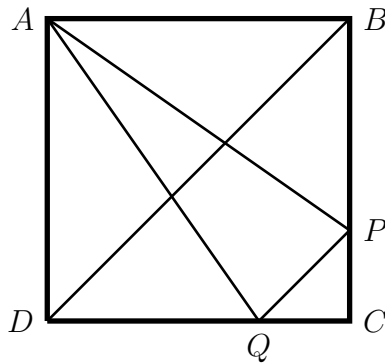


PROBLEM SECTION

Q.1043 An equilateral triangle APQ is drawn so that P, Q are on the sides BC and DC of a square $ABCD$, with $|AP| = |AQ|$. Show that the perimeter of APQ is less than the perimeter of the triangle ABD (unless P is at B and Q is at D).



Q.1044 Two missiles are heading towards each other, one at 21,000 km per hour and the other at 39,000 km per hour. If they start 1,319 km apart, how far apart will they be when they collide?

Q.1045 The airforce of a certain island country decide to fly a plane around the world without landing. Since each plane can only hold enough fuel to fly halfway around the world and they can only get fuel from their own island, they decide to send extra planes and transfer fuel in flight (the extra plane or planes returning home each time to refuel). What is the minimum number of planes they can use?

Q.1046 Smith, Brown and Jones agree to fight a three-way duel. They stand at the vertices of an equilateral triangle and each in turn fires a pistol at either (but not both) of the two. If Smith has a 100% accuracy rate, Brown has an 80% accuracy rate and Jones has a 50% accuracy rate, and each uses the best strategy, who has the best chance of survival?

Q.1047 Which of the two number $\sqrt[88]{88!}$ or $\sqrt[99]{99!}$ is the bigger?
(Here $n!$ means the product of the numbers $1, 2, \dots, n$)?

Q.1048 Show that $\cos 72^\circ = (\sqrt{5} - 1)/4$.

(Hint: $\cos 5\theta = 16 \cos^5 \theta - 20 \cos^3 \theta + 5 \cos \theta$).

Q.1049 Suppose that you wish to walk from A to B in steady vertical rain and you want to remain as dry as possible. Should you walk as quickly as possible or as slow as possible or at some intermediate speed? Would it make any difference if you wore a broad brimmed rain hat?

Q.1050 After her first encounter with the three bears, Goldilocks became their life-long friend and often brought them bags of cookies for a treat. She always gave the largest bag of cookies to father bear, the next largest bag of cookies to mother bear and the smallest bag of cookies to baby bear. The bears always ate all their cookies deliriously never noticing how many cookies each of the others had received.

One day after the bears had eaten their cookies Goldilocks invited the bears to play a game with her. "I will tell you how many cookies I brought in total and then you tell me how many cookies each of the other bears ate". So Goldilocks told them how many cookies she had brought in total and then she began by asking father bear: "How many cookies has each of the other bears eaten?" Father bear replied that he didn't know. Then Goldilocks asked mother bear: "How many cookies has each of the other bears eaten?" Mother bear replied that she didn't know too. Then she asked baby bear the same question but baby bear didn't know either. Then Goldilocks asked father bear again: "How many cookies has each of the other bears eaten?" Father bear replied that he still didn't know. Then Goldilocks asked mother bear again, but before mother bear had a chance to answer baby bear said: "She doesn't know but I do".

Your problem is to work out how many cookies each of the bears ate.

(Hint: The bears are clever at arithmetic and Father bear didn't eat more than ten cookies.)