



CSM LEARN
High Performance, for everyone

This guide describes the curriculum of the CSM Course and provides examples of the all the Core Skills

CSM
CURRICULUM
GUIDE

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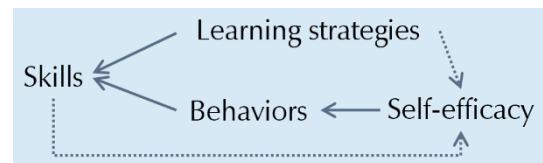
CSM Overview

What is CSM?

CSM is an online, self-paced course that builds high performance skills and traits, including:

- college-level quantitative reasoning
- applied literacy
- problem solving strategies and mindset
- the ability to learn new skills independently
- the persistence to push through problems and the resilience to bounce back from failures
- high personal expectations to do things right and to the best of your ability
- a strong self-efficacy: the belief informed from personal experience that you can do what you try to do, and do it well

These are the skills and competencies needed by everyone to succeed in school, college, work and life. CSM teaches these skills and traits through the first adaptive learning system that not only personalizes instruction in academic/cognitive skills, but also in the learning-to-learn metacognitive and how-you-feel/how-you-act noncognitive realms, as well. Furthermore, CSM is exceptionally sensitive to the social-emotional issues that strongly affect struggling students.



How is CSM structured?

The **CSM Course** covers core math and literacy skills and key problem-solving strategies. Students who finish the CSM Course are eligible for the **CSM Certificate**. There are also additional CSM+ Courses, which focus on advanced problem solving and critical thinking with an emphasis on teaching students how to attack novel problems in unfamiliar situations.

Who is CSM designed for?

CSM's adaptive learning system adjusts to the needs of widely diverse people, from high school students through adults -- everyone learns all of the Core Skills and each person is guided to as many Supporting Skills as they need. CSM will fill in gaps down to roughly 3rd grade math and 5th grade literacy, but is also appropriate for college graduates and even those with post-graduate degrees. CSM has many applications in secondary schools, adult education, workforce education, postsecondary education, and in the workplace, from frontline workers to managers, and across business functions.

What does the CSM Course cover?

The CSM Course covers the most important workforce academic and decision-making skills for educational and professional success – math and literacy skills, problem-solving skills, active learning, and academic habits of mind, like persistence, confidence, and attention to detail.

Math and Literacy Skills

The CSM curriculum comprises the most important math and literacy skills used across many occupations and industries, as well as in college. CSM aims for math and literacy skills to be

transferable by students into their classes, work and lives. Towards that goal, CSM emphasizes the following:

- **Depth of Understanding.**

CSM teaches skills in ways that emphasize conceptual understanding. For example, most curricula treat the concept of percents as simply a set of procedures, like "What is 20% of 240?". In contrast, a CSM percent problem like that shown

Solve the following problems in your head. Do not use a calculator, and only use paper if absolutely necessary.

99.5% of computer keyboards produced by Dolan Production do **not** have keys that stick.

Another way of saying this is to say that 1 in of the computer keyboards has keys that stick.

We believe that only 5% of the adult population and 15-20% of the 4-year college graduate population can do this CSM problem.

requires students to have a deep and intuitive sense of percents, to understand scale and magnitude, and to have facility with mental math -- it can't be done procedurally.

- **Integrated Math and Literacy.** Math and literacy are almost always taught in isolation from each other, but most issues that come up in the workplace require both math and literacy to solve. CSM problems integrate math and literacy, which also allows CSM to tackle some integrated problems that slip between the silos of conventional math and literacy instruction.

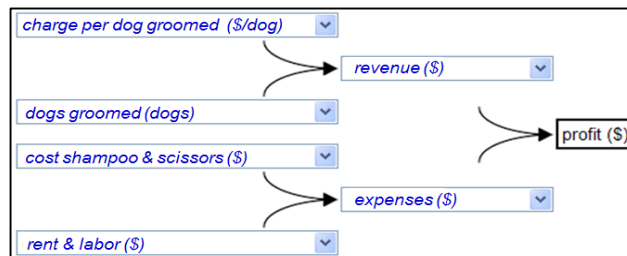
- **Workforce Contextualization.** Almost all problems on CSM are workforce contextualized, so students understand the importance and applications of the skills they are learning.

Problem-solving and thinking skills

CSM equips students with specific problem-solving strategies and the problem-solving mindset to help them tackle real-world challenges.

In the CSM Course, problem-solving focuses on planning. Students often don't realize that there are two steps to a solving a problem -- planning and execution (as their coursework usually focuses almost exclusively on the execution of isolated procedures).

CSM emphasizes the planning step by giving students problems where they are just asked to plan the solution (but not carry out their plan), and simultaneously teaches problem-solving strategies like chunking, sequencing, working backwards, and more.



Active Learning

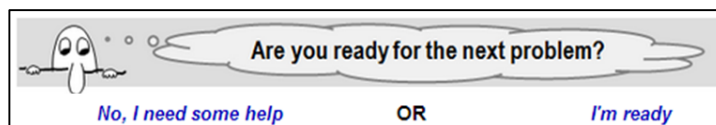
A major focus of CSM is **teaching students how to learn skills on their own**. It's good if a student knows a skill, but it's GREAT if the student learned the skill independently.

Why is this important? Independent learning is the hallmark of a college student who is ready to succeed, and an employee who can adapt to changing work and technology.

CSM transforms student learning in many ways, including:

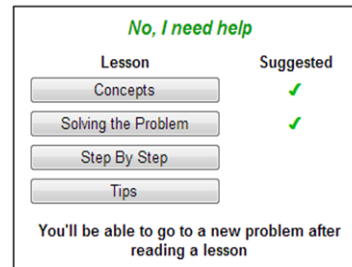
- **Thinking about learning.**

Metacognition is a critical skill for independent learning -- a good learner will consistently be reflecting on their own learning, what they know and don't know, and what they could do to learn something better. CSM consistently challenges students to think about their own learning through



"reflection questions" that ask them how they are feeling about the skill, and whether they need more help.

- Multiple learning styles and lesson types.** CSM knows that different students learn in different ways, and provides conceptual (cognitivist) and procedural (behaviorist) lessons for every skill, with other lessons such as contextual (constructivist) examples, multiple solutions (so that the student can find their own best solution), tips, advice on checking the answers, etc. CSM provides students with feedback on what they're reading and whether or not it is helping them learn. It also suggests specific lessons that might be particularly useful for the student.
- Learning through reading.** Most student learning in school is through passively listening to a teacher lecture. Instead, CSM focuses on learning through reading, because it is the most powerful form of learning in college and in the workplace. To help the student learn how to learn independently through reading, CSM measures and responds to the **learning decisions** that students make (what types of lessons they read, when they read the lessons, and how they read the lessons) and **reading effectiveness** (how effectively they learn).



Habits of Mind

Being a successful student requires good academic habits of mind like persistence, carefulness, confidence, self-reliance and self-efficacy. CSM is unique among adaptive learning systems in measuring and responding to these important affective aspects of self-regulated learning.

Persistence and grit

Most learning systems respond to a student who is stuck on a skill by alerting the teacher that the student needs a personal lesson on that skill -- the role of the teacher is the instructor of "last resort". This strategy, however, saps student persistence and self-reliance as they don't need to try very hard on their own -- the easiest way to move forward is to have the teacher help them. This makes the student more dependent on the teacher for learning.

CSM, on the other hand, wants students to learn how to keep trying until they experience success. To do this, CSM doesn't call over a teacher when a student gets stuck, but simply gives the student a break by moving them to another skill for a while. As they are returned to the difficult skill, they learn that it's up to them to learn the skill, and generally put in more effort. When the student finally masters the skill, they have also learned deeper persistence and self-reliance.

Confidence and overcoming learned helplessness.

Many students respond to questions that seem hard by just giving up. They might say to themselves, "I can't do the problem because I'm not smart enough," or "I've forgotten how to do this. Why bother?" or they may say, "If I spend 5 minutes on the problem, I still won't be able to do it, and then I'll feel even worse. So, I won't even try."

CSM addresses these patterns of learned helplessness in many ways. For example, after learning a skill, students are informed of what fraction of all adults and 4-year college graduates could do the problem.



After the student has seen this type of information a few times, they gain confidence in their own abilities and their internal narrative changes to: "I can't do the problem, but it's not because I'm dumb – it's because these are difficult problems. I've learned that I can do tricky problems if I try, and it will feel really good because I'll be able to do things that even many college graduates can't do. Let's get started!"

Attention to detail and A-level work

Attention to detail and carefulness are traits that are highly prized by employers, but generally undermined in most educational technology and in the many traditional classes that require minimal competency – such as 60-70% passing grades on multiple choice tests. CSM requires extraordinary levels of accuracy and attention to detail to complete.

All work done on CSM must be "A-level" work for a student to make progress. CSM's high mastery level helps to teach students what A-level work demands, that they are capable of A-level work, and how good A-level performance *feels* - so that they are more likely to demonstrate such performance in other classes and as they transition to the workforce.

How does the CSM Course teach?

To achieve the highest learning efficiency, CSM is an adaptive learning system that personalizes instruction by guiding each student on a unique path through the lessons according to their individual needs.

- Zone of proximal development.** CSM maintains students at their "edge of knowledge" where lessons are neither too easy and boring, nor too hard and frustrating. At this edge of knowledge, learning is both fastest and most rewarding. Students move through "trees" of skills, earning yellow, red and black belts to mark their mastery of skills.
- No traditional tests.** In most computer-based instruction, students spend a lot of their time in pre- and post- tests, which cut significantly into instructional time. In contrast, in CSM, testing and training are woven together seamlessly. CSM formatively analyzes each student interaction in terms of skills acquisition, independent learning, and habits of mind to guide them on their optimal path through the curriculum.
- Feedback tailored to specific errors.** CSM analyzes every incorrect answer to determine the specific error made by the student, and in most cases, CSM identifies the problem and immediately provides the student with their thinking error to help them correct their mistake.
- Higher level of mastery.** Most conventional educational technology requires minimal competency – often 60-70% passing scores on multiple choice questions. CSM requires a much higher level of mastery, resulting in significantly deeper learning.
- Durability of mastery.** CSM uses a karate belt metaphor to bring students back to skills over weeks as they move from yellow to red belt, and finally to a black belt. Instead of just giving students a check-mark and moving on, CSM determines that the student can reproduce the skill over an extended period, demonstrating that the skills acquisition is deep, secure and durable.
- Guided metacognition.** CSM guides students through the process of metacognition, by asking them to consider their learning and needs every time they miss a question. CSM also helps students learn how they learn best by providing many lesson types that are geared towards various learning styles, as well as feedback to students on which lessons they are reading and which lessons are most successful in helping them learn.



- **Measurement of and response to effort and learning.** Most adaptive learning systems focus exclusively on the cognitive aspects of a student's performance. CSM addresses the whole student by also measuring and responding to effort and learning.

What are the CSM+ Courses?

