

Unit Name: Measures of Central Tendency		Unit Length: 1 Week
Overview: Lesson 1 of 2 on Mean, Median, Mode, and Range		
DESIRED RESULTS		
TEKS and Student Expectations (See Appendix A for detailed description.)		
(6.10) Probability and statistics. (B)		
<p><u>Enduring Understandings (Big Ideas)</u></p> <p>There are special numerical measures that describe the center and spread of numerical data sets. It is frequently helpful to be able to succinctly describe sets of numbers using mean, median, mode and range instead of having to list each number in a set of numbers.</p>	<p><u>Essential Questions</u></p> <p>How are means, medians, modes and ranges used in real life situations? When is it advantageous to know the mean of a set of numbers rather than simply having the entire list of numbers in a data set? What are the steps involved in calculating the mean, median, mode and range of a set of numbers?</p>	<p><u>Critical Vocabulary</u></p> <p>Average Mean Median Mode Range</p>
<p><u>Learning Goals</u></p> <p>The student will be able to: Explain in his/her own words the meaning of mean, median, mode and range. Give at least three examples of how the concepts of mean, median, mode and range can be applied to real-world situations.</p>	<p><u>Materials Needed</u></p> <p>Overhead transparencies or PowerPoint slides Number cubes Chart paper, markers, masking tape Math problem worksheet Student math journals Spanish/English Math dictionaries available (also other languages, if needed)</p>	
ASSESSMENT PLAN		
<u>Performance Tasks</u>	<u>Other Evidence</u>	

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<p>The teacher will use a scoring rubric (see Attachment) to individually assess students' ability to:</p> <ul style="list-style-type: none"> • demonstrate how to calculate the mean of a data set using addition and division. • demonstrate how to calculate the mean of a data set using number cubes. • write in their own words how to calculate a mean in their math journals. • generate and display examples of how means are used in real-world situations. • exhibit appropriate group work habits when engaging in group tasks. 	<p>Students' grasp of how means are used in calculating grades will be evidence of student understanding of the concept of mean.</p> <p>Examples contributed by students to class discussions will demonstrate student understanding.</p> <p>As news events occur that integrate measures of central tendency, teacher can pose questions to students and assess their grasp of concepts based upon their answers and discussions.</p>
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GENERAL MELL CONNECTIONS THAT APPLY TO ALL LESSONS

(MC-01) - To assist the ELLs, the teacher should avoid speaking too rapidly and when possible use basic words rather than unfamiliar ones to introduce new concepts.

(MC-02) - Teachers should foster trusting relationships with ELLs through informal conversations and presentation of a culturally rich classroom.

(MC-03) - ELLs may need extra opportunities to demonstrate mastery. Grading policies should be flexible enough to provide multiple learning opportunities without severe grade penalties.

(MC-04) - ELLs may work at a slower pace than other students because of limited English language skills and should be provided with shortened assignments, or when appropriate, extra time to work on assignments.

(MC-05) - ELLs should be scheduled in a math class that has students who have some proficiency in both languages. Teachers may need to work with counselors and others to ensure that this happens.

(MC-06) - Teachers should offer tutoring as frequently as possible and encourage ELLs to come in for extra assistance. If possible, the teacher should arrange for an aide or parent volunteer who speaks the language of the ELL to help with translation during the tutoring period on a regular schedule (for example, on Tuesdays and Thursdays, after school).

LEARNING PLAN

Engage (5 minutes) (MC-17), (MC-09)

Teacher should launch lesson by asking students how many have had a part-time or summer job and then transition into a discussion of why people work (ie. to earn money, to help others, etc.). Teacher should then pose this situation to students:

Elena has been offered a summer job at the local grocery store earning \$7 an hour, but the hours are irregular. Her aunt has invited her to spend the summer in another state and will pay her \$100 a week to baby-sit her younger cousins. She wants to make as much money as possible this summer. What information does she need to make her decision?

Explore/Explain (MC-10), (MC-08), (MC-14)

In a class discussion teacher should allow the students to identify that Elena will need to know how many hours she will get to work at the grocery store. The teacher can then transition into the lesson by telling students that "today we are going to work with some different math concepts that help people make decisions, much like the one Elena is faced with making."

