JEFFERSON MATH PROJECT
REGENTS BY TOPIC

NY Geometry Regents Exam Questions
from Fall 2008 to January 2010 Sorted by Topic

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Dear Sir

I have to acknolege the reciept of your favor of May 14. in which you mention that you have finished the 6. first books of Euclid, plane trigonometry, surveying & algebra and ask whether I think a further pursuit of that branch of science would be useful to you. there are some propositions in the latter books of Euclid, & some of Archimedes, which are useful, & I have no doubt you have been made acquainted with them. trigonometry, so far as this, is most valuable to every man, there is scarcely a day in which he will not resort to it for some of the purposes of common life. the science of calculation also is indispensible as far as the extraction of the square & cube roots; Algebra as far as the quadratic equation & the use of logarithms are often of value in ordinary cases: but all beyond these is but a luxury; a delicious luxury indeed; but not to be indulged in by one who is to have a profession to follow for his subsistence. in this light I view the conic sections, curves of the higher orders, perhaps even spherical trigonometry, Algebraical operations beyond the 2d dimension, and fluxions.

Letter from Thomas Jefferson to William G. Munford, Monticello, June 18, 1799.

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Geometry Regents Exam Questions by Performance Indicator: Topic

<u>G.G.62: PARALLEL AND PERPENDICULAR LINES</u>

1 What is the slope of a line perpendicular to the line whose equation is $y = -\frac{2}{3}x - 5$?

1   $-\frac{3}{2}$

2   $-\frac{2}{3}$

3   $\frac{2}{3}$

4   $\frac{3}{2}$

2 What is the slope of a line perpendicular to the line whose equation is $5x + 3y = 8$?

1   $\frac{5}{3}$

2   $\frac{3}{5}$

3   $-\frac{3}{5}$

4   $-\frac{5}{3}$

3 What is the slope of a line that is perpendicular to the line whose equation is $3x + 4y = 12$?

1   $\frac{3}{4}$

2   $-\frac{3}{4}$

3   $\frac{4}{3}$

4   $-\frac{4}{3}$

<u>G.G.63: PARALLEL AND PERPENDICULAR LINES</u>

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

1   $x + y = 5$
2   $2x + y = -2$
3   $y - x = -1$
4   $y - 2x = 3$

5 Which equation represents a line parallel to the line whose equation is $2y - 5x = 10$?

1   $5y - 2x = 25$
2   $5y + 2x = 10$
3   $4y - 10x = 12$
4   $2y + 10x = 8$

6 Which equation represents a line perpendicular to the line whose equation is $2x + 3y = 12$?

1   $6y = -4x + 12$
2   $2y = 3x + 6$
3   $2y = -3x + 6$
4   $3y = -2x + 12$

7 The lines $3y + 1 = 6x + 4$ and $2y + 1 = x - 9$ are

1   parallel
2   perpendicular
3   the same line
4   neither parallel nor perpendicular

<u>G.G.64: PARALLEL AND PERPENDICULAR LINES</u>

8 What is an equation of the line that passes through the point $(-2, 5)$ and is perpendicular to the line whose equation is $y = \frac{1}{2}x + 5$?

1   $y = 2x + 1$
2   $y = -2x + 1$
3   $y = 2x + 9$
4   $y = -2x - 9$

1

9 What is an equation of the line that contains the point $(3,-1)$ and is perpendicular to the line whose equation is $y = -3x + 2$?

1 $y = -3x + 8$

2 $y = -3x$

3 $y = \dfrac{1}{3}x$

4 $y = \dfrac{1}{3}x - 2$

G.G.65: PARALLEL AND PERPENDICULAR LINES

10 What is the equation of a line that passes through the point $(-3, -11)$ and is parallel to the line whose equation is $2x - y = 4$?

1 $y = 2x + 5$

2 $y = 2x - 5$

3 $y = \dfrac{1}{2}x + \dfrac{25}{2}$

4 $y = -\dfrac{1}{2}x - \dfrac{25}{2}$

11 Find an equation of the line passing through the point $(5,4)$ and parallel to the line whose equation is $2x + y = 3$.

12 Write an equation of the line that passes through the point $(6,-5)$ and is parallel to the line whose equation is $2x - 3y = 11$.

G.G.68: PERPENDICULAR BISECTOR

13 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]
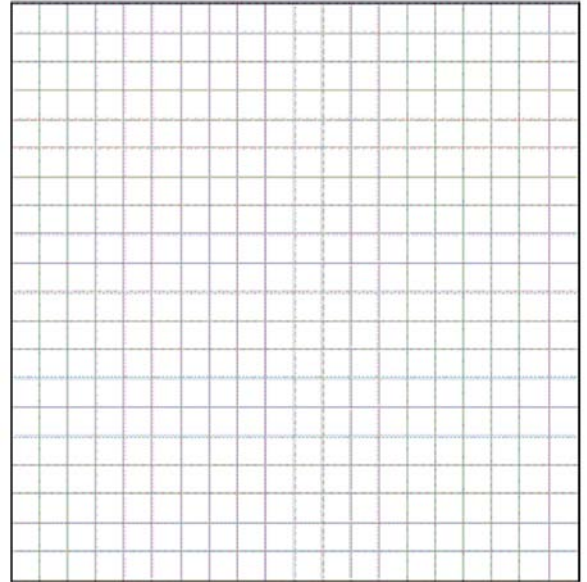
G.G.70: QUADRATIC-LINEAR SYSTEMS

14 Given the system of equations:

$$y = x^2 - 4x$$

$$x = 4$$

The number of points of intersection is

1 1

2 2

3 3

4 0

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

$$y + x = 4$$
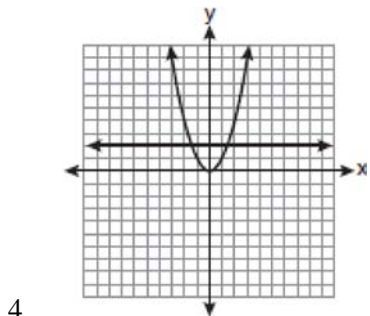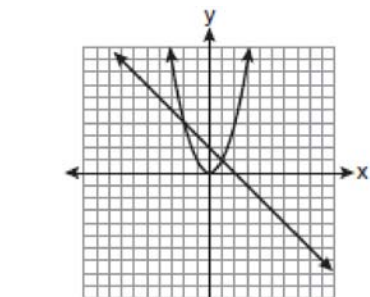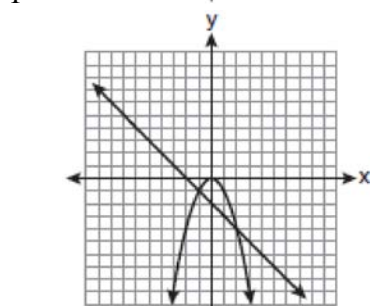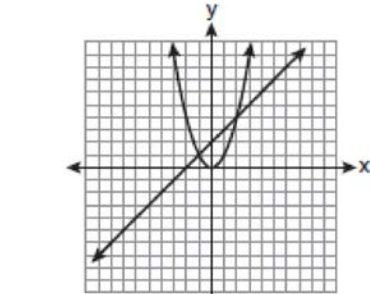
What is the solution to the given system of equations?

1 $(2,3)$

2 $(3,2)$

3 $(2,2)$ and $(1,3)$

4 $(2,2)$ and $(3,1)$

2

16 Which graph could be used to find the solution to the following system of equations?
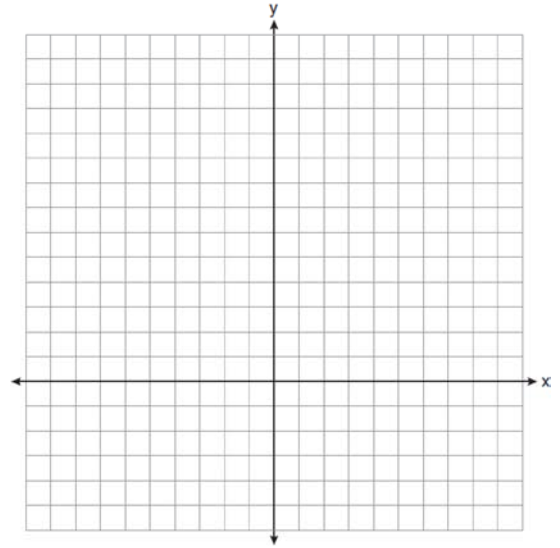
$$y = -x + 2$$

$$y = x^2$$

1

2

3

4

17 On the set of axes below, solve the following system of equations graphically for all values of x and y.

$$y = (x - 2)^2 + 4$$

$$4x + 2y = 14$$

G.G.66: MIDPOINT
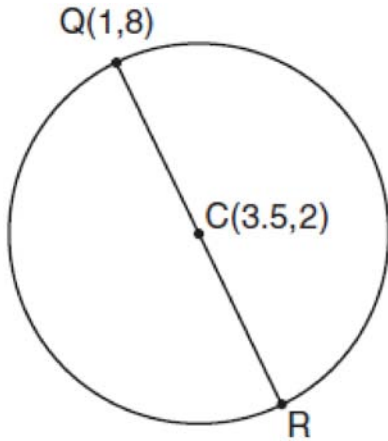
18 The endpoints of $\overline{CD}$ are $C(-2, -4)$ and $D(6, 2)$. What are the coordinates of the midpoint of $\overline{CD}$?

1 $(2, 3)$
2 $(2, -1)$
3 $(4, -2)$
4 $(4, 3)$

19 Line segment AB has endpoints $A(2, -3)$ and $B(-4, 6)$. What are the coordinates of the midpoint of $\overline{AB}$?

1 $(-2, 3)$
2 $\left(-1, 1\frac{1}{2}\right)$
3 $(-1, 3)$
4 $\left(3, 4\frac{1}{2}\right)$

3

20 In the diagram below of circle C, $\overline{QR}$ is a diameter, and $Q(1,8)$ and $C(3.5,2)$ are points on a coordinate plane. Find and state the coordinates of point R.

Q(1,8)

C(3.5,2)

R

21 Square $LMNO$ is shown in the diagram below.

y

O   N

L   M   x
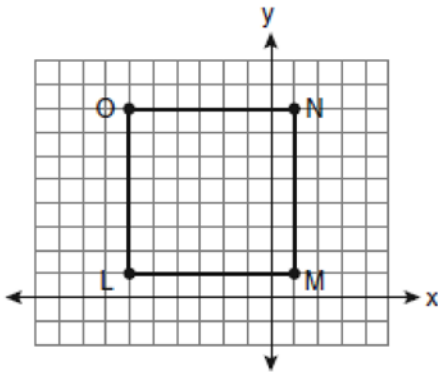
What are the coordinates of the midpoint of diagonal $\overline{LN}$?

