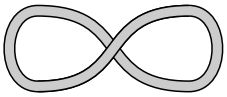
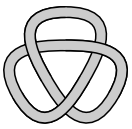
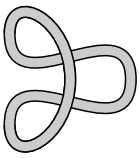
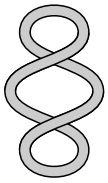
Cadet

3 points

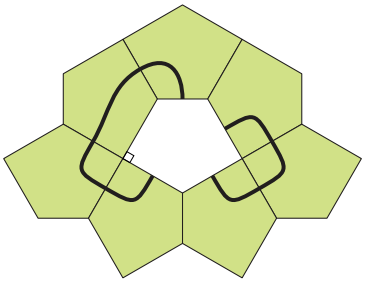
1 (Germany). Which of the following strings cannot be transformed into the string on the right without cutting?



(**A**)  (**B**)  (**C**)  (**D**)  (**E**) 

Solution: Only for B, two rings are formed that must pass through each other and it is impossible to do this without cutting the string.

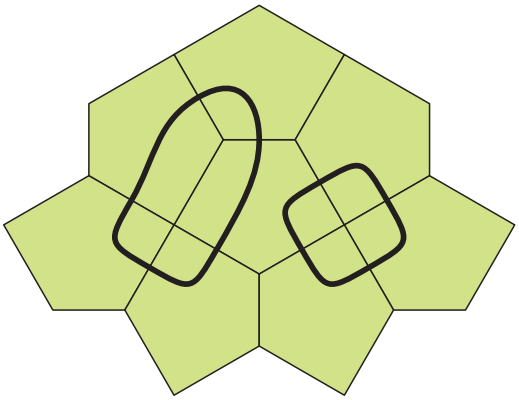
2 (Slovenia). A shape is made of equal-sized pentagonal tiles. Which of the following tiles can be placed in the space in the shape to produce two closed curves?



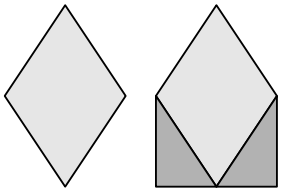
(**A**)  (**B**)  (**C**) 

(**D**)  (**E**) 

Solution: Note that all tiles are rotated by 180°. No other rotation can make the tile fit as the pentagonal tile has exactly two right angles.

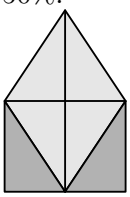


3 (Spain). The first diagram shows a rhombus. The area of the first diagram is increased by adding two right-angled triangles, as shown. By what percentage has the area increased?



(**A**) 20% (**B**) 25% (**C**) 30%
(**D**) 40% (**E**) 50%

SOLUTION: The initial figure can be divided into four right triangles of the same area, and the initial figure into six triangles, thus the proportion in 6/4, that is $3/2 = 1.5$, therefore it has increased by 50%.

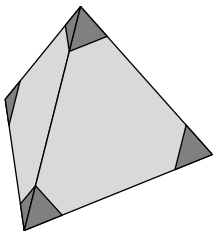


4 (Uganda). What is the value of $\dfrac{20 \times 24}{2 \times 0 + 2 \times 4}$?

(**A**) 12 (**B**) 30 (**C**) 48 (**D**) 60 (**E**) 120

SOLUTION: $\frac{20\times24}{2\times0+2\times4} = \frac{20\times24}{0+8} = \frac{20\times3\times8}{8} = 20 \times 3 = 60$

5 (Germany). Julio cuts off the four corners of a regular tetrahedron, as shown. How many corners does the shape that remains have?



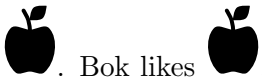
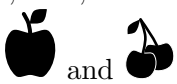
(**A**) 8 (**B**) 9
(**C**) 11 (**D**) 12
(**E**) 15

SOLUTION: A tetrahedron has four corners. Three sides meet at each vertex. Every cut corner therfor gives three new corners. So if all four old corners are cut off, $4 \times 3 = 12$ new corners are created.

6 (Netherlands). Ria has three counters marked 1, 5 and 11, as shown. She wants to place them side by side to make a four-digit number.
How many different four-digit numbers can she make?

(**A**) 3 (**B**) 4 (**C**) 6 (**D**) 8 (**E**) 9

SOLUTION: You can make 1511, 1115, 5111 and 1151. Notice that, normally you can make $3 \cdot 2 \cdot 1 = 6$ numbers, but when 1 and 11 are next to each other, the order is not important, so you lose 2 possibilities.

7 (Switzerland). A fruit bowl contains five types of fruit:  . Al likes  . Bok likes  . Cam likes  . Don likes  . Eva likes  .

The fruit is shared so that everyone gets a different type of fruit and everyone gets a type of fruit that they like.

Who gets  ?