CIRCLE PUZZLE

Performance Standard 9B.J

Calculate the measure of an inscribed angle using the marked tangent, a secant, chords and angles .

- *Mathematical knowledge*: Determine the correct angle measurement using central angles, inscribed angles, arcs, angles between tangents and chords and their relationships;
- *Strategic knowledge*: Use an auxiliary line segment and a sequence of inscribed angles and arc relationships as well as the angle between the tangent and the chord;
- *Explanation*: Explain completely what was done and why it was done.

Procedures

1. Provide students with sufficient learning opportunities to develop the following in order to identify, describe, classify and compare relationships using points, lines, planes, and solids.
   - Solve problems using relationships between and among figures.
2. The student is given a copy of the task to be completed in a classroom setting. It is assumed that students have studied and discussed central angles, inscribed angles, arcs, angles between tangents and chords, and their relationships.
3. Evaluate the work using the mathematics rubric:
   - A 4 in mathematical knowledge would require a correct answer of 55°. A mathematical error in addition or subtraction would earn a score of 3.
   - A 4 in strategic knowledge would require an auxiliary line segment QM and a sequence of inscribed angles and arc relationships as well as the angle between the tangent and the chord QM.
   - A 4 in explanation would require a complete description of the process and the reason for each step.

Examples of Student Work follow

Resources

- Copies of the "Circle Puzzle" task sheet
- Mathematics Rubric

Time Requirements

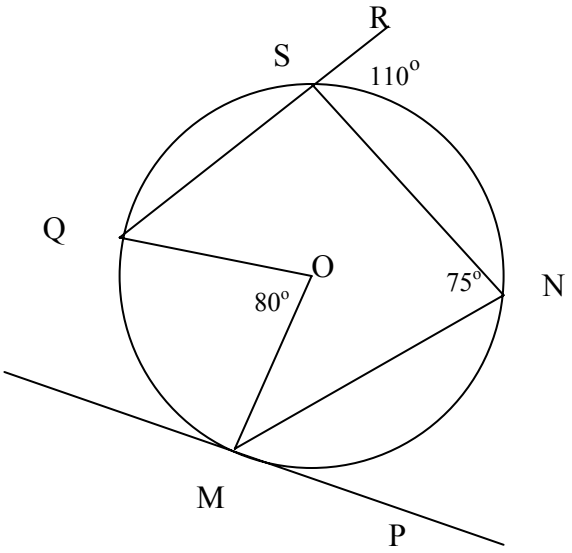
- One class period

NAME _____ DATE _____

CIRCLE PUZZLE

Student Task Sheet

Find the measure of angle OQS from the following figure:



O is the center of the circle.

Angle RSN measures 110°

Angle SNM measures 75°

MP is tangent to the circle at M

Angle QOM measures 80°

S, Q, M and N are on the circle.

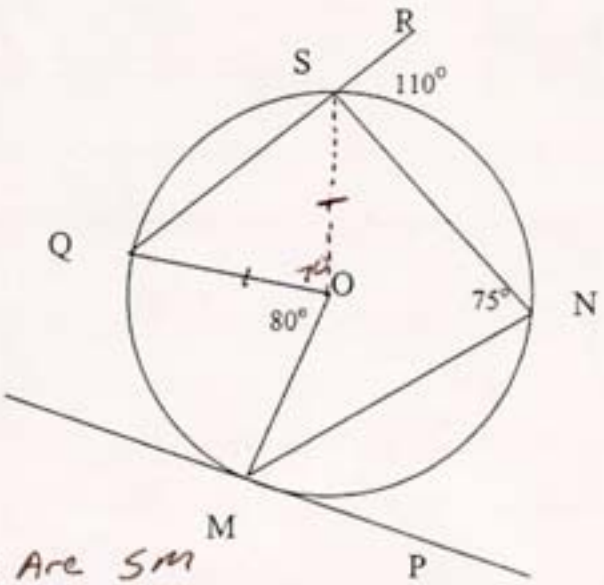
Adapted from New Elementary Mathematics Syllabus D, 3, Workbook, p. 129, Cheng, KHL Printing, Singapore, 1998.

