CCSS REASONING Point X is chosen at random on $\overline{FK}$. Find the probability of each event.

6. P(X is on $\overline{FH}$)

SOLUTION:

$$\begin{aligned} P(X \text{ is on } \overline{FH}) &= \frac{\text{length of } FH}{\text{length of } FK} \\ &= \frac{16}{4+12+14+6} \\ &= \frac{16}{36} \\ &= \frac{4}{9} \end{aligned}$$

ANSWER:

$\frac{4}{9}$, 0.44, or 44%

8. P(X is on $\overline{HK}$)

SOLUTION:

$$\begin{aligned} P(X \text{ is on } \overline{HK}) &= \frac{\text{length of } HK}{\text{length of } FK} \\ &= \frac{14+6}{4+12+14+6} \\ &= \frac{20}{36} \\ &= \frac{5}{9} \end{aligned}$$

ANSWER:

$\frac{5}{9}$, 0.56, or 56%

10. **BIRDS** Four birds are sitting on a telephone wire. What is the probability that a fifth bird landing at a randomly selected point on the wire will sit at some point between birds 3 and 4?

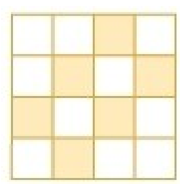
SOLUTION:

$$\begin{aligned} P(\text{between 3 and 4}) &= \frac{\text{distance from 3 to 4}}{\text{total distance}} \\ &= \frac{8}{6+10+8} \\ &= \frac{8}{24} \\ &= \frac{1}{3} \end{aligned}$$

ANSWER:

$\frac{1}{3}$, 0.33, or 33%

Find the probability that a point chosen at random lies in the shaded region.

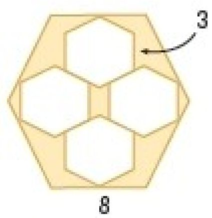
12. 

SOLUTION:

$$\begin{aligned} P(\text{shaded}) &= \frac{\text{area of shaded}}{\text{total area}} \\ &= \frac{6 \text{ squares}}{16 \text{ squares}} \\ &= \frac{6}{16} \\ &= \frac{3}{8} \end{aligned}$$

ANSWER:

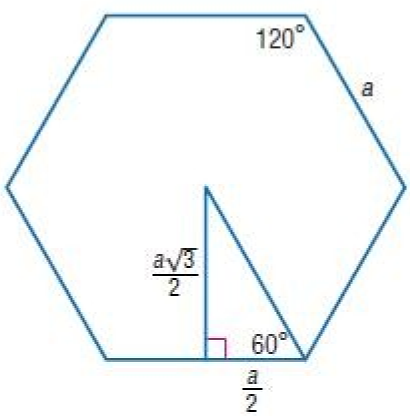
$\frac{3}{8}$, 0.375 or 37.5%

14. 

SOLUTION:

If a region A contains a region B and a point E in region A is chosen at random, then the probability that point E is in region B is $\frac{\text{Area of region A}}{\text{Area of region B}}$.

The area of a regular polygon is the half the product of the apothem and the perimeter. Find the apothem.



The length of the apothem of an hexagon of side length a units is $\frac{a\sqrt{3}}{2}$ units.

Area of the large hexagon:

$$\begin{aligned} A &= \tfrac{1}{2}Pa \\ &= \tfrac{1}{2}(6\cdot 8)\left(\frac{8\sqrt{3}}{2}\right) \\ &= 24\left(\frac{8\sqrt{3}}{2}\right) \\ &= 96\sqrt{3} \end{aligned}$$

Area of the small hexagons:

$$\begin{aligned} A &= 4\left(\tfrac{1}{2}Pa\right) \\ &= 4\left[\tfrac{1}{2}(6\cdot 3)\left(\frac{3\sqrt{3}}{2}\right)\right] \\ &= 4\left[9\left(\frac{3\sqrt{3}}{2}\right)\right] \\ &= 54\sqrt{3} \end{aligned}$$

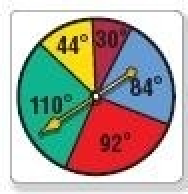
The area of the shaded region is $96\sqrt{3} - 54\sqrt{3} = 42\sqrt{3}$.

Therefore, the probability is $\frac{42\sqrt{3}}{96\sqrt{3}} = \frac{7}{16} = 43.75\%$.

ANSWER:

$\frac{7}{16}$, 0.4375, or 43.75%

Use the spinner to find each probability. If the spinner lands on a line it is spun again.



16. P(pointer landing on blue)

SOLUTION:

The spinner is divided into 5 sectors. The ratio of the area of a sector of a circle to the area of the entire circle is the same as the ratio of the sector's central angle to 360.The measure of the sector colored in blue is 84º. Therefore, the probability that the pointer will land on blue is $\frac{84}{360} \approx 23.3\%$.

ANSWER:

23.3%

18. *P*(pointer landing on red)

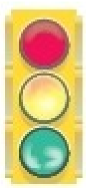
SOLUTION:

The spinner is divided into 5 sectors. The ratio of the area of a sector of a circle to the area of the entire circle is the same as the ratio of the sector's central angle to 360.The measure of the sector colored in red is 92º. Therefore, the probability that the pointer will land on red is $\frac{92}{360} \approx 25.6\%$.

