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.
fall08ge
Answer Section

1 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

2 ANS: 4
TOP: Negations

PTS: 2 REF: fall0802ge STA: G.G.24

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

PTS: 2 REF: fall0803ge STA: G.G.54 TOP: Translations

4 ANS: 3
TOP: Constructions

PTS: 2 REF: fall0804ge STA: G.G.18

5 ANS: 3

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

6 ANS: 2
TOP: Planes

PTS: 2 REF: fall0806ge STA: G.G.9

7 ANS: 1
TOP: Constructions

PTS: 2 REF: fall0807ge STA: G.G.19

8 ANS: 3
The lateral edges of a prism are parallel.

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

9 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

10 ANS: 4
Median $BF$ bisects $AC$ so that $\overline{CF} \cong \overline{FA}$.

PTS: 2 REF: fall0810ge STA: G.G.24 TOP: Statements

11 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
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:

$$y = mx + b$$

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

$$-5 = b$$

$\text{PTS: 2} \quad \text{REF: fall0812ge} \quad \text{STA: G.G.65} \quad \text{TOP: Parallel and Perpendicular Lines}$

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

$\text{PTS: 2} \quad \text{REF: fall0813ge} \quad \text{STA: G.G.66} \quad \text{TOP: Midpoint}$

$\text{TOP: Equations of Circles}$

$\text{ANS: 1}$

$$3x^2 + 18x + 24$$

$$3(x^2 + 6x + 8)$$

$$3(x+4)(x+2)$$

$\text{PTS: 2} \quad \text{REF: fall0815ge} \quad \text{STA: G.G.12} \quad \text{TOP: Volume}$

$\text{TOP: Planes}$

$\text{ANS: 2}$

$$x^2 = 3(x + 18)$$

$$x^2 - 3x - 54 = 0$$

$$(x - 9)(x + 6) = 0$$

$$x = 9$$

$\text{PTS: 2} \quad \text{REF: fall0817ge} \quad \text{STA: G.G.53} \quad \text{TOP: Segments Intercepted by Circle}$

$\text{KEY: tangent and secant}$

$\text{TOP: Analytical Representations of Transformations}$

$\text{ANS: 4}$

$$7 + 18 > 6 + 12$$

$\text{PTS: 2} \quad \text{REF: fall0819ge} \quad \text{STA: G.G.33} \quad \text{TOP: Triangle Inequality Theorem}$

$\text{ANS: 1}$

$$M_x = \frac{-2 + 6}{2} = 2. \quad M_y = \frac{3 + 3}{2} = 3.$$  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 $r^2 = 16$.

$\text{PTS: 2} \quad \text{REF: fall0820ge} \quad \text{STA: G.G.71} \quad \text{TOP: Equations of Circles}$
21 ANS: 1
\(\triangle PRT\) and \(\triangle SRQ\) share \(\angle R\) and it is given that \(\angle RPT \cong \angle RSQ\).

PTS: 2 
REF: fall0821ge 
STA: G.G.44 
TOP: Similarity Proofs

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

PTS: 2 
REF: fall0822ge 
STA: G.G.63 
TOP: Parallel and Perpendicular Lines

23 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 \(B''(6,8)\).

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

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

25 ANS: 3
PTS: 2 
REF: fall0825ge 
STA: G.G.21 
TOP: Centroid, Orthocenter, Incenter and Circumcenter

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

PTS: 2 
REF: fall0826ge 
STA: G.G.45 
TOP: Similarity
KEY: perimeter and area

27 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

28 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

29 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
25. \( d = \sqrt{(-3 - 4)^2 + (1 - 25)^2} = \sqrt{49 + 576} = \sqrt{625} = 25. \)

22.4. \[ V = \pi r^2 h \]

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

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

\[ r \approx 22.4 \]

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

![Diagram of triangle with midpoints and parallel lines](image)

36 ANS:

\[ \angle D, \angle G \text{ and } 24^\circ \text{ or } \angle E, \angle F \text{ and } 84^\circ. \]

\[ m\overline{FE} = \frac{2}{15} \times 360 = 48. \] Since the chords forming \( \angle D \) and \( \angle G \) are intercepted by \( \overline{FE} \), their measure is \( 24^\circ \).

\[ m\overline{GD} = \frac{7}{15} \times 360 = 168. \] Since the chords forming \( \angle E \) and \( \angle F \) are intercepted by \( \overline{GD} \), their measure is \( 84^\circ \).

