Q0. Practice input and print.

Write a program to ask for a user to input what makes him/her happy. Then, report it back.

Example:

```
============================================================

What makes you happy:balance life and live well

So keep doing:balance life and live well.

============================================================
```

Hint: tricks to get print without space

1. Try `print('a', 'b')`

    Conferring to

    `print('a', 'b', sep='')`

2. Try `print('a', 'b')`

    Conferring to

    `print('a'+'b')`


Q1. Write a program to take in an integer number and print out the number and if the number is an odd number, also print "What an odd!"

Example 1:

```
============================================================

What is your favorite number:19

Your favorite number is 19.

What an odd!

============================================================
```

## Example 2:

```
============================================================
What is your favorite number:38

Your favorite number is 38.
============================================================
```

Recall: if statement has syntax

if *evaluable-condition*:

```
    # if body
    # statements to work when condition is true
```

*Next statement after if-statement.*


Q2. Write a program to take in an integer number and print out the number and if the number is an odd number, also print "What an odd!". Otherwise, print "That's even." Confer to Q1.

## Example 1:

```
============================================================
What is your favorite number:19

Your favorite number is 19.

What an odd!

============================================================
```


## Example 2:

```
============================================================
What is your favorite number:38

Your favorite number is 38.

That's even.
============================================================
```

Q3. To ride a roller coaster, a rider has to be at least 120-cm tall. Write a program to ask a potential rider for his/her height (in cm) and if the potential rider can ride, let him/her know, otherwise apologize him/her.

Example 1:

```
===========================================================
Your height (cm): 130

Welcome on board!

===========================================================
```

Example 2:

```
===========================================================
Your height (cm): 110

Sorry. You have to be at least 120 cm to ride.

===========================================================
```

Q4. Write a program to take a score from a user and then report the grade as follows.

When score < 40, grade is 'F'.

When score is in [40, 50), grade is 'D'.

When score is in [50, 60), grade is 'C'.

When score is in [60, 70), grade is 'C+'.

When score is in [70, 80), grade is 'B'.

When score is in [80, 90), grade is 'B+'.

When score ≥ 90, grade is 'A'.

## Examples (multiple runs)

```
================================================================
Enter your score:28                     Enter your score:75

F                                       B

=========================               =========================
Enter your score:42                     Enter your score:88

D                                       B+

=========================               =========================
Enter your score:54                     Enter your score:93

C                                       A

=========================               =========================
Enter your score:68

C+

=========================
```

Q5. Write a program to ask a user for (1) his/her favorite activity, (2) what activity he/she does most often, and (3) what activity he/she thinks is the most beneficial. Then, report the following.

If the favorite and the most often activities are the same, print out "You are lucky."

If the favorite and the most beneficial activities are the same, print out "You are smart."

If the most often and the most beneficial activities are the same, print out "Good for you."

If all activities are the same, print out "You are blessed."

Otherwise, print out "Oh, sorry for that."

Examples (multiple runs)

```
================================================================
What is your most favorite activity?reading
What kind of activities do you do most?social media
In your opinion, what kind of activities is the most beneficial?studying
Oh, sorry for that.
================================================================
What is your most favorite activity?reading
What kind of activities do you do most?reading
In your opinion, what kind of activities is the most beneficial?studying
You are lucky.
================================================================
What is your most favorite activity?reading
What kind of activities do you do most?studying
In your opinion, what kind of activities is the most beneficial?studying
Good for you.
================================================================
What is your most favorite activity?reading
What kind of activities do you do most?studying
In your opinion, what kind of activities is the most beneficial?reading
You are smart.
================================================================
What is your most favorite activity?reading
What kind of activities do you do most?reading
In your opinion, what kind of activities is the most beneficial?reading
You are blessed.
================================================================
```

Q6. In math, division is quite tricky, such that given numerator $a$ is divided by a denominator $b$, the division result $r$ is as follows:

* if both $a = 0$ and $b = 0$ then the division is not defined.  So, report "`Not defined`" to a user;

* if $a \neq 0$, $b = 0$ then           $r$ will be $\infty$ when $a > 0$

                    or           $r$ will be $-\infty$ when $a < 0$;

So, report either "`Infinity`" or "`Negative infinity`" as fit;

* otherwise $r = a \div b$ (for regular division) and report the division result.

