

1. In a 1st grade probability lesson, students are shown a picture that contains 9 butterflies, 3 caterpillars, 2 snails, and 1 bee. They are asked to use the words likely, unlikely, and impossible to describe how likely it would be to catch a particular item. Use those same options to describe the following mix of 1st grade versus MATH 210-310 level probabilities, and also use counts to justify your choice.

- (a) How likely are you to catch a butterfly?
- (b) How likely are you to catch a snail?
- (c) How likely are you to catch a lightning bug?
- (d) How likely are you to catch something that cannot fly?
- (e) How likely are you to catch something that turns into one of the other items?
- (f) How likely are you to catch something that has legs?

2. Another 1st grade probability activity shows a picture with an elephant, a leaf, a car, a dinosaur, a shoe, a rainbow, a firefighter, a dog with wings, a bouquet of balloons, and a smiling child. They are asked to color each item based on how likely they are to see it today: items they are nearly certain to see should be colored blue, likely items should be red, unlikely items green, and impossible items orange.

- (a) Realistically thinking, which items will be blue?
- (b) Realistically thinking, which items will be red?
- (c) Realistically thinking, which items will be green?
- (d) Realistically thinking, which items will be orange?

3. Yet another child-level probability task focuses on how counting (but NOT fractions) relates to likelihood. One question shows a jar of red and blue marbles - some partially or even completely hidden - and says "It is unlikely that you get a red marble when you pick one. What can you say about the number of red marbles in the jar?" Upon counting the marbles that are visible, the child can tell that there are fewer red marbles than blue.

Answer the similar child- or 210-310-level questions below, about reaching into some bags that contain a mix of red, white, blue, and/or green cubes and/or marbles. In our case, it is possible that different bags are missing some things (such as having no red cubes at all), or that we can't say anything one way or the other.

- (a) It is likely that you get a green cube in Bag #1. What can you say about the number of red cubes versus green cubes in the bag?
- (b) It is likely that you get a green cube in Bag #2. What can you say about the number of red cubes versus white cubes in the bag?
- (c) It is likely that you get a blue object in Bag #3. What can you say about the number of red objects versus blue objects in the bag?
- (d) It is likely that you get a red object in Bag #4. What can you say about the number of red objects versus all other colors of objects combined in the bag?
- (e) It is impossible that you get a white marble in Bag #5. What can you say about the number of white marbles in the bag?
- (f) It is impossible that you get a white marble in Bag #6. What can you say about the number of red marbles in the bag?
- (g) It is certain that you get a cube that's blue in Bag #7. What can you say about the number of red cubes in the bag?
- (h) It is certain that you get a cube that's not blue in Bag #8. What can you say about the number of red cubes in the bag?

1.
 - (a) Likely (there are 9 butterflies and only 6 other bugs - more butterflies than not)
 - (b) Unlikely - there are only 2 snails, but 13 bugs that are not snails - happens less often than not
 - (c) Impossible - there are no lightning bugs in the picture at all
 - (d) Unlikely - there are 5 bugs that cannot fly versus 7 that can - so non-flying happens less often than its opposite (flying)
 - (e) Caterpillars turn into butterflies, and butterflies come from caterpillars - Likely - there are 12 of the bugs we want and only 3 of the ones we don't want - happens more often than not
 - (f) Butterflies, caterpillars, and bees have legs - Likely - there are 13 bugs with legs and 2 without - happens more often than not
2.
 - (a) Leaf, car, shoe, smiling child (we hope)
 - (b) none, though any of the above could reasonably be listed here (maybe it's a day the 1st grader doesn't go outside to see leaves or cars)
 - (c) Elephant (maybe...they could see one on tv or in a book?), rainbow, firefighter, bouquet of balloons
 - (d) Dinosaur, dog with wings (unless someone they know likes to dress up their dog!) - elephant could go here in a pinch, but it doesn't seem totally impossible to come across one on tv or a book
3.
 - (a) There are fewer red cubes than green cubes.
 - (b) We can't say anything either way.
 - (c) There are fewer red objects than blue objects.
 - (d) There are more red objects than all other objects combined.
 - (e) There are no white marbles in the bag.
 - (f) We can't say anything.
 - (g) There are no red cubes in the bag.
 - (h) We can't say anything for sure - maybe there are some red ones, but maybe not.