1 $\left(4\frac{1}{2}, -2\frac{1}{2}\right)$

2 $\left(-3\frac{1}{2}, 3\frac{1}{2}\right)$

3 $\left(-2\frac{1}{2}, 3\frac{1}{2}\right)$

4 $\left(-2\frac{1}{2}, 4\frac{1}{2}\right)$

G.G.67: DISTANCE

22 What is the distance between the points $(-3,2)$ and $(1,0)$?

1 $2\sqrt{2}$

2 $2\sqrt{3}$

3 $5\sqrt{2}$

4 $2\sqrt{5}$

23 If the endpoints of $\overline{AB}$ are $A(-4,5)$ and $B(2,-5)$, what is the length of $\overline{AB}$?

1 $2\sqrt{34}$

2 2

3 $\sqrt{61}$

4 8

24 The endpoints of $\overline{PQ}$ are $P(-3,1)$ and $Q(4,25)$. Find the length of $\overline{PQ}$.

G.G.1: PLANES

25 Lines k_1 and k_2 intersect at point E. Line m is perpendicular to lines k_1 and k_2 at point E.
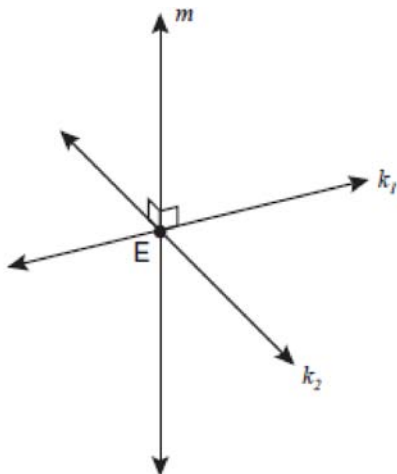
Which statement is always true?
1   Lines k_1 and k_2 are perpendicular.
2   Line m is parallel to the plane determined by lines k_1 and k_2.
3   Line m is perpendicular to the plane determined by lines k_1 and k_2.
4   Line m is coplanar with lines k_1 and k_2.

26 Lines j and k intersect at point P. Line m is drawn so that it is perpendicular to lines j and k at point P. Which statement is correct?
1   Lines j and k are in perpendicular planes.
2   Line m is in the same plane as lines j and k.
3   Line m is parallel to the plane containing lines j and k.
4   Line m is perpendicular to the plane containing lines j and k.

G.G.2: PLANES

27 Point P is on line m. What is the total number of planes that are perpendicular to line m and pass through point P?
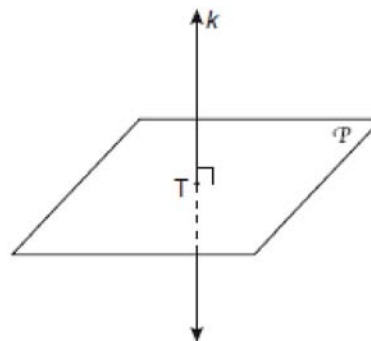1   1
2   2
3   0
4   infinite

G.G.3: PLANES

28 Through a given point, P, on a plane, how many lines can be drawn that are perpendicular to that plane?
1   1
2   2
3   more than 2
4   none

G.G.4: PLANES

29 If two different lines are perpendicular to the same plane, they are
1   collinear
2   coplanar
3   congruent
4   consecutive

G.G.7: PLANES

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

Which statement is true?
1   Any point in plane $\mathcal{P}$ also will be on line k.
2   Only one line in plane $\mathcal{P}$ will intersect line k.
3   All planes that intersect plane $\mathcal{P}$ will pass through T.
4   Any plane containing line k is perpendicular to plane $\mathcal{P}$.

31 In three-dimensional space, two planes are parallel
    and a third plane intersects both of the parallel
    planes. The intersection of the planes is a
    1   plane
    2   point
    3   pair of parallel lines
    4   pair of intersecting lines

G.G.9: PLANES

32 Line k is drawn so that it is perpendicular to two
    distinct planes, P and R. What must be true about
    planes P and R?
    1   Planes P and R are skew.
    2   Planes P and R are parallel.
    3   Planes P and R are perpendicular.
    4   Plane P intersects plane R but is not
        perpendicular to plane R.

G.G.10: SOLIDS

33 The figure in the diagram below is a triangular
    prism.
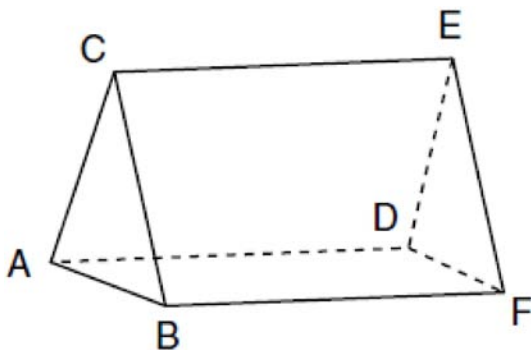
    Which statement must be true?
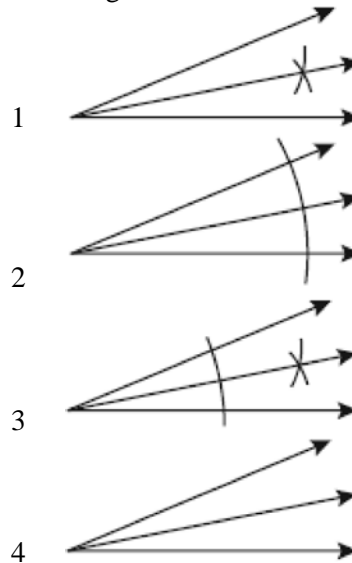   1 $\overline{DE} \cong \overline{AB}$
    2   $\overline{AD} \cong \overline{BC}$
    3   $\overline{AD} \parallel \overline{CE}$
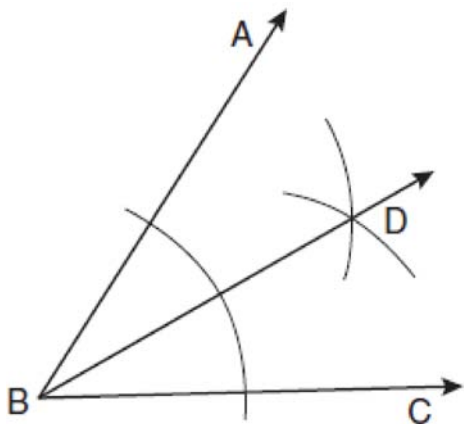   4 $\overline{DE} \parallel \overline{BC}$

G.G.13: SOLIDS

34 The lateral faces of a regular pyramid are
    composed of
    1   squares
    2   rectangles
    3   congruent right triangles
    4   congruent isosceles triangles

G.G.17: CONSTRUCTIONS

35 Which illustration shows the correct construction
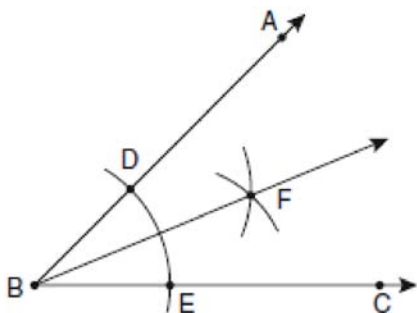   of an angle bisector?

36 Based on the construction below, which statement must be true?

1 $m\angle ABD = \frac{1}{2}m\angle CBD$

2 $m\angle ABD = m\angle CBD$

3 $m\angle ABD = m\angle ABC$
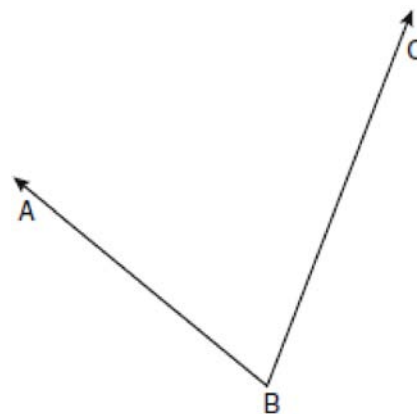
4 $m\angle CBD = \frac{1}{2}m\angle ABD$

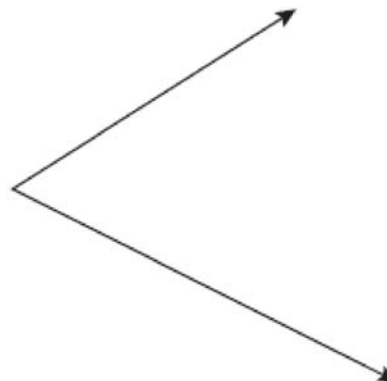37 The diagram below shows the construction of the bisector of $\angle ABC$.

Which statement is *not* true?

1 $m\angle EBF = \frac{1}{2}m\angle ABC$

2 $m\angle DBF = \frac{1}{2}m\angle ABC$

3 $m\angle EBF = m\angle ABC$

4 $m\angle DBF = m\angle EBF$

38 Using a compass and straightedge, construct the angle bisector of $\angle ABC$ shown below. [Leave all construction marks.]
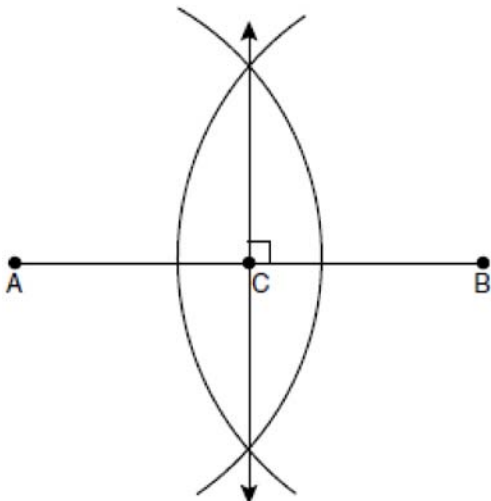

39 Using a compass and straightedge, construct the bisector of the angle shown below. [*Leave all construction marks*.]

G.G.18: CONSTRUCTIONS

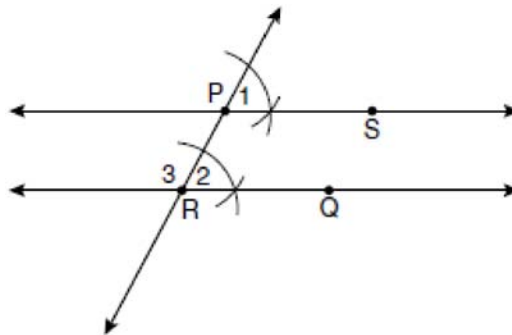40 The diagram below shows the construction of the perpendicular bisector of $\overline{AB}$.

Which statement is *not* true?
1 $AC = CB$
2 $CB = \dfrac{1}{2}AB$
3 $AC = 2AB$
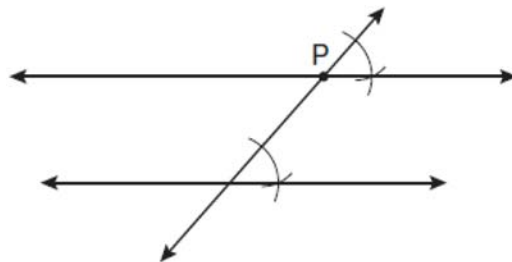4 $AC + CB = AB$

G.G.19: CONSTRUCTIONS

41 The diagram below illustrates the construction of $\overleftrightarrow{PS}$ parallel to $\overleftrightarrow{RQ}$ through point P.


Which statement justifies this construction?
1 $m\angle 1 = m\angle 2$
2 $m\angle 1 = m\angle 3$
3 $\overline{PR} \cong \overline{RQ}$
4 $\overline{PS} \cong \overline{RQ}$

42 Which geometric principle is used to justify the construction below?

1 A line perpendicular to one of two parallel lines is perpendicular to the other.
2 Two lines are perpendicular if they intersect to form congruent adjacent angles.
3 When two lines are intersected by a transversal and alternate interior angles are congruent, the lines are parallel.
4 When two lines are intersected by a transversal and the corresponding angles are congruent, the lines are parallel.

