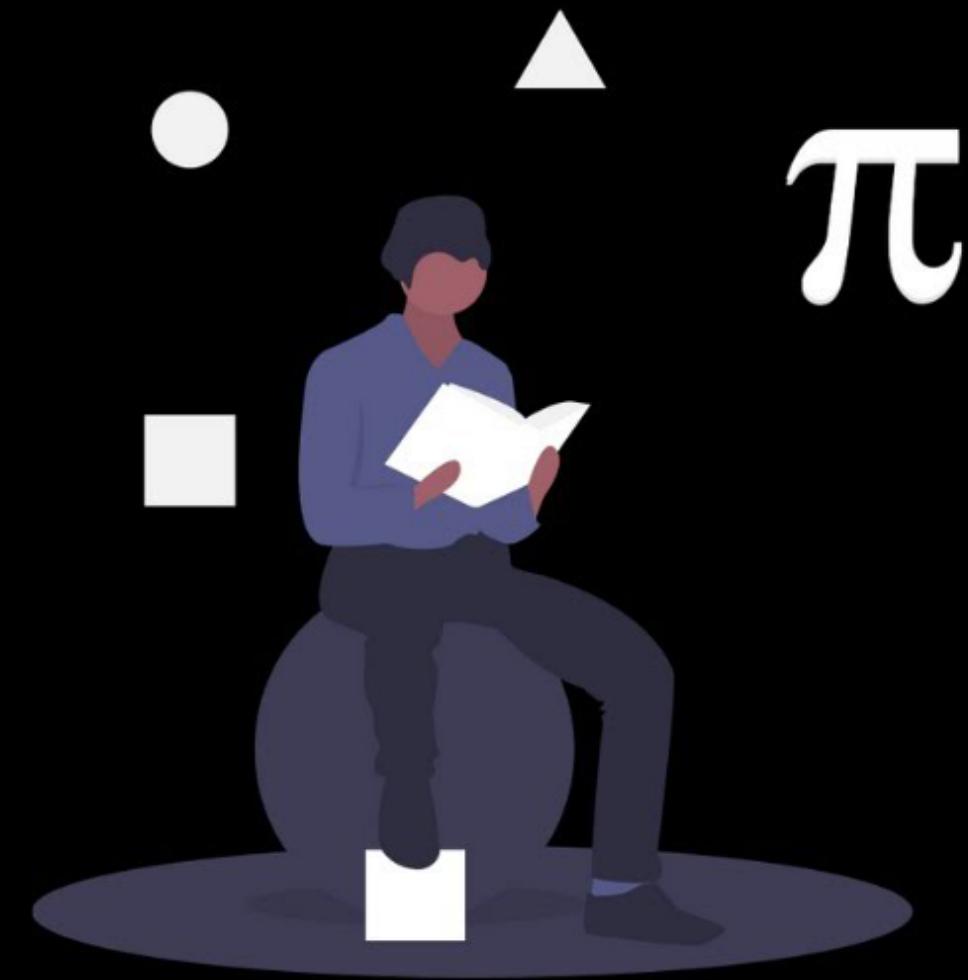


Arithmetic
progression
animated
intuition



introduction to math

Arithmetic progression
Geometric progression
Harmonice sum
Power and log
Cumulative sum
Ranged sum



Arithmetic Progression

Definition :

an arithmetic progression (AP) or arithmetic sequence is a sequence of numbers such that the difference between the consecutive terms is constant .



Arithmetic Progression

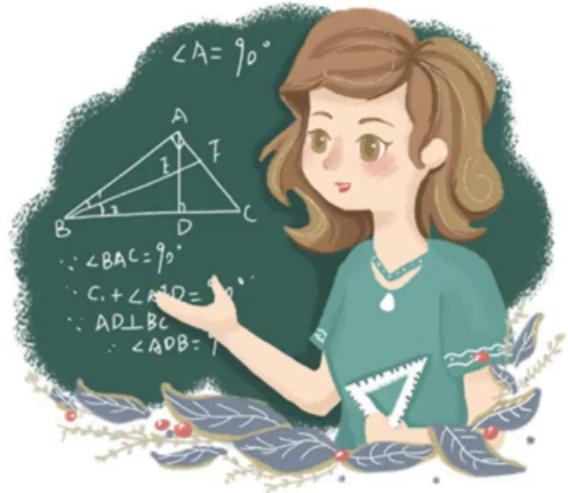
EX 1:

