Algebra I
12-2: Frequency and Histograms

Name ____________________
Date ____________ Class Period ______

Learning Target: Today you will be able to MAKE AND INTERPRET FREQUENCY TABLES AND HISTOGRAMS

Question/Main Ideas: | **Notes:**

Example 1: Making a Frequency Table

The number of home runs by the batters in a local home run derby are listed below. What is a frequency table that represents the data?

7 17 14 2 7 9 5 12 3 10 4 12 7 15

Home Runs	Frequency
2-5	4
6-9	4
10-13	3
14-17	3

Choose a equal range for each row.

Definition: Histogram

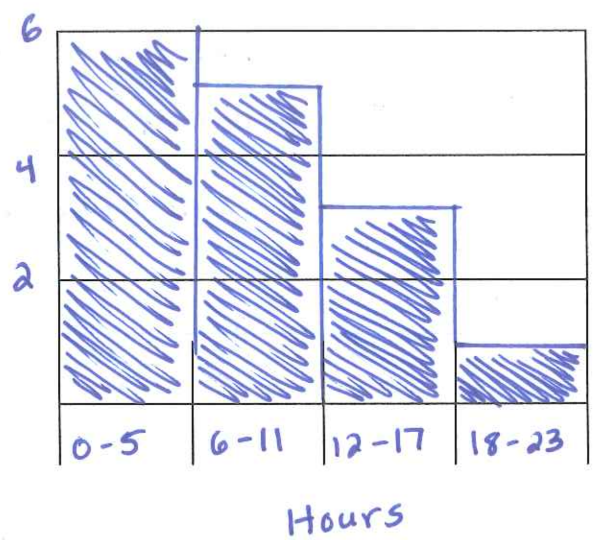
A graph that can display a frequency table. Each bar represents an interval.

Example 2: Making a Histogram

The data below are the numbers of hours per week a group of students spent watching television. What is a histogram that represents the data?

7 10 1 5 14 22 6 8 0 11 13 3 4 14 5

Hours	Frequency
0-5	6
6-11	5
12-17	3
18-23	1

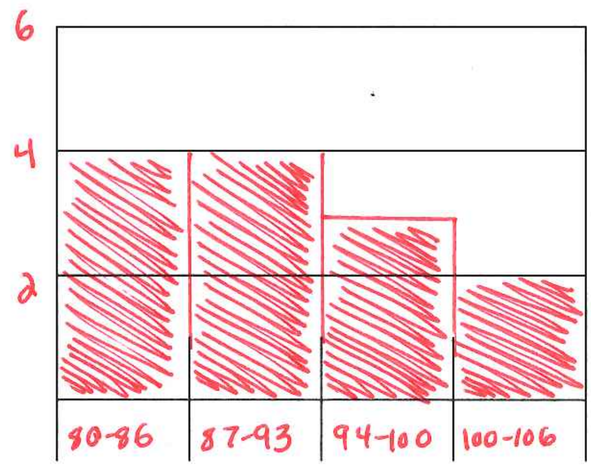


Now It's Your Turn

The finishing times, in seconds, for a race are shown below. What is a histogram that represents the data?

95 105 83 80 93 98 102 99 82 89 90 82 89

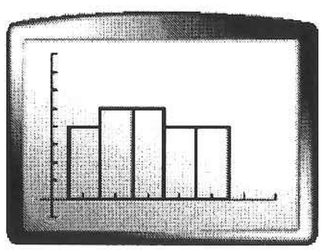
Race Times (Seconds)	Frequency
80-86	4
87-93	4
94-100	3
100-106	2



Definitions: Uniform, Symmetric, Skewed

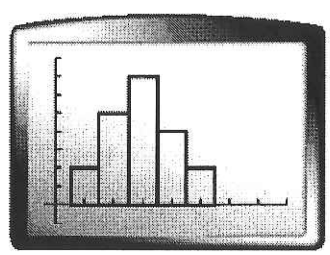
You can describe histograms in terms of their shape. Three types are shown below.

