Problem 1

(1) False

(2) True

(3) False

(4) False

(5) False

(6) True

59/60

Problem 2

need 0.37 or 0.38

(1) $Pr(Z > 0.374) = 1 - Pr(Z <= 0.374) = 0.354$

(2) pnorm(0.374, lower.tail = FALSE) = 0.354

-1 (3) $z_{0.12} = 1.175$ → how did you find it from table?

(4) qnorm(1 - 0.12) = 1.175

Problem 3

(1)

$Pr(Y > 12) = Pr(Z > (12 - 10) / 2) = Pr(Z > 1) = 0.1587$

$Z_1 = (3 - 5) / 5 = -0.4$, $Z_2 = (6 - 5) / 5 = 0.2$

$Pr(3 < X < 6) = Pr(Z < 0.2) - Pr(Z < -0.4) = 0.5793 - 0.3446 = 0.2347$

(2)

Since X and Y are independent

$Pr(Y>12 \text{ and } 3<X<6)= 0.1587 \times 0.2347= 0.0372.$

(3)

$Pr(Y>12 \text{ or } 3<X<6) = Pr(Y>12) + Pr(3<X<6) - Pr(Y>12 \text{ and } 3<X<6)$

$Pr(Y>12 \text{ or } 3<X<6) = 0.1587 + 0.2347 - 0.0372$

$Pr(Y>12 \text{ or } 3<X<6) = 0.3562$

(4)

$Pr(Y<C) = 0.94$

The z–score for 0.94 is approximately 1.5548

$C = 10 + 1.5548 \times 2$

$C = 13.11$

(5)

$Pr(X>D) = 0.40$

$Pr(X <= D) = 0.60$

The z–score for 0.60 is about 0.2533

$D= 5 + 0.2533 \times 5$

$D = 6.27$

Problem 4

(1)

Probability that the sample mean is between 6400 and 6550 psi:

The sampling distribution of the mean has

$SE = 250/sqrt(16) = 62.5$ psi

Standardize the endpoints:

For 6400: $Z = (6400 - 6500) / 62.5 = -1.6$

For 6550: $Z = (6550 - 6500) / 62.5 = 0.8$

$Pr(6400 < X_{mean} < 6550) = z_{0.8} - z_{-1.6} = 0.7881 - 0.0548 = 0.7333$

(2)

We assume that the underlying distribution of the MOR (or the sampling distribution of the mean) is normal (or that the Central Limit Theorem applies).

Problem 5

(1)

We need the 90th percentile since 90% are below this value:

Cutoff = 100 + 15 × qnorm(0.90)

Cutoff = 100 + 15 × 1.2816

Cutoff = 119.22

(2)

$Pr(90 < X < 110) = Pr(z < 0.6667) - Pr(z < -0.6667) = 0.495$

(3)

Probability that in a sample of 20 children the sample mean differs from 100 by more than 3 points:

The sampling distribution of the mean has standard error:

SE = 15 /sqrt(20) = 3.3541

$Pr(| X_{mean} - 100| > 3) = 2 Pr (Z > 3 / 3.3541) = 2 Pr(Z > 0.894) = 0.372$