Name $\qquad$ Date $\qquad$
Review Questions

1) Solve for all values of $x: \cos ^{2} x+\cos x=0$
2) Solve for all values of $x . \quad \sin (2 x)=1 / 2$
3) Write parametric equations for the line $y=2 x+8$.

Sequence: A list of values with a definite pattern

Series: A sum of values with a definite pattern
$\Sigma$ NOTATION: We use $\Sigma$ notation to represent a series. $\Sigma$ stands for "find the sum".

Expand each series and find the sum.
Ex. $1 \sum^{\sum(2 x+1)}$
versus $\quad \sum(2 x+1)$ multiplied by a scalar (c)
Ex. $2 \sum_{2}^{(4-5 x)}$

Ex. 3 $\sum x!$
a) Simplify 8!/7!
b) Simplify $33!/ 32$ !
C) Simplify $(n+1)!/ n$ !
$\sum\left(3^{x}\right)$

Ex. 4

Ex. $5 \sum^{\cos x}$

Write each series using sigma or summation notation.
Ex. $7 \quad 1+2+6+24+120$

Ex. $8 \quad 1+4+9+16+25+36+49$

Ex. $9 \quad 2+4+6+8+10+12+14+16$

Ex. $10 \quad 1-3+9-27+81$

Ex. $11 \sin 0+\sin 1+\sin 2+\sin 3+\sin 4$

Ex. $123+6+9+12+\ldots$

Ex. $13 \quad 2+5+10+17+26+37$

Ex. $141+4+7+10+13+16+19$

Ex. $15-1+1+3+5+7+9+11+\ldots$

More Challenging Problems:
Ex. 16 (1) $(4)+(2)(16)+(6)(64)+(24)(256)$

Ex. $17 \quad 0+3+8+15+24+35+48$
$\begin{array}{lllllll}3 & 3 & 3 & 3 & 3 & 3 & 3\end{array}$

Ex. $181+4+6+4+1$

Day 2
Review Questions

1) What is the formula for $\sin 2 x$ ?
2) What is one formula for $\cos 2 x$ ?
3) Solve for all values of $x \cos 5 x=1$.

Recursive Formula: A recursive formula for a sequence is used when you are describing the sequence in terms of a previous term in the sequence. Always write $\mathrm{a}_{1}=$ $\qquad$ and $\mathrm{a}_{\mathrm{n}}=$ $\qquad$ .

## A Perfect Example of a Recursive Formula

Fibonacci Sequence
$1,1,2,3,5,8,13,21,34$, etc

The following sequences are defined using recursion formulas. Write the first five terms of each sequence.

Ex. $1 \mathrm{a}_{1}=4, \mathrm{a}_{\mathrm{n}}=\mathrm{a}_{\mathrm{n}-1}+3$ for $\mathrm{n} \geq 2$

Ex. $2 \mathrm{a}_{1}=3, \mathrm{a}=5\left(\mathrm{a}_{\mathrm{n}-1}\right)$ for $\mathrm{n} \geq 2$

Ex. $3 a_{1}=4, a_{2}=5, a_{n}=a_{n-1}+a_{n-2} \quad$ for $n>2$

Ex. $4 a_{1}=2, a_{n}=3\left(a_{n-1}\right)+3$ for $n \geq 2$

Ex. $5 a_{1}=0, a_{n}=2\left(a_{n-1}\right)^{2}+1$ for $n \geq 2$

## Factorial Practice

Expand each factorial and evaluate.
Ex. 6 13!/12!
Ex. 7 20!/18!
Ex. 8 130!/129!

Ex. $9 \mathrm{n}!/(\mathrm{n}-1)!\quad$ Ex. 10 50!/46! Ex. 11 The number of arrangements in MISSISSIPPI

Ex. $12 \mathrm{n}!/(\mathrm{n}-2)!$
Ex. 13 (2n)!/(2n-2)!

Write each series using summation notation. Use k for the index in each.
Ex. $14 \quad 14^{1}+14^{2}+14^{3}+\ldots$
Ex. $154+7+10+13+16+19$

Ex. $1632+29+26+23+20+17$

$$
\begin{array}{llllll}
\text { Ex. } 17 & 1 & + & 2+ & 3+ & 4
\end{array}+\ldots+\mathrm{n}
$$

Ex. $18 \tan 0 \sin 1+\tan 1 \sin 2+\tan 2 \sin 3+\tan 3 \sin 4+\tan 4 \sin 5+\tan 5 \sin 6$

Ex. $192+7+14+23+34$

Ex. $202+4+12+48+240$

Day 3
Review Questions

1) How many triangles are possible? $A=37^{0}, b=12, a=7$
2) When do you use Law of Cosines?
3) What is $\sin (x+y)$ ?

## Arithmetic Sequence: A list of numbers with a common difference (d) <br> Arithmetic Series: A list of numbers with a common difference (d) written in summation form or with + signs in between

Finding the nth term of an arithmetic sequence:
Consider the arithmetic sequence $3,7,11,15, \ldots$
What is the fifth term?
What is the $12^{\text {th }}$ term?
What is the $112^{\text {th }}$ term?

