1. Match each vocabulary word to the picture.
   A. Linear Pair
   B. Vertical Angles
   C. Angle Bisector
   D. Parallel Lines
   E. Orthocenter
   F. Centroid

2. Name all the possible segments on \( \overline{AD} \).

For questions 3 – 4 use the diagram below.

3. Name all possible lines on the given figure.

4. Name all possible rays on the given figure.

5. \( AC = 72 \) \( BC = \) ______

6. Solve for \( x \).

7. Find \( \angle CAB \) ______

8. \( AB \) bisects \( \angle CAT \). If \( m\angle CAT = 30 \) and \( m\angle CAB = 2x + 10 \) then give the value of \( x \).

9. \( AB \) bisects \( \angle CAT \). If \( m\angle CAT = 8x - 30 \) and \( m\angle CAB = 2x + 10 \) then give the value of \( x \).
10. \( \overline{AB} \) bisects \( \angle CAT \). If \( m\angle BAT = 5x + 20 \) and \( m\angle CAB = 2x + 50 \) then give the measure of \( \angle CAT \).

11. Choose the terms below that can be defined.

\begin{array}{llllllll}
\text{line} & \text{space} & \text{parallel} & \text{segment} & \text{point} & \text{ray} & \text{plane} \\
\end{array}

12. If \( \overline{AB} \) has endpoints \( A(2, -1) \) and \( B(10, 13) \) then give the midpoint of \( \overline{AB} \).

13. If \( \overline{AB} \) has endpoint \( A(2, 13) \) and midpoint \( (10, -1) \) then give the coordinates of \( B \).

14. What is the distance between \((-5, 2)\) and \((-9, -4)\)?

15. Given: \( \triangle ABC \) is isosceles with \( AB = BC \). If \( m\angle A = 30^\circ \) then find \( m\angle B \).

16. Given: \( \triangle RST \) is isosceles with \( RS = ST \). If \( m\angle R = 40^\circ \) then find \( m\angle S \).

17. Given: \( \triangle RST \) is isosceles with \( TS = RT \). If \( m\angle R = 40^\circ \) then find \( m\angle S \).

18. In the diagram above, \( m\angle 1 = (5x + 20)^\circ \) and \( m\angle 2 = (3x + 16)^\circ \). What is \( m\angle 2 \)?

\begin{align*}
A. & \ 18 \\
B. & \ 22 \\
C. & \ 22 \\
D. & \ 70
\end{align*}

19. In the diagram above, \( m\angle 1 = (5x - 20)^\circ \) and \( m\angle 2 = (3x + 8)^\circ \). What is \( m\angle 1 \)?

20. True or False (A through E):

\begin{align*}
A. & \ \text{Angles 1 and 11 are corresponding angles.} \\
B. & \ \text{Angles 7 and 5 are corresponding angles.} \\
C. & \ \text{Since no lines have been said to be parallel, there are no corresponding angles in this picture.} \\
D. & \ \text{Angles 5 and 10 are alternate interior angles.} \\
E. & \ \text{Angles 14 and 11 are alternate interior angles.}
\end{align*}
21. Find the value of \(x\) and \(y\) in the diagram below, if the lines \(p\) and \(q\) are parallel.

\[
\begin{align*}
4x^\circ & = (5y - 50)^\circ \\
3x + 20^\circ & = (3y - 10)^\circ 
\end{align*}
\]

\(x = \) 
- A. 22.9 
- B. 20 
- C. 2.9 
- D. 4 

\(y = \) 
- A. 30 
- B. 19.75 
- C. 11 
- D. 1 

22. If \(m\angle AEB = (2x + 32)^\circ\) and \(m\angle DEC = \left(\frac{1}{2}x + 65\right)^\circ\), what is the value of \(x\)?

