Dear Sir,

I have to acknowledge the receipt 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.
**Geometry Regents at Random**

**Answer Section**

1. ANS: 3  
   PTS: 2  
   REF: 060928ge  
   STA: G.G.8  
   TOP: Planes

2. ANS:  
   \[ 15 + 5\sqrt{5} \]

3. ANS:  
   \[ \frac{180 - 46}{2} = 67 \]
   PTS: 4  
   REF: 060936ge  
   STA: G.G.69  
   TOP: Triangles in the Coordinate Plane

4. ANS: 2  
   The slope of \( y = \frac{1}{2}x + 5 \) is \( \frac{1}{2} \). The slope of a perpendicular line is \( -2 \). \[ y = mx + b \]
   \[ 5 = (-2)(-2) + b \]
   \[ b = 1 \]
   PTS: 2  
   REF: 011029ge  
   STA: G.G.31  
   TOP: Isosceles Triangle Theorem

5. ANS: 20  
   The sides of the triangle formed by connecting the midpoints are half the sides of the original triangle.

6. ANS: 3  
   PTS: 2  
   REF: fall0814ge  
   STA: G.G.42  
   TOP: Midsegments  
   TOP: Equations of Circles

7. ANS: 1  
   The closer a chord is to the center of a circle, the longer the chord.

PTS: 2  
REF: 011005ge  
STA: G.G.49  
TOP: Chords
8 ANS: 2  
Parallel chords intercept congruent arcs. \( \overarc{AC} = \overarc{BD} = 30 \). 180 – 30 – 30 = 120.

PTS: 2  REF: 080904ge  STA: G.G.52  TOP: Chords

9 ANS: 2  
The slope of \( 2x + 3y = 12 \) is \( \frac{A}{B} = \frac{2}{3} \). The slope of a perpendicular line is \( \frac{3}{2} \). Rewritten in slope intercept form, (2) becomes \( y = \frac{3}{2}x + 3 \).

PTS: 2  REF: 060926ge  STA: G.G.63  TOP: Parallel and Perpendicular Lines

10 ANS: 3  
TOP: Reflections  KEY: basic

11 ANS: 4  
\[ M_x = \frac{-6 + 1}{2} = -\frac{5}{2}, \quad M_y = \frac{1 + 8}{2} = \frac{9}{2}. \]

PTS: 2  REF: 060919ge  STA: G.G.66  TOP: Midpoint

12 ANS: 3  
\[ m = -\frac{A}{B} = \frac{5}{2}, \quad m = -\frac{A}{B} = \frac{10}{4} = \frac{5}{2}. \]

PTS: 2  REF: 011014ge  STA: G.G.63  TOP: Parallel and Perpendicular Lines

13 ANS: 3  
TOP: Centroid, Orthocenter, Incenter and Circumcenter

14 ANS: 1  
\[ V = \pi r^2 h \]

1000 = \( \pi r^2 \cdot 8 \)

\[ r^2 = \frac{1000}{8\pi} \]

\[ r \approx 6.3 \]

PTS: 2  REF: 080926ge  STA: G.G.14  TOP: Volume

15 ANS:  
18. If the ratio of \( TA \) to \( AC \) is 1:3, the ratio of \( TE \) to \( ES \) is also 1:3. \( x + 3x = 24 \). \( 3(6) = 18 \).

\[ x = 6 \]

PTS: 4  REF: 060935ge  STA: G.G.50  TOP: Tangents  KEY: common tangency
16 ANS:

\[ D'(1,1), E'(1,5), G'(-4,5) \]


18 ANS: 3 PTS: 2 REF: 080928ge STA: G.G.50 TOP: Tangents KEY: common tangency

19 ANS: 4

\[ y + x = 4 \quad x^2 - 6x + 10 = -x + 4 \quad y + x = 4 \quad y + 2 = 4 \]

\[ y = -x + 4 \quad x^2 - 5x + 6 = 0 \quad y + 3 = 4 \quad y = 2 \]

\[ (x - 3)(x - 2) = 0 \quad y = 1 \]

\[ x = 3 \text{ or } 2 \]

PTS: 2 REF: 080912ge STA: G.G.70 TOP: Quadratic-Linear Systems

20 ANS: 1 PTS: 2 REF: 080918ge STA: G.G.41 TOP: Special Quadrilaterals

21 ANS: 3

The lateral edges of a prism are parallel.

