

What can I use to study? ? ?

***OLD NOTES PACKETS**

***OLD TEST REVIEWS!**

***MIDTERM REVIEW!**

***THE BLOG (www.gervaismath.wordpress.com)**

***FRIENDS ALSO TAKING ALGEBRA II**

***THE MATH LAB**

***MRS. GERVAIS**

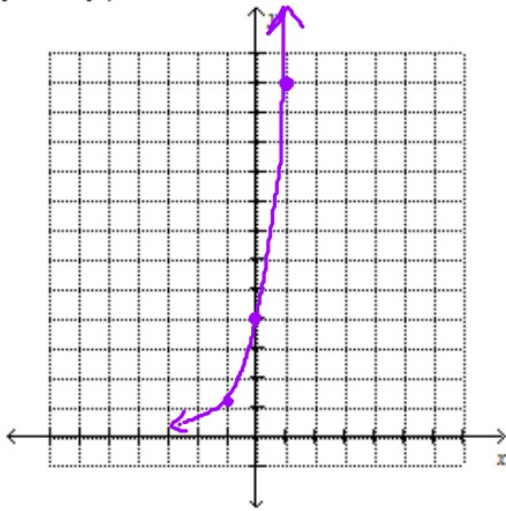
***THE INTERNET (Khan's Academy / YouTube)**



Algebra 2B Semester REVIEW

1. Graph the exponential function.

$$y = 4(3)^x$$



| x | y |
|----|-----|
| -1 | 4/3 |
| 0 | 4 |
| 1 | 12 |
| 2 | 36 |
| 3 | 108 |

2. An initial population of 745 quail increases at an annual rate of 6%. Write an exponential function to model the quail population. What will the approximate population be after 4 years?

$$y = 745(1.06)^t$$

$$y = 745(1.06)^4 = 940.5$$

941 quails

3. Suppose you invest \$900 at an annual interest rate of 7.9% compounded continuously. How much will you have in the account after 5 years? ($A = Pe^{rt}$)

$$A = 900e^{.079(5)} = \$1,335.95$$

$$\log_b a = x \iff b^x = a$$

4. Write the equation in exponential form.

a. $\log_{54} 6x = w$

$$54^w = 6x$$

b. $\log_4 625 = n$

$$4^n = 625$$

5. Write the equation in logarithmic form.

a. $(a + b)^{12} = 520$

$$\log_{(a+b)} 520 = 12$$

b. $(2b)^c = 16$

$$\log_{2b} 16 = c$$

$$3^2 = 9$$

6. The pH of a liquid is a measure of how acidic or basic it is. The concentration of hydrogen ions in a liquid is labeled $[H^+]$. Use the formula $pH = -\log[H^+]$ to find the pH level, to the nearest tenth, of a liquid with $[H^+]$ about 6.9×10^{-13} .

$$pH = -\log(6.9 \times 10^{-13}) = 12.16$$

7. Use the Change of Base Formula to evaluate $\log_6 55$. = $\frac{\log 55}{\log 6} = \boxed{2.24}$

8. Solve the exponential equation.

$9^{8x} = 27$ $\rightarrow \log_9 27 = 8x$
(exp. form \rightarrow log form) $\rightarrow \frac{1.5}{8} = \frac{8x}{8}$ $\boxed{X = .1875}$

9. Solve the logarithmic equation. Round to the nearest ten-thousandth if necessary.

$\log_{10}(3x + 7) = 2$ $\rightarrow 10^2 = 3x + 7$
(log form \rightarrow exp. form) $\rightarrow 100 = 3x + 7$
 $\quad \quad \quad -7 \quad \quad -7$

 $\quad \quad \quad 93 = 3x$
 $\quad \quad \quad \frac{93}{3} = \frac{3x}{3}$
 $\quad \quad \quad 31 = x$
 $\quad \quad \quad \boxed{X = 31}$

"vary directly" $y = kx$

find k!

10. Suppose that x and y vary inversely, and $x = 4$ when $y = 3$. Write the function that models the inverse variation.

$$y = \frac{k}{x} \quad 4 \cdot 3 = \frac{k}{4} \quad k = 12 \rightarrow \boxed{y = \frac{12}{x}}$$

11. A drama club is planning a bus trip to New York City to see a Broadway play. The table represents the cost per person for the bus rental compared to the number of people going on the trip. What function models the data, and how much per person will it cost if 20 students go on the trip?

| | | | | |
|------------------------------------|------|------|-----|-------|
| Number of Students (n) " x " | 3 | 6 | 9 | 16 |
| Cost per Student (c) " y " | \$24 | \$12 | \$8 | \$4.5 |

