AlgoHack #4

PROGRAMING CONDITIONS

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If marks < 50 grade can be D or E
If marks > 40 grade can be D, C, B or A

If (marks >=40) AND (marks < 50) then D
If (marks >=50) AND (marks < 65) then C
If (marks >=65) AND (marks < 75) then B

What grade will it be? if the marks is 100?

Design a program for your teacher to assign a grade on math marks obtained at the term test.
Tip: Draw a flowchart, write pseudocode and code.

There is a digital clock at Mr. Crow's house.
The alarm is set to every hour. The alarm is off after 8PM till 5AM when Mr. Crow is sleeping.
Design a program to remind Mr. Crow to sleep at 8PM, get up at 5PM, eat breakfast at 7AM. Take a bath at 11AM, lunch at 12PM and tea at 3PM. He should play from 4PM to 5PM and take a wash at 6PM and Eat dinner at 7PM.

Create an interesting problem to solve using a program. Use what you have learned so far.

Write a program to find student house by index number.

Draw a flowchart, write pseudocode,
write python code and test the program with index
numbers 2234, 2245, 2467, 1678, 1997, 1245, 1642

How does your teacher give grades to your marks?

0 - 39 gets E
40 - 49 gets D
50 - 64 gets C
65 - 74 gets B
75 - 100 gets A

What grade will you get for marks 78, 63 and 47 ?
How many marks you need to get a B ?

Here, we use two conditions to find marks range.
Instead of checking equality we check if the number is bigger than a value and smaller than another value.

What can you get for a score bigger than 40 ?
If the score is smaller than 50 what can you get ?
Are there multiple grades possible for same score?

When we are doing a range check, we combine two comparisons in to one condition to check if a value is within a range.

Conditions
We always obey conditions in our life.

Mother says "**Don't light fire**" to a child.
She says "**Light the fire**" to the other child.
Why ?

The small child is 4 years old. The other child is 17 years old. So mother is afraid that the small child will hurt himself, while other other can help her.

We can build a condition from this explanation.
If child age is over 16
        child can light the fire.

But in 12 years the younger child also can light the fire.

So, we can write a program
to check who can light the fire everyday.
A child can come to the computer and
ask can I light the fire?
The Computer ask **what is your age?**
Child **inputs age.**
Now the computer will test age condition with age input.
Before we write a program, let us visualise this condition.

We can show the condition in a diagram
Depending on age program branches out to yes or no to light the fire.

The sample python program

```
var =input()
if var == 1:
    print "one"
elif var == 2:
    print "two"
elif var == 3:
    print "Three"
else:
    print "not one or two or three"
```

These diagrams called flowcharts help us design algorithms to write programs.

If you work hard, you will be rich.

If you wash the plates, you will get icecream.

Have you ever wondered

"If this happens, then that will happen."

The **hypothesis** is the first.

The **conclusion** is the second,

If (condition or hypothesis) **then** (conclusion).

Write a program with conditions

How can you separate all students in school to the four houses Red, Green, Blue and Yellow for the sports meet.

How does your school do it?
In our school we asked all students to lineup on index number. The first student was taken to red house. Second student was taken to green, 3rd to the blue and fourth to the yellow house.

Then a problem came!

We could not get all students to line up on one day.

So, We created an algorithm.

We divided the students index number by 4.
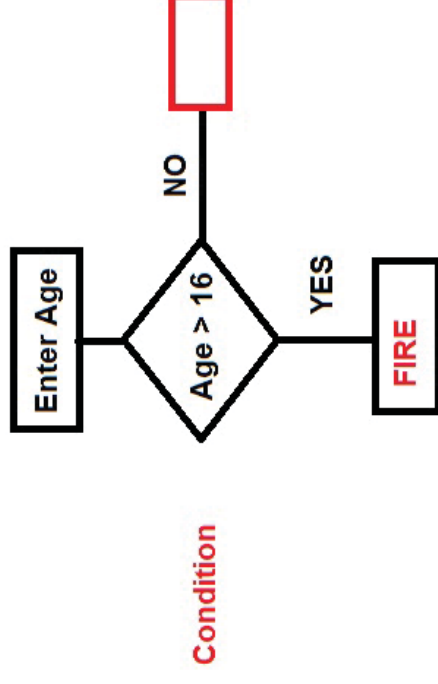If the remainder is 1, student goes to red house.
If the remainder is 2, student goes to green house.
If the remainder is 3, student goes to blue house
If the remainder is 0, student goes to yellow house.
All students can find their house from index number...

A condition is a comparison of two things

White Rabbit is a Rabbit.

Rabbit is not a tortoise.

x=y is a condition

If x and y are equal, then condition becomes true.

If x and y are different then condition becomes false.

