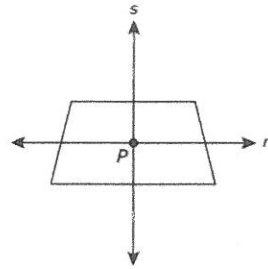Indicate your answers clearly. **Work** must be shown (where needed) to receive credit.

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1. The figure shows two perpendicular lines, s and r, intersecting at point P in the interior of the trapezoid. Line r is parallel to the bases and bisects both legs of the trapezoid. Line s bisects both bases.
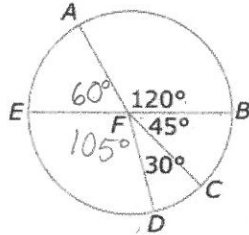
Which transformation(s) will always carry the figure onto itself? Choose all that apply.

   A. A reflection across line r
   (B.) A reflection across line s
   C. A rotation of 90° clockwise about point P
   D. A rotation of 180° clockwise about point P
   E. A rotation of 270° clockwise about point P

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2. The circle with center F is divided into sectors, $\overline{EB}$ is a diameter, and FB = 3 units. Which expression represents the arc length of $\overarc{AED}$?

   A. π
   (B.) $\frac{11\pi}{4}$
   C. $\frac{13\pi}{4}$
   D. $\frac{7\pi}{4}$

   $\left(\frac{165}{360}\right) 2 \cdot \pi \cdot 3$

   $\frac{990\pi}{360} = \frac{11\pi}{4}$

   [circle diagram with angles: $60°$, $120°$, $45°$, $30°$, $105°$, labeled A, B, C, D, E, F]

3. The equation $x^2 + y^2 - 4x + 2y = b$ describes a circle.
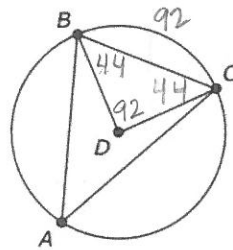
   What is the y-coordinate of the center of the circle? $\boxed{-1}$

   $(x^2 - 4x + 4) + (y^2 + 2y + 1) = b + 4 + 1$
   $(x-2)(x-2)$ $(y+1)(y+1)$ $b+5$

   If the radius of the circle is 7 units, what is the value of b?
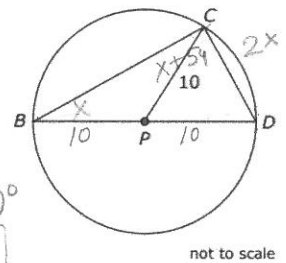
   $r = 7; r^2 = 49$
   $b + 5 = 49$ $\boxed{b = 44}$

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4. The figure shows ΔABC inscribed in circle D. If m∠CBD = 44°, find m∠BAC, in degrees.

   $\boxed{46°}$

   [circle diagram with D center, triangle ABC, angles 92, 44, 44, 92 marked]

5. The figure shows a circle with center P, a diameter $\overline{BD}$, inscribed ΔBCD, and PC = 10. Let m∠CBD = (x)° and m∠BCD = (x + 54°). Find the value of x.

   $x + 54 = 90°$
   $\boxed{x = 36}$

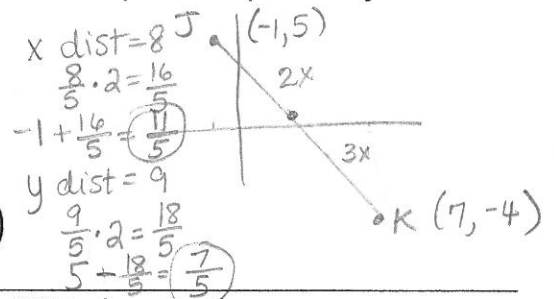   [circle diagram with center P, points B, C, D, marked 10, 10, 10, 2x, 54, x]

   not to scale

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6. Marco is determining the number of angles of rotational symmetry (up to 360°) that different shapes have. How many angles of rotational symmetry do each of the following shapes have?

   [shapes: triangle (A), square (D), trapezoid (A), circle (F), rectangle (B)]
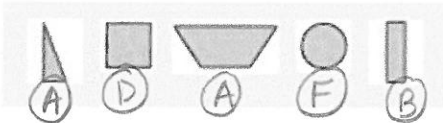
   A. 1   B. 2   C. 3   D. 4   E. 5   F. 6 or more

7. The endpoints of $\overline{JK}$ are J(-1, 5) and K(7, -4). What are the coordinates of the point that partitions $\overline{JK}$ in the ratio 2:3?

   A. $\left(\frac{7}{5}, \frac{23}{5}\right)$
   (B.) $\left(\frac{11}{5}, \frac{7}{5}\right)$
   C. $\left(3, \frac{13}{3}\right)$
   D. $\left(\frac{13}{3}, -1\right)$

   x dist = 8   J (-1,5)
   $\frac{8}{5} \cdot 2 = \frac{16}{5}$ 2x
   $-1 + \frac{16}{5} = \frac{11}{5}$
   y dist = 9   3x
   $\frac{9}{5} \cdot 2 = \frac{18}{5}$ K (7,-4)
   $5 - \frac{18}{5} = \frac{7}{5}$

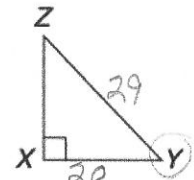8. A circle has its center at (-2, 5). An endpoint of a radius is at (3, 7). Which points are on the circle? Choose all that are correct.

