1.(a) $f(3)=0.425$ AND SLOPE IS POSITIVE, SO

$f(x) \geq 0 \ \forall x \in \mathbb{R}$.

$$\int_{-\infty}^{\infty} f(x)\,dx = \int_{-\infty}^{3} 0\,dx + \int_{3}^{5} (0.075x + 0.2)\,dx + \int_{5}^{\infty} 0\,dx$$

$$= \left(\frac{0.075}{2}x^2 + 0.2x\right)\Big|_3^5 = \left(\frac{0.075}{2}\cdot 5^2 + 1\right) - \left(\frac{0.075}{2}\cdot 3^2 + 0.6\right) = 1$$

$\therefore f$ IS A PDF.

(b) $P(x>4) = \int_4^{\infty} f(x)\,dx = \int_4^5 (0.075x + 0.2)\,dx = \left(\frac{0.075}{2}x^2 + 0.2x\right)\Big|_4^5$

$$= \left(\frac{0.075}{2}\cdot 5^2 + 1\right) - \left(\frac{0.075}{2}\cdot 4^2 + 0.8\right) = 0.5375$$

(c) $\int_{-\infty}^{Q_1} f(x)\,dx = 0.25 \rightarrow \left(\frac{0.075}{2}x^2 + 0.2x\right)\Big|_3^{Q_1} = 0.25 \rightarrow$

$0.0375Q_1^2 + 0.2Q_1 - 0.3375 - 0.6 = 0.25 \rightarrow$

$0.0375Q_1^2 + 0.2Q_1 - 1.1875 = 0$

$$Q_1 = \frac{-0.2 \pm \sqrt{0.2^2 - 4\cdot 0.0375(-1.1875)}}{2\cdot 0.0375} = \begin{cases} 3.56 \\ -8.89 \end{cases}$$

$\therefore Q_1 = 3.56$

2.(a) $\mu = 10 \rightarrow \lambda = \frac{1}{10} = 0.1$

$P(t<7) = F(7) = 1 - e^{-\lambda\cdot 7} = 0.5034$

$P(t \geq 7) = 1 - F(7) = 0.4966$

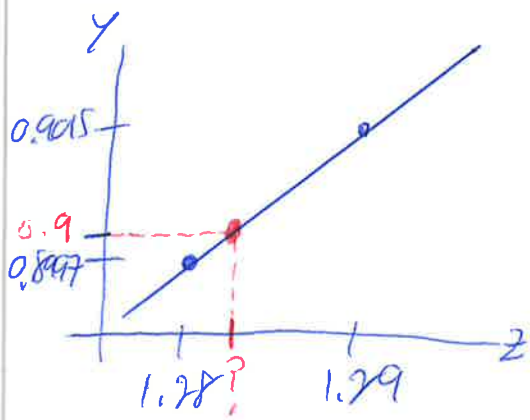
(b) $P(9 \leq t \leq 11) = F(11) - F(9) = (1 - e^{-1.1}) - (1 - e^{-0.9}) = 0.0737$

3. $\mu = 33, \sigma^2 = 4 \to Z = \frac{x-33}{2}$.

(a) $P(36 \le x \le 39) = P\left(\frac{36-33}{2} \le Z \le \frac{39-33}{2}\right) = P(1.5 \le Z \le 3)$

$= P(Z \le 3) - P(Z \le 1.5) \underset{(\text{TABLE})}{=} 0.9987 - 0.9332 = 0.0655$

(b) $P(Z \le 1.29) = 0.9015$ AND $P(Z \le 1.28) = 0.8997$. INTERPOLATE!



$y - y_1 = \frac{y_2 - y_1}{z_2 - z_1}(z - z_1)$

$y - 0.8997 = \frac{0.9015 - 0.8997}{1.29 - 1.28}(z - 1.28)$

$y - 0.8997 = 0.18z - 0.2304$

$0.9 - 0.8997 = 0.18z - 0.2304 \to z = 1.2817$

$1.2817 = \frac{x-33}{2} \to x = 2 \cdot 1.2817 + 33 = 35.5634$.

90% OF PLAYERS RETIRE BEFORE 35.5634 YEARS.

4. (a) $\mu = 128 \to \mu_{\bar{x}} = 128$, $\sigma = 22$, $\sigma_{\bar{x}} = \frac{22}{\sqrt{36}} = 3.67$.

(b) $P(118 \le \bar{x} \le 138) = P\left(\frac{118-128}{3.67} \le z \le \frac{138-128}{3.67}\right) = P(-2.72 \le z \le 2.72)$

$= 0.9967 - 0.0033 = 0.9934$.

(c) $s = 16 \to t = \frac{\bar{x} - \mu_{\bar{x}}}{16/\sqrt{36}}$. $df = 35$

$P\left(\frac{118-128}{16/6} \le t_{35} \le \frac{138-128}{16/6}\right) = P(t_{35} \le 3.75) - P(t_{35} \le -3.75)$

$\underset{(R)}{=} 0.9996804 - 0.0003195945 = 0.9993608$

5. (a) $\alpha = 0.2$ MEANS 0.1 EACH SIDE:

Z-SCORE CLOSEST TO 0.1 IS 0.1003 AT $Z = -1.28$, WHICH IS CLOSE ENOUGH NOT TO NEED INTERPOLATION (OR USE R).

$$Z_{\frac{\alpha}{2}} \frac{\sigma}{\sqrt{n}} = 1.28 \frac{5.6}{\sqrt{40}} \approx 1.13$$

$$C.I._{80\%} = (32 - 1.13, 32 + 1.13) = (30.87, 33.13)$$

(b) $Z_{0.05} \frac{\sigma}{\sqrt{n}} = 1.65 \frac{5.6}{\sqrt{40}} \approx 1.46$

$$C.I._{90\%} = (30.54, 33.46)$$

(c) $Z_{0.01} \frac{\sigma}{\sqrt{n}} = 2.33 \frac{5.6}{\sqrt{40}} \approx 2.06$

$$C.I._{98\%} = (29.94, 34.06)$$

6. THE YES/NO ANSWER IS BINOMIAL, SO $\hat{p} = \frac{x}{n} = \frac{142}{250} = 0.568$,

$$s^2 = \hat{p}(1-\hat{p}) = 0.568 \cdot 0.432 \approx 0.2454$$

$$S.E. = \sqrt{\frac{\hat{p}(1-\hat{p})}{n}} = \sqrt{\frac{0.2434}{250}} \approx 0.0319$$

99%: $Z_{0.005}$ IS RIGHT BETWEEN -2.58 AND -2.57, SO USE -2.575.

$$C.I._{99\%} = (0.568 - 2.575 \cdot 0.0319, 0.568 + 2.575 \cdot 0.0319)$$
$$= (0.4856, 0.6501).$$

WE ARE 99% CONFIDENT THAT 48.56 TO 65.01 PERCENT OF TEACHERS FIND COMPUTERS ESSENTIAL.