

## Practice Question # 1

- The first term of an arithmetic sequence is 36 and the fifteenth term is -62. What is the common difference?

$$a_1 = 36 \quad a_{15} = -62 \quad (n=15) \quad d=?$$

$$a_n = a_1 + d(n-1)$$

$$-62 = 36 + d(15-1)$$

$$\frac{-98}{14} = \frac{14d}{14}$$

$$\boxed{d = -7}$$

## Practice Question # 2

- What is the sum for a geometric series  $5 + 15 + 45 + \dots$  up to 13 terms?

$$a_1 = 5 \quad r = \frac{15}{5} = 3 \quad n = 13 \quad S_{13} = ?$$

$$S_{13} = \frac{5(1-3^{13})}{(1-3)}$$

$$\boxed{S_{13} = 3,985,805}$$

## Practice Question # 3

- Each year, students at Upton Academy must select class presidents, vice-presidents, and secretaries. If the junior class has 37 students, how many different winning slates are possible?

$${}_{37}P_3 = \boxed{46,620 \text{ slates}}$$

## Practice Question # 4

- What is the probability of drawing a five <sup>multiply</sup> and a club from a standard deck of cards if replacement does not occur? <sup>subtract</sup>

$$P(5 \text{ or club}) = \frac{4}{52} \cdot \frac{13}{51} = \frac{52}{2 \cdot 52} = \boxed{2\%}$$

- What is the probability of drawing a King <sup>add</sup> or a red card from a standard deck of cards?

$$P(\text{King or red}) = \frac{4}{52} + \frac{26}{52} - \frac{2}{52} = \frac{28}{52} = \boxed{53.8\%}$$

## Practice Question # 5

- Billy typically makes 68% of his free-throw shots. If he shoots 5-free throws, what is the probability that he will get at least 4 of them?

$$P(4) + P(5) \rightarrow$$

$$5C_4 (.68)^4 (.32)^1 + 5C_5 (.68)^5 (.32)^0 = \boxed{48.7\%}$$

## Practice Question # 6

- Mr. Francis teaches two small Algebra 1 classes.

Below are his classes' scores on their last test:

1st Period: {78, 95, 83, 80, 90, 72, 45, 67, 94, 89}

2nd Period: {63, 87, 82, 91, 54, 74, 85, 94, 97, 81}

$$\textcircled{1} \bar{x} = 79.3 \quad \textcircled{2} \bar{x} = 80.8$$

What is the **difference** between the means of the classes' scores?

$$80.8 - 79.3 = \boxed{1.5}$$



### Practice Question # 7

- Solve for x:

$$a.) 4e^{x+3} - 6 = 26$$

$$\frac{4e^{x+3}}{4} = \frac{32}{4}$$

$$e^{x+3} = 8$$

$$x+3 = \ln 8$$

$$x = \ln 8 - 3$$

$$x = -1.92056$$

$$b.) \log_2(\ln x + 4) = 3$$

$$2^3 = \ln x + 4$$

$$8 = \ln x + 4$$

$$\ln x = 4$$

$$x = e^4$$

$$x = 54.5982$$

### Practice Question # 8

- Given the function:  $f(x) = \begin{cases} 2x-5 & \text{if } x \leq 1 \\ 4-3x^2 & \text{if } x > 1 \end{cases}$

$$\text{Find: } f(4) + 2f(-3) - 5f(1)$$

$$\textcircled{1} f(4) = 4 - 3(4)^2 = -44$$

$$\textcircled{2} f(-3) = 2(-3) - 5 = -11$$

$$\textcircled{3} f(1) = 2(1) - 5 = -3$$

$$\rightarrow -44 + 2(-11) - 5(-3) = \boxed{-51}$$

### Practice Question # 9

- A power function contains the points  $(4, 8)$  and  $(6, 10)$ .

What is the value of y when x = 15?

x	y
4	8
6	10

$$\textcircled{1} y = 3.73637476x^{.5503397132}$$

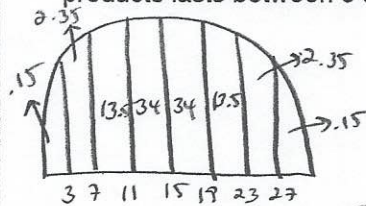
$$\textcircled{2} x = 15 \rightarrow \text{table! (TI)}$$

$$y = ?$$

$$\rightarrow \text{get regression eq! } \boxed{y = 16.6}$$

### Practice Question # 10

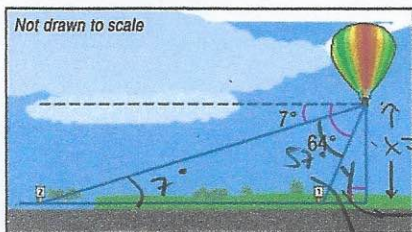
- The shelf life of a particular dairy product is normally distributed with a mean of 15 days and a standard deviation of 4 days. What percent of the products lasts between 3 and 19 days?



