## Mean, Standard Deviation and the Normal Model (Bell Curve)

Do now: What is the probability of failing a quiz if you guess on each one and the choices are $A, B, C$ or $D$ ? There are 10 questions. What is the Probability of passing?

Find the mean, median and mode of the following set of grades:

80,82, 56, 72, 90, 83, 92, 98

Who knows what Standard Deviation is and how to find it? 80,82, 56, 72, 90, 83, 92, 98<br>\section*{Calculator Steps:}<br>- Hit STAT, ENTER<br>- Enter the data values in $\mathbf{L}_{1}$<br>- Hit STAT<br>- Arrow over to CALC<br>- Choose \#1:1-Var Stats<br>- Hit ENTER<br>- Scroll down to find $\sigma$<br>- Square to find $\sigma^{2}$



The Empirical Rule

In a normal distribution with mean $\mu$ and standard deviation $\sigma$ :

- Approximately $\qquad$ of the data falls within $1 \sigma$ of the mean.
- Approximately $\qquad$ of the data falls within $2 \sigma$ of the mean.
- Approximately $\qquad$ of the data falls within $3 \sigma$ of the mean.



Directions: Draw and label normal distribution curves, then answer the questions.

1. The weights of the 50 football players are normally distributed with a mean of 178 pounds and a standard deviation of 8 pounds.

a) What percent of the players weigh between 178 lbs and 194 lbs ?
b) What is the probability that a player weighs at most 170 lbs ?
c) What is the probability that a player weighs less than 162 lbs or greater than 194 lbs ?
d) How many players weight between 170 lbs and 186 lbs ?


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2. A set of 120 test scores are normally distributed with a mean of 82 and a standard deviation of 5.

3. The price of a gallon of regular gasoline at 75 gas stations across the state is normally distributed with a mean of $\$ 2.05$ and a standard deviation of $4 \not \subset$.

a) What percent of the scores are between 72 and 87 ?
b) What is the probability that a score is greater than 77?
c) What is the probability that a score is less than 82 or greater than 92?
d) About how many students scored outside two standard deviations of the mean?
a) What percent of gas stations sell a gallon of regular gas for less than $\$ 1.97$ ?
b) What percent of gas stations sell a gallon of regular gas for at least \$2.17?
c) What is the probability that a gas station sells a gallon of regular gas for less than $\$ 1.97$ or greater than $\$ 2.05$ ?
d) About how many stations sell a gallon of regular gas for no more than $\$ 2.01$ ?


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4. Mrs. Fuller recently tested her 120 keyboarding students to see how many words per minute they can type. The results were normally distributed with a mean of 45 and a standard deviation of 6 .

a) About how many students can type at least 39 words per minute?
b) About how many students can type within one standard deviation of the mean?
c) Students need to be in the top $2 \%$ in order to be eligible for the national typing competition. If Carla can type 56 wpm , is she eligible?

## Steps on the Calculator

1) 2nd VARS (this will take you to Distributions)
2) 2 (Normalcdf)
3) Put in the lowest and highest values as well as the mean and standard deviation.
4) Press Enter (maybe twice)

Name: $\qquad$ Unit 11: Probability \& Statistics


Date: $\qquad$ Bell: $\qquad$ Homework 5: Measures of Center, Variation, and Normal Distribution

* This is a 2-page document! **

Directions: Find the mean, median, and mode of each data set below.

1. $\{11,14,11,5,17,28,3\}$
2. $\{24,29,31,16,49,52,29,35,62,29\}$

| Mean | $=$ |
| ---: | :--- |
| Median | $=$ |
| Mode(s) | $=$ |

Mean = $\qquad$
Median = $\qquad$
Mode(s) = $\qquad$
Directions: Find the mean absolute deviation, variance, and standard deviation for each data set.
3. The following data shows the number of fish caught by a seven boy scouts on their camping trip: $\{1,2,2,4,5,6,8\}$

MAD $=$ $\qquad$
Variance: $\boldsymbol{\sigma}^{\mathbf{z}}=$
Standard Deviation: $\boldsymbol{\sigma}=$ $\qquad$
4. The following data shows the points scored by a football team during their first ten games of the season: $\{27,32,41,9,14,20,31,33,20,13\}$

MAD $=$ $\qquad$
Variance: $\boldsymbol{\sigma}^{\mathbf{2}}=$ $\qquad$
Standard Deviation: $\boldsymbol{\sigma}=$ $\qquad$
5. The following data shows the high temperature for the past eight days:
$\{66,46,53,50,52,47,45,49\}$

MAD = $\qquad$
Variance: $\boldsymbol{\sigma}^{\mathbf{2}}=$ $\qquad$
Standard Deviation: $\boldsymbol{\sigma}=$ $\qquad$
6. The following data shows the price of six different jars of pasta sauce at the grocery store: \{\$2.79, \$1.99, \$4.29, \$2.49, \$2.29, \$3.49\}

MAD = $\qquad$
Variance: $\boldsymbol{\sigma}^{\mathbf{2}}=$ $\qquad$
Standard Deviation: $\boldsymbol{\sigma}=$ $\qquad$

For questions 7 and 8, draw the normal distribution curve, then answer the questions.
7. A set of 125 golf scores are normally distributed $\quad$ a) What percent of the scores are between 67
with a mean of 76 and a standard deviation of 3.

