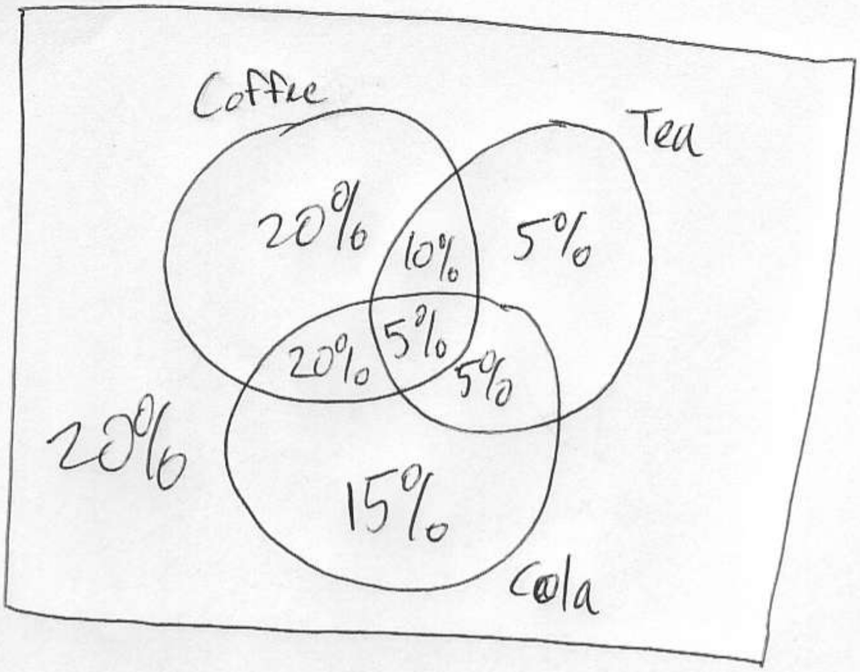
Homework #4 Solutions

4.96, 4.46, 4.52, 4.74, 1.87, 1.97

Problem 4.96



(a) P(cola only) = 15%

(b) P(none) = 100% − (20+20+10+5+5+5+15)%

= 20%

Problem 4.46

(a) "more than one person lives in this household"

$\equiv Y > 1$

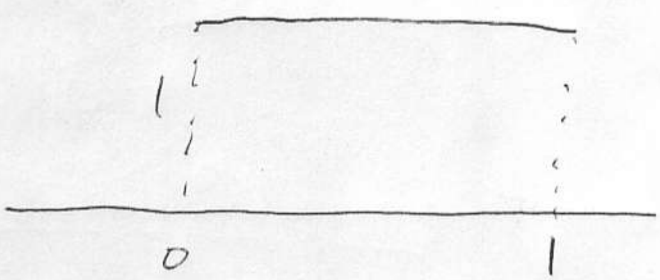
$P(Y>1) = 1 - P(Y=1) = 1 - 0.25$

$= .75$

b) $P(2 < Y \leq 4) = P(Y=3) + P(Y=4)$
$= .17 + .15$
$= .32$

c) $P(Y \neq 2) = 1 - P(Y=2)$
$= 1 - .32$
$= 0.68$

Problem 4.52

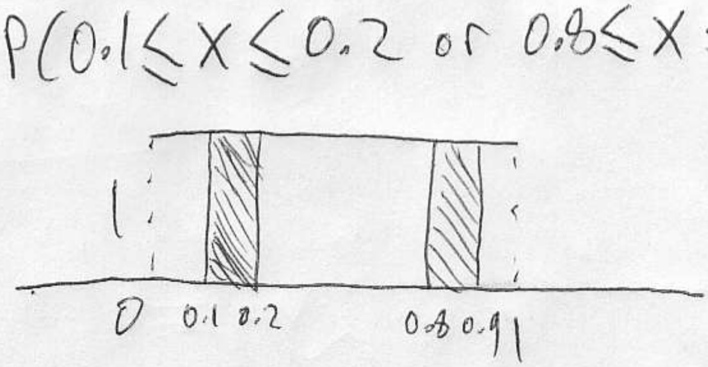


(a) $P(X \geq 0.27) = (1-0.27)(1) = 0.73$

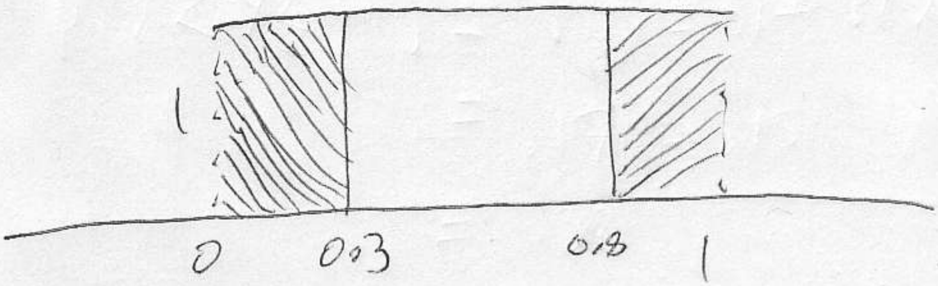
(b) $P(X = 0.27) = (0.27 - 0.27)(1) = 0$