After students complete the CSM Course, they enter the optional CSM+ Courses, which focus on advanced problem-solving and thinking skills and how to tackle novel problems in unfamiliar contexts. CSM+ Courses start out at approximately the level of the Core Skills in the CSM Course, and their difficulty grows gradually as the student progresses.

The instructional paradigm for the CSM+ Courses is completely different from that of the CSM Course – whereas the CSM Course focuses on direct instruction and learning through reading, students working on CSM+ Courses are gently guided towards an “aha!” moment through hints. The goal is for students to learn how to explore a problem on their own, trying different tactics and strategies until they come to their own solution.

There are three types of CSM+ Courses, which can be selected according to the needs of a specific program:

- **Problem Solving People** follow people in the fictional town of Hutterville, CO through their lives and the issues that come up, developing applied real-world problem-solving. The occupations explored include a newspaper reporter, a skateboard shop owner, a detective, a college student, and a veterinarian.
- **Mathematical Intuitions** develop abstract mathematical abilities, especially statistical reasoning. By taking students through problems with incrementally increasing difficulty, students develop numerical intuitions.
- **Social Science Deep Dives** develop analytical reading skills. Students read passages about social science topics (such as self-interest and the Ultimatum Game, or how people develop expertise), and think deeply about the experiments described and what can be inferred.

Many of the CSM+ are quite difficult and can be of college-level difficulty, and individual problems can require sustained effort of 30 minutes or more. The entire set of CSM+ Course can take even advanced students tens of hours to complete.

Note that the CSM+ Courses can be adapted to focus on specific contexts – manufacturing, healthcare, groceries, hospitality or more. Please contact Miriam Goldberg, Chief Education Officer at miriam@csmlearn.com, to learn more.

What is the CSM Certificate?

The CSM Certificate is the first certificate of general high performance, which encompasses the skills and traits that employers value in ALL employees.

Introduction to the CSM Core Skills

The next sections contain examples of each of the **Core Skills** of the CSM Course. To complete the CSM Course, students must earn black belts on all of these Core Skills, indicating durable mastery.

Skills on CSM are organized into parts, which are one or more questions that are presented on separate webpages. **ALL of the questions in a part must be answered correctly at the same time in order to be considered correct.**

All skills on CSM are created using CSMlearn’s proprietary templating system, which generates many skills of equivalent difficulty with different names, contexts, and numbers. While this guide contains only one example from each Core Skill, the CSM Course contains 30 equivalent questions for each skill, with questions regenerated every 3 months.

Note: The Core Skills are only a fraction of the curriculum of CSM, and the following sections do not include the 65 **Supporting Skills** that students are optionally taken to depending on their prior preparation and knowledge, or the optional **CSM+ Courses** for advanced problem solving after the CSM Course.

Appendix A gives a short description of both the Core Skills and Supporting Skills.

Finally, these sections **do not** describe things that are taught through CSM instruction (i.e. the learning process), rather than explicitly through the curriculum. Such areas include active, independent learning and many performance traits like persistence, resilience, self-efficacy and attention-to-detail.

Curriculum goals and structure

The goal of CSM is to build the skills, strategies, mindsets, behaviors, and feelings that will help people to be self-sufficient learners and successful in school, college, work and life. The strategies, mindsets, behaviors and feelings are built through the CSM instructional paradigm and methods, while the skills are more explicitly developed through the CSM curriculum.

CSM Skills have several important characteristics:

- CSM Skills are practical and broadly useful. The curriculum was designed through a US Department of Education grant to represent skills that have a broad range of usefulness across a variety of sectors and occupations
- CSM Skills build deep understanding, and can’t be solved procedurally. This deep fluency with skills makes them transferable – when people encounter problems in their everyday lives, they need to feel confident that they can think the problem through, rather than just reaching for a procedure that might not be appropriate.
- CSM Skills provide a strong foundation. CSM provides can easily be built on in college or in the workplace.

Skills are composites

The CSM Curriculum is divided into 5 units:

- Number sense and mental math
- Units and measurements
- Mathematical applications

- Problem solving
- Literacy and information extraction

There is, however, significant overlap between some of these categories, and the assignments are not always clear. Most of the Core Skills comprise many skills and are hard to categorize.

For example, the **L-shaped figure** skill involves a variety of composite skills, including decomposition of an L-shaped area into rectangles, area calculations, perimeter calculations, units and conversions, complex rounding, problem-solving, and close reading.

This is even true of the nominally straightforward **Invoice** skill, which involves complex tables, understanding the use and purpose of taxes and discounts, as well as their understanding, rounding to the nearest penny, close reading of informational text, and more.

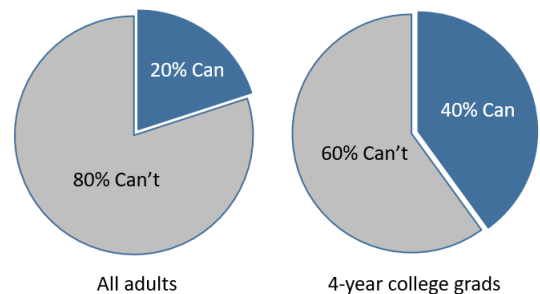
It should also be noted that these **five units are interwoven on CSM**, and **skills are not presented in this guide in the order they are encountered on CSM**. Students do not complete all of the skills in a unit before moving on. This ensures that students do not feel bored or overwhelmed, and also helps students encode skills in long-term memory.

Skill difficulty

Each skill contains a rough indication of the percent of all adults in the US and the percent of 4-year college graduates who can do the given skill.

These numbers are estimates that come from a combination of sources:

- Comparisons with problems on widely used assessments such as the Program for the International Assessment of Adult Competencies (PIAAC) and the earlier National Adult Literacy Survey (NALS) and National Assessment of Adult Literacy (NAAL).
- Interpolations from these problems and difficulties as determined by related NAEP/PISA problems
- Information from the difficulties of skills as determined by CSM Course students



Core Skills: Number Sense and Mental Math

Introduction to Number Sense and Mental Math

Arithmetic is typically taught in a procedural fashion that may not develop a strong intuitive sense of number relationships and scale and magnitude. CSM's number sense and mental math curriculum is designed to develop these intuitions, with a particular emphasis on those aspects that will be most likely to be used on a daily basis, and includes:

- Fluency in fractions, decimals and percents, including reducing fractions (e.g. $6/10 = 3/5$)
- A strong sense of decimals such as 10ths, 100ths, and 1000ths on the number line
- Mental arithmetic that spans a large range of scale, from hundredths to millions
- Coupling this mental arithmetic to estimations, since many calculations may not be of "simple numbers" (e.g., estimating that the answer to "what is 19×63 " will be close to 20×60).

While these skills might seem basic, fewer than half of 4-year college graduates are capable of answering the problems.

Fractions, Decimals, Percents

Part 1 of 2

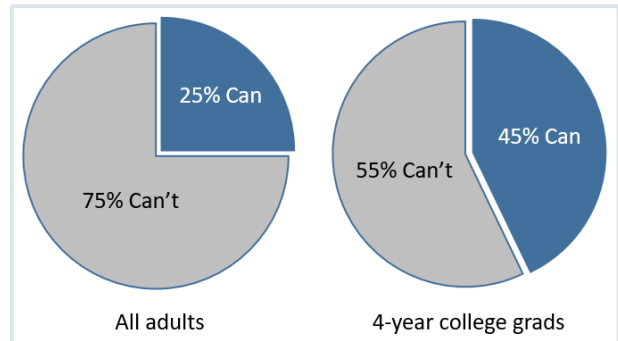
In each line below, convert the number on the left to the type of number indicated on the right in brackets.

$9/10 = \text{[]} \text{ [decimal number]}$

$2/5 = \text{[]} \text{ [decimal number]}$

$75\% = \text{[]} \text{ [decimal number]}$

$80\% = \text{[]} \text{ [decimal number]}$



 $1/3 = \text{[]} \% \text{ [percent]}$

$7/10 = \text{[]} \% \text{ [percent]}$

$0.3 = \text{[]} \% \text{ [percent]}$

$0.25 = \text{[]} \% \text{ [percent]}$

 $0.6 = \text{[]} \text{ [fraction]}$

$0.6667 = \text{[]} \text{ [fraction]}$

$10\% = \text{[]} \text{ [fraction]}$

$50\% = \text{[]} \text{ [fraction]}$

Part 2 of 2

Question 1: Select the percent of the circle that is colored:



- 20%
- 25%
- 33%
- 50%
- 65%
- 80%

Question 2: Select the percent of the circle that is colored:



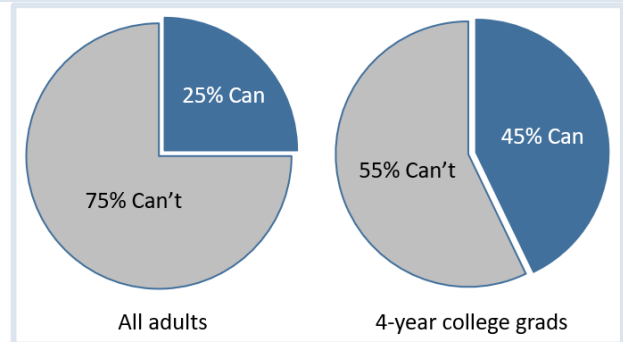
- 15%
- 25%
- 33%
- 65%
- 75%
- 85%

Decimal Number Relationships

Part 1 of 4

Question 1: Click on the boxes of all numbers that are smaller than **5.6**

- 5.197
- 5.61
- 6.1
- 0.099
- 5.0099
- 5.09
- 4.97



Part 2 of 4

Question 1: Click on the boxes of all numbers that are larger than **0.014**

- 0.104
- 0.04
- 0.0104
- 1.004
- 0.0014
- 0.01
- 0.14

Part 3 of 4

Question 1: Which one of the following shows the numbers **3.39**, **3 2/5**, and **3.3** placed in the correct order, from smallest to largest?

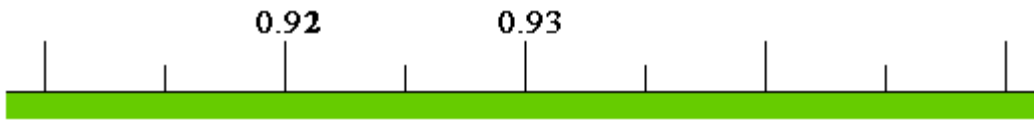
- 3.3 3.39 3 2/5
- 3.39 3 2/5 3.3
- 3.39 3.3 3 2/5
- 3 2/5 3.39 3.3
- 3.3 3 2/5 3.39
- 3 2/5 3.3 3.39

Question 2: You need to change the mixed number **48 3/8** into a decimal number. Which one of the following procedures should you do?

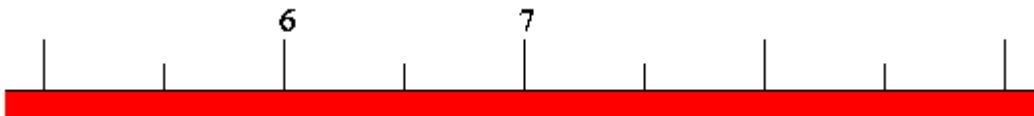
- Divide 3 by 8 and then place 48 directly to the left of the decimal point.
- Divide 48 by 8 and then place 3 directly to the left of the decimal point.
- Multiply 3 times 8 and then place 48 directly to the left of the decimal point.
- Multiply 48 times 8 and then place 3 directly to the left of the decimal point.

