

Algebra II to Pre-Calculus Samples

- 1) The diameter of a circle (d) in terms of its area (A) is given by the relation

$$d \approx 1.13\sqrt{A}$$

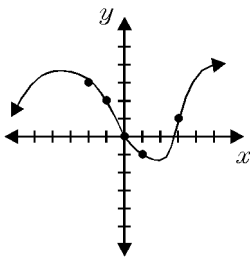
Solve this relation for A .

- 2) Given $k^7 - 25k^4 - 54k$, what are its factors? Select all that apply.

- k
 $k - 3$
 $k^3 + 2$
 $k^2 + 3k + 9$
 $k + 3$

- 3) Find the roots of $\frac{3}{(x-2)} + \frac{2}{(x+1)} = 1$ to two decimal places.

- 4) If the graph shows $y = f(x)$, what is the value of $f(1)$?



- 5) Convert to general form: $\frac{x^2}{4} + \frac{y^2}{25} = 1$
- 6) Find the center and radius, then graph the circle $(x + 2)^2 + (y - 5)^2 = 81$.
- 7) What are the lines of symmetry for an ellipse with vertices at $(-5, -7)$ and $(-1, -7)$?

- 8) A weather satellite must fit in the payload compartment of a rocket. The compartment is in the shape of an ellipse 4.8 meters long and 4.2 meters wide. If the satellite is 3.5 meters long, how wide can it be?

- 9) In May, 2000, the population of a small town was 64,748 and was increasing at a rate of 1.4% per year. In what year would the town's population reach 80,000 at the same rate of growth?

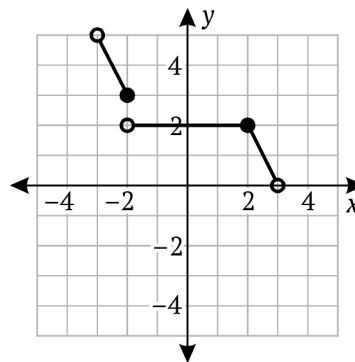
- 10) The last term (ℓ) of an arithmetic sequence is given by

$$\ell = a + (n - 1)d$$

where a is the first term, d is the difference between any two successive terms, and n is the number of terms.

Solve the formula for d .

- 11) Refer to the graph shown.

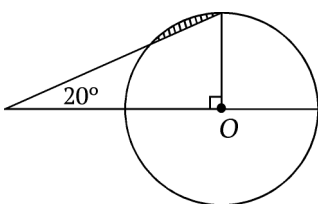


- What is $f(-1)$?
 - What is $f(2)$?
 - What is $f(3)$?
- 12) If the equation $x^2 + y^2 = 36$ is changed to $(x - 4)^2 + y^2 = 36$, what effect will this have on the graph?
- 13) If $y = -\frac{1}{3}x^2 - 2x + \frac{2}{3}$ is put in the form $y = a(x - h)^2 + k$, then what is the value of a , h , and k ?

- 14) If x and y are real numbers, what is the minimum value of y where $4x^2 + y^2 - 4x + 6y - 6 = 0$?

- 15) The transformation $(x - 5)^2 + \left(\frac{y + 3}{4}\right)^2 = 4$ takes the circle $x^2 + y^2 = 4$ and transforms it into an ellipse with a center (____, ____), and compressed ____ by a factor of ____.

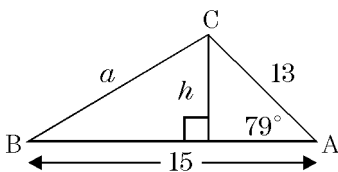
- 16) A telephone pole of radius 30 cm is planed flat on one side. If the plane angle makes a 20° angle with the horizontal, how wide is the flat part of the telephone pole to the nearest tenth of a centimeter?



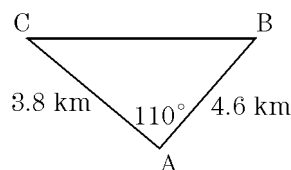
- 17) The load that a beam of fixed length can support varies jointly as its width and the square of its depth. A beam 40 cm wide and 20 cm deep can support a load of 880 kg. How much can a beam 50 cm wide and 10 cm deep support?

- 18) Given that y varies inversely as \sqrt{x} , and that $y = 16$ when $x = 3$, what is the value of y when $x = 8$?

- 19) Calculate to two decimal places the length of side BC .



- 20) The diagram represents a radar station at point A tracking ships at B and C . For an observer on ship B , calculate the angle between the lines of sight to the ship at C and the radar station to the nearest tenth of a degree.



- 21) Complete the following chart. Assume $0 \leq \theta < 2\pi$.

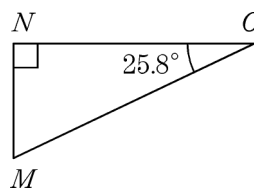
radius r	central angle θ	arc length s
3		$\frac{3\pi}{8}$
	$\frac{\pi}{4}$	2π
4	$\frac{3\pi}{4}$	
	$\frac{7\pi}{8}$	$\frac{21\pi}{4}$
1		$\frac{3\pi}{2}$

- 22) Find the linear velocity of the tip of the minute hand of a clock if the hand is 6 centimeters long.

