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Answer

	Cat	Document
Training	-	Just plain boring
	-	Entirely predictable and lacks energy
	-	no surprises and very few laughs
	+	very powerful
	+	the most fun film of the summer.
Test	?	predictable with no fun.

① prior from training.

$$P(c_j) = \frac{N_{c_j}}{N_{total}} \Rightarrow \begin{matrix} P(-) = 3/5 \\ P(+) = 2/5 \end{matrix}$$

② likelihood from training

$$P(w_i|c) = \frac{count(w_i, c) + 1}{\left|\sum_{w \in V} count(w, c) + |V|\right|}$$

Here $V = 20$ ie (unique words)

$$P(\text{predictable} \mid +) = \frac{0+1}{9+20} = \frac{1}{29}$$

$$P(\text{predictable} \mid -) = \frac{1+1}{14+20} = \frac{2}{34} = \frac{1}{17}$$

$$P(no|+) = \frac{0+1}{9+20} = \frac{1}{29}$$

$$P(no|-) = \frac{14+1}{14+20} = \frac{3}{34} = \frac{1}{17}$$

$$P(\text{-fun}(+) = \frac{1+1}{9+20} = \frac{1}{29}$$

$$P(\text{fun}|-) = \frac{0+1}{14+20} = \frac{1}{34}$$

Here we have Drop 'with' because 'wit' is not present in the training set

③ Solving test set:

$$P(-) \cdot P(\text{Pred}|-) \cdot P(NO(-) \cdot P(\text{fun}|-)$$

$$= \frac{3}{5} \times \frac{3}{34} \times \frac{3}{34} \times \frac{1}{34}$$

$$= 6.105 \times 10^{-5}$$

$$P(+) = P(\text{Pred}/+) \cdot P(P(NO|+) \cdot P(\text{fun}/+)$$

$$= \frac{2}{5} \times \frac{1}{29} \times \frac{1}{29} \times \frac{3}{29}$$

$$= 3.2 \times 10^{-5}$$