

**MASSACHUSETTS MATHEMATICS LEAGUE
CONTEST 3 - DECEMBER 2010 ANSWERS**

Round 1 Trig: Right Triangles, Laws of Sine and Cosine

- A) 13 B) 31 C) $\frac{\sqrt{2}}{2}$

Round 2 Arithmetic/Elementary Number Theory

- A) 37 B) $23333_{(4)}$ C) 918

Round 3 Coordinate Geometry of Lines and Circles

- A) $\frac{2}{5}$ (or 0.4) B) $2\sqrt{10}$ C) $5(\sqrt{2}-1), 13(\sqrt{2}-1)$
or equivalent (Both answers required)

Round 4 Alg 2: Log and Exponential Functions

- A) $30\sqrt{6}$ B) 16 C) $0, \log_{10} 5$
[$\log 5$ is also acceptable]

Round 5 Alg 1: Ratio, Proportion or Variation

- A) 2010 B) Ben: \$22,500
Joe: \$12,500 C) (63, 24)

Round 6 Plane Geometry: Polygons (no areas)

- A) 20 B) 48° C) 14 : 15

Team Round

- A) 8 D) $\log_5 \left(y + \sqrt{y^2 + 1} \right)$
[$\log_5 \left(y - \sqrt{y^2 + 1} \right) < 0$ is extraneous]
- B) CADB E) (15, 32, 53)
- C) (12, 7), (-3.5, -8.5) F) (70, 49)