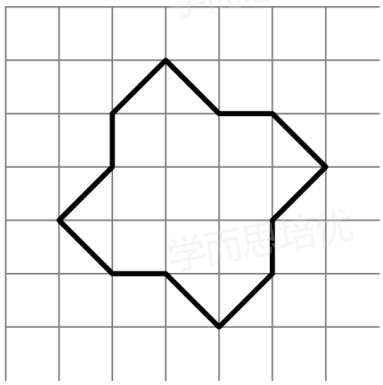
1-4 test

1 The twelve-sided figure shown has been drawn on $1\text{cm} \times 1\text{cm}$ graph paper. What is the area of the figure in cm^2? ( ) .



A. 12 B. 12.5 C. 13 D. 13.5 E. 14

Answer C

Solution We count $3 \cdot 3 = 9$ unit squares in the middle, and 4 small triangles each with an area of 1. Thus, the answer is $9 + 4 = \boxed{(\text{C})13}$.

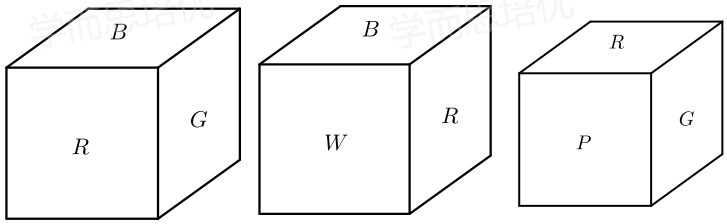
2 Let N be the greatest five-digit number whose digits have a product of 120. What is the sum of the digits of N? ( ) .

A. 15 B. 16 C. 17 D. 18 E. 20

Answer D

Solution If we start off with the first digit, we know that it can't be 9 since 9 is not a factor of 120. We scale down to the digit 8, which does work since it is a factor of 120. Now, we have to know what digits will take up the remaining four spots. To find this result, just divide $\frac{120}{8} = 15$. The next place can be 5. as it is the largest factor, aside from 15. Consequently, our next three values will be 3, 1 and 1 if we use the same logic! Therefore, our five-digit number is 85311, so the sum is $8 + 5 + 3 + 1 + 1 = 18$.

3 The faces of a cube are painted in six different colors: red (R), white (W), green (G), brown (B), aqua (A), and purple (P). Three views of the cube are shown below. What is the color of the face opposite the aqua face? ( )



A. red B. white C. green D. brown E. purple

Answer A

Solution With the first and second plots, G and W are opposite to each other. With the first and third plots, B and P are opposite to each other. A cube is made up of three pairs. Thus the rest two form the last pair: R and A.

4 How many different real numbers x satisfy the equation

$$(x^2-5)^2=16\ ?$$

A. 0 B. 1 C. 2 D. 4 E. 8

Answer D

Solution **How many distinct real numbers satisfy the equation**

$(x^2-5)^2=16$? ?

$x^2-5=\pm 4$

$x_{1,2}=\pm 3$

$x_{3,4}=\pm 1$.

5 (2020 AMC 8 Problem 15)

Suppose 15% of x equals 20% of y. What percentage of x is y ?

A. 5 B. 35 C. 75 D. $133\frac{1}{3}$ E. 300

Answer C

Solution We are asked:

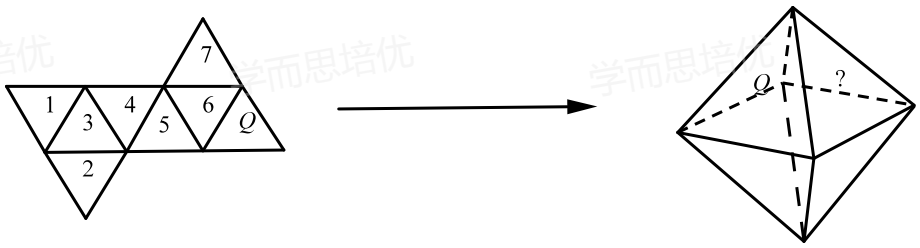
15% of $x = 20\%$ of y.

