Standards INSTITUTE

Focus and Coherence

Leadership I - High School - Day 1

Content from CCSSM Widely Applicable as Prerequisites for a Range of College Majors, Postsecondary Programs and Careers*

This table[1] lists clusters and standards with relatively wide applicability across a range of postsecondary work. Table 1 is a **subset** of the material students must study to be college and career ready (CCSSM, pp. 57, 84). Curricular materials, instruction, and assessment must give especially careful treatment to the domains, clusters, and standards in Table 1, including their interconnections and their applications—amounting to a majority of students' time.

Number and Quantity	Algebra	Functions	Geometry	Statistics and Probability	Applying Key Takeaways from Grades 6–8**
N-RN, Real Numbers: Both clusters in this domain contain widely applicable prerequisites. **N-Q★, Quantities**: Every standard in this domain is a widely applicable prerequisite. Note, this domain is especially important in the high school content standards overall as a widely applicable prerequisite.	**Every domain in this category** contains widely applicable prerequisites.° Note, the **A-SSE** domain is especially important in the high school content standards overall as a widely applicable prerequisite.	**F-IF, Interpreting Functions**: Every cluster in this domain contains widely applicable prerequisites.° Additionally, standards **F-BF.1** and **F-LE.1** are relatively important within this category as widely applicable prerequisites.	**The following standards and clusters** are relatively important within this category as widely applicable prerequisites: **G-CO.1** **G-CO.9** **G-CO.10** **G-SRT.B** **G-SRT.C** Note, the above standards in turn have learning prerequisites within the Geometry category, including: G-CO.A G-CO.B G-SRT.A	**The following standards** are relatively important within this category as widely applicable prerequisites: **S-ID.2** **S-ID.7** **S-IC.1** Note, the above standards in turn have learning prerequisites within 6-8.SP.	**Solving problems at a level of sophistication appropriate to high school by**: • Applying ratios and proportional relationships. • Applying percentages and unit conversions, e.g., in the context of complicated measurement problems involving quantities with derived or compound units (such as mg/mL, kg/m^3, acre-feet, etc.). • Applying basic function concepts, e.g., by interpreting the features of a graph in the context of an applied problem. • Applying concepts and skills of geometric measurement e.g., when analyzing a diagram or schematic. • Applying concepts and skills of basic statistics and probability (see 6-8.SP). • Performing rational number arithmetic fluently.

A note about the codes: Letter codes (A, B, C) are used to denote cluster headings. For example, G-SRT.B refers to the *second* cluster heading in the domain G-SRT, "Prove theorems using similarity" (pp. 77 of CCSSM).
* Informed by postsecondary survey data in Conley *et al.* (2011), "Reaching the Goal: The Applicability and Importance of the Common Core State Standards to College and Career Readiness," http://www.epiconline.org/publications/documents/ReachingtheGoal-FullReport.pdf.
** See CCSSM, p. 84: "…some of the highest priority content for college and career readiness comes from Grades 6-8. This body of material includes powerfully useful proficiencies such as applying ratio reasoning in real-world and mathematical problems, computing fluently with positive and negative fractions and decimals, and solving real-world and mathematical problems involving angle measure, area, surface area, and volume."
★ Modeling star (present in CCSSM)
° Only the standards without a (+) sign are being cited here.

[1] This table is excerpted from the *High School Publishers Criteria for the Common Core State Standards for Mathematics*.

Algebra I Overview

Numerals in parentheses designate individual content standards that are eligible for assessment in whole or in part. Underlined numerals (e.g., 1) indicate standards eligible for assessment on two or more end-of-course assessments. For more information, see Tables 1 and 2. Course emphases are indicated by: ■ Major Content; □ Supporting Content; ○ Additional Content. Not all CCSSM content standards in a listed domain or cluster are assessed.

The Real Number System (N-RN)
- ○ B. Use properties of rational and irrational numbers (3)

Quantities★(N-Q)
- □ A. Reason quantitatively and use units to solve problems (1, 2, 3)

Seeing Structure in Expressions (A-SSE)
- ■ A. Interpret the structure of expressions (1, 2)
- □ B. Write expressions in equivalent forms to solve problems (3)

Arithmetic with Polynomials and Rational Expressions (A-APR)
- ■ A. Perform arithmetic operations on polynomials (1)
- □ B. Understand the relationship between zeros and factors of polynomials (3)

Creating Equations★ (A-CED)
- ■ A. Create equations that describe numbers or relationships (1, 2, 3, 4)

Mathematical Practices

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.

