

MA.4.GR.1.3

Overarching Standard: MA.4.GR.1 Draw, classify and measure angles.

Benchmark of Focus

MA.GR.4.1.3: Solve real-world and mathematical problems involving unknown whole- number angle measures. Write an equation to represent the unknown.

Example: A 60° angle is decomposed into two angles, one of which is 25° . What is the measure of the other angle?

Benchmark Clarifications

Instruction includes the connection to angle measure as being additive.

Related Benchmark/Horizontal Alignment

- MA.4.AR.1.1
- MA.4.AR.2.2

Vertical Alignment

Previous Benchmarks	Next Benchmarks
MA.3.GR.1.1	MA.8.G.1.4

Terms from the K-12 Glossary

- Angle
- Circle
- Right Angle
- Straight Angle

Purpose and Instructional Strategies

The purpose of this benchmark is to extend student thinking about angle measures beyond right angles that were taught in Grade 3 (MA.3.GR.1.1) and introducing the idea that angle measures are additive (MA.4.GR.1.2). Students will use this idea to find a missing angle measure.

- For instruction, students should use protractors to draw angles that add up to make right angles, straight angles and circles.

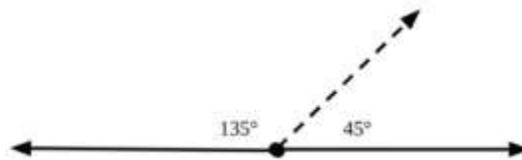
- With the knowledge that angle measures are additive, students can solve interesting and challenging problem with all four operations to find the measurements of unknown angles on a diagram in real world and mathematical problems.
- Students can use a protractor to ensure that they develop understanding of benchmark angles (e.g., 30° , 45° , 60° and 90°).

Common Misconceptions or Errors

- Students may make errors when writing equations used to solve angle measurement problems. During instruction, expect students to justify their equations and solutions.
- Students may not understand that straight lines, even if intersected, measure 180° .

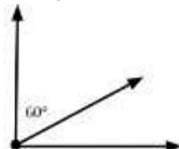
Strategies to Support Tiered Instruction

- The teacher provides a right angle, straight angle, or circle and asks students to use the protractor to divide the angle into two angles and specify their measurements. The teacher has students write an equation to show that the sum of the two angles is equivalent to the angle they started with and explain their equation.
 - For example, when provided with a straight angle, students divide the angle into a 45-degree angle and a 135-degree angle as show below. Students label each angle and explain the equation $135 + 45 = 180$, knowing that a straight angle measures 180-degrees.

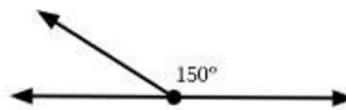


- Instruction includes matching equations with given angle images containing angle measures. Students explain the equations and how they know they match the image selected.
 - For example, when provided images similar to those shown below, students match the equation from a list of equations provided and explain how they know the equation matches.

$$60 + 30 = 90$$



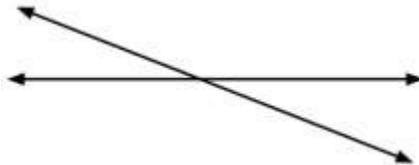
$$150 + 30 = 180$$



- The teacher provides images that contain missing angle measures. Students identify straight angles in the image and use their understanding that straight angles measure 180-degrees to help them find the missing angle measure.
 - For example, when provided with the image below, students highlight or trace over the straight angle and label as 180-degrees. Students then write an equation using this information and the angle measure provided to help them solve for the unknown angle.



- Instruction includes identifying straight angles as measuring 180-degrees.
 - For example, when provided images similar to the one shown below, students highlight straight angles and label them as 180-degrees. In this example, students identify both straight angles, highlighting them with different colors and explain that both have a measure of 180-degrees.



Questions to ask students:

- **Write an addition or subtraction equation to represent the missing angle measure.**
 - Sample answer that indicates understanding: *The total angle measure was 90° and one of the decomposed angle measures is 50° , so $50^\circ + a = 90^\circ$. Or $90^\circ - 50^\circ = a$. So the missing angle measure is 40° .*
- **Pose the question, "If I have a right angle and I draw another ray inside that measures 60° , what would the measure of the remaining angle be?"**
 - Sample answer that indicates understanding: *A right angle is 90° . $30 + 60 = 90$. The missing angle would be 30° .*

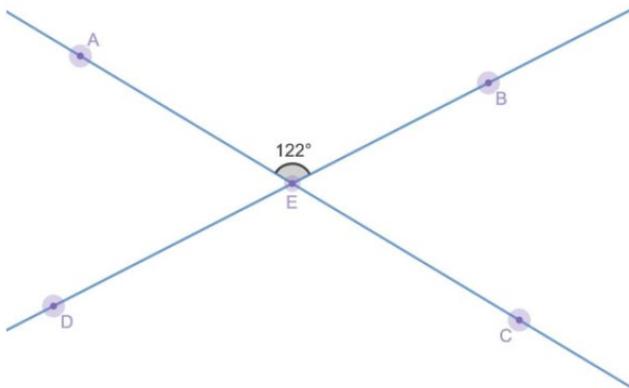
- **Point to a missing angle and ask... What information do you need to know to find the missing angle measure?**
 - Sample answer that indicates understanding: *I need to know how big the whole angle and the other parts are. I can use that information to subtract and find the missing angle.*
 - Sample answer that indicates an incomplete understanding or a misconception: *I can only find the measure of the angle with a protractor.*
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Instructional Tasks

Instructional Task 1

Two straight lines, AC and BD , intersect at point E . Using the given angle $\angle AEB$, find the measure of the other 3 angles.

This item may seem a bit challenging but it fits within the benchmark, because it can be solved by repeatedly using additivity, and that fact that a straight line is 180° .



Instructional Items

Instructional Item 1

Carlos is adding angles together to create a 150° angle. Select all the angle measures that Carlos can use to create a 150° angle.

- $50^\circ + 100^\circ$
 - $45^\circ + 95^\circ$
 - $50^\circ + 90^\circ$
 - $50^\circ + 20^\circ + 20^\circ$
 - $50^\circ + 50^\circ + 50^\circ$
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Achievement Level Descriptors

Benchmark		Context	Assessment Limits
MA.4.GR.1.3 Solve real-world and mathematical problems involving unknown whole-number angle measures. Write an equation to represent the unknown. Example: A 60° angle is decomposed into two angles, one of which is 25° . What is the measure of the other angle?		Both	Whole number degree measures, sums, and differences will only be within 0° and 360° . Items will use variables for unknown angle measures. Items will not have angles decomposed into more than three angles.
ALD 2	ALD 3	ALD 4	ALD 5
solves mathematical problems with a given equation involving unknown whole-number angle measures.	solves real-world and mathematical problems with a given equation involving unknown whole-number angle measures.	solves real-world or mathematical problems involving unknown whole-number angle measures and writes an equation to represent the unknown.	N/A

Additional Resources:

[CPALMS Resources](#)

[Khan Academy Decomposing Angles](#)

Resources/Tasks to Support Your Child at Home:

Draw angles to have your child measure. Have them decompose the angle into two smaller angles and measure with a protractor the angle in degrees and then record the smaller angle measures. Extend to have them decompose in different ways. Consider extending to give the larger angle measure and one of the smaller angle measures, then they have your child determine the missing angle measure.

[Adjacent Angles Online Math Game](#)