**Team 14**

**Math**

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**Series of Number**

**Definition of Series of Number**

Series of Number is the sum of the terms of a sequence.

If U1, U2, U3, U4, … and so on is called line of numbers, then series of number is U1 + U2 + U3 + U4 + … etc.

**Arithmetic**

Arithmetic series, which is a sum of the terms of an arithmetic series of numbers.

If a , a+b , a+2b , a+3b , a+4b , .... a+(n-1)b is line of numbers arithmetic then the shape of arithmetic is a+ (a+b) + ( a+2b) + (a+3b) + (a+4b) + … etc.

The formula for the sum of the arithmetic series of the n terms is

Sn = ½ n ( a + Un )

or

Sn = 1/2 n ( 2a + ( n – 1 ) b )

Description

Sn = number of terms to n

n = number of terms

b = ratio or difference

**Example**

4 + 9 + 14 + 19 + . . .

From the series of numbers above, determine S30!

**Answer**

a = 4

b = 5

U30 = 4 + ( 30 - 1 ) 5

= 4 + 29 × 5

= 4 + 145

= 149

Then, S30 is

1st method

Sn = ½n ( a + Un )

S30 = ½ × 30 ( 4 + 149 )

= 15 x 153

= 2295

2nd method

Sn = ½ n ( 2a + ( n – 1 ) b )

S30 = ½ × 30 [ 2 × 4 + ( 30 – 1 ) 5 ]

= 15 ( 8 + 29 × 5 )

= 15 ( 8 + 145 )

= 15 ( 153 )

= 2295

**Example 2**

Determine the value of n and Sn from the arithmetic series below

3 + 7 + 11 + 15 + . . . + 199

**Answer**

a = 3

b = 4

n =?

Un = a + ( n – 1 ) b

199 = 3 + ( n – 1 ) 4

199 = 3 + 4n – 4

199 = -1 + 4n

200 = 4n

50 = n

1st method

Sn = ½n ( a + Un )

S50 = ½ × 50 ( 3 + 199 )

= 25 ( 202 )

= 5050

2nd method

Sn = ½n ( 2a + ( n – 1 ) b )

S50 = ½ × 50 ( 2 × 3 + ( 50 – 1 ) 4 )

= 25 ( 6 + 49 × 4 ]

= 25 ( 6 + 196 )

= 25 ( 202 )

= 5050

**Example 3**

Given an arithmetic series has the 5th term = 13 and the 9th term = 21. Define:

* a and b
* U10
* S11

**Answer**

* U5 = 13 -> a + 4b = 13

U9 = 21 -> a + 8b = 21

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-4b = -8

b = 2

a + 4b = 13

a + 4 × 2 = 13

a + 8 = 13

a = 5

* U10 = a + 9b

U10 = 5 + 9 × 2

U10 = 5 + 18 = 23

* Sn = ½n ( 2a + ( n – 1 ) b )

S11 = ½ × 11 ( 2 × 5 + ( 11 – 1 ) 2 )

S11 = ½ × 11 ( 10 + 10 × 2 )

S11 = ½ × 11 ( 30 )

S11 = 165

**Geometry**

Geometric number series is the sum of the geometric number sequences.

If the geometric number line form is a, a×r, a×r2, a×r3, a×r4, a×r5... a×rn-1 then the form of the geometric number series is a + a×r + a×r2 + a×r3 + a×r4 + a×r5 .... a×rn-1

The sum of the first n terms of the geometric series or denoted by Sn, is:

Sn = a + a×r + a×r2 + a×r3 + a×r4 + a×r5 ... a×rn-1

If we multiply the above formula by r. it will produce the following formula:

rSn =   a×r + a×r2 + a×r3 + a×r4 + a×r5 + a×r6 ... a×rn-1 + a×rn

From the two equations above, we subtract it and it will be produced as follows:

Sn = a + a×r + a×r2 + a×r3 + a×r4 + a×r5 ... a×rn-1

rSn =   a×r + a×r2 + a×r3 + a×r4 + a×r5 + a×r6 ... a×rn-1 + a×rn

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Sn – rSn = a –  a×rn

Sn ( 1 – r ) = a ( 1 – rn )

Sn =  a – a rn  / 1 – r

Sn = a ( 1 – rn ) / ( 1 – r )

So, we can conclude that, the formula for the sum of the first n terms in a geometric series is:

Sn = a – a rn  / 1 – r

Or

Sn = a ( 1 – rn) / 1 – r  , with r  ≠ 1

**Example**

Given a geometric series, where U3 = 18, and U6 = 486. Define:

* a and r
* S10

**Answer**

* U6 = 486 –> a×r5 = 486

U3 = 18 –> a×r2 = 18

U6 / U3 = 486 / 18

a×r5 /   a×r2 = 486 / 18

r3 = 27

r = 3

a×r2 = 18

a×32 = 18

a×9 = 18

a = 2

* Sn = a ( 1 – rn ) / 1 – r

S10 = 2 ( 1 – 310 ) / ( 1 – 3 )

S10 = 2 ( -59048 ) / ( -2 )

S10 = 59048

**Example 2**

Look at the following geometric series:

2 + 6 + 18 + 54 + . . . . . + 1458

Define Sn!