1 2 3 4 difference = 1

EX 2:

2 5 8 difference = 3

notice that N can be even or odd
and we can start with any number



Arithmetic Progression

EX 1 :

1 2 3 4

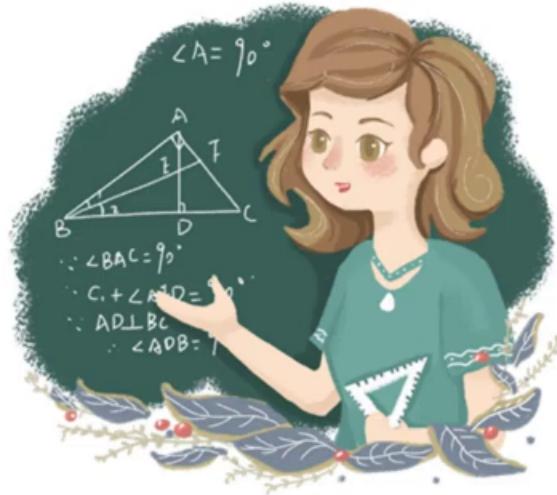
sum = 10

EX 2 :

2 5 8

sum = 15

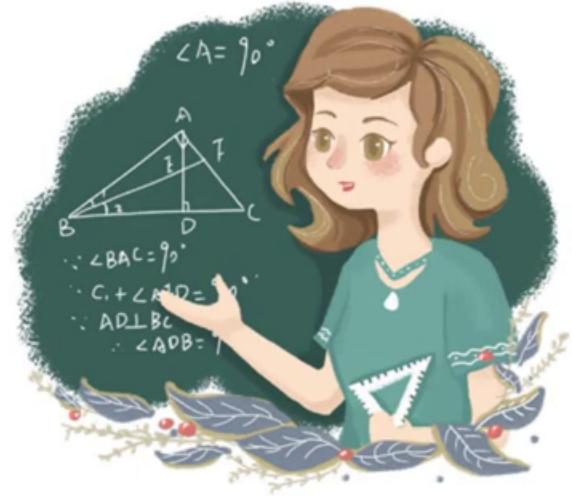
okay is there is a formula for the sum
try to find it first (hint in the next slide)