Condition	True or False
2=2	True
2=3	False
Kandy is in Sri Lanka	
London is in Sri Lanka	
The boy is 200 years old	

Write 5 real life conditions.
Do they have inputs?
Are they always true?
Do they become false for some inputs?

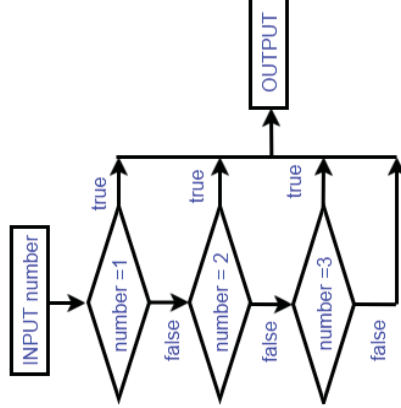| Condition	Input	True or False

Else If structure

How do we process an input with multiple conditions?
Using many if then statements is not efficient enough. It will make program long and slow. **else if** This structure helps us to combine many conditions into one structure.

```
if (condition1)
      ......
else if (condition2):
      ......
else if  (condition3)
      ......
else
      ......
```

Now we can do several things in one if then else if else structure. In python else if is syntax is elif.

Input numbers 1, 2, 3 and 4 to following number check program flow chart. Discuss what happens?

Write a python program to check 10 numbers.

Rube Goldberg Napkin Machine

Can you describe what happens from A→B … L→M

A→B: If the man raises spoon, then it pulls a string.
B→C: If the string is pulled, then it tugs back a spoon
D→E:.....
Complete all conditions in **if … then** form

Write a pseudocode for the program.

Draw a flowchart for your program.
You may need a large cardboard for this.

IF THEN ELSE

If you want a program to do something when a condition is true, we use **If then** structure. If we want the program to do something else, when the condition is false, we use **If then** else structure.

In this number printing python program, we check if the number is 1, **then** printed "one". If the number is not 1 we print "not one" using **else.**
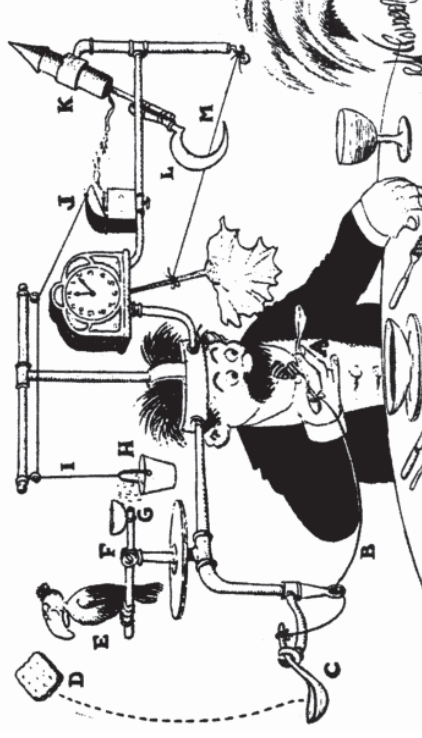
```
n=int(input())
If (n==1) :
    print("one")
else
    print("not one")
```

Write a python program
Check input of 1, 2 and 3 and print "one", "two" , "three" and "not 1 2 3"
Tip : use multiple if then conditions

Hypothesis and the Conclusion.

If x=3, then x + 2= 5

If you sleep well, then you are relaxed.

If you do your homework, then you can watch TV.

Rewrite each statement in if-then form.

Saman eats a bun every Thursday.

Rani takes bus to school when raining..

Ajantha goes to school every weekday.

All students have a math class.

All angles of a Squares are right angles.

Joining conditions

We can join two conditions.

If weekend and if not raining then we can play outside.

When joining we put ( ) for each condition. The output another condition which can be true or false.

(**If** (sky is dark) **and if** (thunder strike)) **then** (it will rain).

Write condition with multiple conditions.

If electricity available and switch is on bulb will light

If you have a car and a licence you can drive a car.

The flow chart

date=input day

Weekday ? Yes → Goto School

No

Saturday Yes → Go Play

No

Sunday Yes → Goto Fair
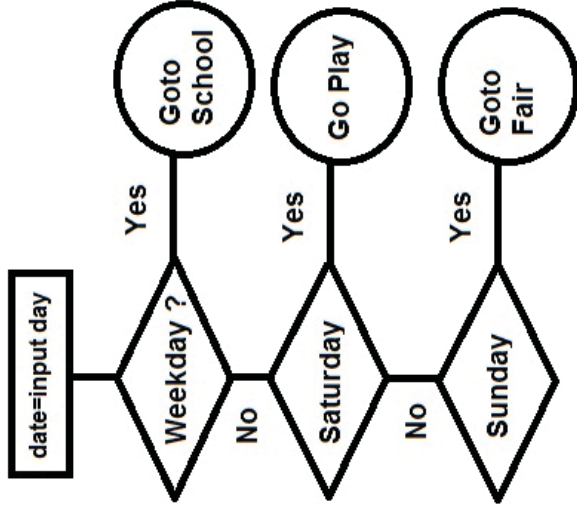
The program takes the date as in input

Then it checks 3 conditions.

