PROBLEMS

Problem 1. If the graph of the equation $y=(x+2)^2$ is reflected with respect to the y-axis, what is the equation of the resulting graph?

(A) $y=x^2-4x+4$ (B) $y=x^2-4x+2$ (C) $y=(x-2)^2$

(D) $y=x^2-4x-4$ (E) $y=x^2-2x+4$

Problem 2. P and Q are reflections of $(2,-3)$ across the x-axis and the y-axis, respectively. Find the length of $\overline{PQ}$ in simplest radical form.

(A) $\sqrt{97}$ (B) $2\sqrt{13}$ (C) $\sqrt{13}$ (D) 6 (E) 4

Problem 3. If the graph of the equation $y=x^2+3$ is reflected with respect to the line $y=-2$, what is the maximum value of the reflected graph?

(A) -4 (B) 7 (C) -7 (D) 3 (E) 4

Problem 4. What is the sum of the coordinates of the point obtained by first reflection (8, 8) over the line $x=3$, and then reflecting that point over the line $y=4$?

(A) -2 (B) 8 (C) -8 (D) 3 (E) 4

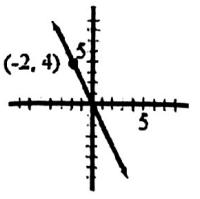
Problem 5. The point (2, 3) is reflected about the x-axis to a point P. Then P is reflected about the line $y=x$ to a point Q. What is the x-coordinate of Q?

(A) 2 (B) 5 (C) -3 (D) 3 (E) -2

Problem 6. The center of a circle has coordinates $(6,-5)$. The circle is reflected about the line $y=x$. What are the coordinates of the center of the image circle?

(A) $(6,-5)$ (B) $(-5,6)$ (C) $(5,-6)$ (D) $(1,0)$ (E) $(0,1)$

Problem 7. Write the equation for the graph shown below after it is reflected about the line $y=-x$



(A) $x+2y=0$ (B) $x-2y=0$ (C) $2x+y=0$

(D) $2x-y=0$ (E) $x+y=0$

Problem 8. What is the sum of the new coordinates of point $(5,-1)$ when it is reflected across the line $y=-x$.

(A) -4 (B) 4 (C) -6 (D) 6 (E) 5

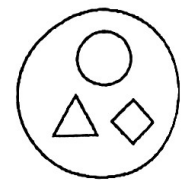
Problem 9. Point A has coordinates $(-2, 1)$. Point B is the image of A reflected in the line $y=3$. Point C is the image of B reflected in the line $y=x+3$. Point D is the image of C reflected in the line $x=0$. What is the distance between A and D ?

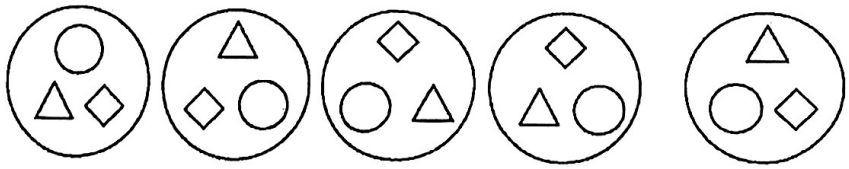
(A) $2\sqrt{5}$ (B) 4 (C) 2 (D) 0 (E) 1

Problem 10. The point Q is the image of point $P(2, 7)$ reflected through the line $x+2y=6$. What are the coordinates of Q?

(A) $(-4,-6)$ (B) $(-2,-1)$ (C) $(2,-1)$ (D) $(-2, 1)$ (E) $(7, 2)$

☆**Problem 11.** Which of the following represents the result when the figure shown is rotated clockwise 240° about its center?



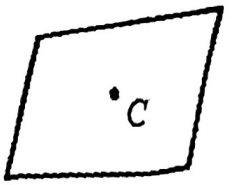


(A) (B) (C) (D) (E)

Problem 12. Which of the figures shown can be obtained from  by a rotation of the figure in the plane of the paper?

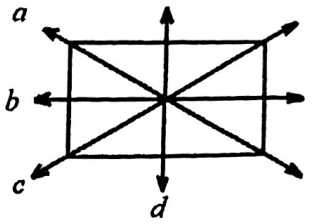
(A)  (B)  (C)  (D) 

Problem 13. If the rhombus is rotated clockwise about its center point C, what is the minimum number of degrees it must rotate before it coincides with the original shape?

