

## **Introduction**

I

The **Challenging Geometry Computations MathSet** is organized along the following topics:

### **Lines and Angles**

Lines, Parallel Lines and Special Segments  
Angles, Special Pairs of Angles

### **Triangles**

Angles, Special Segments, Classifications of Triangles  
Congruence, Similarity, Proportions  
Right Triangles and Pythagorean Theorem

### **Quadrilateral and Polygons**

Squares, Rectangles, Parallelograms  
Areas, Circumferences, Arc Lengths

### **Measurements in Space**

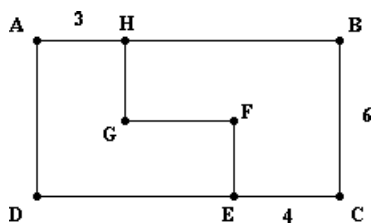
Prisms, Pyramids  
Cylinders, Cones, Spheres

There are over 500 open-ended questions with numerous graphics. Detailed worked out solutions for all questions are provided.

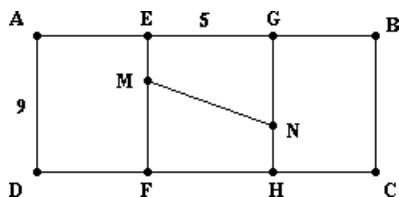
The questions in this math set are also available as Challenging Geometry Computations TestBank.

# 1.1 ••• Lines, Parallel Lines, Special Segments

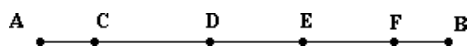
1. In the following figure,  $\overline{AB} \perp \overline{BC}$ ,  $\overline{BC} \perp \overline{CD}$ ,  $\overline{CD} \perp \overline{AD}$ ,  $\overline{GH} \perp \overline{AB}$ ,  $\overline{EF} \perp \overline{CD}$ ,  $\overline{FG} \perp \overline{GH}$ ,  $AH = 3$ ,  $AB = 12$ ,  $CE = 4$ , and  $BC = 6$ . Find the length of  $EF + FG + GH$ .



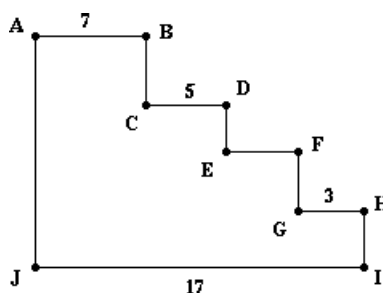
2. In the figure below,  $\overline{AD} \parallel \overline{EF} \parallel \overline{GH} \parallel \overline{BC}$ ,  $\overline{AB} \parallel \overline{CD}$ , and  $\overline{AD} \perp \overline{CD}$ . Also,  $EM = \frac{1}{3}AD$ ,  $HN = \frac{1}{3}BC$ ,  $AD = 9$ ,  $EG = 5$ ,  $AB = 12$ , and the length of the composite segment  $AEMNHC = 20$ . Find the length of  $MN$ .



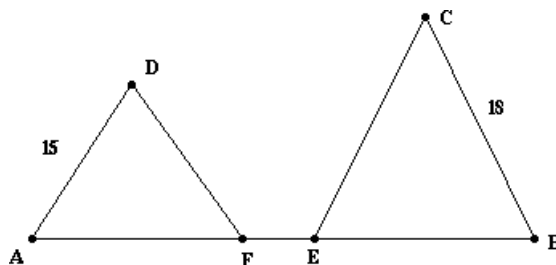
3. If  $AB + CB + DB + EB + FB = 62$  and  $2CD + 3DE + 4EF + 5BF = 56$  in the figure below, find the length of  $\overline{AC}$ .



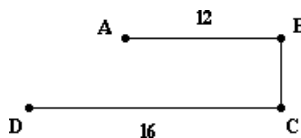
4. In the figure below, every segment is perpendicular to its adjacent segments. Using the lengths given in the diagram, find the distance between the perpendicular bisectors of  $\overline{AB}$  and  $\overline{EF}$ .



5. C is equidistant from B and E, and D is equidistant from A and F. Also,  $AD = 15$ ,  $BC = 18$ ,  $AF + BE = 28$ , and  $\overline{FD} + \overline{DA} + \overline{AB} + \overline{BC} + \overline{CE} = 100$ . Find the length of  $\overline{EF}$ .



