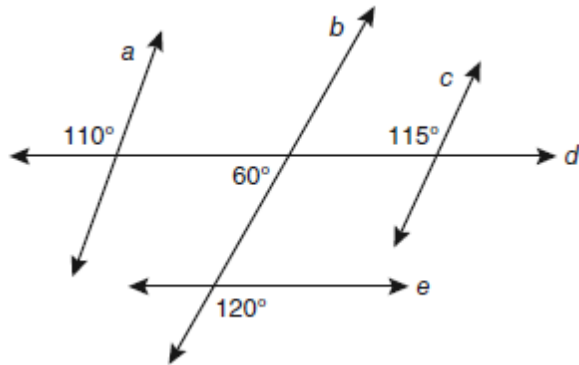


1. 080901ge, P.I. G.G.35

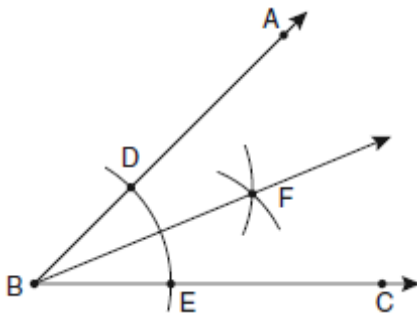
Based on the diagram below, which statement is true?



- [A] $b \parallel c$ [B] $d \parallel e$ [C] $a \parallel b$ [D] $a \parallel c$

2. 080902ge, P.I. G.G.17

The diagram below shows the construction of the bisector of $\angle ABC$.

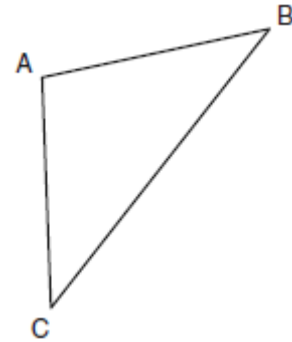


Which statement is *not* true?

- [A] $m\angle DBF = m\angle EBF$
 [B] $m\angle DBF = \frac{1}{2}m\angle ABC$
 [C] $m\angle EBF = m\angle ABC$
 [D] $m\angle EBF = \frac{1}{2}m\angle ABC$

3. 080903ge, P.I. G.G.31

In the diagram of $\triangle ABC$ below, $\overline{AB} \cong \overline{AC}$. The measure of $\angle B$ is 40° .

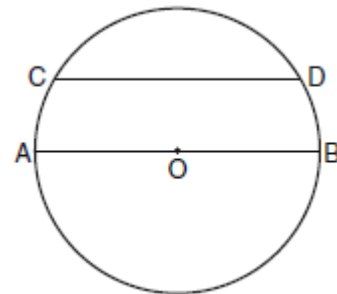


What is the measure of $\angle A$?

- [A] 40° [B] 100° [C] 70° [D] 50°

4. 080904ge, P.I. G.G.52

In the diagram of circle O below, chord \overline{CD} is parallel to diameter \overline{AOB} and $m\widehat{AC} = 30$.

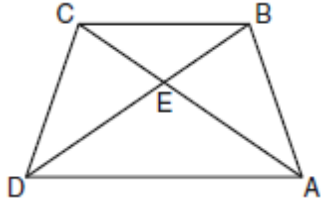


What is $m\widehat{CD}$?

- [A] 100 [B] 150 [C] 120 [D] 60

5. 080905ge, P.I. G.G.29

In the diagram of trapezoid $ABCD$ below, diagonals \overline{AC} and \overline{BD} intersect at E and $\triangle ABC \cong \triangle DCB$.



Which statement is true based on the given information?

- [A] $\angle CDB \cong \angle BAC$
 [B] $\angle CDE \cong \angle BAD$
 [C] $\overline{CD} \cong \overline{AD}$ [D] $\overline{AC} \cong \overline{BC}$

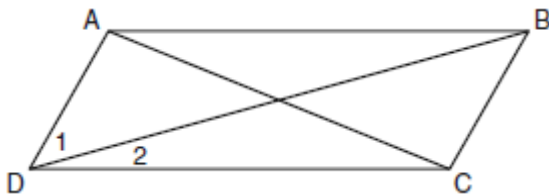
6. 080906ge, P.I. G.G.59

Which transformation produces a figure similar but *not* congruent to the original figure?

