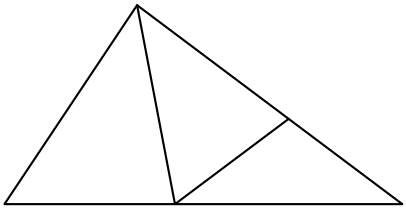
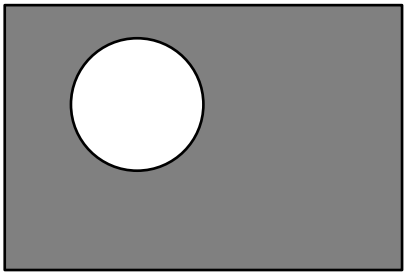
Easy

1. How many triangles are in this figure? (Some triangles may overlap other triangles.)



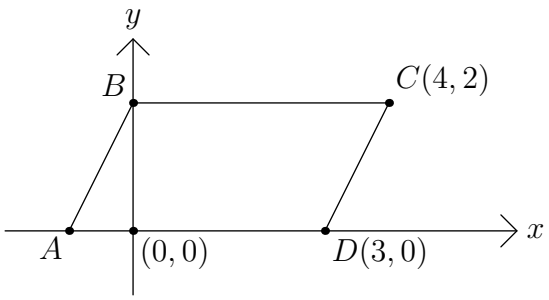
(A) 9 (B) 8 (C) 7 (D) 6 (E) 5

2. A circle of diameter 1 is removed from a 2×3 rectangle, as shown. Which whole number is closest to the area of the shaded region?



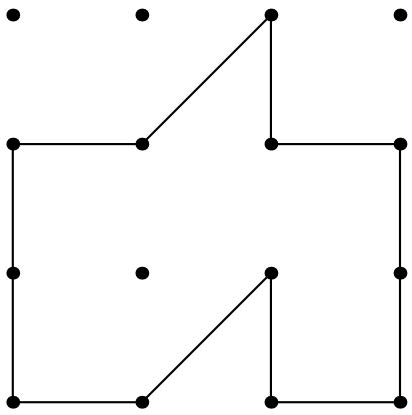
(A) 1 (B) 2 (C) 3 (D) 4 (E) 5

3. The area in square units of the region enclosed by parallelogram $ABCD$ is



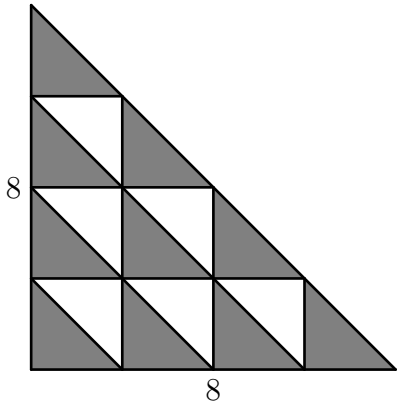
(A) 6 (B) 8 (C) 12 (D) 15 (E) 18

4. Dots are spaced one unit apart, horizontally and vertically. The number of square units enclosed by the polygon is



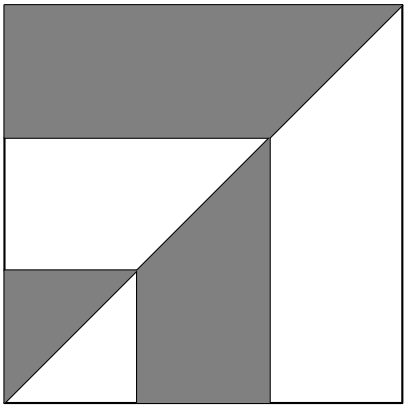
(A) 5 (B) 6 (C) 7 (D) 8 (E) 9

5. An isosceles right triangle with legs of length 8 is partitioned into 16 congruent triangles as shown. The shaded area is



