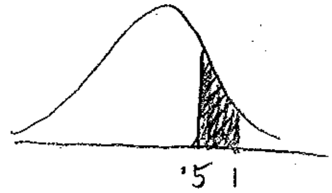
Stat 1040 Recitation 3 Solutions

1. Scores on a math test follow the normal curve with an average of 75 and an SD of 10.

(a) What percentage of the children scored between 80 and 85?

standard units: $\left.\begin{array}{l} \dfrac{80-75}{10} = 0.5 \\ \dfrac{85-75}{10} = 1 \end{array}\right\}$ so



From the tables:

38.29% ≈ 38%

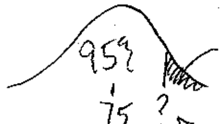
68.27% ≈ 68%

so if we remove the middle bit:

68 − 38% = 30%

so each part is <u>15%</u>

(b) If my daughter is at the 95th percentile, what is her score?



so the complete picture is:

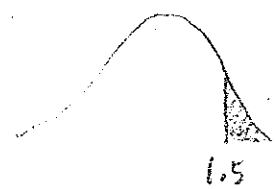
From the tables, we get $z = 1.65$ because

90.11% ≈ 90%

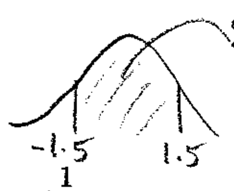
So she is 1.65 SDs above the average and so her score is $75 + (1.65)(10) = \underline{91.5}$

(c) If my daughter's friend scored 90, what percentage of children scored higher than my daughter's friend?

standard units: $\dfrac{90-75}{10} = 1.5$



From the tables



86.64% ≈ 87%

So there is 13% in <u>both</u> tails

so each tail is about <u>6.5%</u>

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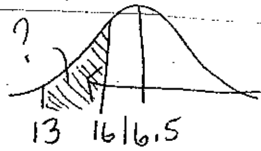
2. The lengths of 212 trout are measured. A histogram of their lengths follows the normal curve, and the average length is 16.5 cm, with an SD of 4.8 cm.

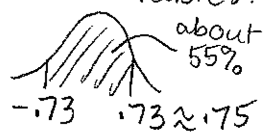
(a) Estimate the percentage of these trout that are between 13.0 cm and 16.0 cm in length.



standard units: $\frac{13-16.5}{4.8} = -.73$

$\frac{16-16.5}{4.8} = -.10$

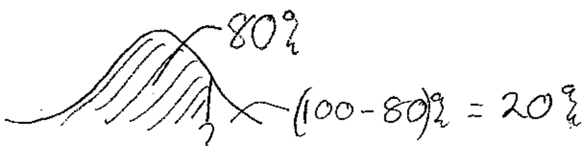
From the tables:



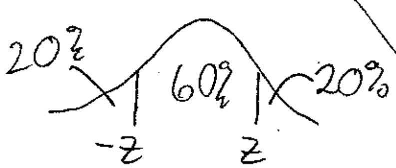
Subtracting the inside gives: 55-8 = 47%

and dividing by 2 gives $\frac{47}{2} = \underline{\underline{23.5\%}}$

(b) Find a length such that about 80% of the trout are shorter than this length.



so the complete picture is:



Each tail must be 20% so they take up 40% and it leaves 60% for the middle (total has to be 100%)

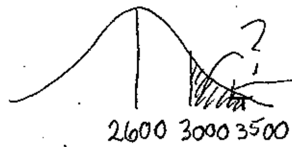
From the tables, $z = .85$

So the length is

$16.5 + (.85)(4.8) = \underline{\underline{20.6}}$

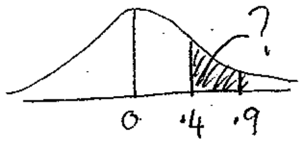
3. The average size of Cache Valley homes that are currently for sale is 2,600 square feet and the SD is 1,000 square feet.

(a) Using the normal curve, estimate the percentage of these homes that are between 3,000 and 3,500 square feet.