37 ANS:

![Diagram of circle with points and chords](image)

38 ANS:

Because \( AB \parallel DC \), \( AD \cong BC \) since parallel chords intersect congruent arcs.

\[ \angle BDC \cong \angle ACD \text{ because inscribed angles that intercept congruent arcs are congruent.} \]

\[ AD \cong BC \text{ since congruent chords intersect congruent arcs.} \]

\[ DC \cong CD \text{ because of the reflexive property.} \] Therefore, \( \triangle ACD \cong \triangle BDC \) because of SAS.

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

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

KEY: inscribed

PTS: 4  REF: fall0837ge  STA: G.G.23  TOP: Locus

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

\[ \text{ANS: 1} \]

\[ \text{PTS: 2} \quad \text{REF: 060901ge} \quad \text{STA: G.G.30} \quad \text{TOP: Interior and Exterior Angles of Triangles} \]

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°)).

\[ \text{ANS: 3} \]

\[ \text{PTS: 2} \quad \text{REF: 060902ge} \quad \text{STA: G.G.28} \quad \text{TOP: Triangle Congruency} \]

\[ \text{ANS: 1} \quad \text{PTS: 2} \quad \text{REF: 060903ge} \quad \text{STA: G.G.56} \]

\[ \text{TOP: Identifying Transformations} \]

\[ \text{ANS: 4} \quad \text{PTS: 2} \quad \text{REF: 060904ge} \quad \text{STA: G.G.13} \]

\[ \text{TOP: Solids} \]

\[ \text{ANS: 3} \quad \text{PTS: 2} \quad \text{REF: 060905ge} \quad \text{STA: G.G.54} \]

\[ \text{TOP: Reflections} \quad \text{KEY: basic} \]

\[ \text{ANS: 2} \]

Parallel chords intercept congruent arcs. \( \widehat{AD} = \widehat{BC} = 60 \). \( m\angle CDB = \frac{1}{2} m\widehat{BC} = 30 \).

\[ \text{ANS: 2} \quad \text{PTS: 2} \quad \text{REF: 060906ge} \quad \text{STA: G.G.52} \quad \text{TOP: Chords} \]

\[ \text{ANS: 2} \]

The slope of \( y = \frac{1}{2} x + 5 \) is \( \frac{1}{2} \). The slope of a perpendicular line is \( -2 \). \( y = mx + b \)

\[ 5 = (-2)(-2) + b \]

\[ b = 1 \]

\[ \text{ANS: 3} \quad \text{PTS: 2} \quad \text{REF: 060907ge} \quad \text{STA: G.G.64} \quad \text{TOP: Parallel and Perpendicular Lines} \]

\[ \text{TOP: Identifying Transformations} \]

\[ \text{ANS: 1} \]

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°.

\[ \text{ANS: 2} \quad \text{PTS: 2} \quad \text{REF: 060909ge} \quad \text{STA: G.G.30} \quad \text{TOP: Interior and Exterior Angles of Triangles} \]

\[ \text{TOP: Equations of Circles} \]

\[ \text{ANS: 2} \]

Longest side of a triangle is opposite the largest angle. Shortest side is opposite the smallest angle.

\[ \text{ANS: 2} \quad \text{PTS: 2} \quad \text{REF: 060911ge} \quad \text{STA: G.G.34} \quad \text{TOP: Angle Side Relationship} \]
12 ANS: 4 PTS: 2 REF: 060912ge STA: G.G.23
TOP: Locus

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

14 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

15 ANS: 1
\( AB = 10 \) since \( \triangle ABC \) is a 6-8-10 triangle. \( 6^2 = 10x \)
\[ 3.6 = x \]

PTS: 2 REF: 060915ge STA: G.G.47 TOP: Similarity
KEY: leg

16 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

17 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

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

19 ANS: 4
\( M_x = \frac{-6 + 1}{2} = \frac{-5}{2} \)
\( M_y = \frac{1 + 8}{2} = \frac{9}{2} \).

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

20 ANS: 1 PTS: 2 REF: 060920ge STA: G.G.74
TOP: Equations of Circles

21 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
TOP: Equations of Circles
23 ANS: 1

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

PTS: 2 REF: 060923ge STA: G.G.70 TOP: Quadratic-Linear Systems

24 ANS: 4

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

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

25 ANS: 3

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

26 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

27 ANS: 4

\[ \Delta ABC \sim \Delta DBC. \quad \frac{AB}{DB} = \frac{AC}{DE} \]

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

\[ x = 13.5 \]

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

28 ANS: 3

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

29 ANS:

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

\[ 5 + 7 + 8 = 20. \]

