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 &c 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, &c some of Archimedes, which are useful, &c 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 indispensable as far as the extraction of the square &c cube roots; Algebra as far as the quadratic equation &c 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.
1 ANS: 2 PTS: 2 REF: 061022ge STA: G.G.62
TOP: Parallel and Perpendicular Lines

2 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

3 ANS: 3
$2y = -6x + 8$ Perpendicular lines have slope the opposite and reciprocal of each other.

$y = -3x + 4$

$m = -3$

$m_\bot = \frac{1}{3}$


4 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

5 ANS: 3
$m = \frac{-A}{B} = -\frac{3}{4}$

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

6 ANS: 4
The slope of $3x + 5y = 4$ is $m = \frac{-A}{B} = -\frac{3}{5}$. $m_\bot = \frac{5}{3}$.


7 ANS: 2
The slope of $x + 2y = 3$ is $m = \frac{-A}{B} = -\frac{1}{2}$. $m_\bot = 2$.


8 ANS:
$m = \frac{-A}{B} = \frac{6}{2} = 3$. $m_\bot = \frac{1}{3}$.

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
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

11 ANS: 3
$m = \frac{-A}{B} = \frac{5}{2}$. $m = \frac{-A}{B} = \frac{10}{4} = \frac{5}{2}$

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

12 ANS: 1
$-2\left(-\frac{1}{2}y = 6x + 10\right)$

$y = -12x - 20$

PTS: 2 REF: 061027ge STA: G.G.63 TOP: Parallel and Perpendicular Lines

13 ANS: 2
$y + \frac{1}{2}x = 4$  $3x + 6y = 12$

$y = -\frac{1}{2}x + 4$  $6y = -3x + 12$

$y = -\frac{3}{6}x + 2$

$m = -\frac{1}{2}$  $y = -\frac{1}{2}x + 2$

PTS: 2 REF: 061027ge STA: G.G.63 TOP: Parallel and Perpendicular Lines

14 ANS: 4
$3y + 1 = 6x + 4$.  $2y + 1 = x - 9$

$3y = 6x + 3$  $2y = x - 9$

$y = 2x + 1$  $y = \frac{1}{2}x - 5$

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

15 ANS: 1

TOP: Parallel and Perpendicular Lines
16 ANS: 4
\[3(x - 2) = -y - 4\]
\[6y = -x + 12\]
\[y = \frac{1}{6}x + 2\]
\[m = \frac{-1}{6}\]

PTS: 2
REF: 01119ge
STA: G.G.63
TOP: Parallel and Perpendicular Lines

17 ANS: 2
The slope of \(y = \frac{1}{2}x + 5\) is \(\frac{1}{2}\). The slope of a perpendicular line is \(-2\). \(\cdot\)
\[5 = (-2)(-2) + b\]
\[b = 1\]

PTS: 2
REF: 060907ge
STA: G.G.64
TOP: Parallel and Perpendicular Lines

18 ANS: 4
The slope of \(y = -3x + 2\) is \(-3\). The perpendicular slope is \(\frac{1}{3}\). \(\cdot\)
\[-1 = \frac{1}{3}(3) + b\]
\[-1 = 1 + b\]
\[b = -2\]

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

19 ANS:
\[y = \frac{2}{3}x + 1\]
\[2y + 3x = 6\]
\[\cdot\]
\[2y = -3x + 6\]
\[y = \frac{3}{2}x + 3\]
\[m = \frac{3}{2}\]
\[m_\perp = \frac{2}{3}\]

PTS: 4
REF: 061036ge
STA: G.G.64
TOP: Parallel and Perpendicular Lines

20 ANS: 2
The slope of a line in standard form is \(\frac{A}{B}\), so the slope of this line is \(\frac{-2}{-1} = 2\). A parallel line would also have a slope of 2. Since the answers are in slope intercept form, find the \(y\)-intercept:
\[y = mx + b\]
\[-11 = 2(-3) + b\]
\[-5 = b\]

PTS: 2
REF: fall0812ge
STA: G.G.65
TOP: Parallel and Perpendicular Lines
21 ANS: 4
The slope of a line in standard form is \( \frac{-A}{B} \), so the slope of this line is \( \frac{-4}{2} = -2 \). A parallel line would also have a slope of \(-2\). Since the answers are in slope intercept form, find the y-intercept: 

\[ y = mx + b \]

\[ 3 = -2(7) + b \]

\[ 17 = b \]

PTS: 2 REF: 081010ge STA: G.G.65 TOP: Parallel and Perpendicular Lines

22 ANS: 4
\[ y = mx + b \]
\[ 3 = \frac{3}{2}(-2) + b \]
\[ 3 = -3 + b \]
\[ 6 = b \]

PTS: 2 REF: 011114ge STA: G.G.65 TOP: Parallel and Perpendicular Lines

23 ANS: 2
The slope of a line in standard form is \( \frac{-A}{B} \), so the slope of this line is \( \frac{-4}{3} \). A parallel line would also have a slope of \( \frac{-4}{3} \). Since the answers are in standard form, use the point-slope formula.

\[ y - 2 = \frac{-4}{3}(x + 5) \]

\[ 3y - 6 = -4x - 20 \]

\[ 4x + 3y = -14 \]

PTS: 2 REF: 061123ge STA: G.G.65 TOP: Parallel and Perpendicular Lines

24 ANS: 2
\[ m = \frac{-A}{B} = \frac{-4}{2} = -2 \]
\[ y = mx + b \]
\[ 2 = -2(2) + b \]
\[ 6 = b \]

PTS: 2 REF: 061123ge STA: G.G.65 TOP: Parallel and Perpendicular Lines

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

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

\[ b = 14 \]

PTS: 2 REF: 060931ge STA: G.G.65 TOP: Parallel and Perpendicular Lines
26 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

27 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

28 ANS: 1
\[m = \left(\frac{8 + 0}{2}, \frac{2 + 6}{2}\right) = (4, 4)\]
\[m = \frac{6 - 2}{0 - 8} = \frac{4}{-8} = -\frac{1}{2}\]
\[m_\perp = 2\] \(y = mx + b\)
\[4 = 2(4) + b\]
\[-4 = b\]

PTS: 2 REF: 081126ge STA: G.G.68 TOP: Perpendicular Bisector

29 ANS: 3

PTS: 2 REF: fall0805ge STA: G.G.70 TOP: Quadratic-Linear Systems
30 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

31 ANS: 4

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

\[ x + y = 4. \]
\[ x^2 - 6x + 10 = -x + 4. \]
\[ y + x = 4. \]
\[ y + 2 = 4. \]
\[ y = -x + 4 \]
\[ x^2 - 5x + 6 = 0 \]
\[ y + 3 = 4 \]
\[ y = 2 \]
\[ (x - 3)(x - 2) = 0 \]
\[ y = 1 \]
\[ x = 3 \) or 2

