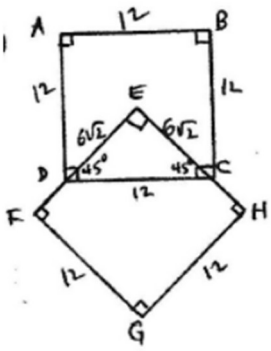
Bergen County Math League
Calculators Permitted

Contest #3 **2022-2023** **Answers/Solutions**

3-1. **Answer:** 108



$Area_{EDC} = \frac{1}{2}\left(6\sqrt{2}\right)\left(6\sqrt{2}\right) = 36$

$Area_{DFGHC} = 144 - 36 = 108$

3-2. **Answer:** 50

Consider the time (t) in hours, required to travel 50 miles while broken down. Then letting r denote the original rate, in mph, we have $t = \frac{50}{\frac{3r}{5}} = \frac{50}{r} + \frac{2}{3}$ or $r = 50$.

3-3. **Answer:** 20

The area of the circle is 81π. A regular hexagon is made up of six equilateral triangles with side length equal to the radius r of the hexagon. Each of these triangles has an area $\frac{\sqrt{3}}{4}r^2$, so the hexagon has area $\frac{3\sqrt{3}}{2}r^2$. Setting these two areas equal results in $r \approx 9.9$, so the diameter, to the nearest integer, is 20.

3-4. **Answer:** 300 (meters)

Let x be the length of the train. Then the train travels $300 + x$ meters in 20 seconds. Since the light is above the train for 10 seconds, the train travels x meters in 10 seconds, so it would travel $2x$ meters in 20 seconds. Thus, $300 + x = 2x$, and $x = 300$ meters.

3-5. **Answer:** $A > D > C > B$ or A, D, C, B

1) $A + B = C + D$

2) $A + C > B + D$

3) $D > C$

$2) - 1)$ gives $C > B \quad (i)$

$1) + (i)$ gives $A > D \quad (ii)$

$(ii), (i), 3)$ gives $A > D > C > B$ or A, D, C, B

3-6. **Answer:** $\left(6, \frac{8}{3}, \frac{3}{2}\right)$ and $\left(-6, -\frac{8}{3}, -\frac{3}{2}\right)$

Set $a = yz, b = xz, c = xy$. Then the equations given are $a + b = 13, b + c = 25, c + a = 20$. Solving as usual yields $a = yz = 4, b = xz = 9, c = xy = 16$. Multiplying, $abc = x^2y^2z^2 = 576$, so $xyz = \pm 24$. Now use $yz = 4, xz = 9, xy = 16$ again to solve for x, y, z.