Reasoning with Equations and Inequalities (A-REI)
- ■ A. Understand solving equations as a process of reasoning and explain the reasoning (1)
- ■ B. Solve equations and inequalities in one variable (3, 4)
- ○ C. Solve systems of equations (5, 6)
- ■ D. Represent and solve equations and inequalities graphically (10, 11, 12)

Interpreting Functions (F-IF)
- ■ A. Understand the concept of a function and use function notation (1, 2, 3)
- ■ B. Interpret functions that arise in applications in terms of the context (4, 5, 6)
- □ C. Analyze functions using different representations (7, 8, 9)

Building Functions (F-BF)
- □ A. Build a function that models a relationship between two quantities (1)
- ○ B. Build new functions from existing functions (3)

Linear, Quadratic, and Exponential Models★ (F-LE)
- □ A. Construct and compare linear, quadratic, and exponential models and solve problems (1, 2, 3)
- □ B. Interpret expressions for functions in terms of the situation they model (5)

Interpreting categorical and quantitative data (S-ID)
- ○ A. Summarize, represent, and interpret data on a single count or measurement variable (1, 2, 3)
- □ B. Summarize, represent, and interpret data on two categorical and quantitative variables (5, 6)
- ■ C. Interpret linear models (7, 8, 9)

Geometry Overview

Numerals in parentheses designate individual content standards that are eligible for assessment in whole or in part. Underlined numerals (e.g., 1) indicate standards eligible for assessment on two or more end-of-course assessments. For more information, see Tables 1 and 2. Course emphases are indicated by: ■ Major Content; ◘ Supporting Content; ○ Additional Content. Not all CCSSM content standards in a listed domain or cluster are assessed.

Congruence (G-CO)

- ◘ A. Experiment with transformations in the plane (1, 2, 3, 4, 5)
- ■ B. Understand congruence in terms of rigid motions (6, 7, 8)
- ■ C. Prove geometric theorems (9, 10, 11)
- ◘ D. Make geometric constructions (12, 13)

Similarity, Right Triangles, and Trigonometry (G-SRT)

- ■ A. Understand similarity in terms of similarity transformations (1, 2, 3)
- ■ B. Prove theorems involving similarity (4, 5)
- ■ C. Define trigonometric ratios and solve problems involving right triangles (6, 7, 8)

Circles (G-C)

- ○ A. Understand and apply theorems about circles (1, 2, 3)
- ○ B. Find arc lengths and areas of sectors of circles (5)

Expressing Geometric Properties with Equations (G-GPE)

- ○ A. Translate between the geometric description and the equation for a conic section (1)
- ■ B. Use coordinates to prove simple geometric theorems algebraically (4, 5, 6, 7)

Geometric measurement and dimension (G-GMD)

- ○ A. Explain volume formulas and use them to solve problems (1, 3)
- ○ B. Visualize relationships between two-dimensional and three-dimensional objects (4)

Modeling with Geometry (G-MG)

- ■ A. Apply geometric concepts in modeling situations (1, 2, 3)

Mathematical Practices

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.

Algebra II Overview

Numerals in parentheses designate individual content standards that are eligible for assessment in whole or in part. Underlined numerals (e.g., 1) indicate standards eligible for assessment on two or more end-of-course assessments. For more information, see Tables 1 and 2. Course emphases are indicated by: ■ Major Content; □ Supporting Content; ○ Additional Content. Not all CCSSM content standards in a listed domain or cluster are assessed.

The Real Number System (N-RN)

- ■ A. Extend the properties of exponents to rational exponents (1, 2)

Quantities★ (N-Q)

- □ A. Reason quantitatively and use units to solve problems (2)

The Complex Number System (N-CN)

- ○ A. Perform arithmetic operations with complex numbers (1, 2)
- ○ C. Use complex numbers in polynomial identities and equations (7)

Seeing Structure in Expressions (A-SSE)

- ■ A. Interpret the structure of expressions (2)
- ■ B. Write expressions in equivalent forms to solve problems (3, 4)

Arithmetic with Polynomials and Rational Expressions (A-APR)

- ■ B. Understand the relationship between zeros and factors of polynomials (2, 3)
- ○ C. Use polynomial identities to solve problems (4)
- □ D. Rewrite rational expressions (6)

Mathematical Practices

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.