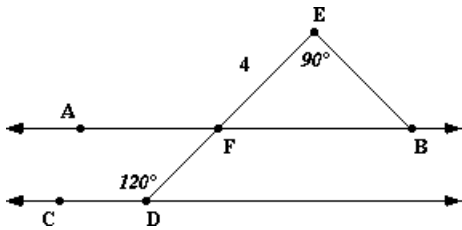
6. In the following figure,  $\overline{AB} \perp \overline{BC}$ ,  $\overline{BC} \perp \overline{CD}$ ,  $AB = 12$  and  $CD = 16$ . Find the distance between the perpendicular bisectors of  $\overline{AB}$  and  $\overline{CD}$ .



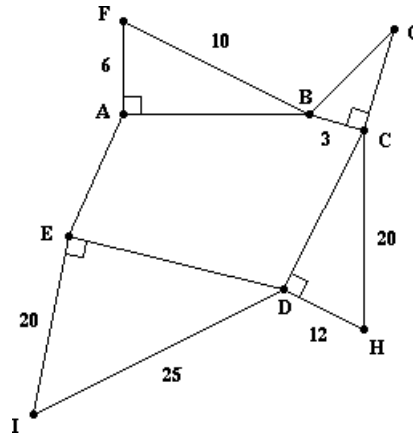
19. In  $\triangle ABC$ ,  $m\angle A = 90$  and  $m\angle B = 15$ .  
If  $BC = 12$ , find  $AC$ .

20. Right  $\triangle ABC$  with  $m\angle A = 90$  has perimeter 60 and area 150. Find the length of the altitude from vertex  $A$ .

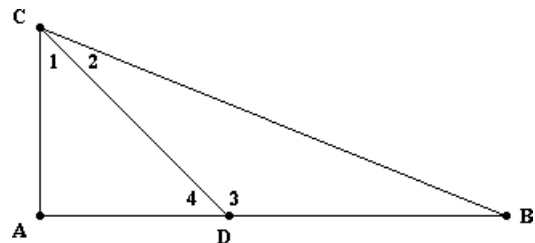
21. In the following figure,  $m\angle E = 90$ ,  $m\angle CDE = 120$  and  $\overleftrightarrow{AB} \parallel \overleftrightarrow{CD}$ . Find the length of  $\overline{BE}$ .



22. In the figure below, right triangles  $ABF$ ,  $BCG$ ,  $CDH$ , and  $DEI$  are formed on the sides of  $ABCDE$ . The perimeter of pentagon  $ABCDE$  is 50. Find the length of  $\overline{AE}$ . Right angles are indicated in the figure.

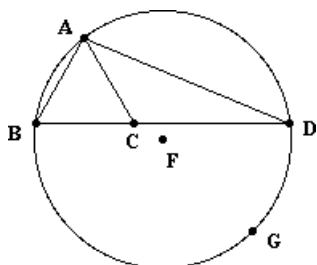


23. In  $\triangle ABC$  shown below,  $m\angle A = 90$ ,  $m\angle 4 - m\angle B = 20$ , and  $m\angle B - m\angle 2 = 20$ . Find the measures of the interior angles in right triangles  $ABC$  and  $ACD$ .

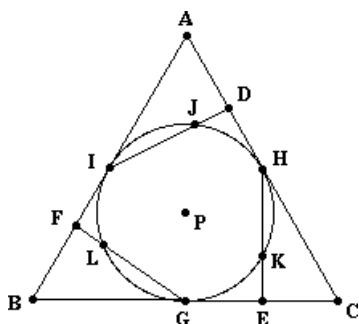


# 4.1 •••• Special Angles, Arcs, Special Segments

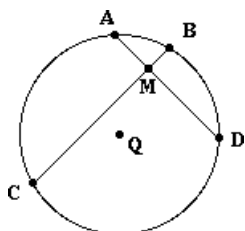
1.  $\triangle ABC$  shown below is equilateral and two of its vertices are on circle  $F$ . Also,  $B, C,$  and  $D$  are collinear and  $m\angle D = 15$ . Find the measure of  $\widehat{BGD}$ .



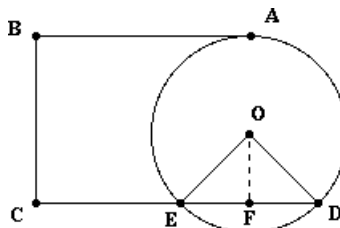
2. In the following figure, equilateral triangle  $ABC$  is circumscribed about the circle. Also,  $\overline{GF} \perp \overline{AB}$ ,  $\overline{DI} \perp \overline{AC}$ , and  $\overline{HE} \perp \overline{BC}$ . Find  $m\widehat{GL} + m\widehat{HK} + m\widehat{IJ}$ .



