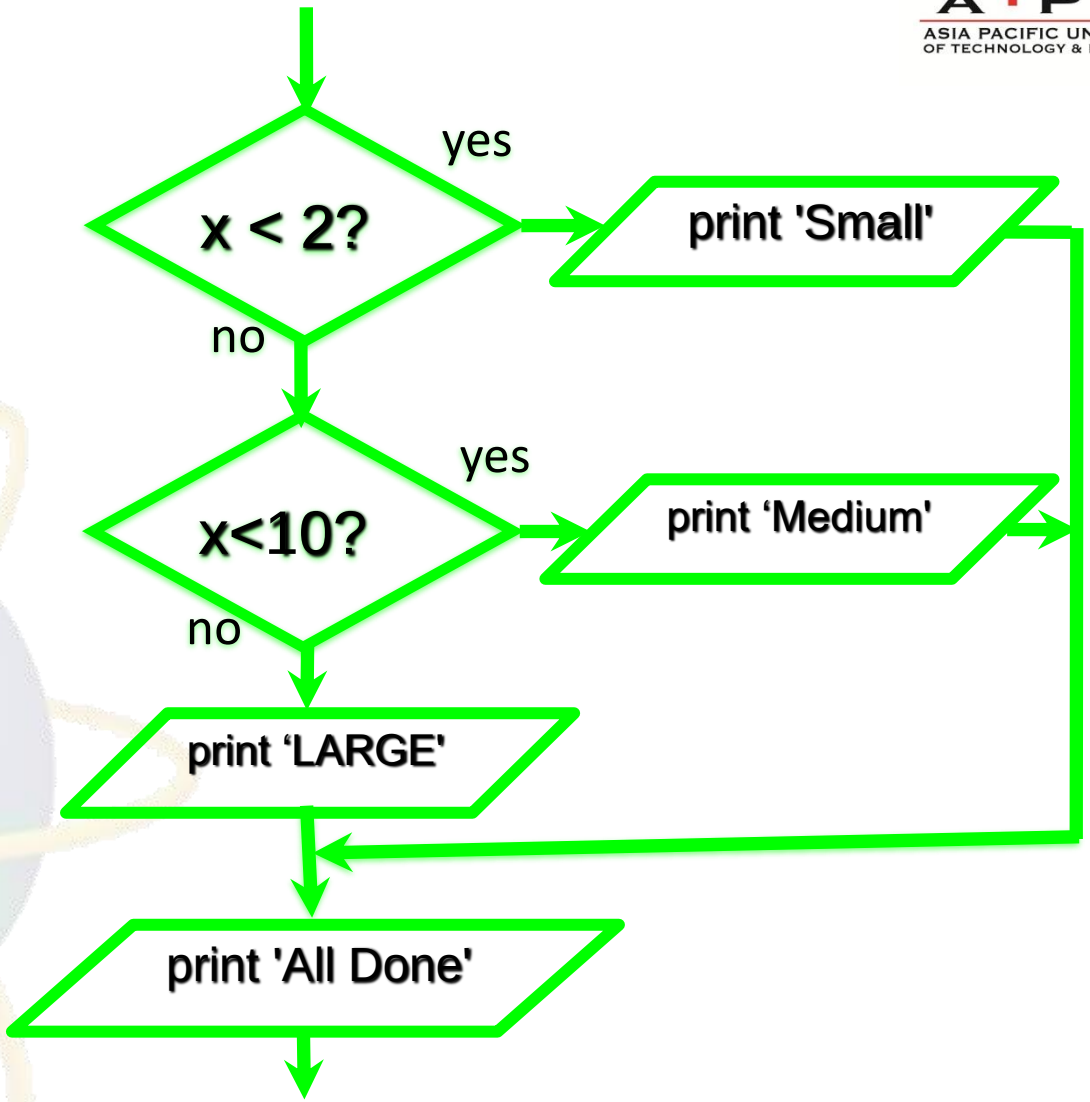
Two-way using else :

```
x = 4

if x > 2 :
    print ('Bigger')
else :
    print ('Smaller')

print ('All Done')
```



