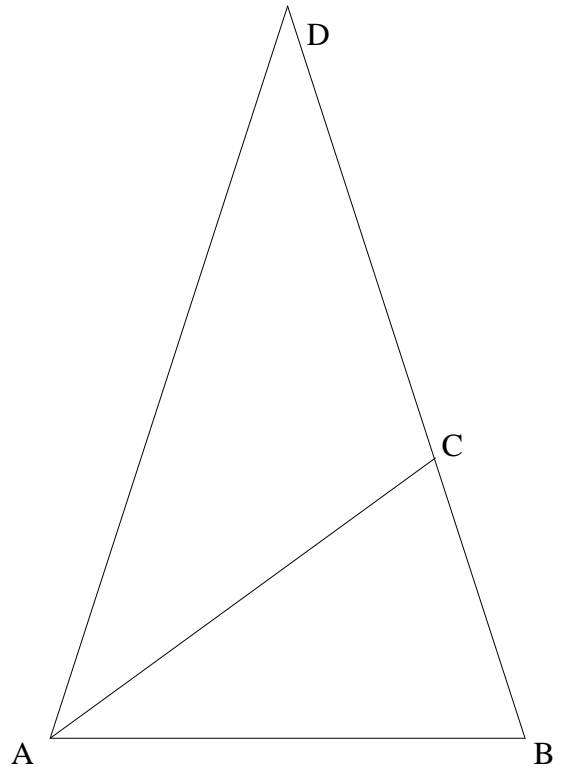
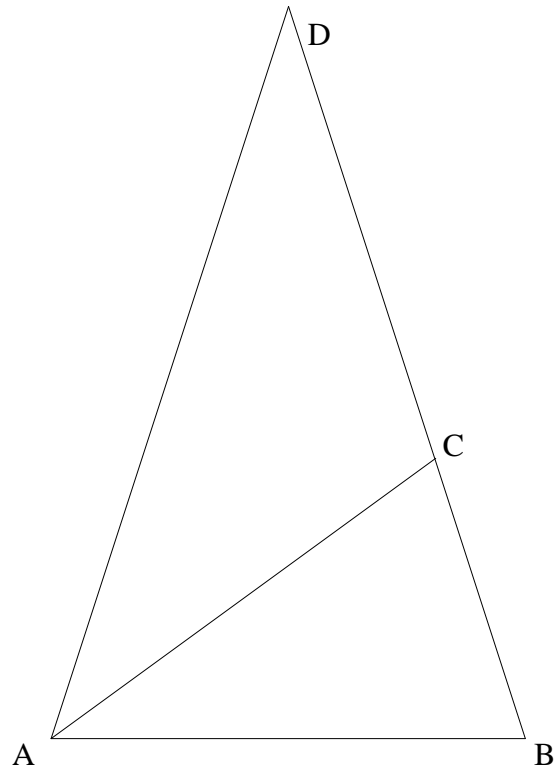


- 1)  $\overline{AB} \cong \overline{AC} \cong \overline{CD}$ ,  $\overline{AD} \cong \overline{DB}$   
 Determine  $m\angle D$



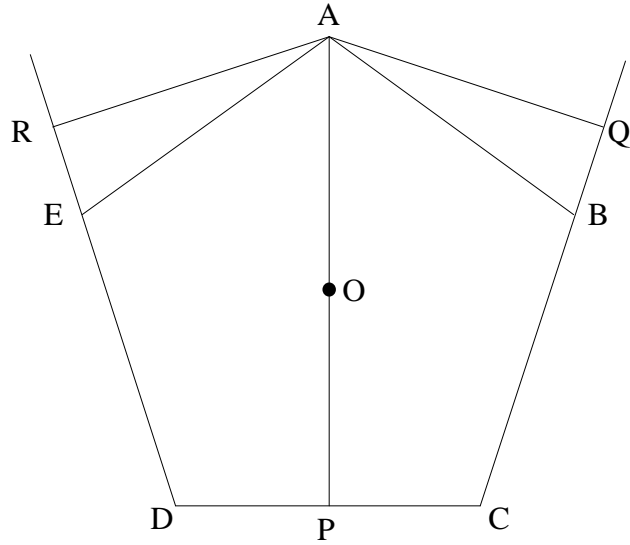
- 2)  $\overline{AB} \cong \overline{AC} \cong \overline{CD}$ ,  $\overline{AD} \cong \overline{DB}$ ,  $AB = 1$   
 Determine the exact value of the length of  $\overline{CB}$   
 Determine the exact value of the length of  $\overline{AD}$



3) The perimeter of a regular pentagon is 5 cm.. Determine the length of one of the diagonals of the pentagon.

