

11.2 Series

PRACTICE

Directions: Use the partial sequence to answer the questions.

1) $3 + 7 + 11 + 15 + \dots$ $d = 4, n = 12$
 a) What is the sum of the first 12 terms?

$$f(n) = \frac{n}{2}(6 + 4(n-1))$$

$$= 6(6 + 4(11))$$

$$= 6(50) = 300$$

b) How many terms are there if the sum is 105?

$$2(105) = \frac{n}{2}(6 + 4(n-1)) \quad (2)$$

$$210 = n(6 + 4n - 4)$$

$$210 = n(4n + 2)$$

$$210 = 4n^2 + 2n$$

$$0 = 4n^2 + 2n - 210$$

X	Y1
100	100
54	54
0	0
82	82
132	132
210	210
298	298

$$n = 7$$

2) $4 + 12 + 36 + 108 + \dots$ $r = 3, n = 10$
 a) What is the sum of the first 10 terms?

$$S(10) = 4 \left(\frac{1-3^{10}}{1-3} \right)$$

$$= 4 \left(\frac{-59048}{-2} \right)$$

$$= 4(29524) = 118,096$$

b) How many terms are there if the sum is 4372?

$$4372 = 4 \left(\frac{1-3^n}{1-3} \right)$$

$$4372 = 4 \left(\frac{1-3^n}{-2} \right)$$

$$4372 = -2(1-3^n)$$

$$-2186 = 1-3^n$$

$$-2187 = -3^n$$

$$2187 = 3^n$$

$$\log_3 2187 = \log_3 3^n$$

$$7 = n$$

3) $1 + 6 + 36 + 216 + \dots$ $r = 6, n = 7$
 a) What is the sum of the first 7 terms?

$$S(7) = 1 \left(\frac{1-6^7}{1-6} \right)$$

$$S(7) = \frac{-279935}{-5}$$

$$S(7) = 55,987$$

b) How many terms are there if the sum is 335,923?

$$(335,923) = 1 \left(\frac{1-6^n}{1-6} \right) (-5)$$

$$-1679615 = 1-6^n$$

$$-1679616 = -6^n$$

$$1679616 = 6^n$$

$$\log_6 1679616 = \log_6 6^n$$

$$8 = n$$

4) $14 + 18 + 22 + 26 + \dots$ $d = 4, n = 23$
 a) What is the sum of the first 23 terms?

$$S(23) = \frac{23}{2}(28 + 4(23-1))$$

$$= 11.5(28 + 4(22))$$

$$= 11.5(116)$$

$$S(23) = 1334$$

b) How many terms are there if the sum is 432?

$$432 = \frac{n}{2}(28 + 4(n-1))$$

$$864 = n(28 + 4n - 4)$$

$$864 = n(4n + 24)$$

$$864 = 4n^2 + 24n$$

$$0 = 4n^2 + 24n - 864$$

X	Y1
100	100
224	224
116	116
0	0
124	124
256	256
396	396

$$n = 12$$

5) $(-2) + (-8) + (-32) + (-128) + \dots$ $r = 4, n = 6$
 a) What is the sum of the first 6 terms?

$$S(6) = -2 \left(\frac{1-4^6}{1-4} \right)$$

$$S(6) = -2 \left(\frac{-4285}{-3} \right)$$

$$S(6) = -2(1365)$$

$$S(6) = -2730$$

b) How many terms are there if the sum is -10,922?

$$-10,922 = -2 \left(\frac{1-4^n}{1-4} \right)$$

$$-5461 = \frac{1-4^n}{-3}$$

$$-16383 = 1-4^n$$

$$-16384 = -4^n$$

$$16384 = 4^n$$

$$\log_4 16384 = \log_4 4^n$$

$$7 = n$$

6) $(-20) + (-8) + 4 + 16 + \dots$ $d = 12, n = 10$
 a) What is the sum of the first 10 terms?

$$S(10) = \frac{10}{2}(-40 + 12(10-1))$$

$$S(10) = 5(-40 + 12(9))$$

$$S(10) = 5(68)$$

$$S(10) = 340$$

b) How many terms are there if the sum is 1120?