PTS: 2 REF: fall0808ge STA: G.G.10 TOP: Solids

22 ANS: 1

\[ AB = 10 \text{ since } \triangle ABC \text{ is a 6-8-10 triangle. } \]

\[ 6^2 = 10x \]

\[ 3.6 = x \]

PTS: 2 REF: 060915ge STA: G.G.47 TOP: Similarity KEY: leg
23 ANS:
\[ C_x = \frac{Q_x + R_x}{2}, \quad C_y = \frac{Q_y + R_y}{2}. \]
\[ 3.5 = \frac{1 + R_x}{2}, \quad 2 = \frac{8 + R_y}{2} \]
\[ 7 = 1 + R_x, \quad 4 = 8 + R_y \]
\[ 6 = R_x, \quad -4 = R_y \]

PTS: 2  REF: 011031ge  STA: G.G.66  TOP: Midpoint

24 ANS: 4
The marked 60º angle and the angle above it are on the same straight line and supplementary. This unmarked supplementary angle is 120º. Because the unmarked 120º angle and the marked 120º angle are alternate exterior angles and congruent, \( d \parallel e \).

PTS: 2  REF: 080901ge  STA: G.G.35  TOP: Parallel Lines and Transversals

25 ANS:

PTS: 2  REF: 060932ge  STA: G.G.22  TOP: Locus

26 ANS: 1
\[ M_x = \frac{-2 + 6}{2} = 2. \quad M_y = \frac{3 + 3}{2} = 3. \] The center is (2,3).  \[ d = \sqrt{(-2 - 6)^2 + (3 - 3)^2} = \sqrt{64 + 0} = 8. \] If the diameter is 8, the radius is 4 and \( r^2 = 16 \).

PTS: 2  REF: fall0820ge  STA: G.G.71  TOP: Equations of Circles

27 ANS: 1
\((x,y) \rightarrow (x + 3, y + 1)\)

PTS: 2  REF: fall0803ge  STA: G.G.54  TOP: Translations
28 ANS: 3

\[ \triangle ABC \quad \text{and} \quad \triangle ECD \] are congruent vertical angles and \( \angle CAB \cong \angle CED \).

PTS: 2 REF: 080920ge STA: G.G.42 TOP: Midsegments

29 ANS: 4 PTS: 2 REF: 011009ge STA: G.G.19
TOP: Constructions

30 ANS: 4

\[ x^2 = (4+5) \times 4 \]
\[ x^2 = 36 \]
\[ x = 6 \]

PTS: 2 REF: fall0832ge STA: G.G.17 TOP: Constructions

31 ANS: 1 PTS: 2 REF: 060920ge STA: G.G.74
TOP: Graphing Circles

32 ANS: 2

\[ \angle ACB \] and \( \angle ECD \) are congruent vertical angles and \( \angle CAB \cong \angle CED \).

PTS: 2 REF: 060917ge STA: G.G.44 TOP: Similarity Proofs

33 ANS: 4
\[ x^2 = (4+5) \times 4 \]
\[ x^2 = 36 \]
\[ x = 6 \]

PTS: 2 REF: 011008ge STA: G.G.53 TOP: Segments Intercepted by Circle
KEY: tangent and secant

34 ANS: 4 PTS: 2 REF: 060922ge STA: G.G.73
TOP: Equations of Circles

35 ANS: 4
Median \( BF \) bisects \( \overline{AC} \) so that \( \overline{CF} \cong \overline{FA} \).

PTS: 2 REF: fall0810ge STA: G.G.24 TOP: Statements
36 ANS: 4
\[
d = \sqrt{(-3-1)^2 + (2-0)^2} = \sqrt{16+4} = \sqrt{20} = \sqrt{4 \cdot 5} = 2\sqrt{5}
\]
PTS: 2  REF: 011017ge  STA: G.G.67  TOP: Distance

37 ANS:
20. \(5x + 10 = 4x + 30\)
\[
x = 20
\]
PTS: 2  REF: 060934ge  STA: G.G.45  TOP: Similarity
KEY: basic

38 ANS: 1
If \(\angle A\) is at minimum (50°) and \(\angle B\) is at minimum (90°), \(\angle C\) is at maximum of 40° (180° - (50° + 90°)). If \(\angle A\) is at maximum (60°) and \(\angle B\) is at maximum (100°), \(\angle C\) is at minimum of 20° (180° - (60° + 100°)).