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

32 ANS: 3

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

\[ x + y = 4. \]
\[ x^2 - 6x + 10 = -x + 4. \]
\[ y + x = 4. \]
\[ y + 2 = 4. \]
\[ y = -x + 4 \]
\[ x^2 - 5x + 6 = 0 \]
\[ y + 3 = 4 \]
\[ y = 2 \]
\[ (x - 3)(x - 2) = 0 \]
\[ y = 1 \]
\[ x = 3 \) or 2

PTS: 2 REF: 061011ge STA: G.G.70 TOP: Quadratic-Linear Systems

33 ANS: 3

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

\[ x + y = 4. \]
\[ x^2 - 6x + 10 = -x + 4. \]
\[ y + x = 4. \]
\[ y + 2 = 4. \]
\[ y = -x + 4 \]
\[ x^2 - 5x + 6 = 0 \]
\[ y + 3 = 4 \]
\[ y = 2 \]
\[ (x - 3)(x - 2) = 0 \]
\[ y = 1 \]
\[ x = 3 \) or 2

PTS: 2 REF: 081118ge STA: G.G.70 TOP: Quadratic-Linear Systems
34 ANS: 3
\[(x + 3)^2 - 4 = 2x + 5\]
\[x^2 + 6x + 9 - 4 = 2x + 5\]
\[x^2 + 4x = 0\]
\[x(x + 4) = 0\]
\[x = 0, -4\]

PTS: 2  REF: 081004ge  STA: G.G.70  TOP: Quadratic-Linear Systems

35 ANS:

PTS: 4  REF: 061137ge  STA: G.G.70  TOP: Quadratic-Linear Systems

36 ANS:

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

37 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
KEY: general
38 ANS: 2
\[ M_x = \frac{7 + (-3)}{2} = 2. \quad M_y = \frac{-1 + 3}{2} = 1. \]

PTS: 2 REFS: 011106ge STA: G.G.66 TOP: Midpoint

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

PTS: 2 REFS: fall0813ge STA: G.G.66 TOP: Midpoint KEY: general

40 ANS: 2
\[ M_x = \frac{3x + 5 + x - 1}{2} = \frac{4x + 4}{2} = 2x + 2. \quad M_y = \frac{3y + (-y)}{2} = \frac{2y}{2} = y. \]

PTS: 2 REFS: 081019ge STA: G.G.66 TOP: Midpoint KEY: general

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

PTS: 2 REFS: 060919ge STA: G.G.66 TOP: Midpoint KEY: graph

42 ANS:
\[ (6, -4). \quad C_x = \frac{Q_x + R_x}{2}, \quad C_y = \frac{Q_y + R_y}{2}. \]
\[ 3.5 = \frac{1 + R_x}{2}, \quad 2 = \frac{8 + R_y}{2} \]
\[ 7 = 1 + R_x, \quad 4 = 8 + R_y \]
\[ 6 = R_x, \quad -4 = R_y \]

PTS: 2 REFS: 011031ge STA: G.G.66 TOP: Midpoint KEY: graph

43 ANS: 1
\[ 1 = \frac{-4 + x}{2}, \quad 5 = \frac{3 + y}{2}. \]
\[ -4 + x = 2, \quad 3 + y = 10 \]
\[ x = 6, \quad y = 7 \]

PTS: 2 REFS: 081115ge STA: G.G.66 TOP: Midpoint
44 ANS:
\[
(2a - 3, 3b + 2). \left( \frac{3a + a - 6}{2}, \frac{2b - 1 + 4b + 5}{2} \right) = \left( \frac{4a - 6}{2}, \frac{6b + 4}{2} \right) = (2a - 3, 3b + 2)
\]

PTS: 2  REF: 061134ge  STA: G.G.66  TOP: Midpoint

45 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

46 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

47 ANS: 4
\[
d = \sqrt{(-6 - 2)^2 + (4 - (-5))^2} = \sqrt{64 + 81} = \sqrt{145}
\]

PTS: 2  REF: 081013ge  STA: G.G.67  TOP: Distance

48 ANS: 4
\[
d = \sqrt{(-5 - 3)^2 + (4 - (-6))^2} = \sqrt{64 + 100} = \sqrt{164} = \sqrt{4 \cdot 41} = 2\sqrt{41}
\]

PTS: 2  REF: 011121ge  STA: G.G.67  TOP: Distance

49 ANS: 2
\[
d = \sqrt{(-1 - 7)^2 + (9 - 4)^2} = \sqrt{64 + 25} = \sqrt{89}
\]

PTS: 2  REF: 061109ge  STA: G.G.67  TOP: Distance

50 ANS: 3
\[
d = \sqrt{(1 - 9)^2 + (-4 - 2)^2} = \sqrt{64 + 36} = \sqrt{100} = 10
\]

PTS: 2  REF: 081107ge  STA: G.G.67  TOP: Distance

51 ANS: 4
\[
d = \sqrt{(146 - (-4))^2 + (52 - 2)^2} = \sqrt{25,000} \approx 158.1
\]

PTS: 2  REF: 061021ge  STA: G.G.67  TOP: Distance
25. \( d = \sqrt{(-3 - 4)^2 + (1 - 25)^2} = \sqrt{49 + 576} = \sqrt{625} = 25 \).

The lateral edges of a prism are parallel.
72 ANS: 3 PTS: 2 REF: 011105ge STA: G.G.10
TOP: Solids
73 ANS: 4 PTS: 2 REF: 060904ge STA: G.G.13
TOP: Solids
74 ANS: 3 PTS: 2 REF: 060925ge STA: G.G.17
TOP: Constructions
75 ANS: 3 PTS: 2 REF: 080902ge STA: G.G.17
TOP: Constructions
76 ANS: 2 PTS: 2 REF: 011004ge STA: G.G.17
TOP: Constructions
77 ANS: 4 PTS: 2 REF: 081106ge STA: G.G.17
TOP: Constructions
78 ANS:

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

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

PTS: 2 REF: 011133ge STA: G.G.17 TOP: Constructions
81 ANS: 1 PTS: 2 REF: 011120ge STA: G.G.18
TOP: Constructions
82 ANS: 3 PTS: 2 REF: fall0804ge STA: G.G.18
TOP: Constructions
83 ANS: 2 PTS: 2 REF: 061101ge STA: G.G.18
TOP: Constructions
84 ANS: 4 PTS: 2 REF: 081005ge STA: G.G.18 TOP: Constructions