$$2(.35) + 13.5 + 2(.34) = \boxed{83.85\%}$$

### Practice Question # 11

- A hot-air balloon crosses over a straight portion of interstate, its pilot eyes two consecutive mile posts on the same side of the balloon. How high is the balloon in ft?



$$\textcircled{1} \frac{5280}{\sin 7} = \frac{x}{\sin 7}$$

$$x = 767.3$$

$$\textcircled{2} \sin 64 = \frac{x}{767.3}$$

$$x = 689.6 \text{ ft}$$

$$5280 \text{ ft} + 180 - 7 - 57 = 116$$

### Practice Question # 12

- Ships and airplanes measure distance in nautical miles. The formula  $1 \text{ nautical mile} = 6077 - 25 \cos(2\theta)$  is given where  $\theta$  = latitude line in degrees. What is the degree of latitude if a ship is 6,061.5 nautical miles from this latitude line?

$$6061.5 = 6077 - 25 \cos(2\theta)$$

$$\frac{-15.5}{-25} = \frac{-25 \cos(2\theta)}{-25}$$

$$\cos^{-1}(\cos(2\theta) = .62)$$

$$\frac{2\theta}{2} = \frac{51.7}{2} \rightarrow \boxed{\theta = 25.8^\circ}$$



### Practice Question # 13

- The first term in a geometric sequence is two and the common ratio is four. What term is 131,072 in this sequence?

$$a_n = 131072 \quad r = 4 \quad a_1 = 2 \quad n = ?$$

$$a_n = a_1 (r)^{n-1}$$

$$131072 = 2(4)^{n-1}$$

$$65536 = 4^{n-1}$$

$$1 + \frac{\log 65536}{\log 4} = \frac{(n-1) \log 4}{\log 4} + 1$$

$$n = 9 \rightarrow \boxed{9^{\text{th}} \text{ term}}$$

### Practice Question # 14

- Amanda is selecting 3 marbles from a bag at random. In the bag there are 4 blue marbles, 3 yellow marbles, and 5 red marbles. What is the probability that Amanda will select 2 yellow marbles and 1 red marble?

multiply

12 marbles total

$$\frac{{}^3C_2 \cdot {}^5C_1}{{}^{12}C_3} = \frac{3 \cdot 5}{220} = \frac{15}{220} = \boxed{6.8\%}$$

### Practice Question # 15

- A new card game at a casino allows you to draw one card from a standard deck of cards. If you pick a heart, you will win \$10. If you pick a face card, which is not a heart, you win \$8. If you pick any other card, you lose \$6. Does the game benefit the "house" or the player?

Find expected value (outcome)

Outcome	+10	+8	-6
probability	$\frac{13}{52}$	$\frac{9}{52}$	$\frac{30}{52}$

$$\rightarrow 10\left(\frac{13}{52}\right) + 8\left(\frac{9}{52}\right) - 6\left(\frac{30}{52}\right)$$

$$= +\$0.42 \rightarrow \boxed{\text{benefit the player b/c gain } \$0.42 \text{ everytime play game}}$$

### Practice Question # 16

- What are the domain and range (in interval notation) of the following functions?

a.)  $f(x) = -|x+2|+4$  D:  $(-\infty, \infty)$  R:  $(-\infty, 4]$

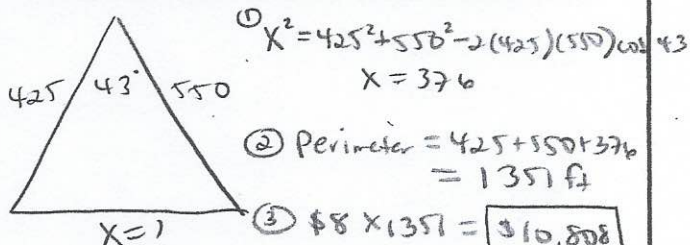
b.)  $f(x) = \sqrt{x-3}+1$  D:  $[3, \infty)$  R:  $[1, \infty)$

c.)  $f(x) = \ln(x+4)-3$  D:  $(-4, \infty)$  R:  $(-\infty, \infty)$

↓  
use calc to  
look at graph!

