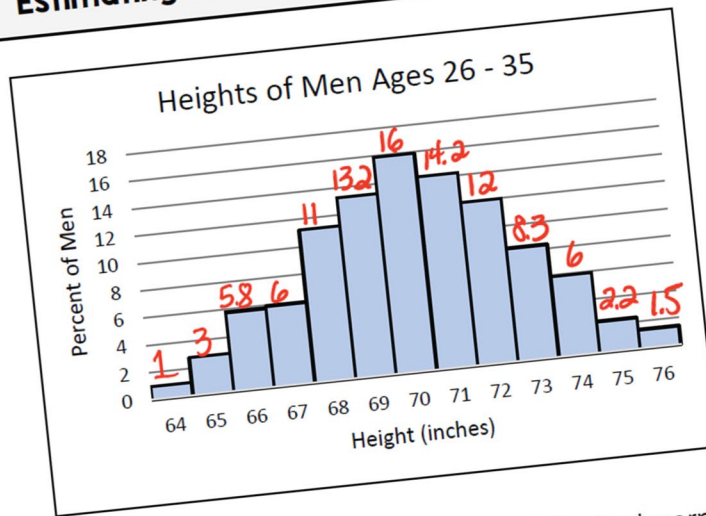


Algebra 2 Honors

Data Analysis



Estimating Probabilities Using a Normal Curve



EX #1: In a survey of American men, the heights are distributed normally about the mean, as shown in the graph above.

aged 26 to 35 are 68 – 70 inches tall?

Guided Notes

13

Completely Editable

ALGEBRA 2 CURRICULUM

Scope and Sequence

Unit I3: Data Analysis & Statistics

Lesson	Skills & Learning Objectives
[13.1] Measures of Central Tendency	☐ Calculate measures of central tendency ☐ Draw, analyze, and interpret box-and-whisker plots ☐ Find outliers
[13.2] Analyzing Data	☐ Find range, interquartile range, standard deviation of a set of data, variance, z-scores ☐ Use standard deviations to help interpret representations of real-world applications
[13.3] Working With Samples	☐ Analyze experimental data to find sample proportions ☐ Determine the margin of error ☐ Determine bias and reliability of samples and categorize types of sampling from different scenarios
[13.4] Binomial Distributions	☐ Use the Binomial Theorem to expand binomials ☐ Determine binomial probabilities ☐ Use binomial distributions to determine probabilities
[13.5] Normal Distributions	☐ Interpret data by using a normal distribution ☐ Interpret data by using the standard normal curve ☐ Calculate standard deviations when outcomes are normally distributed and analyze real-world data ☐ Make predictions based on the standard normal curve
[13.6] Confidence Intervals and Hypothesis Testing	☐ Find confidence intervals for normally distributed data ☐ Perform hypothesis tests on normally distributed data

EX #2: Find the mean, median, and mode for these values:

3.4, 4.1, 3.5, 3.7, 2.8, 5.2, 2.6

Real-World Application

EX #3: The table below shows the water temperatures in the Southeastern Atlantic Ocean. Find the mean, median, and mode of all the water temperatures listed.

Location	J	F	M	A	M	J	J	A	S	O	N	D
Myrtle Beach, SC	48	50	55	64	73	78	82	83	80	70	61	53
Charleston, SC	50	50	57	66	73	79	83	84	81	71	63	54
Daytona Beach, FL	61	59	65	71	76	79	80	81	83	78	71	65
Savannah Beach, GA	51	52	59	67	74	80	85	85	82	73	64	54
St Augustine Beach, FL	57	56	61	69	75	80	83	83	83	75	67	60
Miami Beach, FL	71	73	75	78	80	84	86	85	84	81	76	73

SOURCE: <http://www.nodc.noaa.gov/>

STEP 1: Use the STAT feature to enter all data in L1.