85 ANS:

86 ANS: 1 PTS: 2 REF: fall0807ge STA: G.G.19 TOP: Constructions

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

88 ANS: 2 PTS: 2 REF: 061020ge STA: G.G.19 TOP: Constructions

89 ANS:

90 ANS: 1 PTS: 2 REF: 061012ge STA: G.G.20 TOP: Constructions
91 ANS:

PTS: 2               REF: 011032ge       STA: G.G.20       TOP: Constructions

92 ANS:

PTS: 2               REF: 081032ge       STA: G.G.20       TOP: Constructions

93 ANS:

PTS: 2               REF: 061130ge       STA: G.G.20       TOP: Constructions

94 ANS: 2            PTS: 2              REF: 061121ge       STA: G.G.22
TOP: Locus

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

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

97 ANS:

PTS: 2  REF: 061033ge  STA: G.G.22  TOP: Locus

98 ANS:

PTS: 2  REF: 081033ge  STA: G.G.22  TOP: Locus

99 ANS: 2  PTS: 2  REF: 081117ge  STA: G.G.23  TOP: Locus

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

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

102 ANS:

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

103 ANS:

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

105 ANS:

106 ANS: 2

107 ANS: 4

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

108 ANS: 3

\[ 7x = 5x + 30 \]
\[ 2x = 30 \]
\[ x = 15 \]

109 ANS: 2

\[ 7x = 5x + 30 \]
\[ 2x = 30 \]
\[ x = 15 \]
110 ANS: Yes, \( m\angle ABD = m\angle BDC = 44 \) \( 180 - (93 + 43) = 44 \). Because alternate interior angles \( \angle ABD \) and \( \angle CDB \) are congruent, \( AB \) is parallel to \( DC \).

PTS: 4  REF: 081035ge  STA: G.G.35  TOP: Parallel Lines and Transversals

111 ANS: 3
\( 8^2 + 24^2 \neq 25^2 \)

PTS: 2  REF: 011111ge  STA: G.G.48  TOP: Pythagorean Theorem

112 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

113 ANS: 2
\[
x^2 + (x + 7)^2 = 13^2
\]
\[
x^2 + x^2 + 7x + 7x + 49 = 169
\]
\[
2x^2 + 14x - 120 = 0
\]
\[
x^2 + 7x - 60 = 0
\]
\[
(x + 12)(x - 5) = 0
\]
\[
x = 5
\]
\[
2x = 10
\]

PTS: 2  REF: 061024ge  STA: G.G.48  TOP: Pythagorean Theorem
114 ANS: 3
\[ x^2 + 7^2 = (x + 1)^2 \quad x + 1 = 25 \]
\[ x^2 + 49 = x^2 + 2x + 1 \]
\[ 48 = 2x \]
\[ 24 = x \]

PTS: 2  REF: 081127ge  STA: G.G.48  TOP: Pythagorean Theorem

115 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

116 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

117 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

118 ANS: 1
\[ 3x + 5 + 4x - 15 + 2x + 10 = 180. \quad m\angle D = 3(20) + 5 = 65. \quad m\angle E = 4(20) - 15 = 65. \]
\[ 9x = 180 \]
\[ x = 20 \]

PTS: 2  REF: 061119ge  STA: G.G.30  TOP: Interior and Exterior Angles of Triangles

119 ANS: 4
\[ \frac{5}{2 + 3 + 5} \times 180 = 90 \]

PTS: 2  REF: 081119ge  STA: G.G.30  TOP: Interior and Exterior Angles of Triangles

120 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
121 ANS:
34. \(2x - 12 + x + 90 = 180\)
\[3x + 78 = 90\]
\[3x = 102\]
\[x = 34\]

PTS: 2 REF: 061031ge STA: G.G.30 TOP: Interior and Exterior Angles of Triangles

122 ANS: 4
\[180 - (40 + 40) = 100\]

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

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

124 ANS: 3 PTS: 2 REF: 061004ge STA: G.G.31
TOP: Isosceles Triangle Theorem

125 ANS: 4 PTS: 2 REF: 061124ge STA: G.G.31
TOP: Isosceles Triangle Theorem

126 ANS:
\[67. \frac{180 - 46}{2} = 67\]

PTS: 2 REF: 011029ge STA: G.G.31 TOP: Isosceles Triangle Theorem

127 ANS:

\[30.\]

PTS: 2 REF: 011129ge STA: G.G.31 TOP: Isosceles Triangle Theorem

128 ANS:

\[\text{No, } \angle KGH \text{ is not congruent to } \angle GKH.\]

PTS: 2 REF: 081135ge STA: G.G.31 TOP: Isosceles Triangle Theorem

129 ANS: 2 PTS: 2 REF: 061107ge STA: G.G.32
TOP: Exterior Angle Theorem
130 ANS: 1

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

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

131 ANS: 3

\[x + 2x + 15 = 5x + 15\]
\[2(5) + 15 = 25\]
\[3x + 15 = 5x + 5\]
\[10 = 2x\]
\[5 = x\]

PTS: 2 REF: 011127ge STA: G.G.32 TOP: Exterior Angle Theorem

132 ANS: 110.

\[6x + 20 = x + 40 + 4x - 5\]
\[6x + 20 = 5x + 35\]
\[x = 15\]
\[6((15) + 20 = 110\]

PTS: 2 REF: 081031ge STA: G.G.32 TOP: Exterior Angle Theorem

133 ANS: 3 PTS: 2 REF: 081111ge STA: G.G.32

TOP: Exterior Angle Theorem

134 ANS: 4

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

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

135 ANS: 2

\[6 + 17 > 22\]

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

136 ANS: 2

\[7 + 18 > 6 + 12\]

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

137 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
138 ANS: 4
\[ \angle A = 80 \]

PTS: 2  REF: 011115ge  STA: G.G.34  TOP: Angle Side Relationship

139 ANS: 1  PTS: 2  REF: 061010ge  STA: G.G.34  TOP: Angle Side Relationship

140 ANS: 4
Longest side of a triangle is opposite the largest angle. Shortest side is opposite the smallest angle.

PTS: 2  REF: 081011ge  STA: G.G.34  TOP: Angle Side Relationship

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

PTS: 2  REF: 080934ge  STA: G.G.34  TOP: Angle Side Relationship

142 ANS: 2
\[ \frac{3}{7} = \frac{6}{x} \]
\[ 3x = 42 \]
\[ x = 14 \]

PTS: 2  REF: 081027ge  STA: G.G.46  TOP: Side Splitter Theorem

143 ANS: 3
\[ \frac{5}{7} = \frac{10}{x} \]
\[ 5x = 70 \]
\[ x = 14 \]

PTS: 2  REF: 081103ge  STA: G.G.46  TOP: Side Splitter Theorem

144 ANS: 4
\[ \triangle ABC \sim \triangle DBE. \quad \frac{AB}{DB} = \frac{AC}{DE} \]
\[ \frac{9}{2} = \frac{x}{3} \]
\[ x = 13.5 \]

