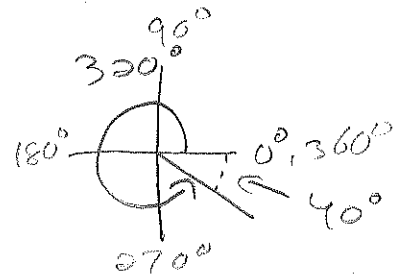
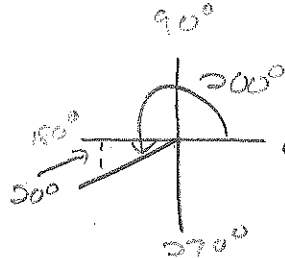
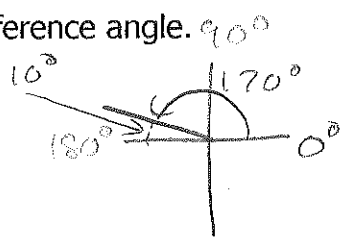
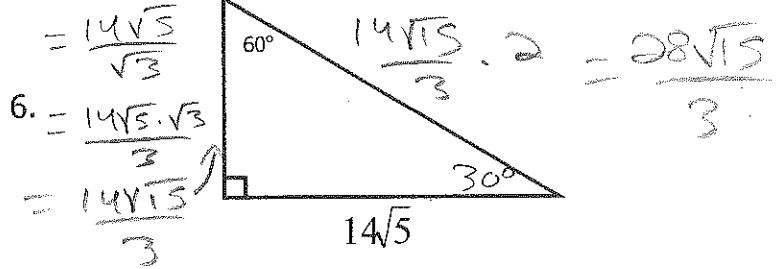
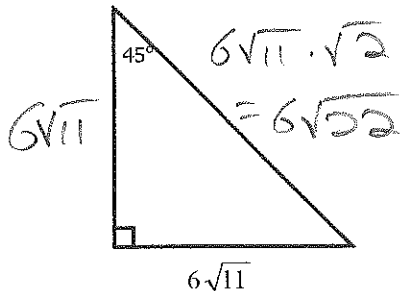


For 1-3, identify the reference angle.

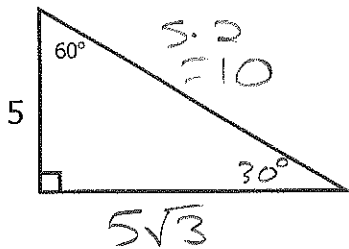
1. $170^\circ \theta = 10^\circ$
2. $200^\circ \theta = 20^\circ$
3. $320^\circ \theta = 40^\circ$



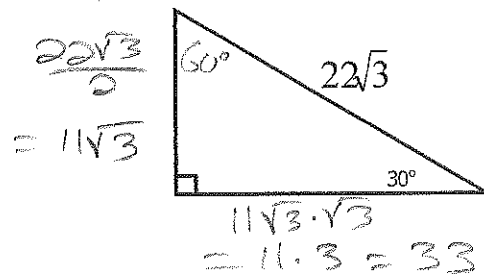
4.



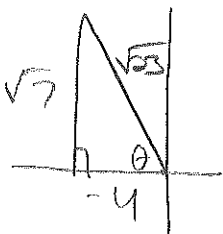
5.



7.



8. Find the six trigonometry ratios for $\angle \theta$ in standard position with $(-4, \sqrt{7})$ on its terminal side.



$$\begin{aligned} (-4)^2 + (\sqrt{7})^2 &= c^2 \\ 23 &= c^2 \\ \sqrt{23} &= c \end{aligned}$$

$$\sin \theta = \frac{\sqrt{7}}{\sqrt{23}} = \frac{\sqrt{161}}{23}$$

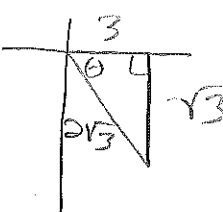
$$\csc \theta = \frac{23}{\sqrt{161}} = \frac{23\sqrt{161}}{161} = \frac{\sqrt{161}}{7}$$

$$\cos \theta = \frac{-4}{\sqrt{23}} = \frac{-4\sqrt{23}}{23}$$

$$\sec \theta = \frac{\sqrt{23}}{-4}$$

$$\tan \theta = \frac{-\sqrt{7}}{4} \quad \cot \theta = \frac{-4\sqrt{7}}{7}$$

9. Find the six trigonometry ratios for $\angle \theta$ in standard position with $(3, -\sqrt{3})$ on its terminal side.



$$\begin{aligned} (3)^2 + (-\sqrt{3})^2 &= c^2 \\ 12 &= c^2 \\ \sqrt{12} &= c \\ 2\sqrt{3} &= c \end{aligned}$$

