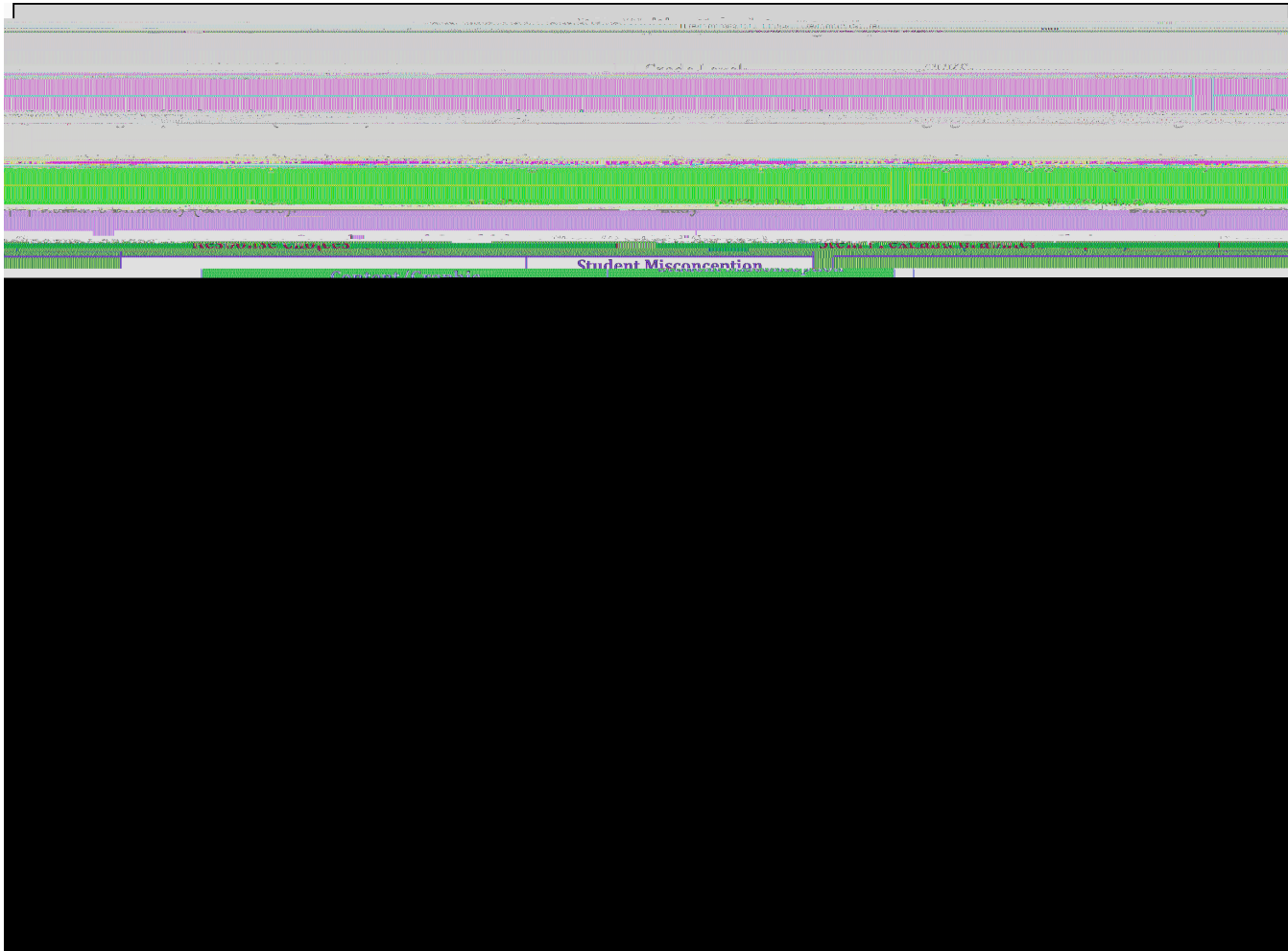




! " # \$ % & ' ' & (% %) % % *) ' + &



,+) * &- ./+/' 0&1) * 234+)&



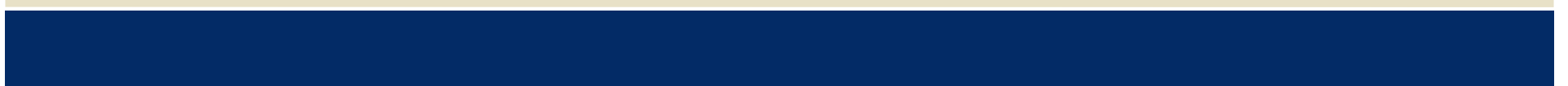


5''' %/6). 4+/''' %&7'' .&1)%+&,+) * %&

- **Knowledge Representations**

- Target knowledge and skills

-







; ' " <3) 60)&=) 2.)%) ' +4+/'" ' %>&
14.0)+&; ' " <3) 60)&4' 6&?@/33%&

•





; ' " <3) 60)&=) 2.)%) ' +4+/' "' %>&
A./60/' 0&; ' " <3) 60)&4' 6&?@/33%&

- Knowledge and skills needed to **connect or support students' learning** from the foundational knowledge to the target knowledge and skills
 - Often represents an integration of knowledge and skills (may be conceptual or model-based)
- The knowledge and skills that students learn from the teacher or instructional materials





?4 * 23)&
B. 46)&C&

&,+) * &

!