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

145 ANS:
\[ \frac{3}{x} = \frac{6+3}{15} \]
\[ 9x = 45 \]
\[ x = 5 \]

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

\[ \frac{16}{20} = \frac{x - 3}{x + 5} \quad \Rightarrow \quad AC = x - 3 = 35 - 3 = 32 \]

\[ 16x + 80 = 20x - 60 \]

\[ 140 = 4x \]

\[ 35 = x \]

PTS: 4 REF: 011137ge STA: G.G.46 TOP: Side Splitter Theorem

147 ANS:

\[ \frac{x}{25} = \frac{12}{18} \]

\[ 18x = 300 \]

\[ x \approx 16.7 \]

PTS: 2 REF: 061133ge STA: G.G.46 TOP: Side Splitter Theorem

148 ANS: 3

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

149 ANS: 1

PTS: 2 REF: 081003ge STA: G.G.42 TOP: Midsegments

150 ANS: 2

\[ \frac{4x + 10}{2} = 2x + 5 \]

PTS: 2 REF: 011103ge STA: G.G.42 TOP: Midsegments
37. Since $DE$ is a midsegment, $AC = 14$. $10 + 13 + 14 = 37$

PTS: 2  REF: 061030ge  STA: G.G.42  TOP: Midsegments

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

Because $G$ and $H$ are midpoints of two sides of a triangle, $GH$ is a midsegment, and parallel to the third side.

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

$BG$ is also an angle bisector since it intersects the concurrence of $CD$ and $AE$.

PTS: 2  REF: 061025ge  STA: G.G.21  KEY: Centroid, Orthocenter, Incenter and Circumcenter

157 ANS: 1  PTS: 2  REF: 081028ge  STA: G.G.21  TOP: Centroid, Orthocenter, Incenter and Circumcenter

158 ANS: 3  PTS: 2  REF: 011110ge  STA: G.G.21  KEY: Centroid, Orthocenter, Incenter and Circumcenter
159 ANS:

\[(7, 5) \quad m_{AB} = \left(\frac{3+7}{2}, \frac{3+9}{2}\right) = (5, 6) \quad m_{BC} = \left(\frac{7+11}{2}, \frac{9+3}{2}\right) = (9, 6)\]

PTS: 2 REF: 081134ge STA: G.G.21 TOP: Centroid, Orthocenter, Incenter and Circumcenter

160 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

161 ANS: 1

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

\[GC = 2FG\]
\[GC + FG = 24\]
\[2FG + FG = 24\]
\[3FG = 24\]
\[FG = 8\]

PTS: 2 REF: 081018ge STA: G.G.43 TOP: Centroid

162 ANS: 1 PTS: 2 REF: 081104ge STA: G.G.43 TOP: Centroid

163 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: fall0809ge STA: G.G.69 TOP: Triangles in the Coordinate Plane

164 ANS: 1

Since \(AC \cong BC\), \(m\angle A = m\angle B\) under the Isosceles Triangle Theorem.

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

165 ANS: 2 PTS: 2 REF: 061115ge STA: G.G.69 TOP: Triangles in the Coordinate Plane
ANS:

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

PTS: 4  REF: 060936ge  STA: G.G.69  TOP: Triangles in the Coordinate Plane
Geometry Regents Exam Questions by Performance Indicator: Topic
Answer Section

167 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

168 ANS: 4

sum of interior $$\angle s = \text{sum of exterior } \angle s$$

\[
(n - 2)180 = n\left(180 - \frac{(n - 2)180}{n}\right)
\]

\[
180n - 360 = 180n - 180n + 360
\]

\[
180n = 720
\]

\[
n = 4
\]

PTS: 2  REF: 081016ge  STA: G.G.36  TOP: Interior and Exterior Angles of Polygons

169 ANS: 4

$$\angle A = \frac{(n - 2)180}{n} = \frac{(5 - 2)180}{5} = 108$$  \(\angle AEB = \frac{180 - 108}{2} = 36$$

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

170 ANS: 2

$$\angle A = \frac{(n - 2)180}{n} = \frac{(6 - 2)180}{6} = 720$$  \(\angle AEB = \frac{180 - 108}{2} = 36$$

PTS: 2  REF: 081125ge  STA: G.G.37  TOP: Interior and Exterior Angles of Polygons

171 ANS: 1

$$\angle A = \frac{(n - 2)180}{n} = \frac{(5 - 2)180}{5} = 108$$  \(\angle AEB = \frac{180 - 108}{2} = 36$$

PTS: 2  REF: 081022ge  STA: G.G.37  TOP: Interior and Exterior Angles of Polygons

172 ANS:

$$(5 - 2)180 = 540$$  \(\frac{540}{5} = 108$$ interior.  $$180 - 108 = 72$$ exterior

PTS: 2  REF: 011131ge  STA: G.G.37  TOP: Interior and Exterior Angles of Polygons
\( \angle DCB \) and \( \angle ADC \) are supplementary adjacent angles of a parallelogram. \( 180 - 120 = 60. \) \( \angle 2 = 60 - 45 = 15. \)

**PTS:** 2  \hspace{1em} **REF:** 080907ge  \hspace{1em} **STA:** G.G.38  \hspace{1em} **TOP:** Parallelograms

**174** \hspace{1em} **ANS:** 1  
Opposite sides of a parallelogram are congruent. \( 4x - 3 = x + 3. \) \( SV = (2) + 3 = 5. \)

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

**PTS:** 2  \hspace{1em} **REF:** 011013ge  \hspace{1em} **STA:** G.G.38  \hspace{1em} **TOP:** Parallelograms

**175** \hspace{1em} **ANS:** 3  \hspace{1em} **PTS:** 2  \hspace{1em} **REF:** 011104ge  \hspace{1em} **STA:** G.G.38

**TOP:** Parallelograms

**176** \hspace{1em} **ANS:** 3  \hspace{1em} **PTS:** 2  \hspace{1em} **REF:** 061111ge  \hspace{1em} **STA:** G.G.38

**TOP:** Parallelograms

**177** \hspace{1em} **ANS:** 1  \hspace{1em} **PTS:** 2  \hspace{1em} **REF:** 011112ge  \hspace{1em} **STA:** G.G.39

**TOP:** Special Parallelograms

**178** \hspace{1em} **ANS:** 3  
\[ \sqrt{5^2 + 12^2} = 13 \]

**PTS:** 2  \hspace{1em} **REF:** 061116ge  \hspace{1em} **STA:** G.G.39  \hspace{1em} **TOP:** Special Parallelograms

**179** \hspace{1em} **ANS:**

\[ 8x - 5 = 3x + 30. \] \[ 4z - 8 = 3z. \] \[ 9y + 8 + 5y - 2 = 90. \]

\[ 5x = 35 \]
\[ z = 8 \]
\[ 14y + 6 = 90 \]
\[ x = 7 \]
\[ 14y = 84 \]
\[ y = 6 \]

