1

can be solved by counting, no formula 2D geometry

2010A

2. **Answer (B):** Let s be the side length of the smaller square. Then the length of the rectangle is $4s$, and the width is $4s - s = 3s$. Hence the rectangle length is $\frac{4s}{3s} = \frac{4}{3}$ times as large as its width.

2012B

2. **Answer (E):** The length of each rectangle is equal to the side length of the square. The width of each rectangle is half the side length of the square, so the rectangle's dimensions are 4 by 8.

2013A

3. **Answer (E):** The legs of $\triangle ABE$ have lengths $AB = 10$ and BE. Therefore $\frac{1}{2} \cdot 10 \cdot BE = 40$, so $BE = 8$.

2015A

3. **Answer (D):** Five vertical and five horizontal toothpicks must be added to complete the fourth step. Six vertical and six horizontal toothpicks must be added to complete the fifth step. This is a total of 22 toothpicks added.

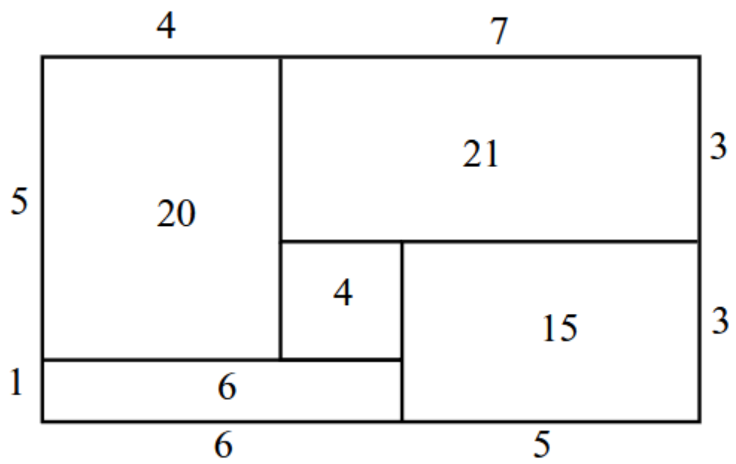
2017A

3. **Answer (B):** The area of the garden is $15 \cdot 10 = 150$ square feet, and the combined area of the six flower beds is $6 \cdot 6 \cdot 2 = 72$ square feet. Therefore the area of the walkways is $150 - 72 = 78$ square feet.

2003B

4. (A) To minimize the cost, Rose should place the most expensive flowers in the smallest region, the next most expensive in the second smallest, etc. The areas of the regions are shown in the figure, so the minimal total cost, in dollars, is

$$(3)(4) + (2.5)(6) + (2)(15) + (1.5)(20) + (1)(21) = 108.$$



2006B

4. **(D)** The circle with diameter 3 has area $\pi\left(\frac{3}{2}\right)^2$. The circle with diameter 1 has area $\pi\left(\frac{1}{2}\right)^2$. Therefore the ratio of the blue-painted area to the red-painted area is

$$\frac{\pi\left(\frac{3}{2}\right)^2 - \pi\left(\frac{1}{2}\right)^2}{\pi\left(\frac{1}{2}\right)^2} = 8.$$

2007B

4. **Answer (D):** Since $OA = OB = OC$, triangles AOB, BOC, and COA are all isosceles. Hence

$$\angle ABC = \angle ABO + \angle OBC = \frac{180^\circ - 140^\circ}{2} + \frac{180^\circ - 120^\circ}{2} = 50^\circ.$$

OR

Since

$$\angle AOC = 360^\circ - 140^\circ - 120^\circ = 100^\circ,$$

the Central Angle Theorem implies that

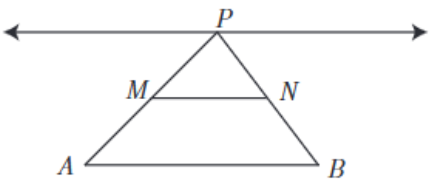
$$\angle ABC = \frac{1}{2}\angle AOC = 50^\circ.$$

2009B

4. **Answer (C):** Each triangle has leg length $\frac{1}{2} \cdot (25 - 15) = 5$ meters and area $\frac{1}{2} \cdot 5^2 = \frac{25}{2}$ square meters. Thus the flower beds have a total area of 25 square meters. The entire yard has length 25 and width 5, so its area is 125. The fraction of the yard occupied by the flower beds is $\frac{25}{125} = \frac{1}{5}$.