$$\sin \theta = \frac{-\sqrt{3}}{2\sqrt{3}} = -\frac{1}{2}$$

$$\csc \theta = -2$$

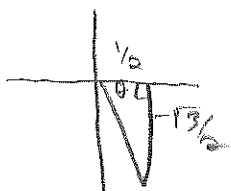
$$\cos \theta = \frac{3}{2\sqrt{3}} = \frac{3\sqrt{3}}{6} = \frac{\sqrt{3}}{2}$$

$$\sec \theta = \frac{2\sqrt{3}}{3}$$

$$\tan \theta = \frac{-\sqrt{3}}{3}$$

$$\cot \theta = \frac{-3}{\sqrt{3}} = -\frac{3\sqrt{3}}{3} = -\sqrt{3}$$

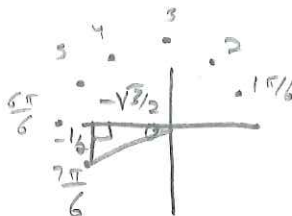
10. What is the coordinate on the terminal side for 300° ?



$$\left(\frac{1}{2}, -\frac{\sqrt{3}}{2} \right)$$

11. What is the coordinate on the terminal side for $\frac{7\pi}{6}$?

$$\left(-\frac{\sqrt{3}}{2}, -\frac{1}{2}\right)$$



12. What is the coordinate on the terminal side for $\frac{3\pi}{4}$?

$$\left(-\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}\right)$$



13. List the six trig. ratios for 225° . $\left(-\frac{\sqrt{2}}{2}, -\frac{\sqrt{2}}{2}\right)$

$$\sin \theta = -\frac{\sqrt{2}}{2}$$

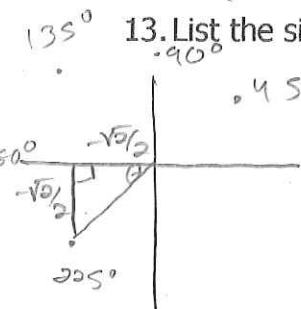
$$\csc \theta = -\frac{2}{\sqrt{2}} = -\frac{2\sqrt{2}}{2} = -\sqrt{2}$$

$$\cos \theta = -\frac{\sqrt{2}}{2}$$

$$\sec \theta = -\sqrt{2}$$

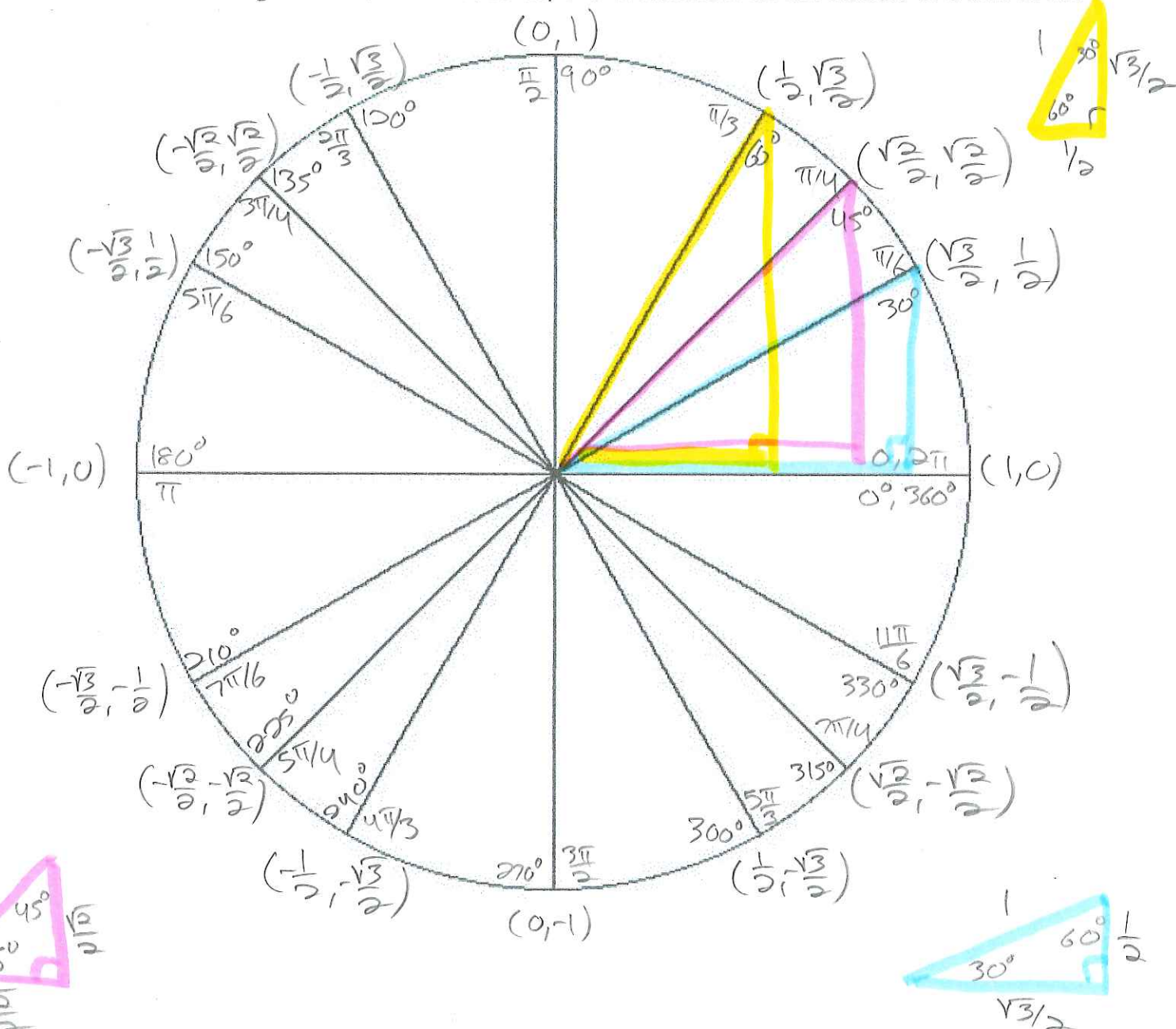
$$\tan \theta = \frac{\sqrt{2}}{\sqrt{2}} = 1$$

