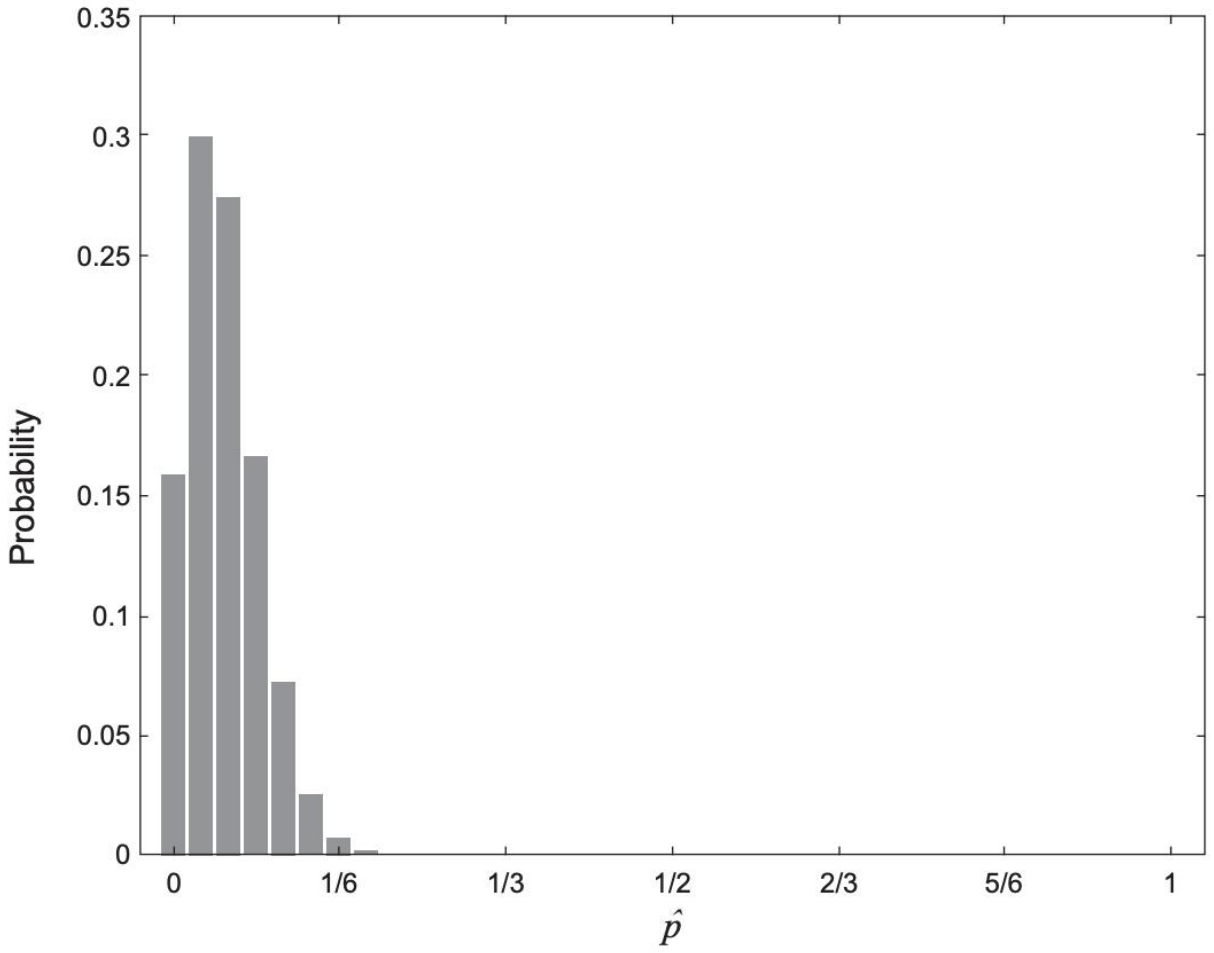
Question 10 **(7 marks)**

Fingerprints can be classified broadly as loop-shaped, whirl-shaped or arch-shaped. Only 5% of the world's population have arch-shaped fingerprints. Consider a random sample of 36 people and let $\hat{p}$ denote the sample proportion of people with arch-shaped fingerprints. The probability distribution for $\hat{p}$ is shown below.



(a) On the basis of the diagram above, is it appropriate to use the normal distribution to approximate the distribution of $\hat{p}$? Justify your answer. (2 marks)

A larger sample of 500 people is selected at random.

(b) Determine the probability that more than 30 people in the sample have arch-shaped fingerprints. (3 marks)

(c) Use the approximate normality of the distribution to determine the probability that the sample proportion of people with arch-shaped fingerprints is greater than 0.06. (2 marks)