Probability Assignment

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Question:If X follows a binomial distribution with parameters n = 5, p and $p_X(2) = 9p_X(3)$ then p is?

Solution:

$$p_X(2) = {}^5C_2 p^2(1-p)^{5-2} \tag{1}$$
$$= \frac{5!}{2!3!} p^2(1-p)^3 \tag{2}$$
$$= 10p^2(1-p)^3 \tag{3}$$
$$p_X(3) = {}^5C_3 p^3(1-p)^{5-3} \tag{4}$$
$$= \frac{5!}{3!2!} p^3(1-p)^2 \tag{5}$$
$$= 10p^3(1-p)^2 \tag{6}$$
$$9p_X(3) = 9 \times 10p^3(1-p)^2 \tag{7}$$
$$= 90p^3(1-p)^2 \tag{8}$$
$$\text{Given that } p_X(2) = 9p_X(3) \tag{9}$$
$$\implies 10p^2(1-p)^3 = 90p^3(1-p)^2 \tag{10}$$
$$\implies (1-p) = 9p \tag{11}$$
$$\implies 10p = 1 \tag{12}$$
$$\implies p = \frac{1}{10} \tag{13}$$