$$\cot \theta = 1$$



✓ 14. Label all of the degree and radian measures, and coordinates on the outside of a unit circle.

↓



Directions: Find all angles $0^\circ \leq \theta \leq 360^\circ$ and $0 \leq \theta \leq 2\pi$ for each of the following.

15. $\frac{\sqrt{2}}{2} \tan \theta + \frac{\sqrt{2}}{2} = 0$
 $\tan \theta = -\frac{\sqrt{2}}{\sqrt{2}} = -1$

$\theta = 135^\circ$ or 315°
 or $3\pi/4$ or $7\pi/4$

18. $2 \sin \theta - \sqrt{3} = 0$
 $\sin \theta = \frac{\sqrt{3}}{2}$

$\theta = 60^\circ$ or 120°
 or $\pi/3$ or $2\pi/3$

16. $2 \cos \theta - 1 = 0$
 $\cos \theta = 1/2$
 $\arccos = x$

$\theta = 60^\circ$ or 300°
 or $\pi/3$ or $5\pi/3$

19. $\sin \theta + \frac{\sqrt{2}}{2} = 0$
 $\sin \theta = -\frac{\sqrt{2}}{2}$

$\theta = 225^\circ$ or 315°
 or $5\pi/4$ or $7\pi/4$

17. $\tan \theta = \text{undefined}$
 $\tan = \frac{y}{x}$

$\theta = 90^\circ$ or 270°
 or $\pi/2$ or $3\pi/2$

20. $\sec \theta - \sqrt{2} = 0$
 $\sec \theta = \sqrt{2}$
 $\cos \theta = \frac{1}{\sqrt{2}} = \frac{\sqrt{2}}{2}$

$\theta = 45^\circ$ or 315°
 or $\pi/4$ or $7\pi/4$

21. Solve $\sin \theta = \frac{\sqrt{2}}{2}$. Give your answers in both degrees and radians.

$\theta = 45^\circ$ or 135°
 or $\pi/4$ or $3\pi/4$

22. Solve $2 \cos \theta - 1 = 0$. Give your answers in both degrees and radians.

$\cos \theta = 1/2$
 $\arccos = x$
 $\theta = 60^\circ$ or 300°
 or $\pi/3$ or $5\pi/3$

23. Solve $\tan \theta = -1$. Give your answers in both degrees and radians.

$\tan = \frac{y}{x}$
 $\theta = 135^\circ$ or 315°
 or $3\pi/4$ or $7\pi/4$

24. Solve $\sin \theta = 0$. Give your answers in both degrees and radians.

$\theta = 0^\circ$ or 180° or 360°
 or 0 or π or 2π

25. What is the coordinate on the terminal side for $\frac{7\pi}{4}$?

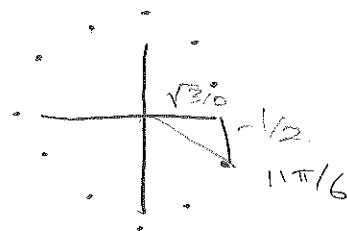


26. What is the coordinate on the terminal side for 150° ?



27. What is the coordinate on the terminal side for $\frac{11\pi}{6}$?

$$\left(\frac{\sqrt{3}}{2}, -\frac{1}{2}\right)$$



28. List the 6 trig ratios for $\frac{11\pi}{6}$?

$$\sin \theta = -\frac{1}{2} \quad \csc \theta = -2$$

$$\cos \theta = \frac{\sqrt{3}}{2} \quad \sec \theta = \frac{2}{\sqrt{3}} = \frac{2\sqrt{3}}{3}$$

