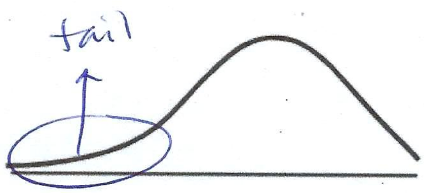
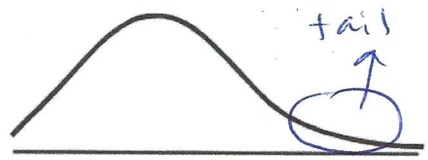
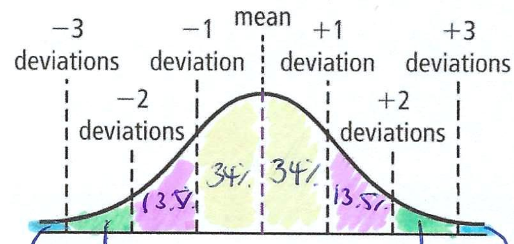
3.4 – The Normal Distribution

– **continuous probability distribution** → occurs when the outcome can be any value in an interval

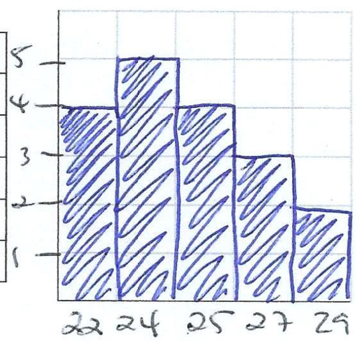
- Never represented by a histogram (bar graph where there are no gaps)
- Always represented by a curve, below are some examples of these… ("Bell curve")

Negatively Skewed **Distribution**	Positively Skewed **Distribution**	Normal **Distribution**
tail  "tail points left"	tail  "tail points right"	

Example 1: Using the given table, make a histogram. Determine if the type of distribution. If it's a normal distribution – draw a normal curve with at least 3 standard deviations.

a.)

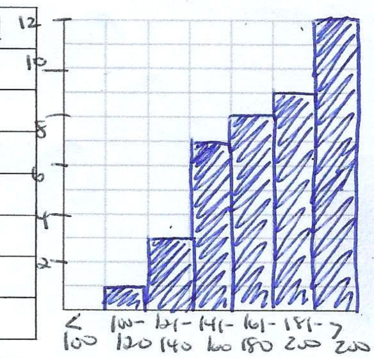
Value	Frequency
22	4
24	5
25	4
27	3
29	2



Type of Distribution: Positively Skewed

b.)

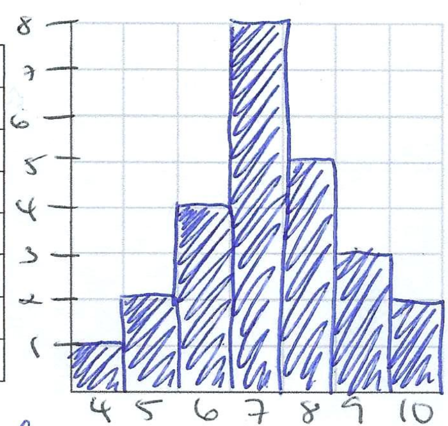
Price	No. Sold
< $100	0
$100 – $120	1
$121 – $140	3
$141 – $160	7
$161 – $180	8
$181 – $200	9
> $200	12

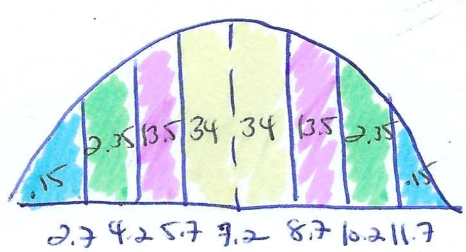


Type of Distribution: Negatively Skewed

c.) (Frequency Table)

Shoe Size	No. of Students
4	1
5	2
6	4
7	8
8	5
9	3
10	2





Type of Distribution: Normal (Bell Curve Shape)

$\bar{x} = 7.2$ (mean)

$\sigma = 1.5$ (std. dev)

Example 2: Use the Normal Distribution Curve to complete each problem.

a.) The shelf-life of a particular dairy product has a mean of 12 days and a standard deviation of 3 days.

i.) What percent of products last between 3 and 12 days?

