Comparing germination proportions

Chapter 8 practice Hypothesis testing and confidence intervals

Two independent random samples each contain 100 seeds grown under one of two methods. Under method A, 60 germinate; under B, 45 germinate. Is there evidence that the population germination proportions differ? Use $\alpha = .05$.

	Method A	Method B
Seeds sampled	100	100
Seeds that germinate	60	45

Assume independent Bernoulli outcomes within and between the samples, with a constant germination probability within each method. Let p_A and p_B denote the population germination probabilities.

Useful information. The upper-tail normal critical value is $z_{.025} = 1.960$. You can make the testing decision using this cutoff. If you also calculate a p-value, use a standard normal table or calculator.

(a) State the null and alternative hypotheses. Calculate the two sample proportions and the estimated difference $p_A - p_B$.

(b) Carry out the appropriate two-proportion test at the 5% significance level. Explain why pooling is appropriate under this null, check the null expected-count conditions, calculate the standard error and test statistic, and state your conclusion in context. Include an approximate p-value if a normal table or calculator is available.

(c) Construct an approximate 95% confidence interval for $p_A - p_B$. Explain why the interval uses separate sample proportions in its standard error. Does its conclusion agree with the test in this example? Does that agreement make the pooled test and this interval exact inverses in general?

(d) Describe a Type I error and a Type II error in the context of this comparison. Explain what the power of this test would mean at a specified pair of unequal population proportions. Is a p-value the probability that the null hypothesis is true?

Show your reasoning. Identify the population quantities, the sampling uncertainty, and which discrepancies count as evidence. Report the estimated difference in percentage points as well as a testing decision.