Using a visual (overhead transparency or Powerpoint), the teacher can share the following data:

Elena's friend worked at the grocery store last summer for 10 weeks. She told Elena that she worked the following number of hours each week, and that most of the other workers worked a similar amount of time.

Week 1 = 10 hours
 Week 2 = 12 hours
 Week 3 = 18 hours
 Week 4 = 12 hours
 Week 5 = 15 hours\
 Week 6 = 20 hours
 Week 7 = 12 hours
 Week 8 = 14 hours

MELL Essentials

(MC-17) - Examples that are relevant to the lives of ELLs are helpful in motivating students and in promoting their engagement with the content.

(MC-09) - To assist the ELLs, the teacher should model the expected task and use visual representations to reinforce concepts and/or steps in the problem-solving process. Critical concepts should be clearly emphasized and repeated.

(MC-10) - ELLs should be provided with or assisted in developing a learning aid that shows math vocabulary in both English and their native language and should be allowed to use this tool when working on assignments. Student-made glossaries, word walls, and compare and contrast charts may help ELLs learn mathematics vocabulary.

(MC-08) - Hands-on activities involving math manipulatives are

Week 9 = 12 hours
Week 10 = 15 hours

What might Elena do with this information to help her make her decision?

As students explain the process, the teacher can start to introduce new vocabulary. Mean is another word for average. So we need to figure out how many hours are worked in an "average" week or to put it another way "What is the mean for the hours worked?"

Teacher should model the problem being solved using addition and division to determine the "mean" for hours worked. Then let the students direct the teacher in figuring out which summer job would pay more. (At an average of 14 hours per week at \$7 per hour, the babysitting sitting job would pay slightly more).

Teacher could then say, "I knew another teacher once who found means a different way. He used these cubes and then he lined them up somehow, but I'm not sure how he did it. Can you work with your partner and use your cubes to figure out how he might have done this and come up with the same answer we did using addition and division? Allow students to work with the cubes, discover how it is done, share with their classmates, and then teacher summarizes the process with input from students.

Elaborate (20 minutes) (MC-12), (MC-15), (MC-18)

Let's do another problem. Let's have this side of the room do it with addition and division, and this side do it with the cubes. Let's switch and do another one—this side use cubes and the other side use addition and division.

Teacher should then pose the question to students "Why do we get the same answers regardless of which method we use to solve the

typically helpful to ELLs because the lesson involves multiple learning modalities and does not require the student to rely solely upon his/her ability to understand verbal instruction.

(MC-14) - Teachers should support ELLs who need extra time for dialogue by providing opportunities to work in groups. When possible, pair each ELL with another student who has some fluency in the ELL's dominant language and who can function as a "peer tutor."

(MC -12) - ELLs should be given numerous opportunities to write about the mathematics concepts they are learning. Journal entries, for example, provide opportunities for the students to crystallize their thinking about concepts and for the teacher to check for understanding. Students who have limited English language skills

problem?" Students will explain the concept and the teacher should summarize it and then say, "Since there are two ways to do it, please write in your math journal in your own words and describe the way that makes the most sense to you." Teacher should give students a couple of minutes to write in their math journal. If time permits, teacher could let students share their entry with a partner and then allow several students to read their journal entries to the class, each time re-emphasizing the concept of mean. Students should be instructed to leave their math journals open to the correct page on their desk for later checking by the teacher.

Following the journaling activity, teacher should transition the lesson into a discussion about how "means" are used in everyday life and could give a few examples: As a teacher, I average grades and use the mean to determine the six-weeks grade. When Mr. Smith is ordering concession stand snacks and supplies, he considers the mean sales for each game and the number of games in the season in order to determine how large to make his order. In groups of 3, I would like you to brainstorm others ways in which people use means to help solve day-to-day problems and I will give each group a sheet of chart paper on which to capture ideas."

Teacher should give the students about 5 minutes for the task and circulate and monitor their group work. Students can then display their charts and each group can briefly present the ideas they generated regarding how means are useful in everyday life. Teacher can then culminate the activity by telling students part of their homework assignment is to talk with their parents and to get them to think of an additional way in which means are used in everyday life. Students can earn 3 bonus points on the next exam if they bring in an example that is different from those generated in class.

