

Homework #1

HW: 4-7, 13, 17, 20. For grad, #8 too. (Due Next Monday; will be graded!)

Homework #1 Solutions

#4. $B=8$ successes out of 10 trials. $H_1: p > 1/2$

Binomial: reject if $B > b_\alpha$. P-value is $P_{1/2}(B \geq 8) = 1 - P_{1/2}(B \leq 7) = 1 - \text{pbinom}(7, 10, 1/2) = 0.0546875$

Large-sample: $B^* = 1.8973$, $P(Z > B^*) = 0.0289$

#5. Power when $p = .4, .6, .8$: $P_p(B \geq 4)$

0.289792

0.710208

0.966656

#6. $H_0: p = .7$, $H_1: p > .7$, $B=18$, $n=20$,

p-value = $P_{.7}(B > 18) = 0.03548313$

$B^* = 0.02548097$

#7. $H_0: p = 1/5$, $H_1: p > 1/5$, $B=3$, $n=10$

P-value = $P_{1/5}(B > 3) = 0.3222005$

#8. ex. 2.2, $H_0: p = 1/3$, $H_1: p > 1/3$, $n=50$,

$\alpha = .05$ test: Reject if

$B^* = (B - n \cdot (1/3)) / \sqrt{n \cdot (1/3) \cdot (2/3)} \geq 1.645$

Or $B \geq 1.645 \cdot \sqrt{n \cdot (1/3) \cdot (2/3)} + n \cdot (1/3) = b$

power of the test when $p = .5$: $P_{.5}(B \geq b) = P_{.5}(Z \geq (b - n \cdot .5) / \sqrt{n \cdot .5 \cdot .5}) \sim 0$.

#13. 663.4897

#17. $\hat{p} = .5$, 95% confidence intervals when $n=30$ vs $n=50$

0.3210806 0.6789194 when 30

0.3614096 0.6385904 when 50

#20. Clopper-person for $n \leftarrow 7$; $B \leftarrow 6$: .4216, .9964

large sample approximation: 0.597918 1.116368

R-code for doing the computation

```
n <- 10; p <- 1/2 # 4
z <- (8 - n * p) / sqrt(n * p * (1 - p))
1 - pbinom(7, n, p)
```

```

1-pnorm(z)

n <- 7; B <- 4 # 5
1-pbinom(B-1, n, .4)
1-pbinom(B-1, n, .6)
1-pbinom(B-1, n, .8)

n <- 20; B <- 18; p <- .7 # 6
z <- (B-n*p)/sqrt(n*p*(1-p))
1-pbinom(B-1, n, p)
1-pnorm(z)

n <- 10; B <- 3; p <- 1/5 # 7
1-pbinom(B-1, n, p)

n <- 50; p0 <- 1/3; b <- 1.645*sqrt(n*p0*(1-p0)) + n*p0 # 8
b # is 22.15
p <- .5
z <- (b-n*p)/sqrt(n*p*(1-p))
z # is 4.295674
1-pnorm(z)

alpha <- .01; D <- .05 # 13
qnorm(1-alpha/2)^2/(4*D^2)

phat <- .5 # 17
n <- 30
c(phat - qnorm(.975)*sqrt(phat*(1-phat)/n),
  phat + qnorm(.975)*sqrt(phat*(1-phat)/n))

n <- 50
c(phat - qnorm(.975)*sqrt(phat*(1-phat)/n),
  phat + qnorm(.975)*sqrt(phat*(1-phat)/n))

```