COSA Common Core State Standards Regional Series

"Mathematics in Action"

A Statewide Regional Series for District and School Leaders of CCSS

Secondary (6-12) Mathematics Session

Locations:

April 15, 2014 – Eagle Crest Resort, Redmond, OR
April 18, 2014 – Winston Community Center , Winston, OR
April 29, 2014 – Linn County Expo Center, Albany, OR
May 1, 2014 – Medford, OR
May 7, 2014 - Convention Center, Pendleton , OR

Mathematics Presenters:

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Temperature Check

1. Which mathematical practices have you been teaching students this year?

2. Which content standards have you taught this year?

3. What are three "big ideas" you want students to come to you knowing next year?

4. How are you feeling about implementing the Common Core State Standards in Mathematics?

Track Your Progress:
Common Core State Standards for Mathematics in Action

Shade each rectangle to show your current understanding of each learning target.

- I can describe strategies for teaching the priority content standards with the mathematical practices.

Starting …	Getting There …	Got It!

- I can create assessments aligned to SBAC claims and DOK levels.

Starting …	Getting There …	Got It!

- I can analyze student work to increase student achievement.

Starting …	Getting There …	Got It!

Next Steps…

CCSSM in Action
6 – 12

Shannon McCaw
SMc Curriculum

What Do We Expect Students To Learn?

The CCSS Requires Three Shifts in Mathematics

1. **Focus:** Focus strongly where the standards focus.
2. **Coherence**: *Think* across grades, and *link* to major topics
3. **Rigor:** In major topics, pursue *conceptual* **understanding,** procedural skill and *fluency*, and *application*

Domains 6 – 8

Domain	6	7	8
Ratios and Proportional Relationships (RP)	✓	✓	
The Number System (NS)	✓	✓	✓
Expressions and Equations (EE)	✓	✓	✓
Geometry (G)	✓	✓	✓
Statistics and Probability (SP)	✓	✓	✓
Functions (F)			✓

Why Do We Need the *Mathematical Practices*?

Solve.

$x^2 + 2x - 8 = 0$

How did you approach each problem?

$\frac{5}{10} \div \frac{5}{12} = ?$

$\frac{7}{4}x + 12 = \frac{3}{2}$

How did you think your students will approach each problem?

Standards for Mathematical Practice

1. Make sense of problems and persevere in solving them.
6. Attend to precision.

2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.

4. Model with mathematics.
5. Use appropriate tools strategically.

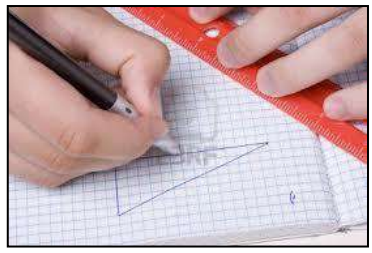
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Essential Question

If students are having trouble just finding the answers to problems,

how am I supposed to get them to think deeply and write about it!?!

Using High Cognitive Tasks



Instructional Tasks Matter!

"*Not all tasks are created equal, and* ***different tasks will provoke different levels and kinds of student thinking***."

Stein, Smith, Henningsen, & Silver, 2000

"***The level and kind of thinking in which students engage determines what they will learn***."

Hiebert, Carpenter, Fennema, Fuson, Wearne, Murray, Oliver, & Human, 1997

Lower Level Demand Tasks

- Algorithmic.
- Require limited cognitive demand for successful completion. Little ambiguity in problem.
- No connection to concepts/procedures being taught.
- Focused on producing a correct answer instead of developing mathematical understanding.
- Reproduces previously learned facts, rules, formulas, or definitions or requires memorization.

--Smith, M. & Stein, M, *5 Practices for Orchestrating Productive Mathematics Discussions*, 2011 (p. 16)

Higher Level Demand Tasks

- Focus on using procedures that develop conceptual understanding.
- Often represented in multiple ways.
- Require some cognitive effort. General procedures used cannot be followed mindlessly.
- Require complex and non-algorithmic thinking.
- Require students to explore and understand the nature of math concepts.

--Smith, M. & Stein, M, *5 Practices for Orchestrating Productive Mathematics Discussions*, 2011 (p. 16)

Five Practices when Implementing High Cognitive Tasks

- **Anticipating** likely student responses to challenging mathematical tasks.
- **Monitoring** students' actual responses to the tasks (while students work on the task in pairs or small groups).
- **Selecting** particular students to present their mathematical work during the whole-class discussion.
- **Sequencing** the student responses that will be displayed in a specific order.
- **Connecting** different students' responses and connecting the responses to key mathematical ideas.

--Smith, M. & Stein, M, *5 Practices for Orchestrating Productive Mathematics Discussions*, 2011 (p. 8)

Sentence Frames

- Help student write in the content area.
- Often used for English Language Learners but most students benefit.
- Use vocabulary banks (create with students and decide which are Level 1 words versus Level 2 words)
- How have you or could you used sentence frames with your students?

Where can I find tasks?

- map.mathshell.org (MARS Tasks)
- www.ccssmath.org (Resources)
- www.engageny.org/mathematics
- www.commoncoreconversation.com
- www.illustrativemathematics.org – click on "Illustrations"
- https://www.georgiastandards.org/Common-Core/Pages/Math-6-8.aspx
- www.smarterbalanced.org
- www.insidemathematics.org
- www.teachingchannel.org

Putting it All Together - Lesson

- Design a lesson using the Lesson Planning Tool that you will teach next week.
  - How will you emphasize a mathematical practice?
  - What are your assessing and advancing questions?
  - How will the lesson begin and end?
  - What are students doing during the lesson?
- Find/Create a high cognitive task to use in the next week with students.
  - How will you also teach a mathematical practice?

Putting it All Together – Unit

Things to consider when unit planning:

- Type of Content Standards being addressed? (pre-requisite, priority cluster, supporting cluster, other
- Math Practices (activities, discovery, tasks, critiquing, etc)
- Rigor (conceptual understanding, procedural skill and application)
- DOK levels (what tasks are students doing)
- Quality formative and summative assessments

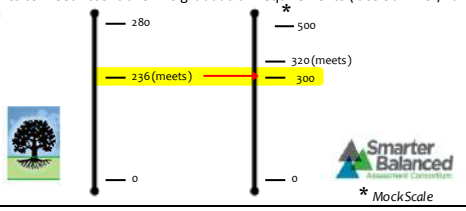
How will we know students have learned the CCSSM?

