Geometry Unit 2: Angles

Bronx Early College Academy

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28 September - 7 October 2022

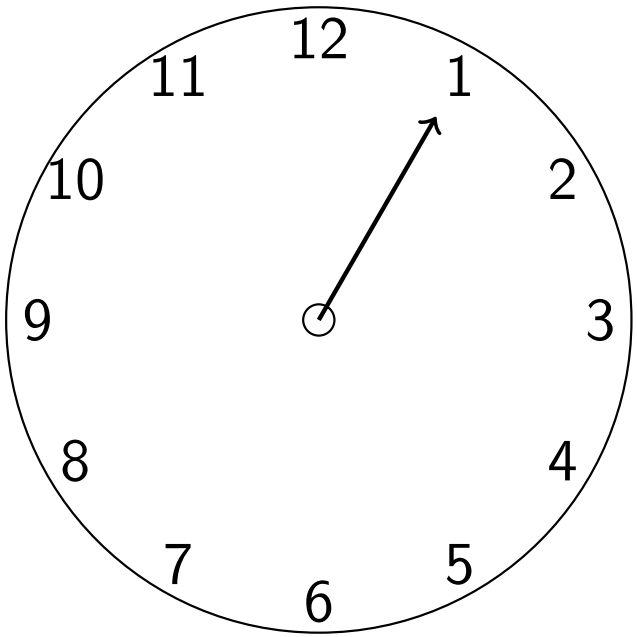
2.1 Angle notation, measures	28 September
2.2 Angle addition	29 September
2.3 Angle pairs	30 September
2.4 Angle bisectors	3 October
2.5 Triangle sum; equilateral, isosceles $\triangle$ angles	4 October
2.6 Review	6 October
2.7 Test: Angle measures	7 October

Open Middle: complementary and supplementary puzzle

Learning Target: I can measure angles

CCSS: HSG.CO.A.1 Know precise geometric definitions 2.1 Wednesday 28 Sept

Do Now: Which takes longer, for a clock's hour hand to go from the 1 to the 4 or the 5 to the 9?

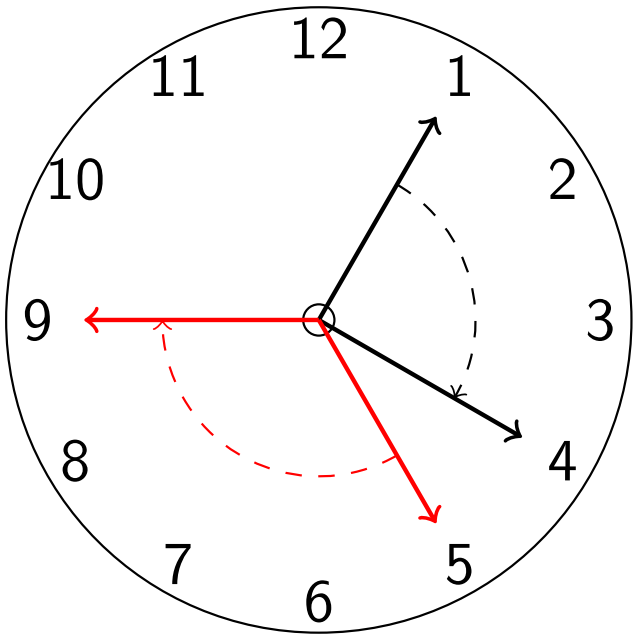


Lesson: Angle measures, internal, external, acute, obtuse, right

Learning Target: I can measure angles

CCSS: HSG.CO.A.1 Know precise geometric definitions 2.1 Wednesday 28 Sept

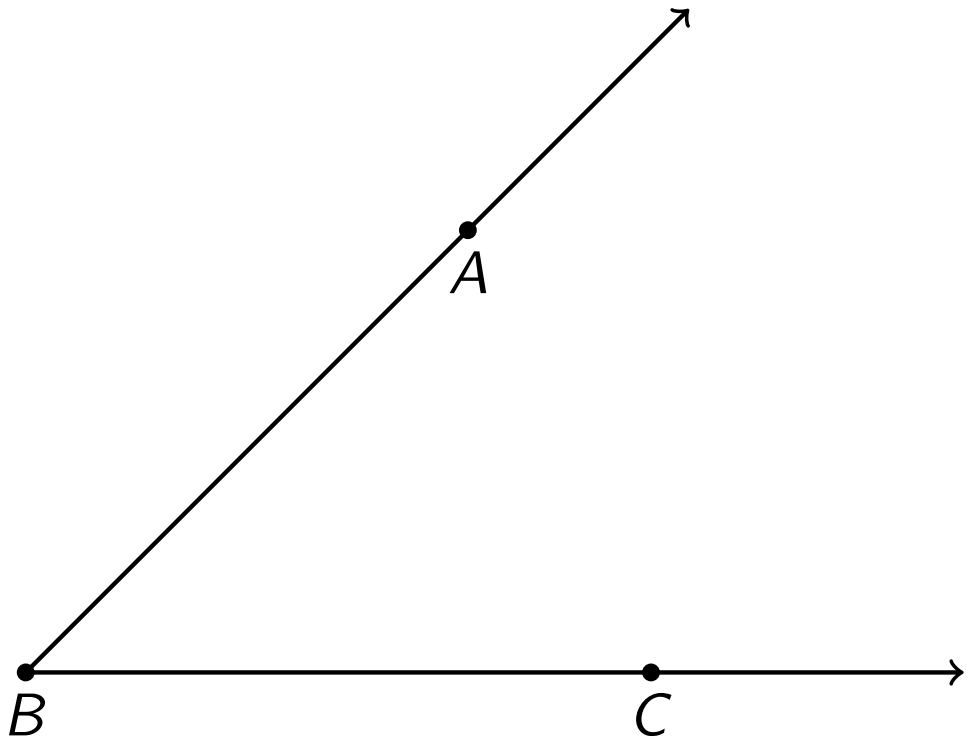
Do Now: Which takes longer, for a clock's hour hand to go from the 1 to the 4 or the 5 to the 9?



