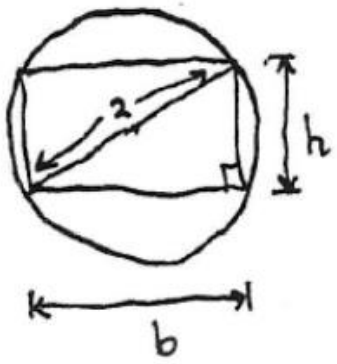
Bergen County Math League
Calculators Permitted

Contest #1 **2025-2026** **Answers/Solutions**

1-1. **Answer:** $\frac{17}{37}$

$$\frac{4x+3z}{6x+5y}=\frac{4+3\frac{z}{x}}{6+5\cdot\frac{y}{x}}=\frac{4+3\cdot\frac{3}{2}}{6+5\cdot\frac{5}{2}}=\frac{17}{37}$$

1-2. **Answer:** $2\sqrt{6}$



$bh=1$
Perimeter = $P=2(b+h)$
$h^2+b^2=2^2=4$
$\therefore\ h^2+2hb+b^2=4+2=6$
$\Rightarrow (h+b)^2=6$
So $P=2(h+b)=2\sqrt{6}$

1-3. **Answer:** 0
Since $f(ab)=f(a)+f(b)$ by unique factorization into primes, the difference (using $a=250, b=175$) is 0.
(Brute force is an alternate method.)

1-4. **Answer:** $\left(\frac{1}{2},-1\right)$
$ab=\frac{a}{b}\ \Rightarrow b\neq 0 \qquad \therefore ab^2=a \qquad \therefore\ a=0$ or $b=\pm 1$.

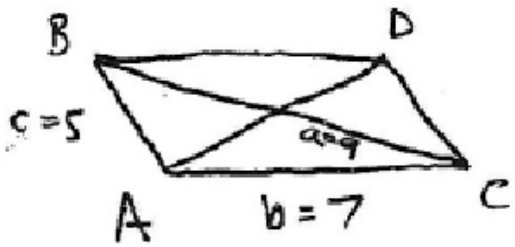
If $a=0$, then $a+b\neq ab$ (since $b\neq 0$). $\quad\therefore, a\neq 0$, so $b=\pm 1$.

If $b=1$, then $a+1=a\cdot 1$, impossible.

$\therefore b=-1\ \Rightarrow\ a-1=-a\ \Rightarrow\ a=\frac{1}{2}$. These check, so $(a,b)=\left(\frac{1}{2},-1\right)$.

1-5. **Answer:** -3
Adding all 3 equations, $2x+2y+2z=6$, so $3=x+y+z=x+3$. $\therefore$ x=0, so $x-y-z=-(y+z)=-3$

1-6. **Answer:** $\frac{1}{2}\sqrt{67}$



Enlarging the triangle to a parallelogram, we get the diagram on the left. Let $\theta=\measuredangle BAC, a=BC, m_a=\frac{1}{2}AD$

$a^2=b^2+c^2-2bc\cos\theta \Rightarrow (2m_a)^2=b^2+c^2-2bc\cos(\pi-\theta)$
$=b^2+c^2+2bc\cos\theta$

$\therefore a^2+(2m_a)^2=2b^2+2c^2 \Rightarrow m_a=\frac{1}{2}\sqrt{2b^2+2c^2-a^2}$

$=\frac{1}{2}\sqrt{2\cdot 49+2\cdot 25-81}=\frac{1}{2}\sqrt{67}$