

Stat 305 HW#7 solutions

Wu
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P263. 2.

The values of $\Phi(z) = P(Z \leq z)$ are given in Table B.3. All of these probabilities correspond to areas under the standard normal curve.

- (a) $P(Z < -.62) = \Phi(-.62) = .2676.$
- (b) $P(Z > 1.06) = 1 - P(Z \leq 1.06) = 1 - \Phi(1.06) = 1 - .8554 = .1446.$
- (c) $P(-.37 < Z < .51) = P(Z < .51) - P(Z \leq -.37) = .6950 - .3557 = .3393.$
- (d) $P(|Z| \leq .47) = P(-.47 \leq Z \leq .47) = P(Z \leq .47) - P(Z < -.47) = .6808 - .3192 = .3616.$
- (e) $P(|Z| > .93) = P(Z < -.93) + P(Z > .93) = 2(P(Z < -.93)) = 2(.1762) = .3524.$
- (f) $P(-3.0 < Z < 3.0) = P(Z < 3.0) - P(Z \leq -3.0) = .9987 - .0013 = .9974.$
- (g) Looking up .90 in the body of the table, $\# \approx 1.28.$
- (h) $P(|Z| < \#) = .90$ is equivalent to $P(Z < \#) = .95$ (by symmetry). Looking up .95 in the body of the table, $\# \approx 1.645.$
- (i) $P(|Z| > \#) = .03$ is equivalent to $P(Z < \#) = .985$ (by symmetry). Looking up .985 in the body of the table, $\# \approx 2.17.$

P263. 3.

Probabilities involving X are just areas under the normal curve with $\mu = 43.0$ and $\sigma = 3.6$. Each of these areas has an equal corresponding area under the standard normal curve.

Define $Z = \frac{X - 43.0}{3.6}$. Then Z is a standard normal random variable. Re-express each of the problems below in terms of Z .

- (a) $P(X < 45.2) = P(Z < .61) = .7291.$
- (b) $P(X \leq 41.7) = P(Z \leq -.36) = .3594.$
- (c) $P(43.8 < X < 47.0) = P(.22 < Z < 1.11) = P(Z < 1.11) - P(Z \leq .22)$
 $= .8665 - .5871 = .2794.$
- (d) $P(|X - 43.0| \leq 2.0) = P(41.0 \leq X \leq 45.0) = P(-.56 \leq Z \leq .56)$
 $= P(Z \leq .56) - P(Z < -.56) = .7123 - .2877 = .4246.$
- (e) $P(|X - 43.0| > 1.7) = 1 - P(|X - 43.0| \leq 1.7) = 1 - P(41.3 \leq X \leq 44.7)$
 $= 1 - P(-.47 \leq Z \leq .47) = 1 - (P(Z \leq .47) - P(Z < -.47))$
 $= 1 - (.6808 - .3192) = .6384.$
- (f) $P(X < \#) = .95$ is equivalent to $P(Z < \frac{\# - 43.0}{3.6}) = .95$. Looking up .95 in the body of the

table,

$$\frac{\# - 43.0}{3.6} \approx 1.645$$

so $\# \approx 48.922$.

- (g) $P(X \geq \#) = .30$ is equivalent to $P(X < \#) = .70$, which is equivalent to $P(Z < \frac{\# - 43.0}{3.6}) = .70$. Looking up .70 in the body of the table,

$$\frac{\# - 43.0}{3.6} \approx .52$$

so $\# \approx 44.872$.

- (h) $P(|X - 43.0| > \#) = .05$ is equivalent to $P(|X - 43.0| \leq \#) = .95$, which is equivalent to $P(X - 43.0 \leq \#) = .975$ (by symmetry). This is equivalent to $P(Z \leq \frac{\#}{3.6}) = .975$. Looking up .975 in the body of the table,

$$\frac{\#}{3.6} \approx 1.96$$

so $\# \approx 7.056$.