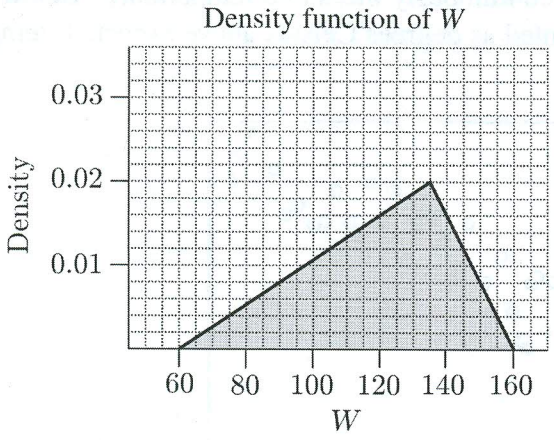
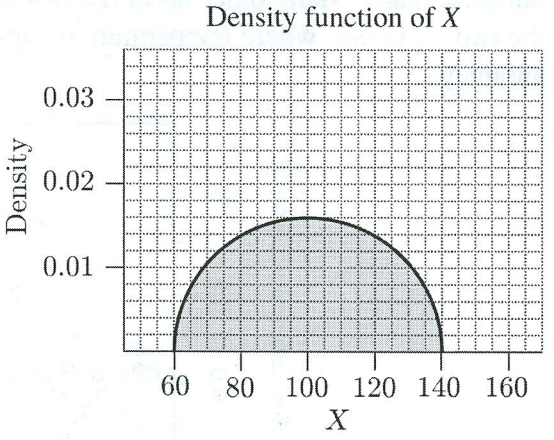
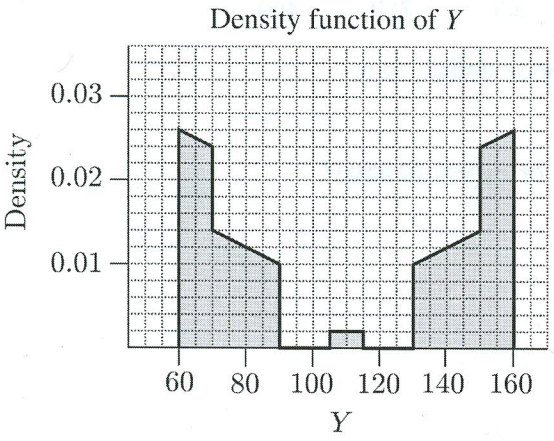
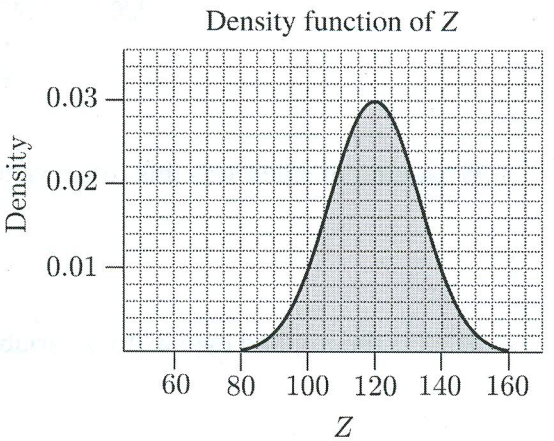
**Q1.** (10 points) Four random variables ($W$, $X$, $Y$, and $Z$) are continuously distributed, and their density functions are shown below. Notice that each density function has an area of 100 percentile squares.




(a) Which variable is most likely to fall below 100? ○ $W$ ● $X$ ○ $Y$ ○ $Z$

(b) Which distribution has the highest $Q_3$? ○ $W$ ○ $X$ ● $Y$ ○ $Z$

(c) Which variable is least likely to fall between 80 and 90? ○ $W$ ○ $X$ ○ $Y$ ● $Z$

(d) Which distribution has a mean not equal to its median? ● $W$ ○ $X$ ○ $Y$ ○ $Z$

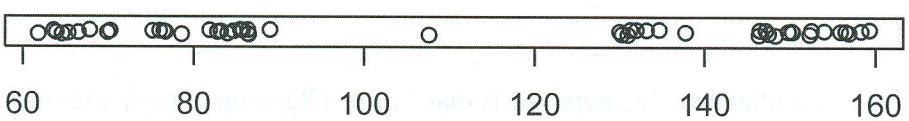
(e) Which distribution has the smallest standard deviation? ○ $W$ ○ $X$ ○ $Y$ ● $Z$

(f) Which distribution has the largest standard deviation? ○ $W$ ○ $X$ ● $Y$ ○ $Z$

(g) Which variable is most likely to fall above 150? ○ $W$ ○ $X$ ● $Y$ ○ $Z$

(h) Which has a 8% chance of falling between 95 and 100? ○ $W$ ● $X$ ○ $Y$ ○ $Z$

(i) Using 50 draws from one of the above distributions, the following dot plot was made:




Which distribution was drawn from? ○ $W$ ○ $X$ ● $Y$ ○ $Z$

(j) $P(W = 120) = ?$ ● 0 ○ 0.016 ○ 0.5 ○ 1

**Q7.** (10 points) The random variable $X$ follows the probability distribution below.

| $x_i$ | $P(X = x_i)$ | $x \cdot P(x)$ | $(x-68.5)^2 \cdot P(x)$ |
|---|---|---|---|
| 1 | 0.50 | 0.5 | 2278.125 |
| 10 | 0.30 | 3 | 1026.675 |
| 100 | 0.15 | 15 | 148.8375 |
| 1000 | 0.05 | 50 | 43384.6125 |
| | | $\mu = 68.5$ | $\sigma^2 = 46838.25$ |
| | | | $\sigma = 216.42$ |

(a) Evaluate $P(X = 100)$.

0.15

(b) Evaluate $P(10 \leq X \leq 100)$.

$0.3 + 0.15 = 0.45$

(c) Evaluate the mean of the probability distribution.

$\mu = 68.5$

(d) Evaluate the standard deviation of the probability distribution.

$\sigma = 216.42$

(e) Assume multiple draws are independent, where $X_i$ is the result of the $i$th draw. Evaluate the probability $P(X_1 = 10 \text{ AND } X_2 = 100)$. In other words, what is the chance of drawing a 10 and then a 100?

$(0.3)(0.15) = 0.045$

(f) Evaluate $P(X_1 \neq 1000 \text{ AND } X_2 \neq 1000 \text{ AND } X_3 \neq 1000)$. In other words, what is the chance of drawing thrice and getting no 1000s?

$(0.95)^3 \approx 0.857$

(g) Evaluate $P(X_1 = 1000 \text{ OR } X_2 = 1000 \text{ OR } X_3 = 1000)$. In other words, what is the chance of drawing thrice and getting at least one 1000?

$1 - 0.857 = 0.143$