$$3 \cdot 24 = 72 \checkmark$$

$$6 \cdot 12 = 72 \checkmark$$

$$9 \cdot 8 = 72 \checkmark$$

$$4.5 \cdot 16 = 72 \checkmark$$

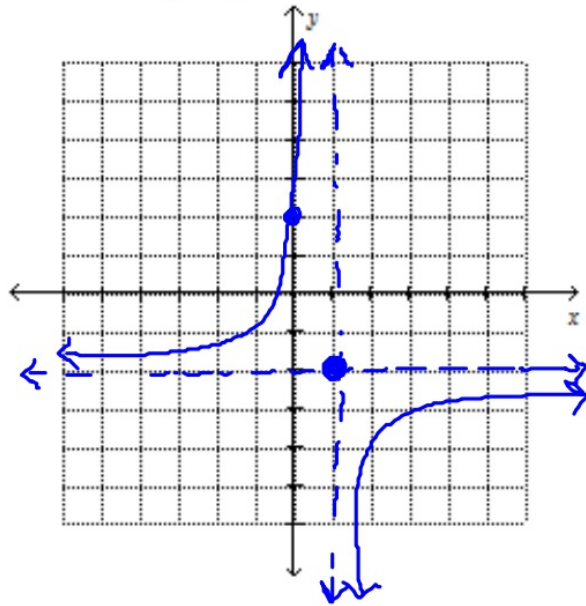
$$k = 72 \checkmark$$

$$"y = \frac{72}{x}"$$

$$C = \frac{72}{n} \rightarrow \frac{72}{20} = \boxed{\$3.60}$$

12. Sketch the asymptotes and graph the function

$$y = \frac{-4}{x-1} - 2$$



$$y = \frac{a}{x-h} + k$$

$$(1, -2)$$

$$(h, k)$$

$x=0$ (y-intercept)

$$y = \frac{-4}{0-1} - 2$$

$$y = \frac{-4}{-1} - 2$$

$$y = 4 - 2 = 2$$

$$(0, 2)$$

x, y

13. Find any points of discontinuity for the rational function.

$$y = \frac{x+5}{x^2+10x+16} = \frac{x+5}{(x+2)(x+8)}$$

$$\frac{16}{28}$$

$$x \neq -2 / x \neq -8$$

14. Simplify the rational expression. State any restrictions on the variable.

$$\frac{q^2 - 2q - 8}{q^2 - 3q - 10} = \frac{(q-4)(q+2)}{(q-5)(q+2)} = \frac{q-4}{q-5}$$

$$q \neq 5 \text{ and } q \neq -2$$

$$\begin{array}{r} -8 \\ -18 \\ 1-8 \\ -24 \\ \hline 2-4 \end{array} \quad \begin{array}{r} -10 \\ -10 \\ 1-10 \\ -25 \\ \hline 2-5 \end{array}$$

15. What is the product in simplest form? State any restrictions on the variable

$$\frac{p^2}{p-6} \cdot \frac{p^2 - 11p + 30}{p^2 - 1p} = \frac{p^2}{\cancel{p-6}} \cdot \frac{(p-5)\cancel{(p-6)}}{p(p-1)} = \frac{p(p-5)}{(p-1)}$$

$p \neq 1$ and $p \neq 6$

30
-130
3215
310
56

16. Simplify the sum.

$$\frac{x^2 + 7x - 8}{x^2 + x - 2} + \frac{5}{x+2} = \frac{x^2 + 7x - 8}{(x+2)(x-1)} + \frac{5}{(x+2)} \cdot \frac{(x-1)}{(x-1)}$$

$$= \frac{x^2 + 7x - 8}{(x+2)(x-1)} + \frac{5x - 5}{(x+2)(x-1)}$$

$$= \frac{x^2 + 12x - 13}{(x+2)(x-1)} = \frac{(x+13)\cancel{(x-1)}}{(x+2)\cancel{(x-1)}} = \frac{x+13}{x+2}$$

$x \neq -2$ and $x \neq 1$

Exam Review – Warm-up

1. Perform the indicated operation and simplify $\frac{8x - 1}{x^2 + x - 6} - \frac{4}{x - 2}$.
2. Solve $\frac{3}{x^2 - 9} = \frac{6}{x + 3}$.
3. Find the probability of randomly drawing a black king from a standard deck of 52 cards.
4. A card is randomly selected from a standard deck of 52 cards. What is the probability that it is a diamond or a king?

Exam Review - Warm-up

1. Perform the indicated operation and simplify $\frac{8x-1}{x^2+x-6} - \frac{4}{(x-2)(x+3)}$

Handwritten work for problem 1:

$$\frac{8x-1}{(x-2)(x+3)} - \frac{4}{(x-2)(x+3)} = \frac{4x-13}{(x-2)(x+3)}$$

Vertical subtraction:

$$\begin{array}{r} -6 \\ -16 \\ \hline 2-3 \\ -23 \end{array}$$

2. Solve $\frac{3}{x^2-9} - \frac{6}{x+3}$

Handwritten work for problem 2:

$$6(x^2-9) = 3(x+3)$$

$$6x^2 - 54 = 3x + 9$$

$$-3x - 9 - 3x + 9$$

$$6x^2 - 3x - 63$$

$$3(2x^2 - x - 21)$$

$$= (2x-7)(2x+6)$$

$$= 3(2x-7)(x+3)$$

Setting factors to zero:

$$\frac{-42}{-7 \cdot 6} \rightarrow \frac{x+3=0}{-3 \cdot -3} \rightarrow x = -3 \quad \times$$

$$\frac{2x-7=0}{+7 \quad +7} \rightarrow \frac{2x=7}{\frac{2}{2} \quad \frac{2}{2}} \rightarrow x = 3.5$$