$$\tan \theta = \frac{-\frac{1}{2}}{\frac{\sqrt{3}}{2}} = -\frac{1}{\sqrt{3}} = -\frac{\sqrt{3}}{3} \quad \cot \theta = -\sqrt{3}$$

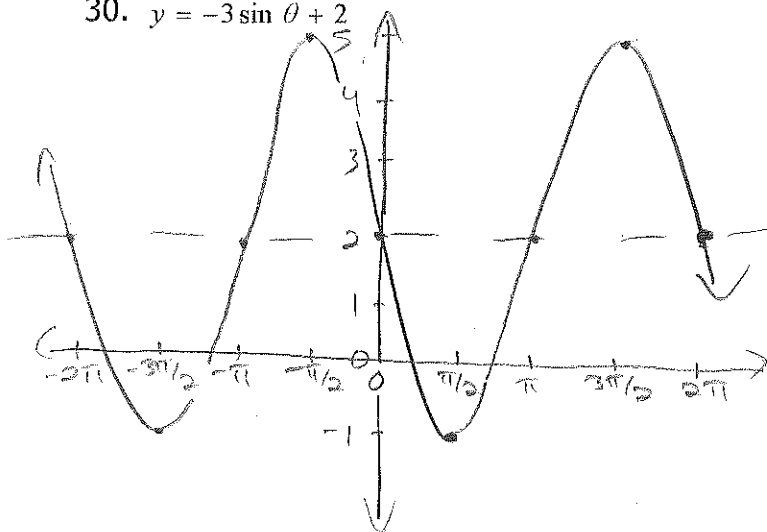
29. What is the coordinate on the terminal side for 225° ?



$$\left(-\frac{\sqrt{2}}{2}, -\frac{\sqrt{2}}{2}\right)$$

For #30-33, graph each function and list intercepts (midline & y), domain, range, max(s) and min(s). Honors A2 graph 2 periods
Regular A2 graph 1 period

