

## Solutions

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**2.1 E.** Restrict to B: divide the joint probability 0.3 by  $P(B)=0.5$ , obtaining 0.6. The conditioned denominator is 0.5. The smaller numerical choices use a marginal, joint probability or different operation, and none equals 0.3 divided by 0.5.

**2.2 B.** Population standard deviation is  $6\sqrt{25}=30$ . Dividing by  $\sqrt{100}=10$  gives standard error 3. Quadrupling sample size divides standard error by two. One-point-five divides by four; six leaves it fixed; twelve and twenty-four reverse the direction.

**2.3** Expected counts are 100 defective and 900 nondefective. Positive counts are  $100(0.8) = 80$  and  $900(0.05) = 45$ , respectively. The conditioned group contains 125 positives, hence

$$P(D \mid +) = \frac{80}{80 + 45} = \frac{16}{25} = 0.64.$$

Negative counts 20 and 855 check both row totals. The sensitivity 0.8 is  $P(+ \mid D)$ , not the requested reversed condition. These are illustrative model rates, not measured performance claims.

**3.1** Independence gives  $\text{Var}(\bar{X}) = 25/n$  and at 100 standard error  $5/10 = 0.5$ . With covariance one,

$$\text{Var}(\bar{X}) = \frac{25n + n(n-1)}{n^2} = 1 + \frac{24}{n}.$$

At 100 it is 1.24. The standard error tends to one as  $n$  grows, rather than to zero; quadrupling  $n$  need not halve it. Covariance terms may be dropped only under justified uncorrelatedness, with independence a sufficient condition.

Local four-mark guidance for each written task: choose and justify the method; carry through the reasoning; give every requested result; check the relevant restriction, hypothesis or boundary case. These are classroom marks, not GRE scoring.