3. Find the probability of randomly drawing a black king from a standard deck of 52 cards.

Handwritten calculation for problem 3:

$$\frac{\text{favorable}}{\text{TOTAL}} = \frac{2}{52} = \frac{1}{26} = .04 = \boxed{4\%}$$

4. A card is randomly selected from a standard deck of 52 cards. What is the probability that it is a diamond or a king?

Handwritten calculation for problem 4:

$$P(D) + P(K) - P(D \cap K)$$

$$\frac{13}{52} + \frac{4}{52} - \frac{1}{52} = \frac{16}{52} = \frac{4}{13} = \boxed{31\%}$$

17. Solve the equation. Check the solution.

$$\frac{-5}{x+5} = \frac{-4}{x-5}$$

$$\begin{aligned} -4(x+5) &= -5(x-5) \\ -4x-20 &= -5x+25 \\ +5x & \quad +5x \\ \hline x-20 &= 25 \end{aligned}$$

$$\begin{aligned} x-20 &= 25 \\ +20 & \quad +20 \\ \hline x &= 45 \end{aligned}$$

18. Solve the equation. Check the solution.

$$\frac{5}{6y} + \frac{4}{3y} = \frac{2}{3}$$

$$\frac{5}{6y} + \frac{8}{6y} = \frac{3}{3}$$

$$\frac{13}{6y} = \frac{3}{3}$$

$$\frac{18y}{18} = \frac{13}{18}$$

$$y = .72$$

CH9

19. What is the 15th term in the sequence using the given formula?

$$z_n = 8n + 14$$

$$\begin{aligned} z_{15} &= 8(15) + 14 \\ &= 134 \end{aligned}$$

$$\begin{aligned} \rightarrow a_n &= a_1 + (n-1)d \\ a_n &= 9 + (n-1)6 \\ a_n &= 9 + 6n - 6 \\ a_n &= 6n + 3 \end{aligned}$$

20. Write an explicit formula for the sequence 9, 15, 21, 27, 33, ... Then find a_{14} .

$$a_n = 6n + 3$$

$$a_{14} = 6(14) + 3 = 87$$

$$\begin{array}{cccc} & a_1 & & \\ & \downarrow & \downarrow & \downarrow & \downarrow \\ & +0 & +0 & +0 & +0 \end{array}$$

21. Find the 111 term of the sequence 3, 12, 21, 30, ...

$$\begin{array}{ccc} & \downarrow & \downarrow & \downarrow \\ & +9 & +9 & +9 \\ \leftarrow & & & \\ \text{(arithmetic)} & & & \end{array}$$

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

$$a_{111} = 3 + (111-1)9$$

$$a_{111} = 993$$

22. What is the fifth term of the geometric sequence?

4, 20, 100, ...

$$\begin{array}{cc} \downarrow \downarrow \\ \times 5 \times 5 & r=5 \end{array}$$

↳ geometric!

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

$$a_5 = 4(5)^{5-1}$$

$$a_5 = 4(5)^4 = 2500$$

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

$$a_n = -3(-2)^{n-1}$$



$$a_5 = -3(-2)^4 = -48$$

23. Write the explicit formula for the geometric sequence. Then find the fifth term in the sequence.
 $a_1 = -3, a_2 = 6, a_3 = -12$

$$-3, 6, -12$$

$$\times \checkmark -2 \quad \times \checkmark -2 \quad r = -2$$

24. Use summation notation to write the series $37 + 29 + 21 + \dots$ for 12 terms. $n=1 \Rightarrow n=12$

find the rule!

$$\checkmark -8 \quad \checkmark -8 \quad d = -8$$

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

$$a_n = 37 + (n-1)(-8)$$

$$a_n = 37 - 8n + 8$$

$$a_n = \underline{\underline{-8n + 45}}$$

$$\sum_{n=1}^{12} (-8n + 45)$$

last
 \sum
 first term
 rule!

$a_1 = \text{first term}$
 $a_n = \text{last term}$

$$n \left(\frac{a_1 + a_n}{2} \right)$$

$$5 \left(\frac{6+10}{2} \right) = 5 \left(\frac{16}{2} \right) = \boxed{40}$$

25. Evaluate the series $\sum_{n=1}^5 (n+5)$.

$$n=5$$

$$a_1=6$$

$$a_n \Rightarrow a_5=10$$

26. What is the sum of the ~~geometric~~ series $\sum_{n=1}^6 (x+5)$?

arithmetic \uparrow

$$\sum_{n=1}^6 (x+5)$$

$$= \overset{n=1}{6}, \overset{n=2}{7}, \overset{n=3}{8}, \overset{n=4}{9}, \overset{n=5}{10}, \overset{n=6}{11} = \boxed{51}$$

add together!