Uniform -



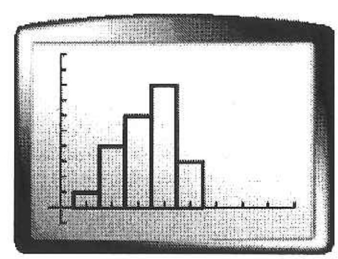
The bars are roughly the same height

Symmetric -



The left side is repeated on the right

Skewed -



The histogram has a peak not in the center

Summary: ______________________________

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Algebra I
12-3: Measures of Central Tendency

Name ____________________
Date __________ Class Period ______

earning Target: Today you will be able to FIND MEAN, MEDIAN, MODE, AND RANGE

Question/Main Ideas:	Notes:
Definition: Mean	Average: Sum of values ÷ # of values
Definition: Median	Middle Number - Put #s in order 1ST
Definition: Mode	Most often occuring number
Definition: Range	Highest # minus lowest #
Example 1: Finding Measure of Central Tendency	What are the mean, median, mode, and range of the bowling scores below? Which measure of central tendency best describes the scores? Median is the best ~~104~~ ~~117~~ ~~104~~ 136 ~~189~~ ~~109~~ ~~113~~ ~~104~~ 104 104 104 109 113 117 136 189 Mean: $976 \div 8 = 122$ Median: $\frac{109+113}{2} = 111$ Mode: 104 Range: $189 - 104 = 85$
Now It's Your Turn	Consider the bowling scores above. Take out the outlier of 189. What are the mean, median, mode, and range of the scores now? Which measure of central tendency best describes the data? Mean: $787 \div 7 = 112$ Range: $136 - 104 = 32$ Median: 109 Mean is best Mode: 104
Example 2: Finding a Data Value	Your grades on three exams are 80, 93, and 91. What grade do you need on the next exam to have an average of 90 on the four exams? $\frac{80+93+91+x}{4} = 90$ $264 + x = 360$ $x = 96$

Now It's Your Turn

a. The grades in Example 2 were 80, 93, and 91. What grade would you need on your next exam to have an average of 88 on the four exams?

$$\frac{80+93+91+x}{4} = 88$$

$264 + x = 352$

$x = 88$

b. If 100 is the highest possible score on the fourth exam, is it possible to raise your average to 92? Explain.

$$\frac{80+93+91+100}{4} = 91$$

No 91 would be the highest average

Extra Example: Page 731 #31

Two manufacturing plants make sheets of steel for medical instruments. The back-to-back stem-and-leaf plot at the right shows data collected from the two plants.

a. What is the mean, median, mode, and range of each data set?

Width of Steel (mm)

Manufacturing Plant A		Manufacturing Plant B
	4	3 5 9
8 7 4 4 2	5	2 7
4 3 1	6	3 4
	7	2

Key: 1 | 6 | 3 → 6 | 3 means 6.3; 1 | 6 means 6.1

A	B
Mean: $46.3 \div 8 = 5.8$	Mean: $44.5 \div 8 = 5.6$
Median - 5.8	Median - 5.5
Mode - 5.4	Mode - N/A
Range - 1.2	Range - 2.9

b. Which measure of central tendency best describes each data set? Explain.

Plant A – Mean; no outlier

Plant B – Mean or Median

c. Which plant has better quality control? Explain.

Plant A – it has a smaller range

Summary: ______________________________

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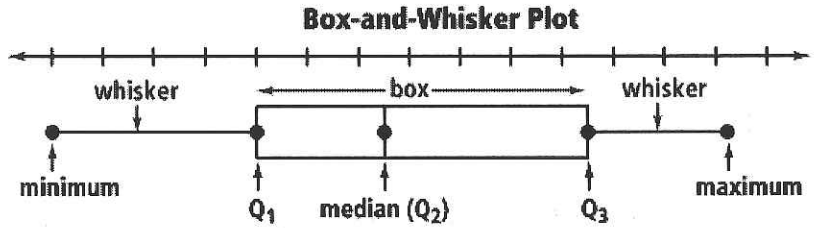
Algebra I
12-4: Box-and-Whisker Plots

Name ____________________________
Date ______________ Class Period _______

earning Target: Today you will be able to MAKE AND INTERPRET BOX-AND-WHISKER PLOTS

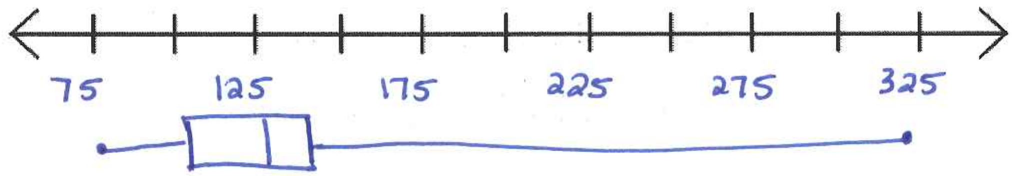
Question/Main Ideas:	Notes:
Definition: Quartiles	Values that divide a data set into four equal parts
Definition: Interquartile Range	The difference between the third and first quartile
Example 1: Summarizing a Data Set	What are the minimum, first quartile, median, third quartile, and maximum of the data set below? 125 80 140 135 126 140 325 75 75 80 / 125 126 / 135 140 / 140 325 102.5 130.5 140 75, 102.5, 130.5, 140, 325
Definition: Five-Number Summary	Minimum, 1ST quartile, Median, 3rd quartile, Maximum
Now It's Your Turn	What is the five-number summary of the data set below? 95 85 75 85 65 60 100 105 75 85 75 60 65 75 75 75 85 85 85 95 100 105 60, 75, 85, 95, 105
Definition: Box-and-Whisker Plot	A graph that represents the five-number summary. by displaying it along a number line.