Part 4 of 4

Question 1: Click the place that best represents the location of the number 0.924 on the colored part of the number line below.



Question 2: Click the place that best represents the location of the number 8.05 on the colored part of the number line below.



Mental Math – Addition and Subtraction

Do these problems in your head. Use paper only for the problems that you just can't do in your head. It's important to do as many of these problems without paper as you can.

Do not use a calculator at all.

Part 1 of 2

$49 + 8 =$

$50 + 190 =$

$72 + 60 =$

$300 + 6700 =$

$5,700 + 5,000 =$

$0.3 + 3.8 =$

$9.8 + 6.0 =$

$0.04 + 0.59 =$

$0.99 + 0.1 =$

Part 2 of 2

$85 - 9 =$

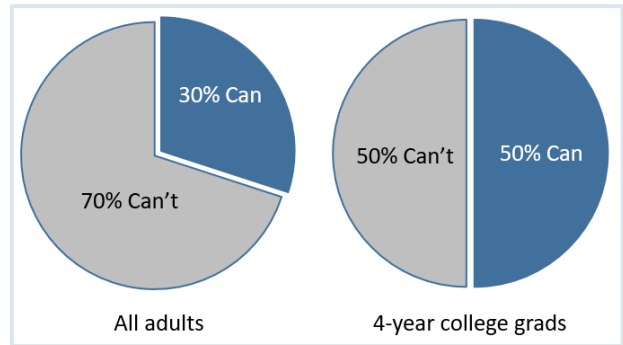
$210 - 60 =$

$8200 - 400 =$

$310,000 - 90,000 =$

$4.2 - 0.7 =$

$0.94 - 0.09 =$



Mental Math - Multiplication and Division

Do these problems in your head. Use paper only for the problems that you just can't do in your head. It's important to do as many of these problems without paper as you can.

Do not use a calculator at all.

Part 1 of 2

$0.2 \times 4 =$

$0.06 \times 9 =$

$6 \times 0.2 =$

$0.9 \times 40 =$

$0.09 \times 30 =$

$0.6 \times 0.6 =$

$0.6 \times 0.5 =$

$0.2 \times 700 =$

$6000 \times 0.9 =$

$80 \times 0.07 =$

Part 2 of 2

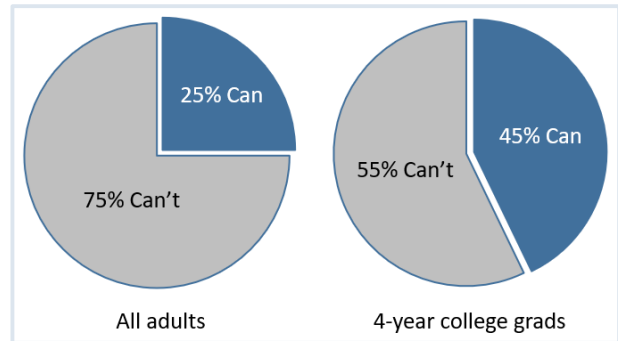
$49 \div 0.07 =$

$2.7 \div 9 =$

$2.7 \div 0.3 =$

$1200 \div 0.4 =$

$0.56 \div 0.7 =$



Mental Math – Thousands and Millions

Do these problems in your head. Use paper only for the problems that you just can't do in your head. It's important to do as many of these problems without paper as you can.

Do not use a calculator at all.

Part 1 of 2

$26 \times 1000 = \text{[]}$

$1 \text{ thousand} \times 920,000 = \text{[]}$

$47 \times 1 \text{ million} = \text{[]}$

$98 \times 10,000 = \text{[]}$

$6 \text{ thousand} \times 10,000 = \text{[]}$

$5000 \times 3 = \text{[]}$

$7000 \times 8000 = \text{[]}$

$4 \text{ million} \times 7 = \text{[]}$

$20 \text{ million} \times 6 = \text{[]}$

Part 2 of 2

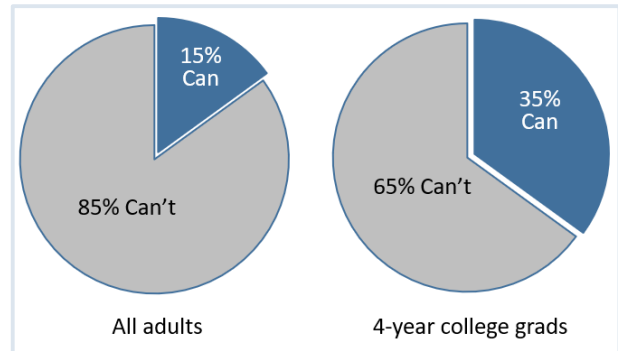
$2 \text{ thousand} \div 1000 = \text{[]}$

$240,000 \div 1 \text{ thousand} = \text{[]}$

$7 \text{ million} \div 1 \text{ thousand} = \text{[]}$

$55 \text{ million} \div 1 \text{ thousand} = \text{[]}$

$54 \text{ million} \div 9000 = \text{[]}$



Estimation

Part 1 of 3

For each question below, you will be given 5 numbers, and a goal range. You need to find which pair of these numbers add or subtract to give a number within the goal range.

For each question, there are about 20 possible pairs of numbers that you could add or subtract. You could do each of the 20 additions or subtractions on paper, but this would take a long time. Instead, we suggest that you:

- round the numbers to an appropriate place, and write them down on paper
- scan through the numbers to find the pair that looks like it works
- test your pair by adding or subtracting the numbers to determine if it is in the goal range

There is only one pair of numbers that works, so as soon as you find it, you don't need to test any more numbers.

Question 1: Choose the two numbers that when added give a result close to 4.8 (the result will be the only number between 4.7 and 4.9)

- 0.52
- 0.68
- 0.872
- 3.61
- 3.91

Question 2: Choose the two numbers that when added give a result close to 2000 (the result will be the only number between 1900 and 2100)

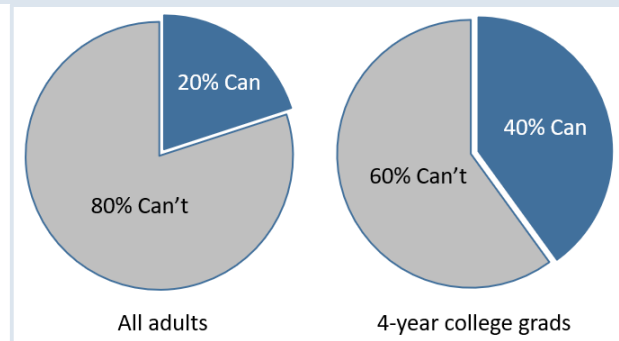
- 130
- 480
- 1110
- 1310
- 1490

Question 3: Choose the two numbers that when subtracted give a result close to 34 (the result will be the only number between 33 and 35)

- 44
- 42.2
- 39.8
- 6.37
- 3.91

Question 4: Choose the two numbers that when subtracted give a result close to 760 (the result will be the only number between 750 and 770)

- 849



- 807
- 792
- 69
- 52.8

Part 2 of 3

For each question below, you will be given 5 numbers. You will need to find which pair of these numbers multiply to give a number within a desired range.

Some problems are about percents. For these problems, you will have to find which percent and value can be paired to give a number within a desired range.

For each question, you will need to scan through many possible pairs of numbers. You could do each of the multiplications exactly on paper, but each problem could take hours. Instead, we suggest that you:

- round the numbers to an appropriate place, and write them down on paper
- scan through the numbers to find the pair that works

There is only one pair of numbers that works, and as soon as you find it, you can enter that answer. If more than one number works, you might want to try either to answer the problems exactly, or to try a different method of rounding.

Question 1: Choose the two numbers that when multiplied have a result close to 5400 (the result will be the only number between 5200 and 5600)

- 9.2
- 62
- 73.9
- 88.2
- 818

Question 2: Choose the two numbers that when multiplied have a result close to 3900 (the result will be the only number between 3700 and 4100)

- 5.11
- 5.98
- 48.4
- 69.7
- 772

Question 3: Choose the percent and the "non-percent" that give a percent calculation with a result close to 15 (the result will be the only number between 13 and 17)

- | | | |
|--------------------------------|-----------|-------------------------------|
| <input type="checkbox"/> 27.8% | OF | <input type="checkbox"/> 3.02 |
| <input type="checkbox"/> 38.9% | | <input type="checkbox"/> 9.29 |
| | • | <input type="checkbox"/> 49.2 |

Question 4: Choose the percent and the "non-percent" that give a percent calculation with a result close to 0.2 (the result will be the only number between 0.18 and 0.22)

- | | | |
|--------------------------------|-----------|-------------------------------|
| <input type="checkbox"/> 4.21% | OF | <input type="checkbox"/> 4.93 |
| <input type="checkbox"/> 19.8% | | <input type="checkbox"/> 5.86 |
| <input type="checkbox"/> 49.9% | | |

Part 3 of 3

For each question below, you will be given 4 numbers. You will need to find which pair of these numbers can be divided to give a number within a desired range.

There is only one pair of numbers that works, and as soon as you find it, you can enter that answer.

Question 1: Choose the two of the following that when divided have a result close to 0.07 (the result will be the only result between 0.06 and 0.081).

- 0.13
- 0.2
- 0.27
- 4

Question 2: Choose the two of the following that when divided have a result close to 80 (the result will be the only result between 68 and 92).

- 40
- 50
- 80
- 6600

Question 3: Choose the two of the following that when divided have a result close to 9000 (the result will be the only result between 7700 and 10000).

- 0.062
- 0.71
- 0.9
- 8000

Core Skills: Units and Measurement

Introduction to Units and Measurement

Units and Measurement are key STEM skills, yet most students often ignore units in their work. Indeed, it is a commonplace observation that students often randomly combine numerical values that are incommensurate (e.g., 10 feet + 3 yards = 13). In problem solving, units can tell both what you have and give a sense of where you're going.

Length, Weight, and Volume introduce English and metric system length, weight and volume units, with a particular emphasis on an intuition of the scale of the units (e.g. approximately how many grams does an egg weigh?) and how they relate across systems (e.g. a line scale with both kilograms and pounds). **Conversions** teaches formal conversion between units.

Reading a Ruler covers reading a 16ths inch ruler and reducing fractions, and **Reading Meters** includes understanding of different ways of splitting up wholes (e.g. by tenths, quarters, fifths, etc.) and interpolation.

Finally, **Answer Units** builds an abstract understanding of types of units – for example, that grams, kilograms, pounds and ounces are all units of weight, and can all be the answer to any question about how much something weighs. More complex questions include rates and conversion factors – e.g. that a dump truck being filled can be in cubic meters per minute or seconds per cubic foot (volume per time or time per volume are both interconvertible rates). This is among the most challenging problems in CSM.

