

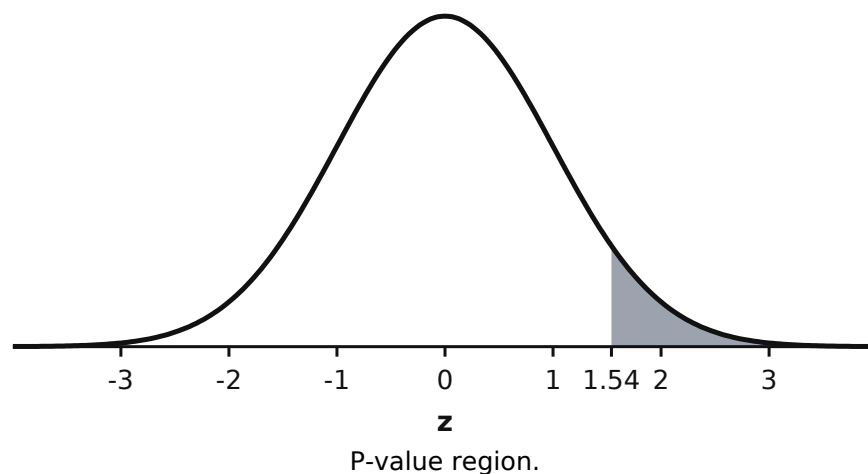
AP Statistics - Significance Tests for a Proportion - Test Answer Key

Common Core AP STAT 6.4, AP STAT 6.5, AP STAT 6.6, AP STAT 6.7, HSS-IC.A.2, HSS-IC.B.5 · maths-pdf.fr/en/

Each solution includes a scoring guide. Give credit for the correct hypotheses, the conditions, the z statistic and p-value, and a conclusion that links the p-value to alpha and to the context.

AP Statistics · Common Core State Standards: **AP STAT 6.4, AP STAT 6.5, AP STAT 6.6, AP STAT 6.7, HSS-IC.A.2, HSS-IC.B.5**

Question 1 - One-proportion z test [5 pts]



State: $H_0: p = 0.30$, $H_a: p > 0.30$, p is the true proportion of customers who return products.

Plan: one-proportion z test; random sample, 200 is less than 10% of the customers, $np_0 = 60$ and $n(1-p_0) = 140$ at least 10.

Do: $\hat{p} = 0.35$, $SE = 0.0324$, $z = 1.54$, $p\text{-value} = 0.0618$.

Conclude: $p\text{-value} > 0.05$, so fail to reject H_0 ; there is not convincing evidence that the return rate exceeds 30%.

Scoring: State 1; Plan 1 (test and conditions); Do 2 (z and p-value); Conclude 1 (link to alpha and context).

Question 2 - Interpret the p-value [2 pts]

If the true return rate were 30%, the probability of a sample return rate of 35% or more in a random sample of 200 customers is 0.0618.

It is the probability of such a result if H_0 is true.

Scoring: 1 point for conditioning on H_0 true, 1 point for context and 'as extreme or more'.

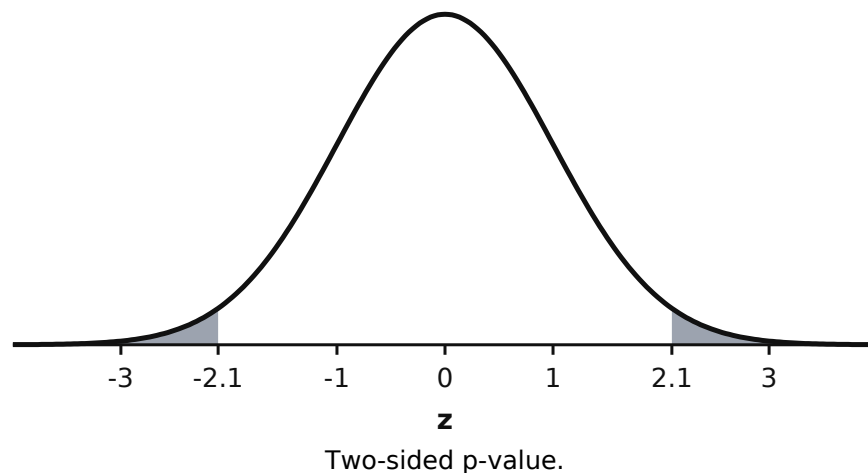
Question 3 - Errors [3 pts]

(a) Concluding the fertilizer increases yield when it does not. (b) Not concluding it increases yield when it does. (c) 0.05.

As described; 0.05.

Scoring: 1 point per part.

Question 4 - Two-sided p-value [2 pts]



$$2P(Z > 2.10) = 2(0.0179) = 0.0357.$$

0.0357 < 0.05: reject H_0 .

Scoring: 1 point for doubling the tail area, 1 point for the conclusion.

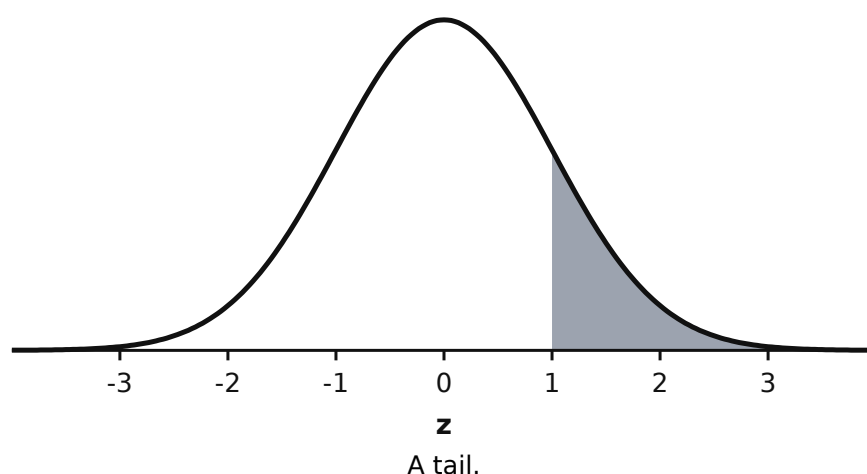
Question 5 - Conclusion language [2 pts]

0.27 is greater than 0.05.

We fail to reject H_0 . There is not convincing evidence that the new app increases the proportion of users who finish a lesson.

Scoring: 1 point for the comparison with alpha, 1 point for the conclusion in context.

Question 6 - Alternative hypothesis [1 pt]



Only the right tail is shaded.

$p > p_0$.

Scoring: 1 point for $p > p_0$.

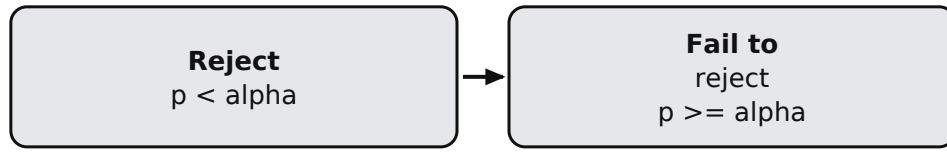
Question 7 - Conditions [2 pts]

$np_0 = 150(0.02) = 3$, less than 10.

No: the large counts condition fails.

Scoring: 1 point for np_0 , 1 point for the conclusion.

Question 8 - Decision [3 pts]



Decision rule.

(a) $P(Z > 1.40) = 0.0808$. (b) $0.0808 < 0.10$: reject H_0 . (c) $0.0808 > 0.05$: fail to reject H_0 .

0.0808; reject; fail to reject.

Scoring: 1 point per part.

Total
20 points