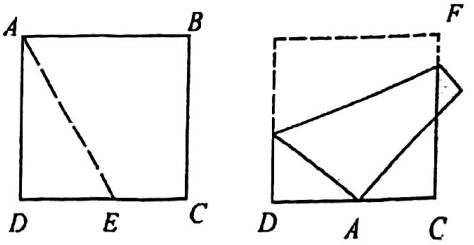


Problem 14. How many axes of symmetry does a rectangle have given that it is not a square?

Problem 15 . Which lines in the rectangle are lines of symmetry?

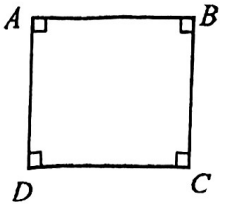


Problem 16. A square piece of paper 12 inches on each side is folded as shown, so that A falls on E, the midpoint of $\overline{DC}$. What is the number of square inches in the area of the triangular piece that extends beyond $\overline{FC}$ (the triangular piece is shaded in the diagram shown)?



(A) 8/3 (B) 9/4 (C) $1\frac{1}{2}$ (D) 7/4 (E) $\frac{\sqrt{5}}{2}$

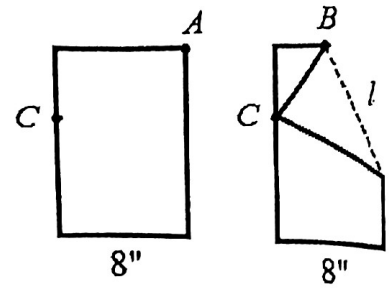
Problem 17. The square piece of paper shown is folded over so that vertex A lies on vertex C. The paper is folded again so that vertex C lies on the midpoint of $\overline{DB}$. Given that the length of one side of the square is 6 cm, find the length in centimeters of the second fold.



(A) $6\sqrt{2}$ (B) 4 (C) 3 (D) $2\sqrt{3}$ (E) $3\sqrt{2}$

Problem 18. Corner A of a rectangular piece of paper of width 8 inches is folded over so that it coincides with point C on the opposite side. If $BC = 5$ inches, find the length in inches of fold l.

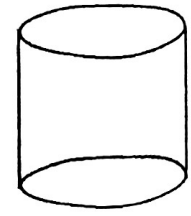
(A) $5\sqrt{5}$ (B) $\sqrt{5}$ (C) $2\sqrt{5}$ (D) $2\sqrt{3}$ (E) $3\sqrt{3}$



Problem 19. A square piece of paper is folded once so that one pair of opposite corners coincide. When the paper is unfolded, two congruent triangles have been formed. Given that the area of the original square is 49 square inches, what is the number of inches in the perimeter of one of these triangles?

(A) $14+7\sqrt{2}$ (B) $7+7\sqrt{2}$ (C) 21 (D) $21\sqrt{3}$ (E) $14+14\sqrt{2}$.

Problem 20. A can is in the shape of a right circular cylinder. The circumference of the base of the can is 12 inches, and the height of the can is 5 inches. A spiral strip is painted on the can in such a way that it winds around the can exactly once as it reaches from the bottom of the can to the top. It reaches the top of the can directly above the spot where it left the bottom. What is the length, in inches, of the strip?



(A) 17 (B) 13 (C) 25π (D) 12π (E) 60

Problem 21. A circular cylinder is formed by rolling an $8\frac{1}{2}$" × 11" paper vertically and taping it with no overlap. A second cylinder is formed by rolling an $8\frac{1}{2}$" × 11" paper horizontally and taping it with no overlap. What is the ratio of the volume of the $8\frac{1}{2}$" tall cylinder to the volume of the 11" tall cylinder?

(A) 11/8 (B) 17/11 (C) 3/2 (D) 22/17 (E) 11/17

☆**Problem 22.** Triangle OAB has $O = (0, 0)$, $B = (4, 0)$, and A in the first quadrant. In addition, $\angle ABO = 90°$ and $\angle AOB = 60°$. Suppose that OA is rotated 90° counterclockwise about O. What are the coordinates of the image of A?

(A) $(4\sqrt{3},4)$ (B) $(-4\sqrt{3},4)$ (C) $(4\sqrt{3},-4)$ (D) $(\sqrt{3},4)$ (E) $(-\sqrt{3},4)$