Example 1:

```
============================================================
a: 10
b: 2
a/b = 5.0
============================================================
```

Example 2:

```
============================================================
a: 0
b: 2
a/b = 0.0
============================================================
```

Example 3:

```
============================================================
a: 2
b: 0
a/b = Infinity
============================================================
```

Example 4:

```
============================================================
a: -2
```

```
b: 0

a/b = Negative infinity

============================================================
```

Example 5:

```
============================================================

a: 0

b: 0

a/b = Not defined

============================================================
```


Q7. Golden Pig Bank has a new financial product to attract more saving accounts. That product offers a small saving interest of 5% higher than a bond rate for any new account with balance not over 1,000,000 baht and a big saving interest, which is 10% higher than a small saving interest. Write a program to take a customer's balance and a bond rate and report the corresponding saving interest rate and compute an estimated balance at the end of year.

Use the Q7 template (Q7bTemplate.py; note: template is to ensure the exact display format and allows smooth auto-grading).

Example 1:

```
============================================================

Balance: 500000

Bond rate (%):2.7

Interest rate (%): 2.84

Estimated year-end balance: 514,175.00

============================================================
```

Example 2:

```
============================================================

Balance: 1200000

Bond rate (%):2.7
```

```
Interest rate (%): 3.12

Estimated year-end balance: 1,237,422.00

==============================================================
```

## Q8. Given a flow chart below (simplified from:
https://www.radcliffecardiology.com/image-gallery/figure-1-flow-chart-suggested-strategies-coronary-artery-disease-management), write a program to suggest the Transcatheter Aortic Valve Implantation (TAVI) management strategy for Coronary Artery Disease (CAD).

Use the Q8 template (Q8bTemplate.py; note: template is to ensure the exact display format and allows smooth auto-grading).
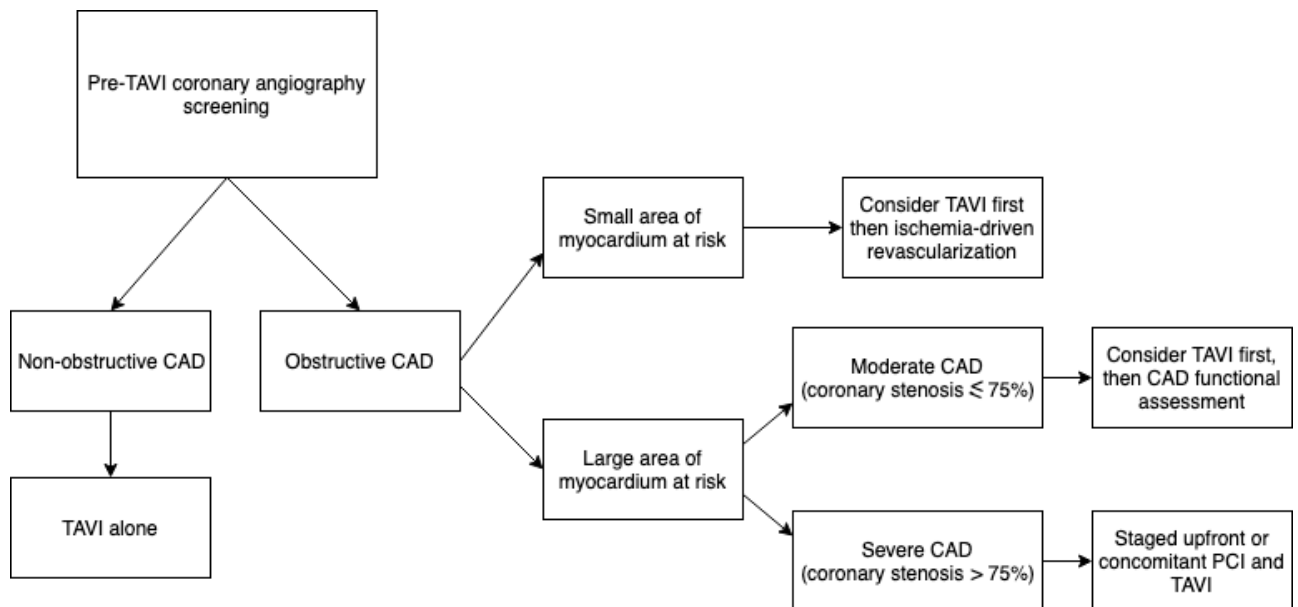