Formative vs. Summative Assessments

Formative	Summative
A process during learning	An event after learning
Descriptive feedback, use of rubrics, student self-assessment	Chapter tests, state assessment, end-of-year placement tests
Used to support ongoing growth, improvement	Used to measure achievement

OAKS to Smarter Balanced
(Equivalent Levels of Rigor)

- 2013-14 Smarter Balanced field test results will be used to establish an equivalent level of rigor to OAKS.
- SBAC will set achievement standards in late Summer 2014. Results may reveal a discrepancy in the level of achievement defined as "meets".
- State Board will make final decision regarding achievement level required for students to meet Essential Skills graduation requirements (late Summer/Fall 2014)



SBAC Member States

SMARTER: Summative Multi-State Assessment Resources for Teachers and Educational Researchers
www.smarterbalanced.org

Four Claims Used in DRAFT SBAC Test Specifications

Claim #1 Concepts & Procedures — 40%
Students can explain and apply mathematical concepts and interpret and carry out mathematical procedures with precision and fluency.

Claim #2 Problem Solving
Claim #4 Modeling & Data Analysis — 60%
Students can solve a range of complex well-posed problems in pure and applied mathematics, making productive use of knowledge and problem solving strategies.
Students can analyze complex, real-world scenarios and can construct and use mathematical models to interpret and solve problems.

Claim #3 Communicating Reasoning
Students can clearly and precisely construct viable arguments to support their own reasoning and to critique the reasoning of others.

Assessment Item Types

- **Selected Response (SR)**
  - Variety of multiple choice and true/false
- **Technology Enhanced (TE)**
  - Technology embedded into items
- **Constructed Response (CR)**
  - Free response questions in the Adaptive portion of the test
- **Extended Response (ER)**
  - Non-computer graded constructed response item
- **Performance Tasks (PT)**
  - Rich, real-world scenarios where multiple math topics are addressed

Cognitive Rigor and Depth of Knowledge (DOK)

- Level 1: **Recall and Reproduction**
  Requires eliciting information such as a fact, definition, term, or a simple procedure, as well as performing a simple algorithm or applying a formula.
- Level 2: **Basic Skills and Concepts**
  Requires the engagement of some mental processing beyond a recall of information.
- Level 3: **Strategic Thinking and Reasoning**
  Requires reasoning, planning, using evidence, and explanations of thinking.
- Level 4: **Extended Thinking**
  Requires complex reasoning, planning, developing, and thinking most likely over an extended period of time.

How do you create higher level DOK tasks?

Ask students to:

- Write a word problem for a given expression.
- Write a word problem with a given answer or range of answers.
- Solve a problem using more than one strategy.
- Find the error in a student solution and correct.
- Make sense of a provided solution strategy by writing the original problem or justifying the work shown.
- Solve multi-step problems.
- Solve open-ended tasks with multiple possible responses.

Sampling of SBAC DOK Level 3 Sentences

- "Use mathematics to justify your answer."
- "Show all work necessary to justify your answer."
- "Explain your reasoning."
- "Explain how you know your answer is correct."
- "Show another way to find (your answer)."
- YES/NO followed by explanation
- "Use words and/or numbers to show how you determined your answer."

Assessment Analysis: Does the Assessment Evaluate Student Understanding of Learning Targets?

- Are learning targets clear?
- Do proficient scores indicate student learning?
- Do low scores indicate that students need intervention?

Assessment Analysis: Is There a Proportional Value Between Scores and Learning Targets on the Assessment?

- Is one learning target weighted more than others? Should it be?
- Is one assessment method weighted more than another? Should it be?

What Is Proficiency?

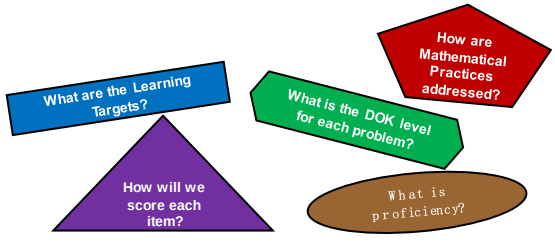
- Rubric: Passing in all categories?
- Can students only get DOK Level 1 problems correct and still be proficient?
- Scoring criteria for overall score or each section?
  - PLC team determines.
  - Look at student work.

Analyze Assessments

- Which standards or learning targets are assessed?
- How are the mathematical practices assessed?
- Use the Assessment Evaluation Tool to determine balance of DOK Levels, Claims and variety of assessment types.
- How should the items be scored?
- What is proficiency?

Time to create/analyze our tests…

- Choose a current or next unit test
- Analyze or create it using the Evaluation of Assessment Tool
- Discuss any changes that are needed…Continue…



Analyze Student Work

- Read the task: Suzi's Company
- What content standards and/or mathematical practices are being assessed in this task?

- Order the five student work papers in order from the what you believe is the lowest score to the highest score. Be ready to support your reasoning.

Analyze Student Work

- What can you learn from student work?
- What can students learn from one another's work?
- How can *all* students be re-engaged in the learning of this content?

Next Steps…

- How can you make sure students are learning multiple strategies for conceptual understanding?
- How can you include the standards for mathematical practice in lessons?
- How can you use high cognitive tasks in class?
- What do you need to consider in assessments?

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SM curriculum
improving math.

CCSSM (SBAC) Priority Clusters 6 – 11

Grade 6	Grade 7	Grade 8	Grade 11
Ratios and Proportional Reasoning Understand ratio concepts and use ratio reasoning to solve problems. **The Number System** Apply and extend previous understandings of multiplication and division to divide fractions by fractions. Apply and extend previous understandings of numbers to the system of rational numbers. **Expressions and Equations** Apply and extend previous understandings of arithmetic to algebraic expressions. Reason about and solve one-variable equations and inequalities. Represent and analyze quantitative relationships between dependent and independent variables.	**Ratios and Proportional Reasoning** Analyze proportional relationships and use them to solve real-world and mathematical problems. **The Number System** Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers. **Expressions and Equations** Use properties of operations to generate equivalent expressions. Solve real-life and mathematical problems using numerical and algebraic expressions and equations.	**Expressions and Equations** Work with radicals and integer exponents. Understand the connections between proportional relationships, lines, and linear equations. Analyze and solve linear equations and pairs of simultaneous linear equations. **Functions** Define, evaluate, and compare functions. **Geometry** Understand congruence and similarity using physical models, transparencies, or geometry software. Understand and apply the Pythagorean Theorem.	**Seeing the Structure in Expressions** Interpret the structure of expressions. Write expressions in equivalent forms to solve problems. **Arithmetic with Polynomials and Rational Expressions** Perform arithmetic operations on polynomials. **Creating Equations** Create equations that describe numbers or relationships. **Reasoning with Equations and Inequalities** Understand solving equations as a process of reasoning and explain the reasoning. Solve equations and inequalities in one variable. Represent and solve equations and inequalities graphically. **Interpreting Functions** Understand the concept of a function and understand function notation. Interpret functions that arise in applications in terms of the context. Analyze functions using different representations. **Building Functions** Build a function that models a relationship between two quantities.