**PTS:** 6  \hspace{1em} **REF:** 061038ge  \hspace{1em} **STA:** G.G.39  \hspace{1em} **TOP:** Special Parallelograms

**180** \hspace{1em} **ANS:** 1  \hspace{1em} **PTS:** 2  \hspace{1em} **REF:** 061125ge  \hspace{1em} **STA:** G.G.39

**TOP:** Special Parallelograms

**181** \hspace{1em} **ANS:** 1  \hspace{1em} **PTS:** 2  \hspace{1em} **REF:** 081121ge  \hspace{1em} **STA:** G.G.39

**TOP:** Special Parallelograms

**182** \hspace{1em} **ANS:** 3  \hspace{1em} **PTS:** 2  \hspace{1em} **REF:** 081128ge  \hspace{1em} **STA:** G.G.39

**TOP:** Special Parallelograms

**183** \hspace{1em} **ANS:** 4  \hspace{1em} **PTS:** 2  \hspace{1em} **REF:** 061008ge  \hspace{1em} **STA:** G.G.40

**TOP:** Trapezoids
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

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: 061016ge  STA: G.G.40  TOP: Trapezoids

3. The non-parallel sides of an isosceles trapezoid are congruent.  \(2x + 5 = 3x + 2\)

\[x = 3\]

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

70.  \(3x + 5 + 3x + 5 + 2x + 2x = 180\)

\[10x + 10 = 360\]

\[10x = 350\]

\[x = 35\]

\[2x = 70\]

PTS: 2  REF: 081029ge  STA: G.G.40  TOP: Trapezoids

TOP: Special Quadrilaterals
ANS:

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

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

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

ANS: 2
Adjacent sides of a rectangle are perpendicular and have opposite and reciprocal slopes.

PTS: 2  REF: 061028ge  STA: G.G.69  TOP: Quadrilaterals in the Coordinate Plane

ANS:
\[ AB \parallel CD \text{ and } AD \parallel CB \] because their slopes are equal. \( ABCD \) is a parallelogram because opposite sides are parallel. \[ AB \neq BC \]. \( ABCD \) is not a rhombus because all sides are not equal. \[ AB \perp BC \] because their slopes are not opposite reciprocals. \( ABCD \) is not a rectangle because \( \angle ABC \) is not a right angle.

PTS: 4  REF: 081038ge  STA: G.G.69  TOP: Quadrilaterals in the Coordinate Plane
The length of each side of quadrilateral is 5. Since each side is congruent, quadrilateral $MATH$ is a rhombus. The slope of $MH$ is 0 and the slope of $HT$ is $-\frac{4}{3}$. Since the slopes are not negative reciprocals, the sides are not perpendicular and do not form right angles. Since adjacent sides are not perpendicular, quadrilateral $MATH$ is not a square.

**ANS:**

PTs: 6 
REF: 011138ge 
STA: G.G.69 
TOP: Quadrilaterals in the Coordinate Plane

---

$\overrightarrow{AB} = \left(\frac{-6+2}{2}, \frac{-2+8}{2}\right) = D(2,3)$  
$\overrightarrow{BC} = \left(\frac{2+6}{2}, \frac{8+-2}{2}\right) = E(4,3)$  
$F(0,-2)$. To prove that $ADEF$ is a parallelogram, show that both pairs of opposite sides of the parallelogram are parallel by showing the opposite sides have the same slope:  
$m_{AD} = \frac{3+-2}{2+-6} = \frac{5}{4} \overline{AF} \parallel \overline{DE}$ because all horizontal lines have the same slope.  
$m_{FE} = \frac{3+-2}{4+-0} = \frac{5}{4}$  

is not a rhombus because not all sides are congruent.  
$AD = \sqrt{5^2+4^2} = \sqrt{41}$  
$AF = 6$

**ANS:**

PTs: 6  
REF: 081138ge  
STA: G.G.69  
TOP: Quadrilaterals in the Coordinate Plane

---

The closer a chord is to the center of a circle, the longer the chord.

**ANS:**

PTs: 2  
REF: 011005ge  
STA: G.G.49  
TOP: Chords

---

Because $\overline{OC}$ is a radius, its length is 5. Since $CE = 2 \ OE = 3$.  
$\triangle EDO$ is a 3-4-5 triangle. If $ED = 4$, $BD = 8$.

**ANS:**

PTs: 2  
REF: fall0811ge  
STA: G.G.49  
TOP: Chords
198 ANS: 3

\[ \sqrt{6^2 - 2^2} = \sqrt{32} = \sqrt{16 \cdot 2} = 4\sqrt{2} \]

PTS: 2 REF: 011112ge STA: G.G.49 TOP: Chords

199 ANS: 4

\[ \sqrt{6^2 - 2^2} = \sqrt{32} = \sqrt{16 \cdot 2} = 4\sqrt{2} \]

PTS: 2 REF: 081124ge STA: G.G.49 TOP: Chords

200 ANS: 1
Parallel lines intercept congruent arcs.

PTS: 2 REF: 061105ge STA: G.G.52 TOP: Chords

201 ANS: 1
Parallel lines intercept congruent arcs.

PTS: 2 REF: 061001ge STA: G.G.52 TOP: Chords

202 ANS: 2
Parallel chords intercept congruent arcs. \( \overrightarrow{AD} = \overrightarrow{BC} = 60 \). \( \overrightarrow{CD} = \frac{1}{2} \overrightarrow{BC} = 30 \).

PTS: 2 REF: 060906ge STA: G.G.52 TOP: Chords

203 ANS: 2
Parallel chords intercept congruent arcs. \( \overrightarrow{AC} = \overrightarrow{BD} = 30 \). \( 180 - 30 - 30 = 120 \).

