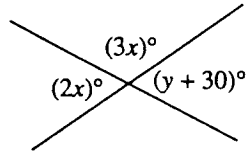
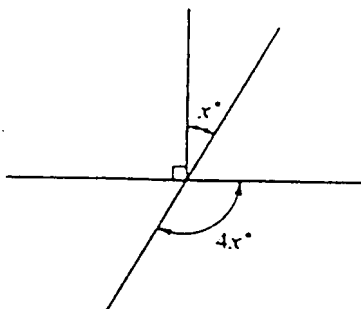


Category 9 Lines and Angles

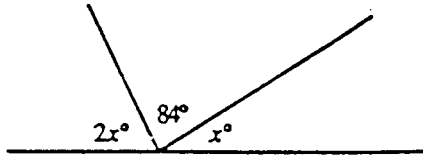


Note: Figure not drawn to scale.

- In the figure above, the value of y is
 - 6
 - 12
 - 24
 - 36
 - 42
- If each of the two lines ℓ_1 and ℓ_2 is parallel to line ℓ_3 , which of the following must be true?
 - Lines ℓ_1 , ℓ_2 , and ℓ_3 lie in the same plane.
 - Lines ℓ_1 , ℓ_2 , and ℓ_3 lie in different planes.
 - Line ℓ_1 is parallel to line ℓ_2 .
 - Line ℓ_1 is the same line as line ℓ_2 .
 - Line ℓ_1 is the same line as line ℓ_3 .

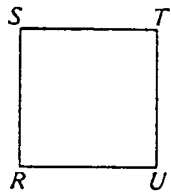


- In the figure above, what is the value of x ?
 - 18
 - 30
 - 36
 - 40
 - 45



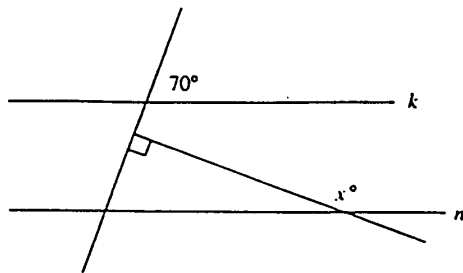
4. In the figure above, what is the value of x ?

(A) 28
(B) 30
(C) 32
(D) 42
(E) 48



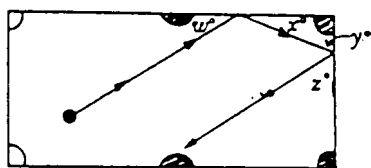
5. Square $RSTU$ shown above is rotated in a plane about its center in a clockwise direction the minimum number of degrees necessary for T to be in the position where S is now shown. The number of degrees through which $RSTU$ is rotated is

(A) 135°
(B) 180°
(C) 225°
(D) 270°
(E) 315°



6. In the figure above, if line k and n are parallel, then $x =$

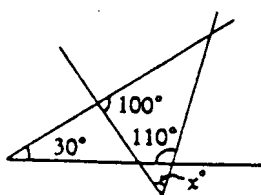
(A) 20
(B) 50
(C) 110
(D) 140
(E) 160



Note : Figure not drawn to scale.

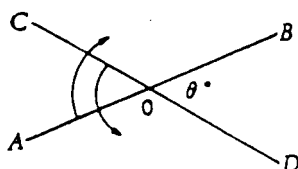
7. The figure above traces the path of a certain billiard ball on a rectangular billiard table. If the ball bounces off the side of the table at the same angle at which it hits the side, and if $w = 42$, what the value of z ?

(A) 42 (B) 48 (C) 52 (D) 58 (E) 60



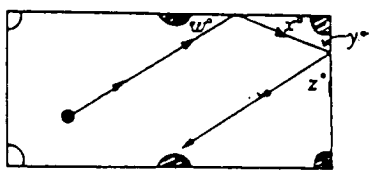
8. In the figure above, what is the value of x ?

(A) 20
(B) 30
(C) 40
(D) 50
(E) 70



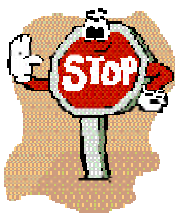
9. The figure above shows two lines intersecting at the point O . If the lines are rotated about O at the same rate and in the directions shown until $AB \perp CD$, through how many degrees must each line move?

