17 Which rotation about its center will carry a regular decagon onto itself?

(1) 54°   (3) 198°

(2) 162°   (4) 252°

18 The equation of a circle is $x^2 + y^2 - 6y + 1 = 0$. What are the coordinates of the center and the length of the radius of this circle?

(1) center $(0,3)$ and radius $= 2\sqrt{2}$

(2) center $(0,-3)$ and radius $= 2\sqrt{2}$

(3) center $(0,6)$ and radius $= \sqrt{35}$

(4) center $(0,-6)$ and radius $= \sqrt{35}$

19 Parallelogram $ABCD$ has coordinates $A(0,7)$ and $C(2,1)$. Which statement would prove that $ABCD$ is a rhombus?

(1) The midpoint of $\overline{AC}$ is $(1,4)$.

(2) The length of $\overline{BD}$ is $\sqrt{40}$.

(3) The slope of $\overline{BD}$ is $\dfrac{1}{3}$.

(4) The slope of $\overline{AB}$ is $\dfrac{1}{3}$.

20 Point Q is on $\overline{MN}$ such that $MQ{:}QN = 2{:}3$. If M has coordinates $(3,5)$ and N has coordinates $(8,-5)$, the coordinates of Q are

(1) $(5,1)$ (3) $(6,-1)$

(2) $(5,0)$ (4) $(6,0)$

21 In the diagram below of circle O, $GO = 8$ and $m\angle GOJ = 60°$.
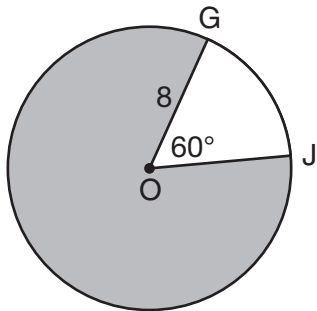

What is the area, in terms of π, of the shaded region?

(1) $\dfrac{4\pi}{3}$ (3) $\dfrac{32\pi}{3}$

(2) $\dfrac{20\pi}{3}$ (4) $\dfrac{160\pi}{3}$

22 A circle whose center is the origin passes through the point $(-5,12)$. Which point also lies on this circle?

(1) $(10,3)$ (3) $(11, 2\sqrt{12})$

(2) $(-12,13)$ (4) $(-8, 5\sqrt{21})$

23 A plane intersects a hexagonal prism. The plane is perpendicular to the base of the prism. Which two-dimensional figure is the cross section of the plane intersecting the prism?

(1) triangle   (3) hexagon

(2) trapezoid   (4) rectangle

24 A water cup in the shape of a cone has a height of 4 inches and a maximum diameter of 3 inches. What is the volume of the water in the cup, to the *nearest tenth of a cubic inch*, when the cup is filled to half its height?

(1) 1.2   (3) 4.7

(2) 3.5   (4) 14.1

Answer all 7 questions in this part. Each correct answer will receive 2 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily drawn to scale. For all questions in this part, a correct numerical answer with no work shown will receive only 1 credit. All answers should be written in pen, except for graphs and drawings, which should be done in pencil. [14]