!

!

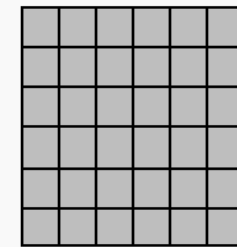
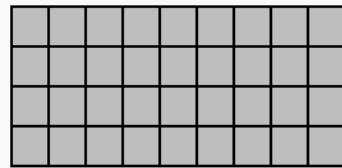
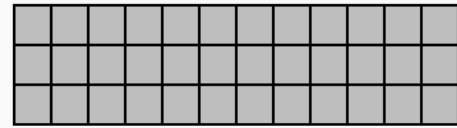
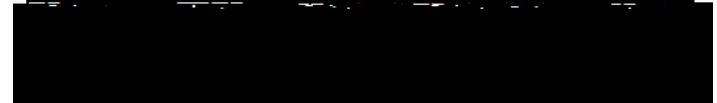
!

5" ..)#+&4' %<).&



?4 * 23)&
B. 46)&C&

&,+) * &

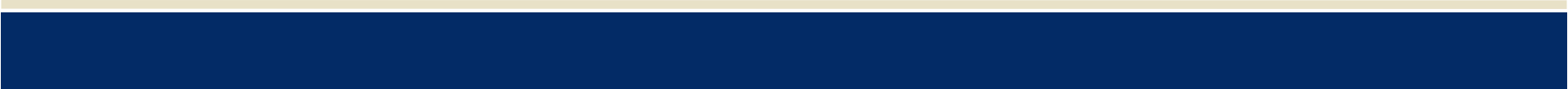


5" ..)#+&4' %<).>& &&





8. "#)%%&7".&(./#\$34+/' 0&+D)&5"' +)' +&"7&4' &
,+) * &+D. "\$0D&@' " <3)60)&.)2.)%)' +4+/' "' %&

- ! Become familiar with the TEKS standard (content standard) for which you are writing a test item
 - ! Articulate the **TARGET SKILLS**
 - ! Articulate the **FOUNDATIONAL SKILLS**
 - ! Articulate the **BRIDGING SKILLS**
-
- 



; ' " <3)60)&=)2.)%)' +4+/' "' %&

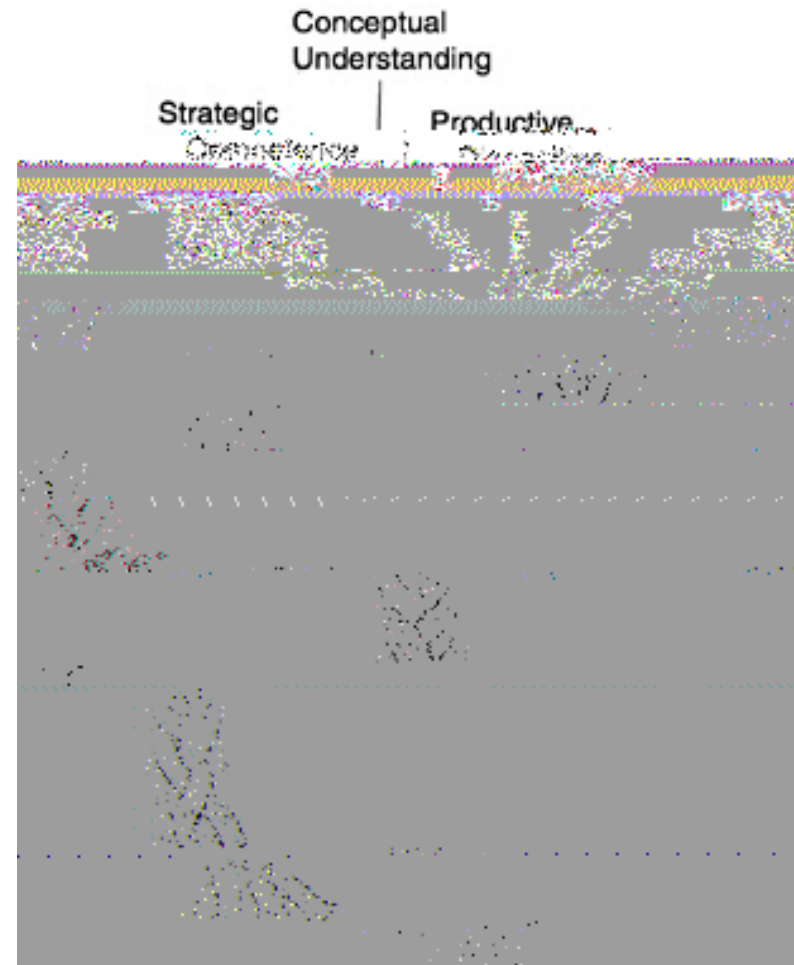
Foundational:





?+. 4' 6%&"7&G4+D) * 4+/#43&
8. "H/#/) ' #: &

- Intertwined Strands of Proficiency

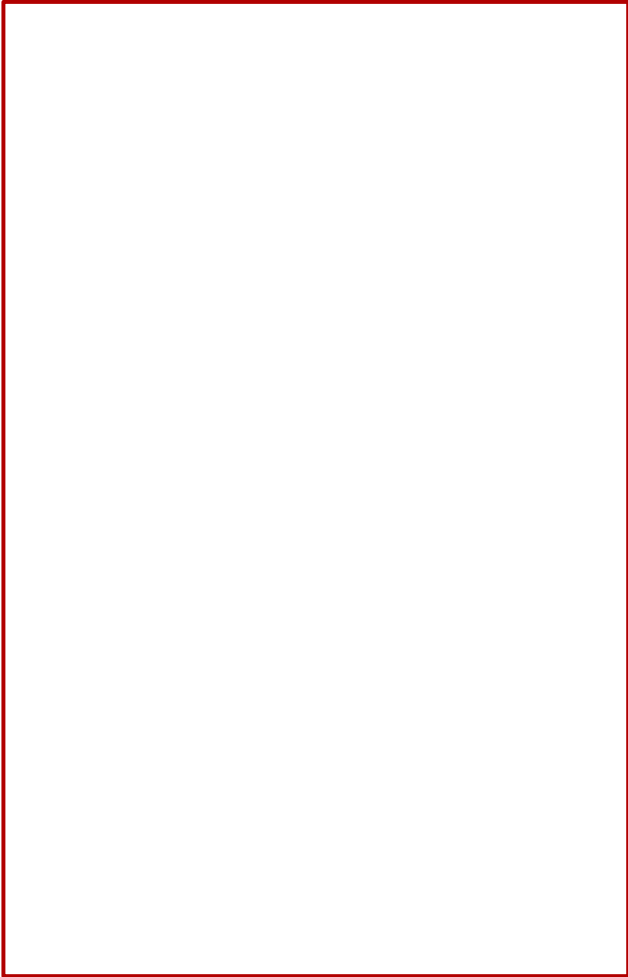


| 4+/' ' 43&=)%)4. #D&5" '\$' #/3&JKLLMN&



5'' #)2+\$43&O' 6).%+4' 6/' 0&

- ! Demonstrate an integrated and functional grasp of mathematical ideas
- ! Understand specific task as it relates to a whole concept
- ! Find relationships between pieces of information
- ! Make connections to similar representations
- ! Use models and multiple representations (e.g. pictures, numbers, real-life situations, words)





8. "#)6\$.43&! 3\$)' #: &

- Use formal language or symbolic representations
- Carry out accurate computations
- Follow multiple steps sequentially
- Make proper use of algorithm and properties



8. "#)6\$.43&!3\$)' #: &

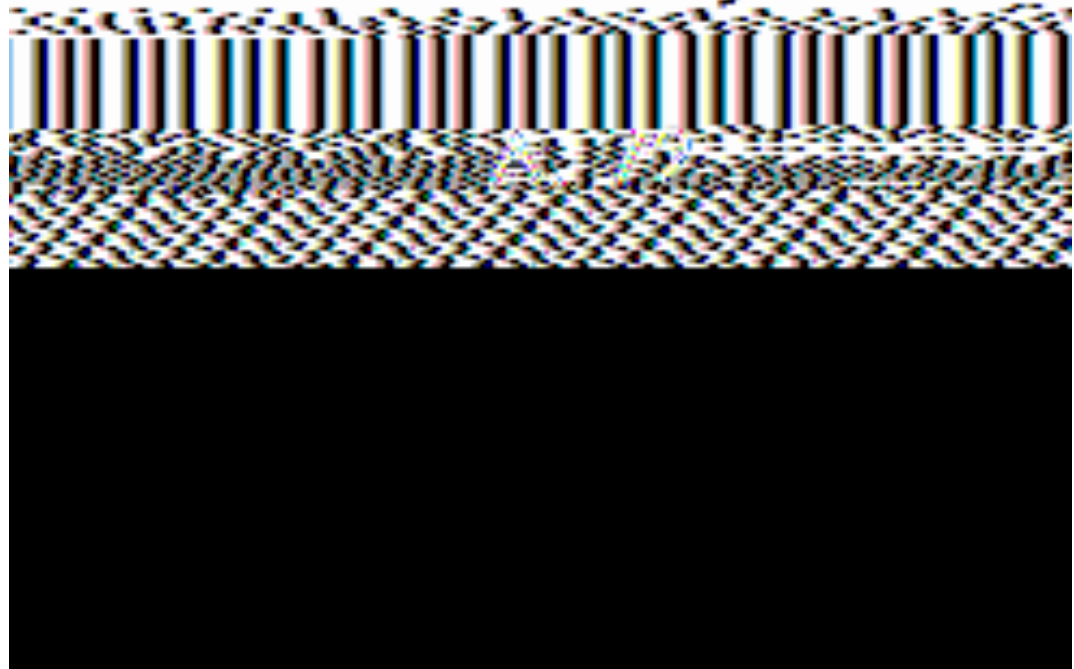
TEKS 7.11A

The student applies mathematical process standards to solve one-variable equations and inequalities. The student is expected to:

(A) Model and solve one-variable, two-step equations and inequalities.