Lesson: Angle measures, internal, external, acute, obtuse, right

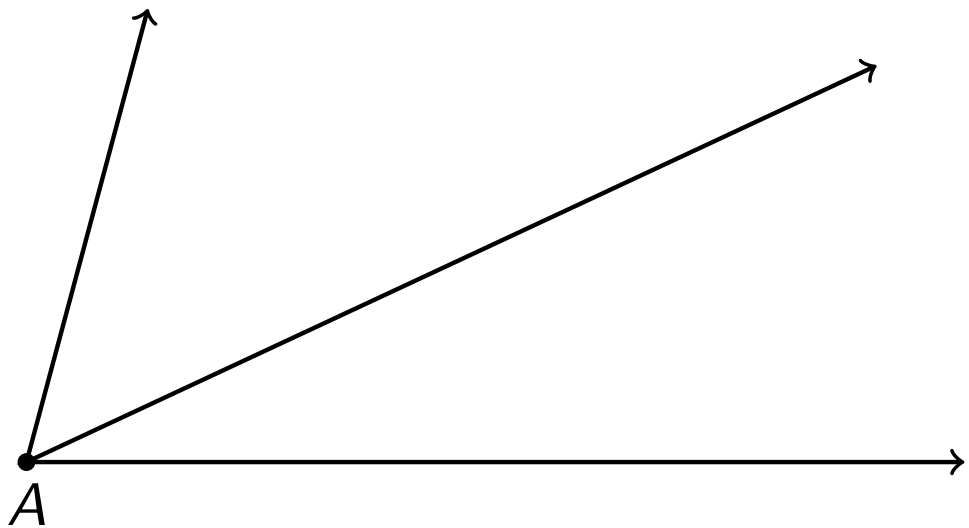
Angle: two rays with a common endpoint or vertex

Rays $\overrightarrow{BA}$ and $\overrightarrow{BC}$. Vertex B. Written notation is $\angle ABC$ or $\angle B$.



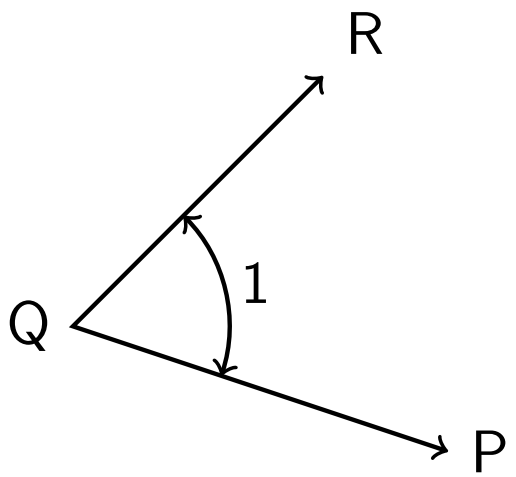
Angle measures: the Babylonian system of 360° in a circle

- A full rotation is 360° (a full "turn").
- A half turn (straight line) is 180°.
- 90° is a quarter turn or a *right* angle.
- *Acute* angles measure less than 90°. *Obtuse* angles measure more than 90°.
- *Adjacent* angles ("next to" each other) share a common ray and are external to each other.



Angle terminology and notation

Write definitions in your notebook



Angle Q, written $\angle Q$ (also $\angle PQR$, $\angle 1$)