(A) 10 (B) 20 (C) 32 (D) 40 (E) 64

6. What fraction of the square is shaded?

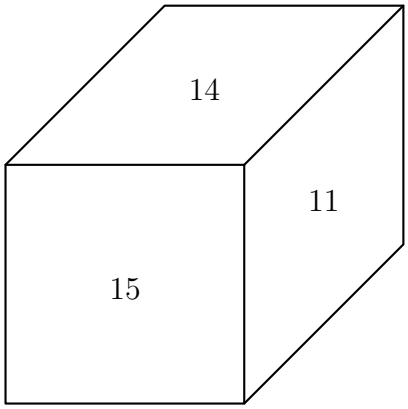


(A) $\frac{1}{3}$ (B) $\frac{2}{5}$ (C) $\frac{5}{12}$ (D) $\frac{3}{7}$ (E) $\frac{1}{2}$

7. What is the number of degrees in the smaller angle between the hour hand and the minute hand on a clock that reads seven o'clock?

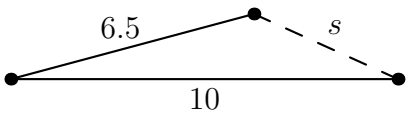
(A) 50° (B) 120° (C) 135° (D) 150° (E) 165°

8. The numbers on the faces of this cube are consecutive whole numbers. The sums of the two numbers on each of the three pairs of opposite faces are equal. The sum of the six numbers on this cube is



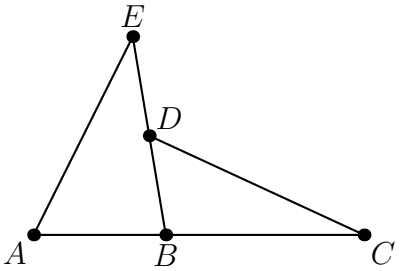
(A) 75 (B) 76 (C) 78 (D) 80 (E) 81

9. The sides of a triangle have lengths 6.5, 10, and s, where s is a whole number. What is the smallest possible value of s?



(A) 3 (B) 4 (C) 5 (D) 6 (E) 7

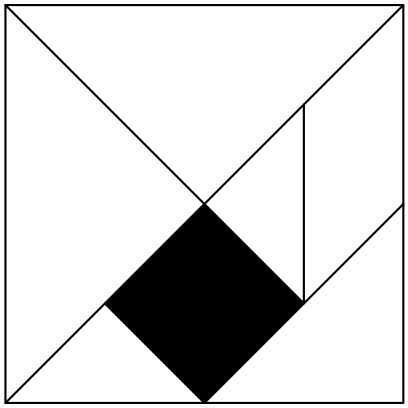
10. If $\angle A = 60°$, $\angle E = 40°$ and $\angle C = 30°$, then $\angle BDC =$



(A) 40° (B) 50° (C) 60° (D) 70° (E) 80°

Medium

1. What is the ratio of the area of the shaded square to the area of the large square? (The figure is drawn to scale)

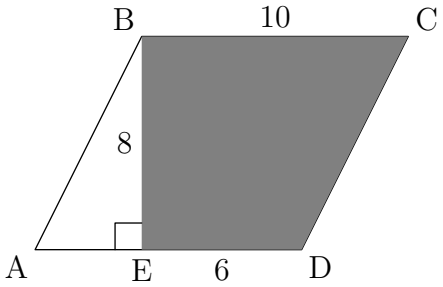


(A) $\frac{1}{6}$ (B) $\frac{1}{7}$ (C) $\frac{1}{8}$ (D) $\frac{1}{12}$ (E) $\frac{1}{16}$

2. The perimeter of one square is 3 times the perimeter of another square. The area of the larger square is how many times the area of the smaller square?

