

Qn 1 $\mu = 65.5''$ and $\sigma = 2.5''$

a) Probability that a woman is between 64'' and 67''.

$$P(64 \leq X \leq 67).$$

$$Z = \frac{X - \mu}{\sigma}.$$

$$\left(\frac{64 - 65.5}{2.5} \right) = \frac{-1.5}{2.5} = -0.6$$

$$\left(\frac{67 - 65.5}{2.5} \right) = \frac{1.5}{2.5} = 0.6.$$

$$P(64 \leq X \leq 67) = -0.6 \leq X \leq 0.6 \\ = P(0.6 \leq X \leq 0.6).$$

b) Probability that a woman is taller than 67''?

$$Z = \frac{X - \mu}{\sigma} = \frac{(67 - 65.5)}{2.5} = \frac{1.5}{2.5} = 0.6$$

$$P(X > 67) = 0.6.$$

c) Probability that a woman is shorter than 62''?

$$Z = \frac{X - \mu}{\sigma} = \frac{62 - 65.5}{2.5} = \frac{-3.5}{2.5} = -1.4.$$

$$P(X < 62) = \underline{\underline{-1.4.}}$$

d) Probability that a woman is taller than 62"?

$$Z = \frac{X - \mu}{\sigma} = \frac{62 - 65.5}{2.5} = \frac{-3.5}{2.5} = -1.4.$$

$$P(X > 62) = -1.4.$$

e) 21st percentile for the women's heights

from the table of percentiles of normal distributions,

21st percentile has Z score (standard score) of -0.8.

$$\text{therefore: } Z = \frac{X - \mu}{\sigma}.$$

$$2.5 \times -0.8 = \frac{X - 65.5}{2.5}$$

$$-2 = X - 65.5$$

$$X = -2 + 65.5$$

$$X = \underline{\underline{63.5}}.$$

f) 90th percentile for women's heights.

From the table, at 90th percentile, Z score is 1.3

$$Z = \frac{X - \mu}{\sigma}$$

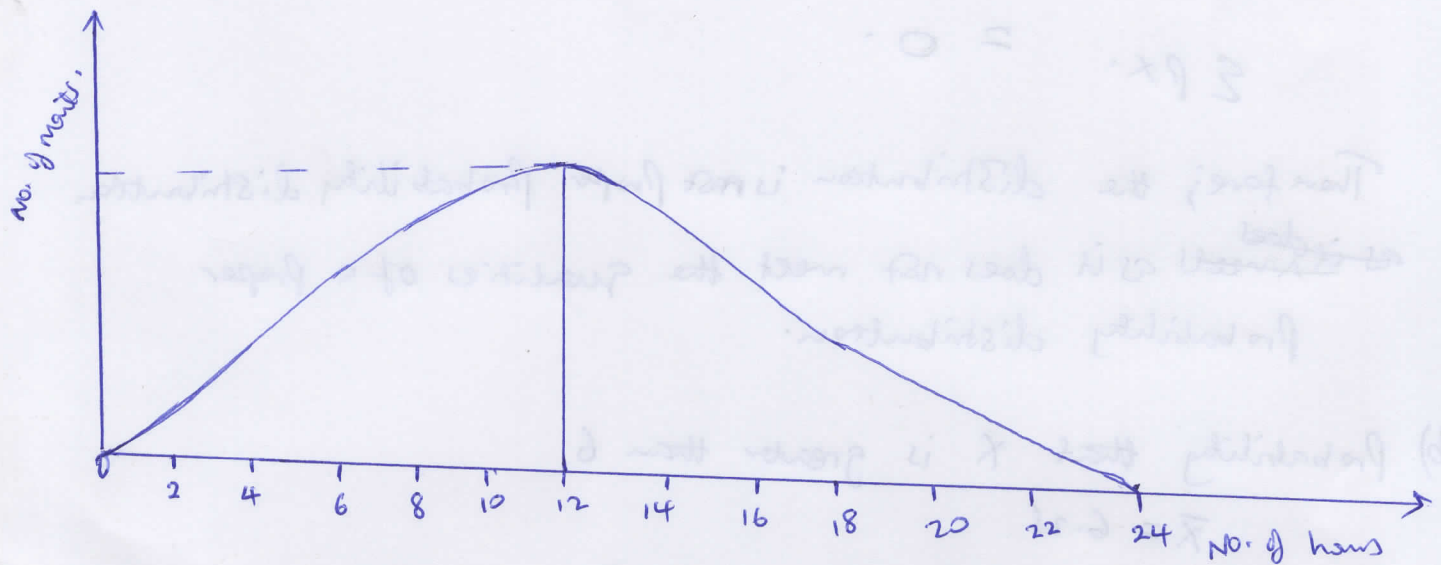
$$2.5 \times 1.3 = \frac{X - 65.5}{2.5}$$

$$3.25 = X - 65.5$$

$$X = 3.25 + 65.5$$

$$X = \underline{\underline{68.75}}$$

Qn 2



- b) Probability that it takes between 8 and 16 hours for a professor to answer an email.