- [A] R_{90° [B] $T_{1,3}$ [C] $r_{y=x}$ [D] $D_{\frac{1}{2}}$

7. 080907ge, P.I. G.G.38

In the diagram below of parallelogram $ABCD$ with diagonals \overline{AC} and \overline{BD} , $m\angle 1 = 45$ and $m\angle DCB = 120$.

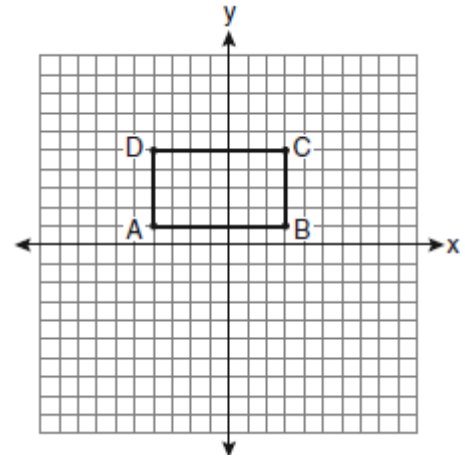


What is the measure of $\angle 2$?

- [A] 15° [B] 45° [C] 60° [D] 30°

8. 080908ge, P.I. G.G.57

On the set of axes below, Geoff drew rectangle $ABCD$. He will transform the rectangle by using the translation $(x, y) \rightarrow (x + 2, y + 1)$ and then will reflect the translated rectangle over the x -axis.



What will be the area of the rectangle after these transformations?

- [A] less than 28 square units
 [B] greater than 28 square units
 [C] It cannot be determined from the information given.
 [D] exactly 28 square units

9. 080909ge, P.I. G.G.63

What is the equation of a line that is parallel to the line whose equation is $y = x + 2$?

- [A] $y - x = -1$ [B] $2x + y = -2$
 [C] $y - 2x = 3$ [D] $x + y = 5$

10. 080910ge, P.I. G.G.66

The endpoints of \overline{CD} are $C(-2,-4)$ and $D(6,2)$. What are the coordinates of the midpoint of \overline{CD} ?

- [A] (2,-1) [B] (2,3)
[C] (4,3) [D] (4,-2)

11. 080911ge, P.I. G.G.73

What are the center and the radius of the circle whose equation is $(x-3)^2 + (y+3)^2 = 36$?

- [A] center = $(-3,3)$; radius = 36
[B] center = $(-3,3)$; radius = 6
[C] center = $(3,-3)$; radius = 6
[D] center = $(3,-3)$; radius = 36

12. 080912ge, P.I. G.G.70

Given the equations:
 $y = x^2 - 6x + 10$
 $y + x = 4$

What is the solution to the given system of equations?

- [A] (2,2) and (3,1) [B] (2,2) and (1,3)
[C] (2,3) [D] (3,2)

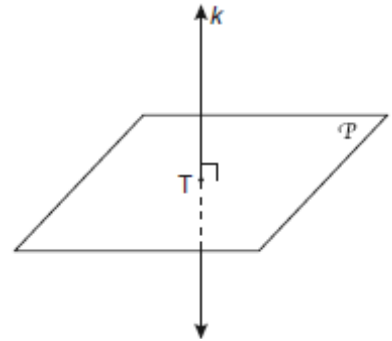
13. 080913ge, P.I. G.G.28

The diagonal \overline{AC} is drawn in parallelogram $ABCD$. Which method can *not* be used to prove that $\triangle ABC \cong \triangle CDA$?

- [A] SAS [B] ASA [C] SSA [D] SSS

14. 080914ge, P.I. G.G.7

In the diagram below, line k is perpendicular to plane \mathcal{P} at point T .

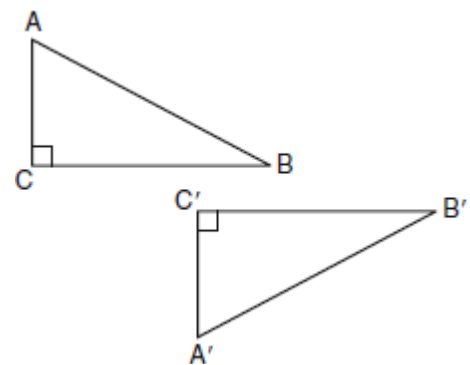


Which statement is true?

