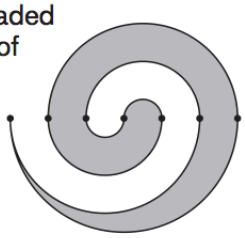
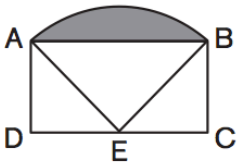
1.

In the figure the collinear dots are equally spaced 2 units apart, and the shaded region is formed from two semicircles of diameter 2 units, two semicircles of diameter 6 units, two semicircles of diameter 10 units and one semicircle of diameter 12 units. What is the area of this shaded region? Express your answer in terms of π.



1

2.



In rectangle ABCD, shown here, AB = 4 cm and BC = 2 cm. If E is the midpoint of side DC and also is the center of a circle that contains points A and B, what is the area of the shaded segment of the circle determined by chord AB? Express your answer as a decimal to the nearest tenth.

3.

Ellie and Emma live 1.04 miles from each other. They decide to meet by walking toward each other, Ellie at 2.4 mi/h and Emma at 2.8 mi/h. If they both leave at 8:00 a.m., at what time in the morning will they meet?

4.

Given the following facts about the numbers a, b, c and d, what is the value of $a + b$? Express your answer as a mixed number.

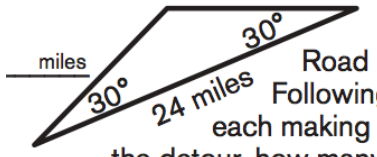
$ab = 1$
$bc = -9$
$b + c + d = 0$
$b = -c$
$c < -a$

5.

A Ferris wheel has the same height as a building with 60 floors of identical height. After boarding at the bottom of the Ferris wheel, Courtney used a stopwatch to find that it took 8 minutes 26 seconds to rise to the top of the 45th floor of the building. How many seconds will it take from there for the Ferris wheel to bring her back around to where she started, assuming the wheel rotates at a constant rate?

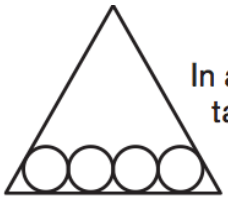
C D

6.



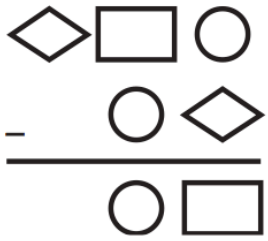
Road repairs prevented Anita from taking the 24-mile direct route home. Following a detour, she traveled on two different roads of equal distance, each making a 30-degree angle with the main road, as illustrated. As a result of the detour, how many more miles did Anita travel? Express your answer as a decimal to the nearest tenth.

7.



In an equilateral triangle with edge length 12 cm, four congruent circles are tangent to each other and at least one side of the triangle as shown. What is the radius of each circle? Express your answer in simplest radical form.

8.



In the subtraction problem shown, the shapes ◇, □ and ○ each represent a different digit. What is the value of □ ◇ ÷ ○?

9.

In the addition problem shown, each letter stands for a different digit. If T = 3, what is the value of the four-digit number MATH?

$$\begin{array}{cccc} & G & E & T \\ + & T & H & E \\ \hline M & A & T & H \end{array}$$