2015 Grade 9 MTAP Math Challenge – Division Orals

15-second question (2 points each)

1.) Determine all positive number x that satisfy $5x^2 = 10x$.
Answer: x = 2

2.) What is the fourth power of $\sqrt{2 + \sqrt{2}}$?
Answer: $6 + 4\sqrt{2}$

3.) Simplify $4^{\frac{-k}{2}} + 8^{-\frac{k-1}{3}}$
Answer: $\frac{3^k}{2}$

4.) If a ♠ b = $\sqrt{a^2 + b^2}$, what is the value of (3 ♠ 4) ♠ 12?
Answer: 13

5.) Suppose that x, y and z are positive integers such that $xy = 6$, $xz = 10$ and $yz = 15$. What is the value of xyz?
Answer: 30

6.) The yearly changes in population of a certain town for two consecutive years are 20% increase on the first year and 20% decrease on the second year. What is the net change in percent over the two year period?
Answer: 4% decrease

7.) What is the slope of the line parallel to $2x + 5y + 2 = 0$.
Answer: -2/5

8.) The area of a triangle is 100 sq. cm. What will be its area if its altitude is increased by 10% and its base is decreased by 10%?
Answer: 99 sq. cm.

9.) The sum of two numbers is 2015. If 9 is added to each of the numbers and then each of the resulting numbers is doubled, what is the sum of the final two numbers?
Answer: 4066

10.) A square and a triangle have the same perimeter. If the square has area 144 sq. cm., what is the area of the triangle?
Answer: $64\sqrt{3}$ sq cm.

11.) Let r and s be the solutions of $x^2 - 3x + 1 = 0$. What is the value of $(r+1)(s+1)$?
Answer: 5

30-second question (3 points each)

1.) If $f(x) = x^2 = x + 1$, find the sum of all numbers y that satisfies $f(2y) = 2$.
Answer: 1/2

2.) A man walks 1 km east then 1 km northwest. How far is he from his starting point?
Answer: 2-√2 km

3.) Four men working for four days can paint 4 cars. How many cars can 6 men working for 6 days paint?
Answer: 9 cars

4.) The longer base of a trapezoid measures 10 cm and the line segment joining the midpoint of the diagonals measures 3 cm. What is the length of the shorter base?
Answer: 4 cm

5.) What is the least possible value of $x^2 + 3x + 2\ if\ x^2 - 3x - 2 \le 0$?
Answer: 6, -1/4

6.) The point D is the midpoint of the side BC of equilateral triangle ABC and E is the midpoint of AD. How long is BE if a side of ΔABC measures 8 cm?
Answer: 2√7 cm

1-minute question (5 points each)

1.) If the roots of $x^2 + nx + m = 0$ are twice those $x^2 + mx + 1 = 0$, what is the value of n?
Answer: 8

2.) The lengths of the sides of a triangle are 10, 17 and 21 cm. How long is the altitude of the triangle to longest side?
Answer: $\frac{4\sqrt{70}}{5}$

3.) Triangle ABC is isosceles. If ∠A = 50°, what are the possible measures of ∠B?
Answer: 50°, 80°

4.) The medians AD and BE of ΔABC are perpendicular. Find the length of AB if BC = 3 cm and AC = 4 cm.
Answer: √5 cm

5.) The product of three consecutive positive integers is 16 times their sum. What is the sum of the three numbers?
Answer: 21

6.) Point E is on the side AC of ΔABC and points D and F are chosen on the side AB such that DE || BC and EF || CD. Find the length of BD if AF = FD = 3 cm.
Answer: 6 cm

Clincher Question
1.) In ΔABC, ∠C = 30°. If D is the foot of the altitude from A to BC and E is the midpoint of AC, find the measure of ∠EDC.
Answer: 30°

2.) One candle will burn completely at a uniform rate in 4 hours while another in 3 hours. At what time should the two candles be simultaneously lighted so that one will be half the length of the other at 6:00 PM?
Answer: 3:36 PM

3.) Points P and Q are drawn on the sides BC and AC of triangle ABC such that ∠AQB and ∠APB measures 110° and 80° respectively. If point R is chosen inside ΔABC such that AR and BR bisects ∠CAP and ∠CAQ respectively, what is the measure if ∠ARB?
Answer: 95°

Do or Die Question

Point E is the midpoint of the side BC of ΔABC and F is the midpoint of AE. The line thru BF intersects AC at D. Find the area of ΔAFD if the area of the triangle is 48 cm^2.
Answer: 4 cm^2