PTS: 2 REF: 060929ge STA: G.G.42 TOP: Midsegments
30 ANS:

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31 ANS:

\[ y = -2x + 14. \] The slope of \( 2x + y = 3 \) is \[ \frac{-A}{B} = \frac{-2}{1} = -2. \] \( y = mx + b \).

\[ 4 = (-2)(5) + b \]

\[ b = 14 \]

32 ANS:

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33 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.
34 ANS:
20. \(5x + 10 = 4x + 30\)
\[x = 20\]

PTS: 2 REF: 060934ge STA: G.G.45 TOP: Similarity
KEY: basic

35 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

36 ANS:

\[15 + 5\sqrt{5}\]

PTS: 4 REF: 060936ge STA: G.G.69 TOP: Triangles in the Coordinate Plane

37 ANS:

PTS: 4 REF: 060937ge STA: G.G.54 TOP: Compositions of Transformations
KEY: grids
ANS: 
\[ \overline{AC} \cong \overline{EC} \] and \[ \overline{DC} \cong \overline{BC} \] because of the definition of midpoint. \[ \angle ACB \cong \angle ECD \] 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.

1 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

2 ANS: 3
TOP: Constructions

3 ANS: 4
$180 - (40 + 40) = 100$

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

4 ANS: 2
Parallel chords intercept congruent arcs. $m\overarc{AC} = m\overarc{BD} = 30$. $180 - 30 - 30 = 120$.

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

5 ANS: 4
TOP: Triangle Congruency

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

PTS: 2 REF: 080906ge STA: G.G.60 TOP: Identifying Transformations

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

PTS: 2 REF: 080907ge STA: G.G.38 TOP: Parallelograms

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

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

9 ANS: 3
The slope of $y = x + 2$ is 1. The slope of $y - x = -1$ is $\frac{-A}{B} = \frac{-(-1)}{1} = 1$.

PTS: 2 REF: 080909ge STA: G.G.63 TOP: Parallel and Perpendicular Lines

10 ANS: 2
$M_x = \frac{-2 + 6}{2} = 2$. $M_y = \frac{-4 + 2}{2} = -1$

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

11 ANS: 1
TOP: Equations of Circles
12 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

13 ANS: 3 PTS: 2 REF: 080913ge STA: G.G.28 TOP: Triangle Congruency

14 ANS: 4 PTS: 2 REF: 080914ge STA: G.G.7 TOP: Planes


16 ANS: 2

\[ 6 + 17 > 22 \]

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

17 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

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

19 ANS: 1

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

PTS: 2 REF: 080919ge STA: G.G.67 TOP: Distance

20 ANS: 3

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

22. \( \text{ANS: 4} \)
Let \( AD = x \). \( 36x = 12^2 \)
\[ x = 4 \]

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

KEY: leg

23. \( \text{ANS: 2} \)
\[ 4(4x - 3) = 3(2x + 8) \]
\[ 16x - 12 = 6x + 24 \]
\[ 10x = 36 \]
\[ x = 3.6 \]

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

KEY: two chords

24. \( \text{ANS: 3} \)
PTS: 2  
REF: 080924ge  
STA: G.G.24
TOP: Negations

25. \( \text{ANS: 4} \)
PTS: 2  
REF: 080925ge  
STA: G.G.21
TOP: Centroid, Orthocenter, Incenter and Circumcenter

26. \( \text{ANS: 1} \)
\[ V = \pi r^2 h \]
\[ 1000 = \pi r^2 \cdot 8 \]
\[ r^2 = \frac{1000}{8\pi} \]
\[ r \approx 6.3 \]

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

27. \( \text{ANS: 2} \)
PTS: 2  
REF: 080927ge  
STA: G.G.4
TOP: Planes

28. \( \text{ANS: 3} \)
PTS: 2  
REF: 080928ge  
STA: G.G.50
TOP: Tangents  
KEY: common tangency

29. \( \text{ANS: 3} \)
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

30. \( \text{ANS:} \)
\[ 2016. \quad V = \frac{1}{3} Bh = \frac{1}{3} s^2 h = \frac{1}{3} 12^2 \cdot .42 = 2016 \]

PTS: 2  
REF: 080930ge  
STA: G.G.13  
TOP: Volume
31 ANS: 
\[ y = \frac{2}{3}x - 9. \text{ The slope of } 2x - 3y = 11 \text{ is } \frac{A}{B} = \frac{-2}{-3} = \frac{2}{3}. \text{ } -5 = \left(\frac{2}{3}\right)(6) + b \]
\[-5 = 4 + b \]
\[ b = -9 \]

