

Problem 1 (5 points): [GH 4.7.9] *A game at a fund-raiser carnival involves throwing a dart at a wall of balloons. If the balloon that is popped has money inside, the player wins the money. Suppose 80% of the balloons have no money inside, 15% have \$5 inside, and the remaining 5% have \$50 inside.*

If the carnival organizers want to make an average profit of \$.50 per player, what should a player have to pay to play the game? Assume that each player pops exactly one balloon.

Solution: The carnival organizers will have an expected payment of

$$\text{Expected Payment} = (.80)(\$0.00) + (.15)(\$5.00) + (.05)(\$50.00) = \$3.25.$$

The carnival organizers should therefore charge a player $\$3.25 + \0.50 , or $\$3.75$, to play the game.

Problem 2 (5 points): *Mr. and Mrs. Smith are expecting a baby. Mr. Smith has type AB blood, while Mrs. Smith has type B blood. Mrs. Smith's mother is known to have type A blood.*

What is the probability that the baby will have type AB blood?

Solution: Since Mr. Smith has type AB blood, he must have the gene pair AB. Since Mrs. Smith has type B blood, she can have either the gene pair BB or Bo. As she must have inherited an A gene or an o gene from her mother, only Bo is possible.

The Punnett Square is thus

	A	B
B	AB	B
o	A	B

We conclude that the baby will have type AB blood with probability $1/4$.