8

43 Using a compass and straightedge, construct a line that passes through point *P* and is perpendicular to line *m*. [Leave all construction marks.]

. P

← m
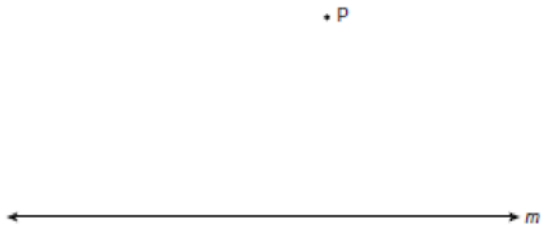
G.G.20: CONSTRUCTIONS

44 Using a compass and straightedge, and $\overline{AB}$ below, construct an equilateral triangle with all sides congruent to $\overline{AB}$. [Leave all construction marks.]

A ———————————————— B

G.G.22: LOCUS

45 Towns *A* and *B* are 16 miles apart. How many points are 10 miles from town *A* and 12 miles from town *B*?
1 1
2 2
3 3
4 0

46 The length of $\overline{AB}$ is 3 inches. On the diagram below, sketch the points that are equidistant from *A* and *B* and sketch the points that are 2 inches from A. Label with an **X** all points that satisfy both conditions.
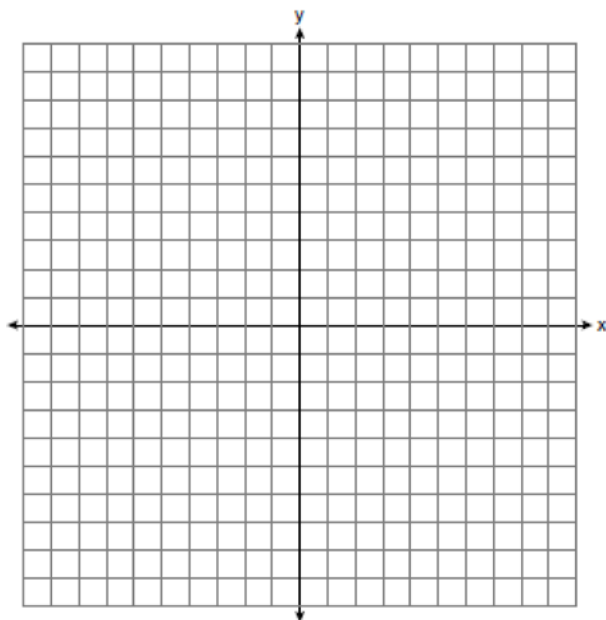
A •———————————————————• B

G.G.23: LOCUS

47 In a coordinate plane, how many points are both 5 units from the origin and 2 units from the *x*-axis?
1   1
2   2
3   3
4   4

48 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.

49 On the grid below, graph the points that are equidistant from both the *x* and *y* axes and the points that are 5 units from the origin. Label with an **X** all points that satisfy both conditions.
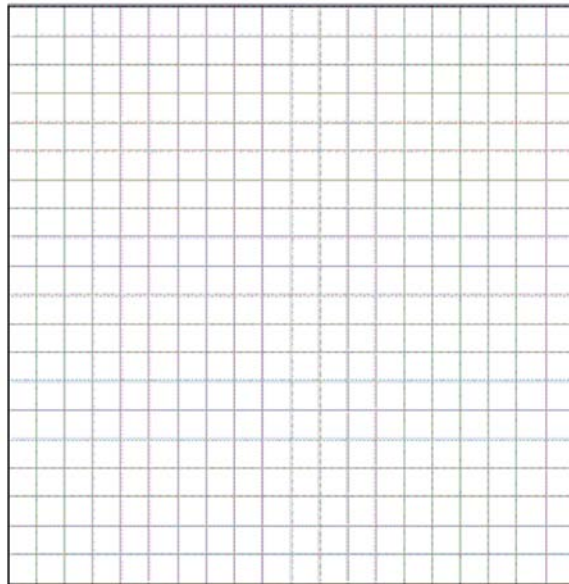
50 A city is planning to build a new park. The park must be equidistant from school A at $(3,3)$ and school B at $(3,-5)$. The park also must be exactly 5 miles from the center of town, which is located at the origin on the coordinate graph. Each unit on the graph represents 1 mile. On the set of axes below, sketch the compound loci and label with an **X** all possible locations for the new park.
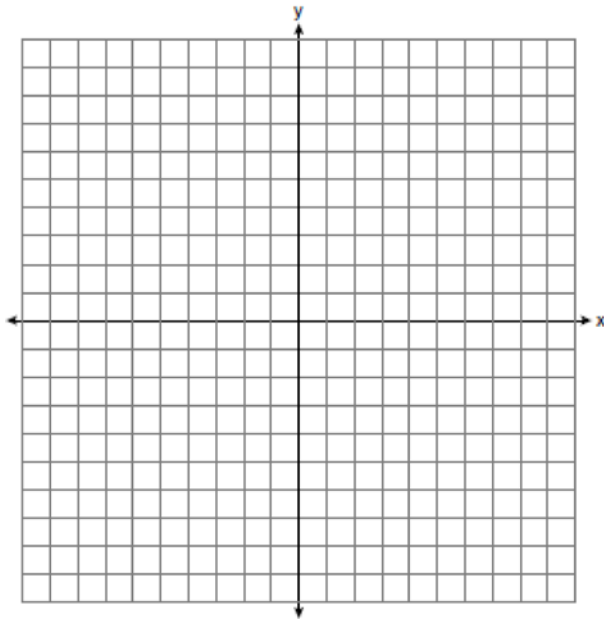
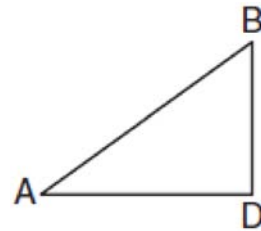### G.G.35: PARALLEL LINES & TRANSVERSALS

51 Based on the diagram below, which statement is true?
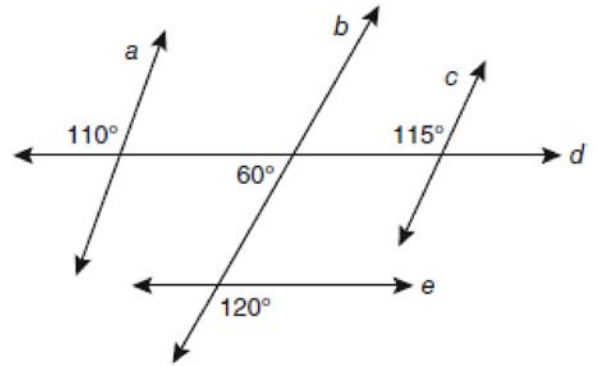
1   $a \parallel b$
2   $a \parallel c$
3   $b \parallel c$
4   $d \parallel e$

G.G.48: PYTHAGOREAN THEOREM

52 In the diagram below of $\triangle ADB$, $m\angle BDA = 90$, $AD = 5\sqrt{2}$, and $AB = 2\sqrt{15}$.


What is the length of $\overline{BD}$?
1   $\sqrt{10}$
2   $\sqrt{20}$
3   $\sqrt{50}$
4   $\sqrt{110}$

11

G.G.30: INTERIOR AND EXTERIOR ANGLES OF TRIANGLES

53 Juliann plans on drawing $\triangle ABC$, where the measure of $\angle A$ can range from $50°$ to $60°$ and the measure of $\angle B$ can range from $90°$ to $100°$. Given these conditions, what is the correct range of measures possible for $\angle C$?
    1   $20°$ to $40°$
    2   $30°$ to $50°$
    3   $80°$ to $90°$
    4   $120°$ to $130°$

54 In an equilateral triangle, what is the difference between the sum of the exterior angles and the sum of the interior angles?
    1   $180°$
    2   $120°$
    3   $90°$
    4   $60°$

55 In $\triangle ABC$, $m\angle A = x$, $m\angle B = 2x + 2$, and $m\angle C = 3x + 4$. What is the value of x?
    1   29
    2   31
    3   59
    4   61

56 The degree measures of the angles of $\triangle ABC$ are represented by x, $3x$, and $5x - 54$. Find the value of x.

G.G.31: ISOSCELES TRIANGLE THEOREM

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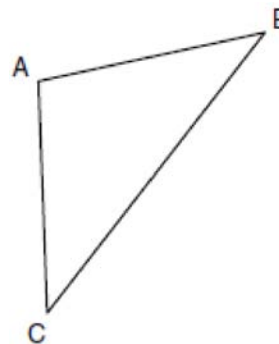

What is the measure of $\angle A$?
    1   $40°$
    2   $50°$
    3   $70°$
    4   $100°$

58 In $\triangle ABC$, $\overline{AB} \cong \overline{BC}$. An altitude is drawn from B to $\overline{AC}$ and intersects $\overline{AC}$ at D. Which conclusion is *not* always true?
    1   $\angle ABD \cong \angle CBD$
    2   $\angle BDA \cong \angle BDC$
    3   $\overline{AD} \cong \overline{BD}$
    4   $\overline{AD} \cong \overline{DC}$

59 In $\triangle RST$, $m\angle RST = 46$ and $\overline{RS} \cong \overline{ST}$. Find $m\angle STR$.

G.G.32: EXTERIOR ANGLE THEOREM

60 Side $\overline{PQ}$ of $\triangle PQR$ is extended through Q to point T. Which statement is *not* always true?
    1   $m\angle RQT > m\angle R$
    2   $m\angle RQT > m\angle P$
    3   $m\angle RQT = m\angle P + m\angle R$
    4   $m\angle RQT > m\angle PQR$

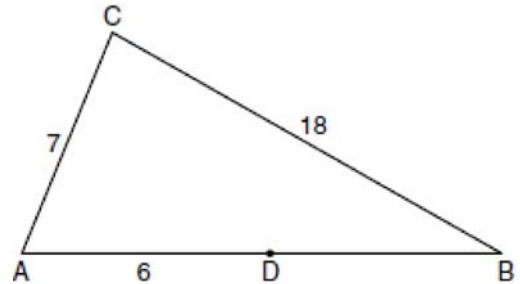61 In the diagram below, $\triangle ABC$ is shown with $\overline{AC}$ extended through point D.
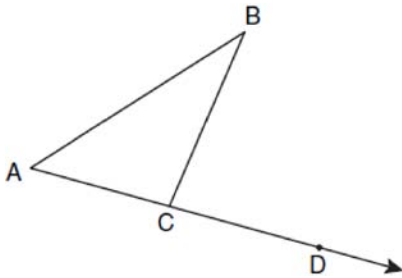
If $m\angle BCD = 6x + 2$, $m\angle BAC = 3x + 15$, and $m\angle ABC = 2x - 1$, what is the value of x?
1   12
2   $14\dfrac{10}{11}$
3   16
4   $18\dfrac{1}{9}$

G.G.33: TRIANGLE INEQUALITY THEOREM

62 Which set of numbers represents the lengths of the sides of a triangle?
1   $\{5, 18, 13\}$
2   $\{6, 17, 22\}$
3   $\{16, 24, 7\}$
4   $\{26, 8, 15\}$

63 In the diagram below of $\triangle ABC$, D is a point on $\overline{AB}$, $AC = 7$, $AD = 6$, and $BC = 18$.
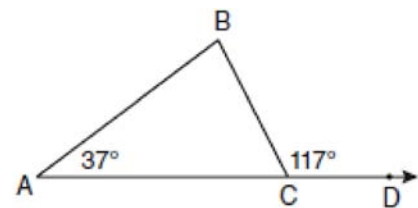

(Not drawn to scale)

The length of $\overline{DB}$ could be
1   5
2   12
3   19
4   25

G.G.34: ANGLE SIDE RELATIONSHIP

64 In $\triangle ABC$, $m\angle A = 95$, $m\angle B = 50$, and $m\angle C = 35$. Which expression correctly relates the lengths of the sides of this triangle?
1   $AB < BC < CA$
2   $AB < AC < BC$
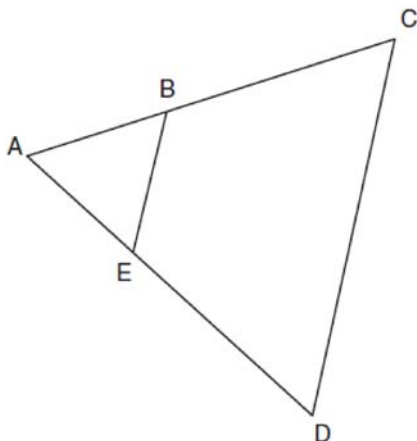3 $AC < BC < AB$
4   $BC < AC < AB$

65 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)

13

G.G.46: SIDE SPLITTER THEOREM

66 In the diagram below of $\triangle ACD$, E is a point on $\overline{AD}$ and B is a point on $\overline{AC}$, such that $\overline{EB} \parallel \overline{DC}$. If $AE = 3$, $ED = 6$, and $DC = 15$, find the length of $\overline{EB}$.

