

Part 1

Scientific Calculator Allowed & Formula Sheet Provided

Good Luck!!!!

Sequences and Series

<p>1. Use the following sequence to answer the questions below:</p> <p style="text-align: center;">-9, -2, 5, 12, 19, ...</p> <p>a. Determine whether the sequence or series is arithmetic (A), geometric (G) or neither (N).</p> <p>b. If arithmetic, give the common difference, d. If geometric, write G and give the common ratio, r. If</p> <p>c. Write an explicit equation or the sequence.</p>	<p>2. Use the following sequence to answer the questions below:</p> <p style="text-align: center;">6, -3, 1.5, -0.75, ...</p> <p>a. Determine whether the sequence or series is arithmetic (A), geometric (G) or neither (N).</p> <p>b. If arithmetic, give the common difference, d. If geometric, write G and give the common ratio, r. If</p> <p>c. Write an explicit equation or the sequence.</p>
<p>3. Which of the following is a_6 in the geometric sequence in which $a_1 = 5$ and $r = 3$.</p> <p>a. 1,215 b. 3,645 c. 9,375 d. 23</p>	<p>4. Which of the following is the formula to use for calculating the sum of the given series?</p> <p style="text-align: center;">Given: $\sum_{n=1}^{\infty} 3(0.2)^{n-1}$</p> <p>a. $S_n = \frac{n}{2}(a_1 + a_n)$ b. $S = \frac{a_1}{1-r}$ c. $S_n = a_1 \left(\frac{1-r^n}{1-r} \right)$ d. None of the above</p>
<p>5. Which of the following is the series represented by the expression $\sum_{n=1}^{\infty} 2\left(\frac{1}{3}\right)^{n-1}$</p> <p>a. $\frac{2}{3}, \frac{2}{9}, \frac{2}{27}, \frac{2}{81}, \dots$ b. $\frac{2}{3} + \frac{2}{9} + \frac{2}{27} + \frac{2}{81}, \dots$ c. $2 + \frac{2}{3} + \frac{2}{9} + \frac{2}{27} + \dots$ d. $2, \frac{2}{3}, \frac{2}{9}, \frac{2}{27}, \dots$</p>	<p>6. Find the sum $\sum_{n=1}^{16} (18 - 4n)$</p>

7. Find the sum

$$\sum_{n=1}^{\infty} 3(-2)^{n-1}$$

- a. no sum exists
- b. 1
- c. -2
- d. 3

8. Find the sum $\sum_{n=1}^{\infty} 3\left(-\frac{1}{2}\right)^{n-1}$

- a. no sum exists
- b. 6
- c. 2
- d. 3

Rational Functions

9. Factor and Simplify: $\frac{x^2 + 3x}{x^2 + 8x + 15}$

10. Subtract and simplify: $\frac{x}{x+1} - \frac{2}{x+4}$

11. Simplify:

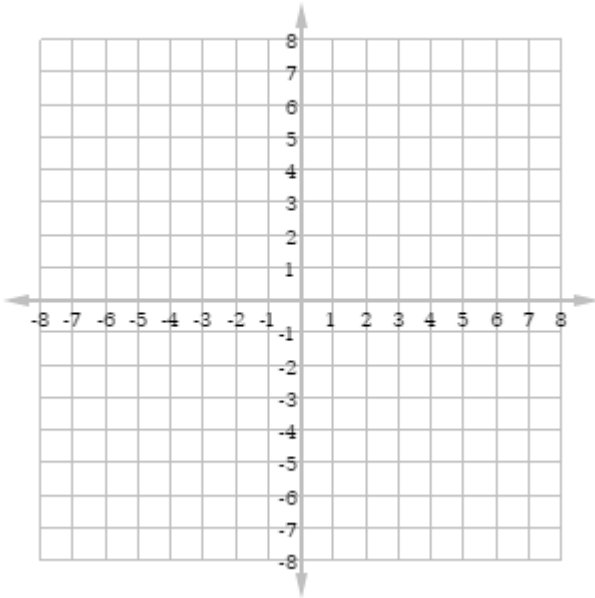
$$\frac{2x^2 - 9x - 35}{x^2 + x} \div \frac{x^2 - 11x + 28}{2x^2 - 6x - 8}$$

