

CISD 6th Grade Math Process Standards

2014-2015


Mathematical Process Standards

The mathematical processes in the revised math state standards are the same from kindergarten to Pre-Calculus. Why? Because these are the processes of doing mathematics. These are the ways that mathematicians work every day. These are the processes that students will use to understand the new math content and show that they know it.

For grades 3 through Algebra II, these are the processes that will be dual coded on STAAR with the content standards, which are the rest of the standards. What that means is that students need to look at the content standards through the lens of the process standards. In the January 2014 Assessed Curriculum documents, TEA states about the process standards, "These student expectations will not be listed under a separate reporting category. Instead, they will be incorporated into test questions across reporting categories since the application of mathematical process standards is part of each knowledge statement."


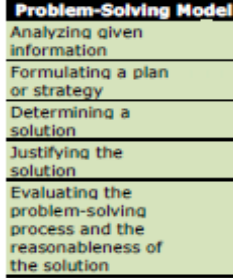
Students in 6th grade who are learning the operations with integers should experience real-life problems that require the use of integers (6.1A). They should use process to solve the problems that includes using concrete objects to solve the problem (6.1C) and communicating their ideas by drawing pictures and writing equations (6.1D). This example certainly isn't an exhaustive list. But it gives the idea that the processes are not taught separately from content. They are the vehicle that allows students to learn math and show what they know.

6.1 Mathematical Process Standards. The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to:

Readiness or Supporting	Student Expectation	Nouns	TEA Supporting Information	Resources
	6.1A apply mathematics to problems arising in everyday life, society, and the workplace.	mathematics, problems, everyday life, society, workplace	The focus has shifted to application. The opportunities for application have been consolidated into three areas: everyday life, society, and the workplace. The revised SE, when tagged to a content SE, allows for increased rigor through connections outside the discipline.	Math Process Standard Series Representations, Communication, Problem Solving, Connections, Reasoning & Proof
		Verbs apply		

6.1A Instructional Information

TEKS 6.1A makes it clear that the math that students experience should be problem-based, rather than numbers with no context. Problems can come from the everyday life of a 6th grader, from the life of the school or the society where they live, or can be work-based.


Readiness or Supporting	Student Expectation	Nouns	TEA Supporting Information	Resources
	<p>6.1B use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution.</p>	<p>problem-solving model, information, plan, strategy, solution, reasonableness problem-solving</p> <hr/> <p>Verbs</p> <p>use, incorporates, analyzing, formulating, determining, justifying, evaluating</p>	<p>The revised SE restates and condenses 6.14B and 6.14C.</p> 	<p>Math Process Standard Series Representations, Communication, Problem Solving, Connections, Reasoning & Proof</p>

6.1B Instructional Information

6.1B is not meant to prescribe a particular problem-solving model. However, any problem-solving model used must contain these elements:

- analyzing the problem,
- making a plan or deciding on a strategy,
- solving the problem,
- justifying the solution,
- evaluating the process that the student just completed, and
- checking the answer for reasonableness.

The CISD Problem-Solving Map and Texas Problem-Solving Model are both tools that develop students' use of these elements.

Readiness or Supporting	Student Expectation	Nouns	TEA Supporting Information	Resources
	<p>6.1C select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate to solve problems.</p>	<p>tools, real objects, manipulatives, paper, pencil technology, techniques, mental math, estimation, number sense, problems</p> <hr/> <p>Verbs</p> <p>select, solve</p>	<p>The phrase “as appropriate” has been inserted into the Revised TEKS (2012). This implies that students are assessing which tool to apply rather than trying only one or all. “Paper and pencil” is now included in the list of tools that still includes real objects, manipulatives, and technology.</p>	<p>Math Process Standard Series Representations, Communication, Problem Solving, Connections, Reasoning & Proof</p>

6.1C Instructional Information

This state standard fits into the second and third bullets of TEKS 6.1B—the tools and techniques that are needed to solve the problem.

6.1C lists four different tools that students should use to solve problems: real objects, manipulatives, paper and pencil, and technology. Many of the content standards specifically state that students should use real objects or manipulatives. Your campus probably has a plethora of manipulatives for students to use. Break them out and put them to use!

The introduction to the 6th grade TEKS specifically lists some appropriate tools that middle school students should use: real objects, manipulatives, algorithms, paper and pencil, and technology. It also lists some techniques that students should use:


- mental math
- estimation
- number sense

This means that it is okay for students to “do the math in their heads”—that’s mental math! They must also be able to explain their thinking and must learn to write it down.

