

### Probability in Geometry

1. In the  $xy$ - plane, a triangle has vertexes  $(0,0)$ ,  $(4,0)$  and  $(4,5)$ . If a point  $(x,y)$  is selected at random from the triangular region, What is the probability that  $x-y>0$  ?  
  
A.  $1/5$   
B.  $1/3$   
C.  $1/2$   
D.  $2/3$   
E.  $4/5$
2. In the coordinate plane, rectangular region R has vertices at  $(0,0)$ ,  $(0,3)$ ,  $(4,3)$ , and  $(4,0)$ . If a point in region R is randomly selected, what is the probability that the point's  $y$ -coordinate will be greater than its  $x$ -coordinate?  
  
A.  $7/12$   
B.  $5/12$   
C.  $3/8$   
D.  $1/3$   
E.  $1/4$
3. A 5 meter long wire is cut into two pieces. If the longer piece is then used to form a perimeter of a square, what is the probability that the area of the square will be more than 1 if the original wire was cut at an arbitrary point?  
  
A)  $1/6$   
B)  $1/5$   
C)  $3/10$   
D)  $1/3$   
E)  $2/5$
4. A triangle with three equal sides is inscribed inside a circle. A point is selected at random inside the circle. What is the probability that the point selected is inside the triangle?  
  
A)  $3/4 \pi$   
B)  $3\sqrt{2} / 5\pi$   
C)  $3\sqrt{3} / 4 \pi$   
D)  $5\sqrt{3} / 4 \pi$   
E)  $3\sqrt{3} / 2 \pi$

5. A game at the state fair has a circular target with a radius of 10 cm on a square board measuring 30 cm on a side. Players win prizes if they throw two darts and hit only the circular area on at least one of the two attempts. What is the probability that Jim won the game?

a)  $1 - ((9 - \pi)/9)$   
 b)  $1 - ((18\pi - \pi^2)/81)$   
 c)  $(9 - \pi)/9$   
 d)  $((9 - \pi)^2)/81$   
 e)  $(18\pi - \pi^2)/81$

6. A cylindrical tank has a base with a circumference of  $4\sqrt{\pi\sqrt{3}}$  meters and an equilateral triangle painted on the interior side of the base. A grain of sand is dropped into the tank, and has an equal probability of landing on any particular point on the base. If the probability of the grain of sand landing on the portion of the base outside the triangle is  $3/4$ , what is the length of a side of the triangle?

A.  $\sqrt{2\sqrt{6}}$

B.  $\frac{\sqrt{6\sqrt{6}}}{2}$

C.  $\sqrt{2\sqrt{3}}$

D.  $\sqrt{3}$

E. 2

7. An  $(x, y)$  coordinate pair is to be chosen at random from the  $xy$ -plane. What is the probability that  $y \geq |x|$ ?

(A)  $1/10$   
 (B)  $1/8$   
 (C)  $1/6$   
 (D)  $1/5$   
 (E)  $1/4$

8. A cylinder has a base with a circumference of  $20\pi$  meters and an equilateral triangle inscribed on the interior side of the base. A marker is dropped into the tank with an equal probability of landing on any point on the base. If the probability of the marker landing inside the triangle is  $(\sqrt{3})/4$ , what is the length of a side of the triangle?
- A.  $3(\sqrt{2}\pi)$   
B.  $3(\sqrt{3}\pi)$   
C.  $10\sqrt{\pi}$   
D.  $10(\sqrt{3}\pi)$   
E.  $20\pi$
9. A circular racetrack is 3 miles in length and has signs posted to indicate each  $1/10$  mile increment. If a race car starts at a random location on the track and travels exactly one half mile, what is the probability that the car ends within a half mile of the sign indicating  $2\frac{1}{2}$  miles?
- A.  $1/6$   
B.  $3/10$   
C.  $1/3$   
D.  $1/2$   
E.  $2/3$
10. In the  $xy$ -plane, the vertex of a square are  $(1, 1)$ ,  $(1, -1)$ ,  $(-1, -1)$ , and  $(-1, 1)$ . If a point falls into the square region, what is the probability that the ordinates of the point  $(x, y)$  satisfy that  $x^2 + y^2 > 1$ ?
- (A)  $1 - \pi/4$   
(B)  $\pi/2$   
(C)  $4 - \pi$   
(D)  $2 - \pi$   
(E)  $\pi - 2$
11. A searchlight on top of the watch-tower makes 3 revolutions per minute. What is the probability that a man appearing near the tower will stay in the dark for at least 5 seconds?
- (A)  $1/4$   
(B)  $1/3$   
(C)  $1/2$   
(D)  $2/3$   
(E)  $3/4$