(A) 2 (B) 3 (C) 4 (D) 6 (E) 9

3. The area of the shaded region BEDC in parallelogram ABCD is



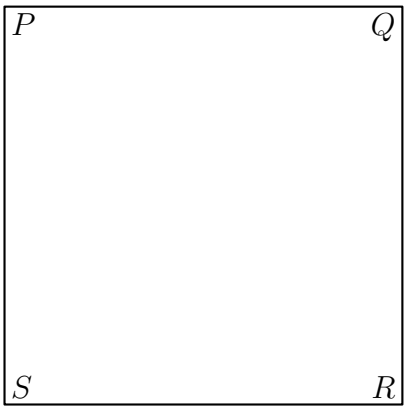
(A) 24 (B) 48 (C) 60 (D) 64 (E) 80

4. The distance between the 5^{th} and 26^{th} exits on an interstate highway is 118 miles. If any two exits are at least 5 miles apart, then what is the largest number of miles there can be between two consecutive exits that are between the 5^{th} and 26^{th} exits?

(A) 8 (B) 13 (C) 18 (D) 47 (E) 98

Hard

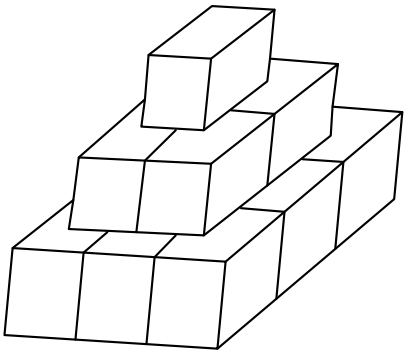
1. Let $PQRS$ be a square piece of paper. P is folded onto R and then Q is folded onto S. The area of the resulting figure is 9 square inches. Find the perimeter of square $PQRS$.



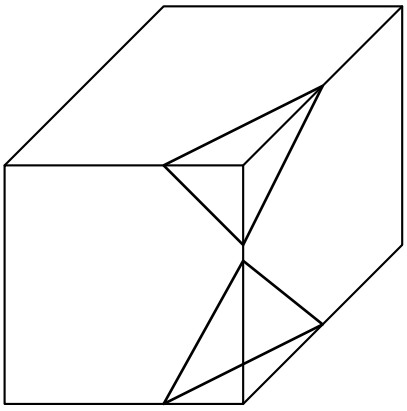
(A) 9 (B) 16 (C) 18 (D) 24 (E) 36

2. An artist has 14 cubes, each with an edge of 1 meter. She stands them on the ground to form a sculpture as shown. She then paints the exposed surface of the sculpture. How many square meters does she paint?

(A) 21 (B) 24 (C) 33 (D) 37 (E) 42



3. Each corner of a rectangular prism is cut off. Two (of the eight) cuts are shown. How many edges does the new figure have?



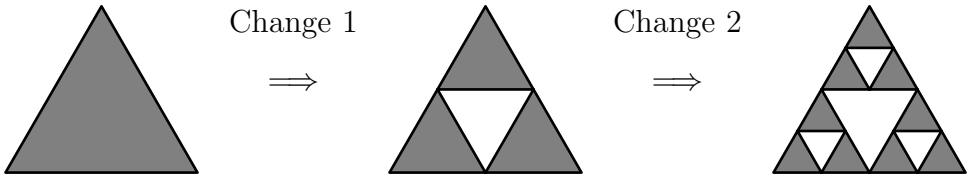
(A) 24 (B) 30 (C) 36 (D) 42 (E) 48

Assume that the planes cutting the prism do not intersect anywhere in or on the prism.

4. A cube of edge 3 cm is cut into N smaller cubes, not all the same size. If the edge of each of the smaller cubes is a whole number of centimeters, then $N =$

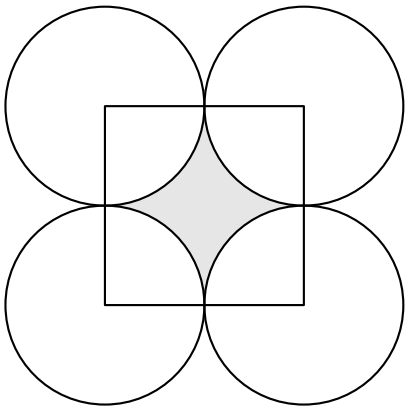
(A) 4 (B) 8 (C) 12 (D) 16 (E) 20

5. An equilateral triangle is originally painted black. Each time the triangle is changed, the middle fourth of each black triangle turns white. After five changes, what fractional part of the original area of the black triangle remains black?