Evaluate (10 minutes) (MC-16)

should be allowed to write in their first language initially and should not be penalized for spelling or grammar errors.

(MC-15) - In forming groups, the teacher should make sure that ELLs are assigned with a peer tutor, that ELLs are distributed among groups, and that no group is predominantly comprised of ELLs.

(MC-18) - Homework assignments must reinforce ELLs understanding of the instructional objectives. Appropriate homework can enhance communication with parents, but such homework should not be dependent upon the parents' skills in mathematics.

(MC-16) - When monitoring ELLs during instruction, the teacher should make a special effort to to assist, re-explain and demonstrate again, if necessary. Encouragement and

Teacher should then give students a handout with three data sets that instructs them to calculate the mean of each set of numbers. Students should work on the assignment until the end of the period and finish it for homework. While students work, the teacher will walk around and check math journal entries

reinforcement should be used frequently.

English Language Proficiency Standards Quick Reference. (Chapter 74. Curriculum Requirements Subchapter A. Required Curriculum, §74.4. English Language Proficiency Standards). The standards checked here are merely examples for the teacher's consideration for inclusion in this lesson.

Cross-curricular second language acquisition/listening. The ELL listens to a variety of speakers including teachers, peers, and electronic media to gain an increasing level of comprehension of newly acquired language in all content areas. ELLs may be at the beginning, intermediate, advanced, or advanced high stage of English language acquisition in listening. In order for the ELL to meet grade-level learning expectations across the foundation and enrichment curriculum, all instruction delivered in English must be linguistically accommodated (communicated, sequenced, and scaffolded) commensurate with the student's level of English language proficiency.

The student is expected to:

- [x] (c)(2)(A) - distinguish sounds and intonation patterns of English with increasing ease;
- [x] (c)(2)(B) - recognize elements of the English sound system in newly acquired vocabulary such as long and short vowels, silent letters, and consonant clusters;
- [x] (c)(2)(C) - learn new language structures, expressions, and basic and academic vocabulary heard during classroom instruction and interactions;
- [x] (c)(2)(D) - monitor understanding of spoken language during classroom instruction and interactions and seek clarification as needed;
- [x] (c)(2)(AE) - use visual, contextual, and linguistic support to enhance and confirm understanding of increasingly complex and elaborated spoken language;
- (c)(2)(F) - listen to and derive meaning from a variety of media such as audio tape, video, DVD, and CD ROM to build and reinforce concept and language attainment;

	<p>[X] (c)(2)(G) - understand the general meaning, main points, and important details of spoken language ranging from situations in which topics, language, and contexts are familiar to unfamiliar;</p> <p>(c)(2)(H) - understand implicit ideas and information in increasingly complex spoken language commensurate with grade-level learning expectations; and</p> <p>[x] (c)(2)(I) - demonstrate listening comprehension of increasingly complex spoken English by following directions, retelling or summarizing spoken messages, responding to questions and requests, collaborating with peers, and taking notes commensurate with content and grade-level needs.</p>
<p><i>Cross-curricular second language acquisition/speaking.</i> The ELL speaks in a variety of modes for a variety of purposes with an awareness of different language registers (formal/informal) using vocabulary with increasing fluency and accuracy in language arts and all content areas. ELLs may be at the beginning, intermediate, advanced, or advanced high stage of English language acquisition in speaking. In order for the ELL to meet grade-level learning expectations across the foundation and enrichment curriculum, all instruction delivered in English must be linguistically accommodated (communicated, sequenced, and scaffolded) commensurate with the student's level of English language proficiency.</p>	<p>The student is expected to:</p> <p>[x] (c)(3)(A) - practice producing sounds of newly acquired vocabulary such as long and short vowels, silent letters, and consonant clusters to pronounce English words in a manner that is increasingly comprehensible;</p> <p>(c)(3)(B) - expand and internalize initial English vocabulary by learning and using high-frequency English words necessary for identifying and describing people, places, and objects, by retelling simple stories and basic information represented or supported by pictures, and by learning and using routine language needed for classroom communication;</p> <p>[X] (c)(3)(C) - speak using a variety of grammatical structures, sentence lengths, sentence types, and connecting</p>