PTS: 2  REF: 060901ge  STA: G.G.30  TOP: Interior and Exterior Angles of Triangles

39 ANS: 2
PTS: 2  REF: fall0806ge  STA: G.G.9  TOP: Planes

40 ANS:
\(AC \cong EC\) and \(DC \cong BC\) because of the definition of midpoint. \(\triangle ACB \cong \triangle ECD\) because of vertical angles. \(\triangle ABC \cong \triangle EDC\) because of SAS. \(\angle CDE \cong \angle CBA\) because of CPCTC. \(BD\) is a transversal intersecting \(AB\) and \(ED\). Therefore \(AB \parallel DE\) because \(\angle CDE\) and \(\angle CBA\) are congruent alternate interior angles.


41 ANS: 3

42 ANS: 2
The length of the midsegment of a trapezoid is the average of the lengths of its bases. \[
\frac{x + 30}{2} = 44.
\]
\[
x + 30 = 88
\]
\[
x = 58
\]

PTS: 2  REF: 011001ge  STA: G.G.40  TOP: Trapezoids

43 ANS: 3
\[
4(x + 4) = 8^2
\]
\[
4x + 16 = 64
\]
\[
x = 12
\]

PTS: 2  REF: 060916ge  STA: G.G.53  TOP: Segments Intercepted by Circle
KEY: tangent and secant
44 ANS: 
\[ y = \frac{2}{3}x - 9. \] The slope of \(2x - 3y = 11\) is \(\frac{A}{B} = \frac{-2}{-3} = \frac{2}{3}\). 
\[-5 = \left(\frac{2}{3}\right)(6) + b \]
\[-5 = 4 + b \]
\(b = -9\)

PTS: 2  REF: 080931ge  STA: G.G.65  TOP: Parallel and Perpendicular Lines

45 ANS: 1
\[ 3x^2 + 18x + 24 \]
\[ 3(x^2 + 6x + 8) \]
\[ 3(x + 4)(x + 2) \]

PTS: 2  REF: fall0815ge  STA: G.G.12  TOP: Volume

46 ANS: 2
Because the triangles are similar, \(\frac{m\angle A}{m\angle D} = 1\)

PTS: 2  REF: 011022ge  STA: G.G.45  TOP: Similarity
KEY: perimeter and area

47 ANS: 4  PTS: 2  REF: fall0824ge  STA: G.G.50
TOP: Tangents  KEY: common tangency

48 ANS: 4
The slope of \(y = \frac{2}{3}x - 5\) is \(-\frac{2}{3}\). Perpendicular lines have slope that are opposite reciprocals.

PTS: 2  REF: 080917ge  STA: G.G.62  TOP: Parallel and Perpendicular Lines

49 ANS: 4  PTS: 2  REF: 060904ge  STA: G.G.13
TOP: Solids

50 ANS:
Because \(\overline{AB} \parallel \overline{DC}\), \(\overline{AD} \cong \overline{BC}\) since parallel chords intersect congruent arcs. \(\angle BDC \cong \angle ACD\) because inscribed angles that intercept congruent arcs are congruent. \(\overline{AD} \cong \overline{BC}\) since congruent chords intersect congruent arcs. \(\overline{DC} \cong \overline{CD}\) because of the reflexive property. Therefore, \(\triangle ACD \cong \triangle BDC\) because of SAS.

PTS: 6  REF: fall0838ge  STA: G.G.27  TOP: Circle Proofs

51 ANS: 4  PTS: 2  REF: 011012ge  STA: G.G.1
TOP: Planes

52 ANS: 1
\(\angle DCB\) and \(\angle ADC\) are supplementary adjacent angles of a parallelogram. \(180 - 120 = 60. \quad \angle 2 = 60 - 45 = 15\).