Point Q is the *vertex*

The sides or *legs* are $\overrightarrow{QR}$, $\overrightarrow{QP}$

Right angles measure $90°$

Perpendicular lines meet at right angles. $\overline{AB} \perp \overline{CD}$

Acute angles measure $< 90°$

Obtuse angles are $90° < \angle m < 180°$

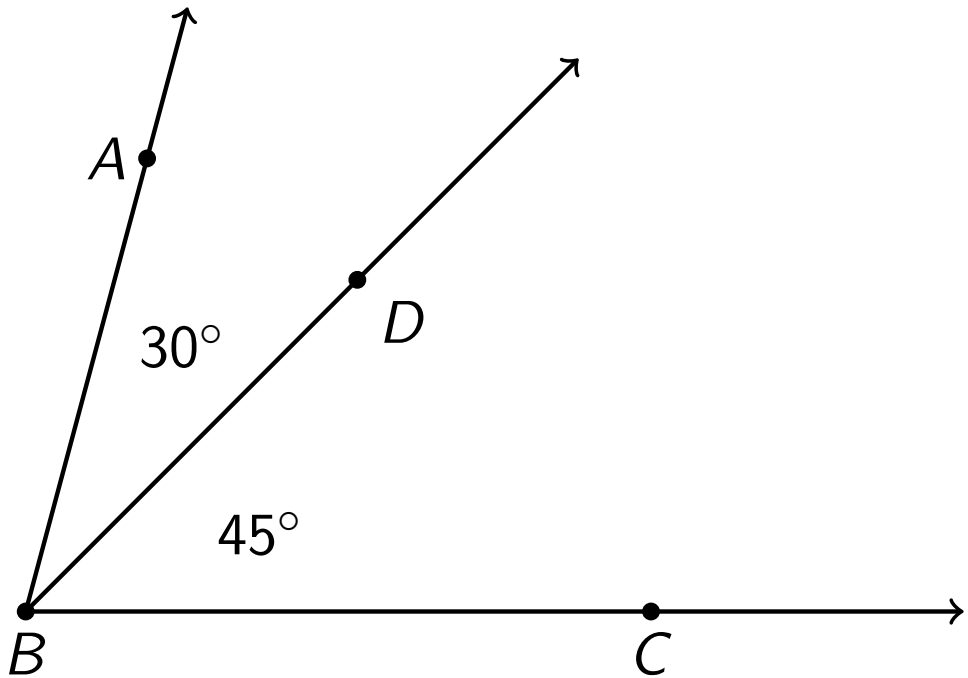
Straight angle or straight line measures $180°$

Reflex angles measure $180° < \angle m < 360°$

Learning Target: I can solve for angle measures

CCSS: HSG.CO.A.1 Know precise geometric definitions 2.2 Thursday 29 Sept

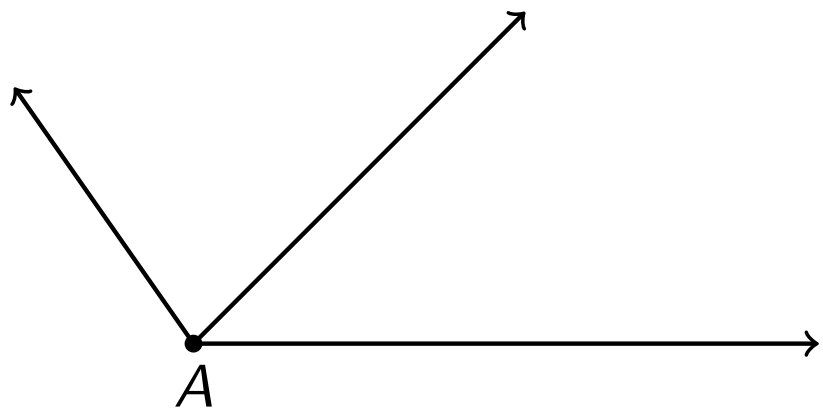
Do Now: $m\angle ABD = 30°$, $m\angle DBC = 45°$. Find $m\angle ABC$.



Lesson: Angle addition problems, vertical angles

Angle addition postulate

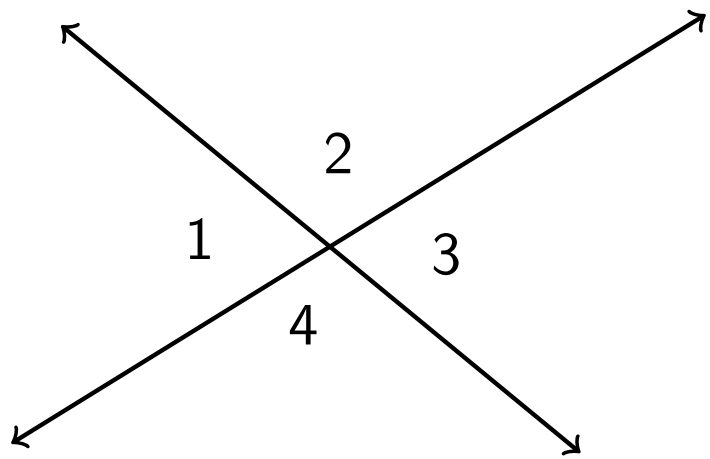
For adjacent angles, the sum of their measures is the measure of their combined angle.
Special pairs of angles [make a new slide]
A *linear pair* are two angles that make a straight line.
Opposite rays have a common endpoint and make a line. (They form an angle measuring 180°).
Angles whose measures sum to 180° are *supplementary*.
Angles whose measures sum to 90° are *complementary*.



Learning Target: I can identify vertical angles

CCSS: HSG.CO.A.1 Know precise geometric definitions 2.3 Friday 30 September

Definition: *Vertical angles* are angles opposite each other when two lines intersect. $\angle 1$ and $\angle 3$ are vertical angles, as are $\angle 2$ and $\angle 4$.