- 23) Given the figure, use your calculator to find the following values to 4 decimal places.

$\tan \angle O$

$\sin \angle M$



- 24) Given $\triangle MNP$ with $m\angle N = 90^\circ$, $MN = 4x$, and $NP = 9x$.
- What is $\tan \angle N$?
 - Using the tangent, determine $m\angle N$ to the nearest degree.

- 25) A tree casts a 50-foot shadow when the angle of elevation of the sun is 48° . What is the height of the tree to the nearest tenth of a foot?

- 26) What is the reference angle for $(270 + \theta)^\circ$ if $0 \leq \theta < 90^\circ$?

- 27) If a first line makes a 40° angle with the x -axis, then which of the following angles will make a second line coterminal with the first line?

- -360°
- -320°
- -40°
- 320°
- 140°

- 28) What is the period for the function $y = 5 \csc 2\pi x$?

- 29) Prove: $\frac{\sin 2x}{1 - \cos 2x} = \cot x$

- 30) If the identity $\cos^2 x = 1 - \sin^2 x$ is verified graphically...
- How would the graphs of $y = \cos^2 x$ and $y = \sin^2 x$ compare?
 - How would the graphs of $y = \cos^2 x$ and $y = \sin^2 x$ compare?

- 31) A Ferris wheel has a radius of 42 m. Its center is 43 m above the ground. It rotates once every 80 s. Suppose you get on the bottom at $t = 0$. Write an equation that expresses your height as a function of elapsed time.

- 32) The Hayton basketball team's game scores were recorded on a stem-and-leaf plot.

106 99 120 87 128 125 108 94 84
124 131

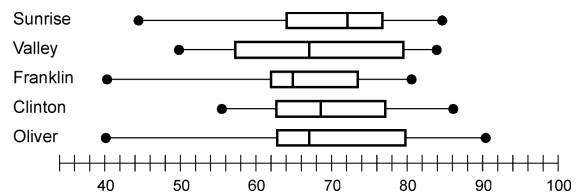
Enter the missing numbers to complete the stem-and-leaf plot.

Basketball Scores

8	4	<input type="checkbox"/>	
9	4	9	
10	6	8	
<input type="checkbox"/>			
12	0	4	<input type="checkbox"/>
<input type="checkbox"/>	1		

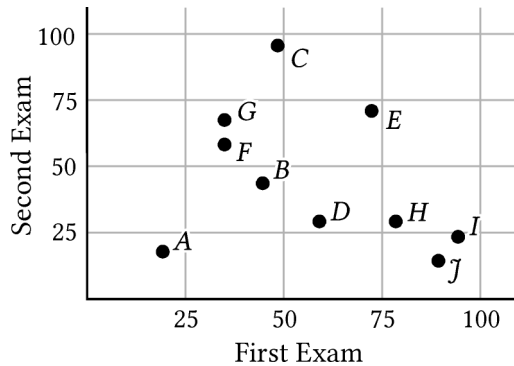
Leaves

- 33) The box-and-whisker plots show the scores of five colleges that participated in a math competition.



- Which college has the largest range?
- At which college did the bottom 50% of students have the worst test scores?

- 34) The scatterplot represents the scores of those students who took a first and second exam in the course. Which of the following statements are true? Select all that apply.



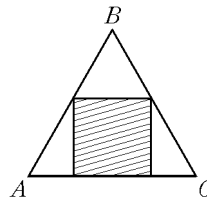
- Three students scored higher on the first exam than the second.
 - Students who did well on the first exam did poorly on the second exam.
 - Students who did well on the first exam also did well on the second exam.
 - Students results on the first exam could not be used to predict the results on the second exam.
- 35) In a particular school students take *one* of Math, Chemistry or Physics, and *one* of History or Drama. The choices are shown in the table.

	<i>Math</i>	<i>Chem.</i>	<i>Physics</i>	Totals
<i>History</i>	94	81	60	235
<i>Drama</i>	25	30	12	67
Totals	119	111	72	302

Calculate the following probabilities to 3 decimal places.

- a) A randomly selected student takes Chemistry.
- b) A randomly selected student takes Math or Physics.

- 36) A square is inscribed in an equilateral triangle as shown in the diagram. The triangle has sides of length 12 cm. If a dart randomly hits the triangle, what is the probability that it hits the shaded region?



- 37) Chuck-a-Luck is a unique dice game where the object is to tumble three dice in a cage and then wager on how they will land once the cage comes to a rest. The dice are standard six-sided cubes, with sides numbered 1 through 6. One bet that can be made is described below.

Numbers Bet. If you place your wager on any of the six numbered squares known as the numbers bet, you will win according to how many dice show the number you bet on. 3 numbers win \$3; 2 numbers win \$2; 1 number win \$1; 0 numbers lose \$1.