PTS: 2  REF: 080907ge  STA: G.G.38  TOP: Parallelograms
53. **ANS:** 3
The diagonals of an isosceles trapezoid are congruent. $5x + 3 = 11x - 5$.

\[ 6x = 18 \]
\[ x = 3 \]

**PTS:** 2  **REF:** fall0801ge  **STA:** G.G.40  **TOP:** Trapezoids

54. **ANS:** 2
The centroid divides each median into segments whose lengths are in the ratio 2 : 1.

**PTS:** 2  **REF:** 060914ge  **STA:** G.G.43  **TOP:** Centroid

55. **ANS:** 1
Opposite sides of a parallelogram are congruent. $4x - 3 = x + 3$. $SV = (2) + 3 = 5$.

\[ 3x = 6 \]
\[ x = 2 \]

**PTS:** 2  **REF:** 011013ge  **STA:** G.G.38  **TOP:** Parallelograms

56. **ANS:**
6. The centroid divides each median into segments whose lengths are in the ratio 2 : 1. $TD = 6$ and $DB = 3$.

**PTS:** 2  **REF:** 011034ge  **STA:** G.G.43  **TOP:** Centroid

57. **ANS:** 3
Because $OC$ is a radius, its length is 5. Since $CE = 2\ OE = 3$. $\triangle EDO$ is a 3-4-5 triangle. If $ED = 4$, $BD = 8$.

**PTS:** 2  **REF:** fall0811ge  **STA:** G.G.49  **TOP:** Chords

58. **ANS:** 1  **PTS:** 2
**TOP:** Constructions

59. **ANS:** 4
$\triangle ABC \sim \triangle DBE$. \[ \frac{AB}{DB} = \frac{AC}{DE} \]

\[ \frac{9}{2} = \frac{x}{3} \]
\[ x = 13.5 \]

**PTS:** 2  **REF:** 060927ge  **STA:** G.G.46  **TOP:** Side Splitter Theorem

60. **ANS:** 3  **PTS:** 2
**TOP:** Triangle Congruency

61. **ANS:**
$JK \cong LM$ because opposite sides of a parallelogram are congruent. $LM \cong LN$ because of the Isosceles Triangle Theorem. $LM \cong JM$ because of the transitive property. $JKLM$ is a rhombus because all sides are congruent.

**PTS:** 4  **REF:** 011036ge  **STA:** G.G.41  **TOP:** Special Quadrilaterals

62. **ANS:** 4  **PTS:** 2
**TOP:** Identifying Transformations
63 ANS: 4 
TOP: Planes
PTS: 2 
REF: 080914ge 
STA: G.G.7

64 ANS: 3 
TOP: Inverse
PTS: 2 
REF: 011028ge 
STA: G.G.26

65 ANS:
3. The non-parallel sides of an isosceles trapezoid are congruent. 
\[2x + 5 = 3x + 2\]
\[x = 3\]

PTS: 2 
REF: 080929ge 
STA: G.G.40 
TOP: Trapezoids

66 ANS: 2 
TOP: Equations of Circles
PTS: 2 
REF: 080921ge 
STA: G.G.72

67 ANS:

PTS: 2 
REF: 080932ge 
STA: G.G.17 
TOP: Constructions

68 ANS: 4 
TOP: Similarity
Let \(AD = x\). 
\[36x = 12^2\]
\[x = 4\]

PTS: 2 
REF: 080922ge 
STA: G.G.47 
TOP: Similarity
KEY: leg

69 ANS:
\[2\sqrt{3} \cdot x^2 = 3 \cdot 4\]
\[x = \sqrt{12} = 2\sqrt{3}\]

PTS: 2 
REF: fall0829ge 
STA: G.G.47 
TOP: Similarity
KEY: altitude

70 ANS: 1 
\(\Delta PRT \text{ and } \Delta SRQ\) share \(\angle R\) and it is given that \(\angle RPT \cong \angle RSQ\).