Let’s examine technology more closely. Technology is listed with other common middle school tools. This indicates that technology should be commonly used. However, calculators cannot be used on the STAAR assessment. Paragraph 3 of the introduction gets even more specific where it states that “while the use of all types of technology is important, the emphasis on algebra readiness skills necessitates the implementation of graphing technology.” Here are some guidelines for using technology in the middle grades.


1. Graphing technology cannot replace being able to do the work by hand. Since students cannot use calculators on the STAAR, they must be able to do the work without calculators, too.
2. Use of the calculator can save time so that you can get to the critical thinking portions of the standards. Students often get stuck in the creation and never get to the analyze piece when it comes to data analysis. Graphing technology can be used to create graphs quickly so that students can work on the interpret and analyze parts of the standards. (See 6.13A.)
3. Technology allows students to input many examples quickly so that they can analyze a pattern and draw a conclusion. For example, in 6.3B, students must predict whether a product will be larger or smaller than the factors when fractions are multiplied. Certainly students can do this by hand. But it takes a long time. If students have the opportunity to look at many examples quickly through the use of a calculator, they may be able to draw conclusions more quickly, thus making this state standard fairly simple to understand. This is an appropriate use of technology—using it to understand math concepts rather than solely for calculations.
4. Although the TEKS specifically mention graphing technology, this does not mean that every middle school math class must have a set of graphing calculators. Instead there are many free apps on the Internet that can be used to create graphs. Another powerful and common tool for graphing is Excel. It has many built-in features that allow graphs to be created quickly and easily.
5. Our students have grown up in a digital age. This means that technology comes more easily to them than it does to some adults. Our students are not fearful of technology and can learn it through exploration. If you are afraid to use the technology because you don’t know everything about it, let a student take charge of the technology part of the lesson. Not only will students understand better from a fellow “digital native,” but you will have given students a chance to shine.

You might learn something from them, too. This means that it is okay for students to “do the math in their heads”—that’s mental math! They must also be able to explain their thinking and must learn to write it down.

Readiness or Supporting	Student Expectation	Nouns	TEA Supporting Information	Resources
	6.1D communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate.	mathematical ideas, reasoning, implications, multiple representations, symbols, diagrams, graphs, language	Communication has expanded to include reasoning and the implications of mathematical ideas and reasoning. The list of representations is now summarized with “multiple representations” with specificity added for symbols and diagrams.	Math Process Standard Series Representations, Communication, Problem Solving, Connections, Reasoning & Proof
		Verbs communicate		


6.1D Instructional Information

Mathematical communication - in fact, technical communication – is a critical skill for students to practice in our technology-driven, science-dependent world. The beauty of mathematical communication is that it makes clear what words sometimes cannot make clear. It is succinct and complete. Students should be able to demonstrate their thinking in several ways—using the symbols that carry mathematical meaning, drawing diagrams that provide a pictorial view of thinking, using graphs that provide a basis for analysis, and using clear mathematical language to explain it all.

Readiness or Supporting	Student Expectation	Nouns	TEA Supporting Information	Resources
	6.1E create and use representations to organize, record, and communicate mathematical ideas.	representations, mathematical ideas	The use of representations is extended to include organizing and recording mathematical ideas in addition to communicating. As students use and create representations, it is implied that they will evaluate the effectiveness of their representations to ensure that they are communicating mathematical ideas clearly. Students are expected to use appropriate mathematical vocabulary and phrasing when communicating mathematical ideas.	Math Process Standard Series Representations, Communication, Problem Solving, Connections, Reasoning & Proof
		Verbs create, use, organize, record, communicate		


6.1E Instructional Information

6.1E is related to the multiple representations listed in 6.1D. It provides the purpose for the use of the representations. The purpose of the representations is to clearly organize, record, and communicate the students’ ideas so that others can understand them, especially you!

Readiness or Supporting	Student Expectation	Nouns	TEA Supporting Information	Resources
	6.1F analyze mathematical relationships to connect and communicate mathematical ideas.	mathematical relationships, mathematical ideas	The Revised TEKS (2012) extends the current TEKS to allow for additional means to analyze relationships and to form connections with mathematical ideas past conjecturing and sets of examples and non-examples. Students are expected to form conjectures based on patterns or sets of examples and non-examples.	Math Process Standard Series Representations, Communication, Problem Solving, Connections, Reasoning & Proof
		Verbs		