**Answer**

**a = 2**

**r = 3**

Un = a×rn-1

1458  = 2 × 3n-1

1458 / 2 = 3n-1

729 = 3n-1

36 = 3n-1

n – 1 = 6

n = 7

Insert n to the formula of Sn

Sn = a ( 1 – rn ) / 1 – r

S7 = 2 ( 1 – 37 ) / 1 – 3

S7 = 2 ( 1 – 2187 ) / -2

S7 = 2187

**Example 3**

The sum of the first 6 terms of the geometric series 2 + 6 + 18 + … is

**Answer**

**a = 2**

**r = 3**

**Sn =** a ( rn – 1 ) / r – 1

**S6 = 2 ( 36** – 1) / 3 – 1

S6 = 2 ( 729 – 1 ) / 2

S6 = 728

**Questions!**

1. There is an arithmetic sequence with pattern of 1, 3, 5, … then, what is the 10th pattern?

a = 1

b = U2 – U1

b = 3 – 1 = 2

Un = a + (n-1) b

U10 = 2 + (10-1) 2

U10 = 2 + (9) 2 = 2 + 18

U10 = 20

1. A sequence has a first term of 5, while the difference is 6, what is the 10th sequence?

a = 5

b = 6

U10 = 5 + (10-1)6

U10 = 59

1. Find the sum of the first 20 terms of 3+7+11+…

B = U2 – U1

B = 7 – 3 = 4

Sn = n/2 (2a + (n-1)b)

S20 = 20/2 (2 x 3 + (20-1)4)

S20 = 10 (6 + 19 x 4)

S20 = 10 (6 + 76)

S20 = 10 (82) = 820

1. The third and fifth terms of the arithmetic sequence are 17 and 31. the 20th term of the sequence is…

U3 = 17

U5 = 31

U3 = a + (3-1)b

17 = a + 2b

a + 2b = 17

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U5 = a + (5-1)b

31 = a + 4b

31 = 17 – 2b + 4b

2b = 31 – 17

2b = 14

B = 14 : 2

B = 7

a + 2 (7) = 17

a + 14 = 17

a = 3

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Un = 3 + (n-1)7

U20 = 3 + (20-1)7

U20 = 3 + 19 x 7

U20 = 3 + 133

U20 = 136

Ratio

A ratio compares values.

A ratio says how much of one thing there is compared to another thing.

3:1 example

**Ratios can be shown in different ways:**

Use the ":" to separate the values:  **3 : 1**

Or we can use the word "to": **3 to 1**

Or write it like a fraction:

Using Ratios

The trick with ratios is to always multiply or divide the numbers by the same value.

Example 1:

4 : 5 is the same as 4×2 : 5×2 = 8 : 10

ratio 4:5 times 2 is 8:10

Example 2:

A Recipe for pancakes uses 3 cups of flour and 2 cups of milk.

So the ratio of flour to milk is 3 : 2

To make pancakes for a LOT of people we might need 4 times the quantity, so we multiply the numbers by 4:

3×4 : 2×4 = 12 : 8

In other words, 12 cups of flour and 8 cups of milk.

The ratio is still the same, so the pancakes should be just as yummy.

Example3:

There are 3 tigers, 2 are boys, and a girl

**Part-to-Part:**

The ratio of boys to girls is 2:1 or 2/1

The ratio of girls to boys is 1:2 or 1/2

**Part-to-Whole:**

The ratio of boys to all tigers is 2:3 or 2/3

The ratio of girls to all tigers is 1:3 or 1/3

**Questions!**

1. There are 300 people in the room, 120 of them are boys and the remaining are girls. What is the ratio of boys to girls?
2. Dr. Pasture, a rural veterinarian, treats only 2 types of animals—cows and horses. Last week, she treated 12 cows and 16 horses.
   * What is the ratio of cows to horses that she treated?
   * What is the ratio of cows to the total number of animals that she treated?