

Sequences and Series Review Homework

Name: _____

Date: _____

1. An auditorium has 20 seats on the first row, 24 seats on the second row, 28 seats on the third row, and so on and has 30 rows of seats. How many seats are in the theatre?

$$20, 24, 28, \dots$$

$$S_n = \frac{n}{2}(A_1 + A_n)$$

$$S_{30} = \frac{30}{2}(20 + 136)$$

$$S_{30} = 2340$$

$$A_n = 20 + (n-1)(4)$$

$$A_{30} = 20 + (30-1)(4)$$

$$A_{30} = 136$$

2. Suppose you go to work for a company that pays one penny on the first day, 2 cents on the second day, 4 cents on the third day and so on. If the daily wage keeps doubling, what will your total income be for working 31 days?

$$.01, .02, .04, \dots$$

$$S_n = A_1 \left(\frac{1-r^n}{1-r} \right)$$

$$S_{31} = (.01) \left(\frac{1-2^{31}}{1-2} \right)$$

$$S_{31} = \$2,147,4836.47$$

3. Logs are stacked in a pile with 24 logs on the bottom row and 15 on the top row. There are 10 rows in all with each row having one more log than the one above it. How many logs are in the stack?

$$S_n = \frac{n}{2}(A_1 + A_n)$$

$$S_{10} = \frac{10}{2}(24 + 15)$$

$$S_{10} = 5(39)$$

$$S_{10} = 195$$

4. A ball is dropped from a height of 16 feet. Each time it drops, it rebounds 80% of the height from which it is falling. Find the total distance traveled in 15 bounces.

$$16, 12.8, 10.24, \dots$$

$$S_{15} = 16 \left(\frac{1-.8^{15}}{1-.8} \right)$$

$$S_{15} = 77.19$$

$$S_{15} = 138.38$$

5. A company is offering a job with a salary of \$30,000 for the first year and a 5% raise each year after that. If that 5% raise continues every year, find the amount of money you would earn in a 40-year career. 30,000, 31,500, 33,075, ...

$$S_{40} = 30,000 \left(\frac{1-1.05^{40}}{1-1.05} \right)$$

$$S_{40} = \$3,623,993.23$$

6. Each hour, a grandfather clock chimes the number of times that corresponds to the time of day. For example, at 3:00, it will chime 3 times. How many times does the clock chime in a day?

$$2, 4, 6, 8, \dots$$

$$S_{12} = \frac{12}{2}(2 + 24)$$

$$S_{12} = 6(26)$$

$$S_{12} = 156$$

$$1, 2, 3, \dots$$

$$S_{12} = \frac{12}{2}(1+12)$$

$$S_{12} = 6(13)$$

$$S_{12} = 78$$

$$= 78 \cdot 2$$

$$S_{12} = 156$$

7. A clock strikes once when its hour hand is at 1, twice when it is at 2, and so on. How many times does the clock strike in six hours? (ASSUME WE ARE STARTING FROM 1)

1, 2, 3, ...

$$A_n = 1 + (n-1)(1)$$

$$A_6 = 1 + (6-1)(1)$$

$$A_6 = 1 + 5$$

$$A_6 = 6$$

$$S_6 = \frac{6}{2} (1 + 6)$$

$$S_6 = 3(7)$$

$$S_6 = 21$$

8. A factory owner repays his loan of \$2088000 by \$20000 in the first monthly installment and then increases the payment by \$1000 in every installment. In how many installments he will clear his loan?

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

$$20,000 + 21,000 + 22,000 + \dots + ? = 2,088,000$$

Arithmetic

$$a_1 = 20,000 ; d = 1,000$$

$$a_n = 20,000 + (n-1)1000$$

$$a_n = 1000n + 19,000$$

$$2,088,000 = \frac{n}{2} (20,000 + (1000n + 19,000))$$

$$2,088,000 = \frac{n}{2} (1000n + 39,000)$$

$$0 = 500n^2 + 19,500n - 2,088,000$$

9. After knee surgery, your trainer tells you to return to your jogging program slowly. He suggests jogging for 12 minutes each day for the first week. Each week thereafter, he suggests that you increase that time by 6 minutes per ~~day~~ ^{week}. How many weeks will it be before you are up to jogging 60 minutes per day?

12, 18, 24

$$A_n = A_1 + (n-1)(d)$$

$$60 = 12 + (n-1)(6)$$

$$48 = 6n - 6$$

$$54 = 6n$$

$$9 = n$$

$$0 = 500n^2 + 19,500n - 2,088,000$$

$$0 = n^2 + 39n - 4176$$

$$n = \frac{-39 \pm \sqrt{1521 - 4(1)(-4176)}}{2(1)} = \frac{-39 \pm \sqrt{18225}}{2}$$

$$n = \frac{-39 \pm 135}{2} = \boxed{48} \text{ or } \cancel{-87}$$

10. You complain that the hot tub in your hotel suite is not hot enough. The hotel tells you that they will increase the temperature by 10% each hour. If the current temperature of the hot tub is 290 K, (Kelvin is the absolute temperature scale) what will be the temperature of the hot tub after 3 hours, to the nearest tenth of a degree? 290, 319, 350.9, ...

$$A_n = A_1 \cdot R^{n-1}$$

$$A_3 = (290)(1.1)^{3-1}$$

$$A_3 = 350.9$$

11. A culture of bacteria doubles in population every 2 hours. If there are 500 bacteria at the beginning, how many bacteria will there be after 24 hours? 500, 1000, 2000, 4000, ...

$$S_{24} = 500 \left(\frac{1 - 2^{24}}{1 - 2} \right)$$

$$S_{24} = 8,388,607,500$$

12. A mine worker discovers an ore sample containing 500 mg of radioactive material. It is discovered that the radioactive material has a half life of 1 day. Find the amount of radioactive material in the sample at the beginning of the 7th day. 500, 250, 125, ...

$$A_n = A_1 \cdot R^{n-1}$$

$$A_7 = 500 \cdot \left(\frac{1}{2} \right)^{7-1}$$

$$A_7 = 7.8125$$