

4. In an online game, players move through a virtual world collecting geodes, a type of hollow rock. When broken open, these geodes contain crystals of different colors that are useful in the game. A red crystal is the most useful crystal in the game. The color of the crystal in each geode is independent and the probability that a geode contains a red crystal is 0.08.

- (a) Sarah, a player, will collect and open geodes until a red crystal is found.
- (i) Calculate the mean of the distribution of the number of geodes Sarah will open until a red crystal is found. Show your work.
- (ii) Calculate the standard deviation of the distribution of the number of geodes Sarah will open until a red crystal is found. Show your work.

- (b) Another player, Conrad, decides to play the game and will stop opening geodes after finding a red crystal or when 4 geodes have been opened, whichever comes first. Let Y = the number of geodes Conrad will open. The table shows the partially completed probability distribution for the random variable Y .

Number of geodes Conrad will open, y	1	2	3	4
Probability, $P(Y = y)$	0.08	0.0736		

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Continue your response to **QUESTION 4** on this page.

- (i) Calculate $P(Y = 3)$. Show your work.
- (ii) Calculate $P(Y = 4)$. Show your work.
- (c) Consider the table and your results from part (b).
- (i) Calculate the mean of the distribution of the number of geodes Conrad will open. Show your work.
- (ii) Interpret the mean of the distribution of the number of geodes Conrad will open, which was calculated in part (c-i).

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