- [A] Any point in plane \mathcal{P} also will be on line k .
[B] Any plane containing line k is perpendicular to plane \mathcal{P} .
[C] All planes that intersect plane \mathcal{P} will pass through T .
[D] Only one line in plane \mathcal{P} will intersect line k .

15. 080915ge, P.I. G.G.56

In the diagram below, which transformation was used to map $\triangle ABC$ to $\triangle A'B'C'$?



- [A] rotation [B] dilation
[C] reflection [D] glide reflection

16. 080916ge, P.I. G.G.33
Which set of numbers represents the lengths of the sides of a triangle?

[A] {6, 17, 22} [B] {16, 24, 7}
[C] {5, 18, 13} [D] {26, 8, 15}

17. 080917ge, P.I. G.G.62
What is the slope of a line perpendicular to the line whose equation is $y = -\frac{2}{3}x - 5$?

[A] $\frac{3}{2}$ [B] $\frac{2}{3}$ [C] $-\frac{3}{2}$ [D] $-\frac{2}{3}$

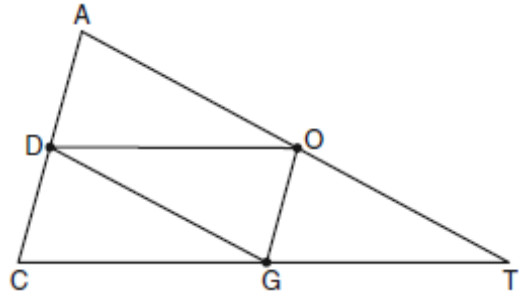
18. 080918ge, P.I. G.G.41
A quadrilateral whose diagonals bisect each other and are perpendicular is a

[A] trapezoid [B] parallelogram
[C] rhombus [D] rectangle

19. 080919ge, P.I. G.G.67
If the endpoints of \overline{AB} are $A(-4,5)$ and $B(2,-5)$, what is the length of \overline{AB} ?

[A] 2 [B] 8 [C] $\sqrt{61}$ [D] $2\sqrt{34}$

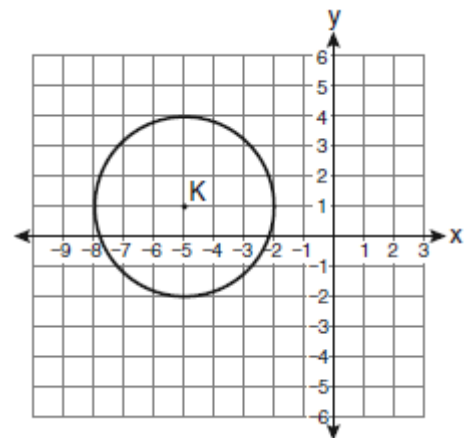
20. 080920ge, P.I. G.G.42
In the diagram below of $\triangle ACT$, D is the midpoint of \overline{AC} , O is the midpoint of \overline{AT} , and G is the midpoint of \overline{CT} .



If $AC = 10$, $AT = 18$, and $CT = 22$, what is the perimeter of parallelogram $CDOG$?

[A] 25 [B] 21 [C] 40 [D] 32

21. 080921ge, P.I. G.G.72
Which equation represents circle K shown in the graph below?



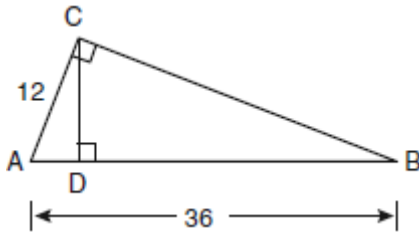
[A] $(x + 5)^2 + (y - 1)^2 = 3$

[B] $(x + 5)^2 + (y - 1)^2 = 9$

[C] $(x - 5)^2 + (y + 1)^2 = 9$

[D] $(x - 5)^2 + (y + 1)^2 = 3$

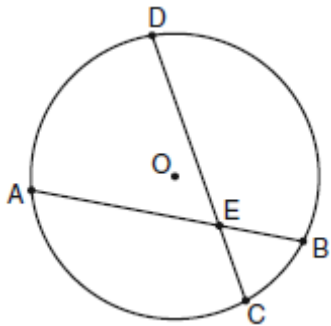
22. 080922ge, P.I. G.G.47
In the diagram below of right triangle ACB , altitude \overline{CD} is drawn to hypotenuse \overline{AB} .