Example 1:

```
==============================================================

Is CAD obstructive (yes/no)? no

Non-obstructive CAD.

TAVI alone.

==============================================================
```

# Example 2:

```
============================================================

Is CAD obstructive (yes/no)? yes

Obstructive CAD.

Is area of myocardium at risk large (yes/no)? no

Small area of myocardium at risk.

Consider TAVI first, then ischemia-driven revascularization.

============================================================
```

# Example 3:

```
============================================================

Is CAD obstructive (yes/no)? yes

Obstructive CAD.

Is area of myocardium at risk large (yes/no)? yes

Large area of myocardium at risk.

How is coronary stenosis (%)? 60

Moderate CAD.

Consider TAVI first, then CAD functional assessment.

============================================================
```

# Example 4:

```
============================================================

Is CAD obstructive (yes/no)? yes

Obstructive CAD.

Is area of myocardium at risk large (yes/no)? yes

Large area of myocardium at risk.

How is coronary stenosis (%)? 80

Severe CAD.

Staged upfront or concomitant PCI and TAVI.

============================================================
```

Q9. Location of any point on two-dimension plane is specified by coordinate, which can be represented in either rectangular or polar form. See the following picture for illustration of rectangular and polar forms.
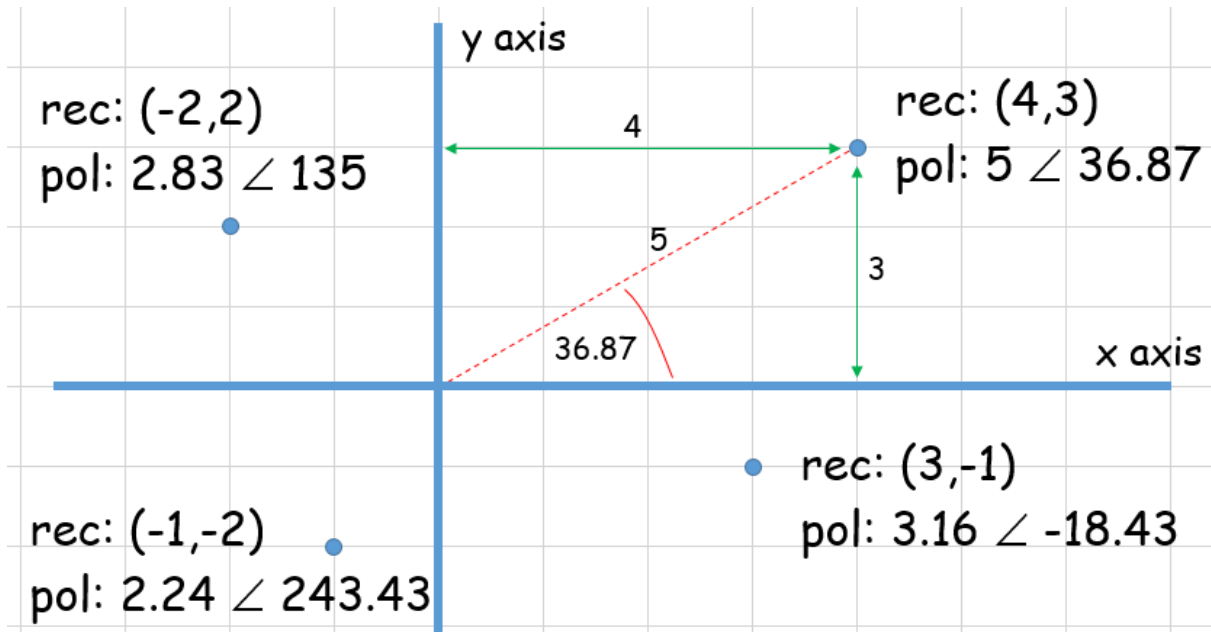


Write a function, named "rec_to_pol", to take x and y values of a coordinate in rectangular and then values (magnitude and phase) of the polar form.

Use the Q9 template (Q9bTemplate.py; note: template is to ensure the exact display format and allows smooth auto-grading).

