MASSACHUSETTS MATHEMATICS LEAGUE
DECEMBER 2003
ROUND 5: RATIO & PROPORTION

ANSWERS

A) $4200

B) 3/4

C) 8

A) Mr. Allen and Mr. Baker were business partners, their profits being divided in the ratio of 4 to 5 respectively. Mr. Currier and Mrs. Dodge were also in business, their profits divided in the ratio of 4 to 7 respectively When the two businesses merged, the first two put in $9 for every $11 put in by the second two. When the new business had a gain of $12.000. how much should Mrs. Dodge get?

A's share $= \frac{4}{9}$, B's $= \frac{5}{9}$

C's $= \frac{4}{11}$, D's $= \frac{7}{11}$

In the new business A+B's share is $\frac{9}{20}$, C+D's $= \frac{11}{20}$

mrs Dodge should get $\frac{7}{11} \cdot \frac{11}{20} \cdot 12000 = 7(600) = \$4200$

B) If the ratio of a to b is 4 to 9, the ratio of b to c is 12 to 7, and the ratio of a to d is 4 to 7; calculate the ratio of c to d as a reduced fraction.

$$\frac{\frac{a}{d}}{\frac{b}{c}} = \frac{\frac{4}{7}}{\frac{12}{7}} = \frac{1}{3} = \frac{a}{d} \cdot \frac{c}{b} = \frac{c}{d} \cdot \frac{a}{b}, \text{ so } \frac{c}{d} \cdot \frac{4}{9} = \frac{1}{3}$$

$$\frac{c}{d} = \frac{1}{3} \cdot \frac{9}{4} = \frac{3}{4}$$

C) The height of a cylindrical tank varies directly as the volume and inversely as the square of the radius. If the height is 24, the volume is 7536, and the radius is 10; find the height when the volume is 628 and the radius is 5.

$$\frac{hr^2}{V} \qquad \frac{25h}{628} = \frac{100 \cdot 24}{7536}, \quad h = \frac{\cancel{100} \cdot 24 \cdot \cancel{628}}{\cancel{25} \cdot \cancel{7536}} = 4 \cdot 2 = 8$$

(4 over 1; 1 over 12)