27. Does the infinite geometric series diverge or converge? Explain.

$$\frac{1}{5} + \frac{1}{25} + \frac{1}{125} + \frac{1}{625} + \dots$$

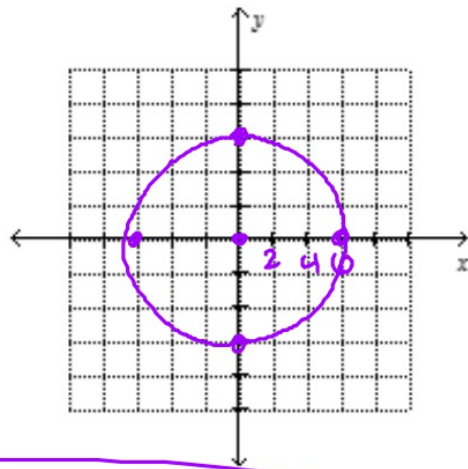
$$\begin{array}{ccc} \vee & \vee & \vee \\ \times \frac{1}{5} & \times \frac{1}{5} & \times \frac{1}{5} \end{array}$$

$$r = \frac{1}{5}$$

$$\text{Sum?} \Rightarrow \frac{a_1}{1-r} = \frac{\frac{1}{5}}{1-\frac{1}{5}} = \boxed{.25}$$

$r < 1 \rightarrow \text{So... Converges! } r = \frac{1}{5} < 1$

28. Graph $5x^2 + 5y^2 = 180$. What are the domain and range?



Domain: $-6 \leq x \leq 6$

Range: $-6 \leq y \leq 6$

$$\frac{5x^2}{5} + \frac{5y^2}{5} = \frac{180}{5}$$

$$x^2 + y^2 = 36$$

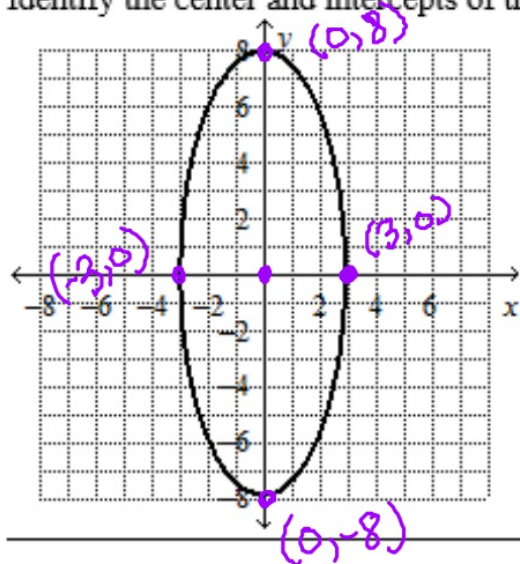
Center (0,0)

$$r^2 = 36$$
$$r = 6 \checkmark$$

↓

Circle with
a radius
of $r = 6$

29. Identify the center and intercepts of the conic section. Then find the domain and range.



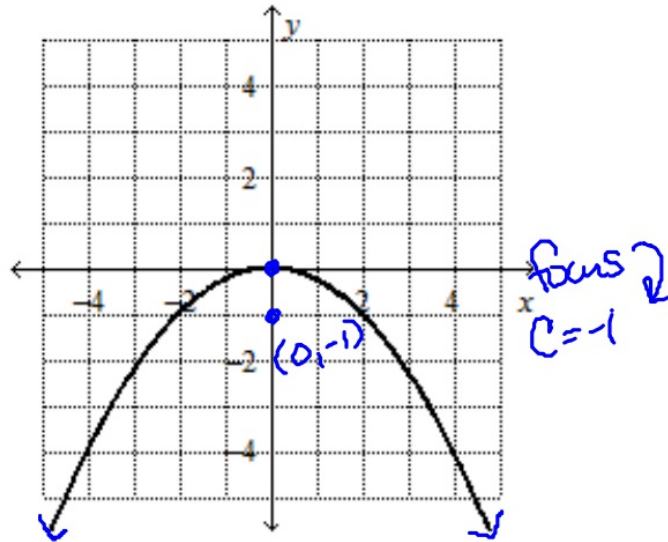
$$\text{Domain: } -3 \leq x \leq 3$$

$$\text{Range: } -8 \leq y \leq 8$$

Center (0,0)

Ellipse

30. Use the graph to write an equation for the parabola.



$$y = ax^2$$

$$a = \frac{1}{4c} = \frac{1}{4(-1)} = -\frac{1}{4}$$

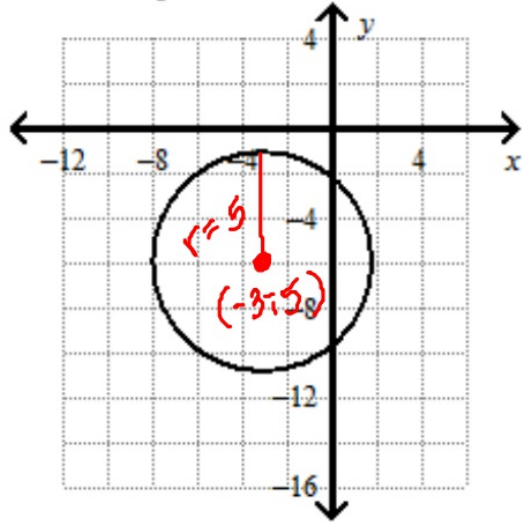
$$y = -\frac{1}{4}x^2$$

$$h=4 \quad k=6$$

31. Write an equation for the translation of $x^2 + y^2 = 36$ by 4 units right and 6 units up.

$$(x-4)^2 + (y-6)^2 = 36$$

32. Write an equation in standard form for the circle.



$$(h, k) = (-3, -5)$$

$$r = 5$$

$$(x-h)^2 + (y-k)^2 = r^2$$

↓

$$(x+3)^2 + (y+5)^2 = 5^2$$

$$(x+3)^2 + (y+5)^2 = 25$$

CH 11

$$12! = 479,001,600$$

33. In how many ways can 12 basketball players be listed in a program?

34. A bag contains 9 red marbles, 6 white marbles, and 5 blue marbles. Find $P(\text{red or blue})$.

$$P(\text{RED}) + P(\text{BLUE}) = \frac{9}{20} + \frac{5}{20} = \frac{14}{20} = .7 = 70\%$$