Put what you just did into a formula.
Formula for finding nth term of an arithmetic sequence

Ex. 1 Find the first five terms of an arithmetic sequence with $\mathrm{a}_{1}=2$ and $\mathrm{d}=4$

Ex. 2 Find the first four terms of the sequence $a_{1}=3, a_{n}=a_{n-1}+1.2$

Find the indicated term with the given $\mathrm{a}_{1}$ and d .
Ex. $3 \mathrm{a}_{17}=$ $\qquad$ $, a_{1}=-2, d=-4$

Ex. $4 \mathrm{a}_{72}=$ $\qquad$ $, a_{1}=23, d=.5$

## Precalculus Guided Notes: Arithmetic Sequences and Series 10.2

Write a formula for the general term (nth term) of each arithmetic sequence. Then find the specified term.

Ex. 5 7, 10, 13, 16, $\ldots$ Find a89.

Ex. 6 9, 5, 1, $-3, \ldots$ Find $\mathrm{a}_{34}$.

Ex. $7 a_{1}=24, d=-7 \quad$ Find $a_{17}$.

Ex. $8 a_{n}=a_{n-1}+2, a_{1}=-17 \quad$ Find $a_{28}$.

Find the SUM of an arithmetic series:
Consider the series $3+7+11+15+19+23$

Using the information above, write the formula for an arithmetic sum.
FORMULA FOR SUM

SUBSTITUTE to the get second form

Ex. 9 Find the sum of the first 20 terms of $3+7+11+\ldots$

Ex. 10 Find the sum of the first 80 natural numbers $1+2+3+\ldots+80$

Ex. 11 Find the sum of the first 50 positive even integers.

Ex. 12 Find the sum of the first 30 even integers.

Find each sum.
Ex. $13 \sum_{1}^{20}(2 x+4)$
Ex. $14 \sum_{0}^{50}(-3 k+2)$
Ex. $15 \sum_{1}^{101}(9 k)$

## Precalculus Guided Notes: Geometric Sequences and Series 10.3

Day 4
Review Questions

1) How many triangles are possible? $a=3, b=7, c=8$
2) What is the formula for $\cos (x-y)$ ?

Geometric Sequence is a list of numbers with a common ratio $\mathbf{r}(\mathbf{r} \neq 0)$. Geometric Series is a list of numbers with + signs in between, for which you are finding a sum.
$r$ can always be found by dividing one term by its previous term $r=a_{n} / a_{n-1}$
Consider the sequence $3,6,12,24, \ldots$

What is the fifth term?

What is the $13^{\text {th }}$ term?
What is the $113^{\text {th }}$ term?
Put this into a formula.
Formula for finding nth term of a geometric sequence:

Ex. 1 Write the first four terms of a geometric sequence with $\mathrm{a}_{1}=1.5$ and $\mathrm{r}=2$.

Ex. 2 Write the first four terms of a geometric sequence with $a_{1}=1$ and $a_{n}=a_{n-1}(-3)$.

Find each specified term by using the formula above
Ex. $3 a_{1}=1.2, r=-2 \quad$ Find $a_{17}$.

Ex. $4 a_{1}=-2, r=.5 \quad$ Find $a_{21}$.

## Precalculus Guided Notes: Geometric Sequences and Series 10.3

Write the general formula for each. Then find the specified term.
Ex. $5 \quad 4,6,9, \ldots \quad$ Find $a_{18}$.

Ex. 6 3, $-1,1 / 3, \ldots$ Find $\mathrm{a}_{12}$.

Sum of a GEOMETRIC SERIES
FORMULA is $\mathrm{S}_{\mathrm{n}}=$

Find the sum of each series.
Ex. 7 Find the sum of the first 21 terms of $2,6,18, \ldots$

Ex. $8 \sum_{1}^{7}(4)^{x}$

Infinite Geometric Series: A series with an infinite number of values. The sum of this can be found when $-1<r<1(r \neq 0)$ because the values will be approaching a certain number.

Consider the series $3+1+1 / 3+1 / 9+\ldots$
Find the sum of this series. What should the sum be close to?

FORMULA FOR INFINITE SERIES $\mathrm{S}_{\infty}=$

Ex. 9 Find the sum of $4+2+1+1 / 2+\ldots$

Use the sum formula to find the fractional form of each repeating decimal.
Ex. 10.7
Ex. 11.8
Ex. 12.9

Ex. 13.89
Ex. 142.45
Ex. 15.17

## Binomial Theorem: Expansion of a Binomial 10.5

## Day 5

Review Questions

1) What is $\sin 2 x$ ?
2) What is $\tan 0$ ?
3) What is sec0?

Expanding a binomial means you must do FOIL at least one time. However, when the power is 3 or higher, this may be quite tedious... $(x+y)^{3}(x+y)^{4}(x+y)^{5}$ etc. On these, it would be easier to use the binomial theorem.

Ex. $1(\mathrm{x}+\mathrm{y})^{4}$

Binomial Theorem:
$(x+y)^{n}=$
For coefficients,
Use Pascal's Triangle:
Write with choose ${ }_{n} \mathrm{C}_{\mathrm{r}}=\binom{n}{r}$

Ex. $2(x-y)^{5}$

Ex. $3(2 x+y)^{6}$

Ex. $4(3 x-2 y)^{5}$

Find the designated term for each binomial expansion.
Ex. $55^{\text {th }}$ term of $(x+y)^{12}$
Ex. $69^{\text {th }}$ term of $(w-y)^{15}$

Ex. $77^{\text {th }}$ term of $(2 a-3 b)^{12}$
Ex. $8 \quad 12^{\text {th }}$ term of $(3 y-x)^{16}$

