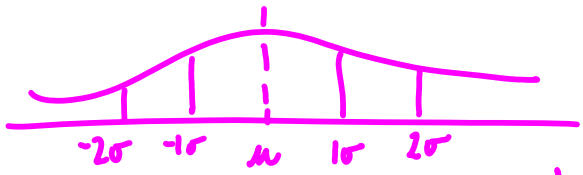
IM3-Semester 2 Exam Review Name:_____

Vocabulary and Essential Questions:

How would you describe a NORMAL DISTRIBUTION? data distribution that is symmetric about the mean

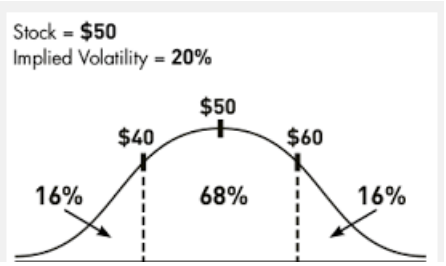
Draw a picture of NORMAL DISTRIBUTION and label the parts.



How would you describe STANDARD DEVIATION? how spread out data is

Problems:

1. What percent of the data in a normal distribution is above the mean?
   50%
2. What percent of the data in a normal distribution is within 1 standard deviation above and below the mean? 68%
3. What is the mean and standard deviation of the graph?



   μ = $50 σ = $10
4. The number of sales company employees make in a month can be represented as a normal distribution with a mean of 200 sales per month and a standard deviation of 20 sales per month. What percent of employees make less than 170 sales per month?
   16.68%

z	0.09	0.08	0.07	0.06	0.05	0.04	0.03	0.02	0.01	0.0
−1.0	0.1379	0.1401	0.1423	0.1446	0.1469	0.1492	0.1515	0.1539	0.1562	0.1587
−0.9	0.1611	0.1635	0.1660	0.1685	0.1711	0.1736	0.1762	0.1788	0.1814	0.1841
−0.8	0.1867	0.1894	0.1922	0.1949	0.1977	0.2005	0.2033	0.2061	0.2090	0.2119
−0.7	0.2148	0.2177	0.2206	0.2236	0.2266	0.2296	0.2327	0.2358	0.2389	0.2420
−0.6	0.2451	0.2483	0.2514	0.2546	0.2578	0.2611	0.2643	0.2676	0.2709	0.2743
−0.5	0.2776	0.2810	0.2843	0.2877	0.2912	0.2946	0.2981	0.3015	0.3050	0.3085

*Go to z score table on Haiku!

Vocabulary and Essential Questions:

What is the difference between an arithmetic sequence and a geometric sequence? arithmetic: difference between 2 terms is constant (add/subt)
geometric: ratio between 2 terms is constant (multiply/divide)

What is the difference between a sequence and a series? sequence: list of #s
series: sum of #s

Identify what the following variables stand for in the arithmetic and geometric sequence formulas.

$a_n =$ last/n^{th} term	$a_1 =$ 1st term	$n =$ # of terms
$d =$ common difference	$r =$ common ratio	$S_n =$ sum

Use the following formulas for questions #5-10

$a_n = a_1 + (n-1)d$ $\quad a_n = a_1(r)^{n-1}$ $\quad S_n = n\left(\frac{a_1+a_n}{2}\right)$ $\quad S_n = \frac{a_1(1-r^n)}{(1-r)}$ $\quad S = \frac{a_1}{(1-r)}$

5. Write the explicit rule for the sequence $-4, 0, 4, 8, \ldots$

$a_n =$ $-4 + (n-1)4 = -4 + 4n - 4 =$ $-8+4n$

6. How many terms are in the following sequence? $2, 9, 16, 23, \ldots, 107$

16

$107 = 2 + (n-1)7$
$107 = 2 + 7n - 7$
$107 = -5 + 7n$
$112 = 7n$
$n = 16$

7. Find the sum of the infinite series, if it exists: $20 + 10 + 5 + 2.5 + \cdots$

40

$S = \frac{20}{1-.5} = \frac{20}{1/2}$

8. Write an infinite series that will **not** have a sum.

$\sum_{n=1}^{\infty} 5(3/2)^{n-1}$ answers vary. * r must be >1

9. The school auditorium has 4 seats in the first row, 7 seats in the second row, 10 seats in the third row, and so on. How many seats are there if the auditorium has 15 rows?