67 In $\triangle ABC$, point D is on $\overline{AB}$, and point E is on $\overline{BC}$ such that $\overline{DE} \parallel \overline{AC}$. If $DB = 2$, $DA = 7$, and $DE = 3$, what is the length of $\overline{AC}$?
1   8
2   9
3   10.5
4   13.5

G.G.42: MIDSEGMENTS

68 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 $\overline{CT}$.
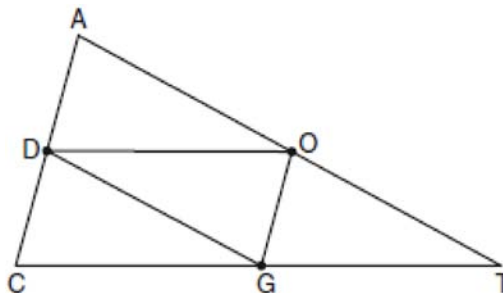
If $AC = 10$, $AT = 18$, and $CT = 22$, what is the perimeter of parallelogram $CDOG$?
1   21
2   25
3   32
4   40

69 On the set of axes below, graph and label $\triangle DEF$ with vertices at $D(-4,-4)$, $E(-2,2)$, and $F(8,-2)$. If G is the midpoint of $\overline{EF}$ and H is the midpoint of $\overline{DF}$, state the coordinates of G and H and label each point on your graph. Explain why $\overline{GH} \parallel \overline{DE}$.
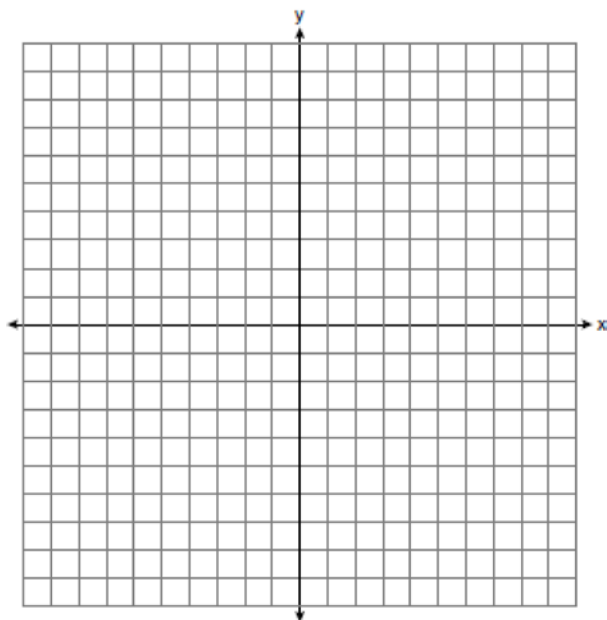
70 In the diagram of $\triangle ABC$ below, $AB = 10$, $BC = 14$, and $AC = 16$. Find the perimeter of the triangle formed by connecting the midpoints of the sides of $\triangle ABC$.
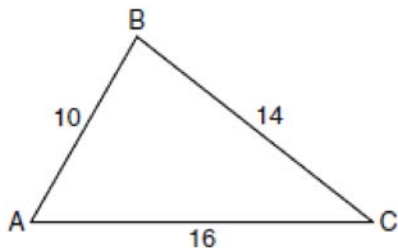
G.G.21: CENTROID, ORTHOCENTER, INCENTER AND CIRCUMCENTER

71 In which triangle do the three altitudes intersect outside the triangle?
1   a right triangle
2   an acute triangle
3   an obtuse triangle
4   an equilateral triangle

72 The diagram below shows the construction of the center of the circle circumscribed about $\triangle ABC$.
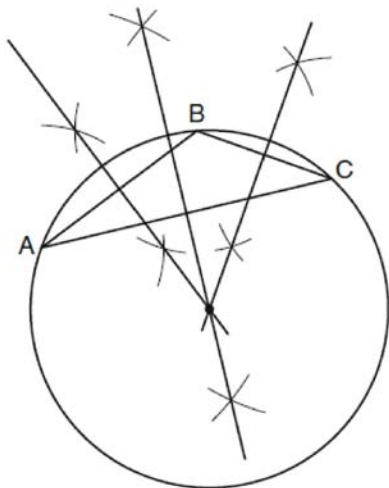
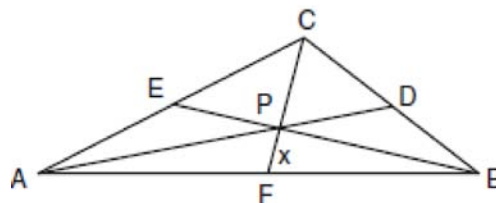This construction represents how to find the intersection of
1   the angle bisectors of $\triangle ABC$
2   the medians to the sides of $\triangle ABC$
3   the altitudes to the sides of $\triangle ABC$
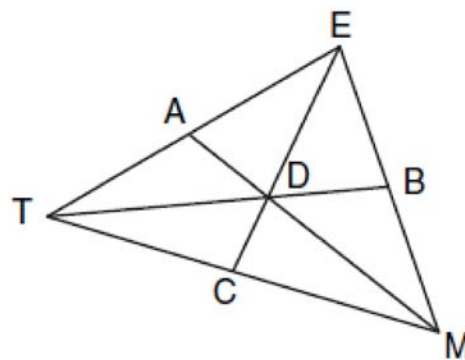4   the perpendicular bisectors of the sides of $\triangle ABC$

G.G.43: CENTROID

73 In the diagram of $\triangle ABC$ below, Jose found centroid P by constructing the three medians. He measured $\overline{CF}$ and found it to be 6 inches.


If $PF = x$, which equation can be used to find x?
1   $x + x = 6$
2   $2x + x = 6$
3   $3x + 2x = 6$
4   $x + \dfrac{2}{3}x = 6$

74 In the diagram below of $\triangle TEM$, medians $\overline{TB}$, $\overline{EC}$, and $\overline{MA}$ intersect at D, and $TB = 9$. Find the length of $\overline{TD}$.


G.G.69: TRIANGLES IN THE COORDINATE PLANE

75 The vertices of $\triangle ABC$ are $A(-1,-2)$, $B(-1,2)$ and $C(6,0)$. Which conclusion can be made about the angles of $\triangle ABC$?
1   $m\angle A = m\angle B$
2   $m\angle A = m\angle C$
3   $m\angle ACB = 90$
4   $m\angle ABC = 60$

15

76 Triangle *ABC* has coordinates $A(-6,2)$, $B(-3,6)$, and $C(5,0)$. Find the perimeter of the triangle. Express your answer in simplest radical form. [The use of the grid below is optional.]
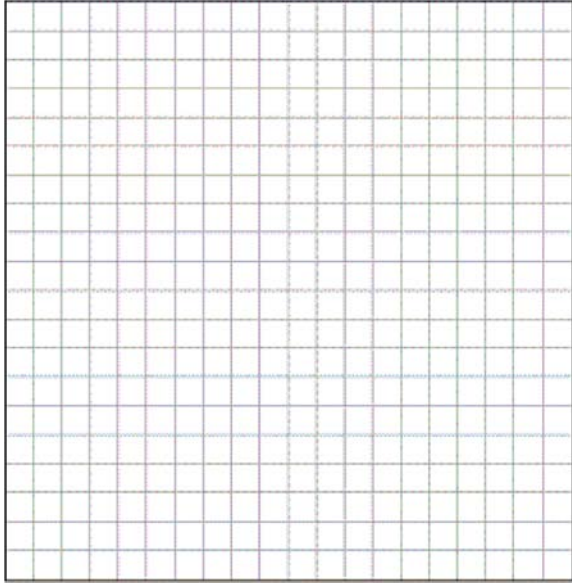
G.G.36: INTERIOR AND EXTERIOR ANGLES OF POLYGONS

77 The pentagon in the diagram below is formed by five rays.
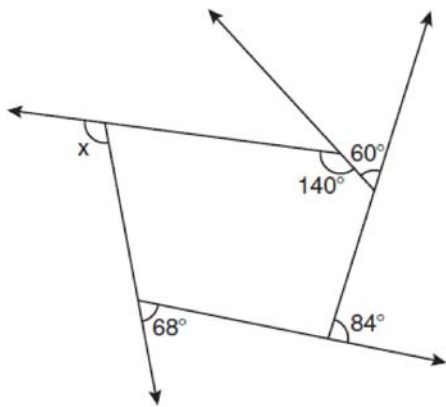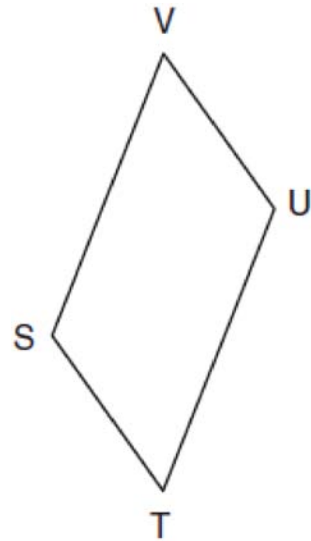

What is the degree measure of angle *x*?
1   72
2   96
3   108
4   112

G.G.37: INTERIOR AND EXTERIOR ANGLES OF POLYGONS

78 What is the measure of an interior angle of a regular octagon?
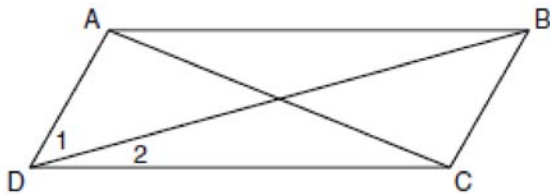1   45°
2   60°
3   120°
4   135°

G.G.38: PARALLELOGRAMS

79 In the diagram below of parallelogram *STUV*, $SV = x + 3$, $VU = 2x - 1$, and $TU = 4x - 3$.

What is the length of $\overline{SV}$?
1   5
2   2
3   7
4   4

16

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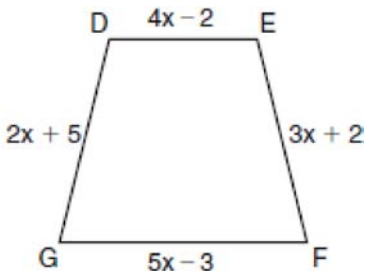

What is the measure of $\angle 2$?
1   15°
2   30°
3   45°
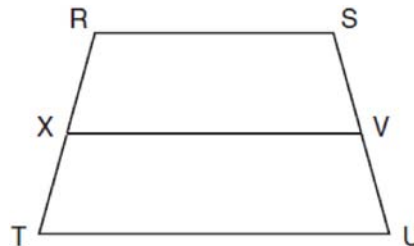4   60°

G.G.40: TRAPEZOIDS

81 Isosceles trapezoid $ABCD$ has diagonals $\overline{AC}$ and $\overline{BD}$. If $AC = 5x + 13$ and $BD = 11x - 5$, what is the value of x?
1   28
2   $10\frac{3}{4}$
3   3
4   $\frac{1}{2}$

82 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.

