Task 1a:

a: (See Lab 6.ipynb notebook)

b: (See Lab 6.ipynb notebook)

c: If Thomas studied more or less hours, would the answer change?

The coefficient for hours_studied is 0.8. This means for every additional hour Thomas studies, the log odds of passing the exam would increase by 0.8. Conversely, if he studied less, the log odds would decrease by 0.8 for every hour less. So, yes, the answer would change based on the number of hours he studied.

d: How would you interpret the coefficient of review_session (1.5) from the above experiment?

The coefficient of review_session is 1.5. This means that attending the review session increases the log odds of passing the exam by 1.5. compared to not attending. It signifies a strong positive effect of attending the review session on the likelihood of passing.

e: Using similar reasoning, how would you interpret the coefficient of hours_studied (0.8)

The coefficient of hours_studied is 0.8 This means that for every additional hour spent studying, the log odds of passing the exam increases by 0.8. It shows a positive correlation between the number of hours studied and the likelihood of passing.

f: How would you interpret the intercept?

The intercept is −3. This represents the log odds of passing the exam for a student who neither studied (0 hours) nor attended the review session. It's a baseline value against which the effects of studying and attending the review session are measured.

g: For someone who studied 8 hours, would you recommend him/her to attend the review session?

For a student who studied 8 hours:
Given hours_studied = 8 and review_session = 0 (without attending):

1. log odds:

$$\text{log odds} = -3 + 0.8(8) = -3 + 6.4 = 3.4$$

Likelihood (without attending):

$$\text{Likelihood} \approx 96.8\%$$

Given hours_studied = 8 and review_session = 1 (attending):

1. log odds:

log odds = −3 + 0.8(8) + 1.5(1) = −3 + 6.4 +1.5 = 4.9

Likelihood (attending):
Likelihood ≈ 99.3%

Given the increase in likelihood, even if it's marginal, I would recommend attending the review session.

h: What type of students seems to benefit most from the review session?

From my calculations, attending the review session significantly increased the likelihood of passing for Thomas, who had studied for only 2 hours (from 19.8%to 52.5%). For a student who studied for 8 hours, the review session still increased their likelihood, but the marginal gain was smaller (from 96.8% to 99.3%).

Thus, students who have studied less seem to benefit more substantially from the review session. The review session might serve as a crucial booster for those who haven't prepared as extensively.