(A) $\frac{1}{1024}$ (B) $\frac{15}{64}$ (C) $\frac{243}{1024}$ (D) $\frac{1}{4}$ (E) $\frac{81}{256}$

6. Four circles of radius 3 are arranged as shown. Their centers are the vertices of a square. The area of the shaded region is closest to

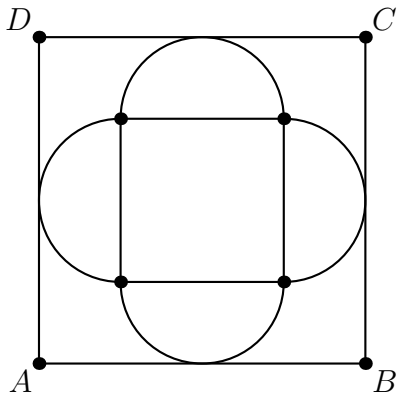


(A) 7.7 (B) 12.1 (C) 17.2 (D) 18 (E) 27

7. One half of the water is poured out of a full container. Then one third of the remainder is poured out. Continue the process: one fourth of the remainder for the third pouring, one fifth of the remainder for the fourth pouring, etc. After how many pourings does exactly one tenth of the original water remain?

(A) 6 (B) 7 (C) 8 (D) 9 (E) 10

8. Around the outside of a 4 by 4 square, construct four semicircles (as shown in the figure) with the four sides of the square as their diameters. Another square, $ABCD$, has its sides parallel to the corresponding sides of the original square, and each side of $ABCD$ is tangent to one of the semicircles. The area of the square $ABCD$ is

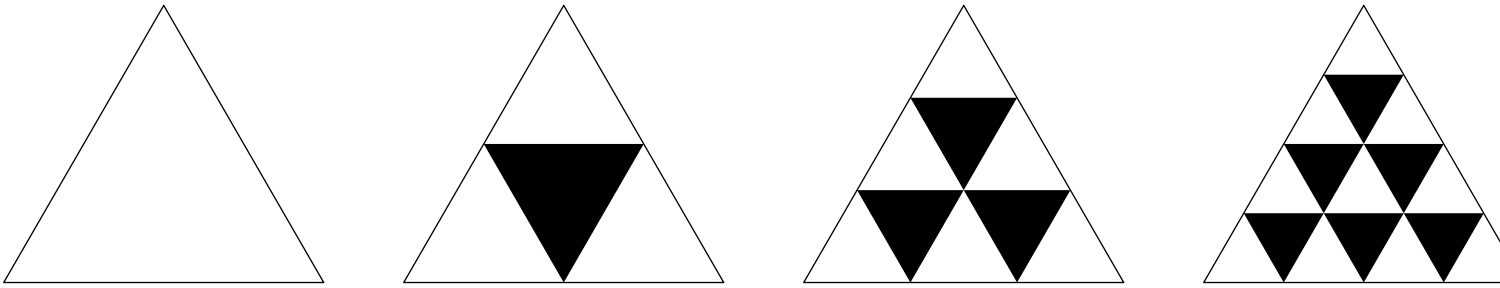


(A) 16 (B) 32 (C) 36 (D) 48 (E) 64

9. A $4 \times 4 \times 4$ cubical box contains 64 identical small cubes that exactly fill the box. How many of these small cubes touch a side or the bottom of the box?

(A) 48 (B) 52 (C) 60 (D) 64 (E) 80

10. If the pattern in the diagram continues, what fraction of the interior would be shaded in the eighth triangle?



(A) $\frac{3}{8}$ (B) $\frac{5}{27}$ (C) $\frac{7}{16}$ (D) $\frac{9}{16}$ (E) $\frac{11}{45}$