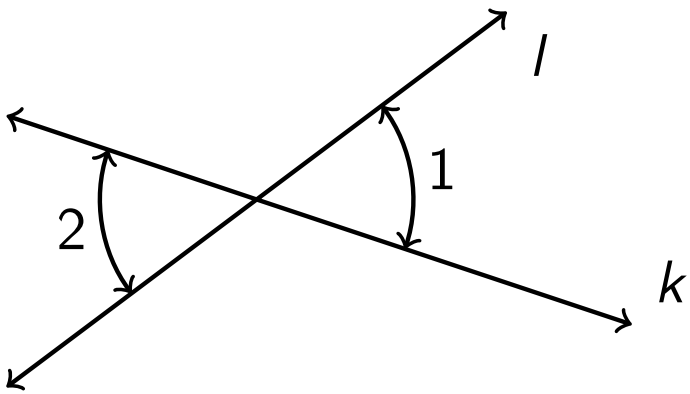


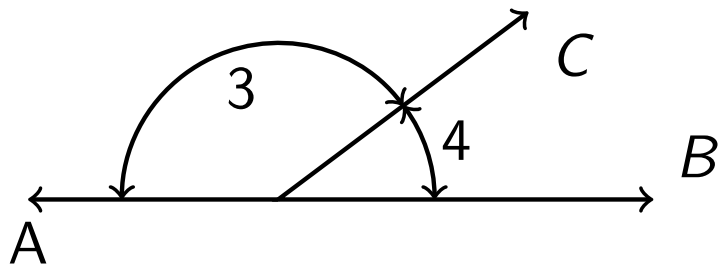
Lesson: Angle addition problems, vertical angles

Write down definitions in your notebook

Angle pairs

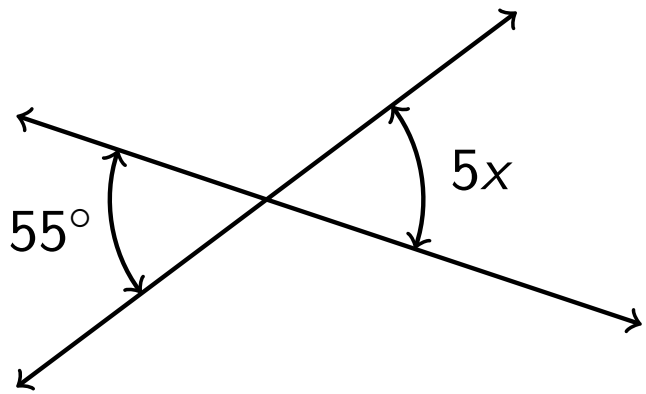
1. *Adjacent* angles share a leg ("next to each other")
2. *Complementary* angles measures sum to 90°
3. *Supplementary* angles sum to 180°
4. *Vertical* or opposite angles made by intersecting lines (1, 2)
5. *Linear pairs*, adjacent angles making a straight line (3, 4)





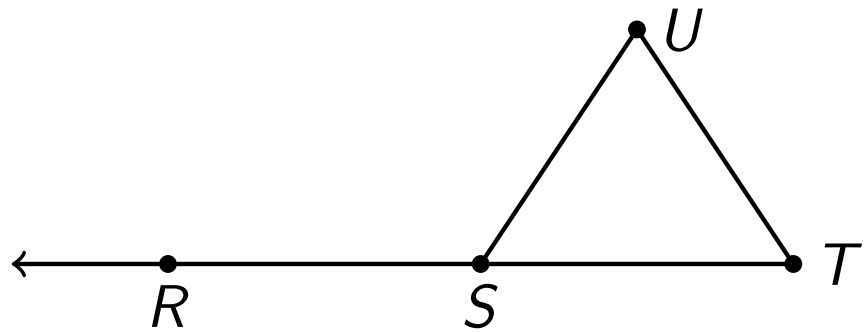
Angle pairs: check your knowledge

1. *Complementary* angles sum to how many degrees?
2. *Supplementary* angles sum to how many degrees?
3. Given complementary angles $\angle A$ and $\angle B$ with $m\angle A = 30°$. Find $m\angle B$.
4. Given $m\angle A = 100°$ and $m\angle B = 2x$. Find x such that angles $\angle A$ and $\angle B$ are supplementary.
5. Given vertical angles as shown. Find x.



Angle pairs: apply your knowledge

Triangle external angle situation



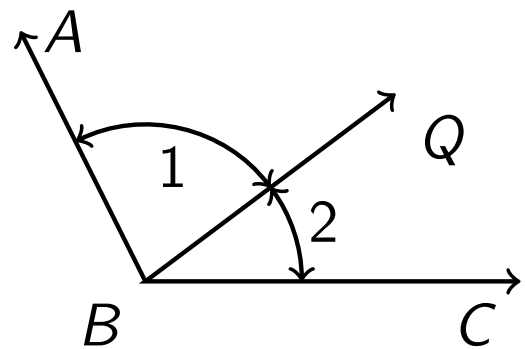
1. Given $m\angle RSU = 115°$. Find $m\angle TSU$
2. Given S bisects $\overline{RT}$, $RS = \frac{1}{5}(x+8)$ and $ST = x$. Find RT.