30. $y = -3 \sin \theta + 2$



D: ALL \mathbb{R} or $(-\infty, \infty)$

R: $[-1, 5]$

midline: $(\pi n, 2)$
ints: πn

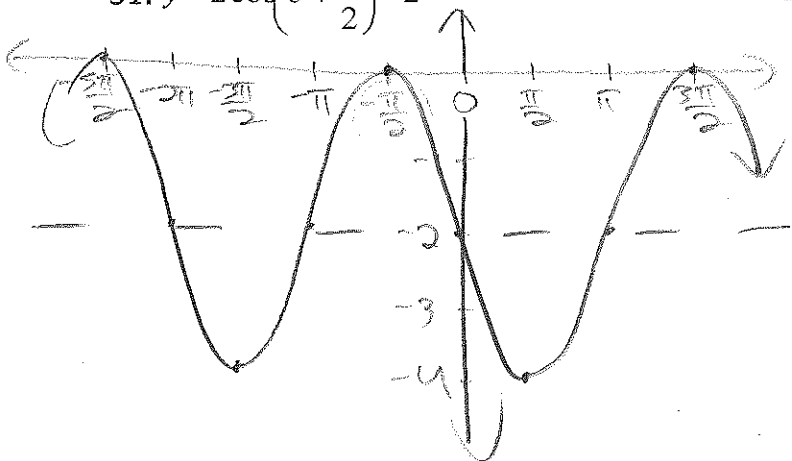
Y-int: $(0, 2)$

maxs: $(-\frac{\pi}{2} + 2\pi n, 5)$
 $n \in \mathbb{Z}$

mins: $(\frac{\pi}{2} + 2\pi n, -1)$
 $n \in \mathbb{Z}$

midline equation: $y = 2$

31. $y = 2 \cos \left(\theta + \frac{\pi}{2}\right) - 2$



D: ALL \mathbb{R} or $(-\infty, \infty)$

R: $[-4, 0]$

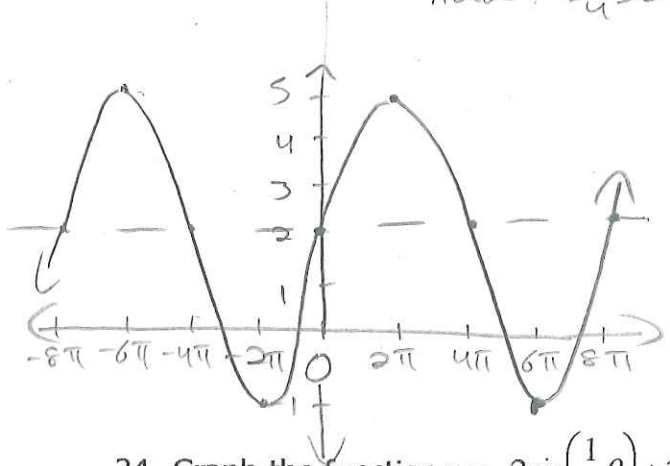
midline: $(\pi n, -2)$
ints: $\pi n + \frac{\pi}{2}$

Y-int: $(0, -2)$

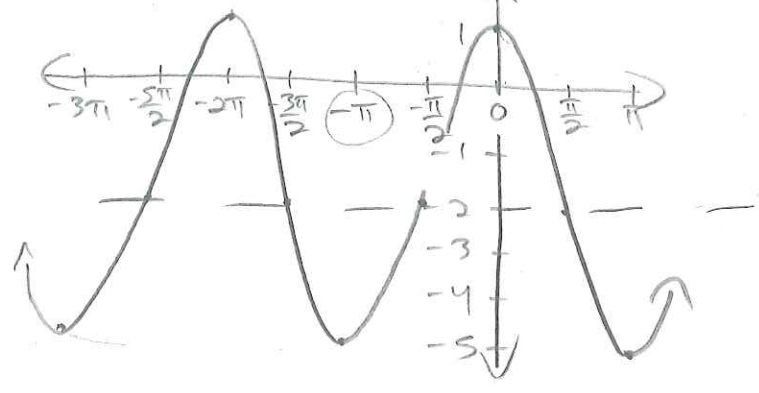
maxs: $(-\frac{\pi}{2} + 2\pi n, 0)$
 $n \in \mathbb{Z}$

mins: $(\frac{\pi}{2} + 2\pi n, -4)$
 $n \in \mathbb{Z}$

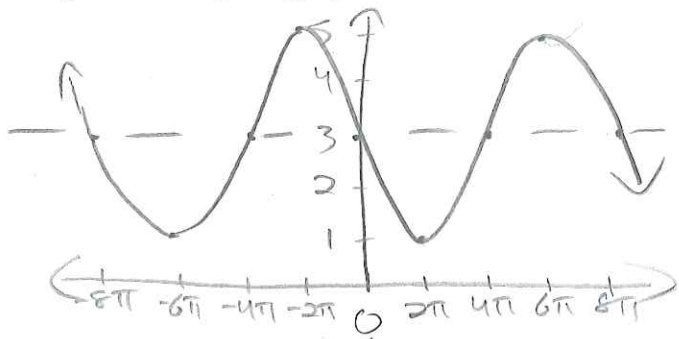
$D: \text{All } \mathbb{R}$ $R: [-1, 5]$
 midline int(s): $(4\pi n, 2)$
 Y-int: $(0, 2)$
 max(s): $(2\pi + 8\pi n, 5)$
 min(s): $(-2\pi + 8\pi n, -1)$
 32. $y = 3 \sin \frac{1}{4}(\theta) + 2$ Per = $\frac{2\pi}{1/4} = 2\pi \cdot 4 = 8\pi$
 Add = $\frac{8\pi}{4} = 2\pi$



$D: \text{All } \mathbb{R}$ $R: [-5, 1]$ Y-int: $(0, 1)$
 midline int(s): $(-\pi/2 + \pi n, -2)$
 max(s): $(2\pi n, 1)$
 min(s): $(-\pi + 2\pi n, -5)$
 33. $y = -3 \cos(\theta + \pi) - 2$ phase shift: left π
 Add $\frac{\pi}{2}$

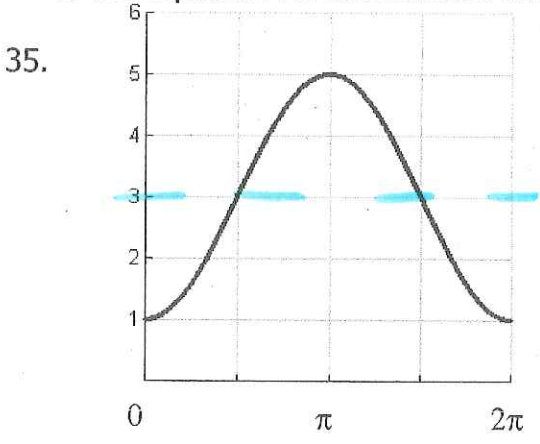


34. Graph the function $y = -2 \sin \left(\frac{1}{4} \theta \right) + 3$ and then answer the questions that follow. You will not be graded on your graph.
 Per = $\frac{2\pi}{1/4} = 2\pi \cdot 4 = 8\pi$ Add = $\frac{8\pi}{4} = 2\pi$



