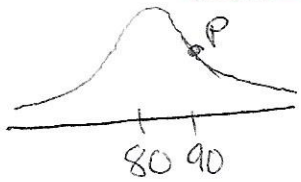
Homework 7 Solutions

1a)



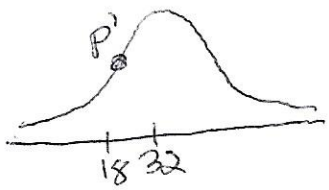
$P = \mu + \sigma \Rightarrow 90 = 80 + \sigma$

$\Rightarrow \boxed{\sigma = 10}$

$Q_1 = \mu - .675\sigma = 80 - .675 \cdot 10 = \boxed{73.25}$

$Q_3 = \mu + .675\sigma = 80 + .675 \cdot 10 = \boxed{86.75}$

b)



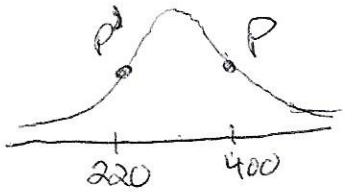
$P' = \mu - \sigma \Rightarrow 18 = 32 - \sigma$

$\Rightarrow \sigma = 32 - 18 = \boxed{14}$

$Q_1 = 32 - .675 \cdot 14 = \boxed{22.55}$

$Q_3 = 32 + .675 \cdot 14 = \boxed{41.45}$

c)



$400 = \mu + \sigma$

$\oplus \quad 220 = \mu - \sigma$

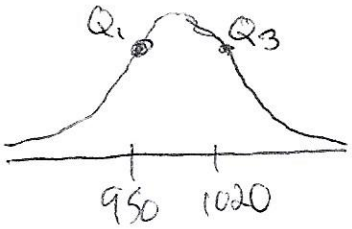
$660 = 2\mu \Rightarrow \boxed{\mu = 310}$

$\sigma = 400 - 310 = \boxed{90}$

$Q_1 = 310 - .675 \cdot 90 = \boxed{249.25}$

$Q_3 = 310 + .675 \cdot 90 = \boxed{370.75}$

d)



$Q_1 = \mu - .675\sigma$

$\oplus \quad Q_3 = \mu + .675\sigma$

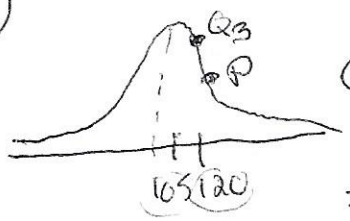
$950 + 1020 = 2\mu \Rightarrow \mu = \frac{950+1020}{2} = \boxed{985}$

~~$Q_3 - Q_1$~~

$Q_3 - Q_1 = 2 \cdot .675\sigma$

$\Rightarrow 1020 - 950 = 1.35\sigma \Rightarrow \sigma = \frac{70}{1.35} = \boxed{51.85}$

e)



$P = \mu + \sigma$

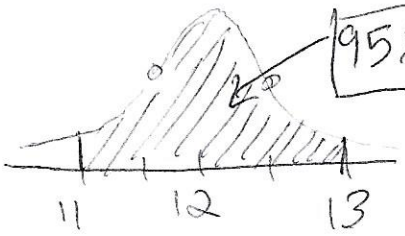
$\ominus \quad Q_3 = \mu + .675\sigma$

$P - Q_3 = .325\sigma \Rightarrow \sigma = \frac{P - Q_3}{.325} = \frac{120-105}{.325} = \boxed{46.15}$

$\Rightarrow \mu = P - \sigma = 120 - 46.15 = \boxed{73.85}$

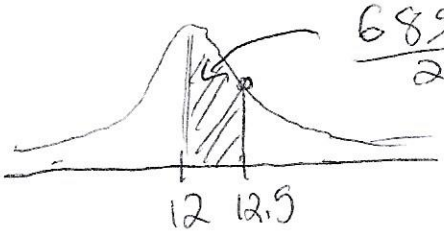
$\Rightarrow Q_1 = \mu - .675\sigma = 73.85 - .675 \cdot 46.15 = \boxed{42.70}$

7a) between 11 and 13



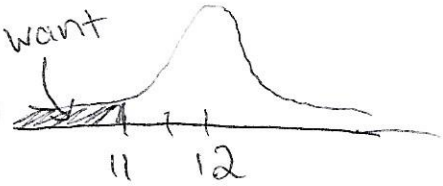
(by 68-95-99.7 Rule)

between 12 and 12.5

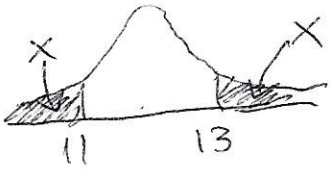


$\frac{68\%}{2} = \boxed{34\%}$ by Rule

~~Between~~ less than 11



Notice

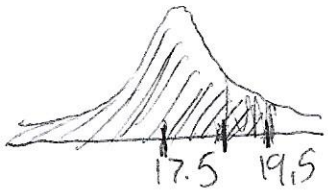


$2x = 100\% - 95\%$

$x = \frac{5\%}{2}$

$x = \boxed{2.5\%}$

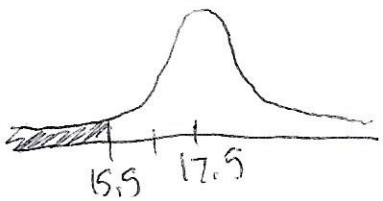
8a)



Percentile means what is the percentage of data below 19.5?

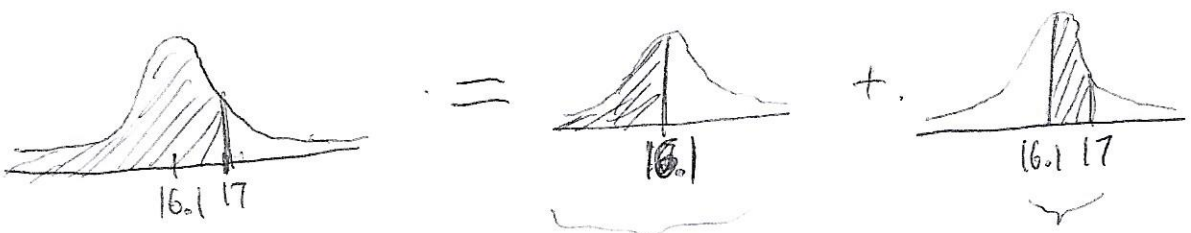
The area above is exactly the 2.5% we calculated in the last problem. Thus the area below is $100\% - 2.5\% = \boxed{97.5\%}$ (97.5^{th} percentile)

b)



The area below is exactly the same as in 3rd bullet of 7a) which was $\boxed{2.5\%}$.

8c)



$$50\% + \frac{68\%}{2}$$

$$= \boxed{84\%}$$

(84th percentile)

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d) Middle 68% of data corresponds to data between $\mu - \sigma$ and $\mu + \sigma$.

$\boxed{(15.2)}$ to $\boxed{(17)}$

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e) Remember $IQR = Q_3 - Q_1$

$Q_3 = 17.5 + .675 \cdot 1 = 18.175$

$Q_1 = 17.5 - .675 \cdot 1 = 16.825$

$\boxed{IQR = 1.35}$

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f)

$$z_{boy} = \frac{18.5 - 17.5}{1} = 1$$

$$z_{girl} = \frac{13.4 - 16.1}{0.9} = -3$$

The magnitude (i.e. ignoring the negative sign) of the z value tells us how "abnormal" the datapoint is.

$\boxed{3 > 1}$ so it is more unlikely for a girl to weigh only 13.4 lbs