Write down definitions in your notebook

A postulate is a fundamental statement we agree is true

1. *Scalene* triangles have three unequal sides
2. *Horizontal*, sideways or level
3. *Vertical*, straight up and down
4. An angle's *measure*, it's size, is written $m\angle$
5. *Angle Addition Postulate*
   Measures of adjacent angles sum to the resulting angle

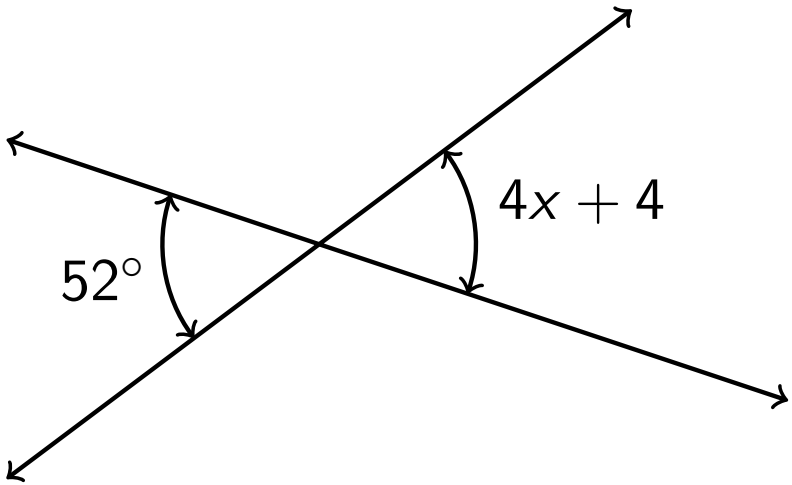
   $m\angle 1 + m\angle 2 = m\angle ABC$



Learning Target: I can bisect angles

CCSS: HSG.CO.A.1 Know precise geometric definitions 2.4 Monday 3 October

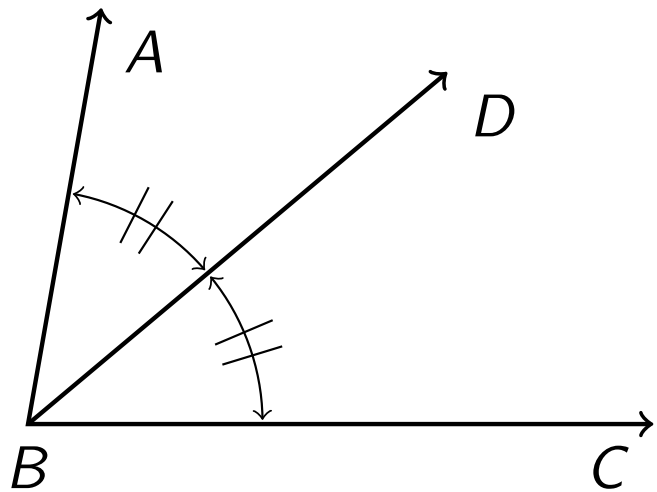
Do Now: Given vertical angles measuring $4x + 4$ and $52°$. Find x.



Lesson: Angle bisector situations

Bisect an angle by dividing it exactly in half

$\overrightarrow{BD}$ bisects $\angle ABC$ if and only if $\angle ABD \cong \angle CBD$.

