

FALL 2014 McNABB GDCTM CONTEST
ALGEBRA TWO

NO Calculators Allowed

1. Fiji apples cost \$4.68 for a half-dozen and 90 cents a piece. Gala apples cost \$5.39 for a half-dozen and 97 cents a piece. If Sarah buys 8 Fiji apples and 9 Gala apples with a \$20 bill, how much change should she receive?

2. Forty-one erasers are distributed to n students. If at least one student always receives at least 6 erasers no matter how the erasers are distributed, what is the largest possible value of n ?

3. Simplify

$$x - y - (3x - 4y) - (x - y - (3x - 4y))$$

4. The area of a rectangle is 864. The sum of the length and width is 60. By how much does the length exceed the width?

5. A regular hexagon is inscribed in a circle of radius one while another regular hexagon is circumscribed about this circle. What is the area of the region enclosed by the two hexagons?

6. How many arrangements of the letters in GDCTM do not have any 3 consecutive letters in alphabetical order? So, for instance, you would count DGCTM but you would not count DGCMT.

7. Solve the system

$$\begin{cases} \frac{x}{6} + \frac{4}{y} = 2 \\ \frac{18}{x} + \frac{y}{2} = 5 \end{cases}$$

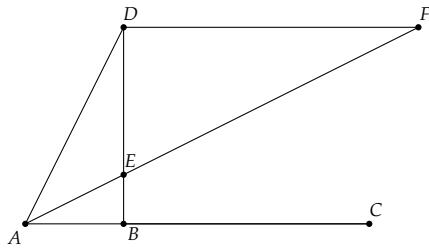
8. Solve:

$$|x - 3|x - 4|| = |7 + 2x|$$

9. Simplify $\left(\sqrt{6}^{\sqrt{12}}\right)^{\sqrt{3}}$.

10. What is the first time after 1pm that the minute and hour hand of a clock will overlap?
Answer to the nearest second and express your answer in hours:minutes:seconds format.

11. In the diagram, segment DB is perpendicular to both DF and AC , and $A - E - F$ are collinear. In addition, $EF = 2AD$. If $\angle FAC$ measures 17° find the angle measure in degrees of $\angle DAB$.



12. The line $y = mx$ intersects the lines $x + y = 7$ and $x + y = -14$ at points A and B respectively. If $AB = 39$, what is a possible value for the slope m ?
13. Find the value of
- $$\sum_{k=1}^{100} i^{k(k+1)/2}$$
- Here, i stands for the square root of negative one.
14. Find the sum of the real roots of the polynomial $x^4 - 16x^2 - 40x - 25$.
15. A regular six-pointed star, composed of two intersecting equilateral triangles each of side length $6\sqrt{3}$, is inscribed in a circle. Six congruent smaller circles are internally tangent to this circle and externally tangent to the star. Find the radius of the small circles.