6.1F Instructional Information

One of the things that engineers do every day is look for ways that ideas are mathematically connected. Students in K - 12 do not possess this skill naturally. By looking for mathematical relationships in the content and learning how to communicate them, students are building a mathematical background that opens the world of engineering to them. Even if they aren't interested in being engineers, many professional areas rely on mathematical ideas—statistics, business, marketing, and 3D animation, for example. Without the ability to communicate mathematical ideas, an adult in the twenty-first century is severely limited in his or her career path. What does “analyze mathematical relationships” mean? When a student analyzes a mathematical relationship between two or more quantities, he or she looks for a pattern or a structure and uses it to solve a problem. He or she can see how two quantities are alike or different mathematically based on their attributes or properties. Check out the verb in the standard: analyze. This is one of the highest levels of Bloom’s Taxonomy and a Depth of Knowledge Level 3. It takes years to build the ability to analyze complex relationships. With teachers of every grade level helping students analyze relationships at their grade at increasing levels of sophistication, students can learn to do this before they go to college or enter the work world.

Readiness or Supporting	Student Expectation	Nouns	TEA Supporting Information	Resources
	6.1G display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.	mathematical ideas, arguments, mathematical language, written communication, oral communication	The Revised TEKS (2012) clarifies “validates his/her conclusions” with displays, explanations, and justifications. The conclusions should focus on mathematical ideas and arguments. Displays could include diagrams, visual aids, written work, etc. The intention is make one’s work visible to others so that explanations and justifications may be shared in written or oral form. Precise mathematical language is expected. For example, students would use “vertex” instead of “corner” when referring to the point at which two edges intersect on a polygon.	Math Process Standard Series Representations, Communication, Problem Solving, Connections, Reasoning & Proof
		Verbs		

6.1G Instructional Information

Why? More than any other question in a math class, the teacher should ask, “Why?” Whether their answer is right or wrong, students should never be allowed to give the only answer. Every answer should be followed by “because...” Students may not naturally do this. In fact, when you begin asking students why, they may immediately change their answer. You may need to redirect them back to their original answer and have them explain it. If the student has the correct solution, great! They will feel empowered to continue to work. If students have incorrect solutions, when he or she comes to the part of the solution where he or she made a mistake, the student will often catch his or her own mistake and make an immediate correction. Great! When the classroom has the right atmosphere, oral justifications can be a great way to build a classroom culture of “It’s okay to be wrong.”

A great way to build the idea of multiple ways to solve problems is to have more than one student explain their solution processes, even if the processes are the same. This gives students who might not have gotten the problem right a chance to hear an explanation using “kid words,” not teacher words. This can be a powerful tool in helping struggling students understand. Certainly, every problem cannot be explained aloud. Have students use their math journals as a place to justify their thinking. Certainly include justification on end-of-unit tests, even if you are required to give a multiple choice test. Students can still provide a mathematical explanation of why they chose “A” over “D.”

Fourth Grading Period **Topics 16 and 17: Personal Financial Literacy** **(10 days)**
Mathematical Process Standards



- (A) apply mathematics to problems arising in everyday life, society, and the workplace;
- (B) use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution;
- (C) select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems;
- (D) communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;
- (E) create and use representations to organize, record, and communicate mathematical ideas;
- (F) analyze mathematical relationships to connect and communicate mathematical ideas; and
- (G) display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.




Unit Vocabulary



debit card	financial institution	deposit	credit	college
credit card	checking account	withdrawal	credit history	grant
monetary award	student loan	work-study	financial aid	salary
checking account	check register	transfer	credit report	scholarship
annual salary	lifetime income	post secondary		

Math Review: During this unit, classroom Math Review should be based on the specific academic needs of each class from a variety of sources; including but not limited to benchmarks, common assessments, informal assessments, and teacher observations.

6.14 Personal financial literacy. The student applies mathematical process standards to develop an economic way of thinking and problem solving useful in one's life as a knowledgeable consumer and investor. The student is expected to:

Readiness or Supporting	Student Expectation	Nouns	TEA Supporting Information	Resources
	6.14A compare the features and costs of a checking account and a debit card offered by different local financial institutions	features, costs, checking account, debit card, financial institutions		Digits *Digits lessons should be taught in their entirety, including Launch, Examples, and Close and Check. Vertical Alignment Digits Teacher Guide Unit F p. 979 & p. 1022
		Verbs		
		compare, offered		
Readiness or Supporting	Student Expectation	Nouns	TEA Supporting Information	Resources
	6.14B distinguish between debit cards and credit cards	debit cards, credit cards		Teacher Guide Topic 16 pp. 977-1027 Topic 17 pp. 1029-1065
		Verbs		
		distinguish		