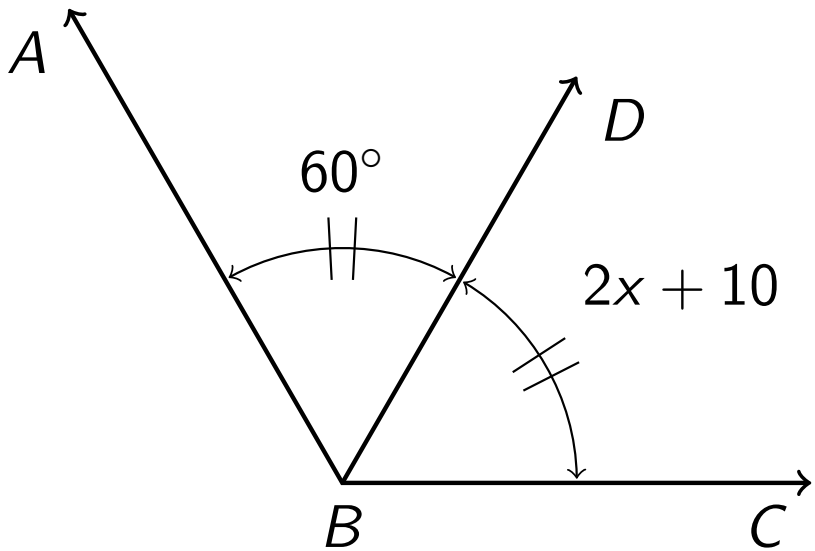


Angle bisector ray dividing an angle into two congruent angles

Hash marks mark congruent angles

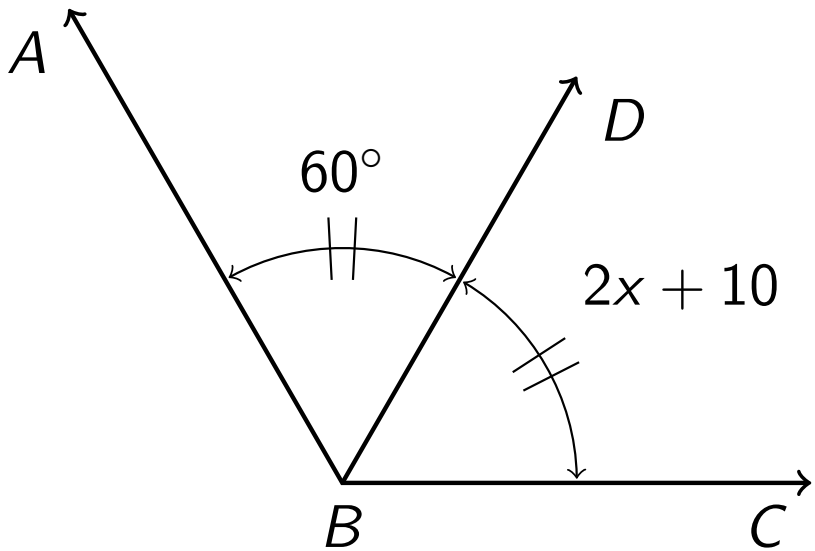
Model angle situations with algebra, then solve

Given angle bisector $\overrightarrow{BD}$ with $m\angle ABD = 60^\circ$ and $m\angle CBD = 2x + 10$. Find x.



Model angle situations with algebra, then solve

Given angle bisector $\overrightarrow{BD}$ with $m\angle ABD = 60^\circ$ and $m\angle CBD = 2x + 10$. Find x.



Solution:

$$\angle ABD \cong \angle CBD$$

$$2x + 10 = 60$$

$$2x = 50$$

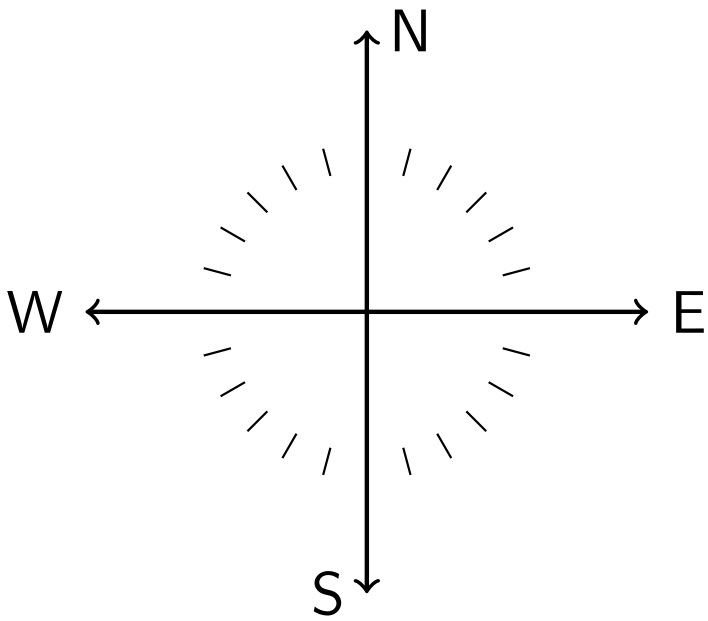
$$x = 25$$

Check:
$2(25) + 10 = 60$? ✓

Extension: Use angles for compass directions

North South East West, points of the compass

Directions are measured relative to North



Bearing The direction as an angle *clockwise* from north

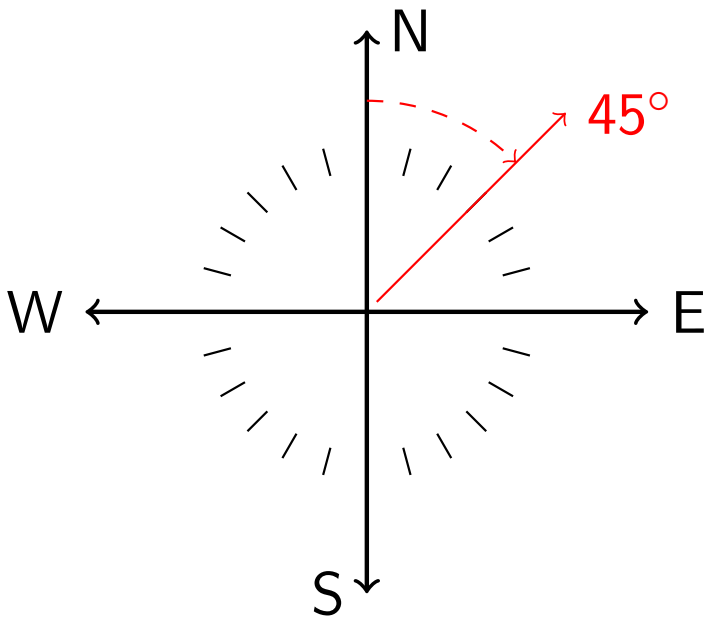
Clockwise The direction the clocks turn, "to the right" (tighten)