23. \(\triangle CAR\) is isosceles with \(CA = RA\). If \(m\angle CRD \cdot 105^\circ\) then fill in the angle measures below.

\[R. m\angle CAT \quad S. m\angle BAT \quad T. m\angle BAR \quad U. m\angle CAR\]

24. Which are congruent? (Check ✓)

- A. Base angles of an isosceles triangle ✓
- B. Corresponding angles of parallel lines ✓
- C. Diagonals of a rectangle ✓
- D. Diagonals of an isosceles trapezoid ✓
- E. Vertical angles ✓
- F. Linear pairs ✓
- G. Alternate interior angles of parallel lines ✓
- H. Opposite angles of a parallelogram ✓
- I. Consecutive angles of a parallelogram ✓

25. Which of the following are supplementary? (Check ✓)

- A. Base angles of an isosceles triangle ✓
- B. Corresponding angles of parallel lines ✓
- C. Diagonals of a rectangle ✓
- D. Diagonals of an isosceles trapezoid ✓
- E. Vertical angles ✓
- F. Linear pairs ✓
- G. Alternate interior angles of parallel lines ✓
- H. Opposite angles of a parallelogram ✓
- I. Consecutive angles of a parallelogram ✓
26. Consider the following statement: "For two real numbers \(a\) and \(b\), if \(a < b\), then \(a^2 < b^2\)."
Select ALL that can be used to prove that the statement is sometimes false?
A. \(a = -4\) and \(b = 3\)
B. \(a = 4\) and \(b = 5\)
C. \(a = -6\) and \(b = 4\)
D. \(a = -1\) and \(b = 2\)

27. Fill out the reasons for the algebraic proof:
Given: \(5(x + 2) - 4 = 21\)
Prove: \(x = 3\)

<table>
<thead>
<tr>
<th>Statements</th>
<th>Reasons</th>
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<tbody>
<tr>
<td>1. (5(x + 2) - 4 = 21)</td>
<td>1.</td>
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<tr>
<td>2. (5(x + 2) = 25)</td>
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<tr>
<td>3. (5x + 10 = 25)</td>
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<tr>
<td>4. (5x = 15)</td>
<td>4.</td>
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<tr>
<td>5. (x = 3)</td>
<td>5.</td>
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</table>

28. Which is the converse of the statement "If a triangle has all acute angles then it is an acute triangle."
A. If a triangle has all acute angles, then it is an acute triangle.
B. If a triangle is an acute triangle then it has all acute angles.
C. If a triangle does not have all acute angles then it is not an acute triangle.
D. If a triangle is not an acute triangle then it does not have all acute angles.

29. Name the corresponding congruent parts of the following triangles.

30. What is the value of \(y\)?

31. What is the value of \(m\angle TRI\)?

32. Given \(\angle R \cong \angle T\) and \(\angle RSU \cong \angle TUS\). We know \(\triangle RUS \cong \triangle TSU\) by ?
A. SSS
B. SAS
C. AAS
D. ASA

33. If \(\overline{AB}\) bisects \(\angle CBD\) and \(\overline{CB} \cong \overline{DB}\) then we can prove \(\triangle ACB \cong \triangle ADB\) by what theorem or postulate?
A. SSS
B. SAS
C. ASA
D. AAS
34. If $\triangle RUS \cong \triangle TSU$ (not shown) then which is NOT true?
   A. $RS \cong TU$
   B. $\angle SUR \cong \angle UST$
   C. $RU \cong TS$
   D. $\angleUSR \cong \angle UST$

35. Given $\angle R \cong \angle T$, $\angle RSU \cong \angle TUS$ then $\triangle RUS \cong \triangle$ ?

36. A mobile maker wants to place a weight at the center of gravity of a triangular piece of metal. Which does she need?
   A. circumcenter
   B. orthocenter
   C. incenter
   D. centroid

37. If $F$, $B$ and $D$ are midpoints of $EC$, $AC$, and $AE$ respectively, then...

38. If $Q$ is the midpoint of $MK$ and $\angle J \cong \angle L$ then the triangles are congruent by
   A. SSS
   B. SAS
   C. AAS
   D. ASA

39. Draw in the lines of symmetry for each of the concave figures above.

40. Draw the lines of symmetry for each figure.
41. In the diagram below $\triangle RAP \cong \triangle ISD$. Which point below can be the placement of point $S$?