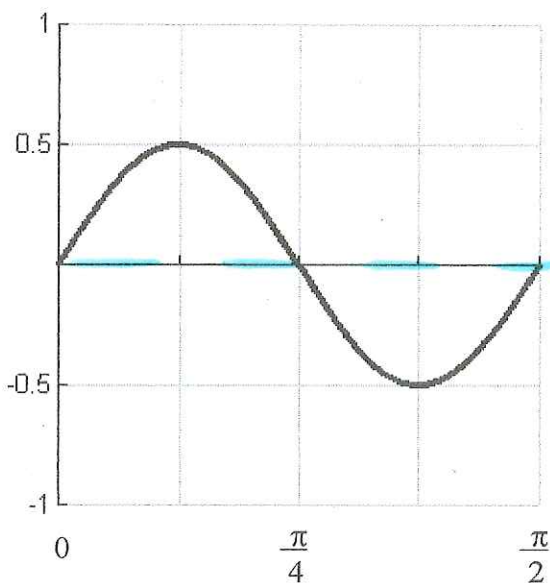
Amplitude = 2 Period = 8pi
 Midline intercept(s) $(4\pi n, 3)$ Midline equation $y = 3$
 Y-intercept $(0, 3)$ Domain All \mathbb{R} Range $[1, 5]$
 Maximum(s) $(6\pi + 8\pi n, 5)$ Minimum(s) $(2\pi + 8\pi n, 1)$

Write the equation for the function that is graphed.



- cosine
 Amp = 2
 no phase shift
 NO period change
 midline $y = 3$
 $y = -2 \cos \theta + 3$

36.



+ sine

Amp = 0.5

No phase shift

Period = $\pi/2$

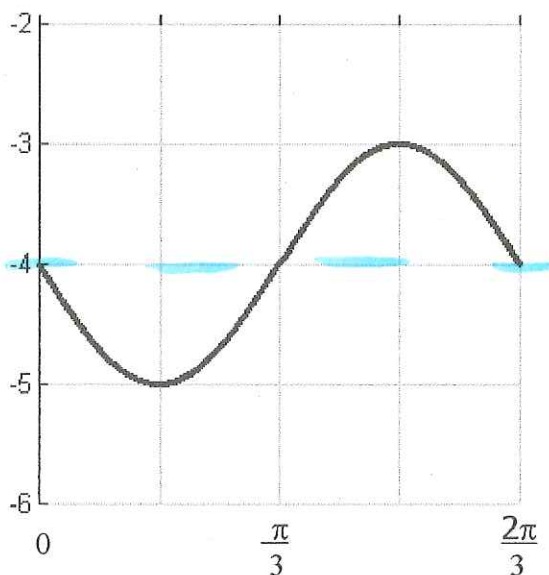
Period = $\frac{2\pi}{b}$

$\frac{\pi}{2} = \frac{2\pi}{b} \rightarrow \pi \cdot b = 4\pi$
 $b = 4$

midline: $y = 0$

$y = 0.5 \sin(4\theta)$

37.



- sine

Amp = 1

No phase shift

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

$\frac{2\pi}{3} = \frac{2\pi}{b} \rightarrow 2\pi b = 6\pi$
 $b = 3$

midline: $y = -4$

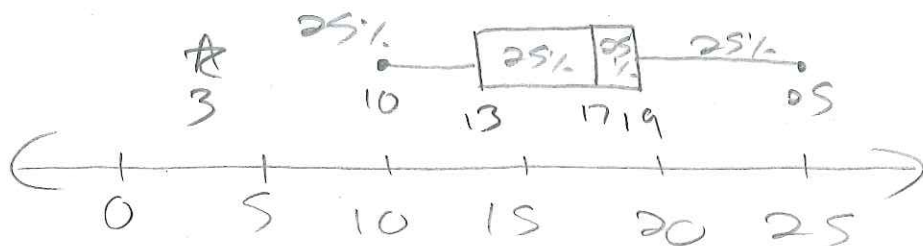
$y = -\sin(3\theta) - 4$

38. Use the following data to answer the questions:

3 10 12 13 15 16 16 17
 18 19 19 19 20 20 25

- a. What is the mean of the data set? 16.13
- b. What is the median of the data set? 17
- c. What is the mode of the data set? 19
- d. What is the lower/1st quartile? 13
- e. What is the upper/3rd quartile? 19
- f. What is the standard deviation? 5
- g. What is the range? Range = $25 - 3 = 22$
- h. Create a box plot for the data.