CCSSM (SBAC) Supporting Clusters 6 – 11

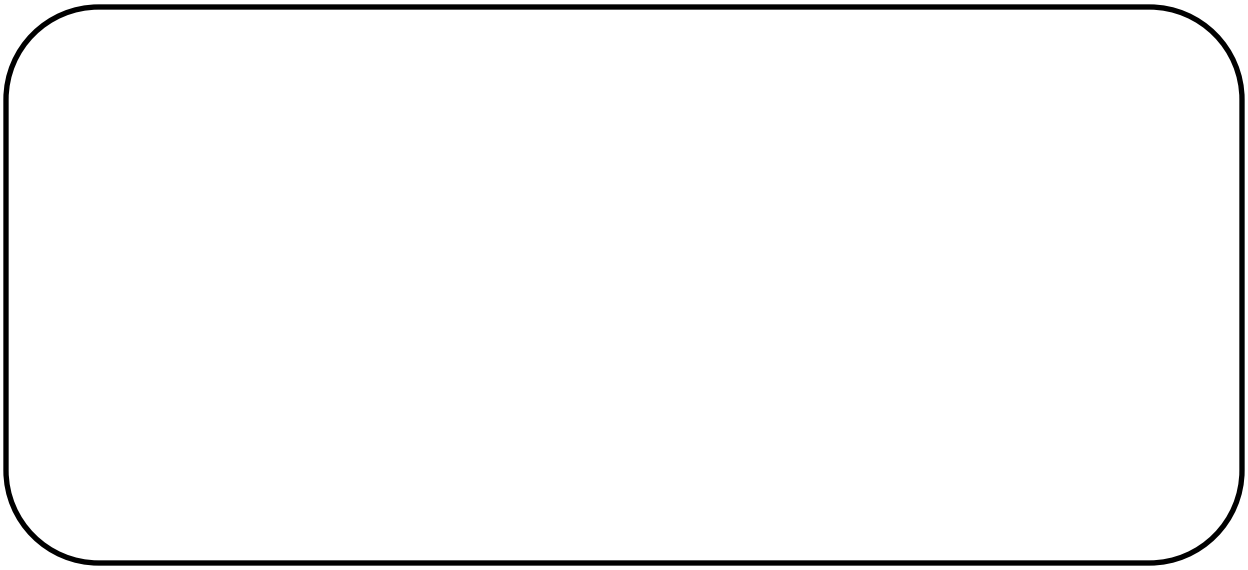
Grade 6	Grade 7	Grade 8	Grade 11
Geometry Solve real-world and mathematical problems involving area, surface area, and volume. **The Number System** Compute fluently with multi-digit numbers and find common factors and multiples. **Statistics and Probability** Develop understanding of statistical variability. Summarize and describe distributions.	**Geometry** Draw, construct and describe geometrical figures and describe the relationships between them. Solve real-life and mathematical problems involving angle measure, area, surface area, and volume. **Statistics and Probability** Use random sampling to draw inferences about a population. Investigate chance processes and develop, use, and evaluate probability models. Draw informal comparative inferences about two populations.	**The Number System** Know that there are numbers that are not rational, and approximate them by rational numbers. **Functions** Use functions to model relationships between quantities. **Geometry** Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres. **Statistics and Probability** Investigate patterns of association in bivariate data.	**Quantities** Reason quantitatively and use units to solve problems. **The Real Number System** Extend the properties of exponents to rational exponents. Use properties of rational and irrational numbers. **Interpreting Categorical and Quantitative Data** Summarize, represent, and interpret data on a single count or measurement variable. **Congruence** Prove geometric theorems.

Essential Skills – CCSSM Content Standards

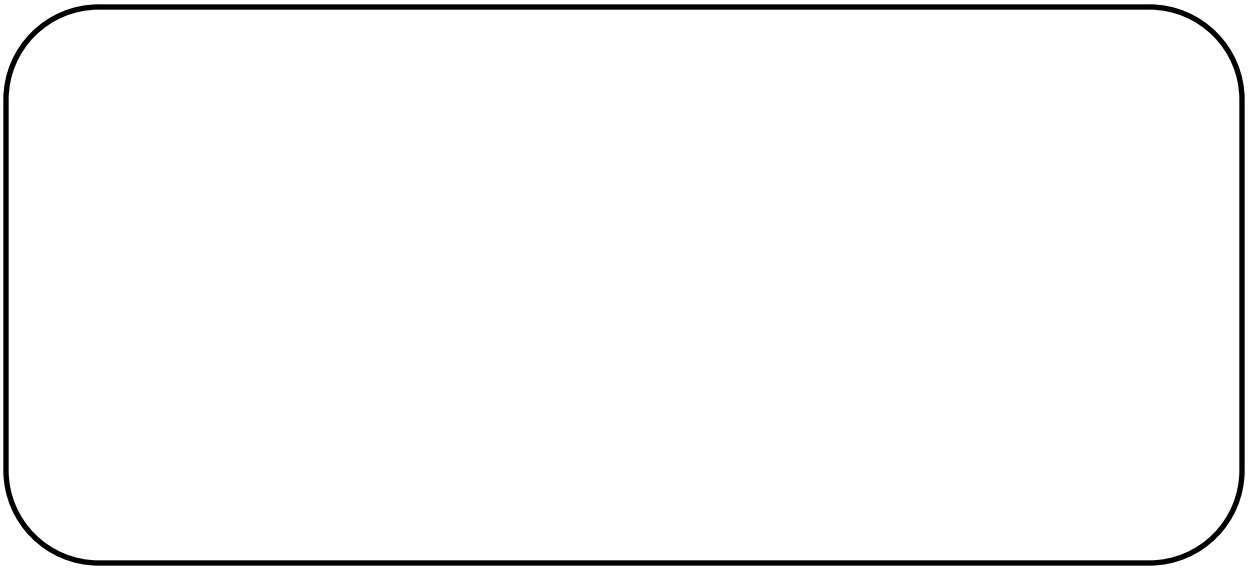
Review the Priority and Supporting Clusters. Read the accompanying content standards.

My Grade Level/Course: _____

1. What are 7 – 10 Essential Skills students in my grade must learn?



2. What are 7 – 10 Essential Skills students should come to my grade having learned?



Mathematical Practices 6 – 11

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Write the number for the mathematical practice best evidenced by each student description.