If $AB = 36$ and $AC = 12$, what is the length of \overline{AD} ?

- [A] 3 [B] 4 [C] 6 [D] 32

23. 080923ge, P.I. G.G.53
In the diagram of circle O below, chord \overline{AB} intersects chord \overline{CD} at E , $DE = 2x + 8$, $EC = 3$, $AE = 4x - 3$, and $EB = 4$.



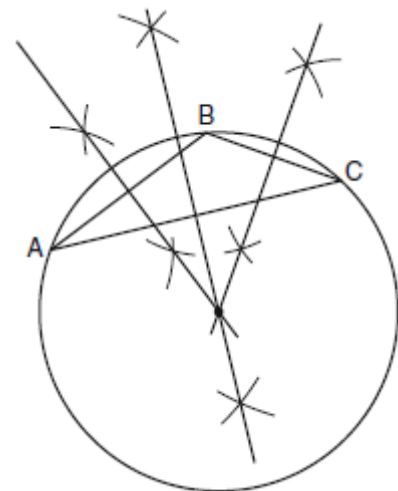
What is the value of x ?

- [A] 10.25 [B] 3.6 [C] 5 [D] 1

24. 080924ge, P.I. G.G.24
What is the negation of the statement "Squares are parallelograms"?

- [A] It is not the case that parallelograms are squares.
[B] Parallelograms are squares.
[C] Parallelograms are not squares.
[D] It is not the case that squares are parallelograms.

25. 080925ge, P.I. G.G.21
The diagram below shows the construction of the center of the circle circumscribed about $\triangle ABC$.



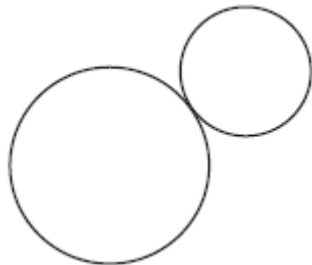
This construction represents how to find the intersection of

- [A] the angle bisectors of $\triangle ABC$
[B] the medians to the sides of $\triangle ABC$
[C] the perpendicular bisectors of the sides of $\triangle ABC$
[D] the altitudes to the sides of $\triangle ABC$

26. 080926ge, P.I. G.G.14
A right circular cylinder has a volume of 1,000 cubic inches and a height of 8 inches. What is the radius of the cylinder to the nearest tenth of an inch.
- [A] 6.3 [B] 39.8 [C] 11.2 [D] 19.8

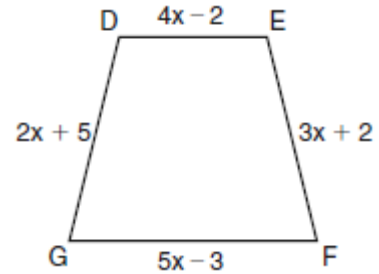
27. 080927ge, P.I. G.G.4
If two different lines are perpendicular to the same plane, they are
- [A] collinear [B] consecutive
[C] congruent [D] coplanar

28. 080928ge, P.I. G.G.50
How many common tangent lines can be drawn to the two externally tangent circles shown below?

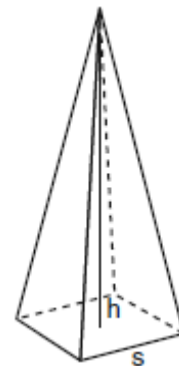


- [A] 1 [B] 3 [C] 2 [D] 4

29. 080929ge, P.I. G.G.40
In the diagram below of isosceles trapezoid $DEFG$, $\overline{DE} \parallel \overline{GF}$, $DE = 4x - 2$, $EF = 3x + 2$, $FG = 5x - 3$, and $GD = 2x + 5$. Find the value of x .



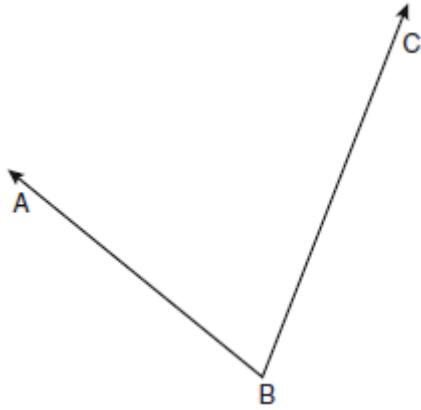
30. 080930ge, P.I. G.G.13
A regular pyramid with a square base is shown in the diagram below.



