Individual Round -- Rocket Test

Example Questions

1. Evaluate (2 + 4 + 6 + 8 + 10) – (1 + 3 + 5 + 7 + 9).

   (A) 1 (B) 5 (C) 10 (D) 15 (E) 25

2. In the multiplication problem below, A, B, C, and D represent different digits. What is the maximum possible value of $A + B + C + D$?

$$\begin{array}{cccc} & A & B & A \\ \times & & C & D \\ \hline C & D & C & D \end{array}$$

   (A) 15 (B) 16 (C) 17 (D) 18 (E) 19

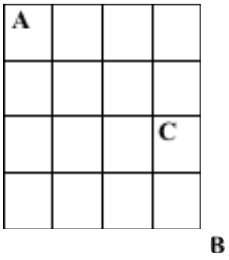
3. If a 4-digit number $\underline{2AB6}$ is divisible by 9, what is the largest possible value of $A \times B$?

   (A) 0 (B) 20 (C) 21 (D) 24 (E) 25

4. During a camping trip, students bring 11 tents, and there are two plans to share tents at night. If there are 7 students per tent, then there will be a tent with only 4 students. Alternatively, if there are 8 students per tent, then there will be a tent with only 5 students. When arranging the tents, they always fill up one tent before using another and at the end some tents might be empty. What is the number of students?

   (A) 46 (B) 53 (C) 60 (D) 74 (E) 85

5. The graph below shows a small city area, with the black lines representing streets. Kenny lives on the upper-left corner, A. One day, he decided to visit his friend, Bob, who lives on the bottom-right corner, B. Kenny only walks downwards and rightwards. Kenny also knows that the intersection C is blocked because of construction work. How many different routes can he choose to visit Bob?



   (A) 30 (B) 40 (C) 50 (D) 60 (E) 70

6. A student is playing with a strange calculator that has only two keys [+1] and [×2]. If the calculator originally displays a '9' and the key [+1] is pressed, the calculator

would display the new result '10'. If then the key [×2] is pressed, it would display a '20'. Starting with the display of '1', what is the fewest number of keystrokes that it would take to reach the display of '2017'?

(A) 12 (B) 13 (C) 14 (D) 15 (E) 16

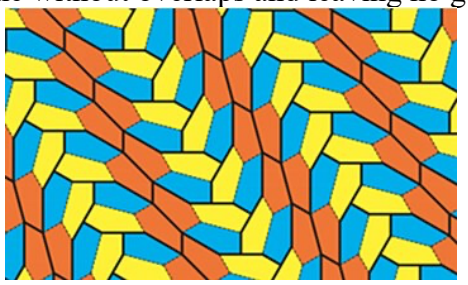
Team Round -- ISS Test

Example Questions

1. Peter is asked to put a King, Queen, and Bishop on a 5×5 chessboard. However, he must follow the rule that each row and column has at most one piece. How many possible ways can he put the three pieces on the board?

2. Alice, Bob, Cathy, David, Eric, and Freddie, want to watch a movie. There are six chairs in a row available. Alice wants to sit next to Eric, and David wants to sit on either side of the row. How many possible seating arrangement are there?

3. Mathematicians have recently discovered a new type of pentagon which can completely cover a plane without overlaps and leaving no gaps:



Referring to the figure above, please find the measure of each interior angle of this pentagon in degrees.

4. Ramanujan was an Indian mathematician and autodidact who, with almost no formal training, made extraordinary contributions to mathematics. His teacher, Hardy, told us: "I remember once going to see him when he was ill. I had ridden in taxi cab number 1729 and remarked that the number seemed to me rather a dull one, and that I hoped it was not an unfavorable omen. 'No,' he replied, 'it is a very interesting number: it is the smallest number expressible as the sum of two cubes in two different ways."
The two different ways are: $1729 = 1^3 + 12^3 = 9^3 + 10^3$.
The quotation is sometimes expressed using the term 'positive cubes', since allowing negative perfect cubes gives the smallest solution as 91.
Find the two different ways for 91:
$91 = (\ \ )^3 + (\ \ )^3 = (\ \ )^3 + (\ \ )^3$.

5. The 4-digit integer $\overline{abcd}$ is a perfect square. If we add one to each digit of $\overline{abcd}$, it is still a perfect square. What is $\overline{abcd}$.

6. During the leisure time on the ISS, three scientists – Solomon from the US, Savva from Russia, and Gavin from China – are playing a game called guessing primes. Solomon first comes up with two prime numbers p and q (not necessarily distinct). Then he writes down their sum on one paper, and the sum of their squares on another paper. Savva gets the sum, and Gavin gets sum of squares. Solomon tells them that both p and q are under 20. After that, they take turns to tell each other.
   Gavin says: "I don't know what the two primes are."
   Savva says: "I don't know either."
   Gavin says: "Now I know p and q."
   What is $p+q$?