Length

Part 1 of 4

Fill in the following conversions factors:

1 cm = mm

1 km = m

1 yd = ft

1 ft = in.

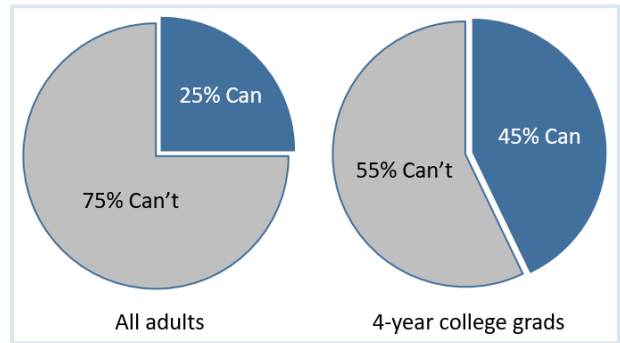
1 mi = ft

1 in. = cm

1 m = cm

1 km is about mile

1 mile is about kilometer



Part 2 of 4

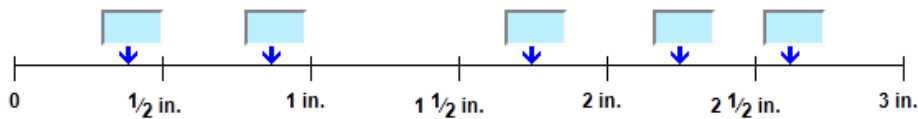
Below are several lines with units of distance marked on them.

The scale for each line is labeled below the line.

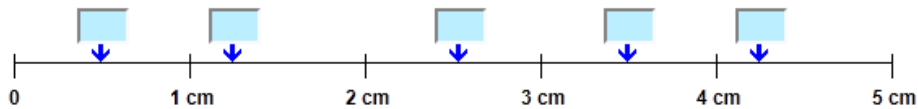
For each line, you are asked to click in a box at a given length on the line. When you click in a box, the value you are asked for will appear.

If you decide that the box you clicked on is not the correct length, click in the box again and the value will disappear. Then, click in the box that you think is correct.

Click in the box that is at **1 centimeter** on this line:

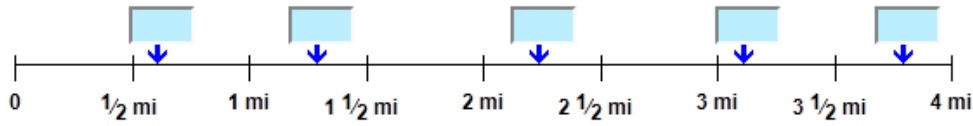


Click in the box that is at **1 inch** on this line:

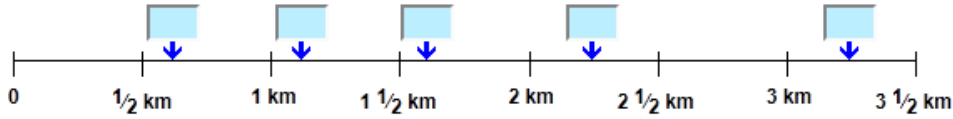


Part 3 of 4

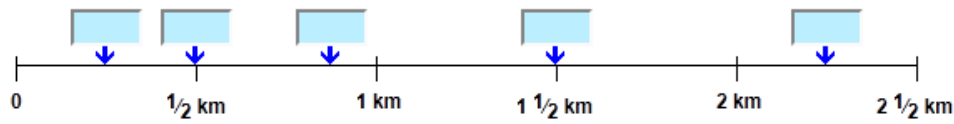
Click in the box that is at **1 kilometer** on this line:



Click in the box that is at **1 mile** on this line:



Click in the box that is at **500 meters** on this line:

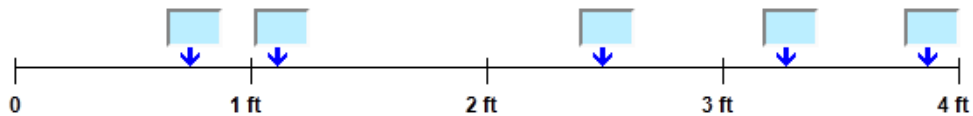


Part 4 of 4

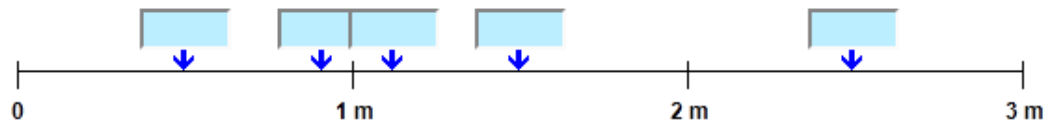
Click in the box that is at **1 yard** on this line:



Click in the box that is at **1 meter** on this line:



Click in the box that is at **250 centimeters** on this line:



Weight

Part 1 of 3

Question 1: Fill in the following conversion factors:

1 kg = g

1 lb = oz

Question 2: Which one of the following statements is true? Click on the radio button that is in front of the statement that is correct.

- One g is about 1.6 oz
- One oz is about 2.8 g
- One g is about 2.8 oz
- One g is about 28 oz
- One oz is about 0.6 g
- One g is about 2.2 oz
- One oz is about 2.2 g
- One oz is about 28 g

Question 3: Which one of the following statements is true? Click on the radio button that is in front of the statement that is correct.

- One lb is about 2.8 kg
- One kg is about 1.6 lb
- One lb is about 2.2 kg
- One kg is about 2.2 lb
- One lb is about 1.6 kg
- One kg is about 2.8 lb

Part 2 of 3

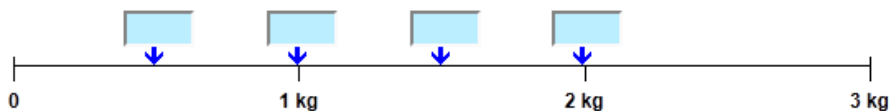
Below are several lines with units of weight marked on them.

The scale for each line is labeled below the line.

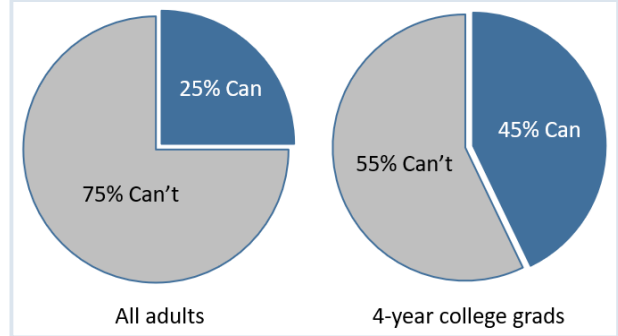
For each line, you are asked to click in a box at a given weight on the line. When you click in a box, the value you are asked for will appear.

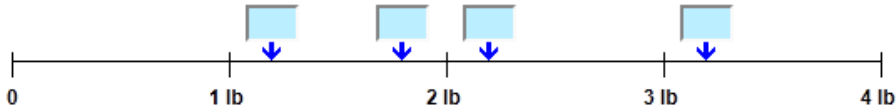
If you decide that the box you clicked on is not the correct weight, click in the box again and the value will disappear. Then, click in the box that you think is correct.

Question 1: Click in the box that is at **500 g** on this line:

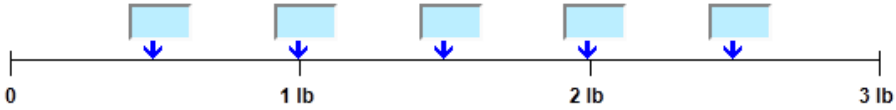


Question 2: Click in the box that is at **1 kg** on this line

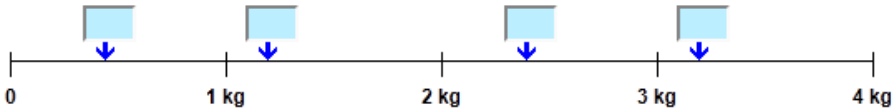




Question 3: Click in the box that is at **8 oz** on this line:



Question 4: Click in the box that is at **1 pound** on this line:



Part 3 of 3

For each of these questions, there is only one true statement. Click in the radio button in front of that true statement.

Question 1: A gallon of water weighs a little less than:

- 4 grams
- 40 grams
- 400 grams
- 4 kilograms
- 40 kilograms

Question 2: A medium sized apple weighs about:

- 10 grams
- 100 grams
- 1 kilogram
- 10 kilograms
- 100 kilograms

Question 3: An average adult man weighs about:

- 80 grams
- 800 grams
- 8 kilograms
- 80 kilograms
- 800 kilograms

Question 4: A chicken egg weighs about:

- 6 grams
- 60 grams
- 600 grams
- 6 kilograms
- 60 kilograms

Question 5: A pencil weighs about:

- 3 grams
- 30 grams
- 300 grams
- 3 kilograms
- 30 kilograms

Volume

Part 1 of 3

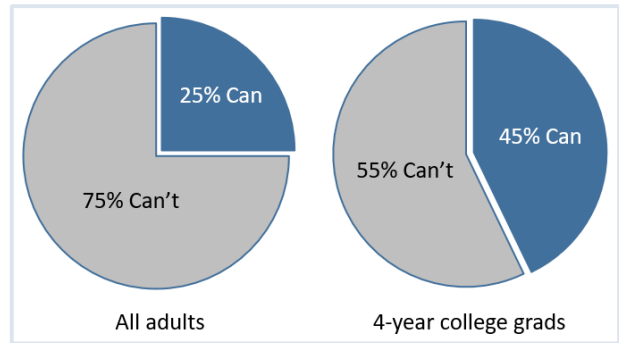
Question 1: Fill in the following conversion factors:

1 gal = qt

1 ml = cc

1 tbsp = tsp

1 L = mL

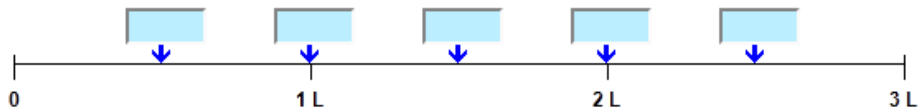


Question 2: One liter is a little more than:

- 1 tablespoon
- 1 quart
- 1 teaspoon
- 1 milliliter
- 1 cubic centimeter
- 1 gallon

Part 2 of 3

Question 1: Click in the box that is at 500 mL on this line:



Part 3 of 3

Question 1: The volume of a **can of soda** is about:

- 35 milliliters
- 350 milliliters
- 3.5 liters
- 35 liters
- 350 liters

Question 2: The volume of **1 heaping teaspoon of sugar** is about:

- 1 milliliter
- 10 milliliters
- 100 milliliters
- 1 liter
- 10 liters

Question 3: The volume of **1 gallon of milk** is about:

- 4 milliliters
- 40 milliliters
- 400 milliliters
- 4 liters
- 40 liters

Conversions

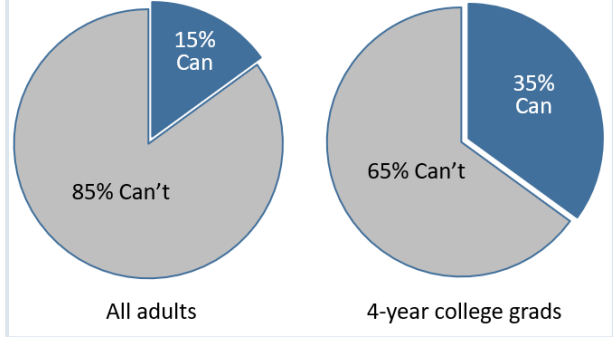
Part 1 of 1

Question 1: Calculate the following conversion. Enter your answer as it appears in your calculator:

$$16 \text{ in.} = \text{ cm}$$

Question 2: Calculate the following conversion. Enter your answer as it appears in your calculator:

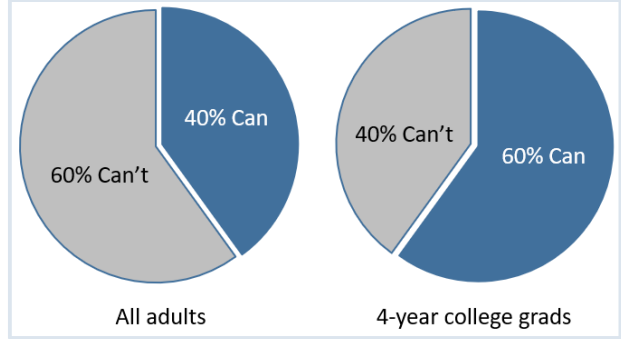
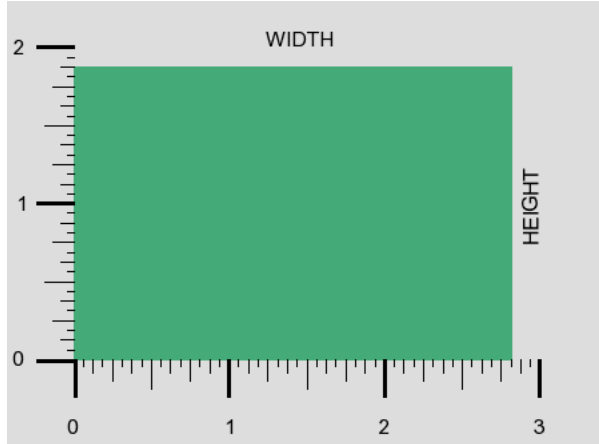
$$9 \text{ cm} = \text{ m}$$



Reading a Ruler

Part 1 of 1

Stewart Rogers is shingling a roof and must measure the shingles, one of which is shown in green below.



General instructions: Write your answers as reduced mixed numbers (for example, $5 \frac{8}{16}$ should be written as $5 \frac{1}{2}$).

NOTE: The drawing is **not** the actual size of the item being measured. Use the ruler markings along the bottom and side of the drawing to do your measurement.

Question 1: What are the height and width of the shingle to the nearest sixteenth of an inch?

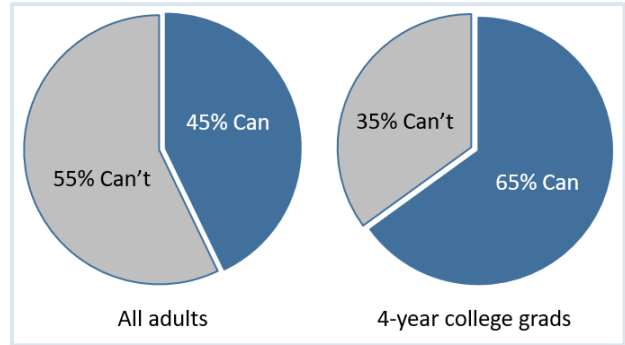
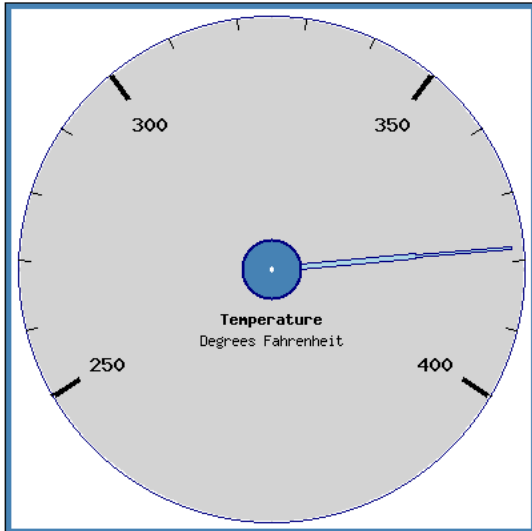
Height:

Width:

Reading Meters

Part 1 of 2

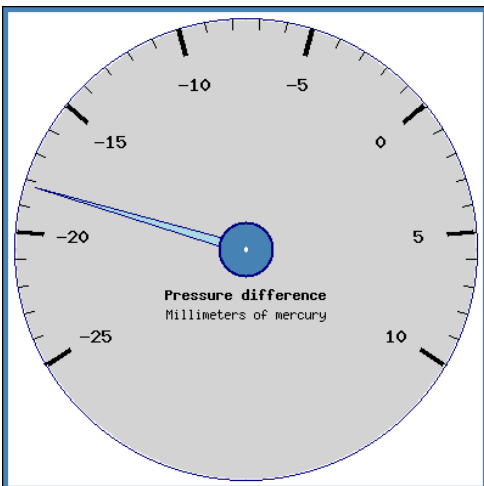
Wallace Patterson is a chef who needs to read the temperature of his baking thermometer. The dish will be done when the thermometer is at 400 degrees Fahrenheit. The baking thermometer is shown below.



Question 1: What is the reading shown on the thermometer, to the closest tick mark? degrees Fahrenheit

Part 2 of 2

Aditya Ray is a hospital consultant determining air flow in a hospital room. His last study showed a result of -19 millimeters of mercury. The pressure gauge is shown below.



Question 1: What is the value shown on the pressure gauge, to the nearest tick mark? millimeters of mercury

Answer Units

Part 1 of 2

This skill teaches you how to answer questions like: **What are possible heights for a sutsuga?**

This might seem to be impossible, because you don't know what a sutsuga is (in fact, we made it up!). However, you know that the height of a sutsuga **must be a length, like inches or meters**. It wouldn't make sense to say that the height of a sutsuga is 42 pounds!

So, all **lengths** are possible heights for a sutsuga, and all answer choices that aren't lengths are not possible heights. If there are multiple lengths in the answer choices, select them all, even if they are different lengths (like 0.3 inches and 312 miles), since you don't know how big a sutsuga actually is.

Other questions in this skill ask about weight, volume, rates, speed and ratios. For each problem, choose all of the possible answers with the right types of units.

If you don't know what type of unit something is (for example, if you don't know if cubic feet are an area or a volume), read the **Concepts** section of the lesson to find out more information.

NOTE: For the following problems, **per** units can be written in two ways. For example, the following units are both ways of indicating the speed:

- 2 feet per second
- 0.5 seconds per foot

Both of these would be possible answers to the question: What are possible speeds for a TriCrown A75?

Question 1: Given a wide orregan, what is its area? Check all the answers that have the right type of units.

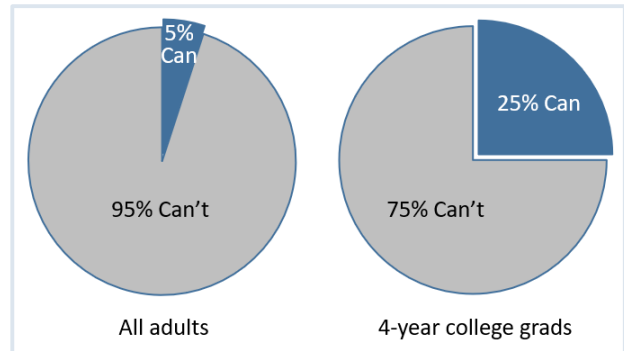
- 0.24 kilograms
- 40 feet
- 3000 square inches
- 21 square feet
- 0.000491 acre

Question 2: What is the weight of a tall M3G/1? Check all the answers that have the right type of units.

- 40 lb
- 0.02 tons
- 19 kg
- 3 liters
- 0.0026 pounds/milliliter

Question 3: Given an average E-985, what is its volume? Check all the answers that have the right type of units.

- 9000 L
- 9200 qt
- 0.002 pounds
- 530,000 cubic inches
- 0.0075 inches per cubic meter



Part 2 of 2

Question 1: At what rate can a dump truck be filled with gravel? Check all the answers that have the right type of units.

- 3000 pounds per hour
- 0.85 pounds per second
- 0.12 pounds/centimeter
- 11 pounds
- 0.02 minutes/pound

Question 2: What is the speed of the Wipperfnaut? Check all the answers that have the right type of units.

- 3000 minutes
- 11 minutes per kilometer
- 0.01 square feet/second
- 71,000 centimeters
- 1500 millimeters/second

Question 3: What is the relationship of toll takers to cars? Check all the answers that have the right type of units.

- 600 cars per minute
- 0.171 toll takers/second
- 46 toll takers
- 0.02 toll takers/car
- 40 cars per toll taker

Core Skills: Mathematical Applications

Introduction to Mathematical Applications

Mathematical Applications cover a range of topics loosely related by the need for deep understanding of a problem and carrying out complex tasks carefully.

- **Invoice** requires math, reasoning and problem-solving, and much of the challenge for students involves careful execution, information extraction, rounding, and the like.
- **Time Schedules** involves reading times tables and understanding the issues in scheduling – sometimes working forward in time, sometimes backward, sometimes looking for the next train and sometimes for the last, as well as the calculation of time differences.
- **Averaging and Prediction** involves table reading, calculating averages (including understanding when to use or ignore a zero value), using averages to predict, and more.
- **L-shaped Figures** includes converting square units, advanced rounding, and areas and perimeters.
- **Conversions and Person-hours** introduces the concept of work in person-hours, graph reading, and decisions on when to round up or down.
- **Percent Prediction** involves table reading, summing across rows and columns, ratios and their use in prediction, etc.
- **Advanced Persons** requires the conversion of percents into ratios, complex mental math, complement, and more.
- **Money Planning** has several different financial-related tasks involving interest and planning, with close reading of text and complex graph-reading (e.g. finding differences).

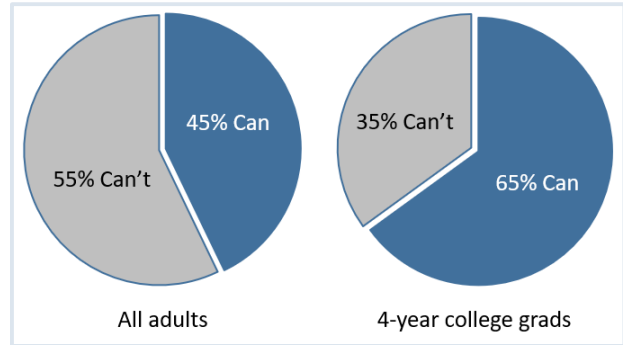
These skills require broad numerical agility and fluency, and with the exception of the Invoice skill, these are among the most challenging skills in CSM. For example, one startling result is that the majority of 4-year college graduates find it difficult to calculate the difference between times across a 12 o'clock boundary!

