Lines and Angles

1. Point shows position.
   • A

2. Straight line is a continuous set of points going on forever in both directions:

3. Ray is a line with one endpoint. The other goes on forever.
   G

4. Line segment is a line with two endpoints.
   J ———— K

5. Vertex is the point where two rays meet to form an angle.
   Vertex V

6. Congruent means the same size, shape, angles, lengths… symbol $\cong$

7. Parallel lines run along each other but never cross. Symbol is $\parallel$

8. Angle is a figure formed by two rays with a common end point.

9. Right angles measure $90^\circ$.

10. Straight angle is an angle that measures $180^\circ$, a line.

   180°
11. **Acute** angles measure between $0^\circ$ and $90^\circ$.

12. **Obtuse** angles measure between $90^\circ$ and $180^\circ$.

13. **Reflex** angles measure between $180^\circ$ and $360^\circ$.

14. **Complementary** angles are two angles that add to $90^\circ$.
\[ \angle ABD + \angle DBC = 90^\circ \]

15. **Supplementary** angles are two angles that add to $180^\circ$.
\[ \angle XYW + \angle WYZ = 180^\circ \]
16. **Perpendicular** lines meet at 90°.

![Perpendicular Lines](image1)

17. Perpendicular Bisector **cuts lines in half** creating two equal segments (congruent). Symbol = ⊥

![Perpendicular Bisector](image2)

18. Angle bisectors cut angles in half. The angles are the same measure (congruent).

19. **Adjacent angles** share a ray.

![Adjacent Angles](image3)

### Measuring, labelling and naming angles:

**Example:**

![Example](image4)

\[ \text{m} \angle ABC = 45^\circ \]

This is read the measure of angle ABC is 45°.
Practice: Find the measure of each angle, label it and state what type of angle it is.

1. 

2. 

3. 

4. 

5. 

6. 

Practice: Use a protractor to construct the following angles.

1. $55^\circ$
2. $100^\circ$
3. $90^\circ$
4. $230^\circ$
5. $78^\circ$
6. $155^\circ$
7. $180^\circ$
8. $87^\circ$
9. $23^\circ$
Solving Angles:
We use the properties of lines and angles to find unknown angles.

Examples:

Complementary angles add to $90^\circ$

![Diagram of complementary angles](image)

Therefore, $\theta = 90^\circ - 60^\circ = 30^\circ$

Supplementary angles add to $180^\circ$

![Diagram of supplementary angles](image)

Therefore, $\theta = 180^\circ - 124^\circ = 56^\circ$

Vertically opposite angles are congruent (equal).

![Diagram of vertically opposite angles](image)

$\angle A$ is opposite $160^\circ$; therefore $\angle A = 160^\circ$

and $\angle B$ is opposite $20^\circ$; therefore $\angle B = 20^\circ$

Try this:

![Diagram of try this example](image)

This $\Box$ is a symbol meaning $90^\circ$ or a right angle.
Practice: Without a protractor, using the properties of lines and angles, find the missing angles. Explain your reasoning.

1. \[ 133^\circ \]
   
   Explanation: ______________________

2. \[ 93^\circ \]
   
   Explanation: ______________________

3. \[ 13^\circ \]
   
   Explanation: ______________________

4. \[ 31^\circ \]
   
   Explanation: ______________________
Parallel Lines and Transversals

A transversal is a line that cuts through two parallel lines.

Properties of Parallel Lines and Transversals:

**Corresponding angles** are equal

\[ \angle 1 = \angle 5 \]
\[ \angle 2 = \angle 6 \]
\[ \angle 3 = \angle 7 \]
\[ \angle 4 = \angle 8 \]

**Alternate interior angles** are equal

\[ \angle 3 = \angle 6 \]
\[ \angle 4 = \angle 5 \]

**Interior angles** on the same side of the transversal add up to 180°

\[ \angle 3 + \angle 5 = 180 \]
\[ \angle 4 + \angle 6 = 180^\circ \]

The above properties for parallel lines and transversals can be used to find missing angles without a protractor.
Practice: Find the missing angles without a protractor. Explain your reasoning.

1. \(a\) \(b\)
   \[56^\circ\]

   Explanation: ________________________________
   Explanation: ________________________________

2. \(a\) \(b\)
   \[96^\circ\]

   Explanation: ________________________________
   Explanation: ________________________________

3. \(a\) \(b\)
   \[26^\circ\]

   Explanation: ________________________________
   Explanation: ________________________________

4. \(a\) \(b\)
   \[122^\circ\]

   Explanation: ________________________________
   Explanation: ________________________________
Practice: Find the missing angles.

1 In the figure on the right, \( m\overline{AE} = m\overline{BE} \).

Angle \( \text{BEC} \) is 65°.

Angles \( \text{PAC} \) and \( \text{RAB} \) are straight angles.

What is the measure of angle \( \text{RAP} \)?

Give a reason (in words) for each step or calculation.

2 Given the figure on the right and the following information:

Rays \( \text{BA} \) and \( \text{BC} \) are perpendicular, angle \( \text{BCE} \) measures 44° and angle \( \text{EBC} \) measures 35°.

a) Explain why angle 1 measures 45°.

b) Explain why angle 2 measures 50°.
Lines and Angles Assignment
Lines and Angles Assignment: Put this assignment in your duo-tang.

Construct the following on paper.

Part A: Lines

1. Construct line segment $AB = 7\text{ cm}$. Perform a **Perpendicular bisector** to the line segment.

2. Construct parallel lines $CM$ and $HN$ 3 cm apart.

3. Construct two **congruent** lines $CD$ and $EF = 6.6\text{ cm}$.

Part B: Angles

4. Construct $\angle ABC = 110^\circ$. What is this angle called?

5. Construct $\angle EFG = 210^\circ$. What type of angle is this?

6. Construct $\angle HIJ = 75^\circ$. What is this angle called?

7. $\angle ABC = 90^\circ$. What type of angle is this?

8. **Bisect** one of the angles above.

9. Construct $\angle BGN = 180^\circ$. What type of angle is this?

10. Construct examples of **complementary** and **supplementary** angles. Explain what type of angles they are.

Part C: Answer the following on these pages.

11. What is the measure of the following angles? What type of angles are they? How do you know?

   a) 
   
   b)
12. What is the measure of angles p and q? Justify your answer and do not use a protractor.

13. Without using a protractor, what are all the missing angles?

14. Solve the unknown angle. How do you know?

15. Solve the unknown angles. How do you know?
16. Solve the unknown angles. **How do you know?**

![Diagram with unknown angles]

17. Solve the following angles. **Do not** use a protractor.

![Diagram with labeled angles]

**Answers:**

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**Due ___________________________**