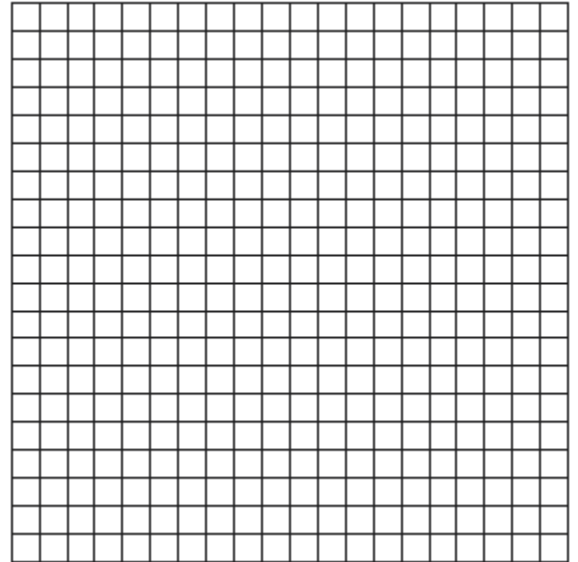
A side, s , of the base of the pyramid is 12 meters, and the height, h , is 42 meters. What is the volume of the pyramid in cubic meters?

31. 080931ge, P.I. G.G.65
Write an equation of the line that passes through the point $(6, -5)$ and is parallel to the line whose equation is $2x - 3y = 11$.

32. 080932ge, P.I. G.G.17
Using a compass and straightedge, construct the angle bisector of $\angle ABC$ shown below. [Leave all construction marks.]

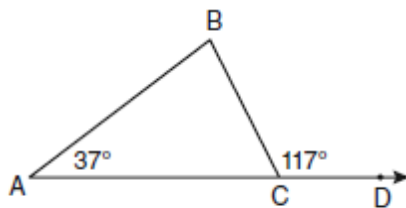


35. 080935ge, P.I. G.G.68
Write an equation of the perpendicular bisector of the line segment whose endpoints are $(-1,1)$ and $(7,-5)$. [The use of the grid below is optional]



33. 080933ge, P.I. G.G.30
The degree measures of the angles of $\triangle ABC$ are represented by x , $3x$, and $5x - 54$. Find the value of x .

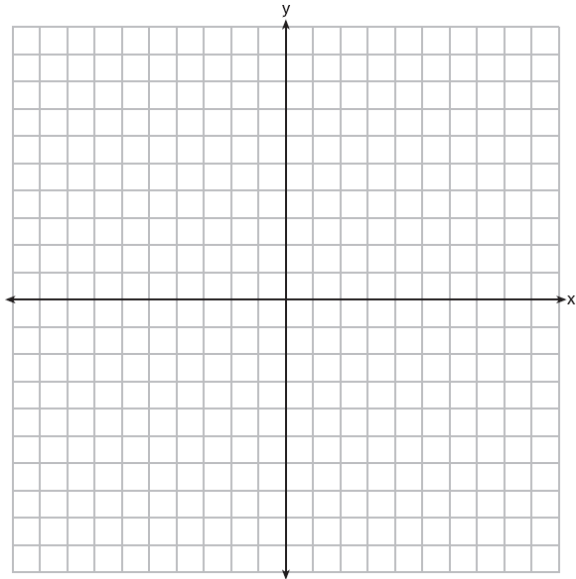
34. 080934ge, P.I. G.G.34
In the diagram below of $\triangle ABC$ with side \overline{AC} extended through D , $m\angle A = 37$ and $m\angle BCD = 117$. Which side of $\triangle ABC$ is the longest side? Justify your answer.