12. Solve. Identify extraneous solutions. If no solution, write 'no solution.'

$$\frac{x+2}{2x} + 1 = \frac{3x-5}{x}$$

13. (4 pts) Identify and sketch the asymptotes. Sketch the function, showing at least two accurate points on each curve.

$$f(x) = \frac{2}{x-4} + 3$$



14. (6pts) Given the following function, identify the following:

$$f(x) = \frac{2x-2}{x^2-1}$$

a. Factor and simplify the function:

b. Give the equation of the vertical asymptote:

c. Give the x-value of the hole:

d. y-intercept: (let $x = 0$ and solve)

e. x-intercept(s): (let $y = 0$ and solve)

Exponential Functions

15. Kaitlyn invests \$4000 at 3.8% annual interest compounded monthly. Find the final amount of Kaitlyn's investment after 6 years.

16. A small town's population is 28,000 people. The annual growth rate for the town is about 1.3%. What will the population be in 5 years? **Show set up for full credit.**

16. Bacteria is growing according to the following schedule. What is the **rate of growth**? Choose the best answer.

Day	Bacteria Population
0	500
1	750
2	1125
3	1680

- a. 25%, $r = 0.25$
- b. 50%, $r = 0.50$
- c. 75%, $r = 0.75$
- d. 250%, $r = 2.50$

17. (4pts) According to the World Wildlife Foundation (WWF.org) Giant Pandas have recently moved from the endangered species list to the vulnerable species list (an upgrade) based on the 17% population growth over the past decade. The current number of Giant Pandas is still only 1,864.

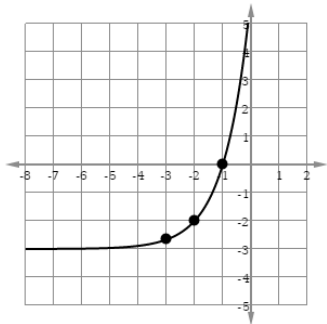
- a. If this trend continues, how many pandas will there be in another decade?
- b. How many pandas were there ten years ago?

18. You deposit \$500 in an account that pays 5% annual interest compounded monthly. What is the balance after 3 years?

19. A car engine overheats to 280 degrees and shuts off. It can be driven again when it cools to 200 degrees. The surrounding temperature is 70 degrees and the rate of cooling, r , is 0.0048. Using Newton's Law of Cooling we can solve for the length of time it will take for the engine to cool to 200 degrees. What is the correct set-up for solving this problem?

- a. $280 = (200 - 70)e^{-0.0048t} + 70$
- b. $200 = (280 - 70)e^{-0.0048t} + 70$
- c. $70 = (280 - 200)e^{-0.0048t} + 200$
- d. None of the above

20. What is the equation of the graph shown?



- a. $f(x) = 3^{x-2} - 3$
- b. $f(x) = 3^{x+2} + 3$
- c. $f(x) = 3^{x+2} - 3$
- d. $f(x) = 3^{x-2} + 3$

21. What is the end behavior of the function in the last problem?

- a) As $x \rightarrow +\infty$, $f(x) \rightarrow +\infty$ and as $x \rightarrow -3$, $f(x) \rightarrow -\infty$
- b) As $x \rightarrow +\infty$, $f(x) \rightarrow +\infty$ and as $x \rightarrow -\infty$, $f(x) \rightarrow 3$
- c) As $x \rightarrow +\infty$, $f(x) \rightarrow +\infty$ and as $x \rightarrow -\infty$, $f(x) \rightarrow -3$

Logarithms – properties and functions

22. Simplify $\log_5 125$

- a. 1
- b. 2
- c. 3
- d. Impossible to say

23. Simplify $\log_2 \left(\frac{1}{8} \right)$

- a. -1
- b. -2
- c. -3
- d. Impossible to say
- e.