The first condition checks if its is a Weekday.

If the condition is true you goto school.

Else checks next condition for Saturday.

If the condition is true you go play.

Else checks next condition for Sunday.

If the condition is true you goto fair.

Enter each day of the week and find output.

What will happen during school holidays?

Improve your flow chart.

This pipeline takes water from A to B

The water will flow to B, if both C and D taps are open.
If tap C OR D is closed, the water will not flow.
Here we have two conditions.
Tap C is the first condition.
Tap D is the second condition.
In both taps Opening is True, closing is False.
What will be the water flow? True or False?

Tap C	Tap D	Water Flow
False	False	
False	True	
True	True	

How do we make water flow?
We combine two conditions with AND, so they become
one condition with one output.
So, we can write in pseudo.
if (C=true) AND (D=true) then (Water Flow=true)
If C or D is false, or both false the final result is false.

Discuss ten conditions with AND in daily life with a friend
and write 5 conditions using if, AND and then.

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images from a camera, analyse them, sense objects
around with infrared signals, check many conditions to
avoid collision.

Let's write a python program to check numbers 1 to 10

```
a=int(input())
If (a==1):
    print("one")
```
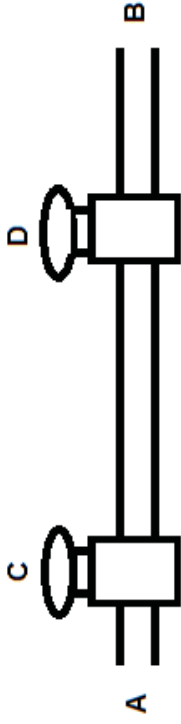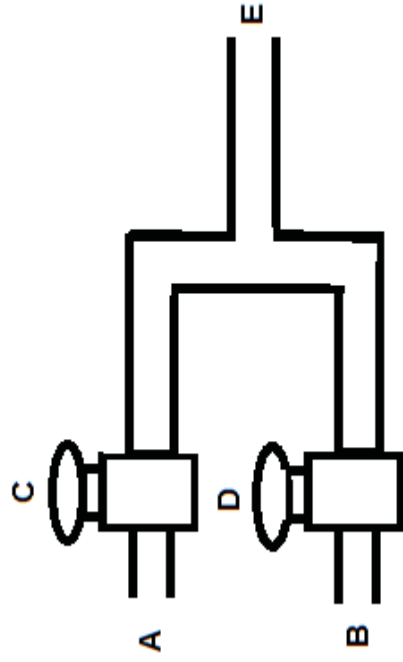
Write the rest of the code to output "two" to "ten".

Let's Look at another if then example.
Your home is situated between the school and the fair.
On weekdays you goto school.
On Saturdays you play.
On Sundays you goto fair with your mother.

We can write a pseudocode program
Input day
Store day in date
If date = Weekday
    Goto School
If date = Saturday
    Go Play
If date = Sunday
    Goto Fair

Discuss ten conditions with OR in daily life with a friend and write 5 conditions using if, OR and then.

Conditions with numbers

(2=2) AND (3=3) = (True) AND (True) = True
(2=4) AND (3=3) = (False) AND (True) = False
(2=2) OR (3=3) = (True) OR (True) = True
(2=4) OR (3=3) = (False) OR (True) = True

Explain Above expressions to a friend. Why fourth condition is true?

We can reverse a result of a condition with **NOT**
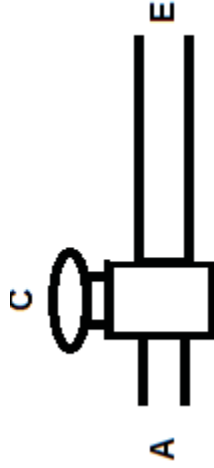
The water will flow if Tap C is open.

NOT (open) = close
NOT (true) = false

NOT (2=2) = NOT (true) = false
NOT (2=3) = NOT (false) = true
NOT(boy) = girl ?
The last expression is not complete why ?
Is the condition clear? Any values like teacher ?
Clear conditions are very important in programing.
Think of a walking Robot avoiding obstacles. It takes

The OR pipe design.

A and B are water inputs from two tanks.
If taps C or D is open, the water will flow to E.

Tap C	Tap D	Water Flow
False	False	
False	True	
True	True	

So here we combine two conditions with OR keyword.
We can write
if (C=true) OR (D=true) then (Water Flow=true)

The OR keyword checks if any of the two conditions are true. If at least one condition is true, the whole condition become true.