Solve for w:

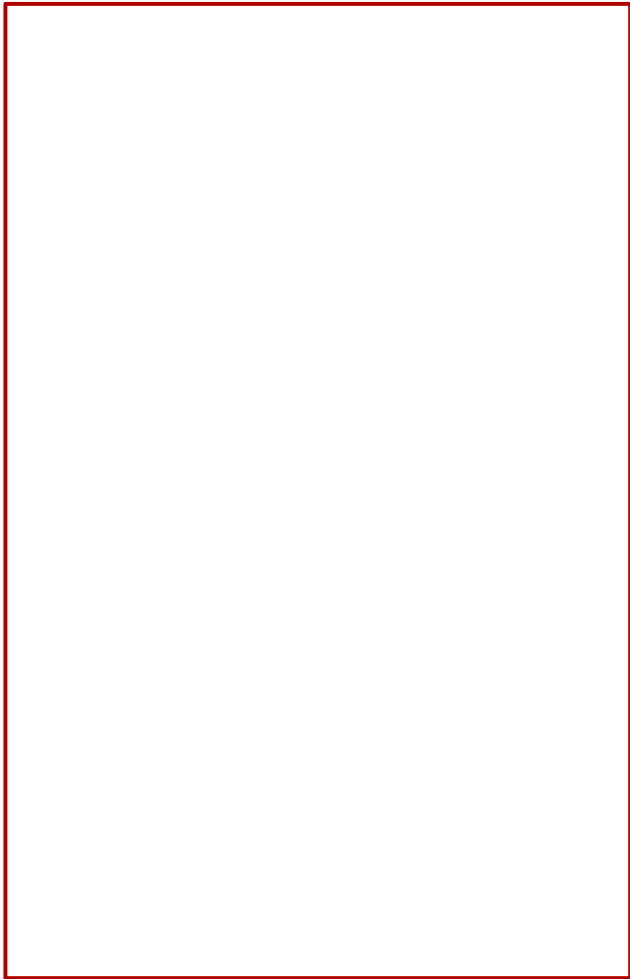
$$\frac{w + 12}{2} = 20$$



5 ...)# +04 70 <). >



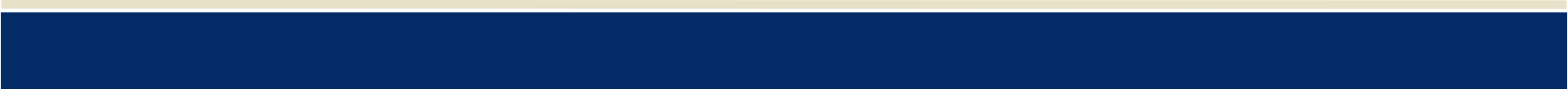
8. "#)6\$.43&! 3\$)' #: &

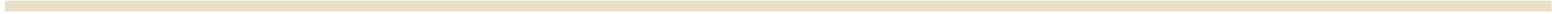


5" ..)#+&4' %<).>



?+. 4+)0/#&5" * 2)+)' #)&&

-
- Ability to formulate a problem in mathematical terms
 - Represent problem solving strategically (verbally, symbolically, graphically, or numerically)
 - Identify and use strategy necessary to solve problems effectively (e.g. use the distributive property to solve)
-
- 





?+. 4+)0/#&5" * 2)+)' #)&&

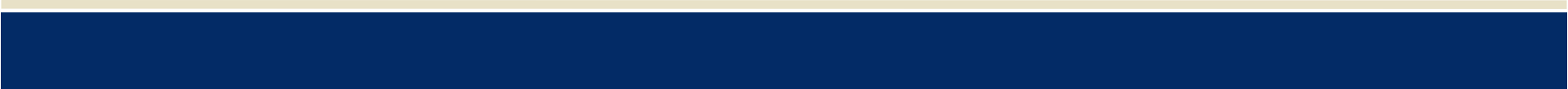
TEKS 3.4A

The student applies mathematical process standards to develop and use strategies and methods for whole number

5" ..)#+&4' %<).>



(642+/P)&=)4%" ' /' 0&&

- Think logically about a problem, which requires reflecting on various approaches to solve a problem and deductively selecting an approach
 - Rationalize and justify strategies
 - Appropriately explain a procedure or concept
-
- 



(642+/P)&=)4%"' /' 0&&

TEKS 3.3H

The student applies mathematical process standards to represent and explain fractional units. The student is expected to:

(H) Compare two fractions having the same numerator or denominator in problems by reasoning about their sizes and justifying the conclusion using

5" ..)#+&4' %<).>



$(642 + /P) \&=) 4\%'' ' /' 0\&\&$

TEKS 6.2B

The student applies mathematical process standards to represent and use rational numbers in a variety of forms. The student is expected to:

(B) Identify a number, its opposite, and its absolute value.

