Warm-up

Find the pattern and write the next three terms.

1. 2, 4, 6, 8, 10, 12 , 14 , 16 pattern: Add 2

2. 1, 4, 9, 16, 25, 36 , 49 , 64 pattern: Perfect squares / increasing odds

3. –2, 4, -8, 16, -32 , 64 , -128 pattern: Mult. by -2

4. 1/2,1,3/2, 2 , 5/2 , 3 , 7/2 pattern: Add 1/2

Unit 8

Probability and Statistics

Sequences and Series

- Ordered list of numbers
- Notation: a_n

- Sum of a sequence
- Notation: S_n or $\sum$

Can be finite (1, 2, 3) or infinite (1, 2, 3, 4, ...)

Sequences and Series

2 types:

Arithmetic: Pattern progresses by adding/subtracting (Common difference)

Geometric: Pattern progresses by multiplying/dividing (Common ratio)

Equation for Arithmetic Sequence:

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

Finding a specific term

a_n is the n^{th} term of the sequence

a_1 is the first term

d is the common difference

what you are adding/subtracting

Examples

1. Write the ~~next term~~ 17th term of the sequence. Then write a rule for the ~~nth~~ term.

a. -4, -3, -2, -1,...

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

$a_n = -4 + (n-1)(1)$ n^{th} term rule

$a_{17} = -4 + (17-1)(1)$

$a_{17} = 12$

b. 6, 9, 12, 15, ...

6, 9, 12, 15

General rule: $a_n = 6 + (n-1)(3)$

$a_{17} = 54$

c. 0,1,2,3,.....

d. 5,1,-3,-7,...

2.

a. Write a rule for the nth term of the sequence 32, 47, 62, 77, …. Then find a12.

b. Write a rule for the nth term of the sequence $\frac{1}{2}$, 1, 3/2, 2, …. Then find a12.

n^{th} rule: $a_n = \frac{1}{2} + (n-1)\frac{1}{2}$

$a_{12} = 6$

Arithmetic Series

Equation for arithmetic series:

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

S_n is the sum of the first n terms of the series

Sum of a specific number of terms

Examples

subtracting 2

1. Arithmetic series: 20+18+16+14+...

Find the sum of the first 25 terms.

$a_{25} = 20 + (25-1)(-2) = -28$

$S_{25} = n\left(\frac{a_1 + a_n}{2}\right) = 25\left(\frac{20 + (-28)}{2}\right) = -100$

2. Arithmetic series 100+110+120+130+....

Find the sum of the first 18 terms

$a_{18} = 100 + (18-1)(10) = 270$

$S_{16} = 18\left(\frac{100 + 270}{2}\right) = 3,330$

Sigma Notation of a Series

last number you plug in

Sum →

$$\sum_{n=1}^{5} (1 + 5n)$$

pattern

first number you plug in to the pattern

Examples

1. $\sum_{n=1}^{5}(1+5n) = 80$

$a_1 = 6$
$a_2 = 11$
$a_3 = 16$
$a_4 = 21$
$a_5 = 26$

80

2. $\sum_{n=3}^{7} (n^2 + 4) = 155$

$a_3 = 13$

$a_4 = 20$

$a_5 = 29$

$a_6 = 40$

$a_7 = 53$

155

You Try

3. $\sum_{n=1}^{5}(4n^2+1) = 225$

$a_1 = 5$

$a_2 = 17$

$a_3 = 37$

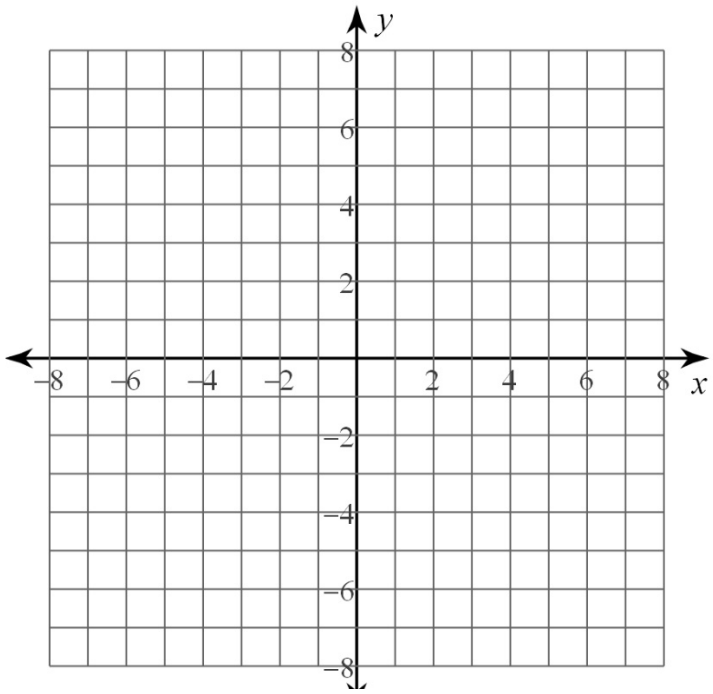
$a_4 = 65$

$a_5 = 101$

225

4. $\sum_{n=4}^{8} (50 - n)$

$\log_2(x-3)+1$



$-\log_2 x - 4$