83 In the diagram below of trapezoid $RSUT$, $\overline{RS} \parallel \overline{TU}$, X is the midpoint of $\overline{RT}$, and V is the midpoint of $\overline{SU}$.

If $RS = 30$ and $XV = 44$, what is the length of $\overline{TU}$?
1   37
2   58
3   74
4   118

G.G.41: SPECIAL QUADRILATERALS

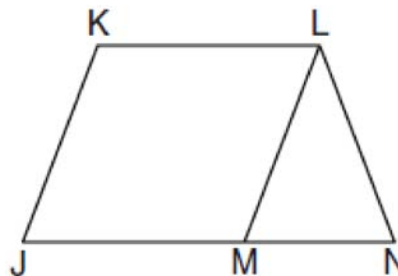84 A quadrilateral whose diagonals bisect each other and are perpendicular is a
1   rhombus
2   rectangle
3   trapezoid
4   parallelogram

85 Given: $JKLM$ is a parallelogram.
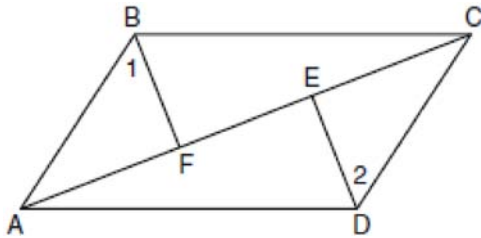$\overline{JM} \cong \overline{LN}$
$\angle LMN \cong \angle LNM$
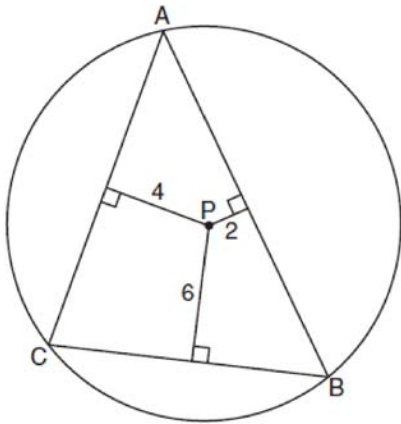Prove: $JKLM$ is a rhombus.

17

86 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.

G.G.49: CHORDS

87 In the diagram below, $\triangle ABC$ is inscribed in circle
P. The distances from the center of circle P to each
side of the triangle are shown.

Which statement about the sides of the triangle is
true?
1   $AB > AC > BC$
2   $AB < AC$ and $AC > BC$
3   $AC > AB > BC$
4   $AC = AB$ and $AB > BC$

88 In the diagram below, circle O has a radius of 5,
and $CE = 2$. Diameter $\overline{AC}$ is perpendicular to
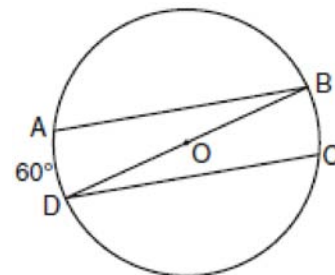chord $\overline{BD}$ at E.
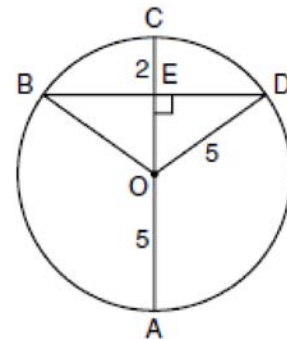
What is the length of $\overline{BD}$?
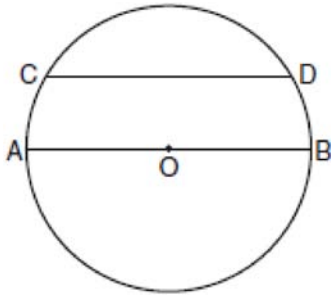1   12
2   10
3   8
4   4

G.G.52: CHORDS

89 In the diagram of circle O below, chords $\overline{AB}$ and
$\overline{CD}$ are parallel, and $\overline{BD}$ is a diameter of the circle.

If $m\overarc{AD} = 60$, what is $m\angle CDB$?
1   20
2   30
3   60
4   120

90 In the diagram of circle O below, chord $\overline{CD}$ is parallel to diameter $\overline{AOB}$ and $m\overset{\frown}{AC} = 30$.
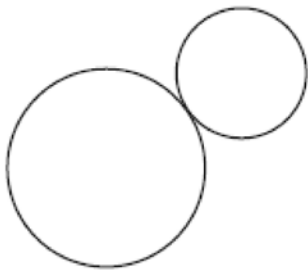
What is $m\overset{\frown}{CD}$?
1   150
2   120
3   100
4   60
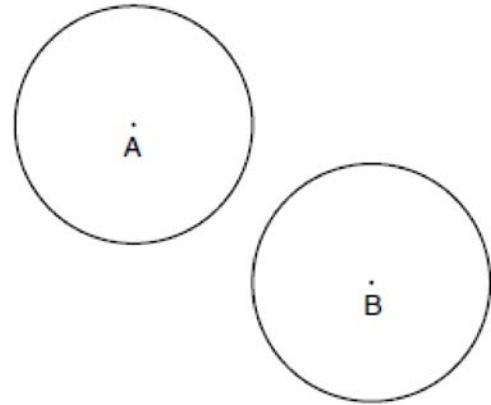
G.G.50: TANGENTS

91 How many common tangent lines can be drawn to the two externally tangent circles shown below?
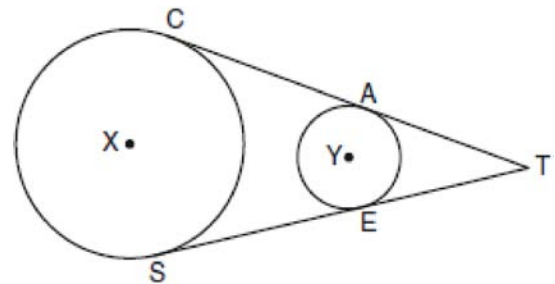
1   1
2   2
3   3
4   4

92 In the diagram below, circle A and circle B are shown.

What is the total number of lines of tangency that are common to circle A and circle B?
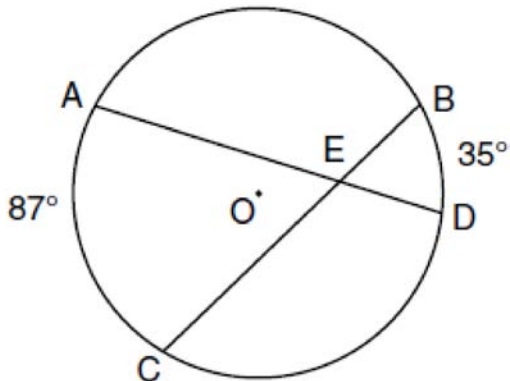1   1
2   2
3   3
4   4

93 In the diagram below, circles X and Y have two tangents drawn to them from external point T. The points of tangency are C, A, S, and E. The ratio of TA to AC is $1:3$. If $TS = 24$, find the length of $\overline{SE}$.

(Not drawn to scale)

G.G.51: ARCS DETERMINED BY ANGLES

94   In the diagram below of circle O, chords $\overline{AD}$ and $\overline{BC}$ intersect at E, $m\overset{\frown}{AC} = 87$, and $m\overset{\frown}{BD} = 35$.


What is the degree measure of $\angle CEA$?

1   87
2   61
3   43.5
4   26

95   In the diagram below of circle O, chords $\overline{DF}$, $\overline{DE}$, $\overline{FG}$, and $\overline{EG}$ are drawn such that $m\overset{\frown}{DF}:m\overset{\frown}{FE}:m\overset{\frown}{EG}:m\overset{\frown}{GD} = 5:2:1:7$. Identify one pair of inscribed angles that are congruent to each other and give their measure.
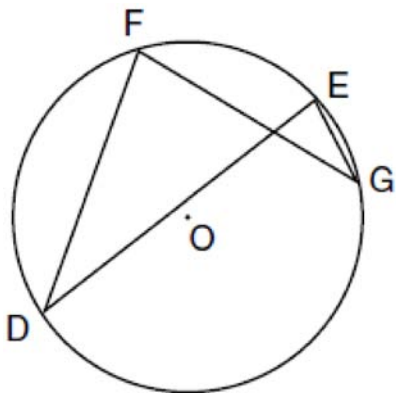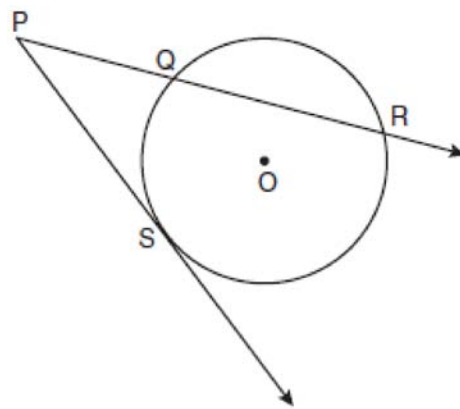

G.G.53: SEGMENTS INTERCEPTED BY CIRCLE

96   In the diagram below, tangent $\overline{PA}$ and secant $\overline{PBC}$ are drawn to circle O from external point P.
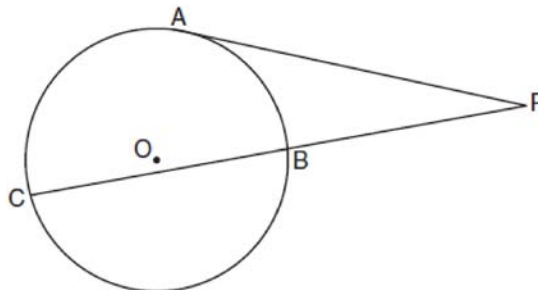
If $PB = 4$ and $BC = 5$, what is the length of $\overline{PA}$?