Picture of a Box-and-Whisker Plot



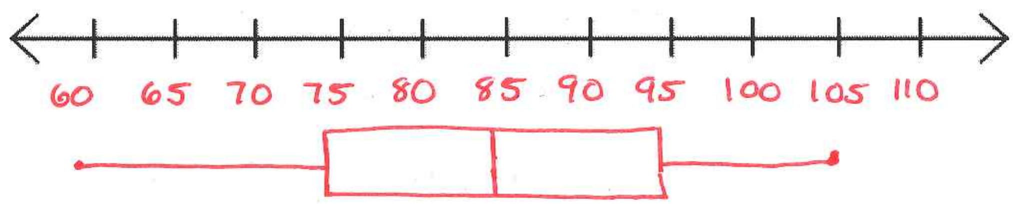
Example 2: Making a Box-and-Whisker Plot

Make a box-and-whisker plot of the data set in example 1.



Now It's Your Turn

Make a box-and-whisker plot of the data set in the first now it's your turn.



Example 3: Finding a Percentile Rank

Of 25 test scores, eight are less than or equal to 75. What is the percentile rank of a test score of 75?

$$\frac{8}{25} = 0.32 \qquad \boxed{32\%}$$

Now It's Your Turn

Of the 25 scores in the problem above, there are 15 scores less than or equal to 85. What is the percentile rank of 85?

$$\frac{15}{25} = 0.6 \qquad \boxed{60\%}$$

Summary: ____

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Algebra I
12-6: Permutations and Combinations

Name ______________________________
Date _____________ Class Period ______

Learning Target: Today you will be able to FIND PERMUTATIONS AND COMBINATIONS (FINDING THE NUMBER OF POSSIBLE WAYS TO CHOOSE OBJECTS WITH AND WITHOUT REGARD TO ORDER)

Question/Main Ideas:	Notes:
Using a Tree Diagram	Use a tree diagram to figure out all the possible orders for watching three movies (a comedy, a drama, and an action movie) C D A  6 orders
Multiplication Counting Principle	If there are m ways for 1st selection. and n ways for 2nd selection... $m \cdot n$ ways
Example 1: Using the Multiplication Counting Principle	A pizza shop offers 8 vegetable toppings and 6 meat toppings. How many different pizzas can you order with one meat topping and one vegetable topping? $\underline{8} \cdot \underline{6} = 48$ pizzas
Definition: Permutation	An arrangement of objects in a specific order
Example 2: Finding Permutations	How many different batting orders can you have with 9 players? $\underline{9} \cdot \underline{8} \cdot \underline{7} \cdot \underline{6} \cdot \underline{5} \cdot \underline{4} \cdot \underline{3} \cdot \underline{2} \cdot \underline{1} = 362,880$
Now It's Your Turn	A swimming pool has 8 lanes. In how many ways can 8 swimmers be assigned lanes for a race? $\underline{8} \cdot \underline{7} \cdot \underline{6} \cdot \underline{5} \cdot \underline{4} \cdot \underline{3} \cdot \underline{2} \cdot \underline{1} = 40,320$
Definition: Factorial	$n!$ is the product of integers n to 1.