A. (3, 8)  
B. (2, 8)  
C. (2, -5)  
D. (3, -5)

42. The rhombus below has vertex coordinates shown. Find the coordinates of vertex $S$.

43. The picture above shows a:

A. dilation  
B. rotation  
C. translation  
D. reflection

44. The picture above shows a:

A. dilation  
B. rotation  
C. translation  
D. reflection

45. Translate the triangle $(x, y) \rightarrow (x + 4, y - 2)$.

46. Given $\triangle LMN$, find the coordinates of $\triangle L'M'N'$ reflected over the y-axis.

The picture above shows a:

A. dilation  
B. rotation  
C. translation  
D. reflection
For questions 47 - 49 use the diagram below.

\( \overline{NA} \) bisects \( \angle GNP \)

47. \( GA = 16, AP = 20, NP = 25 \), \( GN = \) _____

48. \( GN = 15, NP = 18, GP = 25 \), \( GA = \) _____

49. \( GA = 12, AP = 2x + 3, NP = 5 + x \), \( GN = 15 \)
   What is the value of \( x \)?
   A. \( \frac{5}{6} \)  
   B. \( \frac{5}{14} \)  
   C. \( \frac{8}{3} \)  
   D. 8

50. A triangle has sides 12 ft, 14 ft and 20 ft.
    The smallest side of another, similar triangle measures 8 ft. What is the perimeter of the smaller triangle?

51. The diagram above may not be drawn to scale.

If \( \triangle RST \sim \triangle UQP \) then find the value of \( x \).
Round to the nearest tenth.

A. 34.5  
B. 36.2  
C. 11.6  
D. 12.2

52. Find the value of \( x \). Round to the tenth place if needed.

53. In the figures below, \( \triangle MAP \sim \triangle BOX \). If \( m\angle A = 75^\circ \) and \( m\angle X = 50^\circ \), what is \( m\angle B \)?

54. Polygon RVTUS ~ Polygon MNPQR.
   \( SU = 10 \), and side lengths of MNPQR are shown. What is the perimeter of RVTUS?
55. Roger is 6 feet tall and stands by a flag pole. Roger casts a 5 foot shadow at the same time of day that the flag pole casts a 9 foot shadow.

How tall is the flag pole?
A. 10.8 ft  B. 8 ft  C. 10 ft  D. 7.5 ft

56. $AE \parallel BF, EC \parallel DF,$
AE=10, EC=8, AC=9, FD=12. HC=6.

A. What conjecture states $\triangle ACE \sim \triangle BDF$? _______
B. Find BC=____
C. Find BH=____
D. Find HF=____

57. If angle R is congruent to angle N then $RO = ____$ and $OF = ____$

58. Faith, who will play ball on a new type of field (shown below), will be the pitcher. Faith will stand an equal distance from Marie, Linda and Brenda. At which point should Faith stand in the MBL triangle?

A. circumcenter  B. orthocenter  C. incenter  D. centroid
59. Which can NOT be a triangle?
A. right and isosceles
B. obtuse and isosceles
C. equilateral and acute
D. obtuse and scalene
E. right and equilateral

60. Complete each statement.
A. Every point in a plane which is on the _________________ is equidistant from the sides of an angle.
B. Every point in a plane which is on the _________________ is equidistant from the endpoints of a segment.
C. The point called the __________ is equidistant to the sides of the triangle,
D. The point called the __________ is equidistant to the vertices of a triangle.

61. Find the value of x in each diagram.

62. TRAP is a trapezoid with bases $\overline{TR}$ and $\overline{AP}$. If $m\angle R = 132^\circ$ then find $m\angle A$. 
63. Given the following statements, name the quadrilateral that it must be.