1   20
2   9
3   8
4   6

97   In the diagram below, $\overline{PS}$ is a tangent to circle O at point S, $\overline{PQR}$ is a secant, $PS = x$, $PQ = 3$, and $PR = x + 18$.
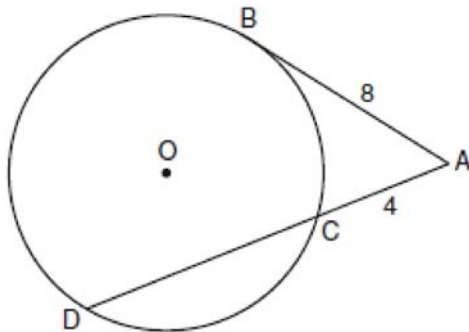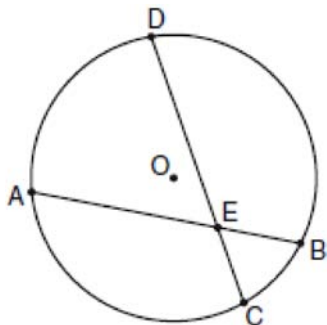

(Not drawn to scale)

What is the length of $\overline{PS}$?

1   6
2   9
3   3
4   27

20

98 In the diagram below, tangent $\overline{AB}$ and secant $\overline{ACD}$ are drawn to circle O from an external point A, $AB = 8$, and $AC = 4$.

What is the length of $\overline{CD}$?
1   16
2   13
3   12
4   10

99 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?
1   1
2   3.6
3   5
4   10.25

G.G.73: EQUATIONS OF CIRCLES

100 What are the center and radius of a circle whose equation is $(x - A)^2 + (y - B)^2 = C$?
1   center = (A, B); radius = C
2   center = $(-A, -B)$; radius = C
3   center = (A, B); radius = $\sqrt{C}$
4   center = $(-A, -B)$; radius = $\sqrt{C}$

101 What are the center and the radius of the circle whose equation is $(x - 3)^2 + (y + 3)^2 = 36$
1   center = $(3, -3)$; radius = 6
2   center = $(-3, 3)$; radius = 6
3   center = $(3, -3)$; radius = 36
4   center = $(-3, 3)$; radius = 36

102 A circle is represented by the equation $x^2 + (y + 3)^2 = 13$. What are the coordinates of the center of the circle and the length of the radius?
1   $(0, 3)$ and 13
2   $(0, 3)$ and $\sqrt{13}$
3   $(0, -3)$ and 13
4   $(0, -3)$ and $\sqrt{13}$

G.G.71: EQUATIONS OF CIRCLES

103 What is an equation of a circle with its center at $(-3, 5)$ and a radius of 4?
1   $(x - 3)^2 + (y + 5)^2 = 16$
2   $(x + 3)^2 + (y - 5)^2 = 16$
3   $(x - 3)^2 + (y + 5)^2 = 4$
4   $(x + 3)^2 + (y - 5)^2 = 4$

104 Which equation represents the circle whose center is $(-2, 3)$ and whose radius is 5?
1   $(x - 2)^2 + (y + 3)^2 = 5$
2   $(x + 2)^2 + (y - 3)^2 = 5$
3   $(x + 2)^2 + (y - 3)^2 = 25$
4   $(x - 2)^2 + (y + 3)^2 = 25$

105 The diameter of a circle has endpoints at $(-2,3)$ and $(6,3)$. What is an equation of the circle?

1 $(x-2)^2 + (y-3)^2 = 16$

2 $(x-2)^2 + (y-3)^2 = 4$

3 $(x+2)^2 + (y+3)^2 = 16$

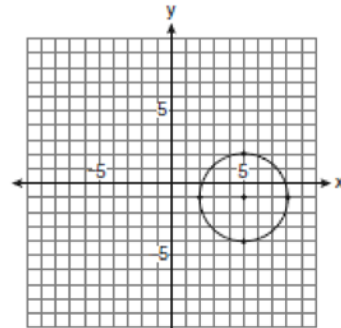4 $(x+2)^2 + (y+3)^2 = 4$

G.G.72: EQUATIONS OF CIRCLES

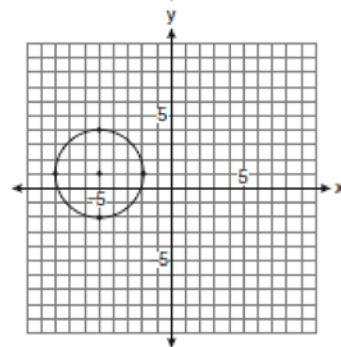106 Which equation represents circle K shown in the graph below?
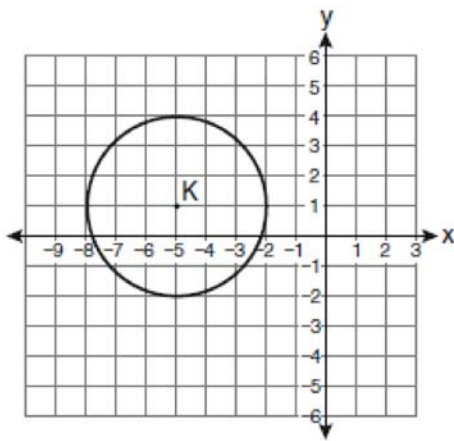
1 $(x+5)^2 + (y-1)^2 = 3$

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

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

4 $(x-5)^2 + (y+1)^2 = 9$

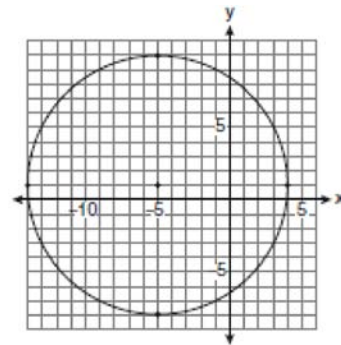## G.G.74: GRAPHING CIRCLES

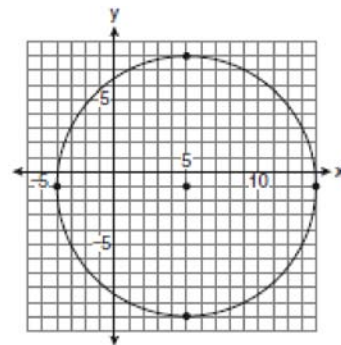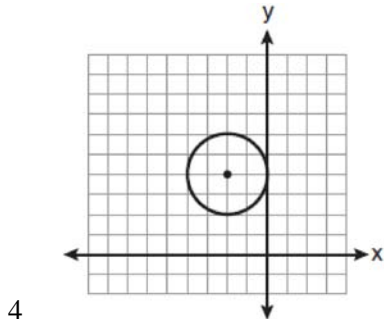107 Which graph represents a circle with the equation $(x-5)^2 + (y+1)^2 = 9$?
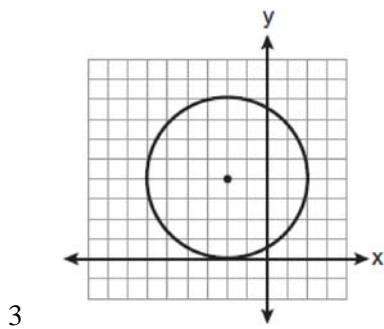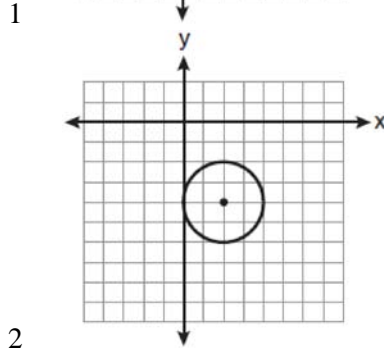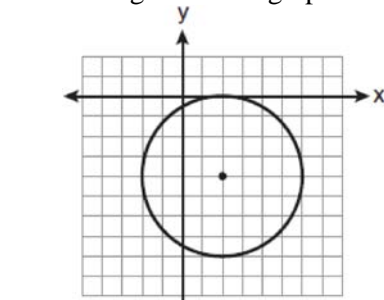

1

2

3

4

108 The equation of a circle is $(x-2)^2 + (y+4)^2 = 4$.
Which diagram is the graph of the circle?

1

2

3

4

G.G.11: VOLUME

109 Tim has a rectangular prism with a length of 10 centimeters, a width of 2 centimeters, and an unknown height. He needs to build another rectangular prism with a length of 5 centimeters and the same height as the original prism. The volume of the two prisms will be the same. Find the width, in centimeters, of the new prism.

G.G.12: VOLUME

110 A rectangular prism has a volume of $3x^2 + 18x + 24$. Its base has a length of $x+2$ and a width of 3. Which expression represents the height of the prism?
1    $x+4$
2    $x+2$
3   3
4    $x^2 + 6x + 8$

G.G.13: VOLUME

111 A regular pyramid with a square base is shown in the diagram below.
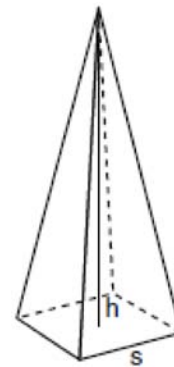
A side, s, of the base of the pyramid is 12 meters, and the height, h, is 42 meters. What is the volume of the pyramid in cubic meters?

G.G.14: VOLUME

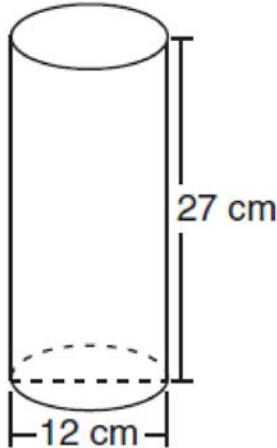112 Which expression represents the volume, in cubic centimeters, of the cylinder represented in the diagram below?

27 cm

12 cm

1   162π
2   324π
3   972π
4     $3,888\pi$

113 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*?
1   6.3
2   11.2
3   19.8
4   39.8

114 The volume of a cylinder is 12,566.4 cm³. The height of the cylinder is 8 cm. Find the radius of the cylinder to the *nearest tenth of a centimeter*.

G.G.15: VOLUME

115 In the diagram below, a right circular cone has a diameter of 8 inches and a height of 12 inches.

8 inches

12 inches
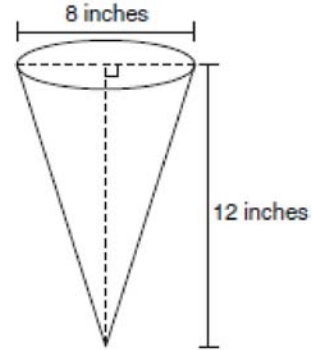
What is the volume of the cone to the *nearest cubic inch*?
1   201
2   481
3   603
4   804

G.G.45: SIMILARITY

116 Given $\triangle ABC \sim \triangle DEF$ such that $\dfrac{AB}{DE} = \dfrac{3}{2}$. Which statement is *not* true?

1     $\dfrac{BC}{EF} = \dfrac{3}{2}$

2     $\dfrac{m\angle A}{m\angle D} = \dfrac{3}{2}$

3     $\dfrac{\text{area of } \triangle ABC}{\text{area of } \triangle DEF} = \dfrac{9}{4}$

4     $\dfrac{\text{perimeter of } \triangle ABC}{\text{perimeter of } \triangle DEF} = \dfrac{3}{2}$

117 Two triangles are similar, and the ratio of each pair of corresponding sides is $2:1$. Which statement regarding the two triangles is *not* true?
1   Their areas have a ratio of $4:1$.
2   Their altitudes have a ratio of $2:1$.
3   Their perimeters have a ratio of $2:1$.
4   Their corresponding angles have a ratio of $2:1$.