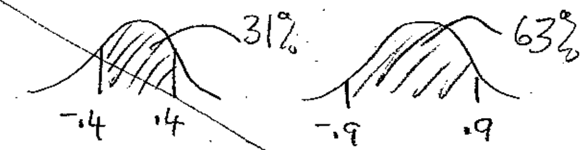


standard units: $\frac{3000-2600}{1000} = .4$

$\frac{3500-2600}{1000} = .9$



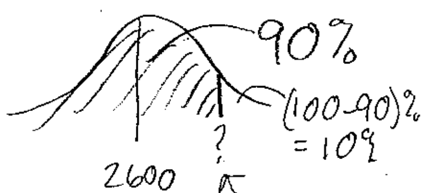
From the tables:



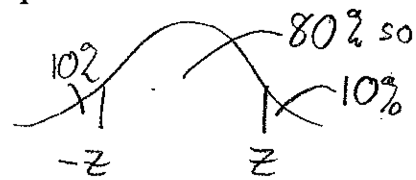
Subtracting the middle gives:

$63-31=32\%$ and dividing by 2 gives: $\frac{32}{2}=16\%$

(b) Using the normal curve, estimate the 90th percentile of home size.



so



From the tables, $z = 1.3$

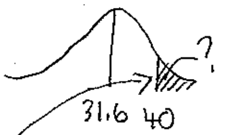
so the 90th percentile is

$2600 + (1.3)(1000) = \underline{3900}$

4. In one of the early rounds of the winter olympics men's 5000 meter speedskating competition, the average time is 6 minutes 31.6 seconds and the SD is 10.9 seconds.

   (a) Assuming that the times follow the normal curve, find the percentage of skaters who would take longer than 6 minutes and 40 seconds to finish the race.

subtracting the 6 mins:



standard units $\frac{40-31.6}{10.9} = 0.77$

From the tables:

so that leaves $(100-55)\% = 45\%$ spread between the two tails, i.e. $\frac{45\%}{2} = \underline{\underline{22\frac{1}{2}\%}}$ in the right hand tail.

   (b) Using the normal curve, find a skater's time if 80% of the skaters take longer than him.

$(100-80)\% = 20\%$

So the complete picture is

as in 2(b)

From the tables $z = .85$

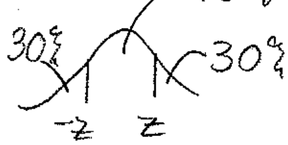
but now we subtract: 6 mins 31.6 secs $- (.85)(10.9)$
(because

$= \underline{\underline{6 \text{ mins } 22.3}}$ secs

5. GRE scores are known to follow the normal curve with an average of 497 and an SD of 115. A graduate school program in English will admit only students whose GRE score is in the top 30%. What is the lowest GRE score they will accept?

$(100-30)\% = 70\%$

so the complete picture is



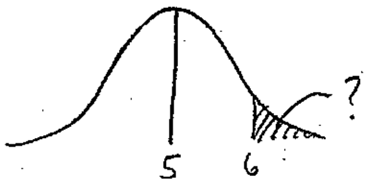
40% so it adds to 100%

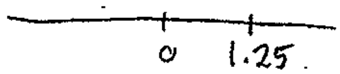
From the tables, $z = .5$ so the score is $497 + (.5)(115)$

$= \underline{\underline{554.5}}$

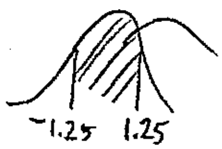
6. A grocery store carries a variety of "on the vine" tomatoes with an average weight of 5.0 ounces and an SD of 0.8 ounces. The weights of these tomatoes follow the normal curve.

(a) (6 points) What percentage of them would weigh more than 6.0 ounces?





$\frac{6-5}{.8} = 1.25$

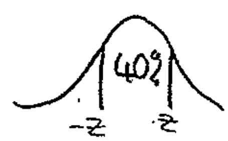


78.87% (tables)

so $\frac{100 - 78.87}{2} = \underline{\underline{10.6}}\,\%$

(b) (6 points) Estimate the 30th percentile of their weights.

30% in this side so



From the tables, we get $z = .55$ and we want the negative version, so

weight $= (-.55)(.8) + 5.0 = 4.56 \approx 4.6$ ounces.

It's also OK to use $z = .5$ so

weight $= (-.5)(.8) + 5.0 = 4.6$ ounces.

7. Which would be larger, the correlation between height and weight of 3-year-olds or the correlation between height and weight of 18-year-olds? Explain.

Correlation between height + weight of 3-year-olds should be larger because weight is more easily predicted from height at age 3 than at age 18.