Creating Equations★ (A-CED)

- □ A. Create equations that describe numbers or relationships (1)

Reasoning with Equations and Inequalities (A-REI)

- ■ A. Understand solving equations as a process of reasoning and explain the reasoning (1, 2)
- □ B. Solve equations and inequalities in one variable (4)
- ○ C. Solve systems of equations (6, 7)
- ■ D. Represent and solve equations and inequalities graphically (11)

Interpreting Functions (F-IF)

- □ A. Understand the concept of a function and use function notation (3)
- ■ B. Interpret functions that arise in applications in terms of the context (4, 6)
- □ C. Analyze functions using different representations (7, 8, 9)

Building Functions (F-BF)

- ■ A. Build a function that models a relationship between two quantities (1, 2)
- ○ B. Build new functions from existing functions (3, 4a)

Linear, Quadratic, and Exponential Models★ (F-LE)

- A. Construct and compare linear, quadratic, and exponential models and solve problems (2, 4)
- B. Interpret expressions for functions in terms of the situation they model (5)

Trigonometric Functions (F-TF)

- A. Extend the domain of trigonometric functions using the unit circle (1, 2)
- B. Model periodic phenomena with trigonometric functions (5)
- C. Prove and apply trigonometric identities (8)

Expressing Geometric Properties with Equations (G-GPE)

- A. Translate between the geometric description and the equation for a conic section (2)

Interpreting categorical and quantitative data (S-ID)

- A. Summarize, represent, and interpret data on a single count or measurement variable (4)
- B. Summarize, represent, and interpret data on two categorical and quantitative variables (6)

Making Inferences and Justifying Conclusions (S-IC)

- A. Understand and evaluate random processes underlying statistical experiments (1, 2)
- B. Make inferences and justify conclusions from sample surveys, experiments and observational studies (3, 4, 5, 6)

Conditional Probability and the Rules of Probability (S-CP)

- A. Understand independence and conditional probability and use them to interpret data (1, 2, 3, 4, 5)
- B. Use the rules of probability to compute probabilities of compound events in a uniform probability model (6, 7)

Examples of Key Advances from Previous Grades or Courses

- In Algebra I, students added, subtracted, and multiplied polynomials. In Algebra II, students divide polynomials with remainder, leading to the factor and remainder theorems. This is the underpinning for much of advanced algebra, including the algebra of rational expressions.

- Themes from middle school algebra continue and deepen during high school. As early as grade 6, students began thinking about solving equations as a process of reasoning (6.EE.B.5). This perspective continues throughout Algebra I and Algebra II (A-REI).[27] "Reasoned solving" plays a role in Algebra II because the equations students encounter can have extraneous solutions (A-REI.A.2).

- In Algebra II, they extend the real numbers to complex numbers, and one effect is that they now have a complete theory of quadratic equations: Every quadratic equation with complex coefficients has (counting multiplicities) two roots in the complex numbers.

- In grade 8, students learned the Pythagorean theorem and used it to determine distances in a coordinate system (8.G.B.6–8). In Geometry, students proved theorems using coordinates (G-GPE.B.4–7). In Algebra II, students will build on their understanding of distance in coordinate systems and draw on their growing command of algebra to connect equations and graphs of conic sections (e.g., G-GPE.A.1).

- In Geometry, students began trigonometry through a study of right triangles. In Algebra II, they extend the three basic functions to the entire unit circle.

[27] See, for example, "Reasoned Solving," in *Focus in High School Mathematics: Reasoning and Sense Making* (National Council of Teachers of Mathematics, 2009).

Task #1

Judy is working at a retail store over summer break. A customer buys a $50 shirt that is on sale for 20% off. Judy computes the discount, then adds sales tax of 10%, and tells the customer how much he owes. The customer insists that Judy first add the sales tax and then apply the discount. He is convinced that this way he will save more money because the discount amount will be larger.

a) Is the customer right?
b) Does your answer to part (a) depend on the numbers used, or would it work for any percentage discount and any sales tax percentage? Find a convincing argument using algebraic expressions and/or diagrams for this more general scenario.

https://www.illustrativemathematics.org/

Observing for Standards and Shifts

An Observation Protocol for Instructional Video

Step One - Before Viewing the Lesson

Team calibrates understanding of intended standards and match to instruction by answering the questions, “What should we see if teacher was addressing the standard correctly?”