$$1120 = \frac{n}{2}(-40 + 12(n-1))$$

$$2240 = n(-40 + 12n - 12)$$

$$2240 = n(12n - 52)$$

$$2240 = 12n^2 - 52n$$

$$0 = 12n^2 - 52n - 2240$$

X	Y1
11	-1360
12	-1136
13	-888
14	-616
15	-320
16	0
17	344

$$n = 16$$

9) Mr. Kelly has the GREATEST (nerdiest) way to assign students to homeroom on their first day of school. He puts 3 kids in the first room, 10 kids in the second room, 17 kids in third room and so on until all the kids are in a room.

a) How many kids will be in the 15th room? $n=15$ $3, 10, 17 \rightarrow d=7$

NOT A SUM!
 $F(n) = 3 + 7(n-1)$
 $F(15) = 101 \text{ kids}$

b) How many classrooms will they need if the school has 1125 students?

$2(1125) = \frac{n}{2}(6 + 7(n-1)) \rightarrow 0 = 7n^2 - n - 2250$
 $2250 = n(6 + 7n - 7)$
 $2250 = n(7n - 1)$
 $2250 = 7n^2 - n$

We would be 18 rooms

X	Y1
14	-892
15	-690
16	-474
17	-244
18	0
19	258
20	530

X=18

10) Mr. Brust really needs to start lifting weights. On Monday he does one bench press of 50 pounds. Each day the amount of weight Mr. Brust does for that single bench press increases by 20%.

50, 50(1.2), 60(1.2)

a) How much weight is his one bench press on Thursday?

50, 60, 72

$f=1.2$ NOT A SUM!
 $a=50$

M T W T F
 $F(4) = 50(1.2^{4-1}) = 50(1.2^3) = 86.4 \text{ Pounds}$

b) If he continued this pattern Monday through Sunday, how much total weight did he lift for the week?

$S(7) = 50 \left(\frac{1-1.2^7}{1-1.2} \right) = 50(12.915) = 645.7952 \text{ POUNDS TOTAL}$

11) The Algebras start a side business selling t-shirts. The first year they make \$500 (mostly from family and friends). The next several years the revenue increased by about 6.8% each year.

500, 500(1.068), 534

a) How much revenue did they make in their fifth year?

NOT A SUM
 $f=1.068$
 $a=500$

$F(5) = 500(1.068)^{5-1} = 500(1.068^4) = \650.51

b) How much total revenue did they make after five years?

TRY NOT TO ROUND TIL THE END!

$S(5) = 500 \left(\frac{1-1.068^5}{1-1.068} \right) = 500 \left(\frac{-0.3894}{-0.068} \right) = 500(5.7278) = \2863.92

12) The Algebras are going to try to create the largest HUMAN PYRAMID in history. They call the Guinness Book of World Records in fact! The bottom row of the pyramid has 49 people, the next row has 47 people, and the third row has 45 people and so on.

49, 47, 45

a) What row number has only 1 person in it?

$1 = 49 - 2(n-1)$
 $-48 = -2(n-1)$
 $24 = n-1$
 $25 = n$

b) If the last row only has 1 person in it, how many total people are in the human pyramid?

$a=49$
 $d=2$
 $n=25$

$S(n) = \frac{n}{2}(98 - 2(25-1)) = 12.5(98 - 48) = 12.5(50) = 625 \text{ PEOPLE}$

Directions: Solve the given equations.

13) $\frac{x}{3} - \frac{y}{y+1} = \frac{1}{2}$ $2(3)(y+1)$

$4(3)(y+1) - 2(3)(y) = 3(y+1)$
 $8(y+1) - 6y = 3y+3$
 $8y+8 - 6y = 3y+3$
 $2y+8 = 3y+3$
 $5 = y$

14) $-5\sqrt{x+1} + 12 = 2$

$-5\sqrt{x+1} = -10$
 $\sqrt{x+1} = 2$
 $(\sqrt{x+1})^2 = 2^2$
 $x+1 = 4$
 $x = 3$