



AP Statistics FRQ Practice · Unit 4

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Name: _____

Date: _____

Score: / 4

What this question practices

- Conditional probability from a two-way table
- Checking independence
- Binomial probabilities
- Mean and standard deviation of a binomial random variable

Show all your work. Answer each part in complete sentences, in the context of the problem. The data are hypothetical.
Suggested time: 13 minutes.

A random sample of 200 students who use an online math channel was asked which language version of the videos they prefer. The results, by grade, are shown.

	English	Filipino	Both	Total
Grade 9	30	48	22	100
Grade 10	42	36	22	100
Total	72	84	44	200

(a) Find the probability that a randomly selected student from this sample prefers the Filipino version, given that the student is in Grade 9.

(b) Are the events "student is in Grade 9" and "student prefers the Filipino version" independent? Justify your answer.

(c) Across the whole channel, 30% of viewers choose the Filipino version. Suppose 10 viewers are selected at random, and let X be the number who choose the Filipino version. Find $P(X = 3)$ and $P(X \geq 1)$. Show your work.



(d) Find the mean and standard deviation of X , and interpret the mean in context.





Each part is scored *E* (essentially correct), *P* (partially correct) or *I* (incorrect), the way AP readers score free-response questions. Compare your work with the model solution, then with the scoring note.

(a) Find the probability that a randomly selected student from this sample prefers the Filipino version, given that the student is in Grade 9.

$$P(\text{Filipino} \mid \text{Grade 9}) = \frac{48}{100} = 0.48$$

→ Restrict attention to the 100 Grade 9 students; 48 of them prefer the Filipino version.

Scoring. Essentially correct: 0.48 with the correct denominator shown.

(b) Are the events "student is in Grade 9" and "student prefers the Filipino version" independent? Justify your answer.

→ The events are not independent. If they were, the probability of preferring Filipino would be the same whether or not we know the student is in Grade 9.

$$P(\text{Filipino}) = \frac{84}{200} = 0.42 \neq 0.48$$

→ Overall, 42% of students prefer Filipino, but 48% of Grade 9 students do. Knowing the grade changes the probability.

Scoring. Essentially correct: compares the two correct probabilities (or an equivalent check) and concludes not independent.

(c) Across the whole channel, 30% of viewers choose the Filipino version. Suppose 10 viewers are selected at random, and let X be the number who choose the Filipino version. Find $P(X = 3)$ and $P(X \geq 1)$. Show your work.

→ X has a binomial distribution with $n = 10$ and $p = 0.30$: there is a fixed number of trials, each viewer either chooses Filipino or not, and viewers are independent (10 is far less than 10% of all viewers).

→ For $P(X \geq 1)$, use the complement: the only way to get fewer than 1 is for none of the 10 to choose Filipino.

$$P(X = 3) = \binom{10}{3}(0.3)^3(0.7)^7 \approx 0.2668$$

$$P(X \geq 1) = 1 - (0.7)^{10} \approx 0.9718$$

Scoring. Essentially correct: identifies the binomial distribution with n and p , and gets both probabilities with work or labeled calculator inputs (binompdf, binomcdf).

(d) Find the mean and standard deviation of X , and interpret the mean in context.

$$\mu_X = np = 10(0.3) = 3$$

$$\sigma_X = \sqrt{np(1-p)} = \sqrt{2.1} \approx 1.449$$

→ Interpretation: if we took many random samples of 10 viewers, the average number who choose the Filipino version would be about 3 per sample.

Scoring. Essentially correct: both values and an interpretation that refers to the long-run average over many samples, in context.