Step Two – While Viewing the Lesson

Observe and capture evidence about what the teacher is saying and doing – script teacher directions and explanations; notice anchor charts, white board/chalk board lesson descriptions and directions, etc.

Observe and capture evidence about what the students are saying and doing. Make note of points of struggle or developing misconceptions. Pay close attention to the students who are not actively participating.

Step Three – Post-Observation Debrief

Begin with the standard(s). As a team, calibrate about what standard(s) were observed. Use the Mastery Connect app to look them up and confirm.

Recreate the student learning experience. Begin with what observers saw first, second, third, etc. Make sure all comments are evidenced-based.

First video only: Spend the first couple of minutes discussing general impressions, pedagogy and classroom management. While important aspects of teacher effectiveness, these observations are not the purpose of the observation. This activity is necessary though: it helps create space for the next phase of the debrief.

Step Three – Drawing Conclusions

Begin to draw conclusions from the observation by discussing the following:

- What standard(s) were being attempted? Were those the intended standard(s)? If not, to what grade and standard is the task aligned?
- What are the knowledge and skills required to be successful on this task?
- Were the following a good match to the intended standard(s):
    - Instruction given by the teacher?
    - Standards knowledge of the teacher?
    - Content knowledge of the teacher?
    - Student materials and tasks?

Step Four - Make a Plan for Providing Feedback

Content Coaching: Unbound

A Tool to Deepen Understanding of Standards, Shifts and Content

So what do you do when you see that students aren't "getting it"? These content-specific questions are intended to be used by teachers, leaders and coaches for job-embedded development of Math and ELA content knowledge, post-lesson debriefing, coaching and lesson planning. The questions should be used to probe and push the thinking behind instructional practices, and to guide informed and actionable decisions on the changes needed for students to engage in grade-level, standards-aligned learning.

This tool is to be used in conjunction with the Instructional Practice Guide suite of tools from Student Achievement Partners. The *Instructional Practice Guides* are an important first step for diagnosing where and when Common Core instruction is taking place. Because every Core Action and every Shift cannot be observable in every lesson, *Beyond the Lesson Discussion Guides* offer questions for teachers and coaches to consider in order to ensure effective CCSS implementation over the course of the year. *Content Coaching: UnboundEd* provides an even more granular layer of instructional analysis and recommended next steps focused on application of content related to standards in the classroom.

MATH

<table>
<tr><th>Shift</th><th colspan="2">Questions that Develop Understanding of Math Standards, Shifts and Content</th></tr>
<tr><td colspan="3">Leading the Conversation:
• What are the knowledge and skills required to be successful on this task?
• To what grade and standard is the task aligned?</td></tr>
<tr><td>Focus</td><td colspan="2">If not grade-level standards:
• Why was instruction not addressing grade-level standards?
• What data or other work supports the decision to teach non-grade-level standards?
• Is this part of the major work of that grade?
If not major work of the grade:
• How will this chosen standard authentically lead students back to working with math content that is emphasized in this grade?
• How does this task connect to the major work in the grades above and below?</td></tr>
<tr><td>Coherence</td><td>Across Grade Coherence
• Does the instruction carefully connect learning across grades so that students can build new understanding onto foundations</td><td>Within Grade Coherence
• Is the instruction leveraging how the standards within a grade were built to reinforce a major topic by utilizing supporting,</td></tr>
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<td colspan="2">built in previous years?
• Are the students who get it making connections to previous learning?
• For students who are not getting it, is the teacher leading students to make connections to previous learning?
• What prerequisite knowledge is a student lacking to be able to make those connections?

If students are still not making connections:
• Ask: What prerequisite knowledge is a student lacking to be able to make those connections?
• Consider: share time studying the wiring diagram, studying linking standards, with next steps being digging into curriculum for additional lessons on knowledge gaps.</td>
<td colspan="2">complementary topics?
• Are the non-major work standards being taught supporting priority content?
• If supporting standards are not linking to major work of the grade: What do the standards say?
• How can this chosen standard authentically lead students back to working with math content that is to be emphasized in this grade?

