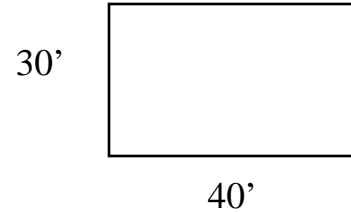


2000 Varsity Ciphering

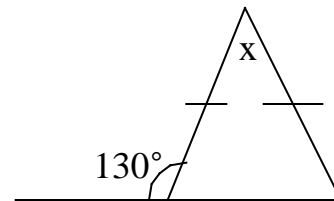
Round 1

1. An empty lot is 30 feet by 40 feet. How many feet would you save by walking diagonally across the lot instead of walking the length and width?



2. Let \diamond be defined as $\diamond(a, b) = \sqrt{a^2 + b^2}$ for all reals a and b . Find $\diamond(12, \diamond(3, 4))$.
3. Determine a value of k so that $(x + 2)$ is a factor of $x^3 - kx + 6$.
4. Evaluate $20\cos\frac{\pi}{3}$.

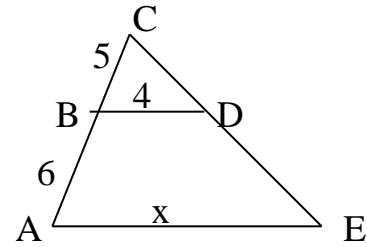
5. In the adjacent picture the triangle is an isoscles triangle, find the measure of the vertex angle x .



6. East High's basketball team has 10 players. How many teams of 5 players can be made if each player can play any position?
7. If the square root of the square root of a number is 2, what is the number?
8. For x such that $0 < x < 2\pi$, list the values of x for which $y = \sec x$ is undefined.

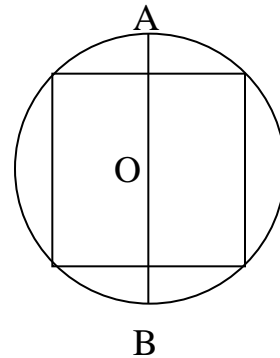
Round 2

1. In the adjacent picture AE is parallel to BD, find the measure of AE. Express your answer as a reduced fraction.



2. There are 4 aces in a ordinary deck of 52 cards. What is the probability of choosing an ace out of an ordinary deck of cards? Express your answer as a fraction in lowest terms.
3. Find a polynomial in the form $x^2 + bx + c$ with zeros of -4 and 9 .
4. For $0^\circ < \theta < 360^\circ$, list all values of θ that would ensure $a^2 = b^2 + c^2 - 2bccos \theta$ is equivalent to $a^2 = b^2 + c^2$.

5. The square is inscribed in a circle with center O. The area of the square is 100 square units. Find the length of the diameter AB. Express your answer as a simplified radical.



6. Express $0.\overline{12}$ as a common fraction in lowest terms.
7. Write $\frac{1-3i}{1+i}$ in $a + bi$ form.
8. Solve $\sin^2 3x - 9 = 0$ for $0 \leq x < 2\pi$.

2000 Varsity Ciphering Answers

Round 1

1. 20 or 20 feet
2. 13
3. 1
4. 10
5. 80 or 80°
6. 252
7. 16
8. $\frac{1}{2}$ and $\frac{3}{2}$

Round 2

1. $\frac{44}{5}$
2. $\frac{1}{13}$
3. $x^2 - 5x - 36$
4. 90° and 270° or 90 and 270
5. $10\sqrt{2}$
6. $\frac{4}{33}$
7. $-1 - 2i$
8. no solution or