	Student Description	MP
A	Students share a strategy that makes sense to them…then change or defend their strategy with others.	
B	Two students are solving a multi-step word problem. Each student approaches the problem differently. After working together they determine a plan to solve the problem.	
C	A student finds the surface area of a rectangular prism by finding the sum of the areas of the lateral faces and base.	
D	A student is trying to understand what $5^3 \cdot 5^2$ means. When thinking about exponents, the student thinks about 5^3 as $5 \cdot 5 \cdot 5$ and 5^2 as $5 \cdot 5$ to conclude that $5^3 \cdot 5^2 = 5^{3+2} = 5^5$.	
E	A student uses his knowledge of decimal operations to figure out the total bill at a restaurant, including tip.	
F	A student writes a real world scenario that is modeled by a given function.	
G	When testing a prediction from a scatter plot, students use the regression function on the graphing calculator.	
H	A student graphs the total cost for a given number of people to attend a concert. She connects the points on the graph and then realizes it should be a discrete graph instead of a continuous graph.	

Grade 6
6.G – Painting a Barn

Alexis needs to paint the four exterior walls of a large rectangular barn. The length of the barn is 80 feet, the width is 50 feet, and the height is 30 feet. The paint costs $28 per gallon, and each gallon covers 420 square feet. How much will it cost Alexis to paint the barn? Explain your work.

---www.illustrativemathematics.org

High School
A.CED.1 – Two Fields

A team of farm-workers was assigned the task of harvesting two fields, one twice the size of the other. They worked for the first half of the day on the larger field. Then the team split into two groups of equal number. The first group continued working in the larger field and finished it by evening. The second group harvested the smaller field, but did not finish by evening. The next day one farm-worker finished the smaller field in a single day's work. How many farm-workers were on the team?

---www.illustrativemathematics.org

(Insert question here)	
	I started the problem by _____ _____ _____ _____.
	Next I _____ because _____ _____ _____
	Finally I _____ because _____ _____ _____.
Answer (in a complete sentence):	

Figure 2.12:
CCSS Mathematical Practices Lesson-Planning Tool

Unit:	Date:	Lesson:
Learning target: As a result of today's class, students will be able to _____		
Formative assessment: How will students be expected to demonstrate mastery of the learning target during in-class checks for understanding?		

Probing Questions for Differentiation on Mathematical Tasks	
Assessing Questions (Create questions to scaffold instruction for students who are "stuck" during the lesson or the lesson tasks.)	**Advancing Questions** (Create questions to further learning for students who are ready to advance beyond the learning target.)

Targeted Standard for Mathematical Practice:

Which Mathematical Practice will be targeted for proficiency development during this lesson?

Tasks (Tasks can vary from lesson to lesson.)	What Will the Teacher Be Doing? (How will the teacher present and then monitor student response to the task?)	What Will the Students Be Doing? (How will students be actively engaged in each part of the lesson?)
Beginning-of-Class Routines How does the warm-up activity connect to students' prior knowledge, or how is it based on analysis of homework?		

Tasks (Tasks can vary from lesson to lesson.)	What Will the Teacher Be Doing? (How will the teacher present and then monitor student response to the task?)	What Will the Students Be Doing? (How will students be actively engaged in each part of the lesson?)
Task 1 How will the students be engaged in understanding the learning target?		
Task 2 How will the task develop student sense making and reasoning?		
Task 3 How will the task require student conjectures and communication?		
Closure How will student questions and reflections be elicited in the summary of the lesson? How will students' understanding of the learning target be determined?		

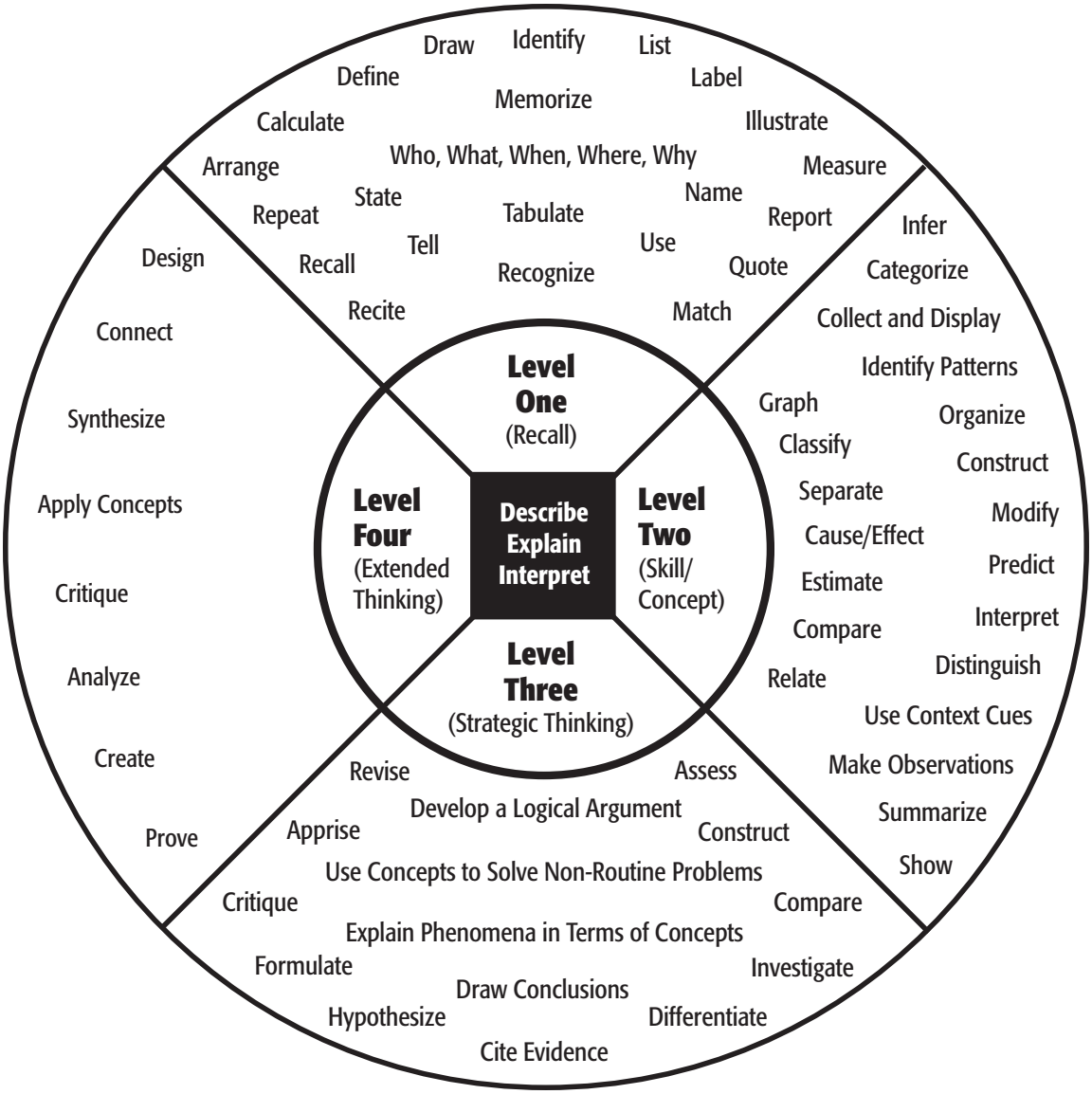
Depth of Knowledge (DOK)

