Geometry Basics
Mid-Unit 1 Review
Lessons 1-7

Distance Formula: \[ d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2} \]
Pythagorean Theorem: \[ a^2 + b^2 = c^2 \]
Midpoint Formula: \[ \left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right) \]

Lesson 1 - Know the correct symbols to write a point, line, ray, segment, etc.

1. Draw one diagram that uses the following information correctly.
   a. Draw three collinear points, \( H, I, \) and \( J \) with \( I \) between \( H \) and \( J \). Add a point \( K \) between \( I \) and \( J \).

   \[ \text{\begin{array}{c}
   H \\
   I \\
   K \\
   J
   \end{array}} \]

   b. Draw five noncollinear points \( M, N, O, P, \) and \( Q \).
      Then sketch \( MN, OP, PQ, MP, \) and \( NO \).

Lesson 2 - Segment Addition Postulate

2. Suppose \( J \) is between \( H \) and \( K \). Use the Segment Addition Postulate to solve for \( x \). Then find the length of each segment. SHOW WORK!

   \[ HJ = 8x - 3 \]
   \[ JK = 12x - 5 \]
   \[ KH = 112 \]

   \[ 8x - 3 + 12x - 5 = 112 \]
   \[ 20x - 8 = 112 \]
   \[ 20x = 120 \]
   \[ x = 6 \]
   \[ \text{Answer: } HJ = 48, \ JK = 67, \ KH = 112 \]

3. \( S \) is between \( T \) and \( V \). \( R \) is between \( S \) and \( T \). \( T \) is between \( R \) and \( Q \). \( QV = 23, QT = 8, \) and \( TR = RS = SV \). Make a sketch and answer the following.

   a. Find \( RS \).
   b. Find \( QS \).
   c. Find \( TS \).
   d. Find \( TV \).

   \[ \text{Answer: } RS = 5, \ QS = 18, \ TS = 10, \ TV = 15 \]
Lesson 3 – Segments on the Coordinate Plane

4. Determine if $AB \cong BC$. (Hint: find each distance and then compare)
   Use distance formula or Pythagorean Theorem. SHOW ALL WORK!!!
   $A (0, -1)$
   $B (-2, -4)$
   $C (-4, -7)$

   $AB = \sqrt{2^2 + 3^2} = \sqrt{4 + 9} = \sqrt{13}$

   $BC = \sqrt{2^2 + 3^2} = \sqrt{4 + 9} = \sqrt{13}$

   Yes, $AB \cong BC$
   because the lengths are equal.

5. Find the distance between the two points. Show all work. $(8.3, -6)$ and $(-1, 3)$.

   $\sqrt{(8.3 - (-1))^2 + (-6 - 3)^2}$
   $\sqrt{(9.3)^2 + (-9)^2}$
   $\sqrt{86.49 + 81} = \sqrt{167.49} \approx 12.94$

6. Find the perimeter of the following triangle. Show all work.

   $AB = \sqrt{4^2 + 2^2} = \sqrt{16 + 4} = \sqrt{20}$
   $BC = \sqrt{7^2 + 1^2} = \sqrt{49 + 1} = \sqrt{50}$
   $AC = \sqrt{5^2 + 5^2} = \sqrt{25 + 25} = \sqrt{50}$

   Perimeter $= \sqrt{20} + \sqrt{50} + \sqrt{50} \approx 18.01$ units
Lesson 4 – Midpoints & Partitioning (Use graph paper!!)

7. Find the coordinates of the midpoint of a segment with endpoints (-3, 5) and (5, -1).
   SHOW WORK
   \[
   \begin{align*}
   \text{ave. } x &= \frac{-3 + 5}{2} = 1 \\
   \text{ave. } y &= \frac{5 + (-1)}{2} = 2 \\
   \end{align*}
   \]
   \[
   (1, 2)
   \]

8. Find the coordinates of the missing endpoint of the segment with given endpoint (-4, 3) and midpoint (-1, -1).
   SHOW WORK
   \[
   \begin{align*}
   -4 + x &= -1 \\
   \frac{-4 + x}{2} &= -1 \\
   -4 + x &= -2 \\
   x &= 2 \\
   \end{align*}
   \]
   \[
   \begin{align*}
   3 + y &= -1 \\
   \frac{3 + y}{2} &= -1 \\
   3 + y &= -2 \\
   y &= -5 \\
   \end{align*}
   \]
   \[
   (2, -5)
   \]

