# Determine

- Probabilities (and/or, conditional, independence)
- Confidence Intervals/MOE
- Regression models
- Trig equations
- Co- terminal angles
- Degrees/Radians
- Reference angles
- Inverse functions
- Even/odd functions
- End behavior
- Equation from roots
- Focus & Directrix
- Factors/ Roots
- Recursive vs. Explicit Sequences
- AROC
- Geometric Series

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1. The results of simulating tossing a coin 10 times, recording the number of heads, and repeating this 50 times are shown in the graph. Based on the results of the simulations, which statement is **FALSE**?
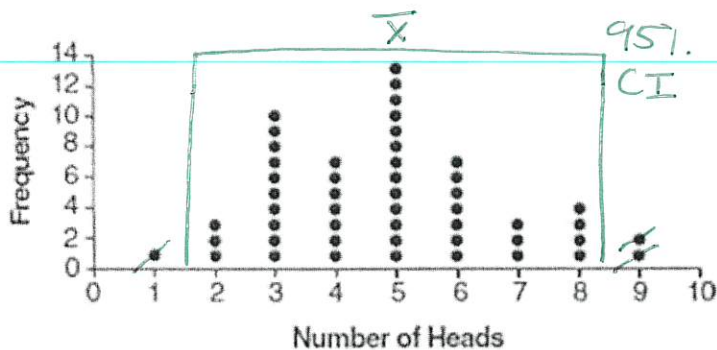
   $5\% \text{ of } 50 = 2.5$

   a. 5 heads occurred the most often, which is consistent with the theoretical probability of obtaining a heads.
   b. 8 heads is unusual, as it falls outside the middle 95% of the data. $\pm 2 SD$
   c. Obtaining 3 heads or fewer occurred 28% of the time.
   d. 7 heads is not unusual, as it falls within the middle 95% of the data.

2. If the terminal side of θ, in standard position, passes through (-4, 3), find the exact value of $\sin\theta$.
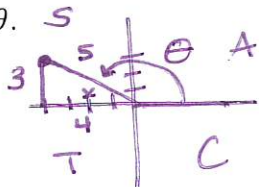
   $$\sin\theta = \sin x = \frac{3}{5}$$

3. Describe how a controlled experiment can be created to examine the effect of using "AWESOME OIL" in a car. Using 2 of the same car, one uses "Awesome Oil" & the other doesn't. measure data on performance of car at certain intervals as car drives the same course.

4. What equation represents the set of points equidistant from the line l and point R, as shown on the graph? *(Parabola)*

Vertex$(2, -1)$

$a \ominus$

$p = 2$

$$y = -\frac{1}{8}(x-2)^2 - 1$$
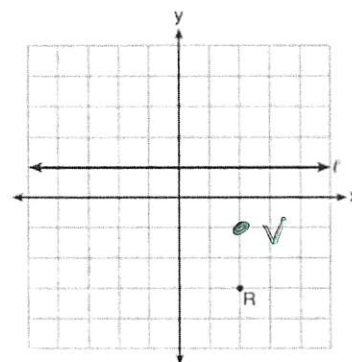
5. Joey has a credit card that has 19.2% annual interest rate compounded monthly. She owes a total balance of B dollars after m months. Assuming she makes no payments on her account, the table shown illustrates the balance shows after m months. Over what interval of time is her average rate of change for the balance on her credit card the greatest?

m	B
0	100.00
10	1172.00
19	1352.00
36	1770.80
60	2591.90
69	2990.00
72	3135.80
73	3186.00

a. Month 10 to month 60 → 28.398
b. Month 19to month 69 → 32.76
c. Month 36 to month 72 → 31.916
d. Month 60 to month 73 → 45.7