	<p>words with increasing accuracy and ease as more English is acquired;</p> <p>[X] (c)(3)(D) - speak using grade-level content area vocabulary in context to internalize new English words and build academic language proficiency;</p> <p>[X] (c)(3)(E) - share information in cooperative learning interactions;</p> <p>[x] (c)(3)(F) - ask and give information ranging from using a very limited bank of high-frequency, high-need, concrete vocabulary, including key words and expressions needed for basic communication in academic and social contexts, to using abstract and content-based vocabulary during extended speaking assignments;</p> <p>(c)(3)(G) - express opinions, ideas, and feelings ranging from communicating single words and short phrases to participating in extended discussions on a variety of social and grade-appropriate academic topics;</p> <p>(c)(3)(H) - narrate, describe, and explain with increasing specificity and detail as more English is acquired;</p> <p>(c)(3)(I) - adapt spoken language appropriately for formal and informal purposes; and</p> <p>(c)(3)(J) - respond orally to information presented in a wide variety of print, electronic, audio, and visual media to build and reinforce concept and language attainment.</p>
<p><i>Cross-curricular second language acquisition/reading.</i> The ELL reads a variety of texts for a</p>	<p>The student is expected to:</p> <p>(c)(4)(A) - learn relationships between sounds and letters of</p>

variety of purposes with an increasing level of comprehension in all content areas. ELLs may be at the beginning, intermediate, advanced, or advanced high stage of English language acquisition in reading. In order for the ELL to meet grade-level learning expectations across the foundation and enrichment curriculum, all instruction delivered in English must be linguistically accommodated (communicated, sequenced, and scaffolded) commensurate with the student's level of English language proficiency. For Kindergarten and Grade 1, certain of these student expectations apply to text read aloud for students not yet at the stage of decoding written text.

the English language and decode (sound out) words using a combination of skills such as recognizing sound-letter relationships and identifying cognates, affixes, roots, and base words;

(c)(4)(B) - recognize directionality of English reading such as left to right and top to bottom;

[X] (c)(4)(C) - develop basic sight vocabulary, derive meaning of environmental print, and comprehend English vocabulary and language structures used routinely in written classroom materials;

(c)(4)(D) - use prereading supports such as graphic organizers, illustrations, and pretaught topic-related vocabulary and other prereading activities to enhance comprehension of written text;

(c)(4)(E) - read linguistically accommodated content area material with a decreasing need for linguistic accommodations as more English is learned;

(c)(4)(F) - use visual and contextual support and support from peers and teachers to read grade-appropriate content area text, enhance and confirm understanding, and develop vocabulary, grasp of language structures, and background knowledge needed to comprehend increasingly challenging language;

(c)(4)(G) - demonstrate comprehension of increasingly complex English by participating in shared reading, retelling or summarizing material, responding to questions, and

	<p>taking notes commensurate with content area and grade level needs;</p> <p>(c)(4)(H) - read silently with increasing ease and comprehension for longer periods;</p> <p>(c)(4)(I) - demonstrate English comprehension and expand reading skills by employing basic reading skills such as demonstrating understanding of supporting ideas and details in text and graphic sources, summarizing text, and distinguishing main ideas from details commensurate with content area needs;</p> <p>[X] (c)(4)(J) - demonstrate English comprehension and expand reading skills by employing inferential skills such as predicting, making connections between ideas, drawing inferences and conclusions from text and graphic sources, and finding supporting text evidence commensurate with content area needs; and</p> <p>(c)(4)(K) - demonstrate English comprehension and expand reading skills by employing analytical skills such as evaluating written information and performing critical analyses commensurate with content area and grade-level needs.</p>
<p><i>Cross-curricular second language acquisition/writing.</i> The ELL writes in a variety of forms with increasing accuracy to effectively address a specific purpose and audience in all content areas. ELLs may be at the beginning, intermediate, advanced, or advanced high stage of English language acquisition</p>	<p>The student is expected to:</p> <p>[x] (c)(5)(A) - learn relationships between sounds and letters of the English language to represent sounds when writing in English;</p> <p>(c)(5)(B) - write using newly acquired basic vocabulary and content-based grade-level vocabulary;</p>

in writing. In order for the ELL to meet grade-level learning expectations across foundation and enrichment curriculum, all instruction delivered in English must be linguistically accommodated (communicated, sequenced, and scaffolded) commensurate with the student's level of English language proficiency. For Kindergarten and Grade 1, certain of these student expectations do not apply until the student has reached the stage of generating original written text using a standard writing system.