8. The talk-time battery life of a group of cell phones is normally disributed with a mean of 5 hours and a standard deviation of 15 minutes.

and 85 ?
b) What is the probability that a score is no more than 79 ?
c) About how many scores fell between one standard deviation of the mean?
a) What percent of the phones have a battery life of at least 4 hours and 45 minutes?
b) What percent of the phones have a battery life between 4.5 hours and 5.25 hours?
c) What percent of the phones have a battery life less than 5 hours or greater than 5.5 hours?
9. The number of hours that the employees at the grocery store worked last week is normally distributed with a mean of 24 and a standard deviation of 6 . If there are 60 total employees, approximately how many worked at least 30 hours last week?
10. The grade point average (GPA) of the students at Lakeview High School is normally distributed with a mean of 3.1 and a standard deviation of 0.3 . If there are 1800 students enrolled at the school, approximately how many have a GPA between 2.5 and 3.7?

Name: $\qquad$

## Unit 11: Probability \& Statistics



Date: $\qquad$ Bell: $\qquad$ Homework 5: Measures of Center, Variation, and Normal Distribution
** This is a 2-page document **

| 1. $\{11,14,11,5,17,28,3\}$ | 2. $\{24,29,31,16,49,52,29,35,62,29\}$ |
| :---: | :---: |
| 3, 5, 11, 11, 14, 17, 28 | $16,24,29,29,29,31,35,49,52,62$ |
| Mean $=\|2.7\|$ | Mean $=35.6$ |
| Median $=11$ | Median $=30$ |
| Mode(s) = 11 | Mode(s) = 29 |

Directions: Find the mean absolute deviation, variance, and standard deviation for each data set.
3. The following data shows the number of fish caught by a seven boy scouts on their camping trip:
$\{1,2,2,4,5,6,8\} \quad$ Mean $=4$
$3+2+2+0+1+2+4$
7
MAD = $\qquad$ 2 Variance: $\sigma^{2}=5.43$ standard Deviation: $\sigma=2.33$
4. The following data shows the points scored by a football team during their first ten games of the season: $\{27,32,41,9,14,20,31,33,20,13\} \quad$ Mean $=24$


MAD $=8.6$
Variance: $\sigma^{2}=97.02$ Standard Deviation: $\sigma=9.85$
5. The following data shows the high temperature for the past eight days: $\{66,46,53,50,52,47,45,49\}$ mean $=51$
$15+5+2+1+1+4+6+2$
8

$$
\begin{aligned}
\text { MAD } & =\frac{4.5}{3} \\
\text { Variance: } \sigma^{2} & =38.94 \\
\text { Standard Deviation: } \sigma & =6.24
\end{aligned}
$$

6. The following data shows the price of six different jars of pasta sauce at the grocery store: $\{\$ 2.79, \$ 1.99, \$ 4.29, \$ 2.49, \$ 2.29, \$ 3.49\}$ mean $=2.89$
```
    .10+.90+1.40+.40+.60+.60
```

$\mathrm{MAD}=0.67$
Variance: $\boldsymbol{\sigma}^{\mathbf{2}}=0.61$
Standard Deviation: $\sigma=0.78$
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## For questions 7 and 8, draw the normal distribution curve, then answer the questions.

7. A set of 125 golf scores are normally distributed 3.

a) What percent of the scores are between 67 and 85 ?

$$
99.89
$$

b) What is the probability that a score is no more than 79 ?

$$
84.1 \%
$$

c) About how many scores fell between one standard deviation of the mean?

$$
\begin{aligned}
& 68.2 \% \text { of } 125=85.25 \\
& \text { About } 85 \text { scores }
\end{aligned}
$$

8. The talk-time battery life of a group of cell phones is normally disributed with a mean of 5 hours and a standard deviation of 15 minutes.

a) What percent of the phones have a battery life of at least 4 hours and 45 minutes?
( 285 min )

$$
84.1 \%
$$

b) What percent of the phones have a battery life between 4.5 hours and 5.25 hours?
( $270 \mathrm{~min}-315 \mathrm{~min}$ )

$$
81.8 \%
$$

c) What percent of the phones have a battery life less than $\mathbf{5}$ hours or greater than 5.5 hours?
$\begin{array}{ll}<300 \mathrm{~min}=50 \\ >330 \mathrm{~min}=2.3 & 52.370\end{array}$
$>330 \mathrm{~min}=2.3$
9. The number of hours that the employees at the grocery store worked last week is normally distributed with a mean of 24 and a standard deviation of 6 . If there are 60 total employees, approximately how many worked at least 30 hours last week?

$$
\begin{array}{ll}
\mu=24 & 15.9 \%_{0} \text { of } 60=9.54 \\
+1 \sigma=30 & \text { About 9 employecs }
\end{array}
$$

10. The grade point average (GPA) of the students at Lakeview High School is normally distributed with a mean of 3.1 and a standard deviation of 0.3. If there are 1800 students enrolled at the school, approximately how many have a GPA between 2.5 and $3.7 ?$
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2.5}\leftarrow2.8<3.1->3.4->3.
-2\sigma -\sigma 杖 t\sigma +2\sigma 9. 95.4%
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