ANSWER:

25.6%

Describe an event with a 33% probability for each model.

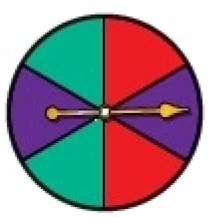
20. 

SOLUTION:

There are three possible outcomes red, yellow and green lights and the probability of each outcome is $\frac{1}{3} \approx 33\%$.

ANSWER:

Sample answer: getting a red light

22. 

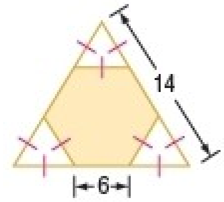
SOLUTION:

The spinner is divided into 6 equal sectors of two colors each. So, landing on any particular color has a probability of $\frac{2}{6} = \frac{1}{3} \approx 33\%$.

ANSWER:

Sample answer: landing on green

Find the probability that a point chosen at random lies in the shaded region.

24. 

SOLUTION:

The length of each side of the large triangle is 14 units. The triangle is equilateral, so we can split it into two 30-60-90 triangles to find the height. The height is $7\sqrt{3}$.

The area of the large triangle is $0.5(14)(7\sqrt{3}) = 49\sqrt{3}$.

The length of each side of the small triangles is 4 units. The triangles are equilateral, so we can split them into two 30-60-90 triangles to find the height. The height is $2\sqrt{3}$.

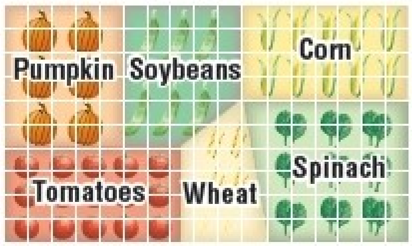
The combined area of the small triangles is $3(0.5)(4)(2\sqrt{3}) = 12\sqrt{3}$.

The probability that a point chosen at random lies in the shaded region is $\frac{49\sqrt{3}-12\sqrt{3}}{49\sqrt{3}} \approx 75.5\%$.

ANSWER:

0.755 or 75.5%

26. **FARMING** The layout for a farm is shown with each square representing a plot. Estimate the area of each field to answer each question.
a. What is the approximate combined area of the spinach and corn fields?
b. Find the probability that a randomly chosen plot is used to grow soybeans.



SOLUTION:

a. Count the number of squares to find the approximate area of the spinach and corn fields. There are 64 complete squares and 5 half squares. Therefore the approximate area is

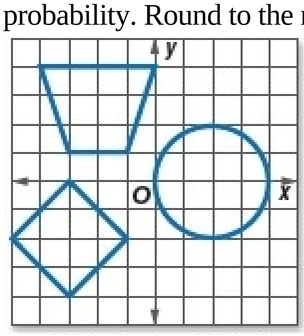
$$64+\frac{1}{2}(5)\approx 67 \text{ sq. units.}$$

b. The total area of the farm is 10(17) = 170 sq. units. and the area of the soybean field is about $25+\frac{1}{2}(4)=27$ sq. units. Therefore, the probability is $\frac{27}{170}\approx 0.16$ or about 16%.

ANSWER:

a. 67 square units
b. 0.16 or 16%

28. **COORDINATE GEOMETRY** If a point is chosen at random in the coordinate grid, find each probability. Round to the nearest hundredth.



a. *P*(point inside the circle)
b. *P*(point inside the trapezoid)
c. *P*(point inside the trapezoid, square, or circle)

SOLUTION:

The total area of the coordinate grid is 100 sq. units.
a. The radius of the circle is 2 units. The area of the circle is $\pi(2)^2=4\pi$ sq. units.
Therefore, the probability that a point chosen is inside the circle is $\frac{4\pi}{100}=\frac{\pi}{25}\approx 13\%$.

b. The lengths of the bases of the trapezoid are 2 and 4 units and the height is 3 units.
The area of the trapezoid is
$\frac{1}{2}(3)(2+4)=9$ sq. units.
Therefore, the probability that a point chosen is inside the trapezoid is $\frac{9}{100}=9\%$.

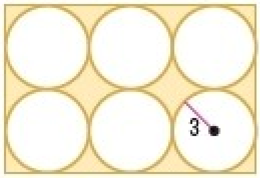
c. The length of each side of the square is $2\sqrt{2}$ units. The area of the square is 8 square units.

The sum of the area of the circle, trapezoid, and square is $4\pi + 8 + 9 \approx 30$ sq. units.
Therefore, the probability that a point chosen is inside the trapezoid, square, or circle is about $\frac{30}{100}=30\%$.

ANSWER:

a. $\frac{\pi}{25}$, 0.13, or 13%
b. $\frac{9}{100}$, 0.09, or 9%
c. $\frac{3}{10}$, 0.30, or 30%

CCSS SENSE-MAKING Find the probability that a point chosen at random lies in a shaded region.

30. 

SOLUTION:

There are three circles with radius 3 units in a row and two in a column . The length of the rectangle is 18 units and the width is 6 units.

The area of each circle is $\pi(3)^2 = 9\pi$ units^2.

The area of the rectangle is 12(18) = 216 units^2.

The area of the shaded region is 216 – 6(9π) = **46.4 units^2.**

Therefore, the probability is about $\frac{46.4}{216} \approx 21\%$.

ANSWER:

0.21 or 21%