A player plays the numbers bet with a wager of \$1 each game. The results are shown in the following table:

game	number chosen	outcome	payout	cumulative payout
1	1	2-1-1		
2	5	1-5-5		
3	3	2-4-1		
4	4	3-4-3		
5	6	3-6-5		

Complete the table and determine the amount of money the player will win or lose.

- 38) A multiple-choice test comprises 10 questions, each with 5 possible answers. Linda guesses the answer to each question. To pass, she must get at least 5 correct answers. What is the probability that Linda does not pass this test?

39) A particular battery claims to have a mean life of 400 hours with a standard deviation of 30 hours. Approximately what percent of the batteries will last between 385 and 425 hours?

40) The standard deviation of reaction time for a certain test in adults is 0.21 seconds. 24 subjects are randomly selected and given two glasses of wine. Their new scores produced a standard deviation of 0.29. At the 0.005 significance level, is the claim that the increase in variability is significant correct? Give the decision and the sample chi-square value.

41) In a geometric progression, the first term is 256 and the common ratio is $\frac{3}{4}$. Find the 7th term.

42) What is the common ratio of the geometric sequence whose first term is 4^x and whose fourth term is 32^x ?

43) If the matrix operation is defined, what number goes in the empty square?

$$\begin{bmatrix} 3 & 4 & 4 \\ 7 & 4 & 0 \\ 1 & 6 & -6 \end{bmatrix} + \begin{bmatrix} 5 & 1 \\ -2 & 7 \\ -8 & 7 \end{bmatrix} = \begin{bmatrix} 8 & \square & 4 \\ 5 & 11 & 0 \\ -7 & 13 & -6 \end{bmatrix}$$

44) Use Cramer's rule to find the value of x ?

$$\begin{aligned} x - 3y - 4z &= 6 \\ x - 5y &= 6 \\ x + y + 3z &= 0 \end{aligned}$$

$$\text{hint: } \begin{vmatrix} 1 & -3 & -4 \\ 1 & -5 & 0 \\ 1 & 1 & 3 \end{vmatrix} = -30$$

45) Consider the following arithmetic sequence.

$$25, 19, 13, \dots$$

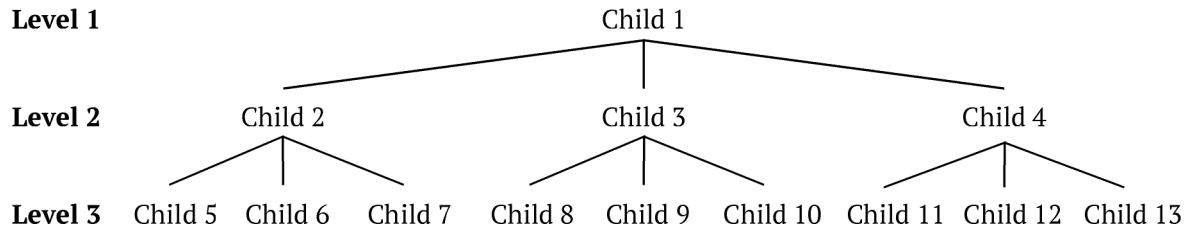
a) Determine the 7th term of this sequence.

b) If the common difference of the sequence was doubled, what would the 7th term be then?

46) The formula for finding the sum of the cubes of the first n positive integers is given by $S = \frac{n^2}{4}(n+1)^2$, where S is the sum. What is the sum of $1^3 + 2^3 + 3^3 + \dots + 19^3 + 20^3$?

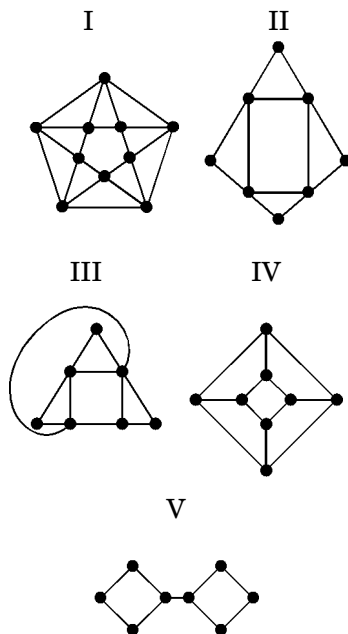
47) For doing a certain job, you are offered 1¢ the first day, 3¢ the second day, 9¢ the third day and so on. In dollars and cents, how much will you earn on the 15th day?

- 48) In a postcard sharing game, one child sends postcards to 3 other children. Those children in turn are each expected to send postcards to 3 children who have not already received postcards. At the third level, 12 children have received postcards as shown.



- a) By the seventh level, how many children have received postcards?
- b) There are about 2.2 billion children on Earth. How many levels will it take for all children on Earth to receive postcards?

- 49) Which of the following networks has 12 regions?



- 50) Regina's paycheck stub indicated the following:

Pay	Deductions
Hourly Wages: \$315	Taxes: \$ 75
Overtime: \$ 25	Insurance: \$ 6
Travel: \$ 55	

What was Regina's final pay?