Some infinite sequences have a LIMIT.

When the terms of an infinite sequence get closer and closer to a fixed number L, then L is called the limit of the sequence.

If there is a limit it will be the Horizontal Asymptote of the graph of the terms of the sequence.

NO infinite arithmetic sequences have a limit.

If a sequence has a limit you can also find it by entering the Explicit Formula into Y= and substituting bigger and bigger numbers for x to see what value the sequence is approaching.

If the explicit formula is a Rational Function you can use this fact to help find the limit of the sequence, if there is one.

Rational Function: $\dfrac{\text{Polynomial}}{\text{Polynomial}}$

Reminder of what you learned last year:

Horizontal Asymptotes (HA) of Rational Functions.

- If the degree of the numerator and denominator are the same the HA is y = ratio of the leading coefficients.
- If the degree of the denominator is larger than the degree of the numerator the HA is y = 0
- If the degree of the numerator is larger than the degree of the denominator there is NO HA.

The Horizontal Asymptote of the explicit formula would be the LIMIT of the sequence.

Find the limit of each sequence, if there is one.

$$0.88, 1.32, 1.98, 2.97, \ldots$$

Geo
$r = 1.5$

geometric sequences whose $|r|>1$ do not have a limit.

NO Limit

$$\frac{900}{8}, \frac{1600}{27}, \frac{2500}{64}, \frac{3600}{125}, \ldots$$

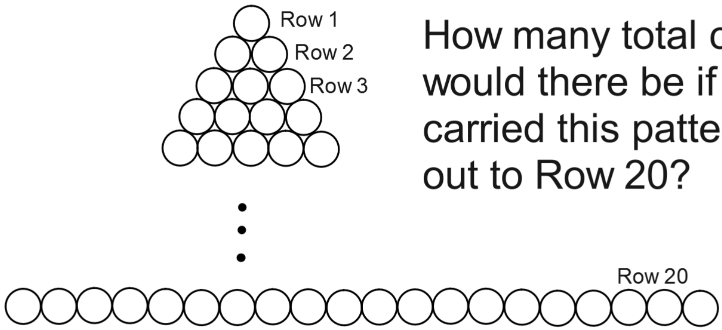
$$a_n = \frac{100(n+2)^2}{(n+1)^3}$$

This explicit formula is a rational function where the degree of the denominator is larger than the degree of the numerator, therefore, the formula a HA that is y=0 which means the limit is 0.

Limit = 0

You can now finish Hwk #32

Practice Sheet: Limit of a Sequence



How many total circles would there be if you carried this pattern out to Row 20?

To answer the previous question you would need to find the following sum:

$$1 + 2 + 3 + 4 + 5 + \ldots + 20$$

$$\overbrace{1 + \underbrace{2 + \underbrace{3 + 4 + 5 + \cdots + 16 + 17 + 18}_{21} + 19}_{21} + 20}^{21}$$

every time you pair up numbers you get a sum of 21. There are 20 numbers in this series which means there are 10 pairs of numbers and each pair adds to 21.

Sum = 10(21) = 210

When you replace the commas of a sequence with addition, you've created a SERIES.

$1 + 2 + 3 + 4 + 5 + ... + 20$

If the sequence was arithmetic then the series is called an Arithmetic Series.

Find the sum of this arithmetic series.

$1+2+3+4+...+39 =$

$\underbrace{1+\underbrace{2+\underbrace{3+4+...+37}_{=40}+38}_{=40}+39}_{=40} =$

there are 39 numbers in this series

When you pair up the numbers you get a sum of 40. Now find the number of terms in the series to see how many pairs of numbers you have.

$Sum = \frac{39}{2}(40) = \boxed{780}$

Find the sum of this arithmetic series.

$4+5+6+7+...+50 =$

$4+5+6+7+...+48+49+50 =$

$= 54$

$= 54$

$= 54$

When you pair up the numbers you get a sum of 54. Now find the number of terms in the series to see how many pairs of numbers you have.

To find the number of terms write the explicit formula replace a_n with the last term and solve for n.

$a_n = 4 + 1(n-1)$

$50 = 4 + 1(n-1)$

$46 = n - 1$

$47 = n$

There are 47 numbers in this Series

$Sum = \frac{47}{2}(54)$

$Sum = 23.5(54)$

$\boxed{Sum = 1269}$

Find the sum of this arithmetic series.

$1+4+7+10+...+40 =$

$\underbrace{1+4+7+10+...+34+37+40}_{1+40=41} =$

When you pair up the numbers you get a sum of 41. Now find the number of terms in the series to see how many pairs of numbers you have.

To find the number of terms write the explicit formula replace a_n with the last term and solve for n.

$a_n = 1 + 3(n-1)$

$40 = 1 + 3(n-1)$

$39 = 3(n-1)$

$13 = n - 1$

$14 = n$

There are 14 numbers in this Series

$Sum = \frac{14}{2}(41)$

$= 7(41)$

$\boxed{Sum = 287}$

If an arithmetic series is infinite, it does not have a sum.

If an arithmetic series is finite, it DOES have a sum.

The sum of a finite Arithmetic Series:

$$S_n = \frac{n}{2}(a_1 + a_n)$$

S_n = Sum of first n terms.
a_1 = First term
a_n = nth term (last term)
n = # of terms

Find the sum of this arithmetic series.

23 + 29 + 35 + 41 + ... + 119

You know the first and last terms so all you need to find is the number of terms.

$S_n = \frac{n}{2}(23 + 119)$

$= \frac{17}{2}(23 + 119)$

$S_{17} = 8.5(142)$

$\boxed{S_{17} = 1207}$

To find the number of terms write the explicit formula replace a_n with the last term and solve for n.

$119 = 23 + 6(n-1)$

$96 = 6(n-1)$

$16 = n-1$

$17 = n$