Invoice

Part 1 of 2

Adriana Morales is an order clerk for Tool Manufacturers. She takes the following order from Land Crafters:

- Land Crafters orders 57 10-pound bags of plant food (EK2526) at \$17.36 each.
- They also order 31 2-count packs of plant hooks (23-88) at \$0.60 a pack.



Below is the top part of an invoice.

Question 1: Fill out the 6 colored fields of the invoice using the above information. All dollar amounts should be rounded to the nearest penny.

INVOICE		Tool Manufacturers		
Invoice Number:	08-145	1101 Jennings Parkway		
Invoice Date:	6/9/02	Detroit MI 48230		
Ship Date:	6/9/02	(313) 555-1452		
Customer #:	WYSBM-09	(313) 555-1463		
Ship To:		Sold To:		
Land Crafters 3323 Bannock Drive Tucson AZ 85704		Land Crafters 5259 Dearborn Street Tucson AZ 85704		
Stock Number	Quantity	Description	Unit Price	Amount
EK2526		10-pound bag of plant food		
23-88		2-count pack of plant hooks		

Part 2 of 2

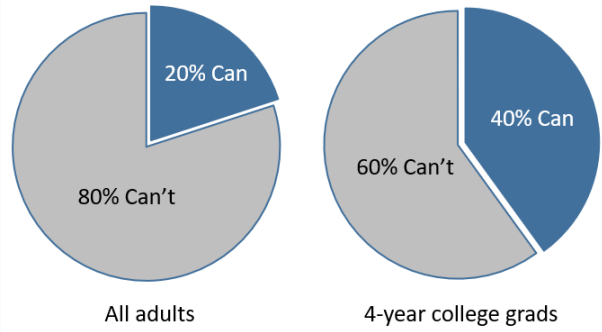
Question 1: Fill out the 5 colored fields of the invoice using the above information. All dollar amounts should be rounded to the nearest penny.

INVOICE		Tool Manufacturers		
Invoice Number:	08-145	1101 Jennings Parkway		
Invoice Date:	6/9/02	Detroit MI 48230		
Ship Date:	6/9/02	(313) 555-1452		
Customer #:	WYSBM-09	(313) 555-1463		
Ship To:		Sold To:		
Land Crafters 3323 Bannock Drive Tucson AZ 85704		Land Crafters 5259 Dearborn Street Tucson AZ 85704		
Stock Number	Quantity	Description	Unit Price	Amount
EK2526	57	10-pound bag of plant food	17.36	989.52
23-88	31	2-count pack of plant hooks	0.60	18.60
			Sub-total	
			Discount	
			Pre-tax Total	
			Tax	
			Total Due	

Using Time Schedules

Part 1 of 2

The Acme Manufacturing shuttles follow a fixed route and stop at different locations in the plant site. The schedule for the shuttles is shown below.



Acme Shuttle Route 6F				
Recycling Center	Shipping Center	Administration Building	Maintenance Shop	Medical Building
8:13 am	9:03 am	9:48 am	10:35 am	11:29 am
9:05 am	9:55 am	10:40 am	11:27 am	12:21 pm
9:57 am	10:47 am	11:32 am	12:19 pm	1:13 pm
10:49 am	11:39 am	12:24 pm	1:11 pm	2:05 pm
11:41 am	12:31 pm	1:16 pm	2:03 pm	2:57 pm

Zelda Livingston is at the Administration Building and needs to go to the Medical Building to meet with the company coordinator. It is now 11:54 am.

Question 1: What is the earliest time Zelda can arrive at the Medical Building?

Question 2: How much time is there between now and that time? hours and minutes

Part 2 of 2

The Acme Manufacturing shuttles follow a fixed route and stop at different locations in the plant site. The schedule for the shuttles is shown below.

Acme Shuttle Route 6F				
Recycling Center	Shipping Center	Administration Building	Maintenance Shop	Medical Building
8:13 am	9:03 am	9:48 am	10:35 am	11:29 am
9:05 am	9:55 am	10:40 am	11:27 am	12:21 pm
9:57 am	10:47 am	11:32 am	12:19 pm	1:13 pm
10:49 am	11:39 am	12:24 pm	1:11 pm	2:05 pm
11:41 am	12:31 pm	1:16 pm	2:03 pm	2:57 pm

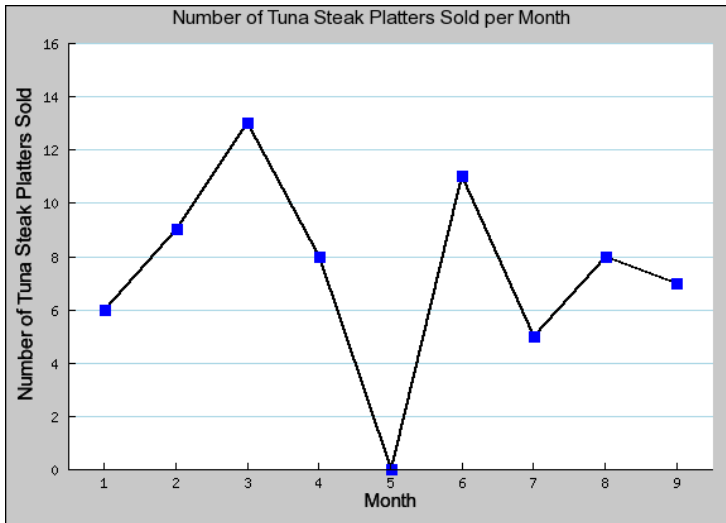
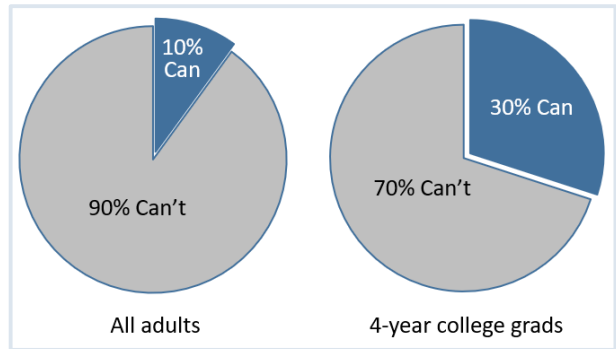
Shreya Verma wants to ride the shuttle from the Administration Building to the Medical Building to meet with a trainee.

Question 1: Shreya has to be at the Medical Building by 12:36 pm. What is the latest time Shreya can leave the Administration Building and still arrive at the Medical Building in time?

Averaging and Prediction

Part 1 of 1

The menu of Rio Grande Steakhouse Fine Dining is being changed to add some new items and get rid of some of the less popular ones. Karan Banerjee wants to know if he should keep the tuna steak platter on the menu. He is looking at the sales records of the tuna steak platter from the last 9 months, shown in the graph below.



Question 1: On average, how many tuna steak platters were sold per month from the beginning of Month 4 to the end of Month 9?

tuna steak platters

Question 2: Using the average calculated in the previous question, predict how many tuna steak platters will be sold over the next 5 months.

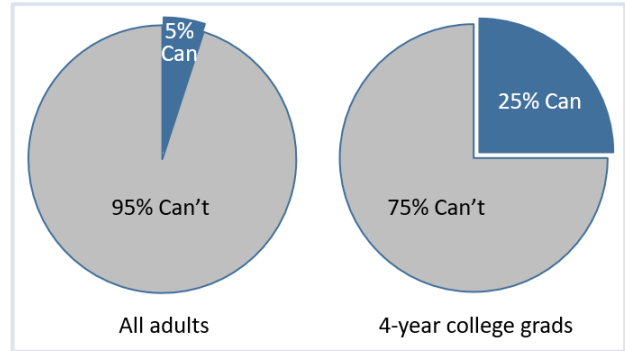
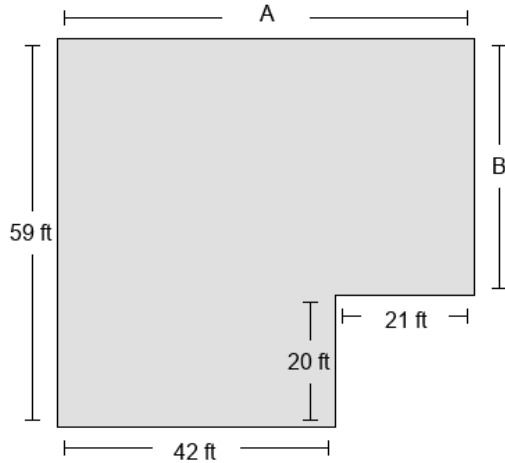
Round your answer to the nearest whole number.

tuna steak platters

L-shaped Figures

Part 1 of 2

Below is a blueprint of a bodega.



Question 1: What is the length of **side A** of the bodega?

feet

Question 2: What is the length of **side B** of the bodega?

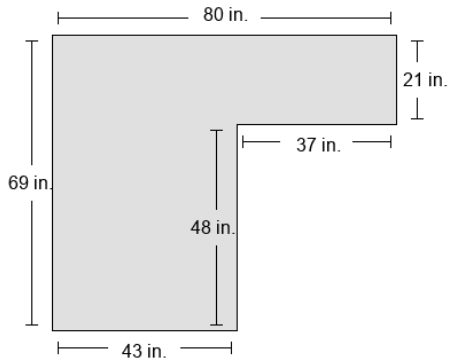
feet

Question 3: What is the perimeter of the bodega?

feet

Part 2 of 2

The piece of woven matting pictured in the diagram below costs \$10.92 per sq ft.



Question 1: What is the area of the woven matting in square inches?

feet

Question 2: To the nearest 10 dollars, how much will the piece of woven matting cost?

\$

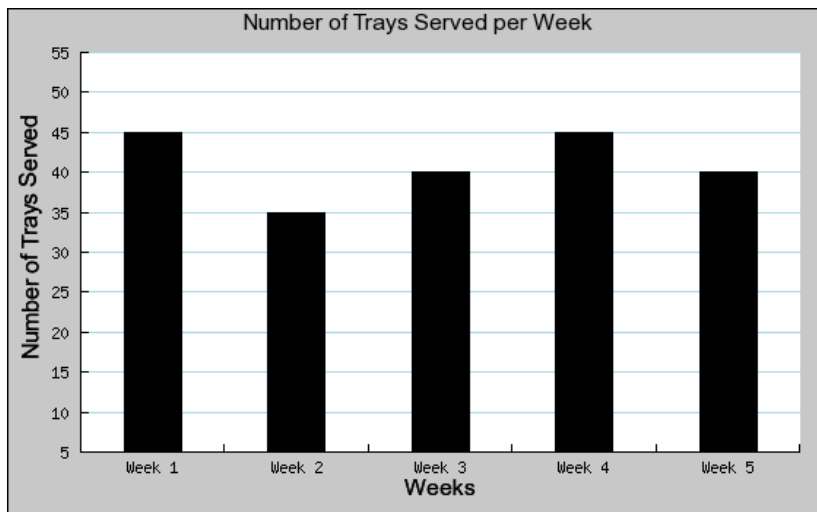
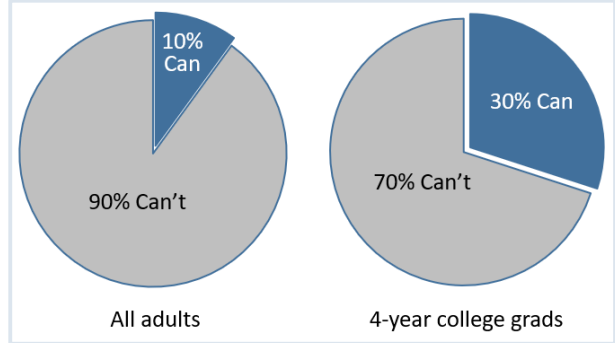
Conversions and Person-Hours

Part 1 of 2

The kitchen at Ideal Events Center stores its cookies in containers that can each hold 20 cookies. When the cookies are being served, they are taken from the kitchen to the tables in trays that can each hold 45 cookies.