Counterclockwise Opposite of clocks, "to the left" (loosen)

Extension: Use angles for compass directions

North South East West, points of the compass

Directions are measured relative to North



"Northeast," half way between north and east, i.e. bearing 45°

north is 0°
east is 90°
south is 180°
west is 270°

Bearing The direction as an angle *clockwise* from north

Clockwise The direction the clocks turn, "to the right" (tighten)

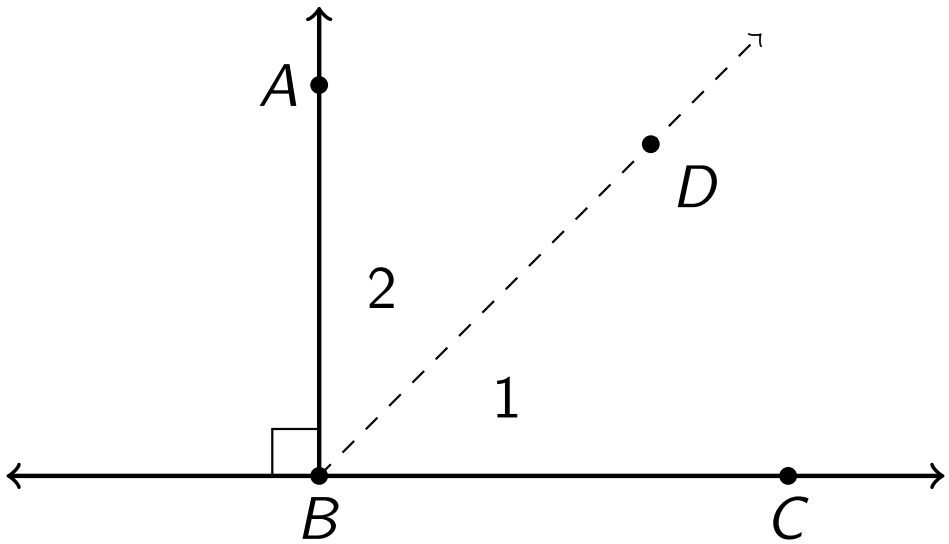
Counterclockwise Opposite of clocks, "to the left" (loosen)

LT: I can work with equilateral and isosceles-right △s

CCSS: HSG.CO.A.1 Know precise geometric definitions 2.5 Tuesday 4 October

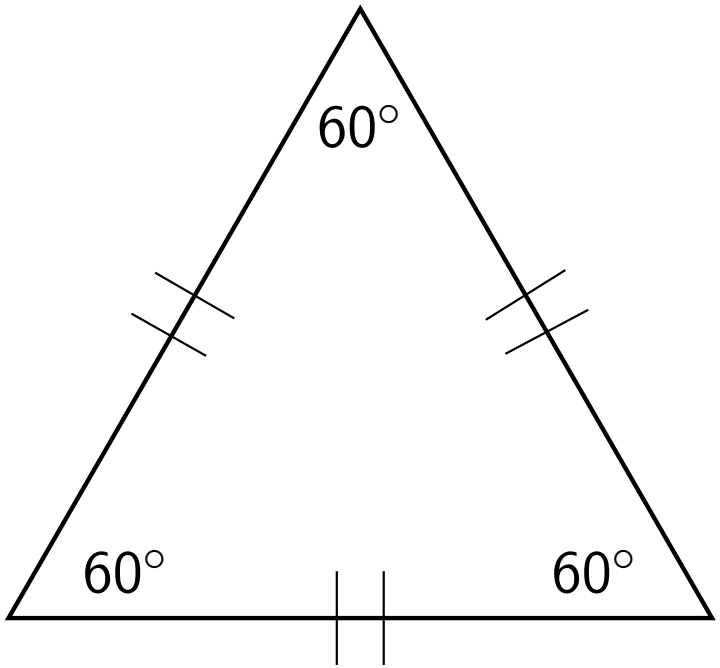
Do Now: Given perpendiculars $\overrightarrow{AB} \perp \overleftrightarrow{BC}$, and that the ray $\overrightarrow{BD}$ bisects $\angle ABC$, making two angles, $\angle 1$ and $\angle 2$.

Find the measures of $\angle 1$, $\angle 2$.