Permutation Notation	$_nP_r$ – number of permutations of n objects arranged r at a time. $_nP_r = \frac{n!}{(n-r)!}$
Example 3: Using Permutation Notation	A band has 7 new songs and wants to put 5 of them on a demo CD. How many arrangements of 5 songs are possible? $_7P_5 = \frac{7!}{(7-5)!} = \frac{7!}{2!} = 7\cdot6\cdot5\cdot4\cdot3 = 6,802$
Definition: Combination	A selection of objects w/o regard to order
Combination Notation	$_nC_r$ – the number of combinations of n objects chosen r at a time. $_nC_r = \frac{n!}{r!(n-r)!}$
Example 4: Using Combination Notation	Twenty people report for jury duty. How many 12-person juries cam be chosen? $_{20}C_{12} = \frac{20!}{12!(20-12)!} = \frac{20!}{12!8!} = \frac{\cancel{20}\cdot19\cdot\cancel{18}\cdot17\cdot\cancel{16}\cdot15\cdot\overset{2}{\cancel{14}}\cdot13}{\cancel{8}\cdot\cancel{7}\cdot\cancel{6}\cdot\cancel{5}\cdot\cancel{4}\cdot\cancel{3}\cdot\cancel{2}\cdot1} = \boxed{125,970}$
Now It's Your Turn	a. There are 6 students in a class with 8 desks. How many seating arrangements are possible? $_8P_6 = \frac{8!}{(8-6!)} = \frac{8!}{2!} = 8\cdot7\cdot6\cdot5\cdot4\cdot3 = 54,432$ b. In how many different ways can choose 3 types of flowers for a bouquet from a selection of 15 flowers? $_{15}C_3 = \frac{15!}{3!\,12!} = \frac{\overset{5}{\cancel{15}}\cdot\overset{7}{\cancel{14}}\cdot13}{\cancel{3}\cdot\cancel{2}\cdot1} = 455$

Summary:

Algebra I
12-7: Theoretical Probability

Name ______________________________
Date _____________ Class Period _______

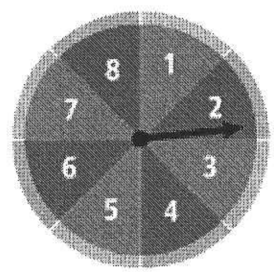
Learning Target: Today you will be able to FIND THEORETICAL AND EXPERIMENTAL PROBABILITIES

Question/Main Ideas:	Notes:
Definition: Event, Sample Space, and Favorable Outcomes	Event - Get a 6 on a numbered cube · Sample Space: 1, 2, 3, 4, 5, 6 · Favorable Outcomes: 6
Definition: Theoretical Probability	How likely an event is going to occur $P(\text{event}) = \dfrac{\#\text{ of favorable outcomes}}{\#\text{ of possible outcomes}}$ $P(6) = \dfrac{1}{6}$
Concept: Theoretical Probability Range	impossible · equally likely to occur or not occur · certain 0 ← less likely 0.5 more likely → 1
Example 1: Finding Theoretical Probability	Our solar system's 8 planets, in order from least to greatest distance from the sun, are Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, and Neptune. You will randomly draw one of the names of the planets and write a report on that planet. What is the theoretical probability that you will select a planet whose distance from the sun is less than Earth's? $P(< \text{Earth}) = \dfrac{2}{8} = \dfrac{1}{4}$
Now It's Your Turn	In Problem 1, what is the theoretical probability that you will select a planet whose distance from the sun is greater than Earth's? $P(> \text{Earth}) = \dfrac{5}{8}$

Definition: Complement of an Event	All outcomes in the sample space that are not in the event
Example 2: Find the Probability of the Complement of an Event	In a taste test, 50 participants are randomly given a beverage to sample. There are 20 samples of Drink A, 10 samples of Drink B, 10 samples of Drink C, and 10 samples of Drink D. What is the probability of a participant not getting drink A? $P(\text{not } A) = \frac{30}{50} = \frac{3}{5}$
Now It's Your Turn	Suppose a taste test is repeated with the same number of samples of Drink A, but more samples of the other drinks. What happens to P(not Drink A)? The probability will increase. $P(\text{not } A) = 1 - \frac{20}{50+x}$
Definition: Odds	Describes the likelihood of an event as a ratio comparing the # of favorabe and unfavorable outcomes

Odds in Favor of an Event	Odds Against an Event
$\frac{\text{\# of favorable outcomes}}{\text{\# of unfavorable outcomes}}$	$\frac{\text{\# of unfavorable outcomes}}{\text{\# of favorable outcomes}}$

Example 3: Finding Odds	What are the odds in favor of the spinning a number greater than or equal to 6? $\frac{\# \geq 6}{\# < 6} = \frac{3}{5}$ 3:5
Now It's Your Turn	What are the odds against spinning a number less than 3? $\frac{\# \geq 3}{\# < 3} = \frac{6}{2} = \frac{3}{1}$ 3:1