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

204 ANS:
\[ \frac{180 - 80}{2} = 50 \]

PTS: 2 REF: 081129ge STA: G.G.52 TOP: Chords

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

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

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

\[
\sqrt{25^2 - 7^2} = 24
\]

\[
\text{PTS: 2} \quad \text{REF: 081105ge} \quad \text{STA: G.G.50} \quad \text{TOP: Tangents} \quad \text{KEY: point of tangency}
\]

\[
\text{ANS: 2}
\]

\[
\angle D, \angle G \text{ and } 24^\circ \text{ or } \angle E, \angle F \text{ and } 84^\circ. \quad \overarc{FE} = \frac{\times 360}{15} = 48. \quad \text{Since the chords forming } \angle D \text{ and } \angle G \text{ are}\n\]
\[
\text{intercepted by } \overarc{FE}, \text{ their measure is } 24^\circ. \quad m\overarc{GD} = \frac{7}{15} \times 360 = 168. \quad \text{Since the chords forming } \angle E \text{ and } \angle F \text{ are}\n\]
\[
\text{intercepted by } \overarc{GD}, \text{ their measure is } 84^\circ.
\]

\[
\text{PTS: 4} \quad \text{REF: fall0836ge} \quad \text{STA: G.G.51} \quad \text{TOP: Arcs Determined by Angles} \quad \text{KEY: inscribed}
\]

\[
\text{ANS: 2}
\]

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

\[
\text{PTS: 2} \quad \text{REF: 011015ge} \quad \text{STA: G.G.51} \quad \text{TOP: Arcs Determined by Angles} \quad \text{KEY: inside circle}
\]
\[
\begin{align*}
\text{215 ANS: } & 3 \\
\frac{36 + 20}{2} & = 28 \\
\text{PTS: } & 2 \\
\text{REF: } & 061019ge \\
\text{STA: } & \text{G.G.51} \\
\text{TOP: } & \text{Arcs Determined by Angles} \\
\text{KEY: } & \text{inside circle}
\end{align*}
\]

\[
\begin{align*}
\text{216 ANS: } & 2 \\
\frac{140 - RS}{2} & = 40 \\
140 - RS & = 80 \\
RS & = 60 \\
\text{PTS: } & 2 \\
\text{REF: } & 081025ge \\
\text{STA: } & \text{G.G.51} \\
\text{TOP: } & \text{Arcs Determined by Angles} \\
\text{KEY: } & \text{outside circle}
\end{align*}
\]

\[
\begin{align*}
\text{217 ANS: } & 30. \\
3x + 4x + 5x & = 360. \\
m\overarc{LN} : m\overarc{NK} : m\overarc{KL} & = 90 : 120 : 150. \\
\frac{150 - 90}{2} & = 30 \\
x & = 20 \\
\text{PTS: } & 4 \\
\text{REF: } & 061136ge \\
\text{STA: } & \text{G.G.51} \\
\text{TOP: } & \text{Arcs Determined by Angles} \\
\text{KEY: } & \text{outside circle}
\end{align*}
\]

\[
\begin{align*}
\text{218 ANS: } & 2 \\
x^2 & = 3(x + 18) \\
x^2 - 3x - 54 & = 0 \\
(x - 9)(x + 6) & = 0 \\
x & = 9 \\
\text{PTS: } & 2 \\
\text{REF: } & \text{fall0817ge} \\
\text{STA: } & \text{G.G.53} \\
\text{TOP: } & \text{Segments Intercepted by Circle} \\
\text{KEY: } & \text{tangent and secant}
\end{align*}
\]

\[
\begin{align*}
\text{219 ANS: } & 3 \\
4(x + 4) & = 8^2 \\
4x + 16 & = 64 \\
x & = 12 \\
\text{PTS: } & 2 \\
\text{REF: } & 060916ge \\
\text{STA: } & \text{G.G.53} \\
\text{TOP: } & \text{Segments Intercepted by Circle} \\
\text{KEY: } & \text{tangent and secant}
\end{align*}
\]
220 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

221 ANS: 4  
\[ 4(x + 4) = 8^2 \]
\[ 4x + 16 = 64 \]
\[ 4x = 48 \]
\[ x = 12 \]

PTS: 2  REF: 061117ge  STA: G.G.53  TOP: Segments Intercepted by Circle  
KEY: tangent and secant

222 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

223 ANS: 1  
\[ 4x = 6 \cdot 10 \]
\[ x = 15 \]

PTS: 2  REF: 081017ge  STA: G.G.53  TOP: Segments Intercepted by Circle  
KEY: two chords
224 ANS:
\[x^2 = 9 \cdot 8\]
\[x = \sqrt{72}\]
\[x = \sqrt{36 \cdot 2}\]
\[x = 6\sqrt{2}\]

PTS: 2  REF: 011132ge  STA: G.G.53  TOP: Segments Intercepted by Circle
KEY: two chords

225 ANS: 2
\[(d + 4)4 = 12(6)\]
\[4d + 16 = 72\]
\[d = 14\]
\[r = 7\]

PTS: 2  REF: 061023ge  STA: G.G.53  TOP: Segments Intercepted by Circle
KEY: two secants

226 ANS: 3

![Diagram of a circle with chords and tangents]

PTS: 2  REF: 011101ge  STA: G.G.53  TOP: Segments Intercepted by Circle
KEY: two tangents

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

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

229 ANS: 3  PTS: 2  REF: 011116ge  STA: G.G.71
TOP: Equations of Circles

230 ANS: 4  PTS: 2  REF: 081110ge  STA: G.G.71
TOP: Equations of Circles

231 ANS: 1
\[M_x = \frac{-2 + 6}{2} = 2. \ M_y = \frac{3 + 3}{2} = 3. \] 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
232 ANS:
Midpoint: \( \left( \frac{-4+4}{2}, \frac{2+(-4)}{2} \right) = (0,-1) \). Distance: \( d = \sqrt{(-4-4)^2 + (2-(-4))^2} = \sqrt{100} = 10 \)
\[
r = 5
\]
\[
x^2 + (y+1)^2 = 25
\]

PTS: 2  REF: 061037ge STA: G.G.71  TOP: Equations of Circles


234 ANS: 4
The radius is 4. \( r^2 = 16 \).

PTS: 2  REF: 061014ge STA: G.G.72  TOP: Equations of Circles


236 ANS:
\[
(x+1)^2 + (y-2)^2 = 36
\]

PTS: 2  REF: 081034ge STA: G.G.72  TOP: Equations of Circles

237 ANS:
\[
(x-5)^2 + (y+4)^2 = 36
\]

PTS: 2  REF: 081132ge STA: G.G.72  TOP: Equations of Circles

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


242 ANS: 3  PTS: 2  REF: fall0814ge STA: G.G.73  TOP: Equations of Circles

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

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

245 ANS: 2  PTS: 2  REF: 011125ge STA: G.G.74  TOP: Graphing Circles
4. \( l_1 w_1 h_1 = l_2 w_2 h_2 \)
\[
10 \times 2 \times h = 5 \times w_2 \times h \\
20 = 5w_2 \\
w_2 = 4
\]

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

247 ANS: 3  PTS: 2  REF: 081123ge  STA: G.G.12
TOP: Volume

248 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

249 ANS:

9.1. \((11)(8)h = 800\)
\[
h \approx 9.1
\]

PTS: 2  REF: 061131ge  STA: G.G.12  TOP: Volume

250 ANS:

2016. \( V = \frac{1}{3} Bh = \frac{1}{3} s^2 h = \frac{1}{3} 12^2 \cdot 42 = 2016 \)

PTS: 2  REF: 080930ge  STA: G.G.13  TOP: Volume

251 ANS:

18. \( V = \frac{1}{3} Bh = \frac{1}{3} lwh \)
\[
288 = \frac{1}{3} \cdot 8 \cdot 6 \cdot h \\
288 = 16h \\
18 = h
\]

PTS: 2  REF: 061034ge  STA: G.G.13  TOP: Volume

252 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

253 ANS: 2
\[ V = \pi r^2 h = \pi \cdot 6^2 \cdot 15 = 540\pi \]

PTS: 2  REF: 011117ge  STA: G.G.14  TOP: Volume
254  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

255  ANS:

22.4.