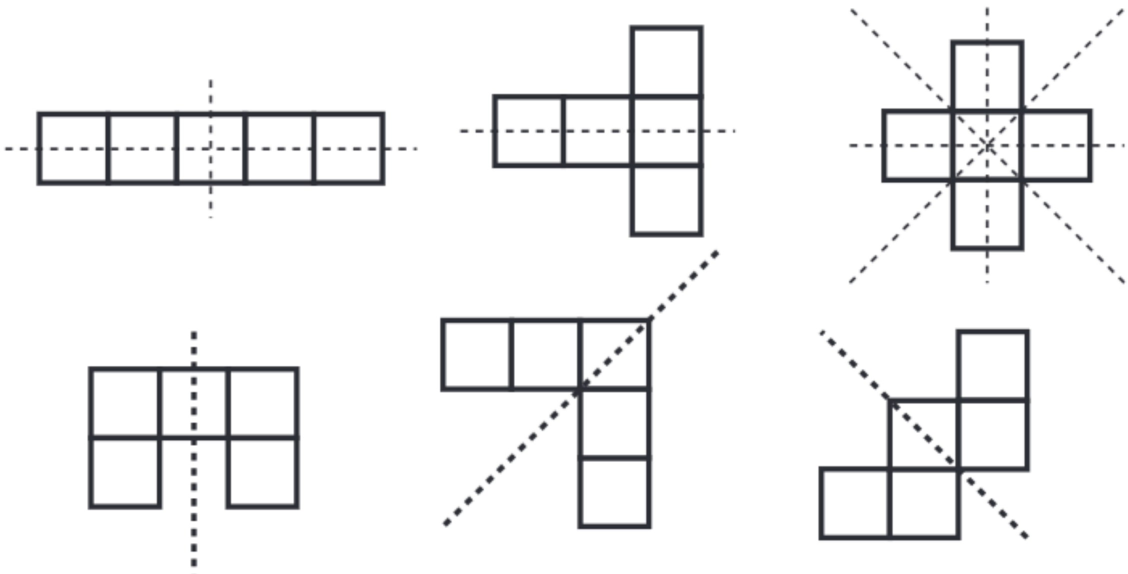
2000

5. **Answer (B):** Since $\triangle ABP$ is similar to $\triangle MNP$ and $PM = \frac{1}{2} \cdot AP$, it follows that $MN = \frac{1}{2} \cdot AB$. Since the base AB and the altitude to AB of $\triangle ABP$ do not change, the area does not change. The altitude of the trapezoid is half that of the triangle, and the bases do not change as P changes, so the area of the trapezoid does not change. Only the perimeter changes (reaching a minimum when $\triangle ABP$ is isosceles).



2001

5. **(D)** Exactly six have at least one line of symmetry. They are:



2002A

5. **(C)** The large circle has radius 3, so its area is $\pi \cdot 3^2 = 9\pi$. The seven small circles have a total area of $7\left(\pi \cdot 1^2\right) = 7\pi$. So the shaded region has area $9\pi - 7\pi = 2\pi$.

2002B

5. **(E)** The diameter of the large circle is $6 + 4 = 10$, so its radius is 5. Hence, the area of the shaded region is

$$\pi(5^2) - \pi(3^2) - \pi(2^2) = \pi(25 - 9 - 4) = 12\pi.$$

2014B

5. **Answer (A):** Denote the height of a pane by $5x$ and the width by $2x$. Then the square window has height $2 \cdot 5x + 6$ inches and width $4 \cdot 2x + 10$ inches. Solving $2 \cdot 5x + 6 = 4 \cdot 2x + 10$ gives $x = 2$. The side length of the square window is 26 inches.