Adam says that the absolute value of -7 is 7 . Why is he correct?

- A. 7 is the distance from -7 to 0 on the number line.
- B. 7 is a prime number with only two factors.
- C. 7 is an odd number, so it is not divisible by 2 .
- D. 7 is the square root of 49 , which is a perfect square.

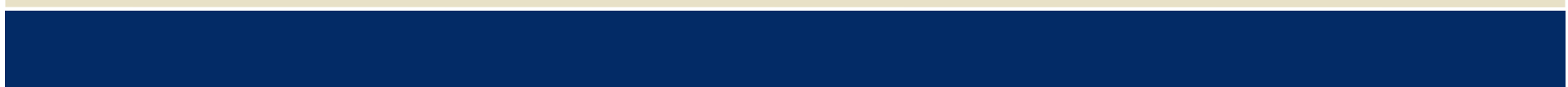
$5'' \dots) \# + \& 4' \% <) . >$



Q) P) 3&" 7&9/7H/#\$3+: &

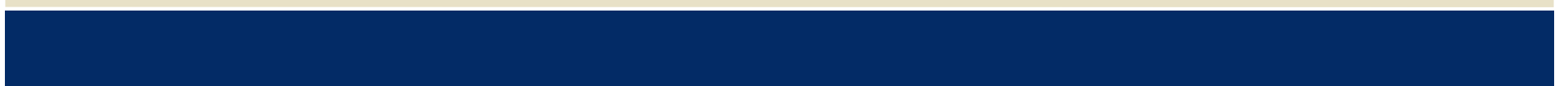
◆ Easy

- Basic Knowledge
-





-
- In your packet of materials is a 4 x 3 matrix with the 4 strands of mathematical proficiency along the top and 3 levels of difficulty along the left side.
 -





,+) * &G4+#D&R&(' %<).&;): &

Procedural

Conceptual

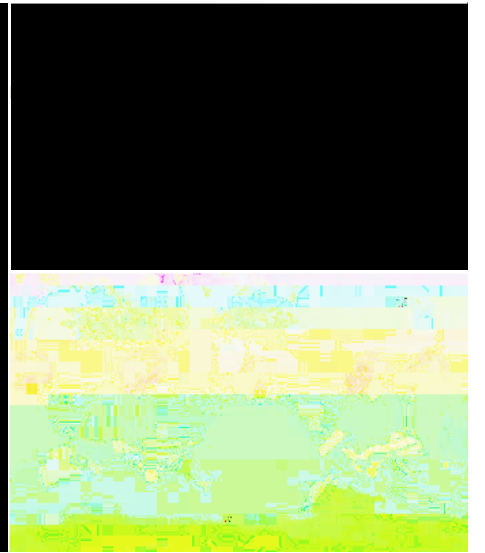
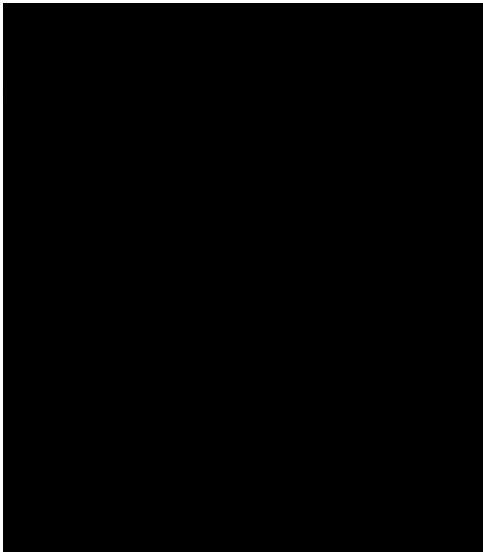
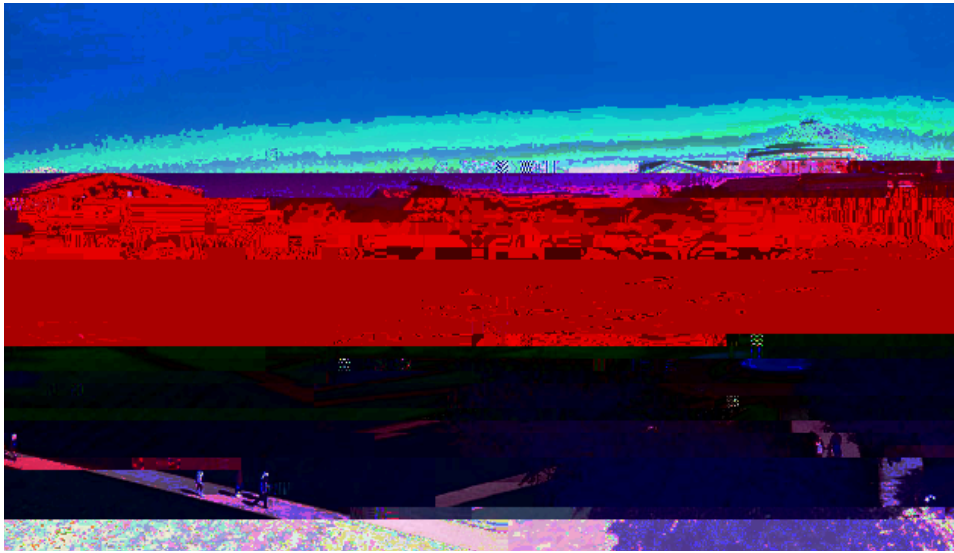
Strategic