A. Parallelogram with equal sides

B. Parallelogram with perpendicular diagonals.

C. Parallelogram with four right angles.

D. Quadrilateral with only two pair of parallel sides.

64. Given that the diagram below is a parallelogram, find the value of x.

\[
\begin{align*}
(4x + 10)° & \quad 70° \\
(5x - 15)° &
\end{align*}
\]

A. 42 \quad B. 31 \quad C. 9 \quad D. 36

65. Rectangle RSUT has diagonals that meet at point X. If RX=4x, ST=100 and XU=5y then \( x = \) ___ and \( y = \) ___?

66. A quadrilateral has all sides equal. Which cannot describe that quadrilateral?

A. rhombus \quad B. square \quad C. regular \quad D. trapezoid \quad E. equilateral

67. In this parallelogram, \( x = \) ?

\[
\begin{align*}
120° & \quad (4x+12)^° \\
80° &
\end{align*}
\]

68. In this parallelogram, \( x = \) ?

\[
\begin{align*}
\not{120°} & \quad (4x+12)^° \\
\not{80°} &
\end{align*}
\]
69. Part 1. In the diagram, what are the coordinates of the midpoint of $AC$?

R. $(d - 1, 1.5)$  
S. $(\frac{d-2}{2}, \frac{3}{2})$  
T. $(\frac{d+2}{2}, \frac{3}{2})$  
U. $(1, 1.5)$

Part 2. What is the length of the shorter diagonal (in terms of $d$ or $w$)?

70. In parallelogram BRAT, $S$ is the intersection of the diagonals. If $SB = 4x-12$, $SR=6x+8$ and $SA=3x+10$, then...

71. PROOF

Given: $\overline{AD} \parallel \overline{BC}$ and $\overline{AD} \cong \overline{BC}$

Prove: $\overline{AB} \parallel \overline{CD}$

(You may use more or less lines than eight.)

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72. A triangle with sides 12, 20 and 10 is
   A. acute    B. obtuse
   C. right    D. equilateral

a. Find the value of $x$.

b. Find the lengths of each diagonal.

73. A triangle with sides 8, 15, 16 is
   A. acute    B. obtuse
   C. right    D. equilateral
74. Describe the triangle above. Circle all that apply.
- acute
- obtuse
- right
- equilateral
- scalene
- isosceles
- enigmatic

75. Which graph best represents a line parallel to the line with the equation \( y = -\frac{1}{3} x + 4 \)?

A. 

B. 

C. 

D.
77. Prove the following using the flow chart proof AND two column proof.

**FLOW CHART**

Given: \( \angle B, \angle D \) are right angles; \( AB \cong DE \)

Prove: \( AC \equiv EC \)

\( \angle B, \angle D \) are right angles

\( AB \equiv DE \)

\( \angle ACB \equiv \angle ECD \)

\( \angle B \cong \angle D \)

\( \triangle ABC \cong \triangle \) (You may use more or less lines than eight steps.)

\( AC \equiv EC \)

**TWO COLUMN PROOF**

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78. The following conditional statements are true. Which of the conditional statements below have converses that are also true?
   I. If a figure is a square, then it is also a rhombus.
   II. If a triangle has three congruent sides, then it has three congruent angles.
   III. If two angles are complement, then the sum of the measures of the two angles is $90^\circ$.

79. What is true about the conditional statement below?
   "If an object is a pentagon, then the object is a polygon."
   A. The converse is always true.
   B. The converse is sometimes true.
   C. The converse is never true.
   D. It cannot be determined if the converse is true.

80. Produce a counterexample to show that the following statement is not true.
   "If a number is divisible by 2, then it is divisible by 6."

81. In the graph below, the graph of $y = x + 2$ is shown. If this graph is reflected across the x-axis, what is the y-coordinate of the point on the reflected graph at $x = -3$?
83. Classify the transformation. (The shaded figure is the pre-image)

84. In the figure below, the dashed figure is the preimage, and the solid outlined figure is the image. What is the transformation rule of the translation below?

85. Draw a 180° counterclockwise rotation of the figure below and identify the new coordinates of each vertex.

86. Based on the measurements below, does \( \overline{MT} \) bisect \( \angle AMH \)? Why or why not?

87. Determine the value of \( x \).
88. Determine the values of $x$ and $y$.

89. What is the value of $x$ in the figure below?

90. In the figure below, what is the length of $PR$?

91. In the figure below, $ABCD \sim JKLM$. What is the perimeter of $JKLM$?

92. In the figure below, $\triangle A'B'C'$ is a dilation of $\triangle ABC$. What is the scale factor of the dilation?