

DUSO Mathematics League 2011 - 2012

Contest #2.

Calculators are not permitted on this contest.

Part I.

ALGEBRA I

Time Limit: 8 minutes

The word "compute" calls for an exact answer in simplest form.

2 - 1. The denominator of a fraction is positive, and is 1 more than the numerator. If the numerator and the denominator are both increased by 2, the resulting fraction is $\frac{1}{40}$ more than the original fraction. Compute the fraction.

2 - 2. If a , b , and c are such that $\frac{a}{b+4} = \frac{b}{c+6} = \frac{c}{a+8} = 2$, compute $a + b + c$.

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Part II.

GEOMETRY

Time Limit: 10 minutes

The word "compute" calls for an exact answer in simplest form.

2 - 3. Two sides of a triangle measure 20 and 11. Compute the number of different integers that could be the measure of the third side of the triangle.

2 - 4. In right $\triangle ABC$ with right angle C , $AC = 6$ and $BC = 8$. Let D be on \overline{BC} and M be on \overline{AB} such that \overline{DM} is the perpendicular bisector of \overline{AB} . Compute the area of $\triangle DMB$.

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Part III.

ALGEBRA II / ADVANCED TOPICS

Time Limit: 12 minutes

The word "compute" calls for an exact answer in simplest form.

2 - 5. Compute all two-digit numbers that are three times the sum of their digits.

2 - 6. The area of obtuse $\triangle BEN$ is $10\sqrt{3}$. The two sides that form the obtuse angle measure 5 and 7. Compute the third side.

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TEAM ROUND

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T-1. Ryan, Sam, and Tyler are playing a 3-player game. In each round, the winner gets 12 points, the second-place player gets 5 points, and the third-place player gets 0 points. After ten rounds of play, Ryan has 75 points and Sam has 34 points. Compute the number of times Tyler finished second.

T-2. If two of the roots of $x^6 - 5x^5 - 34x^4 + 242x^3 - 572x^2 + 1048x - 1680 = 0$ are $2i$ and $3 + i$, compute the real roots.

T-3. At Springfield High School, there are 224 seniors. Some own only a car, some own only a bike, and some own a car and a bike. Every senior owns at least a car or a bike. The ratio of the number of students who own only a car to the number of students who own only a bike is 3 : 7. The ratio of the number of students who own a car to the number of students who own a bike is 7 : 11. If a senior is chosen at random, compute the probability that the student owns a car and a bike.