$0.15x = 0.20y$

$y = \frac{0.15}{0.20}x = \frac{15}{20}x = \frac{3}{4}x$

$\therefore\ y = 75\%$ of x.

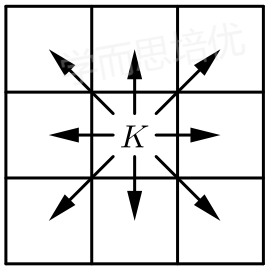
6 A regular octahedron has eight equilateral triangle faces with four faces meeting at each vertex. Jun will make the regular octahedron shown on the right by folding the piece of paper shown on the left. Which numbered face will end up to the right of Q?



A. 1 B. 2 C. 3 D. 4 E. 5

Answer A

7 A chess king is said to attack all the squares one step away from it, horizontally, vertically, or diagonally. For instance, a king on the center square of a 3×3 grid attacks all 8 other squares, as shown below. Suppose a white king and a black king are placed on different squares of a 3×3 grid so that they do not attack each other. In how many ways can this be done?



A. 20 B. 24 C. 27 D. 28 E. 32

Answer E

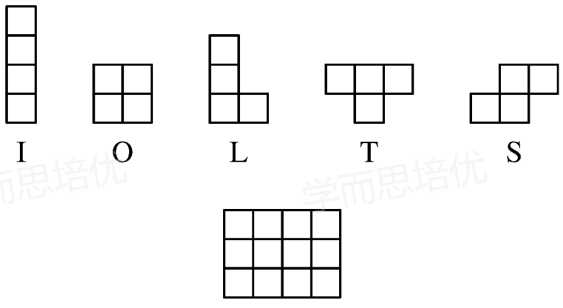
Solution If the white king is at the corner, there are 20 possibilities.

If the white king is at the side, there are 12 possibilities.

If the white king is at the center, there is no possibilities.

There the answer is 20+12=32

8 A *tetromino* consists of four squares connected along their edges. There are five possible tetromino shapes, I, O, L, T, and S, shown below, which can be rotated or flipped over. Three tetrominoes are used to completely cover a 3×4 rectangle. At least one of the tiles is an S tile. What are the other two tiles?



A. I and L B. I and T

C. L and L D. L and S

E. O and T

Answer C

9

A cube with 3-inch edges is made using 27 cubes with 1-inch edges. Nineteen of the smaller cubes are white and eight are black. If the eight black cubes are placed at the corners of the larger cube, what fraction of the surface area of the larger cube is white? ( ) .

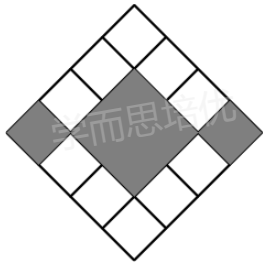
A. $\frac{1}{9}$ B. $\frac{1}{4}$ C. $\frac{4}{9}$ D. $\frac{5}{9}$ E. $\frac{19}{27}$

Answer D

Solution The surface area of the cube is $6(3)(3)=54$. Each of the eight black cubes has 3 faces on the outside, making $3(8)=24$ black faces. Therefore there are $54-24=30$ white faces. To find the ratio, we evaluate $\frac{30}{54}=\boxed{(\mathrm{D})\frac{5}{9}}$.

We can notice that each face is the same, so each face is $\boxed{(\mathrm{D})\frac{5}{9}}$ white.

10 In the figure, what is the ratio of the area of the gray squares to the area of the white squares? ( ) .



A. $3:10$ B. $3:8$ C. $3:7$ D. $3:5$ E. $1:1$

Answer D

Solution Dividing the gray square into four smaller squares, there are 6 gray tiles and 10 white tiles, giving a ratio or $3:5$.