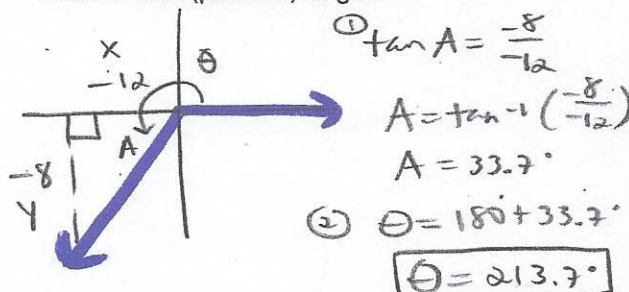
### Practice Question # 17

- Verne is constructing a triangular pen with wood fencing. One side is 425 feet long, another side is 550 feet, and the included angle is  $43^\circ$ . It will cost \$8 per foot to fence the pen. How much will Verne have to spend on his pen?



### Practice Question # 18

- The point  $(-12, -8)$  lies on the terminal side of an angle in standard position. What is the value of this (positive) angle?





### Practice Question # 19

- The table below shows the percent of people ages 25 and over with a high school diploma over the last few decades. Using a linear model, what is the percent of high school graduates in 2010?

LI X L24

Year	Percent
1970	52.3
1975	62.5
1980	68.5
1985	73.9
1990	77.5
1995	81.7
1999	88.4

Source: U.S. Census Bureau

$$Y = 1.03970187X - 1993.120826$$

$$X = 2010 \rightarrow \text{table (TI)}$$

$$Y = ?$$

$$Y = 97.2 \rightarrow \boxed{97.2\%}$$

### Practice Question # 20

- Marta places \$100 into a savings account with a 6% interest rate compounded quarterly. How long will it take for Marta's money to double?

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

$$P = 100$$

$$r = .06$$

$$A = 200$$

$$n = 4$$

$$\frac{200}{100} = \frac{100}{100} \left(1 + \frac{.06}{4}\right)^{4t}$$

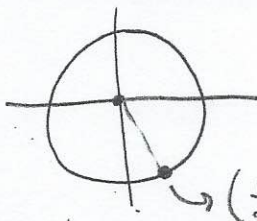
$$2 = (1.015)^{4t}$$

$$\frac{\log 2}{\log (1.015)} = \frac{4t \log (1.015)}{4 \log (1.015)}$$

$$\boxed{t = 11.6 \text{ years}}$$

### Practice Question # 21

- Point P is located at the intersection of a circle of radius 5 and the terminal side of angle  $\theta$  measuring  $\frac{5\pi}{3}$ . What are the exact coordinates of point P?



$$x = r \cos \theta$$

$$y = r \sin \theta$$

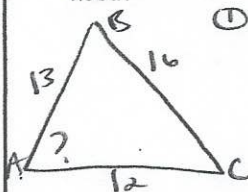
$$x = 5 \cos 300 = \frac{5}{2}$$

$$y = 5 \sin 300 = -\frac{5\sqrt{3}}{2}$$

$$\boxed{P = \left(\frac{5}{2}, -\frac{5\sqrt{3}}{2}\right)}$$

### Practice Question # 22

- Karen is carpeting a triangular section of a room in her house. The lengths of the section that needs carpet is 13 feet, 16 feet, and 12 feet. The carpet Karen wants costs \$22 per square foot. Right now, Karen only has \$1,500 saved up. How much more money does she need?



$$\textcircled{1} 16^2 = 13^2 + 12^2 - 2(13)(12) \cos A$$

$$256 = 313 - 312 \cos A$$

$$A = 79.5^\circ$$

$$\textcircled{2} A = \frac{1}{2} (13)(12) \sin 79.5^\circ$$

$$= 76.7 \text{ ft}^2$$

$$\textcircled{3} 76.7 \times \$22 = \$1687.27$$

$$\textcircled{4} \$1687.27 - \$1500 = \boxed{\$187.27}$$

### Practice Question # 23

- What specific trigonometric function is represented below?