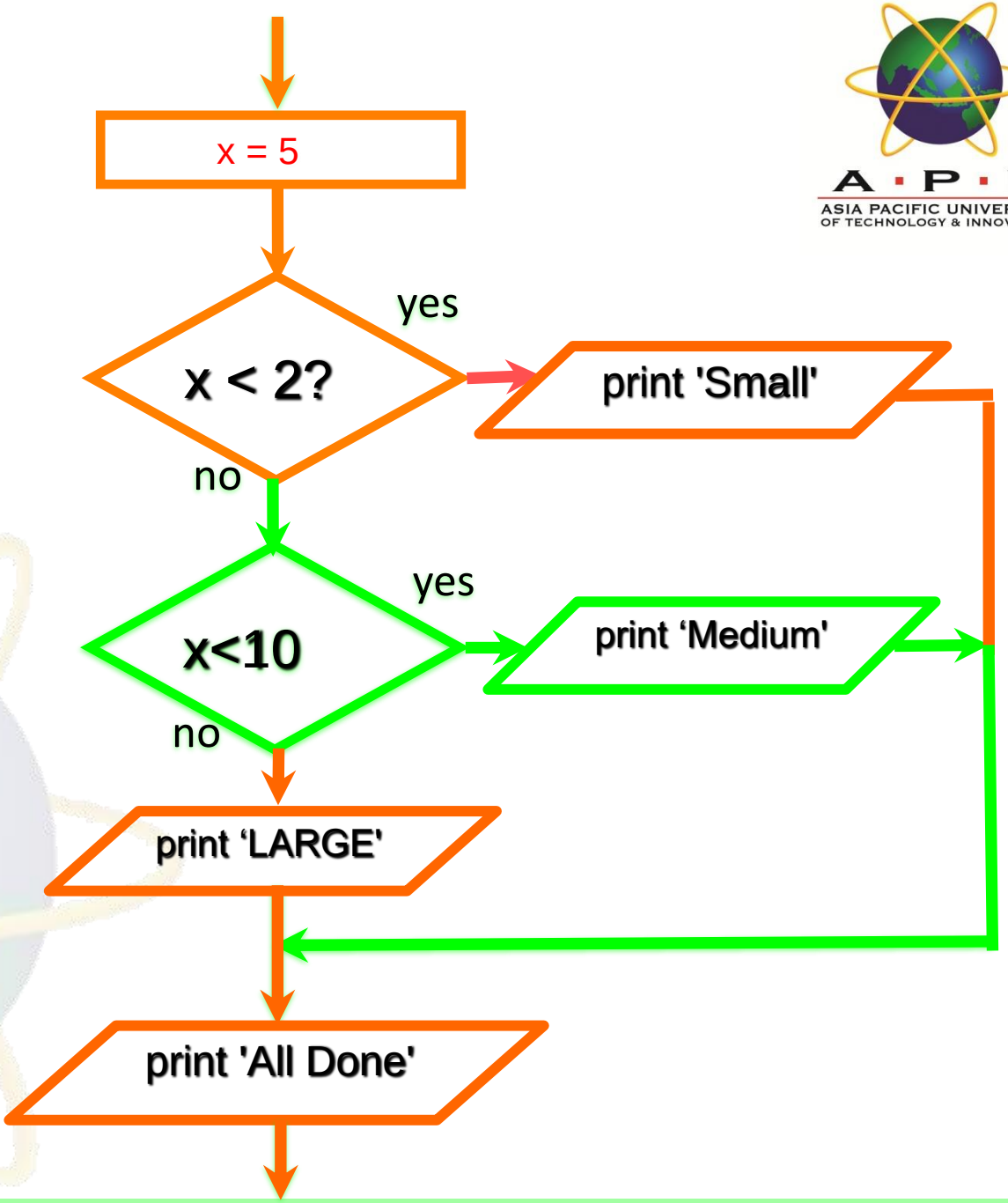
Multi-way

```
x = 10
if x < 2 :
    print ('Small')
elif x < 10 :
    print ('Medium')
else :
    print ('LARGE')
print ('All Done')
```



