DIRECTIONS: Please write your answers on the **Individual Answer Sheet** provided. This part of the contest is 45 minutes. Each correct answer to questions 1-4 is worth 1 point, to questions 5-8 is worth 2 points and to questions 9-11 is worth 3 points. Calculators **MAY NOT** be used

Part A (1-4)

1. If the convex area bounded by the x-axis, the line $y = mx + 4$, $x=1$ and $x=4$ equals 7, then what is m?

    Ans: $m = -2/3$

2. If $f(x) = ax^7 + bx^3 + cx\text{-}5$ and $f(-7) = 7$ then $f(7) = ?$

    Ans: -17

3. Three points determine a triangle. They are $(2,1,7)$ $(9,3,6)$ and $(1,1,2)$. What is the area of it?

    Ans: $5\sqrt{14}$

4. Consider the points $(7, 1, 5)$, $(9,3,2)$ and $(13, m, -4)$. Determine m so they are colinear.

    Ans: $m=7$

Part B (5-8)

5. What is the remainder when $x^3 - 2$ is divided by $x^2 - 2$?

    Ans: $2x - 2$

6. A vertical line divides the triangle whose vertices are $(0,0)$ $(1,1)$ and $(0,1)$ into two regions of equal area. What is its equation?

    Ans: $x = 1 - \frac{\sqrt{2}}{2}$

7. If the length of the diagonal of a cube is a, then what is the surface area of the cube?

    Ans: $2a^2$

8. Determine $z = \sum_{k=0}^{10} c(10, k)$ where $c(n, k)$ is the number of ways to choose k from n.

Ans: $z = 1024$

Part C (9-11)

9. If $\dfrac{\log a}{p} = \dfrac{\log b}{q} = \dfrac{\log c}{r} = \log x$ all logs to the same base, $x \neq 1$ and further, if
$$\frac{b^2}{ac} = x^y$$
then what is y?

Ans: 2 *q-p-r*

10. What is the sum of the squares of all real numbers satisfying
$$x^{256} - 256^{32} = 0$$

Ans: 8

11. Consider a parabola with focus at $(0,2)$ and directrix $y = -2$. What is an equation for the tangent line to it at the point where $x = +4$?

Ans: $y = x - 2$