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Drill Problems: Week 2.3

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COLUMBIA ACADEMY

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Written by Jaehoon Song (Lecturer)

1. **Arc Length Calculation** (10 points)

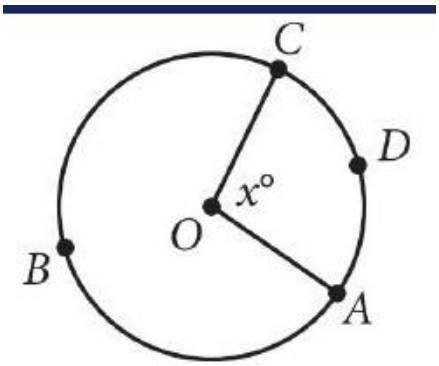

Figure 1: Circle with center O and arcs

The circle above has center O, the length of arc $\overline{ADC}$ is 5π, and $x = 100$. What is the length of arc $\overline{ABC}$?

(A) 9π

(B) 13π

(C) 18π

(D) $\frac{13}{2}\pi$

Answer:

2. **Circle Radius from Equation** (10 points)
The graph of $x^2 + x + y^2 + y = \frac{199}{2}$ in the xy-plane is a circle. What is the length of the circle's radius?

Answer:

3. **Circle Center Coordinates** (10 points)
The equation above defines a circle in the xy-plane. What are the coordinates of the center of the circle?

(A) $(-20, -16)$

(B) $(-10, -8)$

(C) $(10, 8)$

(D) $(20, 16)$

Answer:

4. **Arc Length with Angle** (10 points)

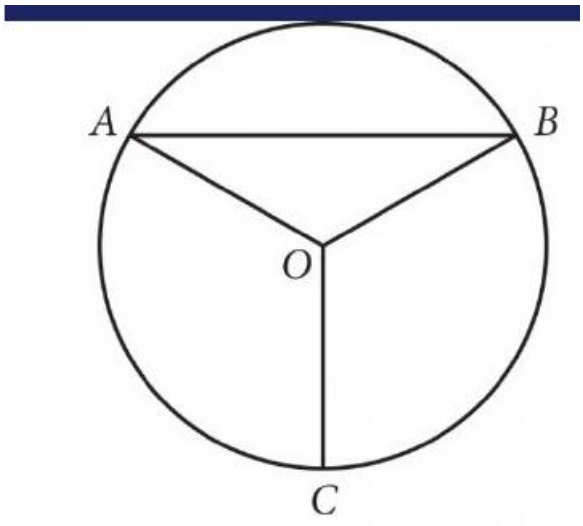

Figure 2: reference attached

Point O is the center of the circle above, and the measure of $\angle OAB$ is $30°$. If the length of $\overline{OC}$ is 18, what is the length of arc $\overline{AB}$?

(A) 9π

(B) 12π

(C) 15π

(D) 18π

Answer:

□

5. **Circle Radius from Diameter** (10 points)
A circle in the xy-plane has a diameter with endpoints $(2, 4)$ and $(2, 14)$. An equation of this circle is $(x-2)^2 + (y-9)^2 = r^2$, where r is a positive constant. What is the value of r?

Answer:

□

6. **Angle Calculation in Triangle** (10 points)

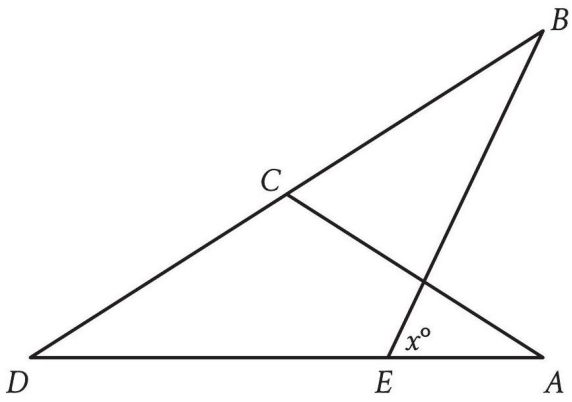

Figure 3: reference attached

In the figure, $AC = CD$. The measure of angle EBC is 45°, and the measure of angle ACD is 104°. What is the value of x?

Answer:

□

7. **Complex Angle Calculation** (10 points)

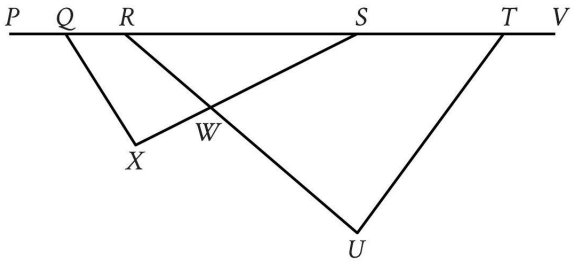

Figure 4: reference attached

In the figure shown, points Q, R, S, and T lie on line segment PV, and line segment RU intersects line segment SX at point W. The measure of $\angle SQX$ is 48°, the measure of $\angle SXQ$ is 86°, the measure of $\angle SWU$ is 85°, and the measure of $\angle VTU$ is 162°. What is the measure, in degrees, of $\angle TUR$?