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

32 ANS:

33 ANS:
26. \[ x + 3x + 5x - 54 = 180 \]
\[ 9x = 234 \]
\[ x = 26 \]

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

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

PTS: 2      REF: 080934ge      STA: G.G.34      TOP: Angle Side Relationship
35 ANS: 
\[ y = \frac{4}{3} x - 6 \]
\[ M_x = \frac{1 + 7}{2} = 3 \]

The perpendicular bisector goes through (3, -2) 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

36 ANS: 

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

37 ANS: 

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

FE ≅ FE (Reflexive Property); AE – FE ≅ FC – EF (Line Segment Subtraction Theorem); AF ≅ CE (Substitution); ∠BFA ≅ ∠DEC (All right angles are congruent); ΔBFA ≅ ΔDEC (AAS); AB ≅ CD and BF ≅ DE (CPCTC); ∠BFC ≅ ∠DEA (All right angles are congruent); ΔBFC ≅ ΔDEA (SAS); AD ≅ CB (CPCTC); ABCD is a parallelogram (opposite sides of quadrilateral ABCD are congruent)

PTS: 6  REF: 080938ge  STA: G.G.41  TOP: Special Quadrilaterals
0110ge
Answer Section

1 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

2 ANS: 1
\( x + 2x + 2 + 3x + 4 = 180 \)
\( 6x + 6 = 180 \)
\( x = 29 \)

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

3 ANS: 2  PTS: 2
REF: 011003ge  STA: G.G.55
TOP: Properties of Transformations

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

5 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

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

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

8 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

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

10 ANS: 3  PTS: 2
REF: 011010ge  STA: G.G.71
TOP: Equations of Circles

11 ANS: 2  PTS: 2
REF: 011011ge  STA: G.G.22
TOP: Locus

12 ANS: 4  PTS: 2
REF: 011012ge  STA: G.G.1
TOP: Planes
13 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

14 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

15 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

16 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

17 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

18 ANS: 4
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


20 ANS: 2 PTS: 2 REF: 011020ge STA: G.G.74 TOP: Graphing Circles
21 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

22 ANS: 2

Because the triangles are similar, \(\frac{\angle A}{\angle D} = 1\)

PTS: 2 REF: 011022ge STA: G.G.45 TOP: Similarity

KEY: perimeter and area

23 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

24 ANS: 1

PTS: 2 REF: 011024ge STA: G.G.3

TOP: Planes

25 ANS: 3

\[m = \frac{-A}{B} = \frac{3}{4}\]

PTS: 2 REF: 011025ge STA: G.G.62 TOP: Parallel and Perpendicular Lines

26 ANS: 1

\(A'(2,4)\)

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

KEY: basic

27 ANS: 3

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

PTS: 2 REF: 011027ge STA: G.G.14 TOP: Volume

28 ANS: 3

PTS: 2 REF: 011028ge STA: G.G.26 TOP: Inverse
29 ANS:
\[ \frac{180 - 46}{2} = 67 \]
PTS: 2 REF: 011029ge STA: G.G.31 TOP: Isosceles Triangle Theorem

30 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

31 ANS:
(6, -4). \[ C_x = \frac{Q_x + R_x}{2}, \quad C_y = \frac{Q_y + R_y}{2} \]
\[ 3.5 = \frac{1 + R_x}{2} \quad 2 = \frac{8 + R_y}{2} \]
\[ 7 = 1 + R_x \quad 4 = 8 + R_y \]
\[ 6 = R_x \quad -4 = R_y \]
PTS: 2 REF: 011031ge STA: G.G.66 TOP: Midpoint

32 ANS:
\[ \frac{3}{x} = \frac{6 + 3}{15} \]
\[ 9x = 45 \]
\[ x = 5 \]
PTS: 2 REF: 011032ge STA: G.G.20 TOP: Constructions

33 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
35 ANS:
36, because a dilation does not affect angle measure. 10, because a dilation does affect distance.

PTS: 4  REF: 011035ge  STA: G.G.59  TOP: Properties of Transformations

36 ANS:
\( \overline{JK} \cong \overline{LM} \) because opposite sides of a parallelogram are congruent. \( \overline{LM} \cong \overline{LN} \) because of the Isosceles Triangle Theorem. \( \overline{LM} \cong \overline{JM} \) 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

37 ANS:

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

38 ANS:

PTS: 6  REF: 011038ge  STA: G.G.70  TOP: Quadratic-Linear Systems