9. Line segment \( \overline{JK} \) in the xy-coordinate plane has endpoints with coordinates (-4, 11) and (8, -1). If the segment is partitioned into four equal parts, select ALL the coordinate points that would be on segment \( \overline{JK} \) at a partition.
   \[
   \begin{align*}
   A. \ (2, 9) & \quad E. \ (3, 4) \\
   B. \ (-1, 8) & \quad F. \ (4, 3) \\
   C. \ (0, 7) & \quad G. \ (5, 2) \\
   D. \ (1, 6) & \quad H. \ (6, 1)
   \end{align*}
   \]

Lesson 5 – Angle Vocabulary, Angle Addition, Angle Bisectors

10. \( \overline{BD} \) bisects \( \angle ABC \). Find the value of \( x \), then find \( m\angle ABC \).
   \[
   \begin{align*}
   2x + 7 &= \angle B \\
   4x - 9 &= \angle ABC \\
   16 &= 2x \\
   x &= 8 \\
   m\angle ABC &= 41^\circ
   \end{align*}
   \]

11. \( \overline{EF} \) is the angle bisector of \( \angle TEA \). Find the two angle measures not given in the diagram.
   a. \[
   \begin{align*}
   m\angle TEF &= 35^\circ \\
   m\angle AEF &= 35^\circ
   \end{align*}
   \]
   b. \[
   \begin{align*}
   m\angle AEF &= 19^\circ \\
   m\angle TEA &= 38^\circ
   \end{align*}
   \]
12. If \( m\angle 1 = 30 \), \( m\angle 2 = 3x \), \( m\angle ABC = 145 \), and \( m\angle 3 = 5x - 5 \), find \( x \).

\[
\text{Angle Addition Postulate}
\]

\[
5x - 5 + 3x + 30 = 145
\]

\[
8x + 25 = 145
\]

\[
x = 15
\]

13. If \( m\angle YMC = 170^\circ \), find set up and solve an equation to find the measure of \( \angle AMC \).

\[
\text{Angle Addition Postulate}
\]

\[
5x + 19 + 5x + 1 = 170
\]

\[
10x + 20 = 170
\]

\[
x = 15
\]

\[
m\angle AMC = 76^\circ
\]

14. If \( m\angle AOC = 76^\circ \) and \( m\angle AOB = 41^\circ \), what is \( m\angle BOC \)?

\[
m\angle BOC = 35^\circ
\]

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**Lesson 6 - Angle Pair Relationships**

15. Use the diagram shown.

- **Vertical a.** If \( m\angle 1 = 15^\circ \), then \( m\angle 3 = 15^\circ \)

- **Linear Pair b.** If \( m\angle 2 = 100^\circ \), then \( m\angle 1 = 80^\circ \)

- **Vertical a.** If \( m\angle 4 = 36^\circ \), then \( m\angle 2 = 36^\circ \)

16. Use the diagram above. State whether the angles are a linear pair or vertical angles.

- a. \( \angle 1 \) and \( \angle 2 \) Linear Pair

- b. \( \angle 2 \) and \( \angle 4 \) Vertical Angles
17. Find the value of the variables. Set up equations and show all work.

a. 
\[ 2x + 5 + 75 = 180 \]
\[ 2x + 70 = 180 \]
\[ 2x = 110 \]
\[ x = 55 \]

b. 
\[ 4y + 25 + 75 = 180 \]
\[ 4y + 100 = 180 \]
\[ 4y = 80 \]
\[ y = 20 \]

18. \( m \angle M = 74^\circ \).

a. If \( \angle N \) is complementary to \( \angle M \), find \( m \angle N \)? \( 16^\circ \)

b. If \( \angle P \) is supplementary to \( \angle M \), find \( m \angle P \)? \( 106^\circ \)

Lesson 7 – Introduction to Constructions

19. **Multiple Choice:** To create an angle bisector of angle \( ABC \), Delilah places her compass point on point \( B \) and makes an arc, intersecting both rays of the angle. Label the intersection of the arc with each angle ray as points \( X \) and \( Y \). What could be Delilah’s next step?

a. Draw a ray from point \( B \) through point \( D \), creating angle bisector \( \overline{BD} \).

b. Place the compass point on point \( X \) and make an arc in the interior of angle \( ABC \).

c. Connect point \( X \) to point \( Y \) to create \( \overline{XY} \).

d. Place the compass point on point \( Y \), open the compass with the width equal to the length of segment \( XY \), and draw an arc.