



Louisiana Mu Alpha Theta

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

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Alpha - Trigonometry

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 and school in the name blank, your code in the date blank, and the area test in the subject blank on your Scantron answer sheet
5. Standard procedure for machine graded papers must be followed. Use only a #2 pencil, marking the appropriate spaces carefully.
6. In case of a tie, winners will be determined according to the order in which the answer sheet was turned into the moderator.
7. Do all scratch work on your test.

Mu Alpha Theta 2010
Trigonometry – Area Test

(NOTA stands for “none of the above”)

1. Which of the following angles are coterminal?
i) $3,900^\circ$
ii) $-9,000^\circ$
iii) 30°
iv) 1530°

A. i and iii only B. i, ii, and iii only C. iii and iv only
D. i and ii only E. all are coterminal
2. $(\sec 60^\circ) \cdot (\tan 300^\circ) \cdot (\cos 300^\circ) \cdot (\sin 30^\circ) =$
A. $\frac{\sqrt{3}}{3}$ B. $\frac{1}{2}$ C. $\frac{\sqrt{3}}{2}$ D. 2 E. NOTA
3. Which of the following is not a Pythagorean triplet?
A. 11, 60, 61 B. 28, 45, 53 C. 33, 56, 65 D. 49, 81, 99 E. NOTA
4. If $\sin A = \frac{2x}{3}$, $x > 0$, and $\tan A < 0$, what is $\sec A$ equal to?
A. $\frac{3}{2x}$ B. $\frac{3}{\sqrt{9-4x^2}}$ C. $\frac{-2x}{\sqrt{9-4x^2}}$ D. $\frac{-3}{\sqrt{9-4x^2}}$ E. NOTA
5. If $\cos 64^\circ 20' = 0.4331$ and $\cos 64^\circ 30' = 0.4305$, what is $\cos 64^\circ 26'$ equal to?
A. 0.4320 B. 0.4318 C. 0.4315 D. 0.4312 E. NOTA
6. $(2r \sin \theta \cos \theta)^2 + r^2 (\cos^2 \theta - \sin^2 \theta)^2 =$
A. $5r^2$ B. r^2 C. $r^2 \sin \theta$ D. $r^2 \cos^2 2\theta$ E. NOTA
7. In $\triangle ABC$ $a = 12$, $b = 7$, and $\angle C = 45^\circ$. What is the area of $\triangle ABC$?
A. 21 B. $21\sqrt{2}$ C. $42\sqrt{2}$ D. $21\sqrt{3}$ E. NOTA
8. $\text{Arctan } x + \text{arccot } x =$
A. π B. x C. $\frac{\pi}{2}$ D. not enough info E. NOTA

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9. $\sin\left(\text{Arc tan}\frac{4}{3} + \text{Arc cot}\frac{3}{4}\right) =$
 A. 1 B. $\frac{24}{25}$ C. $\frac{7}{25}$ D. $\frac{12}{13}$ E. NOTA
10. What is the sum of the solutions of $\sin x + \cos x = 1$ on $[0, 2\pi)$?
 A. $\frac{\pi}{2}$ B. π C. $\frac{3\pi}{4}$ D. 2π E. NOTA
11. Solve for x in the equation $\text{Arc cos } 2x = \text{Arc sin } x$
 A. $\frac{\sqrt{3}}{4}$ B. $\frac{\sqrt{3}}{3}$ C. $\frac{1}{4}$ D. $\frac{\sqrt{5}}{5}$ E. NOTA
12. $(1 - \cos x)(\csc x + \cot x) =$
 A. $\sin x$ B. $\csc x$ C. 1 D. $\cos x$ E. NOTA
13. Find the sum of the fifth roots of 32. ($i = \sqrt{-1}$)
 A. 0 B. $5 + 5\sqrt{3}$ C. $5 + 5\sqrt{3}i$ D. $32i$ E. NOTA
14. $\sin 55^\circ + \sin 35^\circ =$
 A. $\sqrt{2} \cos 10^\circ$ B. $\sqrt{2} \cos 80^\circ$ C. $\sin 110^\circ$ D. $\cos 10^\circ$ E. NOTA
15. What does $\cos 3\theta$ equal to in terms of $\cos \theta$?
 A. $3\cos^2 \theta - 2$ B. $\frac{6\cos^2 \theta - 4}{2}$ C. $3\cos^3 \theta + \cos^2 \theta + 1$
 D. $4\cos^3 \theta - 3\cos \theta$ E. NOTA
16. In any triangle, $a \cos B + b \cos A$ is equivalent to _____?
 A. $2b \cos A$ B. $a + b$ C. c D. $s - c$ E. NOTA
17. If $a=3$, $b = 4$, and $\angle c = 60^\circ$, what is the length of side c ?
 A. 13 B. $\sqrt{25 - 12\sqrt{3}}$ C. $6\sqrt{3}$ D. $\frac{2\sqrt{3}}{3}$ E. NOTA
18. Tom Morris is a very busy man. One day 3 mathletes come up to him simultaneously and begin to pull him in different directions. One pulls him at a 60° angle with a force of 6N (Newtons), a second pulls him with a force of 9N at a 180° angle, and the third mathlete pulls him at a 300° with a force of 16 N. Tom wants to sleep. What is the magnitude of the force (in Newtons) that Tom must put up to stay still and go to sleep?
 A. $\sqrt{373}$ B. $\sqrt{79}$ C. $\sqrt{227}$ D. 31 E. NOTA

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19. $\sin(150^\circ + 45^\circ) =$
 A. $\frac{\sqrt{6} + \sqrt{2}}{4}$ B. $\frac{\sqrt{6} - \sqrt{2}}{4}$ C. $\frac{-\sqrt{6} + \sqrt{2}}{4}$ D. $\frac{-\sqrt{6} - \sqrt{2}}{4}$ E. NOTA
20. As Amy rides a ferris wheel, her distance from the ground varies sinusoidally with time. Amy starts slightly past the bottom and it takes her 4 seconds to reach the top which is 45 feet above the ground. If the diameter of the wheel is 40 feet and she makes a revolution every 10 seconds, which of the following represents an equation of Amy's exact position above the ground, h , in terms of time (in seconds), t ?
 A. $h = 40 \cos \frac{\pi}{5} t$ B. $h = -20 \cos \frac{\pi}{5} t + 25$ C. $h = 25 \cos \frac{5}{\pi} (t + 4) + 20$
 D. $h = 20 \cos \frac{\pi}{5} (t - 4) + 25$ E. NOTA
21. What is the linear speed of a point on the outside of a wheel with radius 6 and angular velocity 3π radians per second?
 A. 9π B. 18π C. 54π D. 108π E. NOTA
22. How many points of intersection are there between the graphs of $r = 4 - 5 \sin \theta$ and $r = 3 \sin \theta$?
 A. 0 B. 1 C. 2 D. 3 E. NOTA
23. If $\sin x > \cos x$, which of the following must be true:
 i) $\tan x$ is always positive
 ii) $\sin 2x$ is never negative
 iii) $\cos 2x$ is always negative
 A. i only B. iii only C. i and iii only D. ii and iii only E. NOTA
24. What is the period of the function: $y = \sin \frac{2}{3} x + \cos \frac{7}{8} x$
 A. 2π B. 3π C. $\frac{16\pi}{7}$ D. 12π E. NOTA
25. In a given triangle $\sin A : \sin B : \sin C = 4 : 5 : 6$ and $\cos A : \cos B : \cos C = x : y : 2$. What is the sum of x and y ?
 A. 18 B. 19 C. 20 D. 21 E. NOTA