★ Use your GC here.

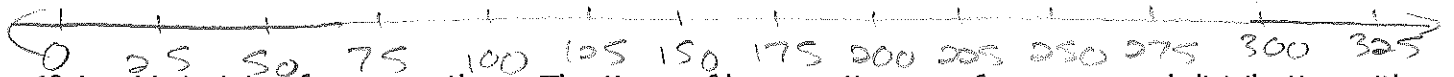
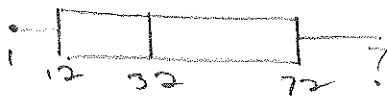


39. The following data has been found when studying the depths of different types of SCUBA equipment:

- Lower Quartile: 12 m below sea level
- Median: 32 m below sea level
- Mean: 38 m below sea level
- Mode: 30 m below sea level
- Upper Quartile: 72 m below sea level

$IQR = 72 - 12 = 60$
 outliers if...
 $< 12 - 1.5 \cdot 60$ or $> 72 + 1.5 \cdot 60$
 < -78 or > 162

- a. Based on the information, explain why you think the data will have a certain shape.
Tails to the right \rightarrow skewed right
- b. Construct a box plot if the minimum and maximum depths are 1 m and 318 m below sea level. *depths of scuba equipment*



40. Lorri is training for a marathon. The times of her practice runs form a normal distribution with $\bar{x} = 2$ hr 33 min and $\sigma = 3.5$ min.

- a. Draw and label the approximately normal curve.

- b. About 68% of her times fall within what times?
 2hr 29.5min and 2hr 36.5min

- c. What percent of her times are between 2 hr 26 min and 2 hr 33 min?
 $13.5 + 34 = 47.5\%$

- d. In order to qualify for a certain marathon, a runner must have an official time of 2:40 or less in a previous race. Once Lorri chooses a qualifying race, what is the probability that she will qualify for the marathon?
 $50 + 34 + 13.5 = 97.5\%$

- e. Lorri ran a marathon in 2:50. She thinks this is not a good representation of her times. Would you agree? Why/why not?
Not a good representation, past 2 σ above the \bar{x} so it's an outlier time.

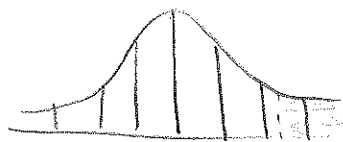
41. It is possible to score higher than 800 on either part of the SAT, but scores above 800 are reported as 800. In 1999, the scores on the math part of the SAT followed a normal distribution with mean 531 and standard deviation 115. What percent of scores were above 800 (but still reported as 800)?

$$z = \frac{800 - 531}{115} = 2.34$$

$$P(X > 800) = 1 - 0.9904 = 0.0096$$

or

$$0.96\%$$



42. Use a standard deck of playing cards to determine each of the following:

- a. $P(\text{not a 9}) = \frac{48}{52}$ or $\frac{12}{13}$ or 0.92 or 92%
- b. Odds in favor of selecting a spade 13:39 or 1:3
- c. $P(\text{selecting a heart then a 6 (with replacement)}) = \frac{13}{52} \cdot \frac{4}{52} = \frac{52}{2,704}$
- d. $P(\text{selecting a face card and then another face card (without replacement)}) = \frac{12}{52} \cdot \frac{11}{51} = \frac{132}{2652}$
- e. $P(\text{not having a 10}) = \frac{48}{52}$

43. The college Physical Education Department offered an Advanced First Aid course last semester. The scores on the comprehensive final exam were normally distributed, and the z-scores for some of the students are shown below:

Robert 1.10	Jan 1.70	Susan -2.00
Joel 0.00	John -0.80	Linda 1.60

- a. Which of these students scored above the mean?

Robert, Jan, Linda

- b. Which of these students scored at the mean?

JOEL

- c. If the mean score was $\bar{x} = 150$ with standard deviation $\sigma = 20$, what was the final exam score for each student? USE $Z = \frac{X - \bar{X}}{\sigma}$ multiply by 20 and add 150

Robert: $1.10 = \frac{X - 150}{20} \rightarrow X = 172$
 Joel: 150
 John: 134
 Linda: 182
 Jan: 184
 Susan: 110

44. The box plot below shows the ages of actresses who have received an Oscar award for their performances.

- a. At what percentile is an actress who is 28 years old?

