



Louisiana Mu Alpha Theta

affiliated with
Mu Alpha Theta
National High School and Junior College
Honorary Mathematics Club

50th State Convention March 25-27, 2010 Baton Rouge, Louisiana

Individual - Theta

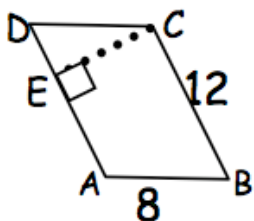
TEST RULES

1. Do not begin test until you are told to do so.
2. You must supply your own #2 pencil.
3. Only ACT approved calculators are allowed on all tests.
4. Print your name, school, and your code on your answer sheet.
5. In case of a tie, winners will be determined according to the order in which the answer sheet was turned into the moderator.
6. Do all scratch work on your test.

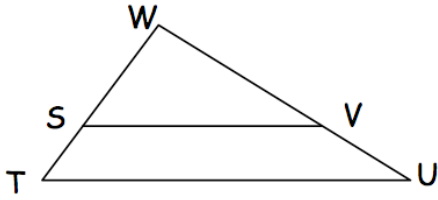
LOUISIANA MU ALPHA THETA STATE CONVENTION
THETA INDIVIDUAL TEST 2010

1. Find x if $7^{\frac{1}{3}}6^{\frac{2}{3}}5 = x^{\frac{1}{3}}$.
2. If $f(x) = 5x - 3 - 4|2 - 3x|$, find $f(1001) - f(1000)$.
3. If Larry and Moe together weigh 380 pounds, Moe and Curly together weigh 350 pounds, and Larry and Curly together weigh 400 pounds, how much do all three men weigh together?
4. Find the length of the major axis of an ellipse with a minor axis endpoint at $(8,9)$ and foci located at $(4,6)$ and $(12,6)$.
5. Solve for a : $\log(a^2 - 15a) = 2$
6. Simplify: $(3 - i)^3$
7. Suppose y varies jointly as x and z and inversely as the square root of u . If $y = 6$ when $x = 2$, $z = 3$, and $u = 16$, find y when $x = 4$, $z = 3$, and $u = 64$.

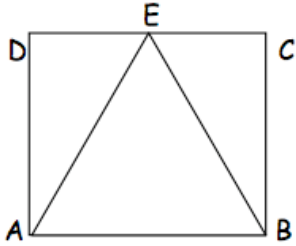
8. Given $f(x) = x^2 - 8x + k$. If the minimum value of $f(x)$ is -12 , find k .
9. Solve: $\left(\frac{1}{x} - 2\right)^2 - 6\left(\frac{1}{x} - 2\right) + 5 = 0$
10. Find the midpoint of the line segment joining the point $(6, 3)$ and the point on the line $y = 2x + 1$ to which it is closest.
11. Chord \overline{AB} is a distance of 14 units from the center of circle R . If the radius of R is 16 units, what is the length of \overline{AB} ?
12. A rhombus has diagonals with lengths $2x$ and $2x + 2$. If its perimeter is $4x + 36$, find x .
13. In rectangle $RSTU$, \overline{RT} and \overline{SU} intersect at point E . If $RE = 3x - 10$, $ES = x + 6$ and $TE = 2x - 2$, then find length RT
14. Parallelogram $ABCD$ has altitude \overline{CE} drawn from point C to \overline{DA} . If $CE = 6$, then what is the area of parallelogram $ABCD$?



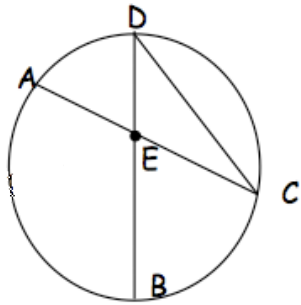
15. In triangle WTU , \overline{SV} is drawn parallel to \overline{TU} as shown. $SV = 10$, $ST = 3$, $TU = 14$. Find length SW .



16. An equilateral triangle ABE shares a side with rectangle $ABCD$ as shown, and E is on side \overline{CD} . If $AB = 10$, then find the perimeter of the rectangle.



17. In circle R , chords \overline{DC} , \overline{AC} , and \overline{BD} are drawn, with the latter two intersecting at point E . If $m\angle CB = 80^\circ$, $m\angle AB = 120^\circ$ and $m\angle CD = 100^\circ$ then find $m\angle AED$.



18. In triangle ABC , C is a right angle, and $m\angle A = 30^\circ$. If the perimeter of ABC is $24\sqrt{3} + 72$, find the area of ABC .

19. Quadrilateral $ABCD$ is inscribed in circle P . If $m\angle A = 20^\circ$, $m\angle B = 2x - 12$ and $m\angle C = 4x - 32$, find x .

20. A regular polygon has one interior angle which measures 108° more than one exterior angle. If the polygon has N sides, what is the value of $N^2 - N$?