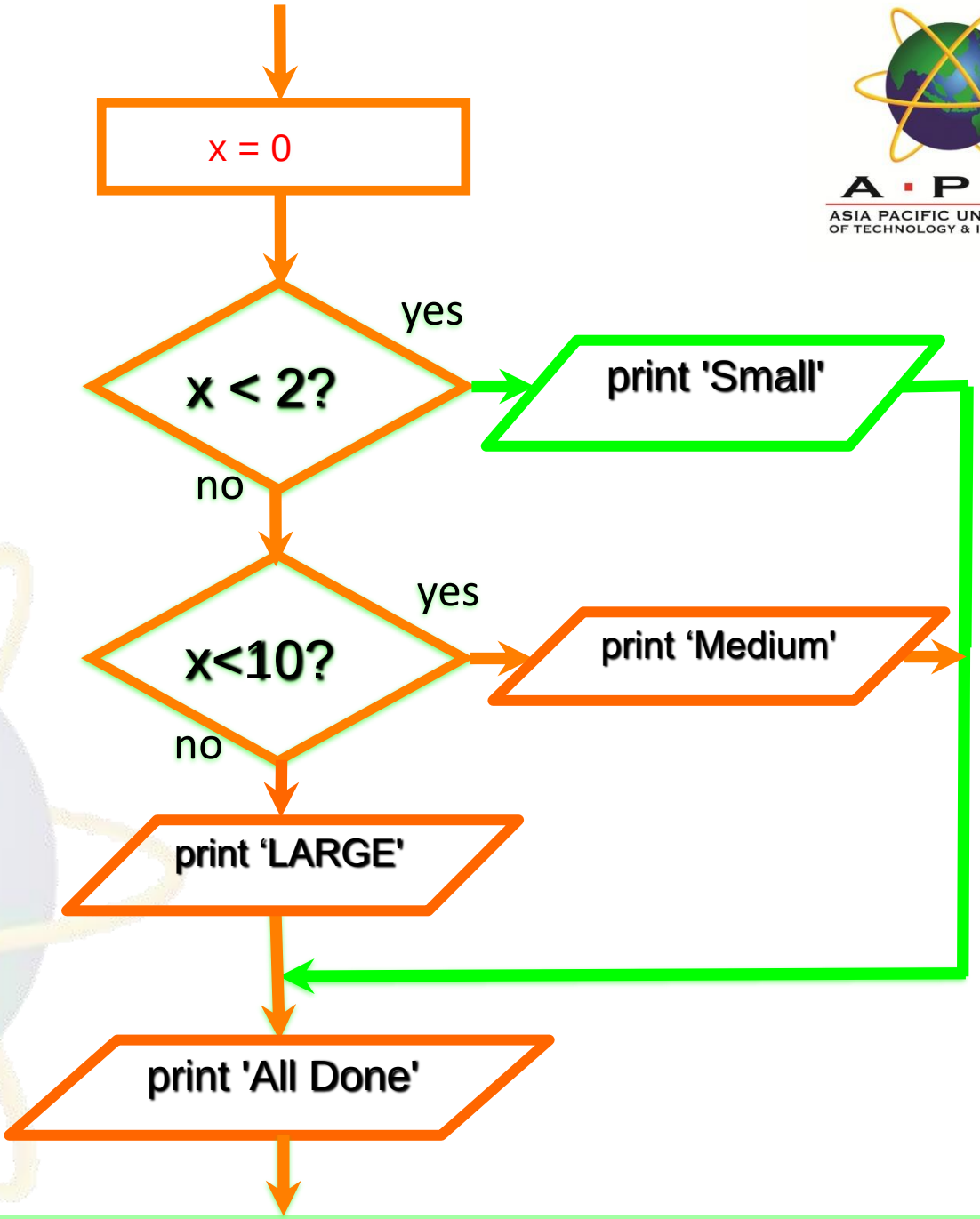
Multi-way

```
x=5
if x < 2 :
    print ('Small')
elif x < 10 :
    print ('Medium')
else :
    print ('LARGE')
print ('All Done')
```