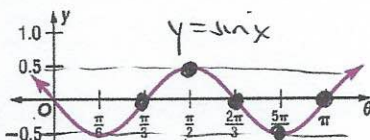
$$a = .5$$

$$b = \frac{2\pi}{\frac{2\pi}{3}} = \frac{2}{\frac{2}{3}} = 3$$

$$c = -3 \cdot \frac{\pi}{3} = -\pi$$

$$d = 0$$

$$\boxed{y = \frac{1}{2} \sin(3x - \pi)}$$



$$\downarrow$$

$$\text{amp} = .5$$

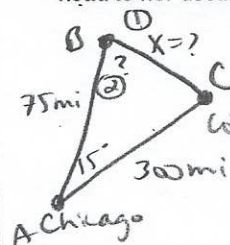
$$pd = \pi - \frac{\pi}{3} = \frac{2\pi}{3}$$

$$pshift = \text{right } \frac{\pi}{3}$$

$$\text{no v shift}$$

### Practice Question # 24

- A pilot is flying from Chicago to Columbus, a distance of 300 miles. In order to avoid an area of thunderstorms, she alters her initial course by  $15^\circ$  and flies on this course for 75 miles. What angle does the pilot use to head to her destination?



$$\textcircled{1} x^2 = 75^2 + 300^2 - 2(75)(300) \cos 15^\circ$$

$$x = 228.4$$

$$\textcircled{2} \frac{228.4}{\sin 15^\circ} = \frac{300}{\sin \theta}$$

$$\boxed{\theta = 19.9^\circ}$$



### Practice Question # 25

- How many terms were added together for a geometric series whose first term is 4, common ratio is 3, and sum is 1,062,880?

$$S_n = 1062880, a_1 = 4, r = 3, n = ?$$

$$1062880 = \frac{4(1-3^n)}{(1-3)}$$

$$-2125760 = 4(1-3^n) \quad \log 531441 = n \log 3$$

$$-531440 = 1-3^n$$

$$-531441 = -3^n$$

$$531441 = 3^n$$

$$n = 12 \quad \boxed{12 \text{ terms}}$$

### Practice Question # 26

- A class has test scores: 76, 52, 82, 95, 76, 92, 99, 85, 89, 64, 78, 82, 76, 95. What is the SUM of the measures of central tendency?

USE calc  $\rightarrow$

$$\text{mean} = 81.5 (\text{avg})$$

$$\text{median} = 82 (\text{middle})$$

$$\text{mode} = 76 (\text{often})$$

$$\boxed{\text{Sum} = 239.5}$$

### Practice Question # 27

- What is the sum of an arithmetic series whose eleventh term is 75, seventeenth term is 117, and last term is 236?

$$a_{11} = 75$$

$$a_{17} = 117$$

$$a_n = 236$$

$$S_n = ?$$

$$\textcircled{4} S_{34} = \frac{34}{2}(5+236) = \boxed{4097}$$

$$\textcircled{1} 75 = a_1 + 10d$$

$$-117 = a_1 + 16d$$

$$-42 = -6d$$

$$d = 7$$

$$\textcircled{2} 75 = a_1 + 10(7)$$

$$-70 = -70$$

$$a_1 = 5$$

$$\textcircled{3} 236 = 5 + 7(n-1)$$

$$231 = 7n - 7$$

$$238 = 7n$$

$$n = 34$$

### Practice Question # 28

- Hank is trying to create a password for his phone. The password has to be 5 characters. The first two characters must be letters, the middle character must be a number, and the last two characters must be vowels. The characters of the password cannot repeat. How many different passwords can Hank make?

$$\frac{26}{\text{letter}} \times \frac{25}{\text{letter}} \times \frac{10}{\text{\# 0-9}} \times \frac{3}{\text{vowel}} \times \frac{2}{\text{vowel}} = \boxed{39,000 \text{ possible passwords}}$$

### Practice Question # 29

Cammie has a bag of marbles containing 4 red, 3 yellow, 2 green, and 5 blue. She selects 2 marbles at random. Which scenario has a greater chance of happening? 14 marbles total

Scenario # 1 - Selecting a yellow and then a blue, no replacement

$$\frac{3}{14} \times \frac{5}{13} = \frac{15}{182} = 8.2\%$$

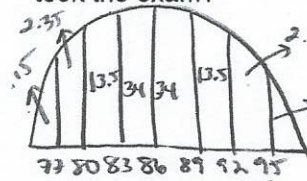
Scenario # 2 - Selecting two yellows or two blues.

$$\frac{3C2}{14C2} + \frac{5C2}{14C2} = \frac{3+10}{91} = \frac{13}{91} = 14.3\%$$

$\rightarrow$  Scenario # 2 by 6.1% more

### Practice Question # 30

- A class has exam scores that are normally distributed with a mean of 86 and a standard deviation of 3. Twenty-three of the students scored between 83 and 95. How many students took the exam?



$$\textcircled{1} 2(34) + 13.5 + 2.35 = 83.85$$

$$\textcircled{2} .8385 X = 23$$

$$.8385 \quad .8385$$

$$X = 27.4$$

about 27 students took exam



### Practice Question # 31

- Nora, who is 22 years old, wants to invest \$1400 into an account that has a 4.3% interest rate and the account is compounded continuously. How old will Nora be when her account's balance is \$3850?