Source: www.smarterbalanced.org Mathematics Content Specifications

A "Snapshot" of the Cognitive Rigor Matrix (Hess, Carlock, Jones & Walkup, 2009)

Depth of Thinking (Webb) + Type of Thinking (Revised Bloom)	**DOK Level 1** **Recall & Reproduction**	**DOK Level 2** **Basic Skills & Concepts**	**DOK Level 3** **Strategic Thinking & Reasoning**	**DOK Level 4** **Extended Thinking**
Remember	• Recall conversations, terms, facts			
Understand	• Evaluate an expression • Locate points on a grid or number on number line • Solve a one-step problem • Represent math relationships in words, pictures, or symbols	• Specify, explain relationships • Make basic inferences or logical predictions from data/observations • Use models/diagrams to explain concepts • Make and explain estimates	• Use concepts to solve non-routine problems • Use supporting evidence to justify conjectures, generalize, or connect ideas • Explain reasoning when more than one response is possible • Explain phenomena in terms of concepts	• Relate mathematical concepts to other content areas, other domains • Develop generalizations of the results obtained and the strategies used and apply them to new problem situations
Apply	• Follow simple procedures • Calculate, measure, apply a rule (e.g., rounding) • Apply algorithm or formula • Solve linear equations • Make conversions	• Select a procedure and perform it • Solve routine problem applying multiple concepts or decision points • Retrieve information to solve a problem • Translate between representations	• Design investigation for a specific purpose or research question • Use reasoning, planning, and supporting evidence • Translate between problem & symbolic notation when not a direct translation	• Initiate, design, and conduct a project that specifies a problem, identifies solution paths, solves the problem, and reports results
Analyze	• Retrieve information from a table or graph to answer a question • Identify a pattern/trend	• Categorize data, figures • Organize, order data • Select appropriate graph and organize & display data • Interpret data from a simple graph • Extend a pattern	• Compare information within or across data sets or texts • Analyze and draw conclusions from data, citing evidence • Generalize a pattern • Interpret data from complex graph	• Analyze multiple sources of evidence or data sets
Evaluate			• Cite evidence and develop a logical argument • Compare/contrast solution methods • Verify reasonableness	• Apply understanding in a novel way, provide argument or justification for the new application
Create	• Brainstorm ideas, concepts, problems, or perspectives related to a topic or concept	• Generate conjectures or hypotheses based on observations or prior knowledge and experience	• Develop an alternative solution • Synthesize information within one data set	• Synthesize information across multiple sources or data sets • Design a model to inform and solve a practical or abstract situation.

Depth of Knowledge (DOK) Levels



Level One Activities	Level Two Activities	Level Three Activities	Level Four Activities
Recall elements and details of story structure, such as sequence of events, character, plot and setting. Conduct basic mathematical calculations. Label locations on a map. Represent in words or diagrams a scientific concept or relationship. Perform routine procedures like measuring length or using punctuation marks correctly. Describe the features of a place or people.	Identify and summarize the major events in a narrative. Use context cues to identify the meaning of unfamiliar words. Solve routine multiple-step problems. Describe the cause/effect of a particular event. Identify patterns in events or behavior. Formulate a routine problem given data and conditions. Organize, represent and interpret data.	Support ideas with details and examples. Use voice appropriate to the purpose and audience. Identify research questions and design investigations for a scientific problem. Develop a scientific model for a complex situation. Determine the author's purpose and describe how it affects the interpretation of a reading selection. Apply a concept in other contexts.	Conduct a project that requires specifying a problem, designing and conducting an experiment, analyzing its data, and reporting results/ solutions. Apply mathematical model to illuminate a problem or situation. Analyze and synthesize information from multiple sources. Describe and illustrate how common themes are found across texts from different cultures. Design a mathematical model to inform and solve a practical or abstract situation.

Webb, Norman L. and others. "Web Alignment Tool" 24 July 2005. Wisconsin Center of Educational Research, University of Wisconsin-Madison. 2 Feb. 2006. <http://www.wcer.wisc.edu/WAT/index.aspx>.

Stations

Go to all eight stations in any order. List the math skills needed to complete the task. Write the DOK Level in the box.

Station # 1	**Station # 2**
Station # 3	**Station # 4**
Station # 5	**Station # 6**
Station # 7	**Station # 8**

Proportions and Similarity

Name_____ Period_____ Date_____

Standards
7.RP.3 Use proportional relationships to solve multistep ratio and percent problems.
7.G.1 Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.

1. What is the value of x in the proportion $\frac{9}{12} = \frac{15}{x}$?

A. 5
B. 9
C. 18
D. 20

2. Trevor bought 5 packages of cake mix for $32.50. How much would 8 packages of cake mix cost?

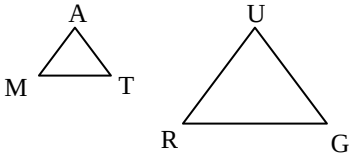
A. $60.00
B. $52.00
C. $48.60
D. $39.00

3. Priscilla ran 5 laps in 12 minutes. How long would it take her to run 14 laps at this pace?

A. $5\frac{5}{6}$ minutes
B. 30 minutes
C. $33\frac{3}{5}$ minutes
D. $36\frac{2}{5}$ minutes

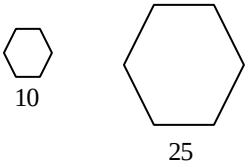
4. ΔMAT is similar to ΔRUG. Which side of ΔRUG corresponds to $\overline{AT}$ in ΔMAT?

A. $\overline{RU}$
B. $\overline{UG}$
C. $\overline{UR}$
D. $\overline{RG}$



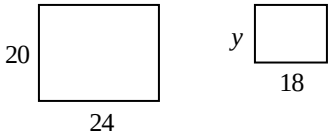
5. What is the scale factor for the similar figures?

