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Solution 1 Chapter 1, Put-Call Parity

We can use put-call parity to solve this problem:

$$C_{put}(K,T) + Ke^{-rT} = P_{call}(K,T) + S_0 - P_{call}(K,T)$$
$$[C_{put}(K,T) - P_{call}(K,T)] - S_0 = -Ke^{-rT}$$
$$-0.15 - 48 = -30e^{-0.08}$$
$$\ln\left(\frac{30.85}{30}\right) = -4r$$
$$r = 0.0218$$

Solution 2 Chapter 2, Arbitrage

Let X be the number of calls with a strike price of 55 that are purchased for Mary's portfolio. If we assume that the net cost of establishing the portfolio is zero, then we can solve for X .

$$11 - 2 + 8 + 11 + 3X = 0$$
$$X = 2$$

The table below shows that regardless of the stock price at time T , Mary's profit is positive. Therefore, Mary is correct. This implies that John is incorrect.

Mary's Portfolio		Time T	
Transaction	Time 0	$50 \leq S_T < 55$	$55 \leq S_T < 60$
Buy 1 of C(55)	-11.00	0.00	$S_T - 55$
Sell 1 of C(50)	10.00	0.00	$-3S_T + 30$
Buy 2 of C(55)	-20.00	0.00	0.00
Long 81	-81.00	e^{rT}	e^{rT}
Total	0.00	$e^{rT} + 3S_T - 49$	$e^{rT} + 11S_T - 55$

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