Arithmetic Progression

hint 1 : N is even

1 2 3 4
↑ ↑



Arithmetic Progression

hint 1 : N is even

1 2 3 4
↑ ↑



Arithmetic Progression

hint 1 : N is even

1 2 3 4

sum = 5+5



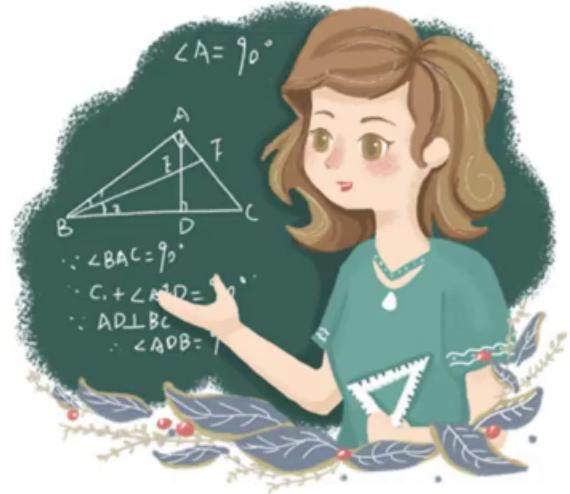
Arithmetic Progression

hint 1 : N is even

1 2 3 4 sum = 5+5

hint 2 : notice the arrows

1 2 3 4 5 6



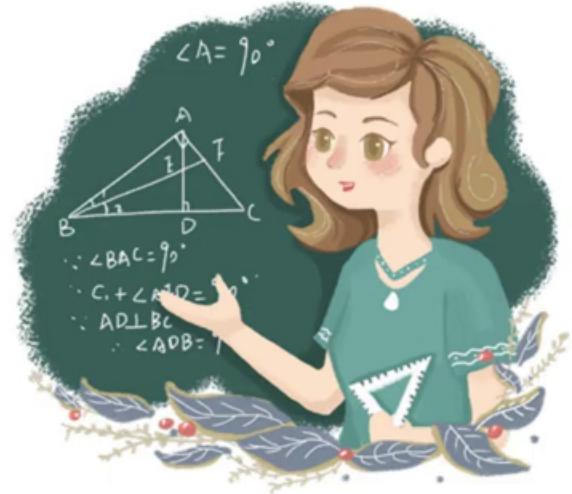
Arithmetic Progression

hint 1 : N is even

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1 2 3 4 5 6



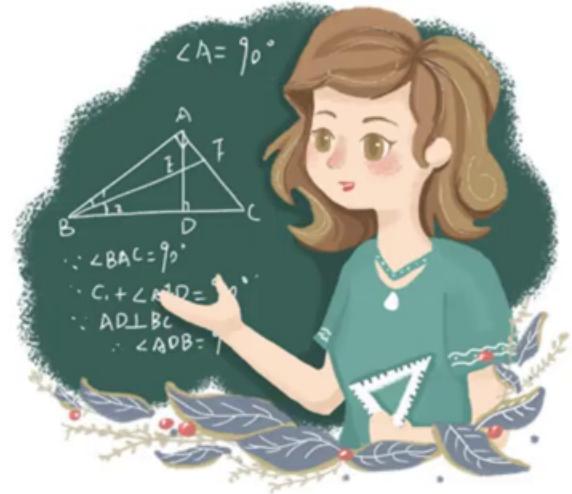
Arithmetic Progression

hint 1 : N is even

1 2 3 4 sum = 5+5

hint 2 : notice the arrows

1 2 3 4 5 6
↑ ↑



Arithmetic Progression

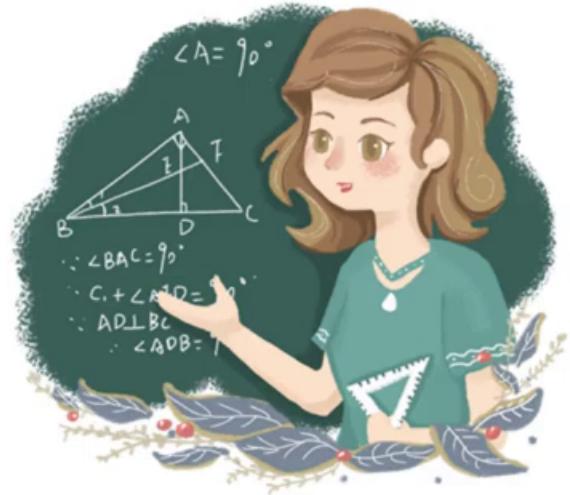
hint 1 : N is even

$$1 \ 2 \ 3 \ 4 \quad \text{sum} = 5+5$$

hint 2 : notice the arrows

$$1 \ 2 \ 3 \ 4 \ 5 \ 6 \quad \text{sum} = 7+7+7$$

focus on the even case for now
did you get the formula ?



Arithmetic Progression

hint : N is even

$$1 \ 3 \ 5 \ 7 \quad \text{sum} = 8*2 = 16$$

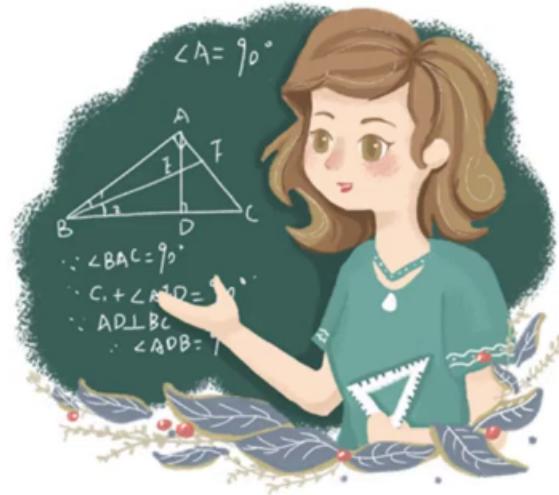
answer :

$$\text{sum} = (a_1 + a_n) * (n/2)$$

a_1 = first number

a_n = last number

n = how many numbers



Arithmetic Progression

hint : N is odd

1 2 3 4 5

$$\text{sum} = 6+6+3$$

$$\text{sum} = (3+3)+6+3$$

$$\text{sum} = (3+3)+(3+3)+3$$

$$\text{sum} = 3*5 = 15$$



Arithmetic Progression

answer :

$$1 \ 2 \ 3 \ 4 \ 5 \quad \text{midnum} * n = 15$$

answer :