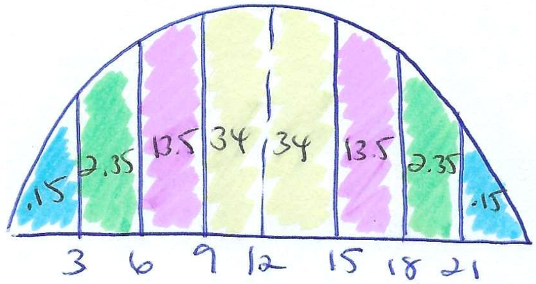
$2.35 + 13.5 + 34 = \boxed{49.85\%}$

ii.) What percent of products last between 6 and 21 days?

$13.5 + 34 + 34 + 13.5 + 2.35 = \boxed{97.35\%}$

iii.) What percent of products last more than 18 days?

$2.35 + .15 = \boxed{2.5\%}$



b.) The scores on a test given to 150 employees have mean of 100 and a standard deviation of 15.

i.) How many employees scored less than 115?

$.15 + 2.35 + 13.5 + 34 + 34 = 84\%$

$\rightarrow .84(150) = \boxed{126 \text{ people}}$

ii.) How many employees scored between 55 and 85?

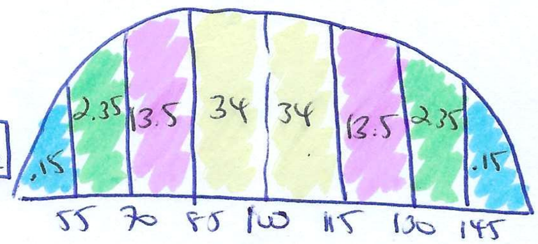
$2.35 + 13.5 = 15.85\%$

$\rightarrow .1585(150) = 23.8 \approx \boxed{\text{about } 23 \text{ people}}$

iii.) How many employees scored greater than 130?

$2.35 + .15 = 2.5\%$

$\rightarrow .025(150) = 3.8 \approx \boxed{\text{about } 3 \text{ people}}$



c.) People at a local lake resort prefer the lake to have a specific surface temperature. The lake's temperature is normally distributed with a mean of 82° and a standard deviation of 4.2°.

i.) If 80 people prefer the temperature to be at least 86.2°, how many people are at the resort?

$13.5 + 2.35 + .15 = 16\%$

$\rightarrow \frac{.16x}{.16} = \frac{80}{.16}$ so $x = 500 \rightarrow \boxed{\text{500 people at resort}}$

ii.) If 611 people prefer the temperature to be between 77.8° and 90.4°, how many people are at the resort?

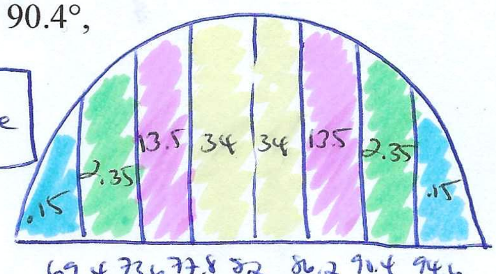
$34 + 34 + 13.5 = 81.5\%$

$\rightarrow \frac{.815x}{.815} = \frac{611}{.815}$ so $x = 749.7 \rightarrow \boxed{\text{about 749 people at resort}}$

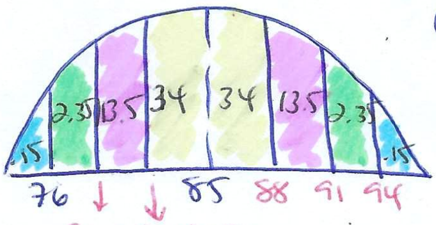
iii.) If 24 people prefer the temperature to be at most 90.4° how many people are at the resort?

$.15 + 2.35 + 13.5 + 34 + 34 + 13.5 = 97.5\%$

$\rightarrow \frac{.9735x}{.9735} = \frac{24}{.9735}$ so $x = 24.6 \rightarrow \boxed{\text{about 24 people at resort}}$



d.) In a set of test scores that are normally distributed, a test score of 76 is 3 standard deviations below the mean of 85. What percent of people scored between 82 and 94?



82−3 = 79 85−3 = 82

① $85 - 76 = 3D$

$\frac{9}{3} = \frac{3D}{3}$

$D = 3$

std dev = 3

② $34 + 34 + 13.5 + 2.35$

$= \boxed{83.85\%}$