(Not drawn to scale)

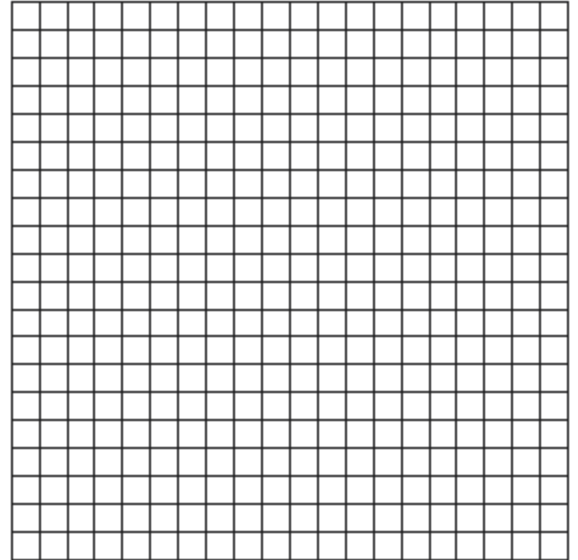
36. 080936ge, P.I. G.G.23

On the set of axes below, sketch the points that are 5 units from the origin and sketch the points that are 2 units from the line $y = 3$. Label with an **X** all points that satisfy both conditions.



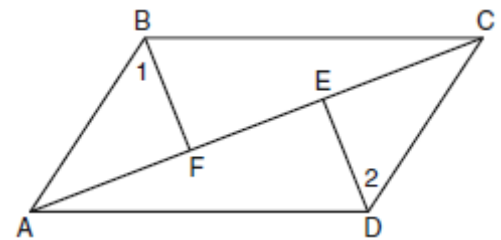
37. 080937ge, P.I. G.G.55

Triangle DEG has the coordinates $D(1,1)$, $E(5,1)$, and $G(5,4)$. Triangle DEG is rotated 90° about the origin to form $\triangle D'E'G'$. On the grid below, graph and label $\triangle DEG$ and $\triangle D'E'G'$. State the coordinates of the vertices D' , E' , and G' . Justify that this transformation preserves distance.



38. 080938ge, P.I. G.G.27

Given: Quadrilateral $ABCD$, diagonal \overline{AFEC} ,
 $\overline{AE} \cong \overline{FC}$, $\overline{BF} \perp \overline{AC}$, $\overline{DE} \perp \overline{AC}$, $\angle 1 \cong \angle 2$
Prove: $ABCD$ is a parallelogram.



- [1] B
- [2] C
- [3] B
- [4] C
- [5] A
- [6] D
- [7] A
- [8] D
- [9] A
- [10] A
- [11] C
- [12] A
- [13] C
- [14] B
- [15] D
- [16] A
- [17] A
- [18] C
- [19] D
- [20] D
- [21] B
- [22] B
- [23] B
- [24] D
- [25] C
- [26] A
- [27] D
- [28] B

- [2] 3, and appropriate work is shown.
[1] Appropriate work is shown, but one computational error is made.
or [1] Appropriate work is shown, but one conceptual error is made.
or [1] 3, but no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
-
- [29] [2] 2016, and appropriate work is shown.
[1] Appropriate work is shown, but one computational error is made.
or [1] Appropriate work is shown, but one conceptual error is made.
or [1] 2016, but no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
-
- [30] [2] $y + 5 = \frac{2}{3}(x - 6)$ or an equivalent linear equation, and appropriate work is shown.
[1] Appropriate work is shown, but one computational error is made.
or [1] Appropriate work is shown, but one conceptual error is made.
or [1] $y + 5 = \frac{2}{3}(x - 6)$ or an equivalent linear equation, but no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
-
- [31] [2] 3, and appropriate work is shown.
[1] Appropriate work is shown, but one computational error is made.
or [1] Appropriate work is shown, but one conceptual error is made.
or [1] 3, but no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
-

- [2] A correct construction is drawn showing all appropriate arcs, and the angle bisector is drawn.
[1] All construction arcs are drawn, but the angle bisector line is not drawn.
or [1] Appropriate work is shown, but one construction error is made, such as not extending the sides of the original angle to show points of intersection of the arc.
[0] A drawing that is not an appropriate construction is shown.
or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
- [32] _____
- [2] 26, and appropriate work is shown.
[1] Appropriate work is shown, but one computational error is made.
or [1] Appropriate work is shown, but one conceptual error is made.
or [1] $x + 3x + 5x - 54 = 180$ or an equivalent equation, but no further correct work is shown.
or [1] 26, but no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
- [33] _____
- [2] \overline{AC} , and an appropriate justification is given, and appropriate work is shown, such as a correctly labeled diagram.
[1] Appropriate work is shown, but one computational error is made.
or [1] Appropriate work is shown, but one conceptual error is made.
or [1] All angle measures are identified correctly, but no further correct work is shown.
or [1] \overline{AC} , but no work is shown, and no justification is given.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
- [34] _____