(c) $P(0.27 < X < 1.27) = P(0.27 < X < 1) = 0.73$

(d) $P(0.1 \leq X \leq 0.2 \text{ or } 0.8 \leq X \leq 0.9) = (0.2 - 0.1)(1)$
$+ (0.9 - 0.8)(1)$
$= 0.2$



(e) $P(\text{not in interval } 0.3 \text{ to } 0.8) = P(X < 0.3 \text{ or } X > 0.8)$
$= P(X < 0.3) + P(X > 0.8)$



$$\text{area} = (1-0.8)(1) + (0.3-0)(1) = 0.2 + 0.3 = 0.5$$

Problem 4.74

(a) $\mu_X = \sum_i x_i p_i$

$$= 540(0.1) + 545(0.25) + 550(0.3) + 555(0.25) + 560(0.1)$$

$$= 54 + 136.25 + 165 + 138.75 + 56 = 550°C$$

$$\sigma_X^2 = \sum_i (x_i - \mu_X)^2 p_i$$

$$= (540-550)^2 0.1 + (545-550)^2 0.25 + (550-550)^2 0.3 + (555-550)^2 0.25 + (560-550)^2 0.1$$

$$= 100(0.1) + 25(0.25) + 0 + 25(0.25) + 100(0.1)$$

$$= 10 + 6.25 + 0 + 6.25 + 10 = 32.5$$

$$\sigma_X = \sqrt{\sigma_X^2} = \sqrt{32.5} = 5.70 \quad (2dp)$$

(b) $$\mu_{X-550} = \mu_X - 550 = 550 - 550 = 0\ ^\circ C$$

$$\sigma^2_{X-550} = \sigma^2_X = 32.5$$

$$\Rightarrow \sigma_{X-550} = \sigma_X = \sqrt{32.5} = 5.70\ ^\circ C$$

(c) $$\mu_Y = \mu_{\frac{9}{5}X+32} = \frac{9}{5}\mu_X + 32$$

$$= \frac{9}{5}(550) + 32$$

$$= 1022\ ^\circ F$$

$$\sigma^2_{\cancel{X}} = \sigma^2_{\frac{9}{5}X+32} = \left(\frac{9}{5}\right)^2 \sigma^2_X$$

$$= \frac{81}{25}(32.5)$$

$$= 105.3$$

$$\sigma_Y = \sqrt{\sigma_Y^2} = 10.26\ ^\circ F$$

Problem 1.87

Ty Cobb $\frac{.420 - .266}{.0371} = 4.15$

Ted Williams $\frac{.406 - .267}{.0326} = 4.26$

George Brett $\frac{.390 - .261}{.0317} = 4.07$

All the players are more than 4 standard deviations above the mean.

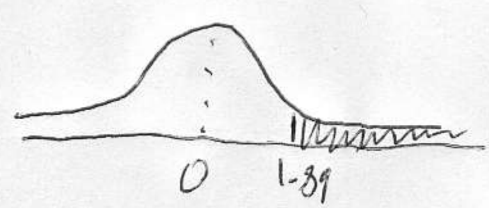
Problem 1.97

(a) $Y =$ "mens score on Math SAT" Y is normal
mean 533
std dev 115

$P(Y > 750)$

$= P\left(\frac{Y-533}{115} > \frac{750-533}{115}\right)$

$= P(Z > 1.89)$



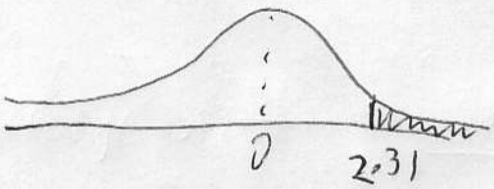
$= 1 - P(Z < 1.89)$

$= 1 - .9706 = .0294 \approx 3\%$

b) $X =$ "womens score on Math SAT"

X is normal with mean 498, std dev 109

$$P(X > 750) = P\left(\frac{X-498}{109} > \frac{750-498}{109}\right)$$



$$= P(Z > 2.31)$$

$$= 1 - P(Z < 2.31)$$

$$= 1 - .9896$$

$$= .0104 \approx 1\%$$