$$\text{mid num} = (a_1 + a_n) / 2$$

$$\text{sum} = ((a_1 + a_n) / 2) * n$$



Arithmetic Progression

$$(a_1+a_n) * (n/2) \text{ or } ((a_1+a_n)/2) * n$$

can be written as

$$((a_1+a_n)*n)/2 \quad ①$$

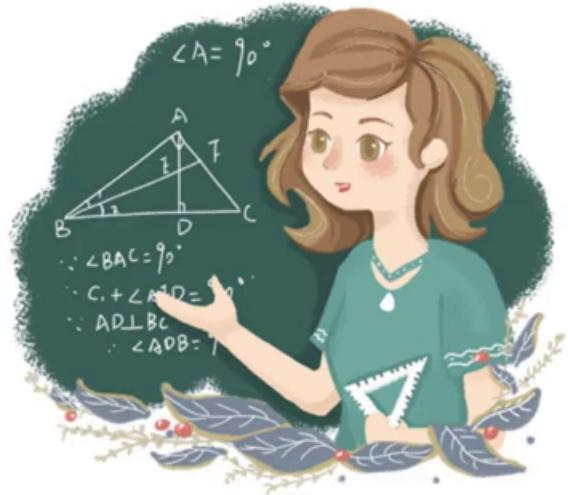
that's our general rule for any case

case 1 : 2 3 4 5

$$\text{ans} = ((2+5)*4)/2 = 14$$

case 2 : 3 8 13 18 23

$$\text{ans} = ((3+23)*5)/2 = 65$$



Arithmetic Progression

EX 1 : n = 4

2 5 8 11 difference = 3

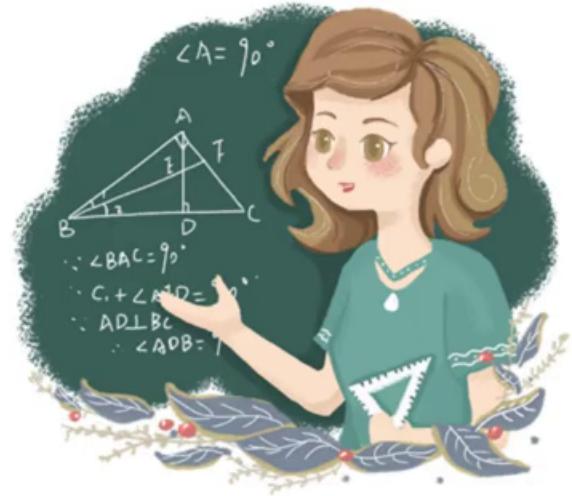
$$a_1 = 2$$

$$a_2 = a_1 + 3 = 5$$

$$a_3 = a_1 + 3 \cdot 2 = 8$$

$$a_4 = a_1 + 3 \cdot 3 = 11$$

$$a_n = a_1 + (n-1) \cdot d$$



Arithmetic Progression

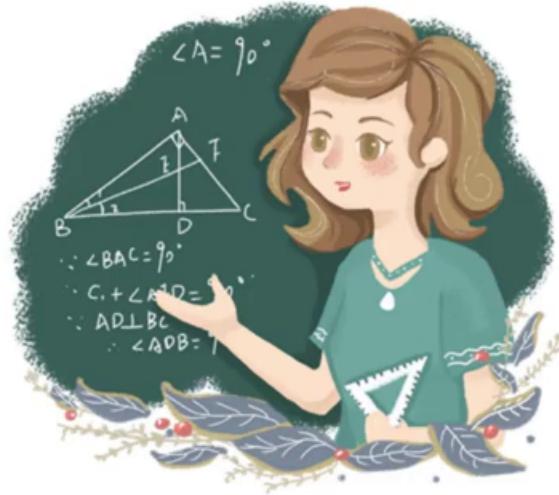
$$\text{sum} = ((a_1 + a_n) * n) / 2 \quad (1)$$



$$a_n = a_1 + (n-1)*d \quad (2)$$

substitute from 2 in 1 we get :

$$\text{sum} = ((2a_1 + (n-1)d) * n) / 2 \quad (3)$$



Arithmetic Progression

$$\text{sum} = ((a_1 + a_n) * n) / 2 \quad 1$$



$$a_n = a_1 + (n-1)*d \quad 2$$

substitute from 2 in 1 we get :

$$\text{sum} = ((2a_1 + (n-1)d) * n) / 2 \quad 3$$