Example 1:

```
============================================================
Enter (x y):4 3
polar: 5.00 with 36.87 degree
============================================================
```

Example 2:

```
============================================================
Enter (x y):-2 2
polar: 2.83 with 135.00 degree
============================================================
```

Example 3:

```
============================================================
Enter (x y):-1 -2
polar: 2.24 with 243.43 degree
============================================================
```

## Example 4:

```
============================================================
Enter (x y):3 -1
polar: 3.16 with -18.43 degree
============================================================
```

## Example 5:

```
============================================================
Enter (x y):0 0
polar: 0.00 with 0.00 degree
============================================================
```

## Example 6:

```
============================================================
Enter (x y):0 8
polar: 8.00 with 90.00 degree
============================================================
```

## Example 7:

```
============================================================
Enter (x y):0 -1
polar: 1.00 with -90.00 degree
============================================================
```

Q10. Given a reaction of burning gas methane ($CH_4$) in air:

$$CH_4 + 2\ O_2 \rightarrow CO_2 + 2\ H_2O$$
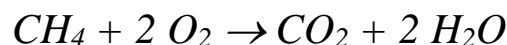
and the fact that when either $CH_4$ or $O_2$ runs out first the reaction stops and the excess other is left over. Write a function, named "ch4combus", to take in weights (in gram) of $CH_4$ and $O_2$ and reports what will be left after the burning. Note: atomic weight: H = 1.008 g/mol; C = 12.011 g/mol; O = 15.999 g/mol.

*Hint:  chemical equation is based on molecules (not weights);*

*(1) find molecular weights (in g/mol);*

*(2) find numbers of moles of methane and oxygen;*

*(3) compare (# CH4 moles) to (# O2 moles / 2), e.g., 3 CH4 moles matches to 6 O2 moles; (a) if CH4 is larger, the CH4 excess will be left and O2 will be used up; and (b) vice versa;*

*(4) the combined product weight =  methane_g + oxygen_g - the excess;*

*(5) work out the product proportion to find CO2 and H2O weights, e.g., total CO2 weight/total product weight = CO2 / (CO2 + 2 H2O).*

Use the Q10b template (Q10bTemplate.py; note: template is to ensure the exact display format and allows smooth auto-grading).

Example 1:

```
============================================================
Methane (CH4, in g):200
Oxygen (O2, in g):200
CH4: 149.86 g. O2 0.00 g. CO2 137.54 g. H2O 112.60 g
============================================================
```

Example 2:

```
============================================================
Methane (CH4, in g):100
Oxygen (O2, in g):400
CH4: 0.00 g. O2 1.10 g. CO2 274.32 g. H2O 224.58 g
============================================================
```

E1. [Multiple-case conditions c.f. E2]

Delivery-One, a package-delivery company, charges its customer by the package weight. The charge is composed of the fixed cost 50 baht and variable cost charged as follows:

(a) it is 20 baht per kg for a package weighs up to 5 kg;

(b) it is 25 baht per kg for a package weighs over 5 kg, but not over 10 kg;
(c) it is 35 baht per kg for a package weighs over 10 kg.
Write a program to take a package weight and calculate the total delivery cost of the package.

*Hint: this is a problem of multiple-case conditions, all case are mutual exclusive, c.f. E2.*


E2. [Cascading conditions c.f. E1]

Delivery-Double, another small-package-delivery company, charges its customer by the package weight. The charge is calculated in a progressive manner, as the following:

(a) It is 20 baht per kg for the first 5 kg.

(b) It is 30 baht per kg for any weight between 5 kg and 10 kg.
(c) It is 40 baht per kg for an extra weight over 10kg.
Write a program to take a package weight and calculate the total delivery cost of the package.

Use the E template (QEaTemplate.py; note: template is only to ensure the exact display format and allows smooth auto-grading). Submit both as one answer.

*Hint: this is a problem of cascading conditions, not mutual exclusive cases, c.f. E1.*


Examples (multiple runs):

============================================================

Enter the package weight (kg):**2**

Delivery One ships it at 90.00.

Delivery Double ships it at 90.00.

============================================================

Enter the package weight (kg):**9**

Delivery One ships it at 275.00.

Delivery Double ships it at 270.00.

============================================================

Enter the package weight (kg):**20**

Delivery One ships it at 750.00.

Delivery Double ships it at 700.00.

============================================================

Package 20 kg:

    Delivery One: $50 + 20*35 = 750$

    Delivery Double: $50 + 20*5 + 30*5 + 40*10 = 700$