If supporting standards are not linking to major work of the grade:
• What do the standards say?
• Same question as before: How can this chosen standard authentically lead students back to working with math content that is to be emphasized in this grade?</td>
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<tr>
<td>Rigor</td>
<td>Procedural Skill and Fluency

If fluency opportunities are not present:
• Where is/will fluency practice be built in upcoming lessons?
If students show fluency as a limiter in their math work:
• How will students' lack of fluency be addressed?
• Consider curriculum: fluency activities from high-quality lessons for the area that is limiting students</td>
<td colspan="2">Conceptual Understanding

If conceptual understanding opportunities are not present:
• How can more opportunities be worked into what the students are thinking when working with math concepts?
If students show conceptual understanding as a limiter in their math work:
• Consider gaps: re-ask questions in Coherence activities
• Consider curriculum: study</td>
<td>Modeling/Application

If application opportunities are not present:
• How can more application opportunities be folded into the student math experience?
If students are provided external prompts to complete application problems:
• How can the teacher adapt opportunities so that students can apply math they know without the prompting?
• Consider</td>
</tr>
</table>

		high-quality lessons aligned to the standard of Focus	curriculum: study high-quality tasks aligned to the standard of Focus

Want more from UnboundEd? Check out our Math Content Guides: Unbound and other resources to help enhance instruction.

ELA

Shift	Questions that Develop Understanding of ELA Standards, Shifts and Content
Leading the Conversation: • What are the knowledge and skills required to be successful on this task? • To what grade and standard is the task aligned? • How are texts selected for units/lessons? How are texts selected for a sequence across the school year? How are texts selected for independent/guided reading? • (FOR P-3 ONLY) Is there a systematic phonics program as part of the literacy block? • (FOR SECONDARY ONLY) Is there collaboration between ELA and other content-area teachers around coherently building knowledge and sharing responsibility for students' literacy development and improvement?	
Regular practice with complex text and its academic language	• Is a grade-level complex text at the center of instruction? • IF NOT – is the focus of the lesson to build knowledge and vocabulary related to a high-leverage topic? • IF NOT – are there opportunities for students to engage in rich evidence-based conversations about complex texts and topics that were experienced in previous lessons or via independent/group work? • IF NOT – is the focus of the instructional time to build fluency, a volume of reading and/or stamina? Or is the focus on small-group instruction with homogenous groups by reading level? **If the above is true, WHEN and HOW OFTEN do students experience complex text at the center of instruction? • Are students engaging in regular practice with complex texts and academic language? • Does instruction focus on students reading grade-level complex texts closely, discerning deep meaning? • Do questions and tasks address the text and help build knowledge by attending to its particular structures, concepts, ideas, and details? • Does instruction focus on building students' academic vocabulary in context throughout instruction?

	• Do questions and tasks attend to the words, phrases, and sentences within the text?
Reading, writing, and speaking grounded in evidence from text, both literary and informational	• Are students' reading, writing, and/or speaking grounded in evidence from text? • Are text-dependent questions sending students back into the text to answer them? Are they connected to the intended standard(s) of the lesson? • If NOT – In cases where the teacher is asking questions that can be answered from students' personal experience, is this happening AFTER and IN ADDITION TO text-based analysis? • Are lessons and tasks designed so that students cite specific evidence from text(s) to support analysis, inferences, and claims, both orally and in writing? • Are students using evidence to build on each other's observations or insights during discussion or collaboration? • Does the teacher expect evidence and precision from students and probe responses accordingly?
Intentionally building knowledge through content-rich nonfiction	• Do questions and tasks address the text and help build knowledge by attending to its particular concepts, ideas, and details? • Do students read a significant amount of nonfiction? • When the anchor text of a unit is fiction, is nonfiction used to supplement the text and help build understanding and knowledge about historical periods, topics and issues explored in the fiction text? • Is instruction designed so that nonfiction is systematically used to build domain-specific knowledge and vocabulary on topics?
Want more from UnboundEd? Check out our ELA Content Guides: Unbound and other resources to help enhance instruction.	

A.SSE Taxes and Sales

Illustrative Mathematics Commentary

This task is not about computing the final price of the shirt but about using the structure in the computation to make a general argument. The key underlying idea is that multiplication is commutative, which we often just take for granted and don't feel needs any explanation. In this case, the context of the problem makes it not obvious at all that we can switch the order of the two computations, but it becomes quite obvious after observing that the application of both the discount and the sales tax are just instances of multiplication. Since the order in which we multiply is irrelevant, the answer must be the same regardless of which we apply first.
The solution presents both an algebraic approach to the general result in part (b), and also a diagram that illustrates the same result graphically.

This task presents a good opportunity for students to construct a viable argument and critique the reasoning of others (MP3).

