TEAM MATH QUEST SCORE SHEET   *2009 Senior Preliminary*
Senior High School   *Category B: Alg II, Trig, Math Analysis or Pre-Calc*

Team Information   School:_____   Center:_____

Student Names: Grade Level: Current Math Class:

1 _____   _____   _____

2 _____   _____   _____

3 _____   _____   _____

Note: All answers must be in reduced form and include appropriate units of measurement.

#	Team Answer		#	Team Answer
1			16	
2			17	
3			18	
4			19	
5			20	
6			21	
7			22	
8			23	
9			24	
10			25	
11			26	
12			27	
13			28	
14			29	
15			30	

For Judge's Use Only

_____   **x 4 =**   _____
 # correct answers

minus

_____   **x 1 =**   _____
 # incorrect answers
(do not include non-responses)

_____   **SCORE**

Solve using two variables.

1. The sum of the digits of a two-digit number is 13. The tens digit is 2 less than twice the ones digit. What is the number?

2. What is the quotient for $(t^4 + 5t^3 - 2t^2 + 10t - 8) \div (t^2 + 2)$?

3. Simplify: $\dfrac{\left(\frac{1}{10}\right)\left(10^{-1}\right)}{(10)\left(\frac{1}{10^{-1}}\right)}$
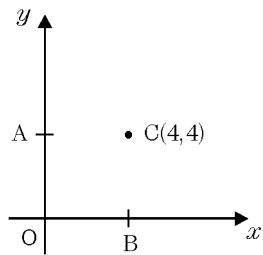
Solve by completing the square.

4. $a^2 - 9a = 36$

5. What is the equation of the circle that has **AB** as its diameter and points $\mathbf{A}(0,4)$, $\mathbf{B}(4,0)$, and $\mathbf{C}(4,4)$?

6. In how many ways can 7 different colors be arranged in a row if the first is always red, the last is always blue, and the middle one is always green?

7. In an arithmetic series, $a_1 = -12$ and $a_{14} = 54$. Find the sum of the first 14 terms.

8. Evaluate: $\log_9 \dfrac{1}{\sqrt{27}}$

9. A rectangle has an area of 180 square centimeters, and it is eight centimeters longer than it is wide. What are the dimensions of the rectangle?
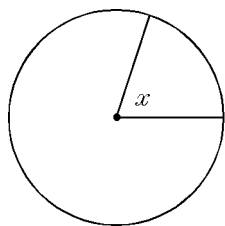
10. How many different five-letter arrangements can be made from the letters in the word "PLUTO"?

11. The area of a sector of a circle of diameter $16\,\text{mm}$ is $19.2\,\text{mm}^2$. Find the central angle in radians (x in the diagram).

12. Given $x = 4$, find the area of this isosceles triangle.
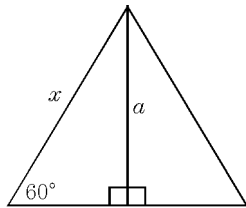
13. Simplify: $\sin^2 \theta + \sec^2 \theta + \tan^2 \theta + \cos^2 \theta$

14. $4\sin 45^\circ + 3\cos 315^\circ$

Write the equation of the graph as a sine function.

15.
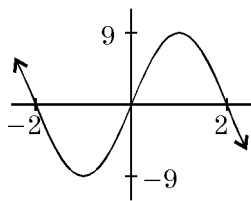
16. Given the plane's height h is 3200 ft, what is the distance d to the nearest foot from the plane to the control tower?
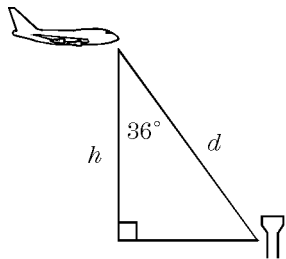
17. Use the half angle formula for the sine function to express $\sin^2 2x$ as a trigonometric function to the first power.

Simplify.

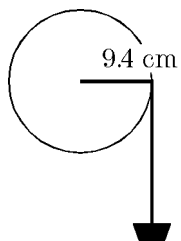18. $-5(3 + 7i)^2 - 2(7 - i)^2$

19. Two planes leave the airport at noon, one traveling east at $300\,\text{km/h}$ and the other traveling northwest at $45\,\text{km/h}$. How far apart are they at 2 pm?

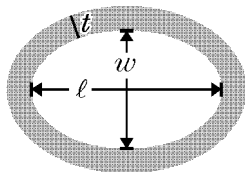20. How many centimeters will the weight in the figure rise if the pulley is rotated through an angle of 325.75°?

9.4 cm

21. Find the vertex and focus of the parabola $x^2 - 6x - 8y + 1 = 0$.

22. Find the equation of the ellipse of the outer border of a track around a field that is described by the equation $\dfrac{x^2}{2500} + \dfrac{y^2}{400} = 1$. The track is 5 meters wide.

23. Solve: $\dfrac{2x}{3} - \dfrac{4}{x} = \dfrac{5}{3}$

24. Find the asymptotes of $y = \dfrac{5x - 14}{x^2 - 4x}$.

25. If a dart thrown randomly hits the square target with perimeter 60 inches diagramed, the probability that it will stick in the square region with sides t inches long is $0.5\overline{3}$. What is the value of t?
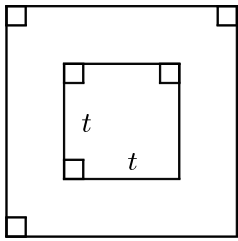
26. State the number of roots of the equation $2x^5 - ix^2 + ix - 3 = 0$.

27. Suppose that you drop a ball from a window 25 metres above the ground. The ball bounces to 50% of its previous height with each bounce. If the ball continues to bounce in this manner how far will it have traveled, up and down, from the time it was dropped from the window?

28. Let $f(x) = 4x - 12$ and $g(x) = x^2 - 9$. Find $\left(\dfrac{f}{g}\right)(x)$.

29. Solve $4\sin^2\theta - 1 = 0$ for $0 \le \theta < 180°$.

30. Find p and q so that $(p-q) + (p+q)i = 1 + 5i$.