118   In the diagram below, $\triangle ABC \sim \triangle EFG$, $m\angle C = 4x + 30$, and $m\angle G = 5x + 10$. Determine the value of x.
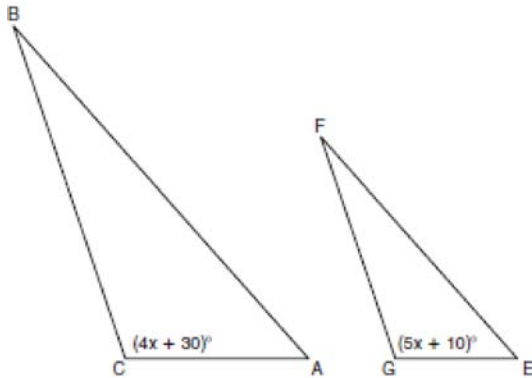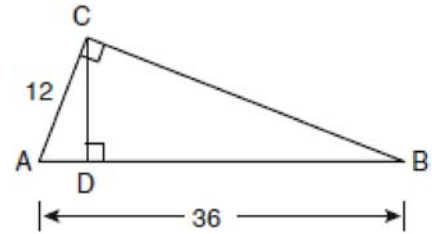

G.G.47: SIMILARITY

119   In the diagram below, the length of the legs $\overline{AC}$ and $\overline{BC}$ of right triangle ABC are 6 cm and 8 cm, respectively. Altitude $\overline{CD}$ is drawn to the hypotenuse of $\triangle ABC$.
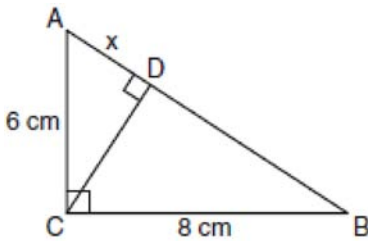
What is the length of $\overline{AD}$ to the *nearest tenth of a centimeter*?
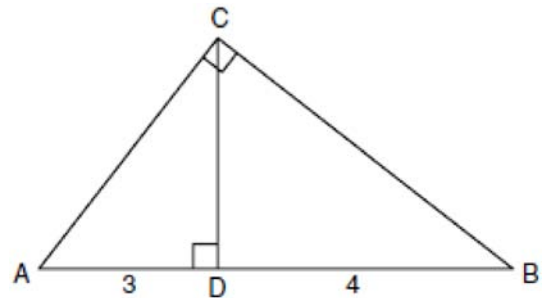1   3.6
2   6.0
3   6.4
4   4.0

120   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 $\overline{AD}$?
1   32
2   6
3   3
4   4

121   In the diagram below of right triangle ACB, altitude $\overline{CD}$ intersects $\overline{AB}$ at D. If $AD = 3$ and $DB = 4$, find the length of $\overline{CD}$ in simplest radical form.

G.G.54: REFLECTIONS

122   Point A is located at $(4, -7)$. The point is reflected in the x-axis. Its image is located at
1    $(-4, 7)$
2 $(-4, -7)$
3    $(4, 7)$
4    $(7, -4)$

G.G.54: TRANSLATIONS

123 Triangle ABC has vertices $A(1,3)$, $B(0,1)$, and $C(4,0)$. Under a translation, A', the image point of A, is located at $(4,4)$. Under this same translation, point C' is located at
1 $(7,1)$
2 $(5,3)$
3 $(3,2)$
4 $(1,-1)$

G.G.54: COMPOSITIONS OF TRANSFORMATIONS

124 What is the image of point $A(4,2)$ after the composition of transformations defined by $R_{90°} \circ r_{y=x}$?
1 $(-4,2)$
2 $(4,-2)$
3 $(-4,-2)$
4 $(2,-4)$

125 The coordinates of the vertices of parallelogram $ABCD$ are $A(-2,2)$, $B(3,5)$, $C(4,2)$, and $D(-1,-1)$. State the coordinates of the vertices of parallelogram $A''B''C''D''$ that result from the transformation $r_{y-axis} \circ T_{2,-3}$. [The use of the set of axes below is optional.]
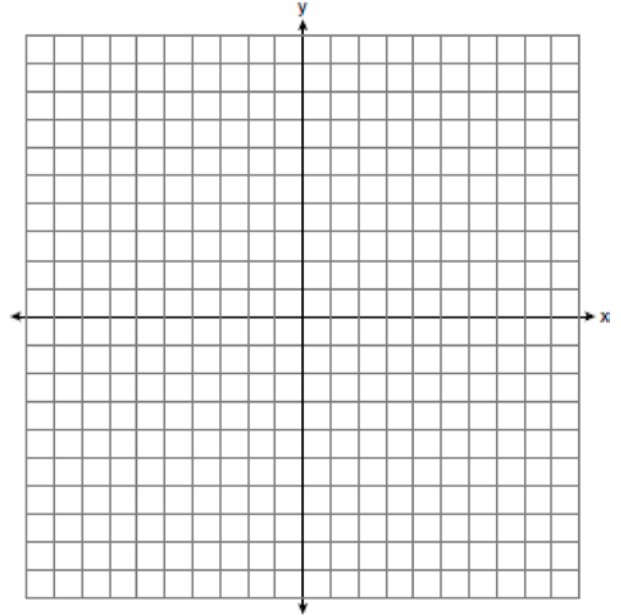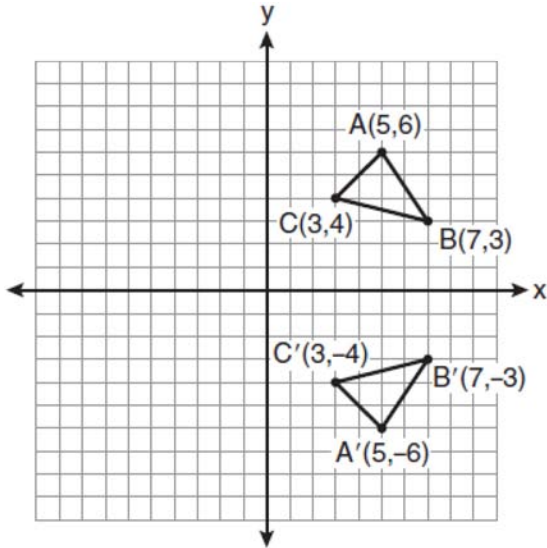

G.G.58: COMPOSITIONS OF TRANSFORMATIONS

126 The endpoints of $\overline{AB}$ are $A(3,2)$ and $B(7,1)$. If $\overline{A''B''}$ is the result of the transformation of $\overline{AB}$ under $D_2 \circ T_{-4,3}$ what are the coordinates of A'' and B''?
1 $A''(-2,10)$ and $B''(6,8)$
2 $A''(-1,5)$ and $B''(3,4)$
3 $A''(2,7)$ and $B''(10,5)$
4 $A''(14,-2)$ and $B''(22,-4)$

G.G.55: PROPERTIES OF TRANSFORMATIONS

127 Which expression best describes the transformation shown in the diagram below?


1 same orientation; reflection
2 opposite orientation; reflection
3 same orientation; translation
4 opposite orientation; translation

128 The vertices of $\triangle ABC$ are $A(3,2)$, $B(6,1)$, and $C(4,6)$. Identify and graph a transformation of $\triangle ABC$ such that its image, $\triangle A'B'C'$, results in $\overline{AB} \parallel \overline{A'B'}$.
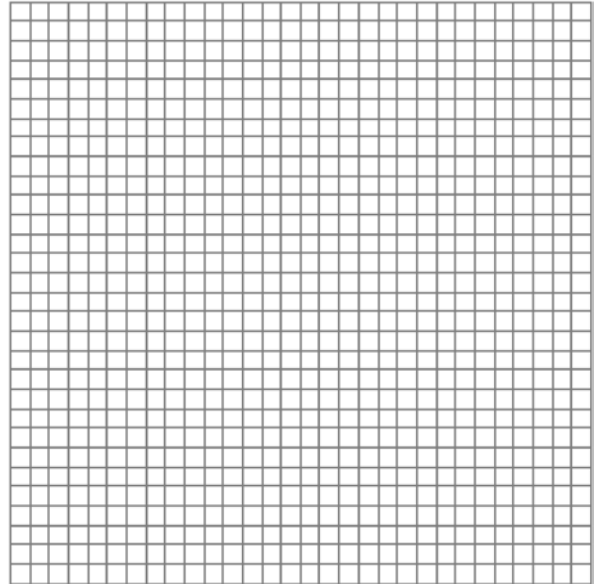

129 Triangle DEG has the coordinates $D(1,1)$, $E(5,1)$, and $G(5,4)$. Triangle DEG is rotated $90°$ about the origin to form $\triangle D'E'G'$. On the grid below, graph and label $\triangle DEG$ and $\triangle D'E'G'$. State the coordinates of the vertices D', E', and G'. Justify that this transformation preserves distance.
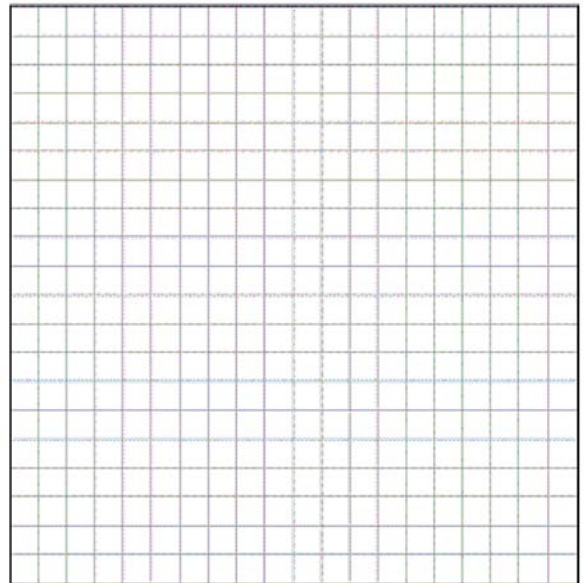
G.G.59: PROPERTIES OF TRANSFORMATIONS

130 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.
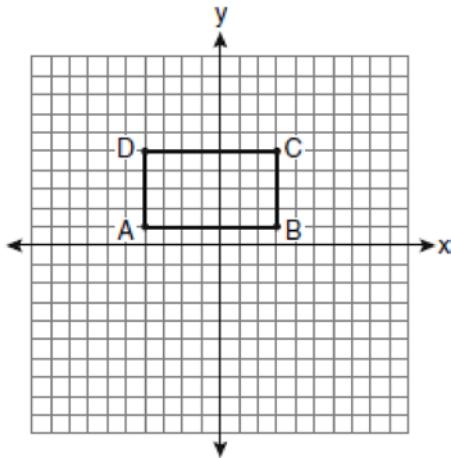

What will be the area of the rectangle after these transformations?
1 exactly 28 square units
2 less than 28 square units
3 greater than 28 square units
4 It cannot be determined from the information given.

131 In $\triangle KLM$, m$\angle K = 36$ and $KM = 5$. The transformation D_2 is performed on $\triangle KLM$ to form $\triangle K'L'M'$. Find m$\angle K'$. Justify your answer. Find the length of $\overline{K'M'}$. Justify your answer.

