

SOUTHEASTERN MASSACHUSETTS CONFERENCE MATH LEAGUE

Meet 2 - November 28, 2007

Round 2: Algebra 1 - Linear Inequalities

All answers must be in simplest exact form

1. Find the solution set for x : $3x + 10 \geq 10x + 3$

2. Find the smallest integer that does NOT satisfy the following inequality:

$$-37x - 32 \geq -3x + 95$$

3. In the following conjunction b is a positive constant. Find the solution set for t : $3t + b > 3(b + t) - 2t$ and $7t - b < 13b$

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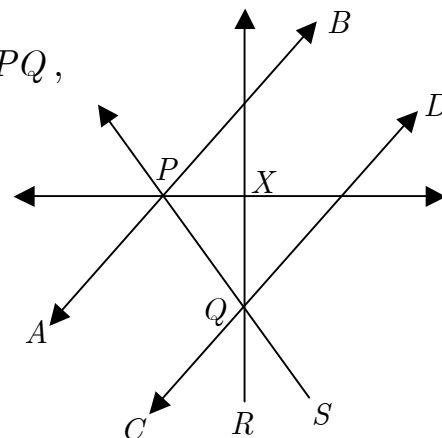
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Round 3: Geometry – Parallel Lines

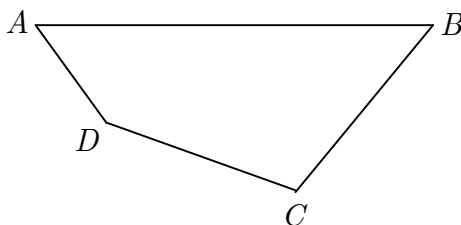
All answers must be in simplest exact form

The diagrams are not drawn to scale

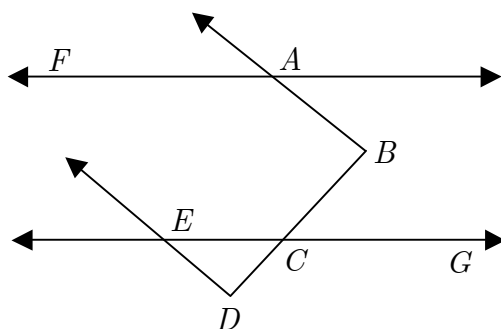
1. In the diagram to the right, $\overrightarrow{AB} \parallel \overrightarrow{CD}$, \overrightarrow{PX} bisects $\angle BPQ$, \overrightarrow{QX} bisects $\angle PQD$, and $\angle RQS = 18^\circ$. Find $\angle QPX$ in degrees.



2. Use the diagram below, where quadrilateral $ABCD$ has $\angle B = 72^\circ$ and $\angle D = 130^\circ$. The angle bisector of $\angle A$ intersects the line through C parallel to \overline{AB} at point F . If quadrilateral $ADCF$ is a trapezoid, find the measure of $\angle BCD$ in degrees.



3. In the diagram below, $\overrightarrow{FA} \parallel \overrightarrow{EG}$, $\overrightarrow{AB} \parallel \overrightarrow{ED}$, $\angle FAB = (3x + 20)^\circ$, $\angle ABC = (2x)^\circ$, and $\angle BCG = 45^\circ$. Find $\angle DEC$ in degrees.



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Round 4: Algebra 2 – Quadratic Equations & Inequalities

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1. Find the solution set of $x^2 - 3x < 2x$.

2. If one root of $x^2 - 2x + n = 0$ is the square of the second root, find all possible values of n .

3. Suppose that the functions $f(x)$ and $g(x)$ satisfy the system of equations

$$f(x) + 3g(x) = x^2 + x + 6$$

$$2f(x) + 4g(x) = 2x^2 + 4$$

for all x . Determine all possible values of x for which $f(x) = g(x)$.

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Round 5: Advanced Topics – Basic Trig. Functions

All answers must be in simplest exact form

1. If $\alpha = -\frac{13}{6}\pi$ radians and $\beta = \frac{2}{5}\pi$ radians, express $\alpha + \beta$ in degrees.

2. Evaluate $\frac{\sec(765^\circ) + \cos(675^\circ)}{\csc(600^\circ)}$ in simplest radical form.

3. In triangle ABC , $AC = 21\sqrt{6}$ and $BC = 42$. If $\angle A = 45^\circ$, find all possible values for the measure of $\angle B$ (in degrees).

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ANSWER SHEET - TEAM ROUND

1. _____ and _____

2. _____

3. _____

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ANSWERS

Round 1 - Arithmetic

1. 5
2. 68
3. 96

Round 2 - Algebra 1

1. $x \leq 1$
2. -3
3. $b < t < 2b$

Round 3 - Geometry

1. 72 (or 72°)
2. 58 (or 58°)
3. 37 (or 37°)

Round 4 - Algebra 2

1. $0 < x < 5$
2. -8 and 1 (need both, in any order)
3. -2 and 5 (need both, in any order)

Round 5 - Adv. Topics

1. -318 (or -318°)
2. $-\frac{3\sqrt{6}}{4}$ (or equivalent)
3. 60 or 120 (or 60° , 120° ; need both)

Team Round

1. (5, 2) and (3, 5) (need both pairs)
2. $\frac{81}{2} = 40\frac{1}{2} = 40.5$
3. -3 and 2 (need both)