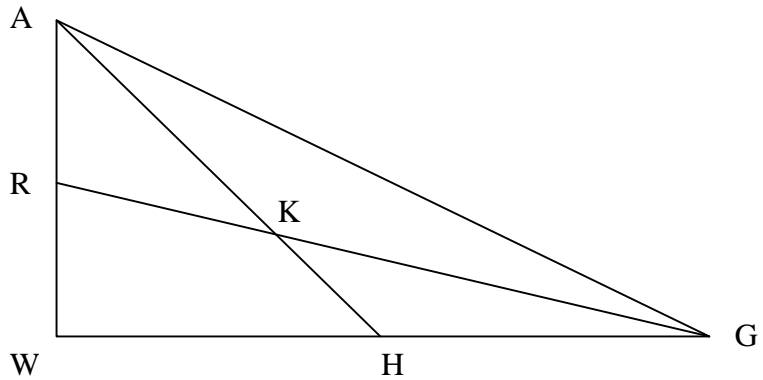
4) ABCDE is a regular pentagon.  
 The center of the pentagon is O  
 $\overline{AR} \perp \overline{RD}$ ;  $\overline{AQ} \perp \overline{QC}$ ;  $\overline{AP} \perp \overline{DC}$   
 $OP = 1$

Find  $AR + AO + AQ$

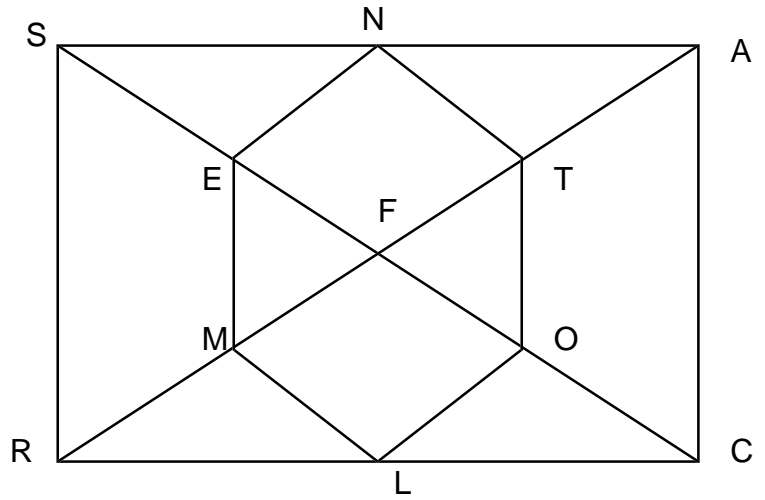


5) An isosceles triangle has base 10 and the medians of its legs are perpendicular. Find the sum of the lengths of the three medians of the triangle.

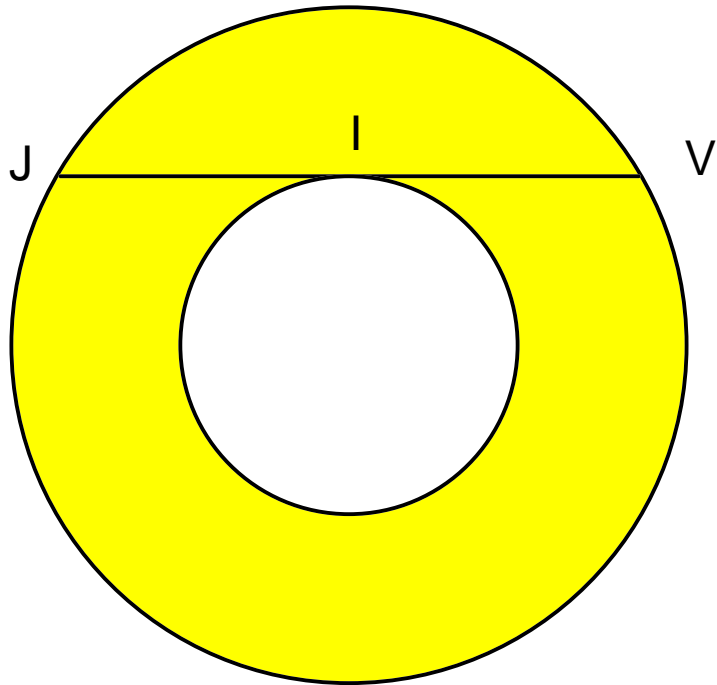
6)  $\overline{AW} \perp \overline{WG}$   
 R is the midpoint of  $\overline{AW}$   
 H is the midpoint of  $\overline{GW}$   
 $AH = 10, GR = 15$   
 Find the length of  $\overline{AG}$   
 Find the length of  $\overline{WK}$



- 7)  $SACR$  is a rectangle  $SR=6$ ,  
 $SA=8$ ;  $T,O,L,M,E,$  &  $N$  are  
 midpoints of  
 $\overline{FA}$ ;  $\overline{FC}$ ;  $\overline{RC}$ ;  $\overline{FR}$ ;  $\overline{SF}$  &  $\overline{SA}$   
 respectively. Find the ratio of  
 the area of hexagon  $TOLMEN$   
 to rectangle  $SACR$ .



- 8)  $\overline{JV}$  is tangent to the smaller  
 of the two concentric circles.  
 $JV = 16$ . Find the largest  
 possible area of the shaded  
 region.



9) In  $\triangle QSP$ , W is on  $\overline{QP}$ , T is on  $\overline{PS}$  and R is on  $\overline{QS}$ .  $\overline{QT} \cap \overline{PR} \cap \overline{WS} = V$

$QR:RS = 9:2$  ;  $PT:TS = 6:7$  Find each of the following ratios.

$QV:VT$ ,  $PV:VR$ ,  $PW:PQ$ , and  $WV:VS$

Find the ratio of the area of  $\triangle SVQ$  to the area of  $\triangle VQW$

10) Each of the circles is tangent to the square or the circles next to it. The circles fill the square and the ones at either end are tangent to it. If there are n circles along the top, and n circles along the side, and each circle has radius r, what is the area of the shaded region?

