# Problem of the Week

## Problem C

## Mapping the Beats 1

Streaming services often use artificial intelligence to recommend music. One way to do this is to represent song attributes and a listener's preferences using numbers or points on a grid. Recommendations for a listener can then be made by looking for songs represented by points that are close in distance to the point representing the listener's preferences.

A particular music app represents song attributes and listener preferences using two scores: Energy and Happiness, which are each integers from 1 to 10. Suppose that three songs are represented by the following points:

| Song | (Energy, Happiness) |
|---|---|
| $A$ | $(5, 5)$ |
| $B$ | $(4, 3)$ |
| $C$ | $(2, 8)$ |

(a) Plot each song as a point on a coordinate grid. Denise's score is represented as $(6, 4)$. What song do you think the music app will recommend to Denise? Why?

(b) Philip's score is $(3, 9)$. Determine the Energy and Happiness scores for a song that both Denise and Philip might enjoy. Explain your reasoning.

(c) After an app update, a song is recommended if both its Energy and Happiness scores differ from the listener's scores by at most 2. How many different scores of $(E, H)$ could there be in the songs recommended to Denise?