Summary: ______________________________

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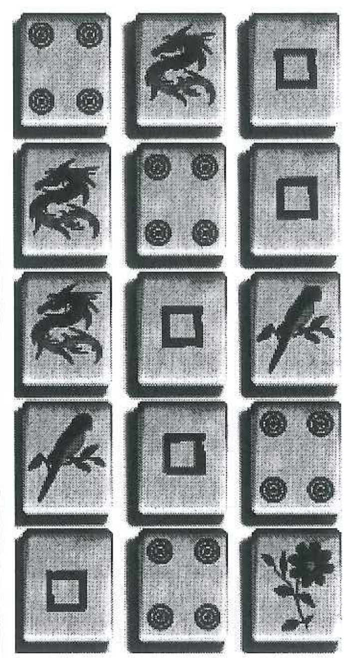
Algebra I
12-8: Probability of Compound Events

Name ______________________________
Date ____________ Class Period ______

Learning Target: Today you will be able to FIND PROBABILITIES OF MUTUALLY EXCLUSIVE AND OVERLAPPING EVENTS AND FIND PROBABILITIES OF INDEPENDENT AND DEPENDENT EVENTS

Question/Main Ideas:	Notes:
Definition: Probability of Two Independent Events	P(1st event) · P(2nd event)
Example 1: Finding the Probability of Independent Events	Suppose you roll a red number cube and a blue number cube. What is the probability that you will roll a 3 on the red cube and an even number on the blue cube? P(3) · P(even) $\frac{1}{6} \cdot \frac{1}{2} = \frac{1}{12}$
Now It's Your Turn	Suppose you roll a red number cube and a blue number cube. What is the probability that you will roll a 5 on the red cube and a 1 or 2 on the blue cube? P(5) · P(1 or 2) $\frac{1}{6} \cdot \frac{2}{6} = \frac{2}{36} = \frac{1}{18}$
Example 2: Selecting with Replacement	You choose a tile at random from the game tiles shown. You replace the first tile and then choose again. What is the probability that you choose a dotted tile and then a dragon tile? P(dotted) · P(dragon) $\frac{4}{15} \cdot \frac{3}{15} = \frac{12}{225} = \frac{4}{75}$
Now It's Your Turn	You choose a tile at random from the game tiles shown. You replace the first tile and then choose again. What is the probability that you choose a bird tile and then a flower tile? P(bird) · P(flower) $\frac{2}{15} \cdot \frac{1}{15} = \frac{2}{225}$



Definition: Probability of Two Dependent Events

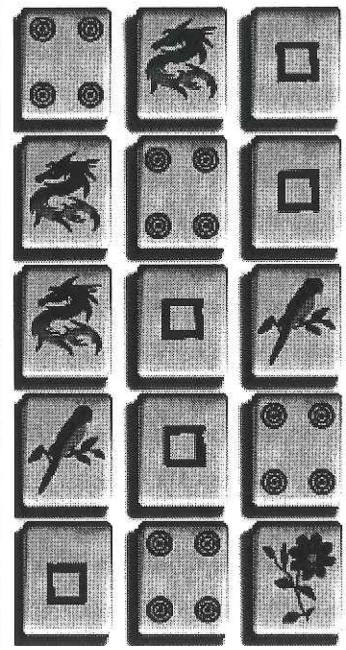
P(1st event) · P(2nd event) ← 2nd event changes b/c of 1st event

Example 3: Selecting without Replacement

You choose a tile at random from the game tiles shown. Without replacing the first tile, you select a second tile. What is the probability that you choose a dotted tile and then a dragon tile?

P(dotted) · P(dragon)

$$\frac{4}{15} \cdot \frac{3}{14} = \frac{12}{210} = \frac{2}{35}$$



Now It's Your Turn

You choose a tile at random from the game tiles shown. Without replacing the first tile, you select a second tile. What is the probability that you choose a flower tile and then a bird tile?

P(flower) · P(bird)

$$\frac{1}{15} \cdot \frac{2}{14} = \frac{2}{210} = \frac{1}{105}$$

Example 4: Finding the Probability of a Compound Event

One freshman, 2 sophomores, 4 juniors, and 5 seniors receive top scores in a school essay contest. To choose which 2 students will read their essays at the town fair, 2 names are chosen at random from a hat. What is the probability that a junior and then a senior are chosen?

P(junior) · P(senior)

$$\frac{4}{12} \cdot \frac{5}{11} = \frac{20}{132} = \frac{5}{33}$$

Now It's Your Turn

One freshman, 2 sophomores, 4 juniors, and 5 seniors receive top scores in a school essay contest. To choose which 2 students will read their essays at the town fair, 2 names are chosen at random from a hat. What is the probability that a freshman and then a junior are chosen?

P(freshman) · P(junior)

$$\frac{1}{12} \cdot \frac{4}{11} = \frac{4}{132} = \frac{1}{33}$$

Summary: ______________________________