PTS: 2 
REF: fall0821ge 
STA: G.G.44 
TOP: Similarity Proofs
71 ANS: 
\[ y = \frac{4}{3}x - 6. \quad M_x = \frac{-1 + 7}{2} = 3 \quad \text{The perpendicular bisector goes through } (3, -2) \text{ and has a slope of } \frac{4}{3}. \]
\[ M_y = \frac{1 + ( -5 )}{2} = -2 \]
\[ m = \frac{1 - ( -5 )}{-1 - 7} = -\frac{3}{4} \]

\[ y - y_M = m(x - x_M). \]
\[ y - 1 = \frac{4}{3}(x - 2) \]

PTS: 4  REF: 080935ge  STA: G.G.68  TOP: Perpendicular Bisector

72 ANS: 4
(4) is not true if \( \angle PQR \) is obtuse.

PTS: 2  REF: 060924ge  STA: G.G.32  TOP: External Angle Theorem

73 ANS: 
True. The first statement is true and the second statement is false. In a disjunction, if either statement is true, the disjunction is true.

PTS: 2  REF: 060933ge  STA: G.G.25  TOP: Compound Statements

74 ANS: 
Contrapositive-If two angles of a triangle are not congruent, the sides opposite those angles are not congruent.

PTS: 2  REF: fall0834ge  STA: G.G.26  TOP: Conditional Statements
75 ANS:

The slope of $y = x + 2$ is 1. The slope of $y - x = -1$ is $\frac{-A}{B} = \frac{-(-1)}{1} = 1$. 

76 ANS: 3

77 ANS: 1

$y = x^2 - 4x = (4)^2 - 4(4) = 0$. (4,0) is the only intersection.

78 ANS: 2

The slope of a line in standard form is $\frac{-A}{B}$, so the slope of this line is 2. A parallel line would also have a slope of 2. Since the answers are in slope intercept form, find the $y$-intercept: $y = mx + b$

$-11 = 2(-3) + b$

$-5 = b$
81 ANS:  
22.4. \[ V = \pi r^2 h \]

\[ 12566.4 = \pi r^2 \cdot 8 \]

\[ r^2 = \frac{12566.4}{8\pi} \]

\[ r \approx 22.4 \]

PTS: 2  REF: fall0833ge  STA: G.G.14  TOP: Volume

82 ANS:  
5. \[ \frac{3}{x} = \frac{6+3}{15} \]

\[ 9x = 45 \]

\[ x = 5 \]

PTS: 2  REF: 011033ge  STA: G.G.46  TOP: Side Splitter Theorem

83 ANS: 1  
\[ a^2 + (5\sqrt{2})^2 = (2\sqrt{15})^2 \]

\[ a^2 + (25 \times 2) = 4 \times 15 \]

\[ a^2 + 50 = 60 \]

\[ a^2 = 10 \]

\[ a = \sqrt{10} \]

PTS: 2  REF: 011016ge  STA: G.G.48  TOP: Pythagorean Theorem

84 ANS: 1  
After the translation, the coordinates are \( A'(-1,5) \) and \( B'(3,4) \). After the dilation, the coordinates are \( A''(-2,10) \) and \( B''(6,8) \).

85 ANS: 1  
\[ x + 2x + 2 + 3x + 4 = 180 \]

\[ 6x + 6 = 180 \]

\[ x = 29 \]

PTS: 2  REF: fall0823ge  STA: G.G.58  TOP: Compositions of Transformations

86 ANS: 2  
PTS: 2  REF: 011002ge  STA: G.G.30  TOP: Interior and Exterior Angles of Triangles

TOP: Properties of Transformations

87 ANS: 2  
A dilation affects distance, not angle measure.

PTS: 2  REF: 080906ge  STA: G.G.60  TOP: Identifying Transformations
88  ANS: 3  PTS: 2  REF: 060908ge  STA: G.G.60
TOP: Identifying Transformations

89  ANS: 2  PTS: 2  REF: 011006ge  STA: G.G.56
TOP: Isometries

90  ANS: 4
180 - (40 + 40) = 100

PTS: 2  REF: 080903ge  STA: G.G.31  TOP: Isosceles Triangle Theorem

91  ANS: 3  PTS: 2  REF: 060925ge  STA: G.G.17
TOP: Constructions

92  ANS: 2
The slope of a line in standard form is $\frac{A}{B}$ so the slope of this line is $\frac{5}{3}$ Perpendicular lines have slope that are the opposite and reciprocal of each other.