A. 2 : 5
B. 10 : 12
C. 5 : 12
D. 2 : 10



6. What is the value for y in the similar figures?

A. 12
B. 14
C. 15
D. 16



7. Two similar triangles have a scale factor of 2 : 3. The smaller triangle has a perimeter of 16 inches. What is the perimeter of the larger triangle?

A. 17 inches
B. 21 inches
C. 24 inches
D. 27 inches

(1 point each)

Solve each proportion. *(1 point each)*

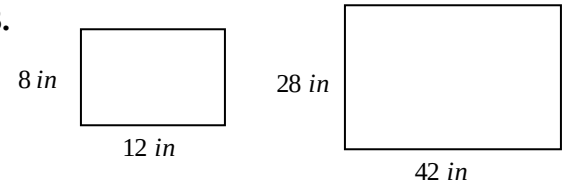
8. $\frac{3}{4} = \frac{24}{x}$ **9.** $\frac{20}{25} = \frac{y}{30}$ **10.** $\frac{a}{12} = \frac{8}{5}$

11. Greg bought four roses for $12.80. How much would ten roses cost? *(1 pt)*

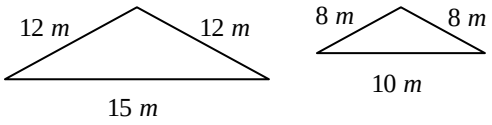
12. Mia ran 10 laps in 6 minutes. Shawna ran 5 laps in 4 minutes. Which person ran at a faster rate? *(1 pt)*

Determine the scale factor for each pair of similar figures. *(1 pt)*

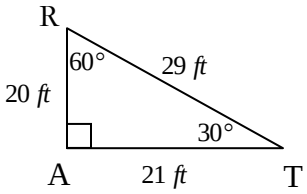
13.



14.



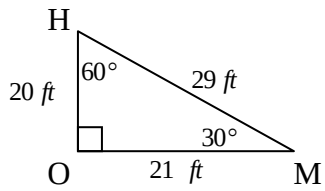
15. For the pair of figures below, find the corresponding sides and corresponding angles to the ones identified. *(3 pts)*



$\overline{RA}$ corresponds to _____ $\angle R \cong \angle$_____

$\overline{AT}$ corresponds to _____ $\angle A \cong \angle$_____

$\overline{RT}$ corresponds to _____ $\angle T \cong \angle$_____

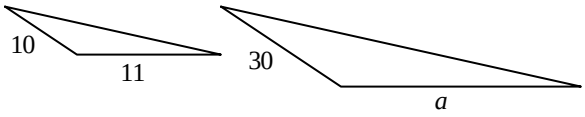


Are ΔRAT and ΔHOM congruent, similar, or neither?

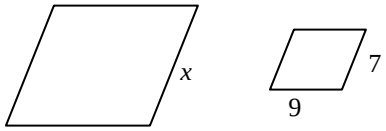
_____

The shapes below are similar. Use proportions to solve for each variable. *(1 pt)*

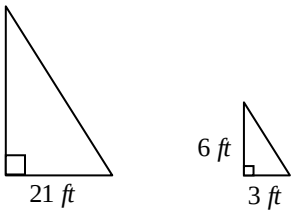
16.



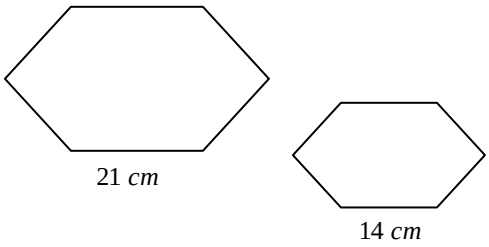
17.



18. Victor wanted to know the height of a tree at his friend's house. On Saturday morning, he measured the shadow of the tree along the ground to be 21 feet long. At the same time, he measured his own shadow to be 3 feet long. Victor is 6 feet tall. Find the height of the tree. *(2 pts)*



19. Use the similar figures below. *(3 pts)*



a. Find the scale factor. _____

b. Find the ratio of the perimeters. _____

c. Find the ratio of the areas. _____

20. Two similar triangles have perimeters of 10 inches and 20 inches. *(4 pts)*

a. Find the ratio of their perimeters. _____

b. Find the scale factor. _____

c. Find the ratio of their areas. _____

d. The smaller triangle has an area of 5 in^2.
Find the area of the larger triangle. _____

27 pts possible
Proficient = 20 pts

Figure 4.4:
Evaluation Tool for Assessment Instrument Quality

Assessment indicators	Description of Level 1	Requirements of the Indicator Are Not Present	Limited Requirements of This Indicator Are Present	Substantially Meets the Requirements of the Indicator	Fully Achieves the Requirements of the Indicator	Description of Level 4
Identification and emphasis on learning targets	Learning targets are unclear or absent from the assessment instrument. Too much attention is given to one target.	1	2	3	4	Clearly stated learning targets are on the assessment and connected to the assessment questions.
Visual presentation	Assessment is sloppy, disorganized, and difficult to read. There is no room for teacher feedback.	1	2	3	4	Assessment is neat, organized, easy to read, and well spaced. There is room for teacher feedback.
Time allotment	Few students can complete the assessment in the time allowed.	1	2	3	4	Test can be successfully completed in time allowed.
Clarity of directions	Directions are missing or unclear.	1	2	3	4	Directions are appropriate and clear.
Clear and appropriate scoring rubrics	Scoring rubric is either not in evidence or not appropriate for the assessment task.	1	2	3	4	Scoring rubric is clearly stated and appropriate for each problem.
Variety of assessment task formats	Assessment contains only one type of questioning strategy and no multiple choice. Calculator usage is not clear.	1	2	3	4	Test includes a variety of question types, assesses different formats, and includes calculator usage.
Question phrasing (precision)	Wording is vague or misleading. Vocabulary and precision of language is problematic for student understanding.	1	2	3	4	Vocabulary is direct, fair, and clearly understood. Students are expected to attend to precision in responses.
Balance of procedural fluency and demonstration of understanding	Test is not balanced for rigor. Emphasis is on procedural knowledge. Minimal cognitive demand for demonstration of understanding is present.	1	2	3	4	Test is balanced with product- and process-level questions. Higher-cognitive-demand and understanding tasks are present.

What does a Common Core Assessment look like?