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

1256.4 = \pi r^2 \cdot 8

\[ r^2 = \frac{1256.4}{8\pi} \]

\[ r \approx 22.4 \]

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

256  ANS: 4

\[ L = 2\pi rh = 2\pi \cdot 5 \cdot 11 \approx 345.6 \]

PTS: 2  REF: 061006ge  STA: G.G.14  TOP: Volume

257  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

258  ANS:

375\pi

\[ L = \pi rl = \pi (15)(25) = 375\pi \]

PTS: 2  REF: 081030ge  STA: G.G.15  TOP: Lateral Area

259  ANS: 2

\[ V = \frac{4}{3} \pi r^3 = \frac{4}{3} \pi \cdot 3^3 = 36\pi \]

PTS: 2  REF: 061112ge  STA: G.G.16  TOP: Volume and Surface Area

260  ANS: 4

\[ SA = 4\pi r^2 \quad V = \frac{4}{3} \pi r^3 = \frac{4}{3} \pi \cdot 6^3 = 288\pi \]

144\pi = 4\pi r^2

36 = r^2

6 = r

PTS: 2  REF: 081020ge  STA: G.G.16  TOP: Surface Area
261 ANS: 
\[ V = \frac{4}{3} \pi \cdot 9^3 = 972\pi \]

PTS: 2  REF: 081131ge  STA: G.G.16  TOP: Surface Area

262 ANS:
\[ 452. \ SA = 4\pi r^2 = 4\pi \cdot 6^2 = 144\pi \approx 452 \]

PTS: 2  REF: 061029ge  STA: G.G.16  TOP: Surface Area

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

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

264 ANS: 4  PTS: 2  REF: 081023ge  STA: G.G.45
TOP: Similarity  KEY: perimeter and area

265 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

266 ANS: 4
\[ 180 - (50 + 30) = 100 \]

PTS: 2  REF: 081006ge  STA: G.G.45  TOP: Similarity
KEY: basic

267 ANS: 3
\[ \frac{7x}{4} = \frac{7}{x} \cdot 7(2) = 14 \]
\[ 7x^2 = 28 \]
\[ x = 2 \]

PTS: 2  REF: 061120ge  STA: G.G.45  TOP: Similarity
KEY: basic

268 ANS:
\[ 20. \ 5x + 10 = 4x + 30 \]
\[ x = 20 \]

PTS: 2  REF: 060934ge  STA: G.G.45  TOP: Similarity
KEY: basic
\[\frac{x + 2}{x} = \frac{x + 6}{4}\]

\[x^2 + 6x = 4x + 8\]

\[x^2 + 2x - 8 = 0\]

\[(x + 4)(x - 2) = 0\]

\[x = 2\]

**PTS:** 2  **REF:** 081137ge  **STA:** G.G.45  **TOP:** Similarity  
**KEY:** basic

\[AB = 10\] 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

Let \(AD = x\). \(36x = 12^2\)

\[x = 4\]

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

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

\[36 = x^2 + 5x\]

\[0 = x^2 + 5x - 36\]

\[0 = (x + 9)(x - 4)\]

\[x = 4\]

**PTS:** 2  **REF:** 011123ge  **STA:** G.G.47  **TOP:** Similarity  
**KEY:** leg

\[x^2 = 7(16 - 7)\]

\[x^2 = 63\]

\[x = \sqrt{9 \cdot \sqrt{7}}\]

\[x = 3\sqrt{7}\]

**PTS:** 2  **REF:** 061128ge  **STA:** G.G.47  **TOP:** Similarity  
**KEY:** altitude
274 ANS:
\[ 2\sqrt{3} \cdot x^2 = 3 \cdot 4 \]
\[ x = \sqrt{\frac{12}{3}} = 2\sqrt{3} \]

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

275 ANS:
\[ 2.4. \quad 5a = 4^2 \quad 5b = 3^2 \quad h^2 = ab \]
\[ a = 3.2 \quad b = 1.8 \quad h^2 = 3.2 \cdot 1.8 \]
\[ h = \sqrt{5.76} = 2.4 \]

PTS: 4  
REF: 081037ge  
STA: G.G.47  
TOP: Similarity  
KEY: altitude

276 ANS: 3  
PTS: 2  
REF: 060905ge  
STA: G.G.54  
TOP: Reflections  
KEY: basic

277 ANS: 2  
PTS: 2  
REF: 081108ge  
STA: G.G.54  
TOP: Reflections  
KEY: basic

278 ANS: 1  
PTS: 2  
REF: 081113ge  
STA: G.G.54  
TOP: Reflections  
KEY: basic

279 ANS:

PTS: 2  
REF: 061032ge  
STA: G.G.54  
TOP: Reflections  
KEY: grids
280 ANS: 

\[
\begin{align*}
\text{PTS: } 2 & \quad \text{REF: 011130ge} \quad \text{STA: G.G.54} \quad \text{TOP: Reflections} \\
\text{KEY: grids}
\end{align*}
\]

281 ANS: 3 

\[
-5 + 3 = -2 \quad 2 + (-4) = -2
\]

PTS: 2 \quad REF: 011107ge \quad STA: G.G.54 \quad TOP: Translations

282 ANS: 1 

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

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

283 ANS: 1 

\[
A'(2, 4)
\]

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

284 ANS: 3 

\[
(3, -2) \rightarrow (2, 3) \rightarrow (8, 12)
\]

PTS: 2 \quad REF: 011126ge \quad STA: G.G.54 \quad TOP: Compositions of Transformations

285 ANS: 

\[
\begin{align*}
\text{PTS: } 4 & \quad \text{REF: 060937ge} \quad \text{STA: G.G.54} \quad \text{TOP: Compositions of Transformations} \\
\text{KEY: grids}
\end{align*}
\]
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

$A'(8, 2), B''(2, 0), C''(6, -8)$

PTS: 4  REF: 081136ge  STA: G.G.58  TOP: Compositions of Transformations

$G''(3, 3), H''(7, 7), S''(-1, 9)$

PTS: 4  REF: 081036ge  STA: G.G.58  TOP: Compositions of Transformations

$A''(3, 3), H''(7, 7), S''(-1, 9)$


$A''(3, 3), H''(7, 7), S''(-1, 9)$


$A''(3, 3), H''(7, 7), S''(-1, 9)$

294 ANS:

![Diagram of triangles](image)

PTS: 2 REF: fall0830ge STA: G.G.55 TOP: Properties of Transformations

295 ANS:

![Diagram of translated triangle](image)

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


296 ANS: 3 PTS: 2 REF: 081021ge STA: G.G.57 TOP: Properties of Transformations

Translating and reflections do not affect distance.