(A) $90 - q$
(B) $90 - \frac{q}{2}$
(C) $90 + \frac{q}{2}$
(D) $\frac{90 + q}{2}$
(E) $\frac{90 + 2q}{2}$



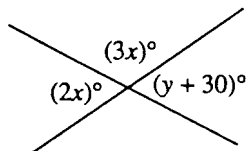
Note : Figure not drawn to scale.

10. The figure above traces the path of a certain billiard ball on a rectangular billiard table. If the ball bounces off the side of the table at the same angle at which it hits the side, and if $w = 42$, what the value of z ?
- (A) 42
(B) 48
(C) 52
(D) 58
(E) 60
11. If each of the two lines ℓ_1 and ℓ_2 is parallel to line ℓ_3 , which of the following must be true?
- (A) Lines ℓ_1 , ℓ_2 , and ℓ_3 lie in the same plane.
(B) Lines ℓ_1 , ℓ_2 , and ℓ_3 lie in different planes.
(C) Line ℓ_1 is parallel to line ℓ_2 .
(D) Line ℓ_1 is the same line as line ℓ_2 .
(E) Line ℓ_1 is the same line as line ℓ_3 .





Category 9 Lines and Angles



Note: Figure not drawn to scale.

1. In the figure above, the value of y is

- (A) 6
(B) 12
(C) 24
(D) 36
(E) 42

$$\begin{aligned}
 & \text{y} \qquad \qquad \qquad \text{x} \\
 & 2x \quad 3x \qquad \qquad \qquad 180 \qquad 2x + 3x = 180 \quad x = 36 \\
 & \qquad \qquad \qquad 3x^\circ + (y+30)^\circ = 180^\circ \quad , \qquad 2x^\circ = y^\circ + 30^\circ \quad (\qquad) \\
 & \qquad \qquad \qquad x=36 \qquad \qquad \qquad y = 42
 \end{aligned}$$



(E)

2. If each of the two lines ℓ_1 and ℓ_2 is parallel to line ℓ_3 , which of the following must be true?

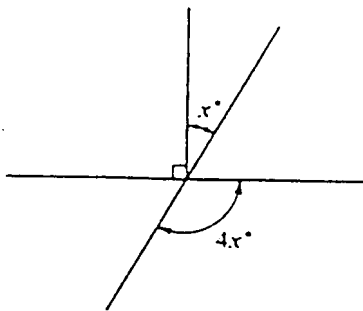
- (A) Lines ℓ_1 , ℓ_2 , and ℓ_3 lie in the same plane.
(B) Lines ℓ_1 , ℓ_2 , and ℓ_3 lie in different planes.
(C) Line ℓ_1 is parallel to line ℓ_2 .
(D) Line ℓ_1 is the same line as line ℓ_2 .
(E) Line ℓ_1 is the same line as line ℓ_3 .

$$\begin{aligned}
 & \ell_1 \quad \ell_2 \text{ 가 } \ell_3 \qquad \qquad \qquad \ell_1, \ell_2, \text{ and } \ell_3 \text{ 가 } \\
 & \qquad \qquad \qquad (\text{plane}) \qquad \qquad (\text{line}) \qquad \qquad \qquad .
 \end{aligned}$$

(C)



(C)



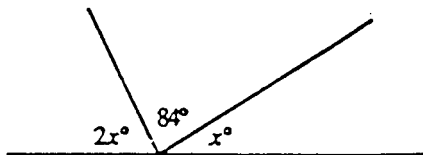
3. In the figure above, what is the value of x ?

- (A) 18
- ☒ (B) 30
- (C) 36
- (D) 40
- (E) 45

x $4x$ y 71
 ① $x + y = 90$ (), ② $4x + y = 180$ () ① ② $x = 30$



(B)



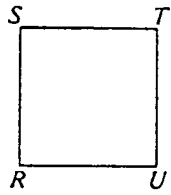
4. In the figure above, what is the value of x ?

- (A) 28
- (B) 30
- ☒ (C) 32
- (D) 42
- (E) 48

$(\quad 180 \quad)$ $2x + 84 + x = 180,$
 $x = 32$



(C)



5. Square $RSTU$ shown above is rotated in a plane about its center in a clockwise direction the minimum number of degrees necessary for T to be in the position where S is now shown.