24. Solve for x.

$$2\log_2 x = 6$$

- a. 2
- b. 4
- c. 8
- d. 16

25. Solve for x. Show work.

$$\log 25 + \log x = \log 100$$

26. Solve:

$$\ln(x+1) = -2$$

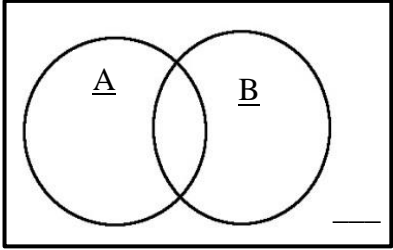
- a.) $x \approx -0.865$
- b.) $x \approx 0.135$
- c.) $x \approx 1.135$
- d.) no solution

27. Solve:

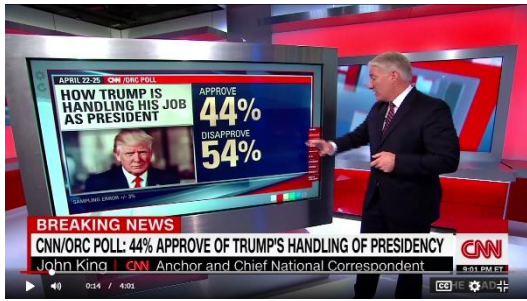
$$\log(x+1) + \log(x+2) = \log(12)$$

<p>28. What is an equivalent expression for $2\log_4 3 + \log_4 2$?</p> <p>a) $2\log_4 6$</p> <p>b) $\log_4 6$</p> <p>c) $\log_4 12$</p> <p>d) $\log_4 18$</p>	<p>29. (4pts) Which of the following are equivalent expressions for $\log_6 54$? Circle all that apply.</p> <p>a) $\log_6 9 + \log_6 6$</p> <p>b) $\log_6 9 + 1$</p> <p>c) $\frac{\log 54}{\log 6}$</p> <p>d) $\frac{\ln 54}{\ln 6}$</p>
<p>30. What is the solution to the equation $\log_4 4x + 2\log_4 x = 4$?</p> <p>a) 4</p> <p>b) 3</p> <p>c) 2</p> <p>d) 1</p>	

Probability

<p>31. Mrs. Hailer is making passwords. She wants to make passwords that have 3 numbers followed by 3 letters. How many unique passwords can she make if she allows numbers and letters to repeat?</p> <p>a) 18,576 b) 11,232,000 c) 17,576,000 d) 28,808,000</p>	<p>32. Mrs. Hailer is <i>still</i> making passwords. She <i>still</i> wants to make passwords that have 3 numbers followed by 3 letters. <i>This time</i>, how many unique passwords can she make if she does not allow numbers and letters to repeat?</p> <p>a) 18,576 b) 11,232,000 c) 17,576,000 d) 28,808,000</p>
	<p>33. Events A and B are independent, and $P(A) = 0.3$ and $P(B) = 0.2$. What is $P(A \text{ and } B)$?</p> <p>a. 0.06 b. 0.1 c. 0.5 d. 0.6 e. not enough info given</p>
<p>34. Use the following information to complete the Venn Diagram (4 pts):</p> <p>$P(A) = .45$ $P(B) = .38$ $P(A \text{ and } B) = .15$</p> 	<p>35. Determine if events A and B are independent.</p> <p>$P(A) = 0.4$, $P(B) = 0.5$, $P(A \text{ and } B) = 0.1$</p> <p>A) Independent B) Dependent C) Impossible to tell</p>

43. (10 pts) In a recent CNN poll, a sample of US Adults were asked whether they approve of the President and about their political affiliation. The table below shows the results for Democrats, Republicans and Independent party members.



	Democrat	Republican	Independent	Totals
Approve	24	269	150	443
Disapprove	317	43	185	545
Neither	4	9	8	21
Totals	345	321	343	1009

Note: these values are approximations from April 2017 poll results they are not exact values.*

Find the following probabilities for a randomly selected adult in the US:

Give answers as percentages, to one decimal place (tenths).

a. $P(\text{Approve}) =$ _____

b. $P(\text{Disapprove}) =$ _____

c. $P(\text{Democrat}) =$ _____

d. $P(\text{Democrat and Approve}) =$ _____

e. $P(\text{Approve} | \text{Democrat}) =$ _____

f. $P(\text{Republican}) =$ _____

g. $P(\text{Approve} | \text{Republican}) =$ _____

h. Are Republican and Approve independent? _____ How do you know?

*** From CNN.org, about this survey:** *The CNN/ORC poll was conducted by telephone April 22-25 among a random national sample of 1,009 adults. Results for the full sample have a margin of sampling error of plus or minus 3 percentage points, it is larger for subgroups.*