6. For the function $f(x) = (x-3)^3 + 1$, find $f^{-1}(x)$.

$y = (x-3)^3 + 1$

$x = (y-3)^3 + 1$

$x - 1 = (y-3)^3$

$(x-1)^{\frac{1}{3}} = y - 3$

$$f^{-1}(x) = (x-1)^{\frac{1}{3}} + 3$$

7. Determine the amplitude, frequency, period, horizontal shift and midline for

$y = -3\cos\left(\frac{\pi}{3}(x-4)\right) + 7.$

HS: Right 4

$A = amp = 3$

$B = freq = \frac{\pi}{3}$

VS/midline: up 7

$y = 7$

$per = \frac{2\pi}{freq} = \frac{2\pi}{\frac{\pi}{3}} = 6$

8. What is the inverse of $y = \log_3 x$?

$$x = \log_3 y$$
(e), (B), (A)

$$\boxed{3^x = y}$$

9. Write a recursive formula for the sequence 18, 9, 4.5, ... Geometric

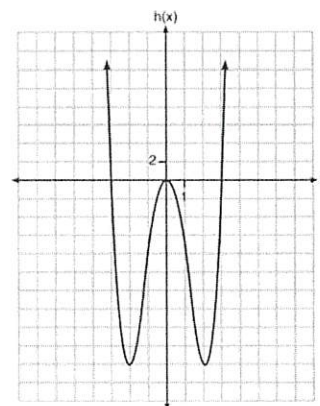$$\boxed{a_1 = 18 \\ a_n = (a_{n-1})\left(\tfrac{1}{2}\right)}$$

$\left(\tfrac{1}{2}\right)\left(\tfrac{1}{2}\right)$ $r = \tfrac{1}{2}$

10. $f(x) = \sin(2x)$, $g(x) = f(x) + 1$, and h(x) is shown in the graph. Determine whether each function is even, odd, or neither. Justify your answer.

h(x)

$f(x)$ is odd, reflects through origin

$g(x)$ is neither → does not reflect over y-axis or through origin

$h(x)$ is even, reflects over y-axis

11. Forever 21 is conducting a consumer satisfaction survey. Which method of collecting data would most likely lead to a biased sample?

    a. Interviewing every 5th customer to come to the store.
    b. Interviewing customers chosen at random by a computer at checkout
    c. Interviewing customers who call an 800 number posted on customers receipts
    d. Interviewing every customer who comes to the store on a day of the week chosen at random out of a hat

12. In 1999, approximately 1.4 million students took the ELA portion of the SAT exam. The mean score, the mode score, and the standard deviation were calculated to be 512, 498, and 117, respectively. Determine an interval that represents 95% of the ELA scores.

$\bar{x} = 512$
mode $= 498$
$\sigma_x = 117$

$\bar{x} \pm 2\sigma$

$498 \pm 2(117)$
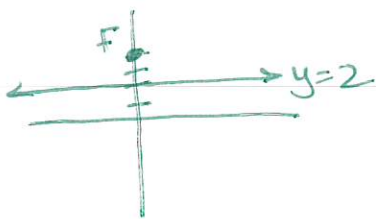
$498 - 2(117) = 278$
$498 + 2(117) = 746$

$$\boxed{95\% \text{ interval} : 278 \text{ to } 746}$$

13. Write an equation that represents a parabola with a focus of (0, 4) and a directrix of y = 2.

$V(0,3)$

$a \oplus$

$p = 1$

$y = \frac{1}{4p}(x-h)^2 + k$

$y = \frac{1}{4}(x-0)^2 + 3$

$$y = \frac{x^2}{4} + 3$$

14. Given $f^{-1}(x) = -\frac{3}{4}x + 2$, find an equation that represents $f(x)$.

$y = -\frac{3}{4}x + 2$

$x = -\frac{3}{4}y + 2$

$x - 2 = -\frac{3}{4}y$

$4x - 8 = -3y$

$$f(x) = \frac{4x-8}{-3}$$

15. A runner is using a 9-week training app to prepare for a race. The table shows the amount of the program completed, A, and the distance covered in a session, D, in miles. Based on these data, write an exponential regression equation, rounded to the nearest thousandth, to model the distance the runner is able to complete in a session as she continues the program.

