sequence = $a_1, a_2, a_3, a_4, \ldots$ geometric if $\frac{a_2}{a_1} = \frac{a_3}{a_2} = \frac{a_4}{a_3} = R$

GSE Algebra II arithmetic if $a_2 - a_1 = a_3 - a_2 = a_4 - a_3 = d$ Day 7.5 - Homework

Name: _____ Date: _____ geometric: $a_n = a_1 R^{n-1}$

Geometric Sequences and Series

Determine whether each sequence could be geometric or arithmetic. If possible find the common ratio or common difference.

1.) $-10, -12, -14, -16, \ldots$

$-12 - -10 = -2$

$-14 - -12 = -2$

Arithmetic $d = -2$

2.) $\frac{1}{2}, 1, 2, 3, \ldots$

Neither

3.) $-320, -80, -20, -5, \ldots$

$\frac{-80}{-320} = \frac{1}{4}$ $\frac{-20}{-80} = \frac{1}{4}$ $\frac{-5}{-20} = \frac{1}{4}$

Geometric $R = 1/4$

4.) $-36, -49, -64, -81, \ldots$

$\frac{-49}{-36} \neq \frac{-64}{-49}$ $-49 - -36 = -13$ $-64 - -49 = -15$

Neither

5.) $-2, -6, -18, -54, \ldots$

Geometric $R = 3$

6.) $2, 7, 12, 17, \ldots$

Arithmetic $d = 5$

Find the 10th term of each geometric sequence.

7.) $2, 6, 18, 54, 162, \ldots$

$a_{10} = 39,366$

8.) $5000, 500, 50, 5, 0.5, \ldots$

$a_{10} = .000005$

9.) $-0.125, 0.25, -0.5, 1, -2, \ldots$

$R = \frac{.25}{-.125} = \frac{-.5}{.25} = \frac{1}{-.5} = \frac{-2}{1} = -2$

$a_{10} = (-.125)(-2)^9 = 64$

Find the 9th term of each geometric sequence.

10.) $\frac{1}{2}, \frac{1}{10}, \frac{1}{50}, \frac{1}{250}, \frac{1}{1250}, \ldots$ $R = \frac{1/10}{1/2} = \frac{1/50}{1/10} = \frac{1/250}{1/50} = \frac{1}{5}$

$a_9 = \frac{1}{2}\left(\frac{1}{5}\right)^8 = \frac{1}{781,250} = .00000128$

11.) $3, -6, 12, -24, 48, \ldots$

$a_9 = 768$

12.) $3200, 1600, 800, 400, 200, \ldots$

$R = \frac{1600}{3200} = \frac{800}{1600} = \frac{400}{800} = \frac{200}{400} = \frac{1}{2}$

$a_9 = 3200\left(\frac{1}{2}\right)^8 = \frac{25}{2} = 12.5$

13.) $8, 24, 72, 216, 648, \ldots$

$a_9 = 52,488$

Find the 7th term of the geometric sequence with the given terms.

14.) $a_4 = 54, a_5 = 162$

$a_5 = a_4 R^1$

$\frac{162}{54} = \frac{54R^1}{54}$

$R = 3$

$a_7 = a_5 R^2$

$a_7 = 162(3)^2$

$a_7 = 1458$

15.) $a_5 = 13.5, a_6 = 20.25$

$a_7 = 30.375$

16.) $a_4 = -4, a_6 = -100$

$a_6 = a_4 R^2$

$\frac{-100}{-4} = \frac{-4R^2}{-4}$

$\sqrt{25} = \sqrt{R^2}$

$R = 5$

$a_7 = a_6 R^1$

$a_7 = -100(5)$

$a_7 = -500$ OR 500

Find the 6th term of the geometric sequence with the given terms.

17.) $a_4 = -12, a_5 = -4$

$a_7 = -\frac{4}{3}$

18.) $a_2 = 4, a_5 = 108$

$a_5 = a_2 R^3$

$\frac{108}{4} = \frac{4R^3}{4}$

$\sqrt[3]{R^3} = \sqrt[3]{27}$

$R = 3$

$a_7 = a_5 R^2$

$a_7 = 108(3)^2$

$a_7 = 972$

19.) $a_3 = 3, a_5 = 12$

$a_7 = 24$

Find the geometric mean of each pair of numbers.

20.) 6 *and* $\frac{3}{8}$ $\sqrt{6\cdot\frac{3}{8}} = \sqrt{\frac{18}{8}}$

$\sqrt{\frac{9}{4}} = \frac{3}{2} = 1.5$

21.) 2 *and* 32

$= 8$

22.) 12 *and* 192 $\sqrt{12\cdot 192}$

$= 48$

23.) 9 *and* $\frac{1}{9}$

$= 1$

24.) 18 *and* 2 $\sqrt{18\cdot 2}$

$\sqrt{36}$

$= 6$

25.) $\frac{1}{5}$ *and* 45

$= 3$

Find the indicated sum for each geometric series. $S_n = a_1\left(\frac{1-R^n}{1-R}\right)$

26.) S_6 *for* $2+0.2+0.02+\ldots$

$R = \frac{.2}{2} = \frac{.02}{.2} = .1$ $a_1 = 2$

$S_6 = 2\left(\frac{1-(.1)^6}{1-.1}\right) = 2.\bar{2}$

27.) $\sum_{k=1}^{5}(-3)^{k-1} = 1-3+9-27+\ldots$ $a_1 = 1$ $R = -3$

$S_5 = 1\left(\frac{1-(-3)^5}{1-(-3)}\right) = 61$

28.) S_5 *for* $12-24+48-96+\ldots$

$S_5 = 132$

29.) $\sum_{k=1}^{9} 256\left(\frac{1}{2}\right)^{k-1}$

$S_9 = 511$

30.) S_6 *for* $1+5+25+125+\ldots$

$R = \frac{5}{1} = \frac{25}{5} = \frac{125}{25} = 5$ $a_1 = 1$

$S_6 = 1\left(\frac{1-(5)^6}{1-5}\right) = 3906$

31.) $\sum_{k=1}^{9} -1\left(\frac{1}{3}\right)^{k-1}$ $a_1 = -1$ $R = \frac{1}{3}$

$S_9 = -1\left(\frac{1-(1/3)^9}{1-1/3}\right) = -\frac{364}{243} = -1.49$

32.) S_8 *for* $10+1+\frac{1}{10}+\frac{1}{100}+\ldots$

$S_8 = 11.\bar{1}$

33.) $\sum_{k=1}^{7} 8(10)^{k-1}$

$S_7 = 8,888,888$

34.)**Salary** In his first year, a math teacher earned $32,000. Each successive year, he earned a 5% raise. How much did he earn in his 20th year? What were his total earnings over the 20-year period?

$a_1 = 32,000$

$R = 1.05$

$a_{20} = a_1 R^{19} = 32,000(1.05)^{19}$

Salary his 20th year is 80,862.41

$S_{20} = 32,000\left(\frac{1-(1.05)^{20}}{1-(1.05)}\right) = 1,058,110.53$