G.G.60: IDENTIFYING TRANSFORMATIONS

132 Which transformation produces a figure similar but not congruent to the original figure?
1 $T_{1,3}$
2 $D_{\frac{1}{2}}$
3 $R_{90°}$
4 $r_{y=x}$

133 After a composition of transformations, the coordinates $A(4, 2)$, $B(4, 6)$, and $C(2, 6)$ become $A''(-2, -1)$, $B''(-2, -3)$, and $C''(-1, -3)$, as shown on the set of axes below.
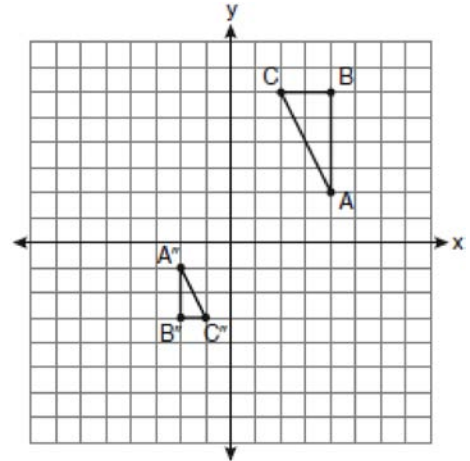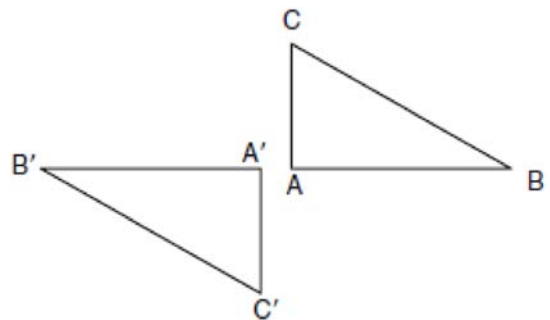

Which composition of transformations was used?
1 $R_{180°} \circ D_2$
2 $R_{90°} \circ D_2$
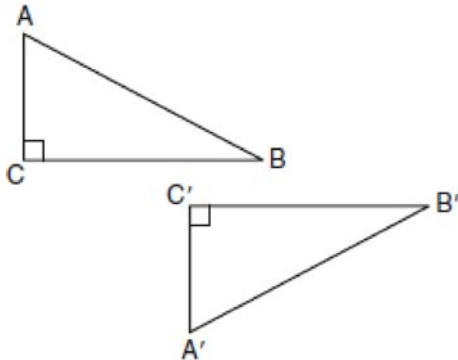3 $D_{\frac{1}{2}} \circ R_{180°}$
4 $D_{\frac{1}{2}} \circ R_{90°}$

G.G.56: IDENTIFYING TRANSFORMATIONS

134 In the diagram below, under which transformation will $\triangle A'B'C'$ be the image of $\triangle ABC$?

1 rotation
2 dilation
3 translation
4 glide reflection

28

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

1 dilation
2 rotation
3 reflection
4 glide reflection

136 Which transformation is *not* always an isometry?
1 rotation
2 dilation
3 reflection
4 translation

G.G.61: ANALYTICAL REPRESENTATIONS OF TRANSFORMATIONS

137 A polygon is transformed according to the rule: $(x,y) \rightarrow (x+2,y)$. Every point of the polygon moves two units in which direction?
1 up
2 down
3 left
4 right

G.G.24: STATEMENTS

138 Given $\triangle ABC$ with base $\overline{AFEDC}$, median $\overline{BF}$, altitude $\overline{BD}$, and $\overline{BE}$ bisects $\angle ABC$, which conclusion is valid?
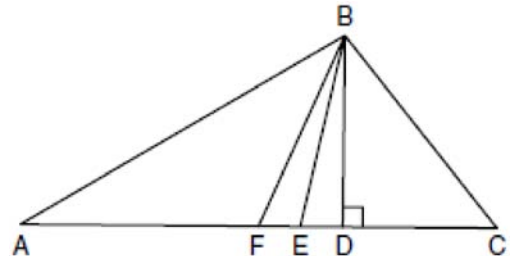
1 $\angle FAB \cong \angle ABF$
2 $\angle ABF \cong \angle CBD$
3 $\overline{CE} \cong \overline{EA}$
4 $\overline{CF} \cong \overline{FA}$

G.G.24: NEGATIONS

139 What is the negation of the statement "Squares are parallelograms"?
1 Parallelograms are squares.
2 Parallelograms are not squares.
3 It is not the case that squares are parallelograms.
4 It is not the case that parallelograms are squares.

140 What is the negation of the statement "The Sun is shining"?
1 It is cloudy.
2 It is daytime.
3 It is not raining.
4 The Sun is not shining.

G.G.25: COMPOUND STATEMENTS

141 Given: Two is an even integer or three is an even integer.
Determine the truth value of this disjunction.
Justify your answer.

G.G.26: CONDITIONAL STATEMENTS

142 What is the inverse of the statement "If two triangles are not similar, their corresponding angles are not congruent"?
 1 If two triangles are similar, their corresponding angles are not congruent.
 2 If corresponding angles of two triangles are not congruent, the triangles are not similar.
 3 If two triangles are similar, their corresponding angles are congruent.
 4 If corresponding angles of two triangles are congruent, the triangles are similar.

143 What is the contrapositive of the statement, "If I am tall, then I will bump my head"?
 1 If I bump my head, then I am tall.
 2 If I do not bump my head, then I am tall.
 3 If I am tall, then I will not bump my head.
 4 If I do not bump my head, then I am not tall.

144 Write a statement that is logically equivalent to the statement "If two sides of a triangle are congruent, the angles opposite those sides are congruent." Identify the new statement as the converse, inverse, or contrapositive of the original statement.

G.G.28: TRIANGLE CONGRUENCY

145 The diagonal $\overline{AC}$ is drawn in parallelogram $ABCD$. Which method can *not* be used to prove that $\triangle ABC \cong \triangle CDA$?
 1 SSS
 2 SAS
 3 SSA
 4 ASA

146 In the diagram of $\triangle ABC$ and $\triangle DEF$ below, $\overline{AB} \cong \overline{DE}$, $\angle A \cong \angle D$, and $\angle B \cong \angle E$.
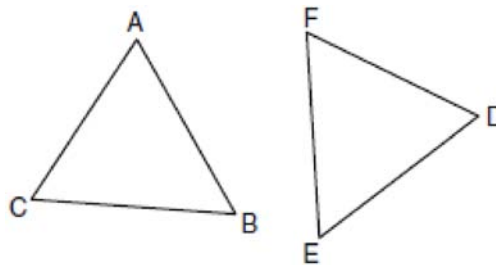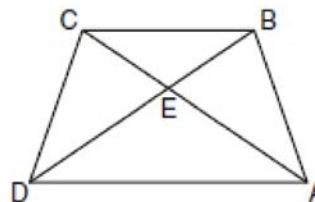

Which method can be used to prove $\triangle ABC \cong \triangle DEF$?
 1 SSS
 2 SAS
 3 ASA
 4 HL

G.G.29: TRIANGLE CONGRUENCY

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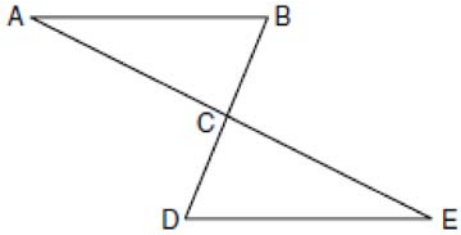

Which statement is true based on the given information?
 1 $\overline{AC} \cong \overline{BC}$
 2 $\overline{CD} \cong \overline{AD}$
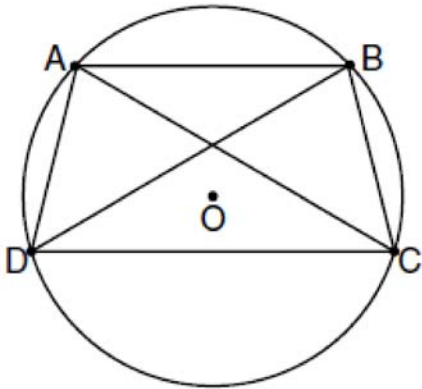 3 $\angle CDE \cong \angle BAD$
 4 $\angle CDB \cong \angle BAC$

G.G.27: TRIANGLE PROOFS

148 Given: $\triangle ABC$ and $\triangle EDC$, C is the midpoint of $\overline{BD}$ and $\overline{AE}$
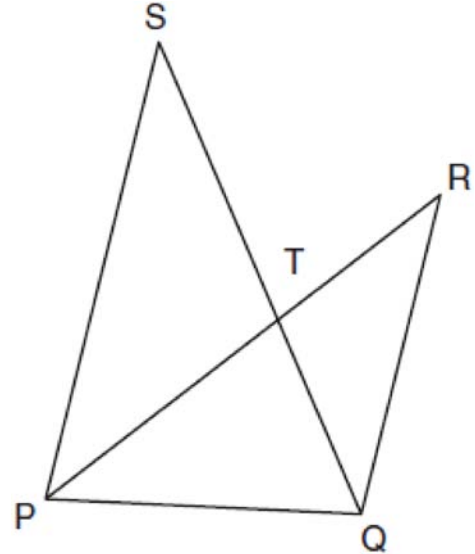
Prove: $\overline{AB} \parallel \overline{DE}$

G.G.27: CIRCLE PROOFS

149 In the diagram below, quadrilateral $ABCD$ is inscribed in circle O, $\overline{AB} \parallel \overline{DC}$, and diagonals $\overline{AC}$ and $\overline{BD}$ are drawn. Prove that $\triangle ACD \cong \triangle BDC$.
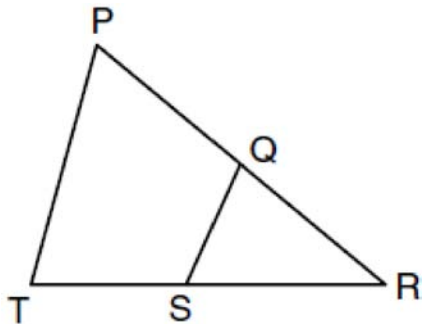

G.G.44: SIMILARITY PROOFS

150 In the diagram below, $\overline{SQ}$ and $\overline{PR}$ intersect at T, $\overline{PQ}$ is drawn, and $\overline{PS} \parallel \overline{QR}$.

What technique can be used to prove that $\triangle PST \sim \triangle RQT$?
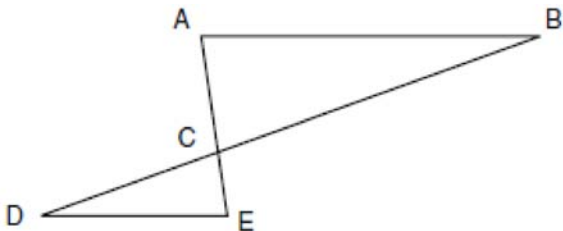
1   SAS
2   SSS
3   ASA
4   AA

151 In the diagram below of $\triangle PRT$, Q is a point on $\overline{PR}$, S is a point on $\overline{TR}$, $\overline{QS}$ is drawn, and $\angle RPT \cong \angle RSQ$.

Which reason justifies the conclusion that $\triangle PRT \sim \triangle SRQ$?

1 AA
2 ASA
3 SAS
4 SSS

152 In the diagram of $\triangle ABC$ and $\triangle EDC$ below, $\overline{AE}$ and $\overline{BD}$ intersect at C, and $\angle CAB \cong \angle CED$.

Which method can be used to show that $\triangle ABC$ must be similar to $\triangle EDC$?

1 SAS
2 AA
3 SSS
4 HL