X A	$\frac{4}{9}$	$\frac{5}{9}$	$\frac{6}{9}$	$\frac{8}{9}$	1
y D	2	2	2.25	3	3.25

Exp Reg

$y = a(b)^x$

$a = 1.223034549$

$b = 2.652024589$

$y = 1.223(2.652)^x$

16. The simulation shown represents 1000 polls of 900 voters, assuming that 55% of the voters would vote for their candidate. Given this output, and assuming 95% confidence level, the margin of error is closest to

$mo\varepsilon = \pm 2SD$
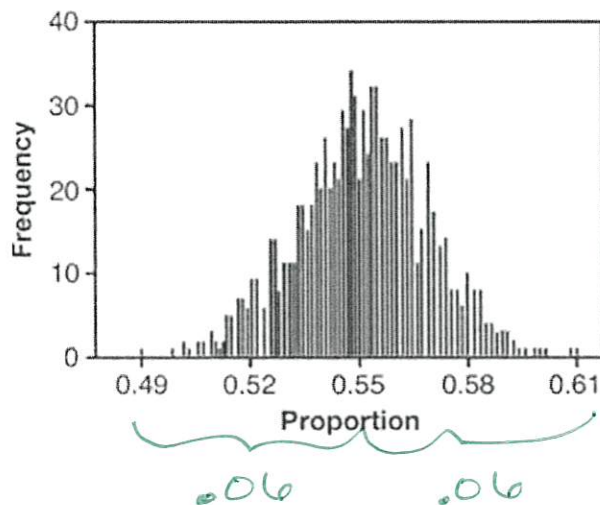
a. 0.01 — too small

b. 0.03

c. 0.06

d. 0.12

.06   .06

17. A student is chosen at random from the student body at a given HS. The probability that a student selects Art as their favorite subject is 0.27. The probability that a student is a sophomore is 0.283. If the probability that a student selected is a sophomore or chooses Art as their favorite subject is 0.45, what is the probability, rounded to the nearest hundredth that a student selected is a sophomore whose favorite subject is Art? Are these events independent of each other? Justify your answer.

Find $P(S \cap A)$

$P(Art) = .27$

$P(Soph) = .283$

$P(S \cup A) = .45$

$P(S \cup A) = P(S) + P(A) - P(S \cap A)$

$.45 = .27 + .283 - x$

$\boxed{x = .10}$

$P(S \cap A) \overset{?}{=} P(S) \cdot P(A)$

$.10 \overset{?}{=} (.283)(.27)$

$.10 \neq .07641$

No

not independent

18. The set of data in the table below shows the results of a survey on the number of messages that people of different ages text on their cell phones each month. If a person from this survey is selected at random, what is the exact probability that the person is between the ages of 23 and 60?

missing Table

$P(23-60) = \dfrac{229}{456}$

19. Determine the shift(s) from $f(x) = 3sinx$ to the function of $g(x) = 3\sin\left(x + \frac{\pi}{3}\right) - 5$.

Left $\frac{\pi}{3}$ units

Down 5 units

20. Given f(9) = -2, write a formula that can be used to generate the sequence
$-8, -7.25, -6.5, -5.75, ...$

$+.75$

Explicit

$a_n = -8 + (n-1)(.75)$

Recursive

$a_1 = -8$

$a_n = a_{n-1} + 0.75$

21. The hours of daylight, y, in Albany in days, x, from January 1, 2013 can be modeled by the equation $y = 3.11sin(0.017x - 1.5) + 12.18$. How many hours of daylight, to the nearest tenth, does this model predict for February 3, 2013?

Radian mode

$y(33) = 3.11 \sin(0.017(33) - 1.5) + 12.18$

$y(33) = 9.670...$

$\boxed{y(33) = 9.7 \text{ hrs}}$

22. Given events A and B, such that $P(A) = 0.6$, $P(B) = 0.5$, and $P(A \cup B) = 0.8$. Determine whether A and B are independent or dependent.

$$P(A \cup B) = P(A) + P(B) - P(A \cap B) \qquad P(A \cap B) \overset{?}{=} P(A) \cdot P(B)$$

$$.8 = .6 + .5 - x \qquad\qquad .3 = (.6)(.5)$$

$$.3 = x \qquad\qquad\qquad .3 = .3 \checkmark$$

Independent

23. In a school with 1400 students, 650 play volleyball and 344 play hockey. If the probability that a student plays either volleyball or hockey is 883/1400, what is the probability that the students play both volleyball and hockey?