35. Teesha is in the French club. There are 36 students in the club. The French teacher will pick two students at random to guide visiting students from France. What is the probability that Teesha will **not** be picked as a guide?

$$\frac{35}{36} \cdot \frac{34}{35} = \frac{34}{36} = \frac{17}{18}$$

36. A jar contains 6 blue cubes, 3 blue spheres, 7 green cubes, and 3 green spheres. If you select an object at random, what is the probability that the object is green or a cube?

$$P(\text{Green OR Cube}) = \frac{10}{19} + \frac{13}{19} - \frac{7}{19} = \frac{16}{19} = .84 = 84\%$$

Exam Review - Warm-up

1. Find the sum of the series $\sum_{k=1}^{25} (15 - 3k)$. $= n \left(\frac{a_1 + a_n}{2} \right) = 25 \left(\frac{12 + (-60)}{2} \right) = \boxed{-600}$

$n = 25$
 $a_1 = 15 - 3(1) = 12$
 $a_n \rightarrow a_{25} = 15 - 3(25) = -60$

2. Write the series using summation notation.

$9 + 14 + 19 + 24 + 29$

$\underbrace{\quad}_{+5} \quad \underbrace{\quad}_{+5} \quad \underbrace{\quad}_{+5}$

$d = 5$

5 last
 \sum rule!
 first
 $n=1$

$\sum_{n=1}^5 5n + 4$

Rule?

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

$a_n = 9 + (n-1)5$

$a_n = \boxed{9} + 5n \boxed{-5}$

$a_n = 5n + 4$

3. Convert 260° to radians.

$260^\circ \cdot \frac{\pi}{180^\circ} = \frac{260}{180} \pi = \boxed{\frac{13}{9} \pi}$

4. Evaluate $\tan\left(-\frac{7\pi}{6}\right)$.

$\tan \theta = \frac{\sin \theta}{\cos \theta} = \frac{-\frac{1}{2}}{-\frac{\sqrt{3}}{2}} = -\frac{1}{2} \cdot \frac{2}{-\sqrt{3}} = \frac{2}{2\sqrt{3}} = \frac{1 \rightarrow \sqrt{3}}{\sqrt{3} \rightarrow \sqrt{3}} = \boxed{\frac{\sqrt{3}}{3}}$

37. Each person in a group of students was identified by year and asked when he or she preferred taking classes: in the morning, afternoon, or evening. The results are shown in the contingency table. Find the probability that the student preferred morning classes given he or she is a freshman. Round to the nearest thousandth.

(conditional)

When Do You Prefer to Take Classes?

| | Freshman | Sophomore | Junior | Senior |
|-----------|----------|-----------|--------|--------|
| Morning | 8 | 6 | 13 | 20 |
| Afternoon | 17 | 16 | 19 | 15 |
| Evening | 20 | 13 | 16 | 4 |

45 TOTAL

$$P(\text{morning} / \text{FRESH}) = \frac{8}{45} = .17 = \boxed{18\%}$$

38. A class of 19 students wants to choose 5 students at random to bring food for a class party. Any set of 2 students should have an equal chance of being chosen. Which of the following strategies will result in a fair decision?
- Arrange the students in a line. Start at one end and have each student flip a coin. The first five students to flip heads can bring the food.
 - Assign a number to each student. Write the numbers on slips of paper and put them all in a hat. Randomly choose five slips of paper. The students with those five numbers can bring the food.
 - Ask the students to volunteer. The first five students to raise their hands can bring the food.
39. Over the first five years of owning her car, Gina drove about 12,200 miles the first year, 7,438 miles the second year, 12,425 the third year, 11,700 the fourth year, and 13,025 the fifth year.
- Find the mean, median, and mode of this data.
 - Explain which measure of central tendency will best predict how many miles Gina will drive in the sixth year.