$$\bar{x} = \frac{\text{Sum (total)}}{n} = \frac{2+4+6+8+10+12+14+16+18+20+22+24}{12}$$

$$= \frac{156}{12} = 13$$

$$\text{std deviation} = \sqrt{\frac{\sum (x - \bar{x})^2}{(n-1)}}$$

$$= \sqrt{\frac{(2-13)^2 + (4-13)^2 + (6-13)^2 + (8-13)^2 + (10-13)^2 + (12-13)^2 + (14-13)^2 + (16-13)^2 + (18-13)^2 + (20-13)^2 + (22-13)^2 + (24-13)^2}{12-1}}$$

$$= \sqrt{\frac{121+81+49+25+9+1+1+9+25+49+81+121}{11}}$$

$$= \sqrt{\frac{572}{11}} = \sqrt{52} = 7.2$$

$$P(8 \leq x \leq 16) = \frac{8-13}{7.2} = \frac{-5}{7.2} = -0.69$$

$$p(16) = \frac{(16-13)}{7.2} = \frac{3}{7.2} = 0.42$$

$$p(8 \pm 16) = -0.697, x \leq 0.42$$

Qn 3

$$a) \bar{x} = \frac{4.5 + 5.0 + 5.5 + 6.0 + 6.5 + 7.0 + 7.5 + 8.0}{8}$$

$$\bar{x} = \frac{50}{8} = 6.25$$

$$\text{Standard deviation} = \sqrt{\frac{\sum (x - \bar{x})^2}{n-1}}$$

$$= \sqrt{\frac{(4.5-6.25)^2 + (5.0-6.25)^2 + (5.5-6.25)^2 + (6.0-6.25)^2 + (6.5-6.25)^2 + (7.0-6.25)^2 + (7.5-6.25)^2 + (8.0-6.25)^2}{8-1}}$$

$$= \sqrt{\frac{3.0625 + 1.5625 + 0.5625 + 0.0625 + 0.0625 + 0.5625 + 1.5625 + 3.0625}{7}}$$

$$= \sqrt{\frac{10.5}{7}} = \sqrt{1.5} = 1.22$$

$$p(4.5) = \frac{4.5 - 6.25}{1.22} = -1.43$$

$$p(5.0) = \frac{5.0 - 6.25}{1.22} = -1.02$$

$$p(5.5) = \frac{5.5 - 6.25}{1.22} = -0.61$$

$$p(6.0) = \frac{6.0 - 6.25}{1.22} = -0.20$$

$$p(6.5) = \frac{6.5 - 6.25}{1.22} = 0.2$$

$$p(7.0) = \frac{7.0 - 6.25}{1.22} = 0.61$$

$$p(7.5) = \frac{7.5 - 6.25}{1.22} = 1.02$$

$$p(8) = \frac{8 - 6.25}{1.22} = 1.43$$

$$\sum p(x) = -1.43 + -1.02 + -0.61 + -0.20 + 0.2 + 0.61 + 1.02 + 1.43 = 0$$

$$\sum p_x = -1.43 + -1.02 + -0.61 + -0.2 + 0.2 + 0.61 + 1.02 + 1.43$$

$$\sum p_x = 0$$

Therefore; the distribution is ~~not~~ proper probability distribution as ~~it does~~ as it does not meet the qualities of a proper probability distribution.

b) Probability that X is greater than 6.

$$\bar{X} = 6.25$$

$$z = \frac{X - \bar{X}}{\sigma} = \frac{6.25 - 6}{1.22} = \frac{+0.25}{1.22} = +0.2$$

c) Probability that X is less than or equal to 6.

$$P(X \leq 6)$$

$$\frac{6 - 6.25}{1.22} = \frac{-0.25}{1.22} = -0.2$$

$$P(X \leq 6) = -0.2$$

d) Probability that X is between 5.5 and 7.

$$\text{at } 5.5 = \frac{5.5 - 6}{1.22} = \frac{-0.5}{1.22} = -0.41$$

$$\text{at } 7 = \frac{7 - 6}{1.22} = 0.81$$

$$P(5.5 \leq X \leq 7) = -0.41 \leq 7, 0.81$$