$$A = Pe^{rt}$$

$$\textcircled{1} 3850 = 1400e^{.043t}$$

$$2.75 = e^{.043t}$$

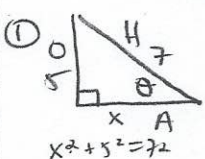
$$\ln 2.75 = \frac{.043t}{.043}$$

$$t = 23.5 \text{ years}$$

$$\textcircled{2} \text{ Nora} = 22 + 23.5 = 45.5 \text{ years old}$$

### Practice Question # 32

- Assuming a right triangle, what is the value of the expression below?

$$\tan\left(\sin^{-1}\frac{3}{7}\right) + \frac{3\sqrt{6}}{4}$$


$$\textcircled{1} x^2 + 3^2 = 7^2$$

$$x^2 = 24$$

$$x = 2\sqrt{6}$$

$$\textcircled{2} \tan \theta = \frac{3}{2\sqrt{6}}$$

$$\tan \theta = \frac{3}{2\sqrt{6}} \cdot \frac{\sqrt{6}}{\sqrt{6}} = \frac{3\sqrt{6}}{12}$$

$$\textcircled{3} \frac{3\sqrt{6}}{12} + \frac{3\sqrt{6}}{4} = \frac{3\sqrt{6}}{12} + \frac{9\sqrt{6}}{12} = \frac{12\sqrt{6}}{12} = \sqrt{6}$$

### Practice Question # 33

- Given the piecewise function:

$$f(x) = \begin{cases} 2x+4 & \text{if } x \leq -2 \\ 3-x^2 & \text{if } x > -2 \end{cases}$$

Find (as a reduced fraction):  $\frac{f(6)+3f(-4)}{3f(-8)-6f(0)}$

$$\textcircled{1} f(6) = 3 - (6)^2 = -33$$

$$\textcircled{2} f(-4) = 2(-4) + 4 = -4$$

$$\textcircled{3} f(-8) = 2(-8) + 4 = -12$$

$$\textcircled{4} f(0) = 3 - (0)^2 = 3$$

$$\textcircled{5} \frac{-33 + 3(-4)}{-12 - 6(3)} = \frac{-33 - 12}{-12 - 18} = \frac{-45}{-30} = \frac{3}{2}$$

### Practice Question # 34

- The table below shows the outstanding household credit market debt (in trillion of dollars) from 1998 through 2004. A linear model best models this data. What will the debt be in the year 2018?

Year	Household credit market debt, D (in trillion of dollars)
1998	6.0
1999	6.4
2000	7.0
2001	7.6
2002	8.4
2003	9.2
2004	10.3

$$y = .710714x - 1414.2964$$

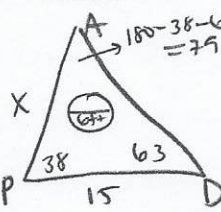
$$x = 2018$$

$$y = ?$$

$$\rightarrow \$19.9 \text{ trillion}$$

### Practice Question # 35

- Parker, Devin, and Andy are all standing in a grassy field and form a triangle around a circular pond that is 6 feet in diameter. Parker and Devin are 15 feet apart from each other where they both can see Andy. Parker's line of sight to Andy is  $38^\circ$  and Devin's line of sight to Andy is  $63^\circ$ . A bird is attempting to land in the triangle the boys have formed. What is the probability that the bird will land in the GRASS?



$$\textcircled{1} \frac{15}{\sin 79^\circ} = \frac{x}{\sin 63^\circ}$$

$$x = 13.6$$

$$\textcircled{2} A = \frac{1}{2}(13.6)(15)\sin 38^\circ = 62.8 \text{ ft}^2$$

$$\textcircled{3} A = \pi(3)^2 = 9\pi$$

$$\textcircled{4} \text{ bird} = \frac{62.8 - 9\pi}{62.8} = \frac{3}{55\%}$$

### Practice Question # 36

- The table shows the numbers N of commercial banks in the U.S. from 1996 to 2005, where  $x = 6$  for 1996. A logarithmic model best models this data. In what year will the number of banks drop to 5,300?

Year	Number, N
1996	9827
1997	9143
1998	8774
1999	8580
2000	8315
2001	8079
2002	7888
2003	7770
2004	7630
2005	7540

$$y = 13387.29022 - 2190.523 \ln x$$

$$x = ?$$

$$y = 5300 > \text{intersect (TF)}$$

$$\rightarrow x = 40 \rightarrow 2036$$