$$P(V \cup H) = P(V) + P(H) - P(V \cap H)$$

$$P(V \cup H) = \frac{883}{1400} \qquad\qquad \frac{883}{1400} = \frac{650}{1400} + \frac{344}{1400} - x$$

$$P(V) = \frac{650}{1400} \qquad P(H) = \frac{344}{1400} \qquad \boxed{x = \frac{111}{1400}}$$

24. Write the recursive sequence $a_1 = 6$, $a_n = 3a_{n-1}$ as an explicit sequence.

$$\boxed{a_n = 6(3)^{n-1}}$$

$\rightarrow$ Geometric
$r = 3$

25. A Ferris wheel takes 7 minutes to make one full rotation. The height, H, in feet, above the ground of one of the 6-person cars can be modeled by $H(t) = 70 \sin\left(\frac{2\pi}{7}(t - 1.75)\right) + 80$, where t is time, in minutes. Determine the car's maximum and minimum height.

$A = amp = 70$

midline: $y = 80$

$$\boxed{\begin{array}{l} max = 150 \\ min = 10 \end{array}}$$
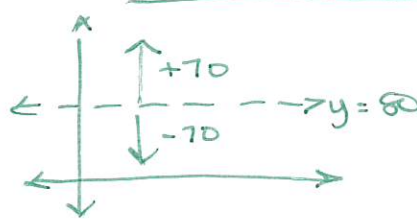
26. The results of a survey are shown in the table. Determine if the events "student is female" and "prefers drama series" are independent. Justify your answer.

	Comedy Series	Drama Series	Reality Series	Total
Males	95	65	70	230
Females	80	70	110	260
Total	175	135	180	490

$$P(F \mid D) \overset{?}{=} P(F)$$

$$\frac{P(F \cap D)}{P(D)} \overset{?}{=} P(F) \longrightarrow \frac{70}{135} \overset{?}{=} \frac{260}{490}$$

$$P(F \cap D) \overset{?}{=} P(F) \cdot P(D) \qquad .51\ldots \neq .53\ldots$$

No, not independent

27. Alex earns $52,000 in her first year of teaching and earns a 1.2% increase in each successive year. Write a geometric series formula to represent Alex's total earnings after n years. Use this formula to find Alex's total earnings for her first 10 years of teaching, to the nearest cent.

$$S_n = \dfrac{a_1 - a_1 r^n}{1-r}$$

$$\boxed{S_n = \dfrac{52000 - 52000(1.012)^n}{1-1.012}}$$

$$S_{10} = \dfrac{52000 - 52000(1.012)^{10}}{1-1.012} = \boxed{\$548{,}997.70}$$

28. The lifespan of a 40-watt light bulb produced by a company is normally distributed with a mean of 1400 hours and a standard deviation of 7.8 hours. If a 40-watt light bulb is produced by this company is selected at random, what is the probability, to the nearest ten-thousandth, that its lifespan will be between 1391 and 1417 hours?

$\mu = 1400$

$\sigma_x = 7.8$

$\text{normalcdf}(1391, 1417, 1400, 7.8)$

$.8610706\ldots$

$\boxed{.8611}$

29. The heights of women in the US are normally distributed with a mean of 64 inches and a standard deviation of 2.75 inches. The percent of women whose heights are between 64 and 69.5 inches, to the nearest whole percent, is

a. 6
b. 48 ⟵ (circled)
c. 68
d. 95

$\mu = 64$

$\sigma_x = 2.75$

$\text{normalcdf}(64, 69.5, 64, 2.75)$

30. Jazz decides to put $1000 into a savings account each month. The account pays 3% annual interest, compounded monthly. Determine how much money will Jazz have after 1 year.

$$A = P\left(1 + \dfrac{r}{n}\right)^{nt}$$

$$A = 1000\left(1 + \dfrac{.03}{12}\right)^{12(1)}$$

$$A = \$1030.415\ldots$$

$$A = \$1030.42$$