Answer:

□

8. **Intersecting Lines Angle** (10 points)
Intersecting lines r, s, and t are shown below.

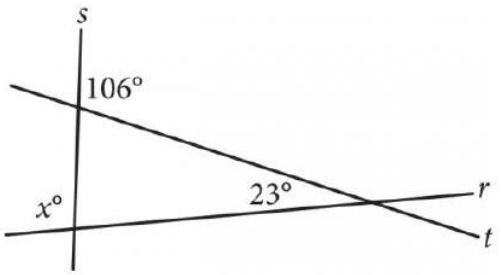

Figure 5: reference attached

What is the value of x?

Answer:

□

9. **Parallel Lines Angle** (10 points)

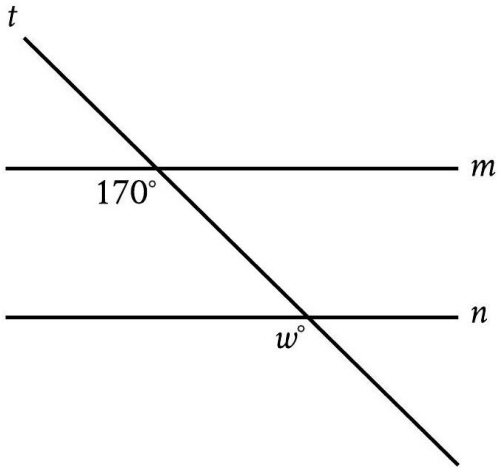

Figure 6: reference attached

In the figure, line m is parallel to line n. What is the value of w?

(A) 17
(B) 30
(C) 70
(D) 170

Answer:

□

10. **Isosceles Triangle Angle** (10 points)

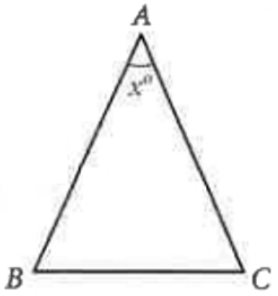

Figure 7: reference attached

In the given triangle, $AB = AC$ and $\angle ABC$ has a measure of 67°. What is the value of x?

(A) 36
(B) 46
(C) 58
(D) 70

Answer:

11. **Intersecting Segments Angle** (10 points)

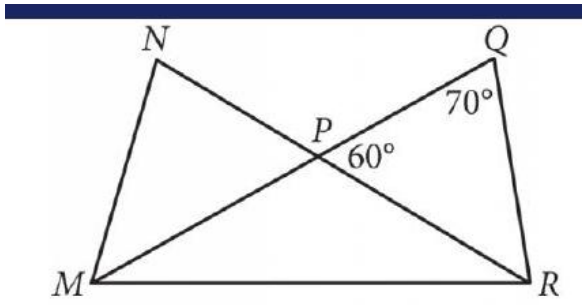

Figure 8: reference attached

In the figure above, $\overline{MQ}$ and $\overline{NR}$ intersect at point P, $NP = QP$, and $MP = PR$. What is the measure, in degrees, of $\angle QMR$? (Disregard the degree symbol when gridding your answer.)

Answer:

12. **Similar Triangles Angle** (10 points)

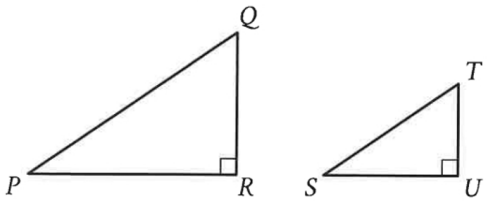

Figure 9: reference attached

Right triangles PQR and STU are similar, where P corresponds to S. If the measure of angle Q is 18°, what is the measure of angle S?

(A) 18°
(B) 72°
(C) 82°
(D) 162°

Answer:

13. **Parallel Lines with Transversal** (10 points)

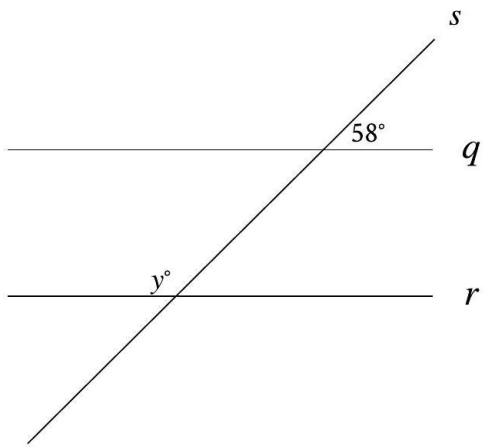

Figure 10: reference attached

In the figure, line q is parallel to line r, and both lines are intersected by line s. If $y = 2x + 8$, what is the value of x?