Solution

a. Judy first takes 20% off which gives a new price of \$50(0.8)=\$40 . She then adds the 10% sales tax for a final price of \$40(1.1)=\$44 . The customer first adds 10% for a new price of \$50(1.1)=\$55 . He then takes 20% off for a final price of \$55(0.8)=\$44.

   The customer is right to say that the discount amount will be larger, it is \$11 opposed to \$10 with his method. But the additional \$1 just gets subtracted from the tax amount that was added in the first step. So the final price is the same in both cases.

   It does not matter in which order the discount and tax are computed.

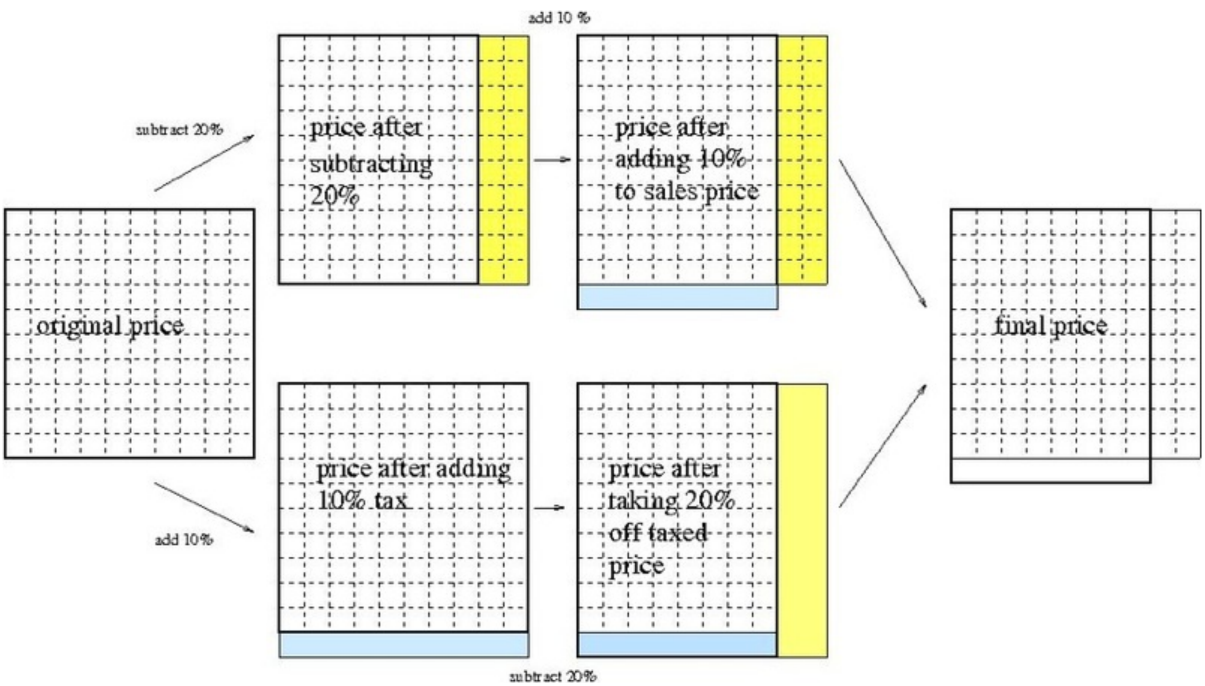
b. If we don't actually perform the computations but just record them we find the following:

   Judy: $50(0.8)(1.1) = 44$
   customer: $50(1.1)(0.8) = 44$

   We see that it is not surprising that both computations get the same answer, since $(0.8)\cdot(1.1)=(1.1)\cdot(0.8)$.

This result will generalize if we replace $50, 20%, 10% by any other numbers. If we let P stand for the original price, s for the sales percentage and t for the tax percentage, we have $P\left(1-\frac{s}{100}\right)\left(1+\frac{t}{100}\right)=P\left(1+\frac{t}{100}\right)\left(1-\frac{s}{100}\right)$
We see that changing the order in which the sale and the tax are applied does not matter.

We can also visualize this with the following diagram. Yellow represents the action of subtracting 20% and blue represents the action of adding 10%. We see that both paths result in the same final answer. Even though the diagram uses the numbers from the problem, we can see from the structure in the diagram that both paths will result in the same final price even if the yellow and blue areas are altered.



https://www.illustrativemathematics.org/content-standards/tasks/677