HW4-1

Total counts: 165 (sum of all counts in the table)

P(senior) = Total count of seniors / Total count
P(junior) = Total count of juniors / Total count

Seniors: 30 (sales, 31-35) + 5 (systems, 31-35) + 3 (systems, 41-45) + 10 (marketing, 36-40) + 4 (secretary, 46-50) = 52
Juniors: Total count - Seniors count = 165 - 52 = 113

So the priors are:
P(senior) = 52 / 165 ≈ 0.315
P(junior) = 113 / 165 ≈ 0.685

For 'systems' department:
Systems seniors: 5 (31-35) + 3 (41-45) = 8
Systems juniors: 20 (21-25) + 3 (26-30) = 23

P(systems| junior)
= Count of juniors in the systems department / Total count of juniors
= 23 / 113

P(age = "26_30" | junior)
= Count of juniors in the '26_30' age group / Total count of juniors
= 49 / 113

P(salary = "46K_50K" | junior)
= Count of juniors in the '46K_50K' salary range / Total count of juniors
= 23 / 113

P(age = "26_30" | senior)
= 1 / (Total count of seniors + Number of age groups) = 1 / (52 + 6)
= 1 / 58

P(systems | senior)
= Count of seniors in the systems department / Total adjusted count of seniors
= 8 / 52

P(salary = "46K_50K" | senior)
= Count of seniors in the '46K_50K' salary range / Total count of seniors
= 40 / 52

For 'senior':
P(senior|system, 26_30, 46K_50K) (Adjusted)
= P(systems | senior) * P(26_30 | senior) * P(46K_50K | senior) * P(senior)
= (8 / 52) * (1 / 58) * (40 / 52) * (52 / 165)
≈ 0.000643035

For 'junior':
P(junior|system, 26_30, 46K_50K)
=P(systems | junior) * P(26_30 | junior) * P(46K_50K | junior) * P(junior)
= (23 / 113) * (49 / 113) * (23 / 113) * (113 / 165)
≈ 0.012302997

Since P(junior | systems, 26_30, 46K_50K) > P(senior | systems, 26_30, 46K_50K), the data tuple is classified as 'junior'.