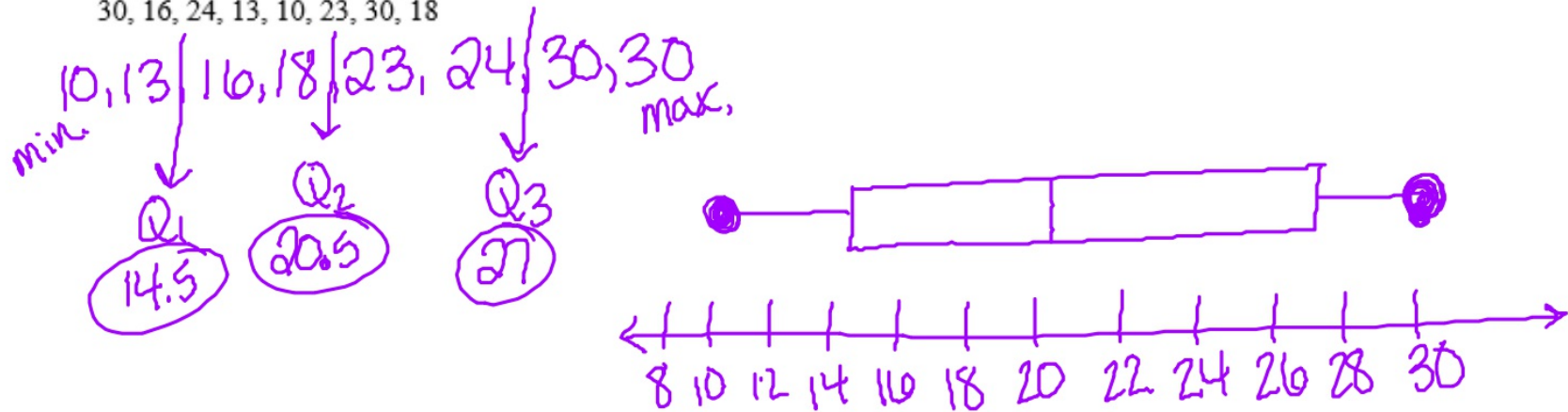
7,438, 11,700, 12,200, 12,425, 13,025

mean = 11,357.6
median = 12,200
mode = x

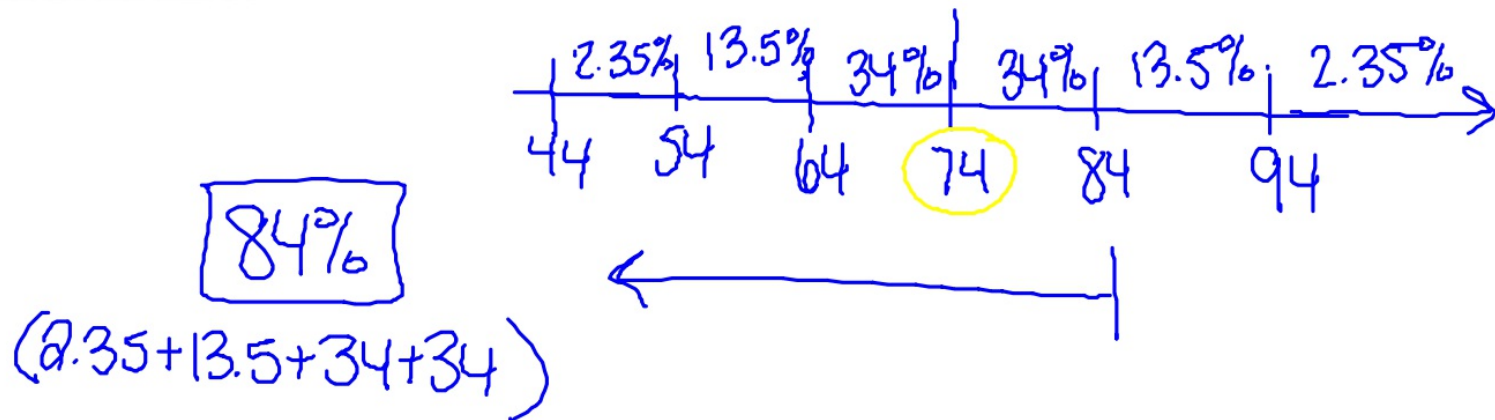
Median! Close to the majority of the data

40. Make a box-and-whisker plot of the data.

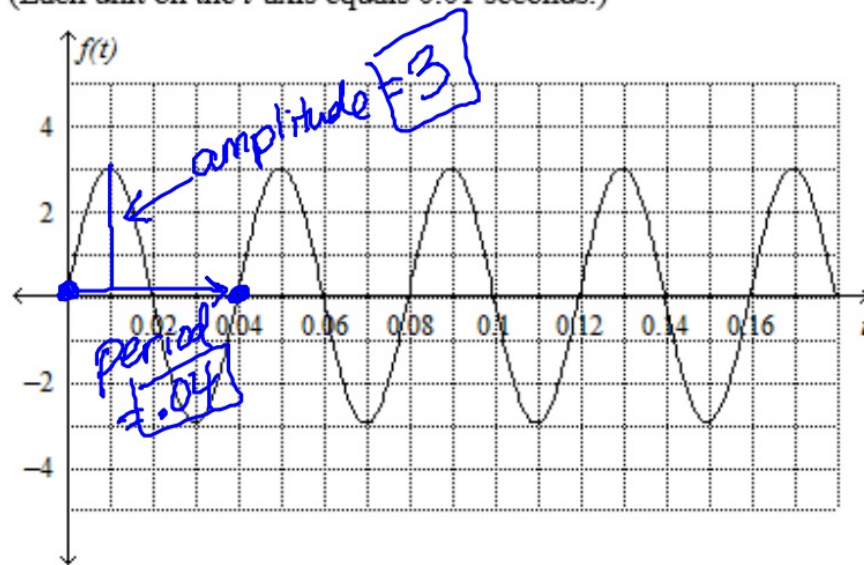
30, 16, 24, 13, 10, 23, 30, 18



41. The scores on an exam are normally distributed, with a mean of 74 and a standard deviation of 10. What percent of the scores are less than 84?