Depth of Knowledge Levels

Level 1: Recall and Reproduce (25% of seat time on assessment)

Level 2: Basic Skills and Concepts (50% of seat time on assessment)

Level 3: Strategic Thinking and Reasoning (25% of seat time on assessment)

Level 4: Extended Thinking (Separate assessment – performance task)

Claims

1. **Concepts and Procedures (40% of overall score on SBAC)**
2. **Problem-Solving (40% of overall score on SBAC)**
3. **Communicating Reasoning (20% of overall score on SBAC)**

Styles of Items

1. Selected Response
   - multiple choice
   - select all that apply
   - true/false or yes/no
   - drag and drop
2. Constructed Response
   - fill in the blank
   - numerical answer
3. Extended Response
   - explain your reasoning
   - show how you know your answer is correct
   - writing a note to convince someone
4. Performance Task

Assessment Evaluation Tool

Item Number	DOK Level	Claim	Item Type

Suzi's Company

Suzi is the chief executive of a small company, TechScale, which makes technical instruments. Fifteen people, including Suzi, work in the company. The table shows the jobs and their annual salaries.

Job Title	*Number of people*	*Annual salary*	*Total*
Chief Executive	1	$100 000	$100 000
Marketing Manager	1	$80 000	
Production Manager	1	$80 000	
Technician	3	$50 000	$150 000
Office worker	2	$40 000	$80 000
Assembly worker	5	$30 000	
Cleaner	2	$20 000	
Total	**15**	***Total***	

1. a. Complete the final column of the table to find the total annual salary bill for TechScale.

   b. Use your answer to question 1a to calculate the mean annual salary for the 15 employees in the company. Give your answer correct to the nearest $.

   $_____

   Show your calculations.

2. John looks at the table and says, "The mode of the salary at TechScale is eighty thousand dollars a year."

a. What mistake has John made?

b. What is the correct mode of the salary? _____

3. a. What is the median annual salary at TechScale? _____

b. Explain how you figured it out.

4. Which of the three averages, mean, median or mode, would you use to show that the average wage at TechScale is very good? _____

Explain your answer.

5. Last year, TechScale did not do very well so Suzi decided not to pay herself any salary for a year.

a. Which of the averages (mean, median and mode) will **not** change?

Suzi's Company		Rubric	
		points	section points
1.a	Table completed correctly. Gives correct answer: total **$680 000**	1 1	
b	Gives correct answer: **$45 333** and shows calculation $\frac{680000}{15}$	1	3
2.a	Gives correct explanation such as: He has not looked at how many people earn each salary	1	
b	Gives correct answer: **$30 000**	1	2
3.a	Gives correct answer: **$40 000**	1	
b	There are 15 people. The middle person, the 8th person, gets $40 000	1	2
4.	Gives correct answer: **Mean** Gives correct explanation such as: That is the highest of the three.	1 1	2
5.a	Gives correct answer: **Mode**	1	1
	Total Points		**10**

Total
$100 000
$80 000
$80 000
$150 000
$80 000
$150 000
$40 000
$680 000

Suzi's Company

T1

This problem gives you the chance to:
- calculate and interpret mean, medium and mode in a given table of realistic data

Suzi is the chief executive of a small company, TechScale, which makes technical instruments. Fifteen people, including Suzi, work in the company. The table shows the jobs and their annual salaries.

Job Title	*Number of people*	*Annual salary*	*Total*
Chief Executive	1	$100 000	$100 000
Marketing Manager	1	$80 000	$ 80 000
Production Manager	1	$80 000	$ 80 000
Technician	3	$50 000	$150 000
Office worker	2	$40 000	$80 000
Assembly worker	5	$30 000	$150 000
Cleaner	2	$20 000	$ 40 000
Total	**15**	***Total***	$680 000

1. a. Complete the final column of the table to find the total annual salary bill for TechScale.

   b. Use your answer to question 1a to calculate the mean annual salary for the 15 employees in the company. Give your answer correct to the nearest $.

   $ 45,333

   Show your calculations.

   $\frac{680\,000}{15}$

T1

2. John looks at the table and says, "The mode of the salary at TechScale is eighty thousand dollars a year."

   a. What mistake has John made?

He just saw the annual salary and saw that 80,000 was there twice what he didn't see was the number of people that get payed that much.

   b. What is the correct mode of the salary? $30,000

3. a. What is the median annual salary at TechScale? $40,000

   b. Explain how you figured it out.

Well I put the annual salary counting number of people in order. 20, 20, 30, 30, 30, 30, 30, 40, 40, 50, 50, 50, 80, 80, 100 then just crossed out the numbers.

4. Which of the three averages, mean, median or mode, would you use to show that the average wage at TechScale is very good?

   Explain your answer. mean

because it make people believe that you are going to get payed at 45,333 because that what most people are making.

5. Last year, TechScale did not do very well so Suzi decided not to pay herself any salary for a year.

   Which of the averages (mean, median and mode) will **not** change?

mode

12

Suzi's Company

T2

This problem gives you the chance to:

- calculate and interpret mean, medium and mode in a given table of realistic data

Suzi is the chief executive of a small company, TechScale, which makes technical instruments. Fifteen people, including Suzi, work in the company. The table shows the jobs and their annual salaries.

GGFFFFF[5] DDDCB

Job Title	*Number of people*	*Annual salary*	*Total*
Chief Executive	1	$100 000	$100 000
Marketing Manager	1	$80 000	80,000
Production Manager	1	$80 000	80,000
Technician	3	$50 000	$150 000
Office worker	2	$40 000	$80 000
Assembly worker	5	$30 000	15,000
Cleaner	2	$20 000	40,000
Total	**15**	***Total***	545,000

5

1. a. Complete the final column of the table to find the total annual salary bill for TechScale.

   b. Use your answer to question 1a to calculate the mean annual salary for the 15 employees in the company. Give your answer correct to the nearest $.

   $ 36333

   Show your calculations.

15 ⟌ 545000 or

$\frac{545000}{15} = \$36333$

2. John looks at the table and says, "The mode of the salary at TechScale is eighty thousand dollars a year."

a. What mistake has John made?

John only looked at one colum when he needed to find out how many of each salary is paid.

b. What is the correct mode of the salary? $30,000

3. a. What is the median annual salary at TechScale? $ 40,000

b. Explain how you figured it out.

I lined up the numbers in order then found the 7th number in line and that is the median.

4. Which of the three averages, mean, median or mode, would you use to show that the average wage at TechScale is very good? median

Explain your answer.

Because the measure of central tendancy is higher than the others in this case.

5. Last year, TechScale did not do very well so Suzi decided not to pay herself any salary for a year.

Which of the averages (mean, median and mode) will **not** change?

mode

13 10

Suzi's Company

T3

This problem gives you the chance to:
- calculate and interpret mean, medium and mode in a given table of realistic data

Suzi is the chief executive of a small company, TechScale, which makes technical instruments. Fifteen people, including Suzi, work in the company. The table shows the jobs and their annual salaries.

