

Part One: *Expected Value...*

1. In her latest “get rich quick scheme”, your friend offers you the chance to flip three coins. She’ll pay you \$0 if you get no heads, \$1 if you get one head, \$4 if you get two heads, and \$8 if you get three heads. Of course, there is the nominal \$3 fee to play the game. Should you play? Will your friend “get rich quick”?

2. In his latest “get rich quick scheme”, another friend offers you the chance to roll a die. He’ll pay you \$1 if you roll a 1, \$4 if you roll a 2, \$9 if you roll a 3, \$16 if you roll a 4, \$25 if you roll a 5, and \$36 if you roll a 6. Of course, there is the nominal \$15 fee to play the game. Should you play? Will your friend “get rich quick”?

3. In Asher’s latest “get rich quick scheme”, he offers you the chance to flip a coin and roll a die. If you flip a tails, he’ll pay you \$0. If you flip a heads, he’ll pay you (in dollars) four times the number you rolled. Of course, there is a nominal \$7 fee to play the game. Should you play? Will Asher “get rich quick”?

Z. Suppose you were offered the opportunity to flip a coin until you got a tails. You’ll be paid $\$2^n$ dollars, where n is the number of heads you flipped. So, for example, if you flip a tails, you’ll be paid $\$2^0 = \1 ; if you flip heads then tails, you’ll be paid $\$2^1 = \2 ; and if you flip ten heads then tails, you’ll be paid $\$2^{10} = \1024 . How much would you be willing to pay to play this game? How much should you be willing to pay to play this game?

Part Two: *Genetics...*

Eye color in humans is determined by a gene pair with a gene for brown eyes B being dominant over the gene for blue eyes b . Therefore, a person will have brown eyes if he or she is of type BB or Bb , and will have blue eyes only if he or she is of type bb .

1. [GH 4.8.3] If two blue-eyed parents have a child, what is the probability that the child will have blue eyes?

2. [GH 4.8.4] Suppose a woman with blue eyes marries a man with brown eyes. If the man's mother had blue eyes, what is the probability that an offspring of the couple will have brown eyes?

3. [GH 4.8.5] The first child of a brown-eyed man and a brown-eyed woman has blue eyes.

(a) What is the probability that their second child will have brown eyes?

(b) If this second child has brown eyes and marries someone with blue eyes, what is the probability that a child of theirs will have brown eyes?

4. Asher's mother and father don't have blue eyes, though Asher does. What is the probability that his parents' three children all have blue eyes? (Aside, all three have blue eyes.)