42. The screen below shows the graph of a sound recorded on an oscilloscope. What are the period and the amplitude? (Each unit on the t -axis equals 0.01 seconds.)



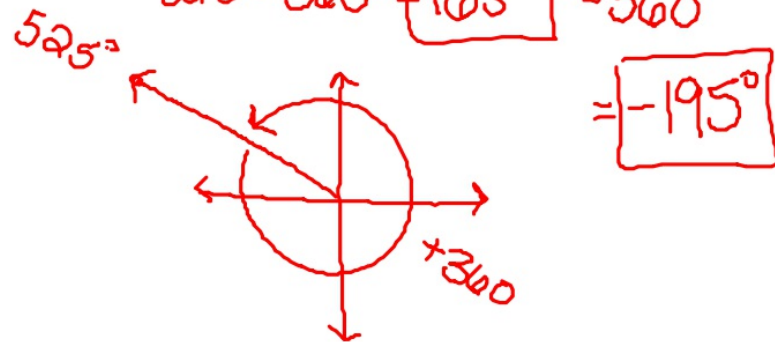
43. For each of the following angles, find two angles that are coterminal with the given angle?

a. $525^\circ + 360^\circ = \boxed{885^\circ}$

b. $-110^\circ + 360^\circ = \boxed{250^\circ}$

$525^\circ - 360^\circ = \boxed{165^\circ} - 360^\circ$

$-110^\circ - 360^\circ = \boxed{-470^\circ}$



$$-320^\circ \cdot \frac{\pi}{180} = \frac{-320}{180} \pi = \boxed{-\frac{16\pi}{9}}$$

44. Find the radian measure of an angle of -320° .

45. Find the exact value of $\sin\left(-\frac{\pi}{2}\right)$ radians.

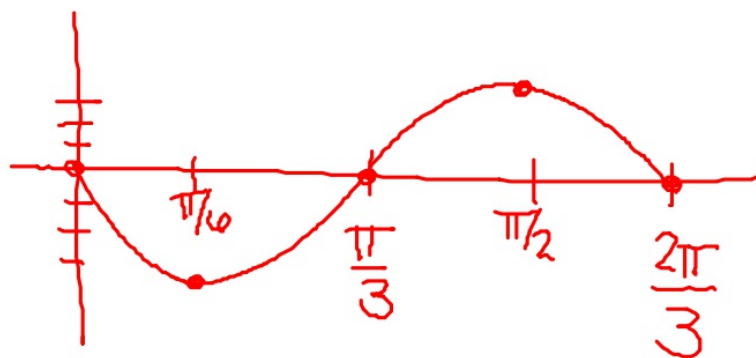
See unit circle!

