PART 1: VOCABULARY

For each of the following terms, write the definition and then draw an example to illustrate it. Be sure to label your diagram appropriately.

1. Opposite rays
   * 2 rays that share a common endpoint and form a line.

2. Midpoint of a segment
   * A point that divides a segment into 2 congruent segments.

3. Linear pair
   * 2 adjacent angles whose noncommon sides are opposite rays (form a line).

4. Adjacent angles
   * 2 coplanar angles with a common side, a common vertex, and no common interior points.

5. Vertical angles
   * 2 angles whose sides are opposite rays.

6. Angle bisector
   * A ray that divides an angle into 2 congruent angles.
PART 2: APPLICATIONS
Use the diagram at the right for #1-4.

1. What are two other names for $\overrightarrow{GI}$? $\overrightarrow{GI}, \overrightarrow{GH}, \overrightarrow{HI}, \overrightarrow{IH}$

2. Name three collinear points. $G, H, I$

3. Name two opposite rays. $\overrightarrow{HG}, \overrightarrow{HI}$

4. What is another way to name plane $D$? Plane $GHI$ (cannot use $GHI$) (cannot use $D$)

Sketch the figure described.

5. Three points that are coplanar but not collinear.

6. Two planes that intersect.

Use a ruler to measure the length of the line segment in millimeters, centimeters, and inches.

7. $\overrightarrow{AB}$

Suppose $J$ is between $H$ and $K$. Use the Segment Addition Postulate to solve for $x$. Then find the length of each segment.

8. $HJ = 2x + \frac{1}{3}$
$JK = 5x + \frac{2}{3}$
$KH = 12x - 4$

$\frac{2x + \frac{1}{3}}{5x + \frac{1}{3}} = \frac{12x - 4}{JK}$

7$x + 1 = 12x - 4$

$JK = 5 \frac{2}{3}$
$KH = 8$

Find the distance between each pair of points. If necessary, round to the nearest tenth.

9. $D(1,3), E(-2,4), F(0,-4)$

$DE = \sqrt{3^2 + 1^2} = \sqrt{10}$
$DF = \sqrt{7^2 + 1^2} = \sqrt{50}$
$EF = \sqrt{8^2 + 2^2} = \sqrt{68}$

Use a protractor to measure the angle to the nearest degree. Classify the angle. Then write all names for the angle.

10. $\angle CDP, \angle D, \angle PDC$
In #11-14, complete the constructions.

11. \( \overline{MN} \) with length \( \frac{1}{2} \overline{AB} \)

12. \( \overline{AB} \) with length \( 3 \cdot TU \)

13. \( \angle QRS \) with \( 2m \angle MAT \)

14. \( \angle R \) such that \( m \angle R = m \angle 1 + m \angle 2 \)

15. Complete the following construction using a compass and straightedge only: \( \overline{QR} \) bisects \( \overline{CD} \) at point \( E \), \( \overline{FG} \) bisects \( \overline{RE} \) at \( H \). Be neat and accurate. Label clearly.

Plot the points in the coordinate plane and sketch \( \angle ABC \). Classify the angle.

16.
- \( A(5, -3) \)
- \( B(-3, -1) \)
- \( C(2, 2) \)
Find the coordinates of the midpoint of a segment with the given endpoints.

17. \(C(-4,-3), D(6,3)\)
   \[
   \frac{-4+k}{2} = \frac{1}{2} = 1 \quad \frac{-3+b}{2} = \frac{0}{2} = 0
   \]
   \((1,0)\)

Find the coordinates of the other endpoint of the segment with the given endpoint and midpoint \(M\).

18. \(A(-4,3), M(-1,-1)\)
   \[
   \frac{x+(-3)}{2} = -1 \quad \frac{y+3}{2} = -1
   \]
   \[
   x+(-3) = -2 \quad y+3 = -2
   \]
   \[
   x = 2 \quad y = -5
   \]
   \((2,-5)\)

19. \(BT\) bisects \(\angle ABC\). Find the value of \(x\). Then find \(m\angle ABT\), \(m\angle TBC\), and \(m\angle ABC\).

   \[
   12x-7 = 5x + 2x \quad 7x = 35
   \]
   \[
   x = 5
   \]

Find the values of the variables.

20. \(\frac{6y+38}{14y-24}\)

21. \(\frac{70}{2x+16}\)

Find the perimeter (or circumference) and area of the figure. Give your answers in exact form.

22. \(p = 8+4+3+4+3\)
   \(p = 20\)

23. \(\frac{3}{4} \cdot 2x+11+11\)
   \(2x+11\) \(\pi\)

24. \(p = 2+6+2+3+4\)
   \(p = 16\)
Find the area of the figure. Give your answers in exact form.

25. \[ \text{Area} = 9 \pi \text{ units}^2 \]

26. \[ \text{Area} = 12 \text{ units}^2 \]

27. \(BD\) bisects \(\angle ABC\) so that \(m\angle ABD = 2y\) and \(m\angle ABC = 5y - 12\). Draw a picture to represent the situation. What is \(m\angle ABC\)?

\[ \begin{align*}
\frac{y}{5} &= 5y - 12 \\
-4y &= -12 \\
y &= 3
\end{align*} \]

\[ m\angle ABC = 6y + 12 = 24 \]

28. \(\angle ABC\) and \(\angle CBD\) form a linear pair. \(m\angle ABC = 8x + 12\) and \(m\angle CBD = 2x + 28\). Draw a picture to represent the situation. Find the measure of each angle.

\[ \begin{align*}
10x + 40 &= 180 \\
10x &= 140 \\
x &= 14
\end{align*} \]

\[ m\angle ABC = 124^\circ \\
m\angle CBD = 56^\circ \]

29. A circle has an area of 121\(\pi\) cm\(^2\). Find its diameter.

\[ \begin{align*}
A &= \pi r^2 \\
121\pi &= \pi r^2 \\
r &= 11 \\
d &= 22 \text{ cm}
\end{align*} \]

30. The endpoints of a diameter of a circle are \(Q(4, -2)\) and \(R(3, 6)\). Find the area of the circle in terms of \(\pi\).

\[ \begin{align*}
d &= \sqrt{(1)^2 + (8)^2} \\
&= \sqrt{65} \\
r &= \frac{\sqrt{65}}{2} \\
A &= \left(\frac{\sqrt{65}}{2}\right)^2 \pi = \frac{65}{4} \pi = \frac{65}{4} \pi \text{ units}^2
\end{align*} \]

31. A rectangle has a base of \(x\) units. The perimeter is \((6x + 2)\) units. Draw a picture to represent the situation. What is the area of the rectangle in terms of \(x\)?

\[ A = x(2x + 1) \]

\[ A = 2x^2 + x \]

either answer is acceptable here!