Answer:

14. **Parallel Lines Angle Relationship** (10 points)

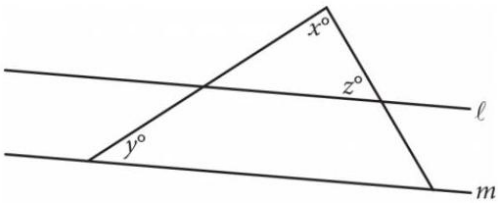

Figure 11: reference attached

In the figure above, lines ℓ and m are parallel, $y = 20$, and $z = 60$. What is the value of x?

(A) 120
(B) 100
(C) 90
(D) 80

Answer:

□

15. **Parallel Lines Proportionality** (10 points)

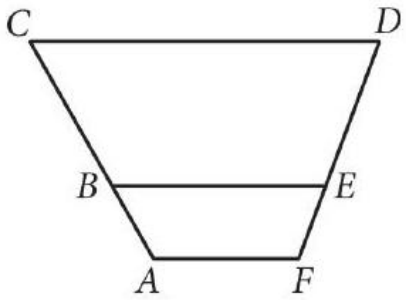

Figure 12: reference attached

In the figure above, $\overline{AF}$, $\overline{BE}$, and $\overline{CD}$ are parallel. Points B and E lie on $\overline{AC}$ and $\overline{FD}$, respectively. If $AB = 9$, $BC = 18.5$, and $FE = 8.5$, what is the length of $\overline{ED}$, to the nearest tenth?

(A) 16.8
(B) 17.5
(C) 18.4
(D) 19.6

Answer:

□

16. **Similar Triangles Sine Value** (10 points)
Triangle FGH is similar to triangle JKL, where angle F corresponds to angle J and angles G and K are right angles. If $\sin(F) = \frac{308}{317}$, what is the value of $\sin(J)$?

(A) $\frac{75}{317}$
(B) $\frac{308}{317}$
(C) $\frac{317}{308}$
(D) $\frac{317}{75}$

Answer:

□

17. **Right Triangle Trigonometric Relationship** (10 points)
In right triangle RST, the sum of the measures of angle R and angle S is 90 degrees. The value of $\sin(R)$ is $\frac{\sqrt{15}}{4}$. What is the value of $\cos(S)$?

(A) $\frac{\sqrt{15}}{15}$
(B) $\frac{\sqrt{15}}{4}$
(C) $\frac{4\sqrt{15}}{15}$
(D) $\sqrt{15}$

Answer:

□

18. **Tangent Value Calculation** (10 points)

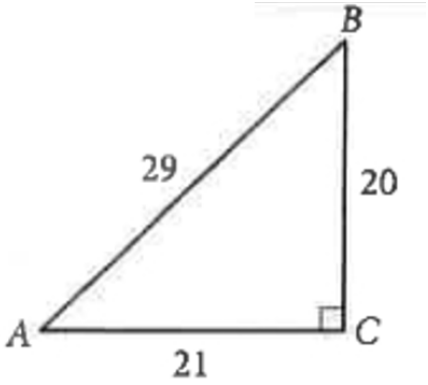

Figure 13: reference attached

In the figure above, what is the value of $\tan(A)$?

(A) $\frac{20}{29}$
(B) $\frac{21}{29}$
(C) $\frac{20}{21}$
(D) $\frac{21}{20}$

Answer:

19. **Right Triangle Side Length** (10 points)

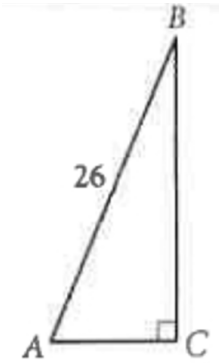

Figure 14: reference attached

Triangle ABC above is a right triangle, and $\sin(B) = \frac{5}{13}$. What is the length of side $\overline{BC}$?

Answer:

20. **Pythagorean Theorem Application** (10 points)

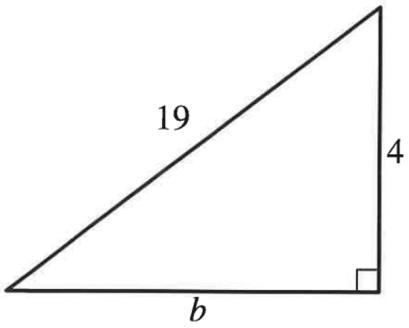

Figure 15: reference attached

Which equation shows the relationship between the side lengths of the given triangle?

(A) $4b = 19$
(B) $4 + b = 19$
(C) $4^2 + b^2 = 19^2$
(D) $4^2 - b^2 = 19^2$

Answer: