

**2010 Middle School Math Festival****Team Round: 13**

**Unless stated in the problem, answers will be written as an integer or an exact decimal (i.e. do not round). Any problems requiring a common fraction or mixed number for the answer will always require the fractional part to be in lowest terms.**

1. A dog is attached to one corner of a 10-foot by 10-foot square shed and is restrained by a 15-foot long leash.

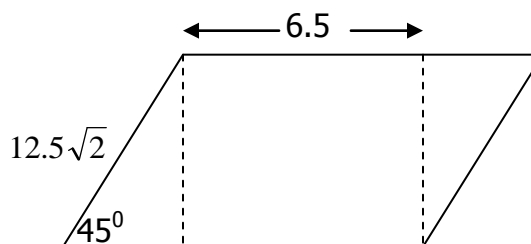
Let  $C$  = the area (in  $\text{ft}^2$ ) where the dog is able to roam, in terms of  $\pi$ .

Let  $D$  = the perimeter (in feet), including the edge of the shed, where the dog is able to roam, written in terms of  $\pi$ .

Calculate  $C + D$ , written in terms of  $\pi$ .

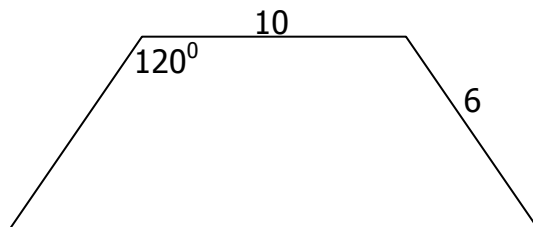
2. Calculate the exact sum of the perimeter and area of the parallelogram to the right.

Drawing is NOT to scale.



3. The coordinates of quadrilateral  $ABCD$  are:  $A = (-2.3, 1.8)$ ,  $B = (-5.3, 0.8)$ ,  $C = (2.7, -3.2)$ , and  $D = (0.7, 2.8)$ . Calculate the exact perimeter.

4. Calculate the exact positive difference between the area and the perimeter of the trapezoid shown below. The drawing is NOT to scale.



5. A square is inscribed inside a circle with an area of  $12.5\pi$ .

Let  $A$  = area of the square. Let  $P$  = perimeter of the square.

Calculate  $\frac{A}{P}$ . Write the answer as a common fraction.

6.  $F, G$  = the slope and  $y$ -intercept of the line containing the points:  
 $(-3.5, 5.2)$  and  $(4.7, 24)$

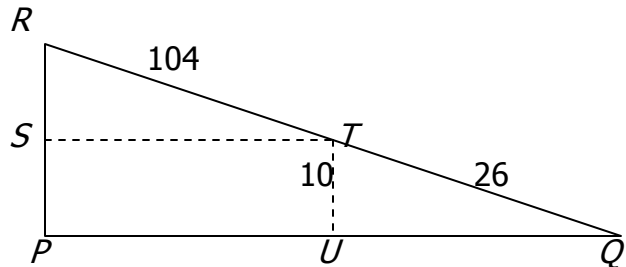
Calculate  $F + G$ . Write the answer as a mixed number.

7. Carl Lewis once ran the 100-yard dash in 10.0 seconds.

Let  $J$  = his average speed, in miles per hour, rounded to the nearest hundredth.  
 An Indianapolis 500 racer completed the 500-mile race in 2 hours and 23 minutes.

Let  $K$  = his average speed, in miles per hour, rounded to the nearest hundredth.  
 Calculate the positive difference between  $J$  and  $K$ .

8. Triangle  $PQR$  is a right triangle. Segments  $ST$  and  $PQ$  are parallel.  
 Quadrilateral  $STUP$  is a rectangle. Calculate the perimeter of triangle  $PQR$ .



9. A square right pyramid has a height of 60 and a slant height of 61.5.  
 Calculate the total surface area of the pyramid.

10. A right triangle  $ABC$  has sides of lengths  $AB = 17.5$ ,  $BC = 62.5$ , and  $AC = 60$ .  
 Calculate  $\frac{\sin B - \cos B}{\tan B}$ . Write the answer as a common fraction.