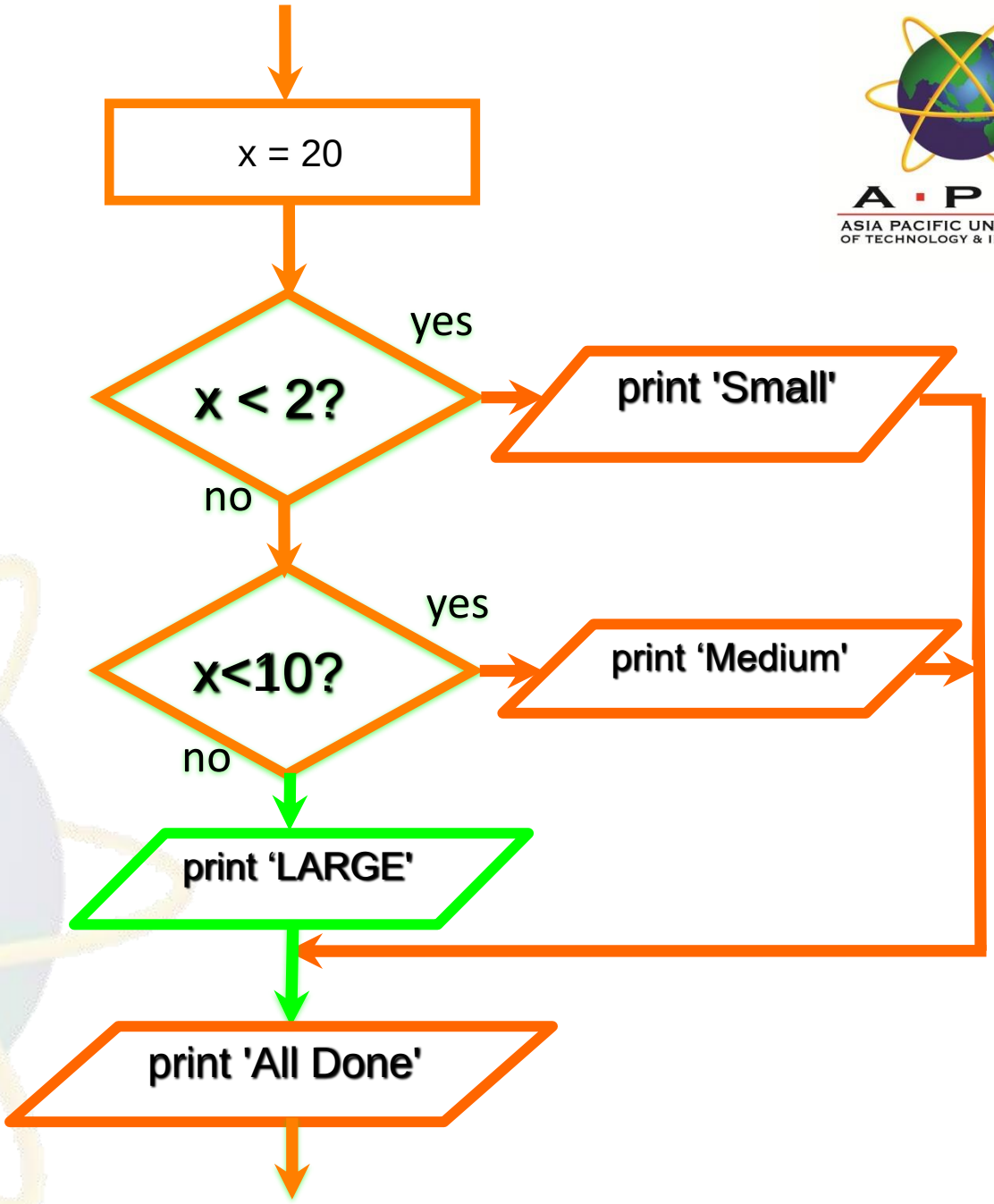
Multi-way

```
x = 0
if x < 2 :
    print ('Small')
elif x < 10 :
    print ('Medium')
else :
    print ('LARGE')
print ('All Done')
```



Multi-way

```
x = 20
if x < 2 :
    print ('Small')
elif x < 10 :
    print ('Medium')
else :
    print ('LARGE')
print ('All Done')
```



Multi-way

```
# No Else
x = 5
if x < 2 :
    print ('Small')
elif x < 10 :
    print ('Medium')

print ('All Done')
```

```
x=5
if x < 2 :
    print ('Small’)
elif x < 10 :
    print ('Medium’)
elif x < 20 :
    print ('Big’)
elif x< 40 :
    print ('Large’)
elif x < 100:
    print ('Huge’)
else :
    print ('Ginormous’)
```

Multi-way Puzzles

Which will never print?

```
if x < 2 :
    print ('Below 2')
elif x >= 2 :
    print ('Two or more')
else :
    print ('Something else')
```

```
if x < 2 :
    print ('Below 2’)
elif x < 20 :
    print ('Below 20’)
elif x < 10 :
    print ('Below 10’)
else :
    print ('Something else’)
```

The try / except Structure

- You surround a dangerous section of code with try and except.
- If the code in the try works - the except is skipped
- If the code in the try fails - it jumps to the except section

```
$ cat notry.py
astr = 'Hello Bob’
istr = int(astr)
print ('First', istr)
astr = '123’
istr = int(astr)
print ('Second', istr)
```

```
$ python notry.py Traceback (most
recent call last):  File "notry.py", line 2,
in <module>    istr = int(astr)ValueError:
invalid literal for int() with base 10:
'Hello Bob'
```

All
Done

```
$ cat tryexcept.py
istr=-1
astr = ('Hello Bob')
try:
    istr = int(astr)
except:
    print('Cannot convert string to int')

print ('First', istr)

astr = '123'
try:
    istr = int(astr)
except:
    istr = -1

print ('Second', istr)
```