Readiness or Supporting	Student Expectation	Nouns	TEA Supporting Information	Resources
	6.14C balance a check register that includes deposits, withdrawals, and transfers	check register, deposits, withdrawals, transfers		Student Companion Topic 16 pp. 367-384 Topic 17 pp. 385-402 Lessons 16-1; 16-2; 16-3 and 16-4 Lessons 17-1; 17-2; 17-3 and 17-4 Process Standard Books: Introduction to Communications CD Activities: Bank Account
		Verbs		
		balance, includes		
Readiness or Supporting	Student Expectation	Nouns	TEA Supporting Information	The following lessons can be downloaded from the Personal Financial Literacy Moodle. TCEE Created Lesson www.smartertexas.org Lesson 1: Best Payment Option: Debit or Credit Lesson 2: Checks and Balances Lesson 3: Credit Reports Lesson 4: Which Job is Best for Me? Lesson 5: Paying for College Financial Fitness for Life Lesson 4: Why Stay in School Lesson 5: Choosing a Career Lesson 6: Productivity Lesson 8: Choosing and Using a Checking Account Lesson 16: Establishing Credit
	6.14D explain why it is important to establish a positive credit history	positive credit history		
		Verbs		
		explain, is , establish		
Readiness or Supporting	Student Expectation	Nouns	TEA Supporting Information	Lesson 2: Checks and Balances Lesson 3: Credit Reports Lesson 4: Which Job is Best for Me? Lesson 5: Paying for College Financial Fitness for Life Lesson 4: Why Stay in School Lesson 5: Choosing a Career Lesson 6: Productivity Lesson 8: Choosing and Using a Checking Account Lesson 16: Establishing Credit
	6.14E describe the information in a credit report and how long it is retained	information, credit report		
		Verbs		
		describe, is retained		
Readiness or Supporting	Student Expectation	Nouns	TEA Supporting Information	Hands on Banking Teens: Saving and Checking Guide Teens: Credit and You Young Adults: All About Credit Young Adults: School and \$ Young Adults: Earning
	6.14F describe the value of credit reports to borrowers and to lenders	value, credit reports, borrowers, lenders		
		Verbs		
		describe		

Readiness or Supporting	Student Expectation	Nouns	TEA Supporting Information
	6.14G explain various methods to pay for college, including through savings, grants, scholarships, student loans, and work-study	methods, college, savings, grants, scholarships, student loans, work-study	
		Verbs	
		explain, pay, including	
Readiness or Supporting	Student Expectation	Nouns	TEA Supporting Information
	6.14H compare the annual salary of several occupations requiring various levels of post-secondary education or vocational training and calculate the effects of the different annual salaries on lifetime income	annual salary, occupations, levels, post-secondary education, vocational training, effects, annual salaries, lifetime incomes	
		Verbs	
		compare, requiring, calculate	

Instructional Information

6.14A
 Notice the verb—compare. For this SE, students are not reading about or just understanding the difference between checking accounts and debit cards. They are using information from your local financial institutions to make the comparisons. Be sure that they compare the offerings of banks and credit unions, as most communities have both of these types of financial institutions.

Minimum to Open: This is the minimum amount of money that needs to be deposited in the account to open the account

Open an Account: When people deposit their money in a financial institution, this is referred to as opening an account.

Monthly Service Fee: A fee that the institution charges each month that the account is open.

ATM Daily Cash Limit: The maximum amount of money that may be withdrawn from an account each day regardless of the amount of money that is in the account.

Overdraft Protection: When funds in a savings account are automatically transferred to cover checks that are written that are more than the amount of money in the bank account.

Overdraft Fee: Fees that are charged when a person tries to spend more money than is in the bank account.

Mobile Banking: The ability to handle most financial transactions from a computer or smart phone.

Additional Information:
 The student will have the opportunity to research different financial institutions and compare the various services offered by each institution. Be sure to include the differences in rates and fee. Be sure to include fees associated with each of the features. (i.e.. ATM fees for a non-network bank.)

Sample Lessons:
http://smartertexas.org/?page_id=914
http://www.msbankers.com/assets/1674/its_a_balancing_act_-_teacher_guide.pdf

6.14B

Students should be able to distinguish between debit and credit cards.