Adaptive

	Procedural	Conceptual	Strategic	Adaptive
Easy	12	7	2	1
Medium	7	10	3	4
Difficult	3	2	11	0



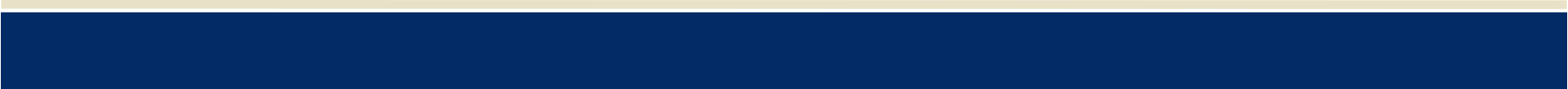
5''' %/6) .&: "\$.&2\$.2''%)&7'' .&0/P/' 0&+D)&
4%%)%%*)' +&<D)' &\$%/' 0&+D)%)&#''' %/6) .4+/''' %&



Assessment Item Development



B)'). 43&,+) * F- ./+/' 0&J8. "#)6\$.)%N&

- ! Avoid the complex multiple-choice format. (i.e., A and D, B and C).
 - !
-
- 



?+) * &9)P)3" 2*)' +&

- State the stem in question form. Minimize use of completion form. When using the completion format, do not leave a blank for completion in the beginning or middle of the stem.
- Include only the material needed to make the problem clear. Avoid extraneous information.
- Word the stem positively; avoid negative phrasing. If an item must be stated negatively, underline or capitalize the negative word.
- Keep all essential information in the stem. Items that require students to read and evaluate each response option prior to selecting an answer increase the cognitive load required.



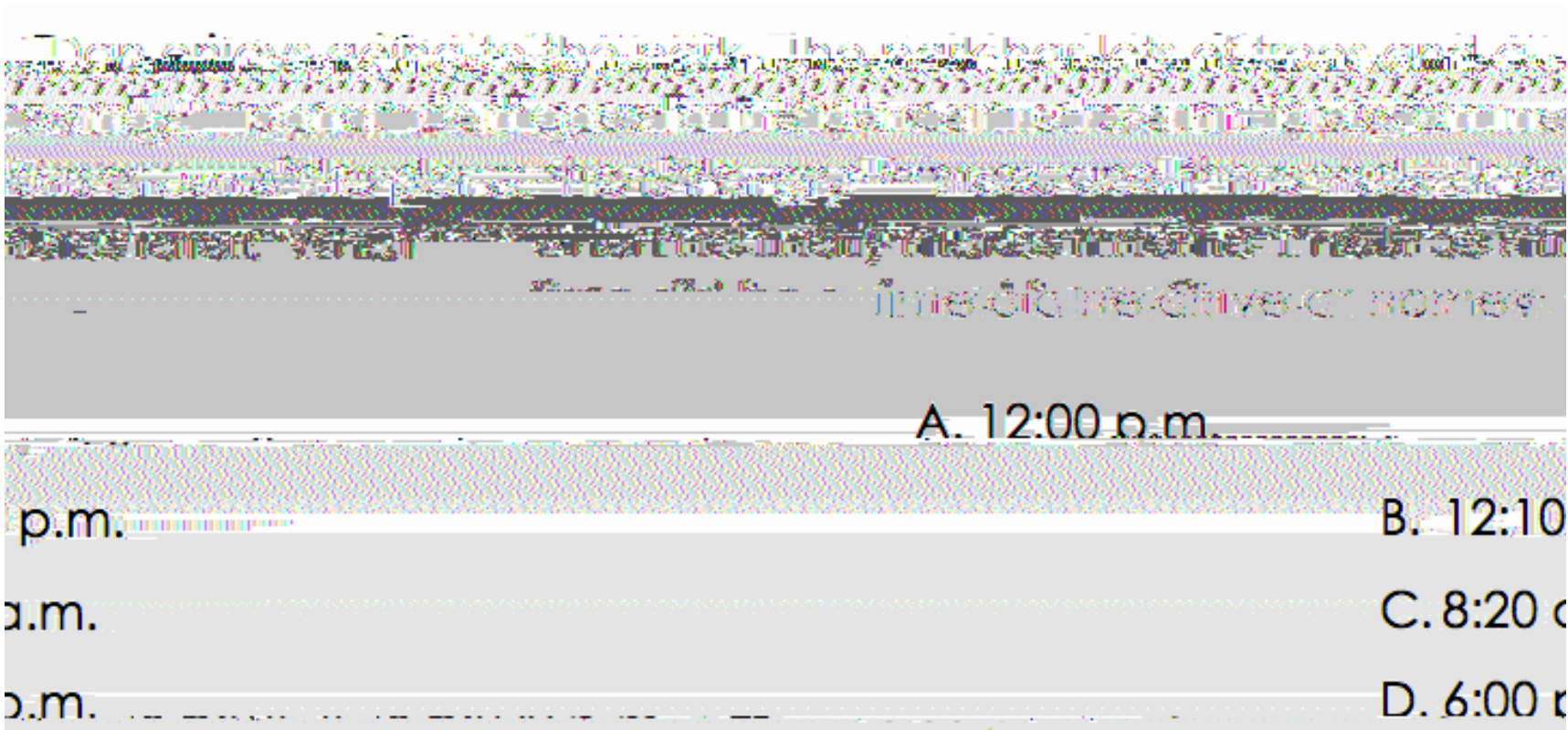
B) '). 43&,+) * F- ./+/' 0&J5''' +)' +N&