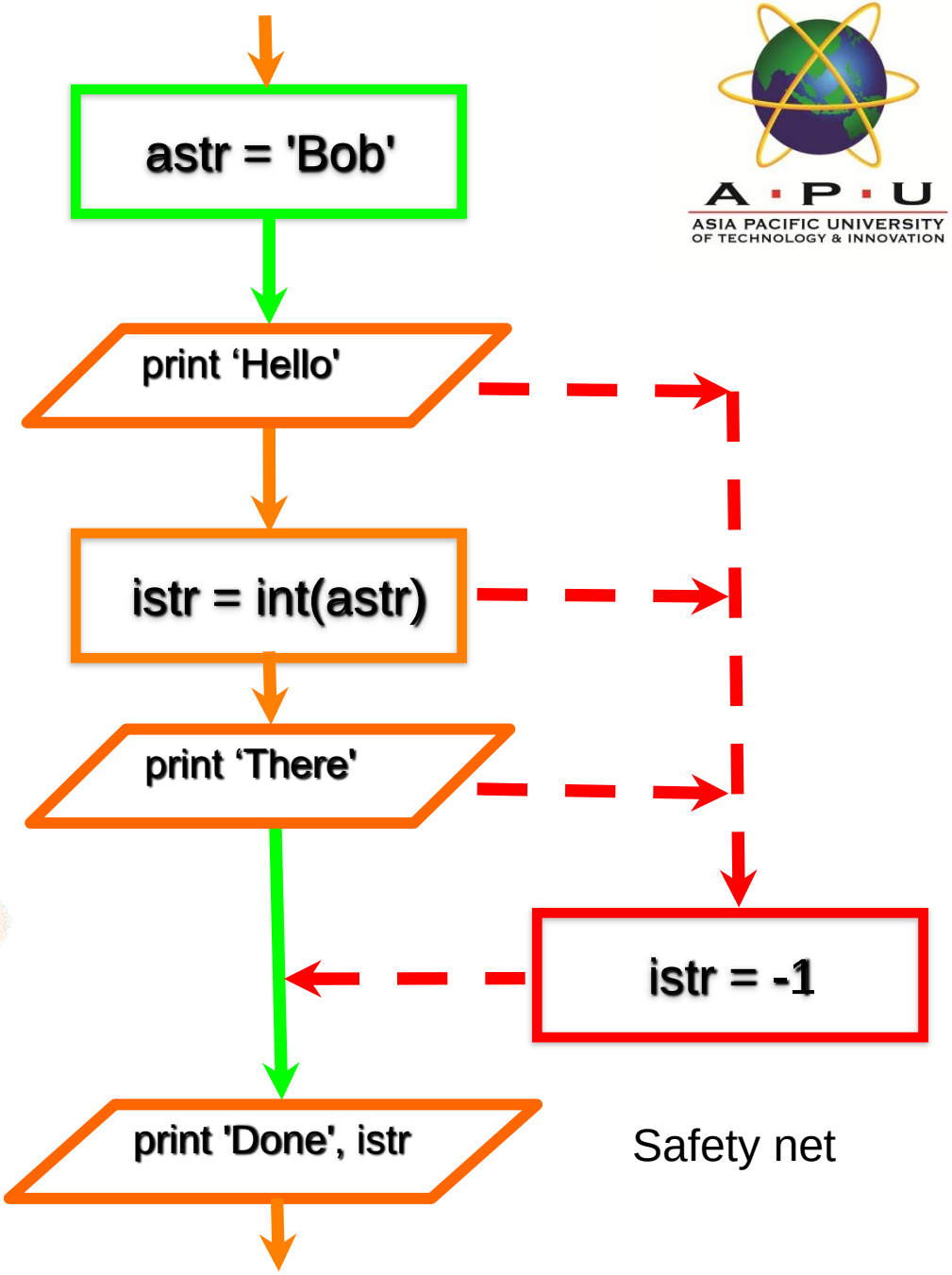
When the first conversion fails - it just drops into the except: clause and the program continues.

```
$ python tryexcept.py
 Cannot convert string to int
First -1
Second 123
```

When the second conversion succeeds - it just skips the except: clause and the program continues.

try / except

```
astr = 'Bob'
try:
    print ('Hello')
    istr = int(astr)
    print ('There')
except:
    istr = -1

print ('Done', istr)
```



Sample try / except

```
rawstr = input('Enter a number:')
try:
    ival = int(rawstr)
except:
    ival = -1

if ival > 0 :
    print ('Nice work’)
else:
    print ('Not a number’)
```

```
$ python trynum.py
Enter a number:42
Nice work
$ python trynum.py
Enter a number:fourtytwo
Not a number
$
```

Summary

- Comparison operators == <= >= > < !=
- Logical operators: and or not
- Indentation
- One Way Decisions
- Two way Decisions if : and else :
- Nested Decisions
- Multiway decisions using elif
- Try / Except to compensate for errors