The number of degrees through which $RSTU$ is rotated is

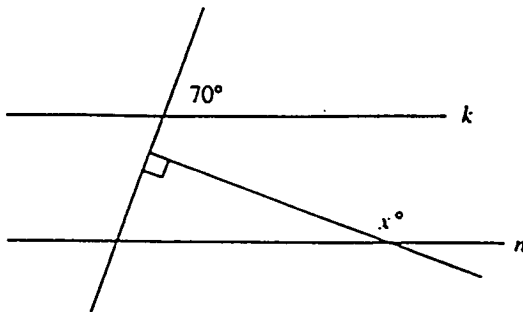
- (A) 135°
 (B) 180°
 (C) 225°
 (D) 270°
 (E) 315°

$RSTU$ 가 , T 가 S

T U 90
 T S 270



(D)



6. In the figure above, if line k and n are parallel, then $x =$

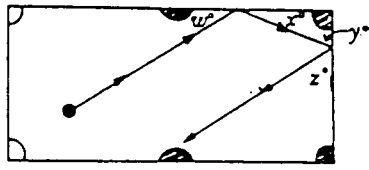
- (A) 20
 (B) 50
 (C) 110
 (D) 140
 (E) 160

180 (180)

$$70 + 90 + (180 - x) = 180, x = 160$$



(E)



Note : Figure not drawn to scale.

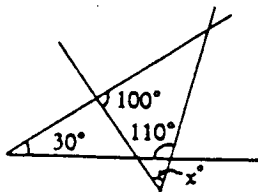
7. The figure above traces the path of a certain billiard ball on a rectangular billiard table. If the ball bounces off the side of the table at the same angle at which it hits the side, and if $w = 42$, what the value of z ?

(A) 42 (B) 48 (C) 52 (D) 58 (E) 60

$$\begin{aligned}
 &w = 42 \\
 &w(=42) + y + 90 = 180, \quad y = 48. \quad y=48 \\
 &z = 48
 \end{aligned}$$



(B)



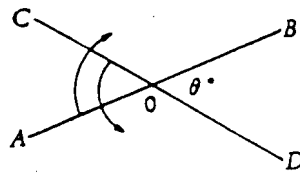
8. In the figure above, what is the value of x ?

(A) 20
(B) 30
(C) 40
(D) 50
(E) 70

$$\begin{aligned}
 &y = 40. \\
 &30 + 110 + y = 180, \\
 &x + y(=40) + 100 = 180 \Rightarrow x = 40
 \end{aligned}$$



(C)

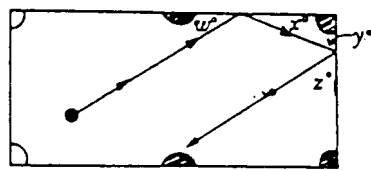


9. The figure above shows two lines intersecting at the point O . If the lines are rotated about O at the same rate and in the directions shown until $AB \perp CD$, through how many degrees must each line move?

- (A) $90 - q$
 (B) $90 - \frac{q}{2}$
 (C) $90 + \frac{q}{2}$
 (D) $\frac{90 + q}{2}$
 (E) $\frac{90 + 2q}{2}$

$AB \perp CD$ 가 AB 90 CD q° CD 가 AB 가 $q^\circ + 90$ 2 O

(D)



Note : Figure not drawn to scale.

10. The figure above traces the path of a certain billiard ball on a rectangular billiard table. If the ball bounces off the side of the table at the same angle at which it hits the side, and if $w = 42$, what the value of z ?

- (A) 42 (B) 48 (C) 52 (D) 58 (E) 60

$$w = 42 \Rightarrow x = 42 \Rightarrow y = (180 - (90 + 42)) = 48 \Rightarrow z = 48$$

(B)

11. If each of the two lines ℓ_1 and ℓ_2 is parallel to line ℓ_3 , which of the following must be true?

- (A) Lines ℓ_1 , ℓ_2 , and ℓ_3 lie in the same plane.
- (B) Lines ℓ_1 , ℓ_2 , and ℓ_3 lie in different planes.
- (C) Line ℓ_1 is parallel to line ℓ_2 .
- (D) Line ℓ_1 is the same line as line ℓ_2 .
- (E) Line ℓ_1 is the same line as line ℓ_3 .

ℓ_1 , ℓ_2 and ℓ_3 are three lines. If ℓ_1 and ℓ_2 are both parallel to ℓ_3 , then ℓ_1 , ℓ_2 , and ℓ_3 must lie in the same plane. (line)

(C)

 (C)