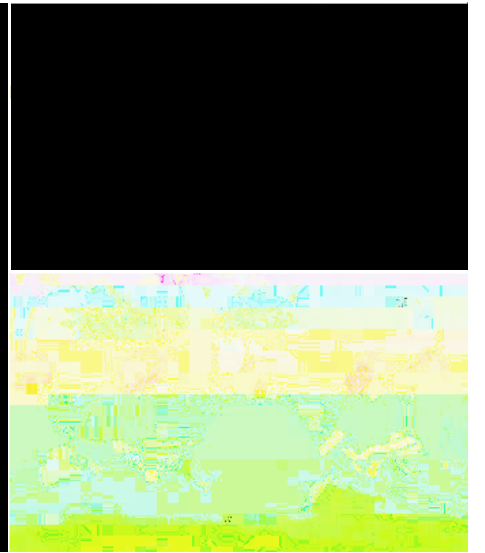
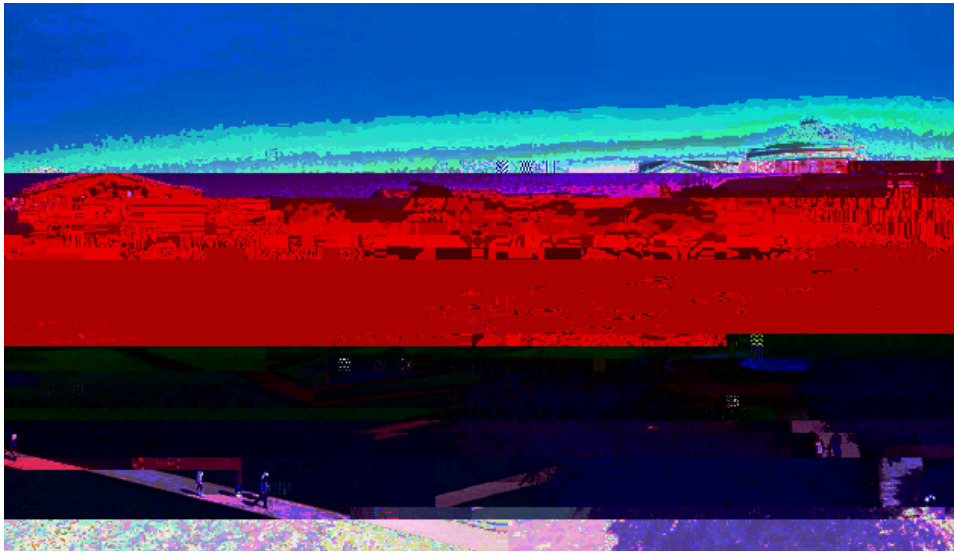
- Base each item on important content to learn; avoid trivial content.
- Keep the content of each item independent from content of other items on the test.
- Avoid cuing one item with another; keep items independent of one another.
- Avoid items based on opinions.
- Develop items that measure higher-level thinking.
- Avoid potentially insensitive content or language.



OD&VD&☹️&

WX4 * 23)%&"7&8"" .3: &- ./++)' &G4+D&,+) * %&





Data-Driven Decision Making



8\$. 2''%)&''7&9/77).)' +&1: 2)%&''7&&
(%%)%%*)' +%&

Universal
Screening



9) #/ %/ "' & G4 @/ ' 0 & 5 D) # @ 3/ % + & 7" . &
(% %) % % *) ' + & 9) P) 3" 2 *) ' + &

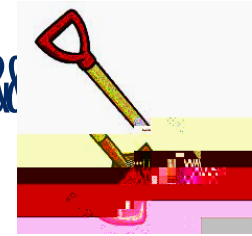
Teachers should agree to analyze the assessments around the same set of criteria. The decisions should be directed toward:

- ✓! Validation about the appropriateness of the assessment
- ✓! Ensuring the assessment is congruent to the stated mastery objective and/or state or district standards
- ✓! Consistency of opinion about the assessment and evaluation of the work
- ✓! Adjustments in teacher directions and support for all students