Each worker at Ideal can decorate 125 cookies in 1 hour.

The graph below shows the number of trays of cookies served by Ideal during each of the last 5 weeks.



Question 1: How many full containers of cookies were served during Week 3? containers

Part 2 of 2

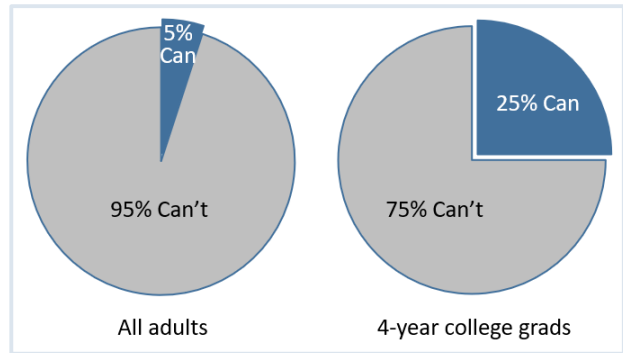
Question 1: One day, Ideal received a rush order to decorate 950 cookies in 4 hours. What is the smallest number of people needed to complete this order? people

Percent and Prediction

Part 1 of 1

Preston Livingston is a supervisor at Paradise Wall Coverings. The company has locations in five cities and the numbers for last week's production of rolls of wallpaper are listed below.

The row labeled **Total Production** lists how many rolls of wallpaper were produced each day and the other rows tell the number of these rolls of wallpaper with production flaws. No roll of wallpaper had more than one type of flaw.



Production Numbers					
	Baltimore	Richmond	Annapolis	Augusta	Jacksonville
Total Production	1669	2662	1998	1752	4632
Trimming Flaws	32	10	16	16	14
Lamination Flaws	15	5	12	6	63
Ink Flaws	6	5	4	4	15

Question 1: How many of the rolls of wallpaper produced in Annapolis had flaws? rolls of wallpaper

Question 2: To the **nearest tenth of a percent**, what **percent** of the rolls of wallpaper produced in Annapolis had flaws?

%

Question 3: How many rolls of wallpaper with flaws should Preston expect next week in Annapolis if:

- 1465 rolls of wallpaper are produced in Annapolis
- the percent of flaws is the same as last week in Annapolis

Round your answer to the nearest whole number

rolls of wallpaper

Advanced Percents

Part 1 of 4

Question 1: 0.05% of satchels produced by Star Fabricators do not have working clasps.

This means that 1 satchel in of the satchels does not have working clasps.

Part 2 of 4

Question 1: 8 microwave ovens in 1000 produced by Amber Products break in the first year.

This means that percent of microwave ovens break in the first year.

Part 3 of 4

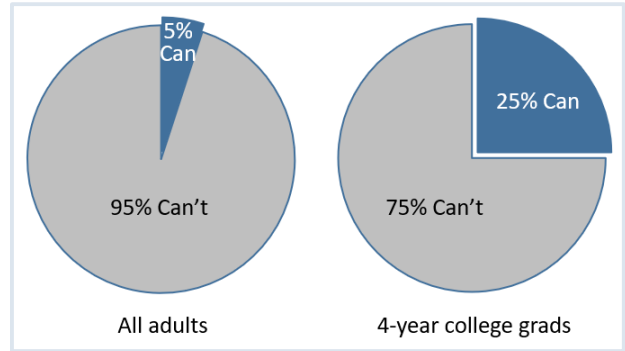
Question 1: 99.9% of raincoats produced by Paradise Apparel do not have cutting errors.

Another way of saying this is to say that 1 in of the raincoats has cutting errors.

Part 4 of 4

Question 1: 20 microwave ovens in 10,000 produced by Creative Fabricators last year had defects.

What percent of the microwave ovens did not have defects? %



Money Planning

Part 1 of 3

Nora Marshall has a savings account at Township Credit Union on which she earns 3% interest. She buys a small store with a loan, with special financing. She makes no payments the first year, but the loan amount increases by 18.5% for the first year. Then she will make monthly payments until the loan is paid off.

Today, Nora has

- \$25,000 in her savings account
- \$17,000 small store loan debt

Today, the combined ("net") value of these two accounts is \$8000, which is the difference between the value of the savings account and the small store loan debt.

Question 1: According to the terms of her loan, Nora makes no payments on her small store loan for the first year. She also makes no deposits or withdrawals from her savings account. At the end of the year, what will be the **net value** of the two accounts:

\$

Question 2: If, instead of getting a loan, Nora bought the small store by using money from her savings account at the beginning of this year, what would the **net value** of the two accounts be at the end of the year:

\$

Part 2 of 3

At the Midwest Health Clinic, you can either:

- see doctors for a price of \$32 a visit, or
- pay a \$14 **weekly** plan fee, and then see doctors for a price of \$11 a visit

Question 1: Andrew estimates that he sees a doctor about 1 time weekly at Midwest Health. How much will he save **in the first year** by choosing his best option? (Remember, there are 52 weeks in a year.)

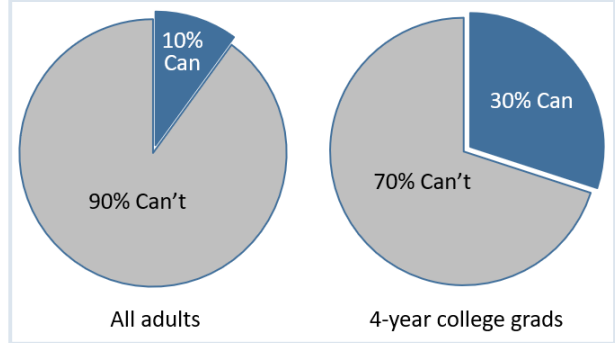
\$

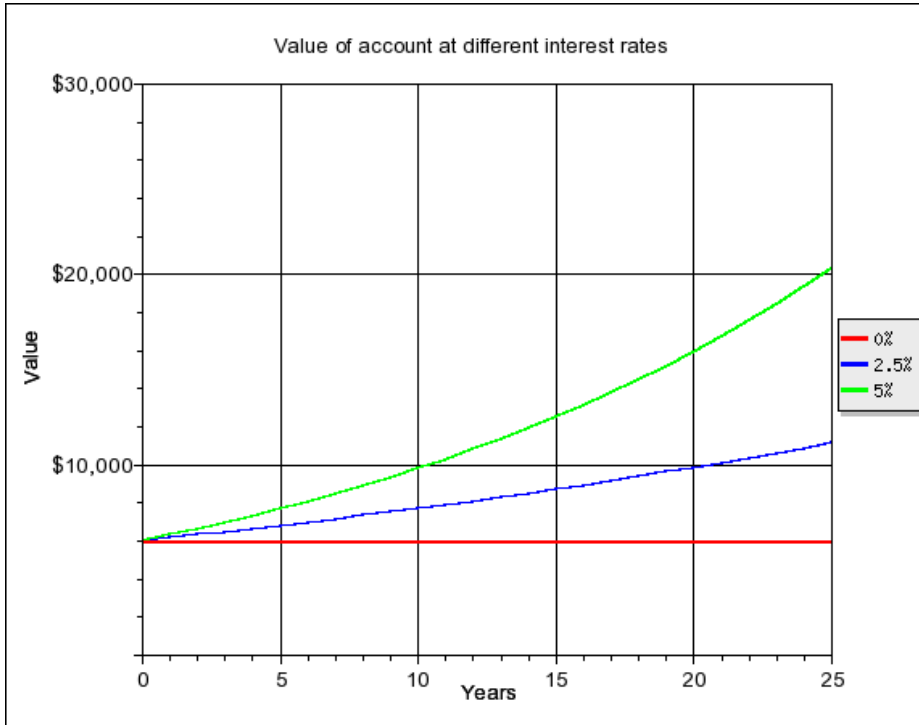
Part 3 of 3

Walter Travers is 25 years old and has \$6000 in savings. He can either:

1. put his money in a checking account that doesn't give interest (that is, has 0% return),
2. put it in a savings account and earn 2.5% annual interest, or
3. put it into a retirement account of stocks and bonds earning 5% annual gains

The following graph shows the value of the three different accounts at various times.





Question 1: 22 years from now, Walter will be 47. At that time, how much more would his \$6000 investment be worth if Walter put this money in the retirement account instead of keeping this money in a savings account?

Your answer should be within \$2000 of the exact amount. \$

Question 2: How much longer will it take for Walter's \$6000 to grow to \$10,000 at 2.5% than at 5%?

Your answer should be within 1 year of the exact number of years. years

Core Skills: Problem Solving

Introduction to Problem Solving

The essence of the **Problem Solving** Core Skills is the planning that comes before the actual work on a problem begins – many people jump into problems before thinking deeply about what is being asked. Many of the problems contain no numerical values and focus exclusively on creating a plan for how to get to a solution.

Multi-step Problems introduces working both forwards and backwards through a set of word “conversion factors” to link an input value to an output value.

Information Relevance is about determining which information is relevant to determining a particular value, and which information is not.

Graphs without Numbers involves interpretation of graphical information (such as maxima, minima, trends, and more) from graphs with no numerical information on the vertical axis.

Strategic Planning includes creating a tree of calculations to arrive at a result and focuses on how values with different units can be combined, as well as common business calculations.

Facts and Requirements covers the use nested logic operators (e.g. $[X \text{ AND NOT } Y] \text{ OR } Z$), including their use in the presence of missing information, in the satisfaction of requirements. While most math curriculum deals with continuous variables, a significant amount of technical/scientific, financial, bureaucratic and other activities are better modeled in logical relationships. Facts and Requirements also requires users to use comparison operators (e.g. less than vs. less than or equal).