Sample Lessons:

http://smartertexas.org/?page_id=914

http://www.msbankers.com/assets/1674/its_a_balancing_act-_teacher_guide.pdf

CARD TYPE	ADVANTAGE	DISADVANTAGE
DEBIT CARD	<ul style="list-style-type: none"> You don't have to carry cash or a checkbook. It's safe because only you know your PIN (personal identification number). Without the PIN, no one else can access your money at an ATM. If someone steals your card, you're only responsible for part of the purchases they make. 	<ul style="list-style-type: none"> You must have enough money in your account to cover purchases. You have to remember your PIN to access cash. If you don't record your purchases, you may overdraw your account and have to pay a fine.
CREDIT CARD	<ul style="list-style-type: none"> You can buy things before you have saved the entire purchase price. It is a way to pay for emergency expenses. If someone steals your card, you're only responsible for part of the purchase they make. It is convenient and makes it easy to have a record of your expenses. 	<ul style="list-style-type: none"> You may have to pay a yearly fee for the card. You pay interest on the unpaid monthly balance. Because of the interest, you may pay more for items than if you paid cash.

6.14C

How do you keep track of the money in your account? It's a simple matter of addition and subtraction. You just have to stay organized.

Why don't you try it? Imagine that you have a checking account and use both checks and a debit card. Here are your transactions for the last half of January. Enter them into the "checkbook" below:

- Your beginning balance is \$150.
- On January 15th, you write check #1150 to your school for \$10 for two tickets to movie night.
- On January 16th, your neighbors pay you \$75 for dog-sitting and you deposit it in the bank.
- On January 17th, you use your debit card to pay \$80 for a new pair of shoes.
- On January 17th, you use your debit card to pay \$10 for your monthly music subscription.
- On January 20th, your parents pay you \$20 in allowance and you deposit it in the bank.
- On January 25th, you write check #1151 to your school for \$10 for a ticket to the school play.
- On January 28th, you use your debit card to pay \$15 for a movie ticket and popcorn.
- On January 29th, your parents pay you \$20 in allowance and you deposit it in the bank.
- On January 30th, you use your debit card for \$25 for pizza with your friends.

Sample Checkbook

			(-)	(+)	
Check or	Date	Description of Transaction	Amount of	Amount of	BALANCE
Receipt #			Withdrawal	Deposit	
					\$150.00
1150	15-Jan	School movie night (2 tickets)	\$10.00		\$140.00
	16-Jan	Payment for dog-sitting		\$75.00	\$215.00

What is your checkbook balance on January 30th after your dinner with your friends?

Do you still have money in your account?

Misconceptions: Students have a difficult time understanding the positive and negative numbers and how to work them in reverse. The perspective who is gaining and who is losing the amounts.

Sample Lessons:

http://smartertexas.org/?page_id=914

http://www.msbankers.com/assets/1674/its_a_balancing_act-_teacher_guide.pdf

6.14C Continued

Net Worth

On the Internet, look up the net worth of someone interesting to your students. Make up two to three assets and two to three debts that will total that net worth, and ask your students to figure out her net worth. Then, with students, look up the net worth of other people of their choice. Have them suggest possible assets and debts for that person.

6.14D, 6.14E, and 6.14F

For 6.14D, E, and F, students begin to understand credit reports. They learn

- why a positive credit history is, or will be, important to them,
- what information is included in a credit report,
- how long information is reported in a credit report, and
- how borrowers and lenders use credit reports to make lending decisions.

A person's credit history is a report that lists

- people's uses of credit
- their repayment of loans
- whether they made their payments on time
- the number of credit cards and amount of credit they are using
- the number of credit cards and amount of credit available to them, whether they are using it or not
- bankruptcies and foreclosures
- when an unpaid account goes into collection
- tax liens

6.14G

comparisons should include:

- saving money for college
- qualifying for grants
- applying and winning scholarships
- taking out loans
- work-study programs offered through universities, the armed forces, and other organizations that pay for college studies or job training

Depending on your population of students, it is likely that some of them will believe that they could never afford college. This is an excellent time to help them understand that college funding is attainable. Many schools now highly promote working toward college acceptance. If you have a college center in your school or at the high school, be sure to tap into the resources available there.

Also, if your school has a college partner, ask the financial aid office to speak to your students.

6.14H

Students are doing two different things with this Student Expectation (SE). First they will compare salaries from different occupations. Then they will calculate a lifetime of annual salaries. Note that the SE says that students compare the annual salary of several occupations, not just investigate one occupation. The meat is in the comparison between the salaries, not just in the investigation.

This SE can be FUN! Students get to investigate their careers of choice and calculate their lifetime income. This should be fascinating to them. Pair it with the interest inventory that most students take

in middle school. Students then can choose some of the careers that seem interesting to them based on the inventory. Certainly you are going to have those students who are convinced that they can be a super model, professional football player, or singer. Let some of them investigate those salaries, not just for the ones who make a great living, but for the average model or football player that retires at 30. How long does that super salary last? As they investigate their super-size salary, be sure they choose another career that is in line with the career inventory.

Note: Allow students to utilize internet resources to explore various career salaries.