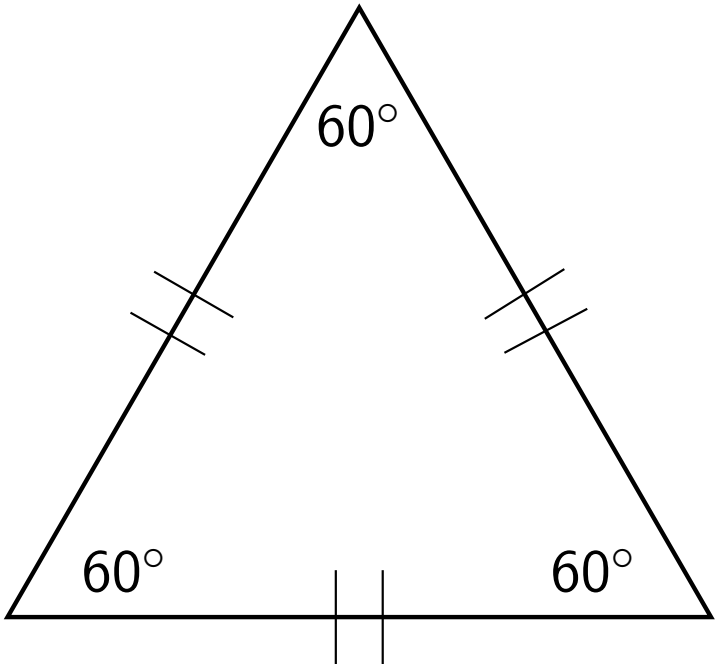
Lesson: Isosceles base theorem, special triangles
60° - 60° - 60°, 30° - 60° - 90°, 45° - 45° - 90°

Equilateral △, special relationships and measures

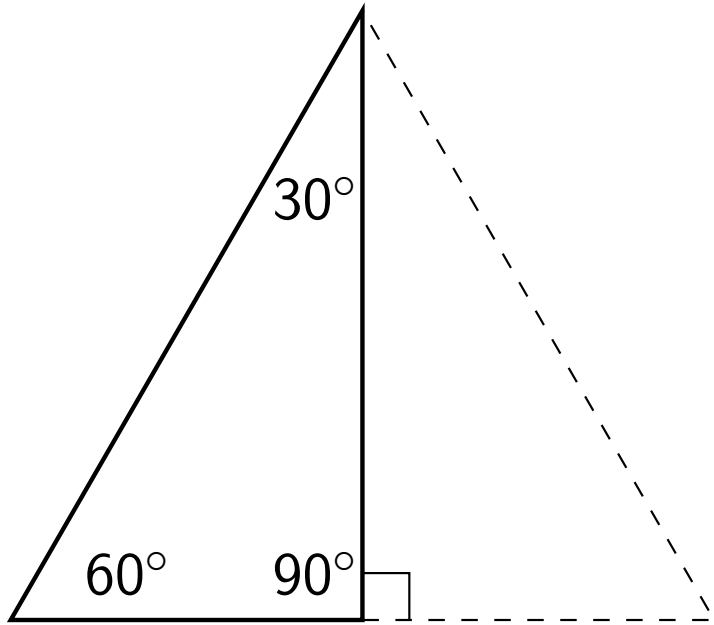


60° - 60° - 60°

Equilateral △, special relationships and measures



60° - 60° - 60°

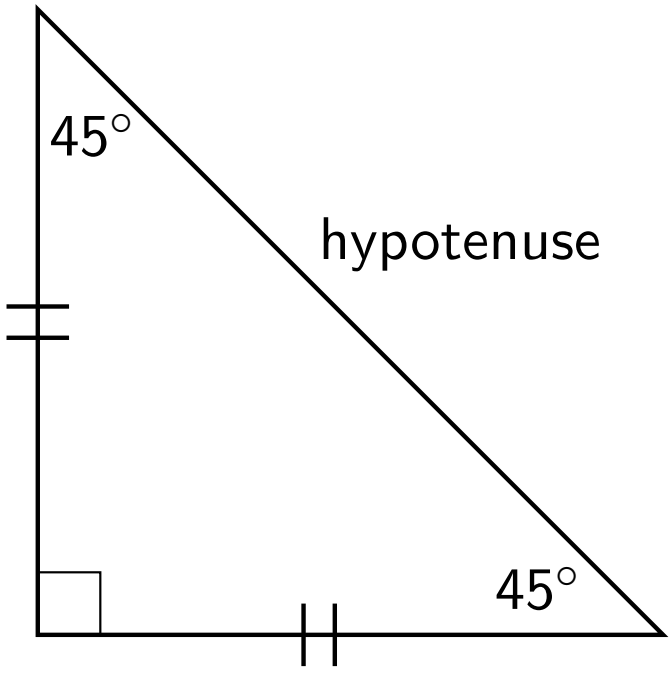


30° - 60° - 90°

Equiangular means having equal angles

Equilateral having equal sides

Isosceles-right triangles' angles measure 45° - 45° - 90°



Hypotenuse the longest side of a right triangle, opposite the 90° angle

Angle relationships

Review: Angle postulates and theorems you have learned.

1. $\perp$ lines and complementary $\angle$s make 90°
2. linear pairs add to 180°
3. vertical $\angle$s are $\cong$
4. definition of an angle bisector

Open Middle problem (fun)

Use digits from 0 to 9. Using a digit no more than once.

The first two angle measures are complementary. The second two angles supplementary. (degrees)