STEP 2: Use the LIST feature to access the MATH menu. Find the mean.

```
NAMES OPS MATH
1:min(
2:max(
3:mean(
4:median(
5:sum(
6:prod(
7:stdDev(
```

```
mean(L1)
70.80555556
```

STEP 3: Return to the same menu to find the median.

```
NAMES OPS MATH
1:min(
2:max(
3:mean(
4:median(
5:sum(
6:prod(
7:stdDev(
```

```
median(L1)
73
```

Lesson I3.2: Analyzing Data

Term	Definition
Measures of Variation	Describe how the data in a data set are spread out (range, interquartile range, standard deviation).
Range	The difference between the greatest and least values.
Variance	The average of the squared differences from the mean (how the data is spread out from the mean).
Interquartile Range	IQR is the difference between the 1 st and 3 rd quartiles, the middle 50% of the data.
Standard Deviation	A measure of how each value in a data set varies, or deviates, from the mean. The Greek letter σ (sigma) represents standard deviation. 1. Find the mean of the data set: $\bar{x}$ 2. Find the difference between each value and the mean: $x - \bar{x}$ 3. Square each difference: $(x - \bar{x})^2$ 4. Find the average (mean) of these squares: $\frac{\Sigma(x - \bar{x})^2}{n}$ 5. Take the square root to find the standard deviation. $\sigma = \sqrt{\frac{\Sigma(x - \bar{x})^2}{n}}$
Z-Score	The number of standard deviations that a value is from the mean. $z\text{-score} = \frac{\text{value} - \text{mean}}{\text{standard deviation}}$

Real-World Connection

EX #1: Fifteen men qualified for a local golf tournament. Find the range and the interquartile range of their ages.

43, 36, 52, 46, 38, 29, 31, 44, 41, 53, 49, 47, 37, 32, 37

Classifying a Sample

EX #1: What type of sampling is represented in each scenario?

- A.** The editor of a skateboarding magazine wants to find the readers' favorite places to skateboard. The latest edition of the magazine included a survey card, and 429 readers completed the survey and returned the card.
- B.** The student council dance committee of 5 students is going to survey their five homeroom classes to determine whether to hire a band or a DJ for the upcoming Valentine Dance.
- C.** A state senator randomly selects 200 voters from each county to call regarding issues related to upcoming legislation.
- D.** A research group selects every 20th person on a list of registered voters in a state to call about their intentions to vote in the next election.
- E.** A national news anchor stands in Time Square on New Year's Eve to question people about their New Year's resolutions.

Bias in Data Collecting

When a part of a population is underrepresented or overrepresented in a sample, the sample is said to be **biased**. By choosing a random sample experiment, researchers can help avoid bias in gathering data.

EX #2: A local news program reports on a proposed gas tax increase to be spent on new roads and bridges in the county. The program wants to identify what percent of the population in its viewing area favors the tax increase. **Identify any bias in each sampling method.**

- A.** A reporter is sent to interview people on the street near the county courthouse.

Lesson 13.4: Binomial Distributions

BINOMIAL EXPERIMENT – has four important features. **B.I.N.S.**

- ☐ Binary? The possible outcomes of a trial is success or failure.
- ☐ Independent? Trials must be independent of each other.
- ☐ Number? The number of trials, n must be fixed in advance.
- ☐ Success? The probability of success, p on each trial remains constant.

Pascal's Triangle

Pascal's Triangle	Combinations (Binomial Coefficients)	Binomial Expansion
1	${}_0C_0$	$(x + y)^0 = 1$
1 1	${}_1C_0$ ${}_1C_1$	$(x + y)^1 = x + y$
1 2 1	${}_2C_0$ ${}_2C_1$ ${}_2C_2$	$(x + y)^2 = x^2 + xy + y^2$
1 3 3 1	${}_3C_0$ ${}_3C_1$ ${}_3C_2$ ${}_3C_3$	$(x + y)^3 = x^3 + 3x^2y + 3xy^2 + y^3$

BINOMIAL THEOREM

For any whole number n ,

$$(x + y)^n = {}_nC_0x^n y^0 + {}_nC_1x^{n-1}y^1 + {}_nC_2x^{n-2}y^2 + \dots + {}_nC_{n-1}x^1y^{n-1} + {}_nC_nx^0y^n$$

