Angle Measure with Reference to a Circle

Apply the skill to decisions and designs

Name _____ **Date** _____ **Score** _____ / 6

QUICK REVIEW

One full turn is $360°$. A sector is a slice of a circle. Divide 360 by the number of equal sectors to find the degrees in one sector. Multiply by the number of sectors crossed. Clockwise follows the hands of a clock; counterclockwise goes the other way.

Worked example

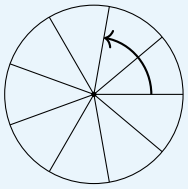
The arrow crosses 2 of 9 equal sectors. Give the angle in degrees and as a fraction of a full turn.

1. A full turn is $360°$, so each sector measures $360 \div 9 = 40°$.

2. Multiply by the number of sectors crossed: $2 \times 40 = 80°$.

3. The turn covers 2 out of 9 equal sectors, or $\frac{2}{9}$ of a full turn.

Answer: $80°$; $\frac{2}{9}$ of a full turn.

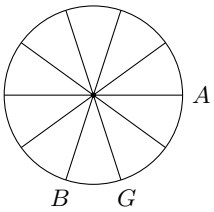


9 equal sectors

Practice Problems

Show your thinking.

1. A dial pointer must turn from A to B without passing the blocked mark G. It must turn in just one direction. Which direction and how many degrees?



10 equal sectors

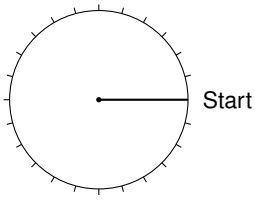
2. Two pointers start at the same mark. One turns clockwise through $\frac{5}{6}$ of a full turn. The other turns counterclockwise to the same stop in less than one full turn. Give the second turn as a fraction of a full turn and in degrees.

3. A camera turns $\frac{2}{5}$ of a full turn clockwise, then $\frac{1}{5}$ of a full turn counterclockwise. Give the degrees and direction of the shortest single turn that points it the same way.

4. A turntable must stop after a quarter-turn but before a half-turn. Its settings are $85°$, $110°$, and $180°$. Which setting works? Explain.

5. A dial needs stops $120°$ and $210°$ clockwise from its start. It can have 8 or 12 equal sectors. Which layout reaches both stops in whole sectors? Give the sector count from the start to each stop.

6. Design a dial with the fewest equal sectors that can stop at $\frac{1}{3}$ and $\frac{1}{2}$ of a full turn clockwise from Start. Use the guide marks to draw each boundary from the center. Label the one-third stop A and the half-turn stop B.



$15°$ between marks

Answer Key

1. Counterclockwise, $252°$.
2. $\frac{1}{6}$ of a full turn, or $60°$ counterclockwise.
3. $72°$ clockwise.
4. Only $110°$.
5. Use 12 sectors: 4 to reach $120°$ and 7 to reach $210°$.
6. 6 equal sectors; A after 2 sectors and B after 3, clockwise from Start.

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. Going clockwise from A to B crosses 3 sectors but passes G, so that route is blocked.

2. Going counterclockwise avoids G and crosses the other $10 - 3 = 7$ sectors.

3. Each sector measures $360 \div 10 = 36°$, so the open route turns $7 \times 36 = 252°$.

Problem 2

1. The two paths from the start to the stop go around opposite sides of the circle.

2. Together they cover one full turn. The counterclockwise path covers $1 - \frac{5}{6} = \frac{1}{6}$ of a turn.

3. One sixth of $360°$ is $360 \div 6 = 60°$.

Problem 3

1. The counterclockwise turn undoes $\frac{1}{5}$ of a full turn from the first move.

2. The camera ends $\frac{2}{5} - \frac{1}{5} = \frac{1}{5}$ of a full turn clockwise from the start.

3. That single turn measures $360 \div 5 = 72°$.

4. Going the other way would take $360 - 72 = 288°$, so $72°$ clockwise is shorter.

Problem 4

1. The two limits are $360 \div 4 = 90°$ and $360 \div 2 = 180°$.

2. The $85°$ setting is below $90°$. The $180°$ setting is at the half-turn, not before it.

3. $90 < 110 < 180$, so only $110°$ is between the limits.

Problem 5

1. With 8 sectors, each measures $360 \div 8 = 45°$. The $120°$ stop falls between the second boundary at $90°$ and the third at $135°$.

2. With 12 sectors, each measures $360 \div 12 = 30°$.

3. $4 \times 30 = 120°$ and $7 \times 30 = 210°$, so both stops are on sector boundaries.

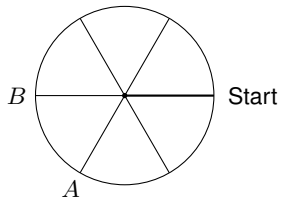
Problem 6

1. The sector count must split into 3 equal groups for thirds and 2 equal groups for halves.

2. 3 is the first count that gives thirds, but it cannot split into 2 equal whole-sector groups. The next count that gives thirds is 6, which works for both.

3. Each sector is $360 \div 6 = 60°$. Count $60 \div 15 = 4$ guide gaps clockwise from Start and draw a radius. Repeat every four gaps.

4. Mark A after $6 \div 3 = 2$ sectors and B after $6 \div 2 = 3$ sectors.



6 equal sectors

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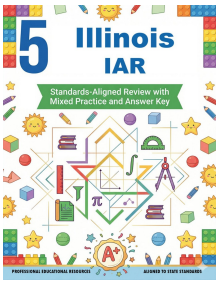

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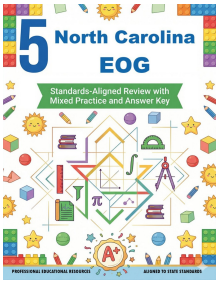

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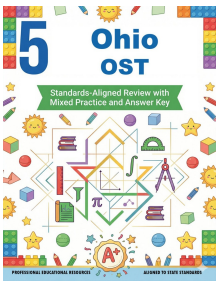

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