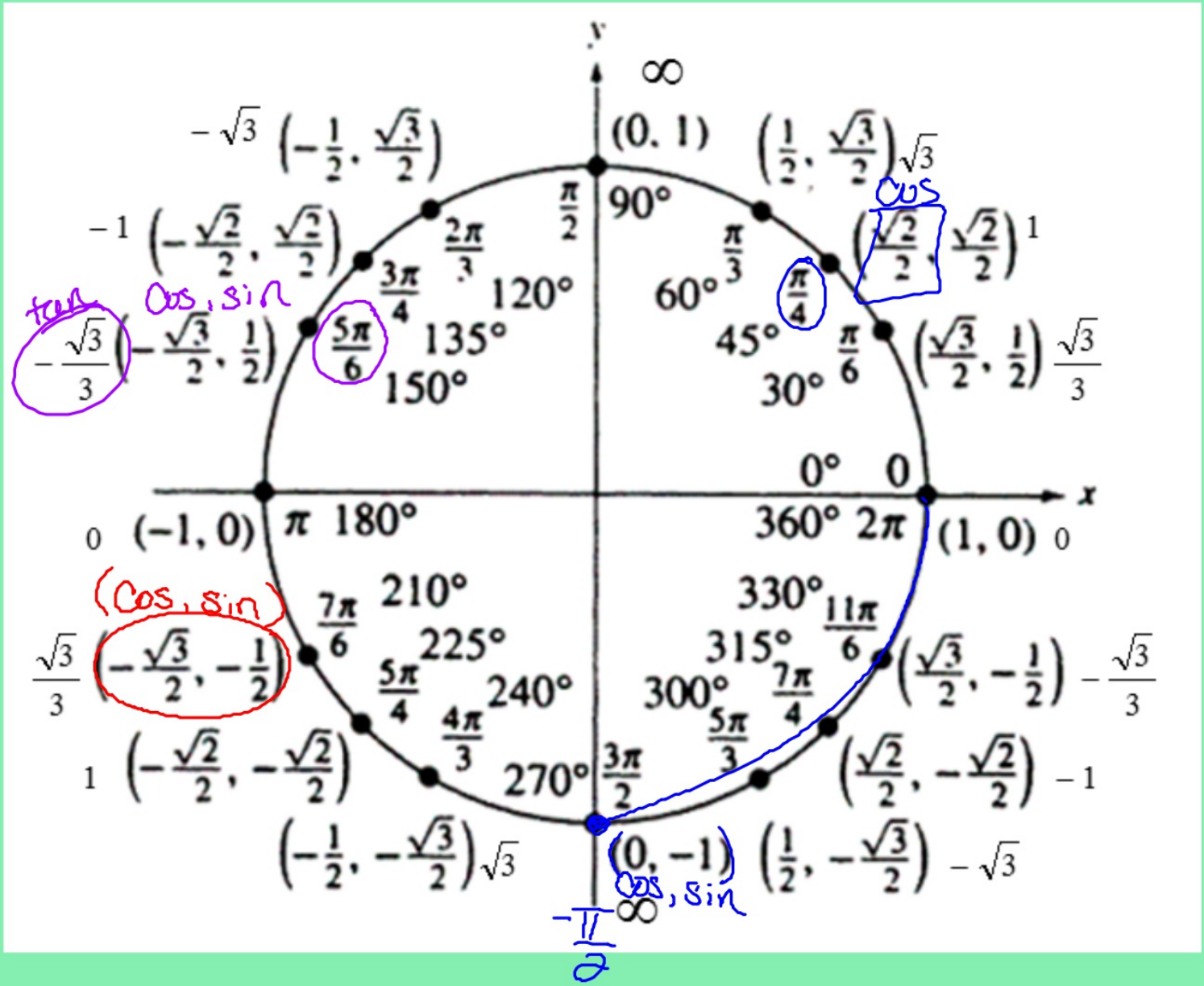
$$= \boxed{-1}$$

46. Sketch one cycle of the sine curve.

$$y = -3 \sin 3\theta$$

amplitude \leftarrow \rightarrow period = $\frac{2\pi}{3}$





47. What is the value of the expression? Do not use a calculator.

$$\tan \frac{5\pi}{6}$$

$$\tan \frac{5\pi}{6} = \frac{\sin \frac{5\pi}{6}}{\cos \frac{5\pi}{6}} = \frac{\frac{1}{2}}{-\frac{\sqrt{3}}{2}} = \frac{1}{2} \cdot \frac{2}{-\sqrt{3}} = -\frac{1}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \boxed{-\frac{\sqrt{3}}{3}}$$

48. What is the value of h in the translation of the given function? Describe the phase shift (use a phrase like 3 units to the left).

$$y = \cos(x + 9)$$

$$h = 9$$

9 units to the right

Ⓜ, or ✖

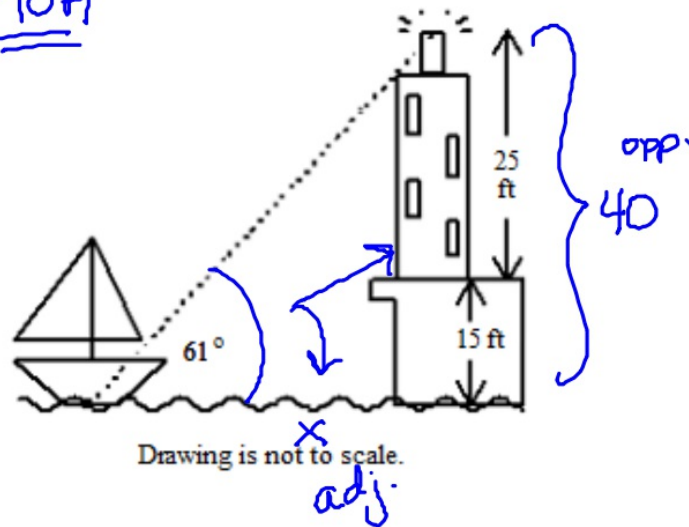
Ex#2: $y = \sin(x + 3) - 2$

$h = -3$ $k = -2$

left 3 units | down 2 units

49. The line of sight from a small boat to the light at the top of a 25-foot lighthouse built on a cliff 15 feet above the water makes a 61° angle with the water. To the nearest foot, how far is the boat from the cliff?

SOH - CAH - TOA



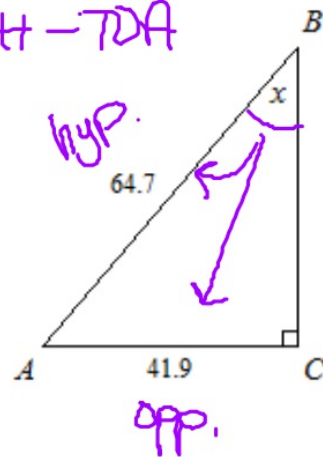
$$x \cdot \tan 61^\circ = \frac{40}{x}$$

$$\frac{x(\tan 61)}{\tan 61} = \frac{40}{\tan 61}$$

$$x = 22 \text{ ft.}$$

50. In $\triangle ABC$, $\angle C$ is a right angle, what is the measure of x ?

SOH - CAH - TOA



$$\sin x^\circ = \frac{41.9}{64.7}$$

$$\sin^{-1}\left(\frac{41.9}{64.7}\right) = 40.36^\circ$$