- [4] $y + 2 = \frac{4}{3}(x - 3)$ or an equivalent linear equation, and appropriate work is shown.
[3] Appropriate work is shown, but one computational or graphing error is made.
or [3] The correct slope and midpoint of the segment and the slope of the perpendicular bisector are found, but no equation or an incorrect equation is written.
[2] Appropriate work is shown, but two or more computational or graphing errors are made.
or [2] Appropriate work is shown, but one conceptual error is made.
or [2] Appropriate work is shown to find the correct slope and midpoint of the segment, but no further correct work is shown.
or [2] Appropriate work is shown to find the slope of the original segment and the slope of the perpendicular bisector, but no further correct work is shown.
[1] Appropriate work is shown, but one conceptual error and one computational or graphing error are made.
or [1] Appropriate work is shown to find the correct slope or midpoint of the segment, but no further correct work is shown.
or [1] $y + 2 = \frac{4}{3}(x - 3)$ or an equivalent linear equation, but no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
- [35] _____

- [4] Both loci are drawn correctly, and the three points of intersection are labeled with an **X**.
- [3] Both loci are drawn correctly, but only two points of intersection are labeled.
or [3] Both loci are drawn, but one graphing error is made, but appropriate points of intersection are labeled.
- [2] Both loci are drawn correctly, but the points of intersection are not labeled or are labeled incorrectly.
or [2] Both loci are drawn, but two or more graphing errors are made, but appropriate points of intersection are labeled.
or [2] Both loci are drawn, but one conceptual error is made, but appropriate points of intersection are labeled.
- [1] One locus is drawn correctly, but no further correct work is shown.
or [1] **X**s are placed appropriately, but no loci are drawn.
- [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
- [36] incorrect procedure.

- [4] $D'(-1,1)$, $E'(-1,5)$, $G'(-4,5)$, $\triangle DEG$ and $\triangle D'E'G'$ are graphed and labeled correctly, and an appropriate justification is given, such as showing congruent segments or stating that all rotations preserve distance.
- [3] Appropriate work is shown, but one computational, graphing, or labeling error is made.
or [3] Appropriate work is shown, but no justification is given.
or [3] Appropriate work is shown, but the coordinates are not stated or are stated incorrectly.
- [2] Appropriate work is shown, but one computational, graphing, or labeling error is made, and no justification is given.
or [2] Appropriate work is shown, but two or more computational, graphing, or labeling errors are made.
or [2] Appropriate work is shown, but one conceptual error is made.
- [0] Both triangles are graphed and labeled correctly, but no further correct work is shown.
- [1] Appropriate work is shown, but one conceptual error and one computational, graphing, or labeling error are made.
or [1] Both triangles are graphed correctly, but no further correct work is shown.
or [1] $D'(-1,1)$, $E'(-1,5)$, $G'(-4,5)$, but no work is shown.
- [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
- [37] incorrect procedure.

[6] A complete and correct proof that includes a concluding statement is written.

[5] A proof is written that demonstrates a thorough understanding of the method of proof and contains no conceptual errors, but one statement or reason is missing or is incorrect.

[4] A proof is written that demonstrates a good understanding of the method of proof and contains no conceptual errors, but two statements or reasons are missing or are incorrect.

[3] A proof is written that demonstrates a good understanding of the method of proof, but one conceptual error is made.

or [3] $\triangle AFB \cong \triangle CED$ is proven, but no further correct work is shown.

[2] A proof is written that demonstrates a method of proof, but one conceptual error is made, and one statement or reason is missing or is incorrect.

or [2] Some correct relevant statements about the proof are made, but three or four statements or reasons are missing or are incorrect.

[1] Only one correct relevant statement and reason are written.

[0] The "given" and/or the "prove" statements are rewritten in the style of a formal proof, but no further correct relevant statements are written.

or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an

[38] obviously incorrect procedure.