25 Using a compass and straightedge, construct the line of reflection over which triangle RST reflects onto triangle $R'S'T'$. [Leave all construction marks.]
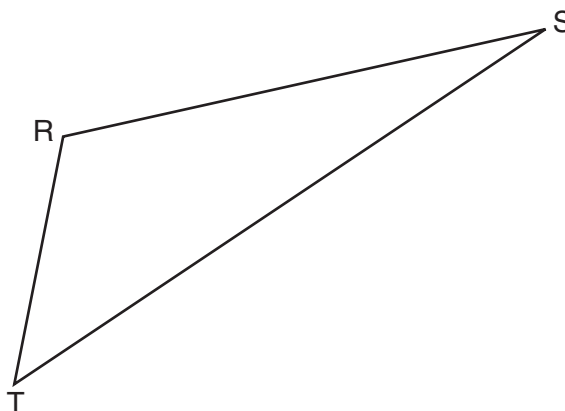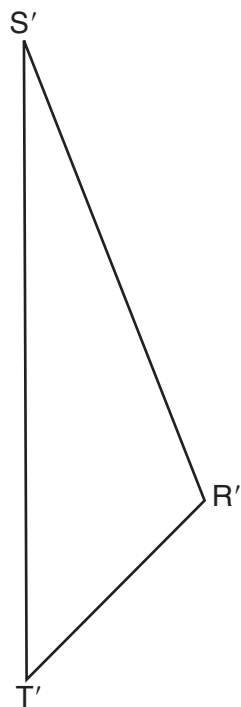
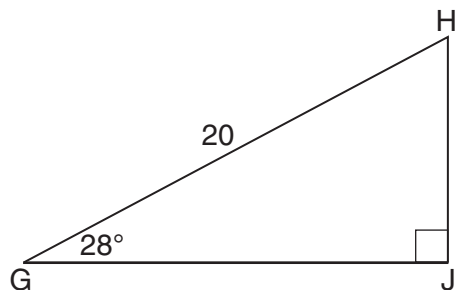**26** The graph below shows $\triangle ABC$ and its image, $\triangle A''B''C''$.
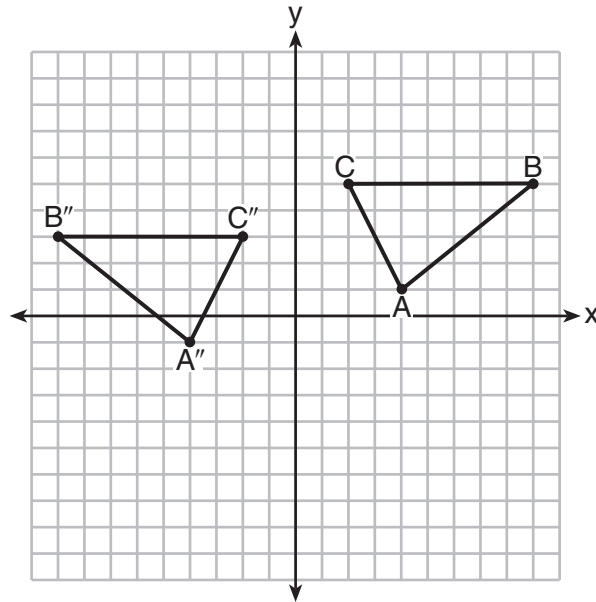
Describe a sequence of rigid motions which would map $\triangle ABC$ onto $\triangle A''B''C''$.
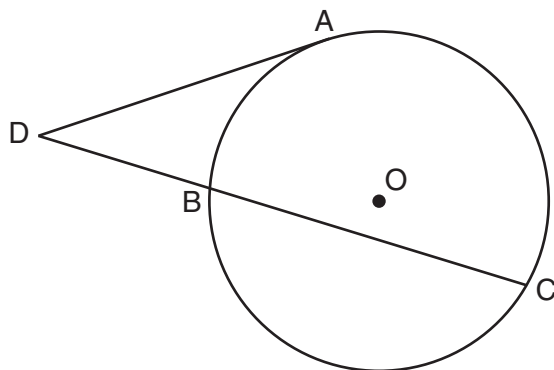
27 When instructed to find the length of $\overline{HJ}$ in right triangle HJG, Alex wrote the equation $\sin 28° = \dfrac{HJ}{20}$ while Marlene wrote $\cos 62° = \dfrac{HJ}{20}$. Are both students' equations correct? Explain why.
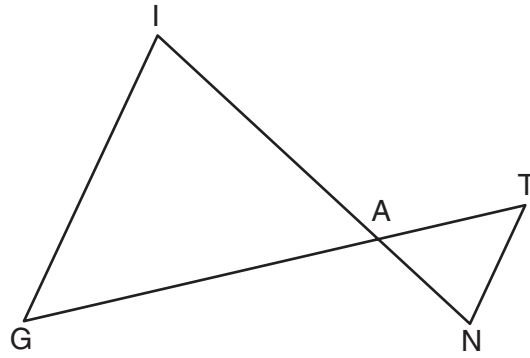

28 In the diagram below, tangent $\overline{DA}$ and secant $\overline{DBC}$ are drawn to circle O from external point D, such that $\widehat{AC} \cong \widehat{BC}$.

If $m\widehat{BC} = 152°$, determine and state $m\angle D$.

29 In the diagram below, $\overline{GI}$ is parallel to $\overline{NT}$, and $\overline{IN}$ intersects $\overline{GT}$ at A.

Prove: $\triangle GIA \sim \triangle TNA$