Task 1(a) =

a) $\ln\left(\frac{P}{1-P}\right) = -3 + 0.8 * Hours\_studied + 1.5 \times Review\_session$

1) log-odds

$$\ln\left(\frac{P}{1-P}\right) = -3 + 0.8 \times 2 + 1.5 \times 0$$

$$= \boxed{-1.4}$$

2) odds

$$\left(\frac{P}{1-P}\right) = e^{-1.4} = \boxed{0.246}$$

3) Liklihood (Probability)

$$P = \frac{0.246}{1+0.246} = \boxed{0.197}$$

$$= 19.7 \approx 20\%.$$

B) Assuming review session is 1 hr :-

1) log odds

$$\ln\left(\frac{P}{1-P}\right) = -3 + 0.8 \times 2 + 1.5 \times 1$$

$$= \boxed{0.1}$$

2) odds $= e^{0.1} = \boxed{1.105}$

3) liklihood $= \frac{1.105}{1+1.105} = 0.524$

$$\boxed{52.4\%}$$

c) If Thomas studied more or less hours.

- Yes, studying more or less hours would change the log odds because the hours_studied term directly affects the model through the coefficient β_1. The more hours studied, the higher the log odds, which increase both the odds and the probability of passing.

d) Interpretation of the coefficient of review_session (1.5)

- The coefficient of the review_session (1.5) indicates that attending the review session increase the log odds of passing by 1.5. In terms of odds, this corresponds to multiplying the odds of passing by $e^{1.5} \approx 4.48$, meaning attending the review session makes passing about 4.48 times more likely.

e) Interpretation of the coefficient of hours_studied (0.8)

- The coefficient of hours_studied (0.8) indicates that every additional hour studied, the log odds of passing Exam increase by 0.8. In terms of odds, this corresponds to multiplying the odds of passing by $e^{0.8} \approx 2.23$, meaning each extra hour of study makes passing about 2.23 times more likely.

F) Interpretation of the intercept:-

- The intercept represents the log odds of passing the exam when both predictors (hours_studied and review_session) are zero. In other words, it is the log odds of passing for someone who studied 0 hours and did not attend the review session.

8) Recommendation for someone who studied 8 hours to attend the review session:

- Even though studying 8 hours would likely give strong chance of passing, attending the review session would still significantly increase the odds of passing. Therefore, it is generally advisable for someone who studied 8 hours to attend the review session to maximize their chances.

h) students who benifit most from the review session

- Students who have studied fewer hours would benifit the most from attending the review session because the review session provides a larger proportion boost to their odds of passing. For students with higher hour studied, the marginal benifit of the review session is still positive but less impactful compared to those with fewer hours of study