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


298 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

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

300 ANS: 4 PTS: 2 REF: 080915ge STA: G.G.56 TOP: Identifying Transformations

301 ANS: 4 PTS: 2 REF: 061018ge STA: G.G.56 TOP: Identifying Transformations

302 ANS: 3 PTS: 2 REF: 061122ge STA: G.G.56 TOP: Identifying Transformations
304 ANS: Yes. A reflection is an isometry.

PTS: 2  REF: 061132ge  STA: G.G.56  TOP: Identifying Transformations

305 ANS: 2
PTS: 2  REF: 011006ge  STA: G.G.56  TOP: Identifying Transformations

306 ANS: 4
PTS: 2  REF: 061015ge  STA: G.G.56  TOP: Identifying Transformations

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

308 ANS: 4
PTS: 2  REF: 061103ge  STA: G.G.60  TOP: Identifying Transformations

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

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

310 ANS: 4
PTS: 2  REF: fall0818ge  STA: G.G.61  TOP: Analytical Representations of Transformations

311 ANS: 4
Median $BF$ bisects $AC$ so that $CF \cong FA$.

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

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

313 ANS: 3
PTS: 2  REF: 080924ge  STA: G.G.24  TOP: Negations

314 ANS: 2
PTS: 2  REF: 061002ge  STA: G.G.24  TOP: Negations

315 ANS: The medians of a triangle are not concurrent. False.

PTS: 2  REF: 061129ge  STA: G.G.24  TOP: Negations

316 ANS: 4
PTS: 2  REF: 011118ge  STA: G.G.25  TOP: Compound Statements  KEY: general

317 ANS: 4
PTS: 2  REF: 081101ge  STA: G.G.25  TOP: Compound Statements  KEY: conjunction

318 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.


319 ANS: 3
PTS: 2  REF: 011028ge  STA: G.G.26  TOP: Conditional Statements

320 ANS: 1
PTS: 2  REF: 061009ge  STA: G.G.26  TOP: Converse and Biconditional
TOP: Conditional Statements

321 ANS: 4  PTS: 2  REF: 060913ge  STA: G.G.26

TOP: Contrapositive

322 ANS: 3  PTS: 2  REF: 081026ge  STA: G.G.26

323 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

324 ANS: 3

TOP: Triangle Congruency

325 ANS: 1  PTS: 2  REF: 011122ge  STA: G.G.28

326 ANS: 4

TOP: Triangle Congruency

327 ANS: 3  PTS: 2  REF: 080913ge  STA: G.G.28

328 ANS: 2

TOP: Triangle Congruency

329 ANS: 4  PTS: 2  REF: 080905ge  STA: G.G.29
330 ANS: 4

\[
\begin{align*}
\overline{AC} & \cong \overline{EC} \text{ and } \overline{DC} \cong \overline{BC} \text{ because of the definition of midpoint. } \\
\angle ACB & \cong \angle ECD \text{ because of vertical angles. } \\
\triangle ABC & \cong \triangle EDC \text{ because of SAS. } \\
\angle CDE & \cong \angle CBA \text{ because of CPCTC. } \\
\end{align*}
\]

331 ANS: 2 PTS: 2 REF: 081102ge STA: G.G.29 TOP: Triangle Congruency

332 ANS: 3 PTS: 2 REF: 061102ge STA: G.G.29 TOP: Triangle Congruency

333 ANS: 4 PTS: 2 REF: 011108ge STA: G.G.27 TOP: Triangle Congruency

334 ANS:

\[
\overline{AC} \cong \overline{EC} \text{ and } \overline{DC} \cong \overline{BC} \text{ because of the definition of midpoint. } \\
\angle ACB \cong \angle ECD \text{ because of vertical angles. } \\
\triangle ABC \cong \triangle EDC \text{ because of SAS. } \\
\angle CDE \cong \angle CBA \text{ because of CPCTC. } \\
\]

BD is a transversal intersecting \( \overline{AB} \) and \( \overline{ED} \). Therefore \( \overline{AB} \parallel \overline{DE} \) because \( \angle CDE \) and \( \angle CBA \) are congruent alternate interior angles.

335 ANS:

\[
\overline{BD} \cong \overline{DB} \text{ (Reflexive Property); } \\
\triangle ABD \cong \triangle CDB \text{ (SSS); } \\
\angle BDC \cong \angle ABD \text{ (CPCTC).}
\]

336 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: 4 REF: 061035ge STA: G.G.27 TOP: Quadrilateral Proofs

PTS: 6 REF: fall0838ge STA: G.G.27 TOP: Circle Proofs
337 ANS: 
\( \overline{OA} \cong \overline{OB} \) because all radii are equal. \( \overline{OP} \cong \overline{OP} \) because of the reflexive property. \( \overline{OA} \perp \overline{PA} \) and \( \overline{OB} \perp \overline{PB} \) because tangents to a circle are perpendicular to a radius at a point on a circle. \( \angle PAO \cong \angle PBO \) because all right angles are congruent. \( \triangle AOP \cong \triangle BOP \) because of HL. \( \angle AOP \cong \angle BOP \) because of CPCTC.

PTS: 5  REF: 061138ge  STA: G.G.27  TOP: Circle Proofs

338 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

339 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


341 ANS:
\( \angle B \) and \( \angle E \) are right angles because of the definition of perpendicular lines. \( \angle B \cong \angle E \) because all right angles are congruent. \( \angle BFD \) and \( \angle DFE \) are supplementary and \( \angle ECA \) and \( \angle ACB \) are supplementary because of the definition of supplementary angles. \( \angle DFE \cong \angle ACB \) because angles supplementary to congruent angles are congruent. \( \triangle ABC \sim \triangle DEF \) because of AA.

PTS: 4  REF: 011136ge  STA: G.G.44  TOP: Similarity Proofs

342 ANS:
\( \angle ACB \cong \angle AED \) is given. \( \angle A \cong \angle A \) because of the reflexive property. Therefore \( \triangle ABC \sim \triangle ADE \) because of AA.

PTS: 2  REF: 081133ge  STA: G.G.44  TOP: Similarity Proofs