0%/' 0&94+4&+''&,' 7'' . * &,' %+. \$#+/''' >&&
9/00/' 0&4&Q/++3)&A/+&9))2).&&



- Although students' overall performance may be similar, this does not necessarily mean that they have similar levels of mastery on the assessed content:

Student	Number of Items Correct				Total Correct
	Number Line Structure	Magnitude as Distance	Part-to-Whole Relationships	Unit Fractions	
Swan, B.	7/10	6/10	5/10	2/10	20/40
Black, J.	5/10	7/10	4/10	6/10	22/40
Cullen, E.	8/10	5/10	3/10	5/10	21/40
Hale, J.	5/10	7/10	3/10	5/10	20/40



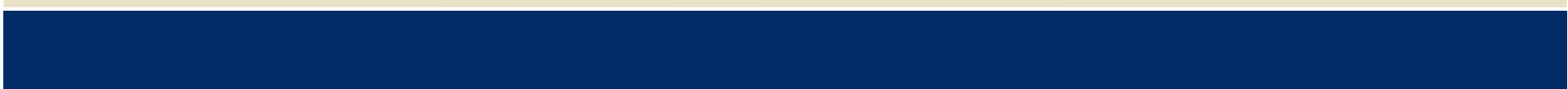
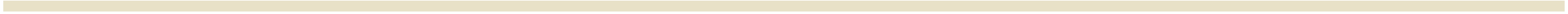


0%/' 0&94+4&+"&, ' 7" . * &, ' %+. \$#+/' "' >&
S" <&! 4. &9" <' &+D)&=4 [[/+&S"3)&
?D" \$36&, &B" \&



Clearly, the level at which you can examine student performance can become increasingly fine-grained. For example, once you start looking at item-level performance you can examine any of the following attributes:

- Whether students selected one distractor more frequently than the others (e.g., **Did all students who got the item incorrect select the first distractor?**)
- Whether students responded correctly to items targeting a specific level of proficiency (e.g., **Did students get all of the items targeting procedural fluency correct?**)
- Whether students consistently selected the incorrect response for items targeting a specific level of proficiency (e.g., **Did students consistently get items targeting strategic competence or adaptive reasoning incorrect?**)

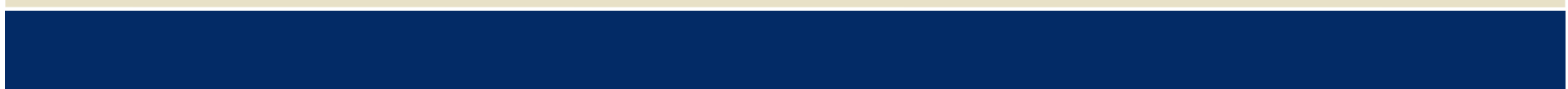




O%/' 0&94+4&+"&, ' 7". * &, ' %+. \$#+/' "' >&
S" <&! 4.&9" <' &+D)&=4 [[/+&S"3)&
?D" \$36&, &B" \&



Did students respond
correctly
to all items targeting a
certain
level of cognitive
complexity?



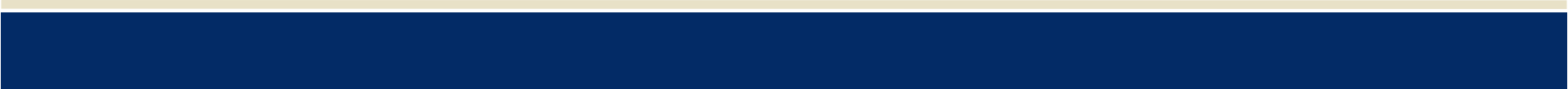


? " *) & ! / ' 4 3 & 1 D " \$ 0 D + % &] & 1 4 @) F
(< 4 : % &

- **Assessment and instruction should be considered together** – performance on assessments can inform instruction and assessments can be specifically designed to provide students with opportunities to demonstrate what they've learned during instruction.
- When considering the level of knowledge represented while designing a test item, start with the outcome (**target knowledge**) in mind. Then consider what **foundational knowledge** the student needs and the **bridging knowledge** that will help the student acquire the



? " *) & ! / ' 4 3 & 1 D " \$ 0 D + % &] & 1 4 @) F
(< 4 : % &

- When designing tests or assessments for use in your classroom, be sure to include items that target **multiple levels of cognitive engagement**.
 - Revisit the **guidelines for item development** as often as needed to ensure that the items you write provide students with the best opportunity possible to demonstrate their knowledge and understanding of the content.
-
- 



=)7) .)' #)%&

- ! Leong, S.C. (2006). *On varying the difficulty of test items*. Paper presented at the 32nd Annual Conference of the International Association for Educational Assessment, Singapore.
- ! Haladyna, T. M. (2004). *Developing and validating multiple-choice items*. New York, NY: Routledge.
- ! National Research Council. (2001). *Adding it up: Helping children learn mathematics*. Washington, DC: National Academies Press.
- ! Rutherford, P. (2008) *Instruction for all students* (2nd ed.). Alexandria, VA: Just Ask Publications & Professional Development