'Meets"

CIRCLE PUZZLE

Student Task Sheet

Find the measure of angle OQS from the following figure:



O is the center of the circle.

Angle RSN measures 110°

Angle SNM measures 75°

MP is tangent to the circle at M

Angle QOM measures 80°

S, Q, M and N are on the circle.

$75 \times 2 = 150^\circ$ = Arc SM

$150 - 80 = 70^\circ$ = Arc QS

$\angle QOS = 70^\circ$

$180 - 70 = 110$

$110 \div 2$

$55^\circ = \angle OQS$

to find Arc SM I multiplied 75 by 2 to get 150. Then I subtracted 80 to get 70° for Arc QS. If $\angle QOS = 70^\circ$ then $\angle OQS$ + $\angle QSO$ both equal 55° because $\overline{QO}$ & $\overline{SO}$ are equal so therefore $\angle OQS = 55^\circ$.

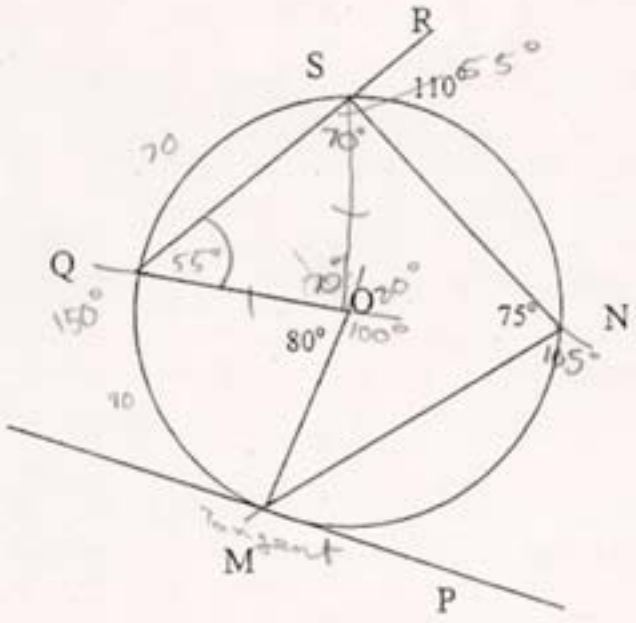
Adapted from New Elementary Mathematics Syllabus D, 3, Workbook, p. 129, Cheng, KHL Printing, Singapore, 1998.

"Exceeds"

CIRCLE PUZZLE

Student Task Sheet

Find the measure of angle OQS from the following figure:



O is the center of the circle.

Angle RSN measures 110°

Angle SNM measures 75°

MP is tangent to the circle at M

Angle QOM measures 80°

S, Q, M and N are on the circle.

$OQS = 55°$

$\angle SNM$ is an inscribed angle measuring $75°$ which makes $\overset{\frown}{SQM} = 150°$ since it is equal to twice the inscribed angle's measure. $\overset{\frown}{MQ}$ is equal to $80°$ since central angle QOM is $80°$. This makes $\overset{\frown}{SQ} = 70°$ since $150° - 80° = 70°$. You can draw $\overline{OS}$ of which is equal to $\overline{OQ}$ since they are both radii of circle O. This makes OQOS an isosceles triangle. $\angle QSO$ and $\angle OQS$ are equal since they are base angles. You take $180 - 70$ to find $\angle OQS$ and $\angle QSO$ sum to 110. They are equal to each other so are equal to $\frac{110}{2}$ which is $55°$. This shows $\angle OQS = 55°$.

Adapted from New Elementary Mathematics Syllabus D, 3, Workbook, p. 129, Cheng, KHL Printing, Singapore, 1998.