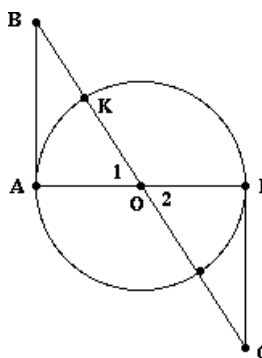
3. In the figure below,  $\overline{AD}$  and  $\overline{BC}$  are chords of  $\odot Q$ . If  $AM = BM$ ,  $AM + BM = 4$ , and  $MC + MD = 12$ , find  $AD$  and  $BC$ .



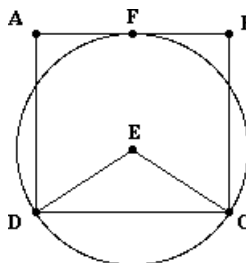
4. In the following figure,  $\overline{AB}$  is tangent to circle  $O$ ,  $\overline{AB} \perp \overline{BC}$ , and  $\overline{BC} \perp \overline{CD}$ . Also,  $BC = 12$  and  $OE = 9$ . Find the area of  $\triangle ODE$ .



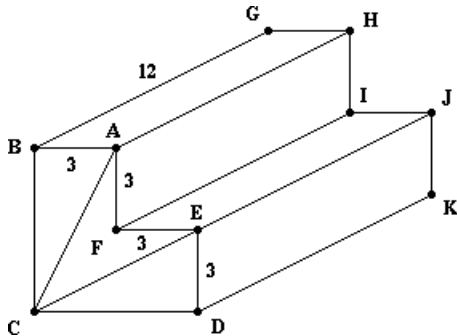
5. In the figure,  $\overline{AB}$  and  $\overline{CD}$  are tangent to circle  $O$ .  $\overline{AD}$  and  $\overline{BC}$  pass through the center of the circle. If  $m\angle B + m\angle C = 80$ , find the measures of  $\angle 1$  and  $\angle 2$ .



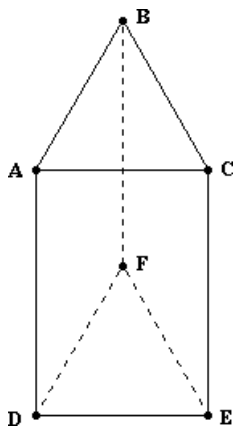
6. In the following figure,  $\overline{AB}$  is tangent to circle  $E$  and  $ABCD$  is a square. If the area of the square is 49 and the area of  $\triangle CDE$  is 7, find the length of a radius of the circle.



11. In the following solid, all adjacent edges are perpendicular in pairs. Portions of the solid are cut out along  $\overline{AC}$  and  $\overline{CE}$ . Find the volume of the solid whose base is bounded by  $\overline{AC}$ ,  $\overline{CE}$ ,  $\overline{EF}$ , and  $\overline{FA}$  and whose height is the same measure as the length of  $\overline{BG}$ .

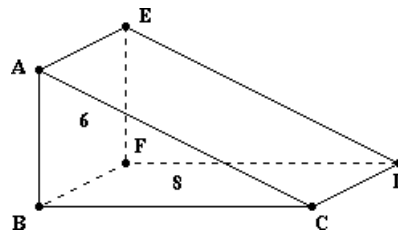


12. The bases of a triangular prism are equilateral triangles each with side length 4. The height of the prism is 8.  $G$  is the midpoint of edge  $\overline{BF}$ . By connecting  $G$  to the vertices  $A$ ,  $C$ ,  $D$ , and  $E$  respectively, a pyramid is formed. Find the volume of the pyramid.



13. Twice the surface area of cube A is equal to the difference between the surface areas of cubes B and C. The sum and difference of the dimensions of cubes B and C are 8 and 4, respectively. Find the volume of cube A.

14. In the right triangular prism shown below, the lateral faces are rectangular. The areas of  $\triangle ABFE$  and  $\triangle BCDF$  are 6 and 8, respectively. If the volume of the prism is 12, find the length of  $\overline{BF}$ .



15. The quadrilaterals below are bases of a prism whose faces are all rectangles. Find the values of  $x$  and  $y$ .