PTS: 2  REF: fall0828ge  STA: G.G.62  TOP: Parallel and Perpendicular Lines

93  ANS:
4.  $l_1w_1h_1 = l_2w_2h_2$
$10 \times 2 \times h = 5 \times w_2 \times h$
$20 = 5w_2$
$w_2 = 4$

PTS: 2  REF: 011030ge  STA: G.G.11  TOP: Volume

94  ANS: 2
$4(4x - 3) = 3(2x + 8)$
$16x - 12 = 6x + 24$
$10x = 36$
$x = 3.6$

PTS: 2  REF: 080923ge  STA: G.G.53  TOP: Segments Intercepted by Circle
KEY: two chords

95  ANS: 1
Since $\overline{AC} \cong \overline{BC}$, $m\angle A = m\angle B$ under the Isosceles Triangle Theorem.

PTS: 2  REF: fall0809ge  STA: G.G.69  TOP: Triangles in the Coordinate Plane

96  ANS: 2
Parallel chords intercept congruent arcs. $m\overarc{AD} = m\overarc{BC} = 60$. $m\angle CDB = \frac{1}{2} m\overarc{BC} = 30$.

PTS: 2  REF: 060906ge  STA: G.G.52  TOP: Chords
97 ANS: 3
\[ m = \frac{-A}{B} = \frac{3}{4} \]
PTS: 2 REF: 011025ge STA: G.G.62 TOP: Parallel and Perpendicular Lines

98 ANS: 1
PTS: 2 REF: 060903ge STA: G.G.56 TOP: Identifying Transformations

99 ANS: 2
PTS: 2 REF: 011004ge STA: G.G.17 TOP: Constructions

100 ANS:

\[ 25. d = \sqrt{(-3-4)^2 + (1-25)^2} = \sqrt{49 + 576} = \sqrt{625} = 25. \]

PTS: 4 REF: 080936ge STA: G.G.23 TOP: Locus

101 ANS: 2
PTS: 2 REF: 060910ge STA: G.G.71 TOP: Equations of Circles

102 ANS:

\[ M_x = \frac{2+(-4)}{2} = -1. \quad M_y = \frac{-3+6}{2} = \frac{3}{2}. \]

PTS: 2 REF: fall0831ge STA: G.G.67 TOP: Distance

103 ANS: 2
PTS: 2 REF: fall0813ge STA: G.G.66 TOP: Midpoint

104 ANS:

\[ 36, \text{ because a dilation does not affect angle measure.} \quad 10, \text{ because a dilation does affect distance}. \]

PTS: 4 REF: 011032ge STA: G.G.20 TOP: Constructions

105 ANS: 2
PTS: 2 REF: 080927ge STA: G.G.4 TOP: Planes

106 ANS:

36, because a dilation does not affect angle measure. 10, because a dilation does affect distance.
107 ANS: 1
\[ V = \frac{1}{3} \pi r^2 h = \frac{1}{3} \pi \cdot 4^2 \cdot 12 \approx 201 \]

PTS: 2 REF: 060921ge STA: G.G.15 TOP: Volume

108 ANS: 2
\[ 6 + 17 > 22 \]

PTS: 2 REF: 080916ge STA: G.G.33 TOP: Triangle Inequality Theorem

109 ANS:

\[ \overline{FE} \cong \overline{FE} \text{ (Reflexive Property)}; \overline{AE} - \overline{FE} \cong \overline{FC} - \overline{EF} \text{ (Line Segment Subtraction Theorem)}; \overline{AF} \cong \overline{CE} \text{ (Substitution)}; \angle BFA \cong \angle DEC \text{ (All right angles are congruent)}; \triangle BFA \cong \triangle DEC \text{ (AAS)}; \overline{AB} \cong \overline{CD} \text{ and } \overline{BF} \cong \overline{DE} \text{ (CPCTC)}; \angle BFC \cong \angle DEA \text{ (All right angles are congruent)}; \triangle BFC \cong \triangle DAE \text{ (SAS)}; \overline{AD} \cong \overline{CB} \text{ (CPCTC)}; \text{ABCD is a parallelogram (opposite sides of quadrilateral ABCD are congruent)} \]