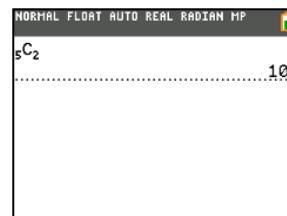
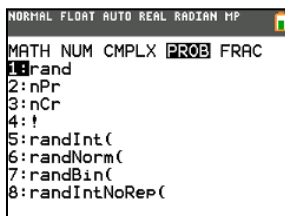
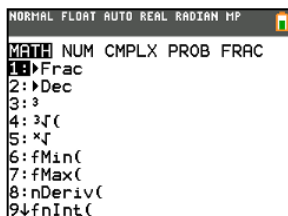
BINOMIAL PROBABILITY

if a binomial experiment has n trials in which p is the probability of success and q is the probability of failure in any given trial, then the **binomial probability** that there will be exactly r success is:

$$P(r) = {}_nC_r \cdot p^r \cdot q^{n-r}$$

Expanding Binomials

To find a binomial coefficient like ${}_5C_2$ on the TI-84; press MATH, arrow over to PROB, choose 3: ${}_nC_r$, press 5, arrow right, press 2 click ENTER.



EX #1: Use the Binomial Theorem to expand each binomial.

A. $(x + y)^4$

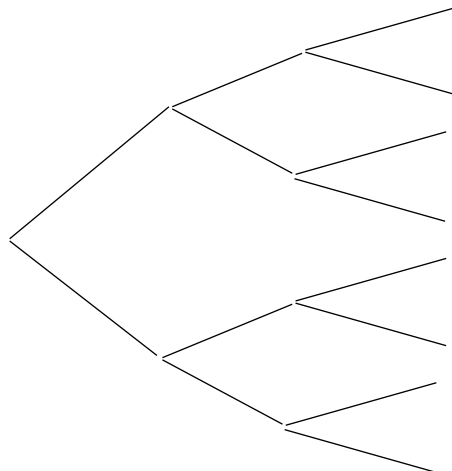
B. $(2m + n)^3$

C. $(a - 2b)^4$

Tree Diagrams

You can use a tree diagram to analyze binomial probabilities.

EX #2: A store is giving away scratch-off cards with prizes. A prize will appear on 40% of the cards. Suppose you have three cards. Find the probability that exactly two of the three cards will contain a prize.



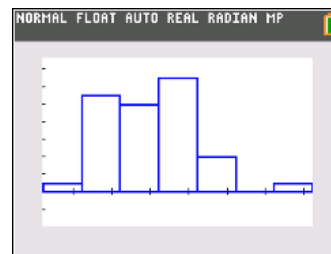
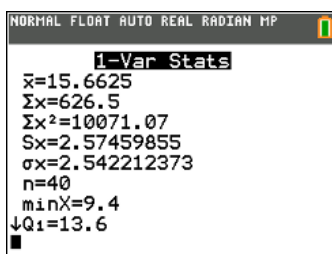
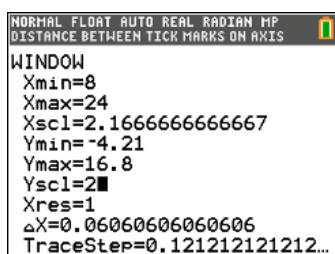
Sketching a Normal Curve

EX #2: The table below shows the lengths, in feet, of 40 great white sharks from Scuba News Magazine.

18.2	16.4	13.2	19.1	16.2	12.3	15.8	16.7	18.6	17.8
14.3	22.8	16.2	16.6	15.7	9.4	12.6	13.6	13.8	18.3
17.8	14.6	15.7	18.2	13.2	12.2	15.8	19.7	13.6	15.2
14.9	18.7	15.3	17.6	13.5	16.8	16.1	12.1	14.7	13.2

A. Enter these data items into your calculator and make a histogram.

B. Calculate one-variable statistics.



C. Sketch a normal curve showing the frequency of the shark lengths. Label the x-axis values at one, two, and three standard deviations from the mean.

