6.4

Applications of the Normal Distribution
Finding Data Values Given Probabilities
Determining Normality

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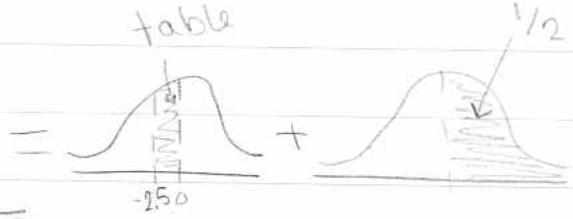
Applications of the Normal Distribution

Recall, $z = \frac{x-\mu}{\sigma}$

(ex) On an exam (normally distributed) the mean was 85, $\sigma = 10$, find percent who passed (over 60)

0. Find z-value, $z = \frac{60-85}{10} = -2.5$

1. Draw picture



$= .4938 + .5$

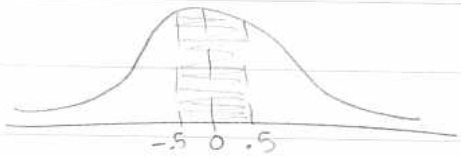
$= \boxed{.9938}$ passed

2. Shade desired area
3. "Chunk" it
4. Add and/or subtract

What percent got a B (between 80 and 90)

0. $z_1 = \frac{80-85}{10} = -.5$ $\quad z_2 = \frac{90-85}{10} = .5$

1.

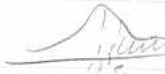


2. Shade
3. "Chunk" it

4. $.1915 + .1915 = \boxed{.383}$

What's P(get A)? (A over 90)

$z = \frac{90-85}{10} = .5$



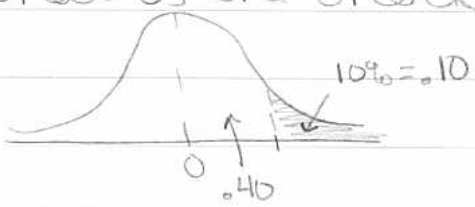
$.5 - .1915 = \boxed{.3085}$

Finding Data Values Given Probabilities

Given a z-value, X is

$X = Z \cdot \sigma + \mu$ $\left(Z = \frac{X-\mu}{\sigma}\right.$, solve for X; $X - \mu = Z\sigma \rightarrow X = Z\sigma + \mu.$)

(ex) Your Dr. tells you that you're in the top 10% for height. Average height is 65 in., $\sigma = 2$ in. What is the shortest you could be?



from table $z = 1.28$

given $z = 1.28$

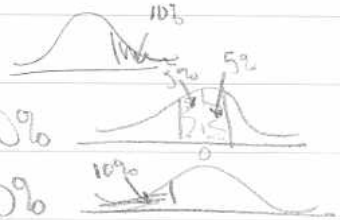
$X = (1.28)(2) + 65 = 67.56 \approx 5'7.5"$ or $1.28 = \frac{X-65}{2}$

$X = 5'7.5"$

Note: top 10%

middle 10%

bottom 10%



Determining Normality

How do we know if data is normal?
Many ways to check, we'll use 2 checks

1. 0 or 1 outliers-OR. (outlier $Q_1-1.5(IQR), Q_3+1.5(IQR)$)
2. $-1 < PI < 1$

PI = Pearson's Index of Skewness
$= \frac{3(\bar{x} - \text{median})}{s}$

ex) 5, 7, 8, 9, 10, 11, 11, 13, 14
$\bar{x} = 9.\overline{7}$ $s = 2.8626$ median = 10
$PI \cong \frac{3(9.\overline{7}-10)}{2.8626} \approx -.2329$
So data is approximately normal

ex) 1, 1, 1, 2, 2, 2, 2, 2, 3, 4, 5, 6, 7, 8
$PI \cong \frac{3(3.2857-2)}{2.335} = 1.65$ so data is NOT normal.

There are other methods.