(c)(5)(C) - spell familiar English words with increasing accuracy, and employ English spelling patterns and rules with increasing accuracy as more English is acquired;

(c)(5)(D) - edit writing for standard grammar and usage, including subject-verb agreement, pronoun agreement, and appropriate verb tenses commensurate with grade-level expectations as more English is acquired;

(c)(5)(E) - employ increasingly complex grammatical structures in content area writing commensurate with grade-level expectations, such as:

- (i) using correct verbs, tenses, and pronouns/antecedents;
- (ii) using possessive case (apostrophe s) correctly; and
- (iii) using negatives and contractions correctly;

(c)(5)(F) - write using a variety of grade-appropriate sentence lengths, patterns, and connecting words to combine phrases, clauses, and sentences in increasingly accurate ways as more English is acquired; and

(c)(5)(G) - narrate, describe, and explain with increasing specificity and detail to fulfill content area writing needs as more English is acquired.

Appendix A
TEKS and Student Expectations

(6.10) **Probability and statistics.** The student uses statistical representations to analyze data.

The student is expected to:

(B) identify mean (using concrete objects and pictorial models), median, mode, and range of a set of data;

Formative Assessment Rubric

Part a) Correct Solution: Yes No

Criteria	4	3	2	1
Part b) Conceptual Knowledge	<p>Attribute(s) of concept(s) Correctly identifies attributes of the problem, which leads to correct inferences</p> <p>Inferences Combines the critical attributes of the problem in order to describe correctly the mathematical relationship(s) inherent in the problem</p>	<p>Attribute(s) of concept(s) Correctly identifies attributes of the problem, which leads to correct inferences.</p> <p>Inferences Combines the critical attributes of the problem in order to describe correctly the mathematical relationship(s) inherent in the problem</p>	<p>Attribute(s) of concept(s) Identifies some of the attributes of the problem, which leads to partially correct inferences</p> <p>Inferences Combines the identified attributes of the problem which leads to a partial identification of the mathematical relationship(s) inherent in the problem</p>	<p>Attribute(s) of concept(s) Lacks identification of any of the critical attributes of the problem.</p> <p>Inferences Combines few of the attributes of the problem which leads to an incomplete identification of the mathematical relationship(s) inherent in the problem</p>
Part c) Procedural Knowledge	<p>Appropriate strategy Selects and implements an appropriate strategy.</p> <p>Representational form Uses appropriate representation to connect the procedure to the concept of the problem.</p> <p>Algorithmic competency Correctly implements procedure to arrive at a correct solution.</p>	<p>Appropriate strategy Selects and implements an appropriate strategy.</p> <p>Representational form Uses appropriate representation to connect the procedure to the concept of the problem.</p> <p>Algorithmic competency Implements selected procedure but arrives at an incorrect solution.</p>	<p>Appropriate strategy Selects and implements an appropriate strategy.</p> <p>Representational form Uses inconsistent or insufficient representation for the selected solution strategy.</p> <p>Algorithmic competency Implements selected procedure but arrives at an incorrect or correct solution. (See Part a above)</p>	<p>Appropriate strategy Selects and implements an inappropriate strategy.</p> <p>Representational form Uses incorrect representations.</p> <p>Algorithmic competency Makes significant errors.</p>
Part d) Communication	<p>Justification Fully answers the question of "why" for the strategy selection, explains procedure, and/or evaluates reasonableness of solution.</p> <p>Terminology Uses appropriate terminology and notation.</p>	<p>Justification Fully answers the question of "why" for the strategy selection, explains procedure, and/or evaluates reasonableness of solution.</p> <p>Terminology Uses some appropriate terminology or notation.</p>	<p>Justification Incompletely answers the question of "why" for the strategy selection; explains procedure; and/or evaluates reasonableness of solution.</p> <p>Terminology Uses some appropriate terminology or notation.</p>	<p>Justification Provides very little or no explanation of what was done and why.</p> <p>Terminology Uses limited or inappropriate terminology or notation.</p>