

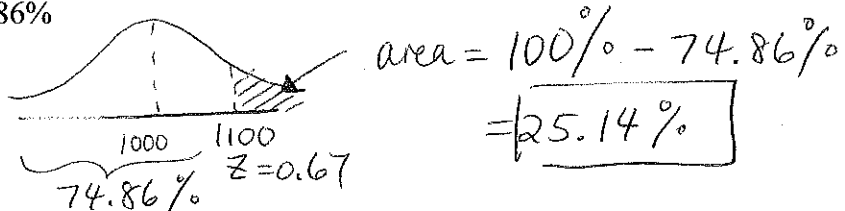
**Question 1 (35 points):** 3. (Hypothetical) An engineer knows from prior records that the distribution of weight on an elevator in an apartment building for each lift last year is approximately normal, with an average weight of 1000 lbs and a standard deviation of 150 lbs. He wants to design a new elevator for the building.

**a) (7 points):** What percentage of the time did the elevator lift more than 1100 lbs?

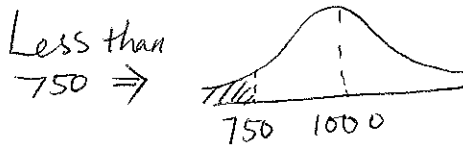
$$z = (1100 - 1000) / 150 = 0.67$$

Normal table  $\Rightarrow$  74.86%

More than 1100  $\Rightarrow$



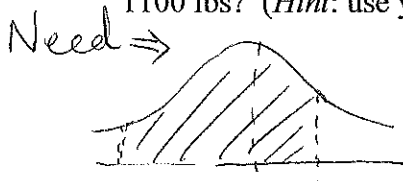
**b) (7 points):** What percentage of the time did the elevator lift less than 750 lbs?



$$z = \frac{750 - 1000}{150} = -\frac{250}{150} = -1.67$$

Normal table  $\Rightarrow$  4.75%

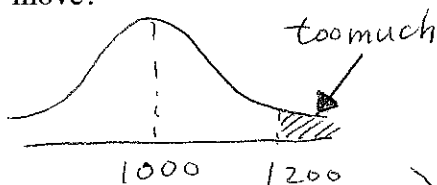
**c) (7 points):** What percentage of the time did the elevator lift between 750 and 1100 lbs? (Hint: use your answers in part a) and b) to make this easy!)



$$z = -1.67 \quad z = 0.67$$

$$100\% - 25.14\% - 4.75\% = \boxed{70.11\%}$$

**d) (7 points):** If the elevator's maximum load capacity was 1200 lbs, what percentage of the time was there too much weight on the elevator for it to safely move?

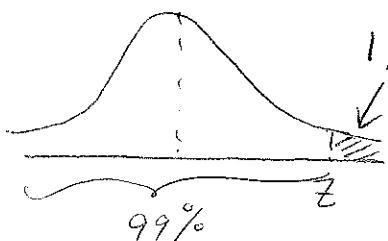


$$z = \frac{1200 - 1000}{150} = 1.33$$

Table  $\Rightarrow$  90.82% on the left

$$\text{Area} = 100 - 90.82\% = \boxed{9.18\%}$$

**e) (7 points):** The engineer designing the new elevator would want to make the maximum load capacity \_\_\_\_\_ lbs to ensure that there was only a 1% chance that the elevator would be overloaded.



1% overloading  $\Rightarrow$  Need to find  $z$ :  
Area to the left of  $z$  is 99%  
table  $\Rightarrow$  2.33

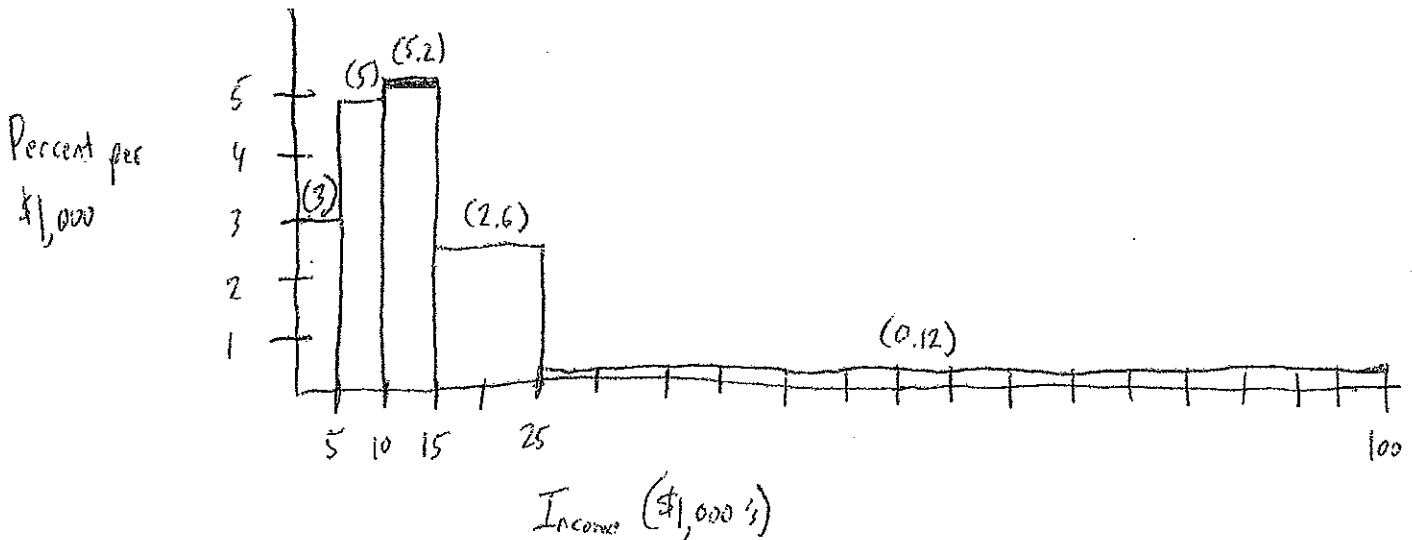
So unstandardize:

$$\text{actual} = 2.33 \times 150 + 1000 = \boxed{1349.50 \text{ lbs}}$$

**Question 3 (30 points):** The following table shows the distribution of families by income in the US in 1973:

Income Level	Percent	height (per \$1,000)
\$0 - \$5,000	15	3
\$5,000 - \$10,000	25	5
\$10,000 - \$15,000	26	5.2
\$15,000 - \$25,000	26	2.6
\$25,000 - \$100,000	9	0.12

a) (10 points) Draw a relative frequency histogram for the data. Label your axes.



b) (10 points) Were there likely more families with incomes of \$12,000 - \$13,000 or \$20,000 - \$21,000?

$\$12,000 - \$13,000$

c) (10 points) If a government official wanted to portray Americans as having high incomes, should he use the average or the median as a central tendency measure? (Hint: from looking at the histogram, which one should be higher?)

He should use the average, as the average is higher due to the long tail.