375 seats

$a_n = 4 + (n-1)3$

$a_{15} = 4 + (15-1)3$
$= 46$

$S_{15} = 15\left(\frac{4+46}{2}\right) = 375$

10. Determine if the sequence $-3, 12, 27, 42, \ldots$ is geometric or arithmetic and then find either the common difference or common ratio.

+15 +15 +15

arithmetic d=15

11. If your salary for the last 5 years has been \$55,000, \$55,750, \$56,530, \$57,321, and \$58, 123 respectively, what would you expect your salary to be after 10 years or working at the same job assuming it keeps increasing by the same rate?

r = 1.014 $a_{10} = 55000(1.014)^9 \approx \$62331$

Vocabulary and Essential Questions:

Explain the difference between exponential growth and exponential decay and give an example of each.

Growth: increasing rate $b>1$ $f(x)=4^x$

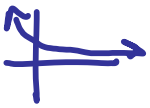
decay: decreasing rate $0<b<1$ $f(x)=0.3^x$

Given $f(x) = 2^x$, write the function that is described by the following transformations.

a. Right 2 units $g(x) = 2^{x-2}$
b. Left 4 units $g(x) = 2^{x+4}$
c. Reflected over x-axis $g(x) = -2^x$
d. Up 3 units $g(x) = 2^x + 3$
e. Left 5 units and down 2 units $g(x) = 2^{x+5} - 2$
f. Reflected over x-axis and moved right 8 units $g(x) = -2^{x-8}$

12. Decide if the function $f(x) = (0.2)^x$ is exponential growth or decay. Then, describe its end behavior using limits.

decay



$\lim_{x \to -\infty} f(x) = \infty$ $\lim_{x \to \infty} f(x) = 0$

13. Where would the asymptote be for the function $f(x) = \ln(x - 5)$.

x=5

14. Find the domain and range for $f(x) = 4^x$.

D: $(-\infty, \infty)$ R: $(0, \infty)$

15. Find the domain and range for $f(x) = \log x$

D: $(0, \infty)$ R: $(-\infty, \infty)$

16. If $f(x) = 2^x$ is translated down 4 units, what is the equation of the asymptote? $y = -4$

17. If $f(x) = \log x$ is translated right 3 units, what is the equation of the asymptote? $x = 3$

18. The population of a city in 2007 was 23,453. Since then, the population has increased at a rate of 1.3% each year. Write a function that describes the population as a function of the number of years, t, since 2007? Use the formula $N(t) = N_0 e^{rt}$.

$N(t) = 25453e^{.013t}$

19. The number of students attending a small Illinois college increases according to the function $A = 1300e^{0.03t}$, where t is measured in years. How many students will be enrolled in the college after 8 years? $A = 1300e^{.03(8)} \approx 1652$ students

20. Gina deposits $400 in a savings account that earns 4% interest compounded quarterly. How much money is in her account at the end of 6 years?

Use the formula $A = P\left(1 + \frac{r}{n}\right)^{nt}$.

$A = 400\left(1 + \frac{.04}{4}\right)^{4(6)} = \$507.89$

21. The growth of bacteria fits the exponential function $A(t) = 450e^{0.09t}$, where t is the number of years since 2003. Estimate the population in the year 2016.

1449.90 bacteria

$A(t) = 450e^{.09(13)}$

22. Write the expanded form of the logarithmic expression $\ln\left(\frac{3x^4}{y^2}\right)$.

$\ln 3 + 4\ln x - 2\ln y$

23. Solve $4^{x-4} = 16$ $4^{x-4} = 4^2$

$x = 6$

24. Solve $\log_2 x + \log_2 5 = 8$. $x = 51.2$

$\log_2 5x = 8$

$2^8 = 5x$

$256 = 5x$

25. Solve to three decimal places $4 \cdot \left(\frac{1}{2}\right)^{2x} = 64$.

$x = -2$

$4 \cdot \left(\frac{1}{2}\right)^{2x} = 64$

$\left(\frac{1}{2}\right)^{2x} = 16$

$(2^{-1})^{2x} = 2^4$

$-2x = 4$

$x = -2$

26. Use the properties of logarithms to rewrite the expression $\log_4 11 - 2\log_4 x$ as a single logarithm. $\log_4\left(\frac{11}{x^2}\right)$