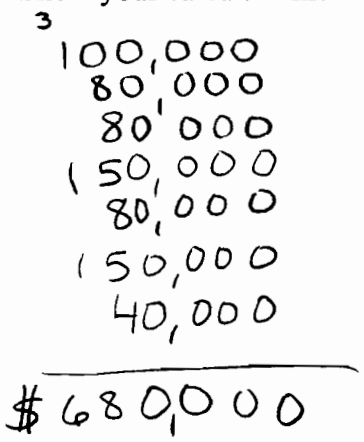
Job Title	*Number of people*	*Annual salary*	*Total*
Chief Executive	1	$100 000	$100 000
Marketing Manager	1	$80 000	$80 000
Production Manager	1	$80 000	$80 000
Technician	3	$50 000	$150 000
Office worker	2	$40 000	$80 000
Assembly worker	5	$30 000	$150 000
Cleaner	2	$20 000	$40 000
Total	**15**	***Total***	$680 000

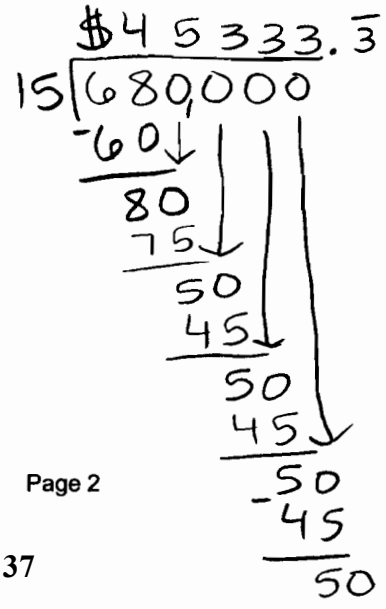
1. a. Complete the final column of the table to find the total annual salary bill for TechScale.

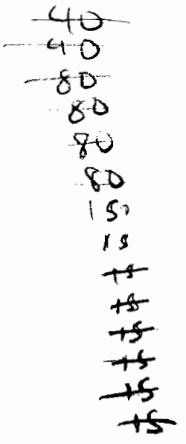
   b. Use your answer to question 1a to calculate the mean annual salary for the 15 employees in the company. Give your answer correct to the nearest $.

   $45,333

   Show your calculations.







T3

2. John looks at the table and says, "The mode of the salary at TechScale is eighty thousand dollars a year."

a. What mistake has John made?

His mistake was that he counted it only for one person and not for others.

b. What is the correct mode of the salary? $150,000

3. a. What is the median annual salary at TechScale? $150.000

b. Explain how you figured it out.

First I put the numbers in order from smallest to largest and then found what number is in the middle of the set of numbers.

4. Which of the three averages, mean, median or mode, would you use to show that the average wage at TechScale is very good? median

Explain your answer.

The median number $150,00 shows about the averages at Techscale.

5. Last year, TechScale did not do very well so Suzi decided not to pay herself any salary for a year.

Which of the averages (mean, median and mode) will **not** change?

The mode and the median.

10/15

Suzi's Company

T4

This problem gives you the chance to:

- calculate and interpret mean, medium and mode in a given table of realistic data

Suzi is the chief executive of a small company, TechScale, which makes technical instruments. Fifteen people, including Suzi, work in the company. The table shows the jobs and their annual salaries.

Job Title	*Number of people*	*Annual salary*	*Total*
Chief Executive	1	$100 000	$100 000
Marketing Manager	1	$80 000	$80 000
Production Manager	1	$80 000	$80 000
Technician	3	$50 000	$150 000
Office worker	2	$40 000	$80 000
Assembly worker	5	$30 000	$150 000
Cleaner	2	$20 000	$40 000
Total	**15**	***Total***	$590 000

1. a. Complete the final column of the table to find the total annual salary bill for TechScale.

   b. Use your answer to question 1a to calculate the mean annual salary for the 15 employees in the company. Give your answer correct to the nearest $.

   $ 39333.3

   Show your calculations.

   $590 000 ÷ 15

T4

2. John looks at the table and says, "The mode of the salary at TechScale is eighty thousand dollars a year."

a. What mistake has John made?

John did the mode because $80 000 has 3 salary as a total

b. What is the correct mode of the salary? $80 000

3. a. What is the median annual salary at TechScale? $50 000

b. Explain how you figured it out.

In the ANNUAL SALARY column $100,000 is the largest and $20 000 is the smallest then you go to the secound smallest and biggest an so on till you get to the middle

4. Which of the three averages, mean, median or mode, would you use to show that the average wage at TechScale is very good? $80 000

Explain your answer.

because you have 2 out of 15 chance to get $80 000

5. Last year, TechScale did not do very well so Suzi decided not to pay herself any salary for a year.

Which of the averages (mean, median and mode) will **not** change?

mode

10

Suzi's Company

T5

This problem gives you the chance to:

- calculate and interpret mean, medium and mode in a given table of realistic data

Suzi is the chief executive of a small company, TechScale, which makes technical instruments. Fifteen people, including Suzi, work in the company. The table shows the jobs and their annual salaries.

Job Title	*Number of people*	*Annual salary*	*Total*
Chief Executive	1	\ $100 000	$100 000
Marketing Manager	1	\ $80 000	$80 000
Production Manager	1	\ $80 000	$80,000
Technician	3	\\\ $50 000	$150 000
Office worker	2	\\ $40 000	$80 000
Assembly worker	5	\\\\\ $30 000	$150,000
Cleaner	2	\\ $20 000	$40,000
Total	**15**	***Total***	$680,000

1. a. Complete the final column of the table to find the total annual salary bill for TechScale.

   b. Use your answer to question 1a to calculate the mean annual salary for the 15 employees in the company. Give your answer correct to the nearest $.

   $4533.33

   Show your calculations.

100,000
80,000
80,000
150,000
80,000
150,000
+ 40,000
$680000

$680,000 ÷ 15
=
$4533.33

T5

2. John looks at the table and says, "The mode of the salary at TechScale is eighty thousand dollars a year."

a. What mistake has John made?

He did the total cost of the job and didn't go by the number of people and the annual salary. $30,000

b. What is the correct mode of the salary? $30,000

3. a. What is the median annual salary at TechScale? $40,000

b. Explain how you figured it out.

I took the number of people there was for their annual salary and lined them up Example. 100,000, 80,000, 80,000, 50,000, 50,000, 50,000, 40,000, 40,000, 30,000, 30,000, 30,000, 20,000, 20,000

4. Which of the three averages, mean, median or mode, would you use to show that the average wage at TechScale is very good? mean

Explain your answer.

Because, that's the highest prices there is, when you use, the mean, median and mode

5. Last year, TechScale did not do very well so Suzi decided not to pay herself any salary for a year.

Which of the averages (mean, median and mode) will **not** change?

mode

15