   (A.) (-7, 3)   (-2,5) = $\sqrt{29}$
   B. (-4, 3) $\sqrt{8}$
   C. (-2, -1)   6
   D. (0, 5)   2
   (E.) $(1, 5 - 2\sqrt{5})$ $9 + 20$
   F. $(5, -2 + \sqrt{29})$

   $r = \sqrt{(-5)^2 + (-2)^2}$
   $r = \sqrt{25 + 4} = \sqrt{29}$

9. Right triangle XYZ is shown. Complete the statements below.

   [right triangle XYZ with Z top, right angle at X, sides 29, 20, 20]

   The value of the cosine of Y is $\frac{20}{29}$.
   Because Y and Z are (**complementary** / corresponding / supplementary / vertical) angles, the value of the sine of Z is $\underline{20/29}$.

10. The circle shown, with center O, has points X, Y, and Z, and m∠YOZ = 124°.

m∠YXZ = **62°**

because the measure of (a central angle / ~~an inscribed angle~~ / a corresponding angle) is (~~half~~ / twice / the same as) the measure of its corresponding (~~central angle~~ / circumscribed angle / inscribed angle).
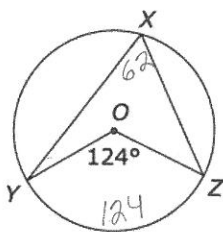
or: central / twice / inscribed

11. A circle inscribed in a quadrilateral is shown. What are the side lengths of quadrilateral JKLM? Choose all that apply.

A. 8 cm
B. 9 cm
C. 11 cm
D. 12 cm
E. 13 cm
F. 14 cm
G. 15 cm
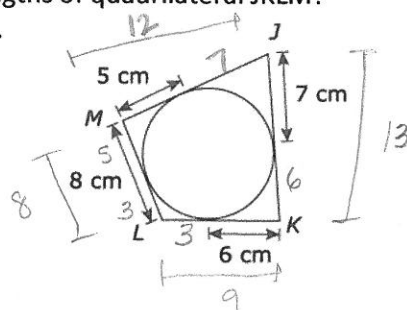
12. An incomplete proof is shown. Which reasons correctly complete the proof? Write them in the appropriate places. Answer choices are given below the diagram.

Given: WXYZ is an isoceles trapezoid.
 V is the intersection of $\overline{WY}$ and $\overline{XZ}$.
 $\overline{WX} \cong \overline{ZY}$

Prove: ∠XWY ≅ ∠YZX
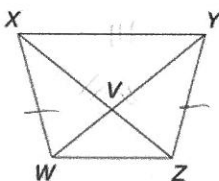
Answer choices:
ASA   SAS   SSS   Reflexive property
Vertical angles are ≅   Corresp. angles are ≅
Diagonals of an isosceles trapezoid are ≅

Statement	Reason
1. WXYZ is an isosceles trapezoid.	1. given
2. V is the intersection of $\overline{WY}$ and $\overline{XZ}$.	2. given
3. $\overline{WX} \cong \overline{ZY}$	3. given
4. $\overline{WY} \cong \overline{ZX}$	4. Diag. of isos. trap. ≅
5. $\overline{XY} \cong \overline{YX}$	5. Reflexive
6. ΔWYX ≅ ΔZXY	6. SSS
7. ∠XWY ≅ ∠YZX	7. corresponding parts of congruent triangles are congruent

13. This monument in the shape of a square pyramid was built in a park. The four lateral faces of the pyramid will be painted. The cost and coverage information for regular and metallic paint are shown in the table. Both paint types will be used on the monument. The regular paint will require 2 coats, and the metallic paint will require 1 coat. Both types of paint are sold only by the gallon. Based on the table, what is the least amount of money that should be budgeted to paint the monument?

A. $1,820
B. $1,720
C. $1,685
D. $1,610

Area of 1 triangle:
$\frac{1}{2} \cdot 24 \cdot 23.3$
= 279.6 ft²
× 4 triangles
1118.4 ft²
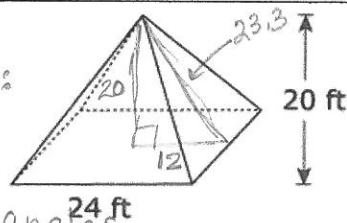
regular: $\frac{2236.8 ft^2}{200}$ = 12 gal ×2

metallic: $\frac{1118.4 ft^2}{80}$ = 14 gal ×1

Information for Regular and Metallic Paint

Paint Type	Cost (dollars per gallon)	Paint Coverage (square feet per gallon)
regular	420 $35	200
metallic	1400 $100	80

14. A right circular cylinder is shown. If the height of the cylinder is greater than the diameter, which shape could be a cross section of the cylinder? Choose all that apply.

A. Circle
B. Oval
C. Rectangle
D. Square
E. Trapezoid
F. Triangle

circle
oval
rectangle
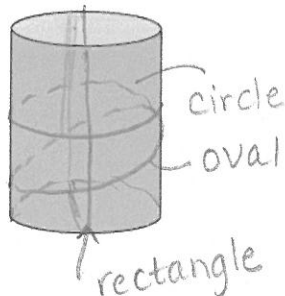
15. Two individuals, shown as X and Y on the figure, are hiking in a park. The angles of elevation from each individual to the top of a waterfall, W, are shown, along with the height of the waterfall. The base of the waterfall, B, is directly below W. Find the distances between X and Y, and between Y and B.

877.5 ft   523.8 ft

$\tan 49 = \frac{1612}{m}$
$m \cdot \tan 49 = 1612$
m = 1401.3

$\tan 72 = \frac{1612}{n}$
$n \tan 72 = 1612$
n = 523.8