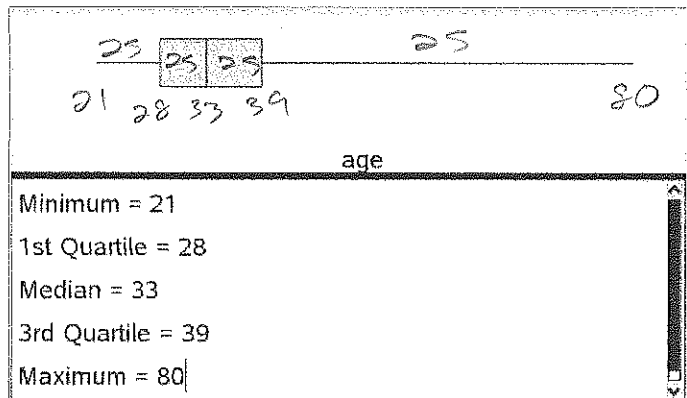
25th

- b. If an actress is at the 50th percentile ranking, what is her age?

33

- c. At what age would 75% of actresses be at that age or below?

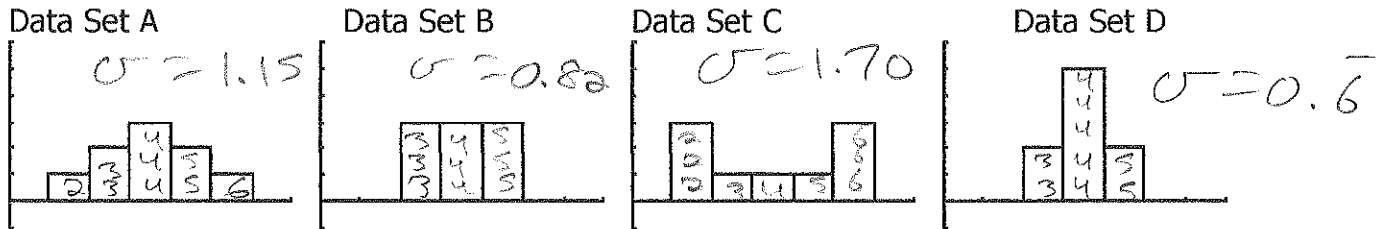
39



the

The more data in the center, smaller standard deviation.

45. Order the following from smallest to largest standard deviation:



(Please write the letters in order from smallest to largest)

D, B, A, C

46. The following data has been found when studying teenager text messages sent/received per day:

- Minimum: 0
- Lower Quartile: 305
- Median: 386
- Mean: 365
- Mode: 409
- Upper Quartile: 495
- Maximum: 600

$$IQR = 495 - 305 = 190$$

Can you conclude that there will be outliers? Show your reasoning.

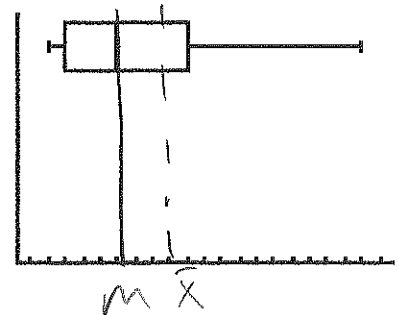
Yes, 0 is an outlier

outlier if ...
 $< 305 - (1.5 \cdot 190)$ or $> 495 + (1.5 \cdot 190)$
 < 20 or > 780

47. Use the following box plot to answer the questions below:

- a. Label the mean and median on the graph.
- b. What is the shape of the graph?

skewed right



Find the first four terms of the sequence described:

48. $a_1 = 4, r = -7$

multiply by -7

4, -28, 196, -1372

49. $a_1 = 12, d = 4$

add 4

12, 16, 20, 24

Find the sum of the given series:

50. $\sum_{k=3}^8 -2(-5)^{k-1}$ $r = -5$
Geo series 1st term = $-2(-5)^{3-1}$
= -50

$$S_6 = -50 \left(\frac{(-5)^6 - 1}{-5 - 1} \right) = \boxed{130,200}$$

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

51. $3 + 9 + 27 + \dots n = 14$
 $r = 3$, geometric

$$S_{14} = 3 \left(\frac{3^{14} - 1}{3 - 1} \right) = \boxed{7,174,453.5}$$

Find the specific term in the sequence.

52. a_{12} in the sequence of $\frac{1}{2}, 2, 8, \dots$ $r = 4$, geometric

$$a_{12} = \frac{1}{2} (4)^{12-1}$$
$$= 2,097,152$$

53. $a_1 = -7, r = 3, a_{14} = ?$

$$a_{14} = -7(3)^{14-1}$$
$$= -11,160,261$$