PTS: 6 REF: 080938ge STA: G.G.41 TOP: Special Quadrilaterals

110 ANS: 1 PTS: 2 REF: 011024ge STA: G.G.3 TOP: Planes

111 ANS: 2
\[ x^2 = 3(x + 18) \]
\[ x^2 - 3x - 54 = 0 \]
\[(x - 9)(x + 6) = 0 \]
\[ x = 9 \]

PTS: 2 REF: fall0817ge STA: G.G.53 TOP: Segments Intercepted by Circle

KEY: tangent and secant

112 ANS: 1

\[ 3x + 15 + 2x - 1 = 6x + 2 \]
\[ 5x + 14 = 6x + 2 \]
\[ x = 12 \]

PTS: 2 REF: 011021ge STA: G.G.32 TOP: External Angle Theorem

113 ANS: 3 PTS: 2 REF: 080902ge STA: G.G.17 TOP: Constructions
114 ANS: 4 PTS: 2 REF: 011019ge STA: G.G.44 TOP: Similarity Proofs

115 ANS:
\[ AC \text{. } m\angle BCA = 63 \text{ and } m\angle ABC = 80. \text{ } AC \text{ is the longest side as it is opposite the largest angle.} \]

116 ANS: 4
\[ 3y + 1 = 6x + 4. \text{ } 2y + 1 = x - 9 \]
\[ 3y = 6x + 3 \quad 2y = x - 10 \]
\[ y = 2x + 1 \quad y = \frac{1}{2} x - 5 \]

117 ANS: 4
Corresponding angles of similar triangles are congruent.

118 ANS: 4 PTS: 2 REF: 080925ge STA: G.G.21 TOP: Centroid, Orthocenter, Incenter and Circumcenter

119 ANS:
\[ 2016. \ V = \frac{1}{3} Bh = \frac{1}{3} s^2 h = \frac{1}{3} 12^2 \cdot 42 = 2016 \]

120 ANS: 4 PTS: 2 REF: fall0802ge STA: G.G.24 TOP: Negations

121 ANS: 4 PTS: 2 REF: 060913ge STA: G.G.26 TOP: Contrapositive


123 ANS: 3 PTS: 2 REF: 011007ge STA: G.G.31 TOP: Isosceles Triangle Theorem

124 ANS: 3

\[ V = \pi r^2 h = \pi \cdot 6^2 \cdot 27 = 972\pi \]

125 ANS: 3 PTS: 2 REF: 011027ge STA: G.G.14 TOP: Volume
126 ANS: 2
Longest side of a triangle is opposite the largest angle. Shortest side is opposite the smallest angle.

PTS: 2 REF: 060911ge STA: G.G.34 TOP: Angle Side Relationship

127 ANS: 4
\[(n - 2)180 = (8 - 2)180 = 1080. \quad \frac{1080}{8} = 135.\]

PTS: 2 REF: fall0827ge STA: G.G.37 TOP: Interior and Exterior Angles of Polygons

128 ANS: 2
\[\frac{87 + 35}{2} = \frac{122}{2} = 61\]

PTS: 2 REF: 011015ge STA: G.G.51 TOP: Arcs Determined by Angles
KEY: inside circle

129 ANS: 2
\[7 + 18 > 6 + 12\]

PTS: 2 REF: fall0819ge STA: G.G.33 TOP: Triangle Inequality Theorem

130 ANS:
\[y = -2x + 14. \quad \text{The slope of } 2x + y = 3 \text{ is } \frac{-A}{B} = \frac{-2}{1} = -2. \quad y = mx + b \quad .\]
\[4 = (-2)(5) + b\]
\[b = 14\]

PTS: 2 REF: 060931ge STA: G.G.65 TOP: Parallel and Perpendicular Lines

131 ANS: 1
Translations and reflections do not affect distance.

PTS: 2 REF: 080908ge STA: G.G.59 TOP: Properties of Transformations

132 ANS: 1
\(A'(2,4)\)

PTS: 2 REF: 011023ge STA: G.G.54 TOP: Compositions of Transformations
KEY: basic

133 ANS: 1
In an equilateral triangle, each interior angle is 60° and each exterior angle is 120° (180° - 120°). The sum of the three interior angles is 180° and the sum of the three exterior angles is 360°.

