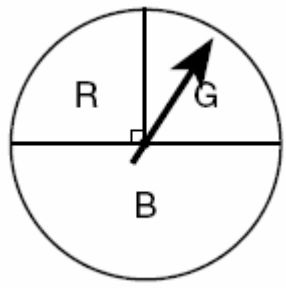
A2.S.13: Calculate theoretical probabilities, including geometric applications

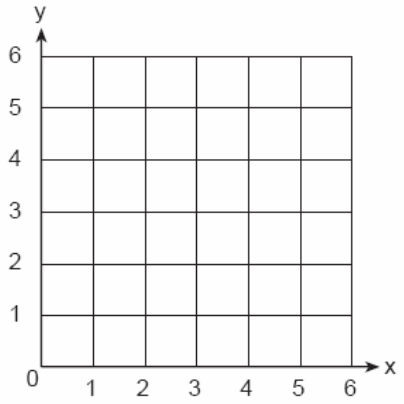
1. 010106a, P.I. A2.S.13
At a school fair, the spinner represented in the accompanying diagram is spun twice.



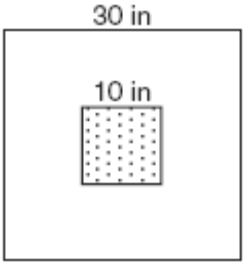
What is the probability that it will land in section *G* the first time and then in section *B* the second time?

[A] $\frac{1}{4}$ [B] $\frac{1}{2}$ [C] $\frac{1}{16}$ [D] $\frac{1}{8}$

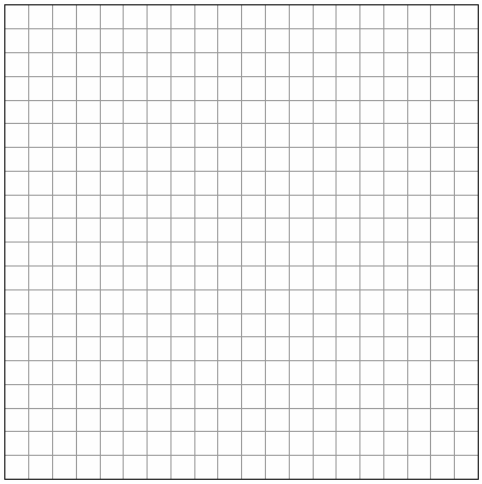
2. 010231a, P.I. A2.S.13
A square dartboard is represented in the accompanying diagram. The entire dartboard is the first quadrant from $x = 0$ to 6 and from $y = 0$ to 6. A triangular region on the dartboard is enclosed by the graphs of the equations $y = 2$, $x = 6$, and $y = x$. Find the probability that a dart that randomly hits the dartboard will land in the triangular region formed by the three lines.



3. 010634a, P.I. A2.S.13
The accompanying diagram shows a square dartboard. The side of the dartboard measures 30 inches. The square shaded region at the center has a side that measures 10 inches. If darts thrown at the board are equally likely to land anywhere on the board, what is the theoretical probability that a dart does *not* land in the shaded region?



4. 060334b, P.I. A2.S.13
For a carnival game, John is painting two circles, *V* and *M*, on a square dartboard.
a On the accompanying grid, draw and label circle *V*, represented by the equation $x^2 + y^2 = 25$, and circle *M*, represented by the equation $(x-8)^2 + (y+6)^2 = 4$.



b A point, (*x*,*y*), is randomly selected such that $-10 \le x \le 10$ and $-10 \le y \le 10$. What is the probability that point (*x*,*y*) lies outside both circle *V* and circle *M*?

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[1] D

[4] $\frac{8}{36}$ or $\frac{2}{9}$ or 2:9, and all three lines are graphed correctly and the triangle's area is shown to be 8 and the square's area is shown to be 36.
[3] The three lines are graphed correctly, but one area is incorrect, but the probability is appropriate, based on this error.
or [3] The graphs and areas are correct, but the probability is incorrect, based on one computational error.
or [3] The three lines are graphed correctly and both areas are calculated correctly, but the probability is not found.
or [3] One equation is graphed incorrectly, but the area is appropriate, based on the graph, and the probability is appropriate, based on the areas.
[2] The three lines are graphed correctly, but the area of the smaller triangle is used, but the probability is appropriate, such as $\frac{2}{36}$.
or [2] Two or three lines are graphed incorrectly, but the areas and the probability are appropriate.
or [2] The lines are graphed correctly, but the areas are incorrect, but the probability is appropriate, based on the errors.
[1] All graphs and the areas are incorrect, but the probability is appropriate.
or [1] $\frac{8}{36}$ or $\frac{2}{9}$ or 2:9, but no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[2] $\frac{800}{900}$ or an equivalent answer, and appropriate work is shown, such as finding the areas of the two squares, subtracting the area of the smaller square from the area of the larger square, and setting up a correct ratio.
[1] Appropriate work is shown, but one computational error is made.
or [1] Appropriate work is shown, but one conceptual error is made, such as calculating the perimeters of the squares instead of the areas.
or [1] Appropriate work is shown, but $\frac{100}{900}$ or an equivalent answer (the complement of the correct answer) is found.
or [1] The areas of the squares are calculated incorrectly, but an appropriate probability is found.
or [1] $\frac{800}{900}$ or an equivalent answer, but no work is shown.
[0] The areas of the squares are calculated correctly, but no probability is stated.
or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[3]

a [2] Both circles are drawn and labeled correctly.
[1] Both circles are drawn, but one conceptual error is made.
or [1] Only one circle is drawn and labeled correctly.
b [4] 0.7722345326 or an equivalent decimal answer, and appropriate work is shown, such as $\frac{400-29\pi}{400}$.
[3] Appropriate work is shown, but one computational or rounding error is made.
or [3] The probability that point (x,y) lies inside the circles is found, and appropriate work is shown.
[2] Appropriate work is shown, but more than one computational or rounding error is made.
or [2] Only the correct areas of the square and the circles are found.
[1] Only the correct area of the square or the circles is found.
or [1] 0.7722345326 or an equivalent answer, but no work is shown.
a and b [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[4]