PTS: 2 REF: 060909ge STA: G.G.30 TOP: Interior and Exterior Angles of Triangles
TOP: Constructions

134 ANS: 3
PTS: 2 REF: fall0804ge STA: G.G.18

135 ANS: 1
\[d = \sqrt{(-4 - 2)^2 + (5 - (-5))^2} = \sqrt{36 + 100} = \sqrt{136} = \sqrt{4 \cdot \sqrt{34}} = 2\sqrt{34} .\]

PTS: 2 REF: 080919ge STA: G.G.67 TOP: Distance
The slope of \( y = -3x + 2 \) is -3. The perpendicular slope is \( \frac{1}{3} \). 

\[-1 = \frac{1}{3} (3) + b\]

\[-1 = 1 + b\]

\[b = -2\]

PTS: 2  REF: 011018ge  STA: G.G.64  TOP: Parallel and Perpendicular Lines

PTS: 4  REF: fall0835ge  STA: G.G.42  TOP: Midsegments

PTS: 2  REF: 060930ge  STA: G.G.19  TOP: Constructions

PTS: 2  REF: fall0816ge  STA: G.G.1  TOP: Planes
140 ANS:

PTS: 4 REF: 011037ge STA: G.G.23 TOP: Locus

141 ANS: 1 PTS: 2 REF: 080911ge STA: G.G.73 TOP: Equations of Circles

142 ANS: 2

\[ M_x = \frac{-2 + 6}{2} = 2. \quad M_y = \frac{-4 + 2}{2} = -1 \]

PTS: 2 REF: 080910ge STA: G.G.66 TOP: Midpoint

143 ANS: 2 PTS: 2 REF: 011020ge STA: G.G.74 TOP: Graphing Circles

144 ANS: 3

PTS: 2 REF: fall0805ge STA: G.G.70 TOP: Quadratic-Linear Systems

145 ANS: 1 PTS: 2 REF: 060918ge STA: G.G.2 TOP: Planes

146 ANS:

PTS: 4 REF: fall0837ge STA: G.G.23 TOP: Locus
147 ANS:
26. \[ x + 3x + 5x - 54 = 180 \]
   \[ 9x = 234 \]
   \[ x = 26 \]

PTS: 2    REF: 080933ge    STA: G.G.30    TOP: Interior and Exterior Angles of Triangles

148 ANS:

PTS: 4    REF: 060937ge    STA: G.G.54    TOP: Compositions of Transformations
KEY: grids

149 ANS: 4    PTS: 2    REF: 060912ge    STA: G.G.23    TOP: Locus

150 ANS:

PTS: 2    REF: fall0830ge    STA: G.G.55    TOP: Properties of Transformations
\[ \angle D, \angle G \text{ and } 24^\circ \text{ or } \angle E, \angle F \text{ and } 84^\circ. \] \[ m \overarc{FE} = \frac{2}{15} \times 360 = 48. \text{ Since the chords forming } \angle D \text{ and } \angle G \text{ are} \]
\[ \text{intercepted by } \overarc{FE}, \text{ their measure is } 24^\circ. \] \[ m \overarc{GD} = \frac{7}{15} \times 360 = 168. \text{ Since the chords forming } \angle E \text{ and } \angle F \text{ are} \]
\[ \text{intercepted by } \overarc{GD}, \text{ their measure is } 84^\circ. \]

PTS: 4  REF: fall0836ge  STA: G.G.51  TOP: Arcs Determined by Angles

KEY: inscribed

152 ANS: 3

The sum of the interior angles of a pentagon is \((5 - 2)180 = 540\).

PTS: 2  REF: 011023ge  STA: G.G.36  TOP: Interior and Exterior Angles of Polygons