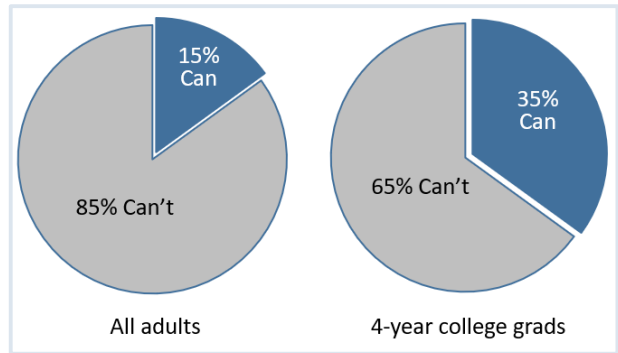
Multistep problems

Part 1 of 1

In the problems in this skill, you need to show the missing steps needed to get from a piece of information you know to another piece of information that you want to know.

To do this, you are given a number of sentences, each of which tells of a link between two pieces of information. In each sentence, XX indicates a number, but you don't need the number to answer the question.

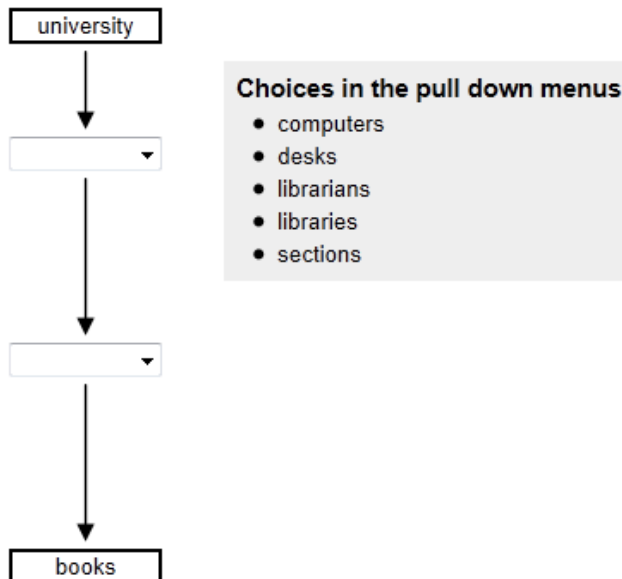
In addition, you are given boxes that are connected by arrows. The top box has the name of something that you know, and the bottom box has the name of what you are trying to find. What you are trying to determine is what pieces of information go into the empty boxes in the middle, so that you can go from what you know (top box) to what you want to know (bottom box). *[[NOTE: IN CSM, AN EXAMPLE IS GIVEN BELOW]]*



Question 1: The university system in Oklahoma is trying to figure out how many books are in their combined libraries. The library director knows the following facts.

- There is an average of XX sections in each library.
- XX libraries are at each university.
- Each section contains an average of XX books.
- Each library has an average of XX desks.
- There are XX librarians for each library.
- There are XX computers in each library.

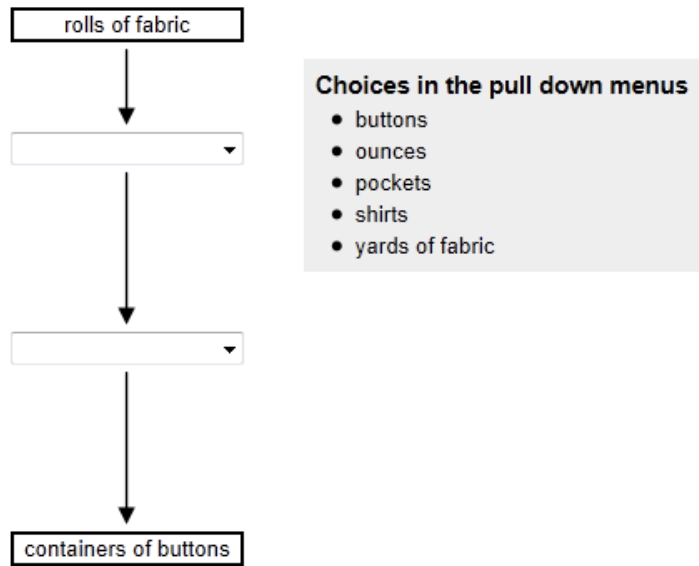
If the university system has XX libraries, how many books are in the combined libraries?



Question 2: A sewing factory is studying its materials needs. The production manager knows the following facts.

- Each shirt has XX pockets.
- Each shirt has XX buttons.
- XX buttons are in each container of buttons.
- Each container of buttons weighs XX ounces.
- Each roll of fabric has XX yards of fabric.
- XX shirts can be made from each roll of fabric.

If the factory has XX rolls of fabric, how many containers of buttons do they need?



Information Relevance

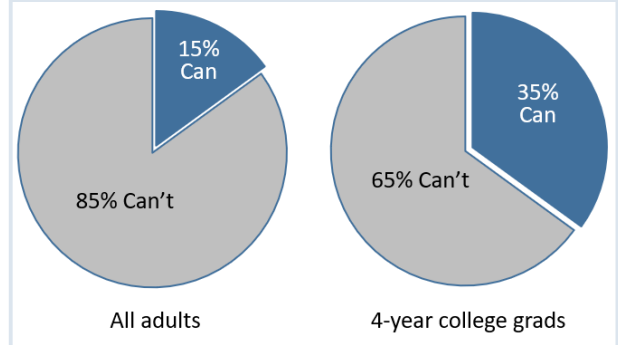
Part 1 of 1

Josephine's Cleaning Service has a cleaning crew that cleans offices. The crew is about to begin a shift during which it will clean offices in a large office building that contains several hundred offices. The company bills customers based on how many hours the cleaning crew spends cleaning.

Question 1: Which of the following pieces of information might Josephine's Cleaning Service want to know to determine how much she will be able to bill customers for the work completed by the crew during this shift?

Select as many choices as you think might be useful.

- the customer's method of payment
- the company's billing rate per hour of crew time
- the average time to clean an office
- the number of elevators in the building
- the length of the shift



Question 2: Which of the following pieces of information might Josephine's Cleaning Service want to know to determine how many offices the crew will clean during the shift?

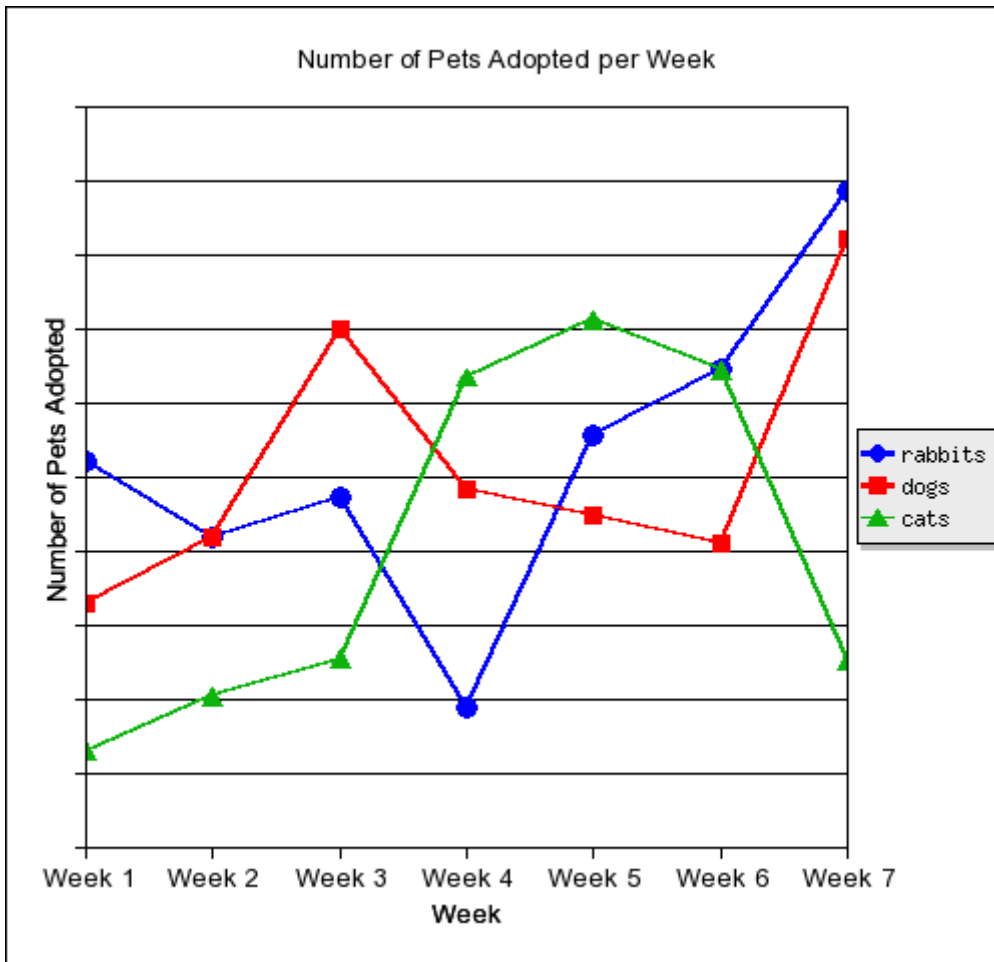
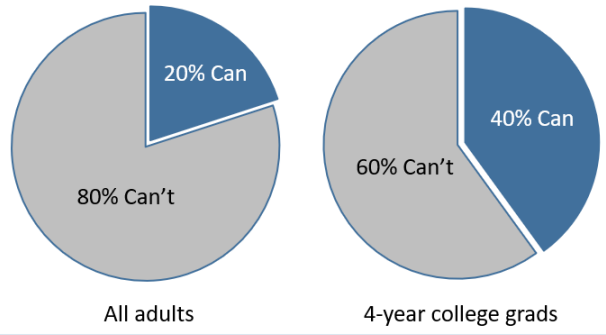
Select as many choices as you think might be useful.

- the customer's method of payment
- the company's billing rate per hour of crew time
- the average time to clean an office
- the number of elevators in the building
- the length of the shift

Graphs without Numbers

Part 1 of 1

In the following graph, the numbers on the vertical axis have been left off. Even without the numbers, you can still answer the questions below.



Question 1: Which type of pet had the largest number of adoptions in a single week?

Question 2: Which week had the smallest number of dogs adopted?

Question 3: In which week were approximately the same number of rabbits and dogs adopted?

Question 4: Which pet had the largest single week decrease in number of adoptions?

Question 5: Which pet had the largest increase in the number of adoptions in Week 1 to the number of adoptions in Week 7?

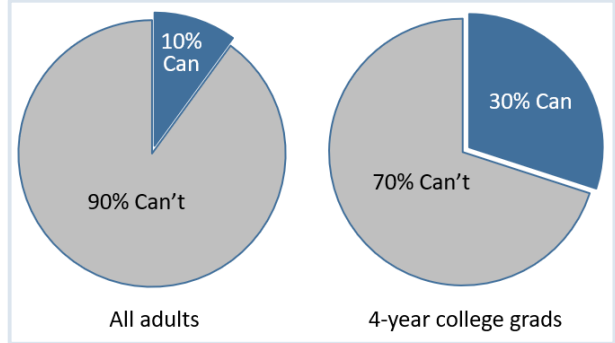
Strategic Planning


Part 1 of 1

Instructions: For the following questions, the right hand box shows what you are trying to calculate. You will try to find an arrangement of the 6 inputs that will allow the calculation of the result.

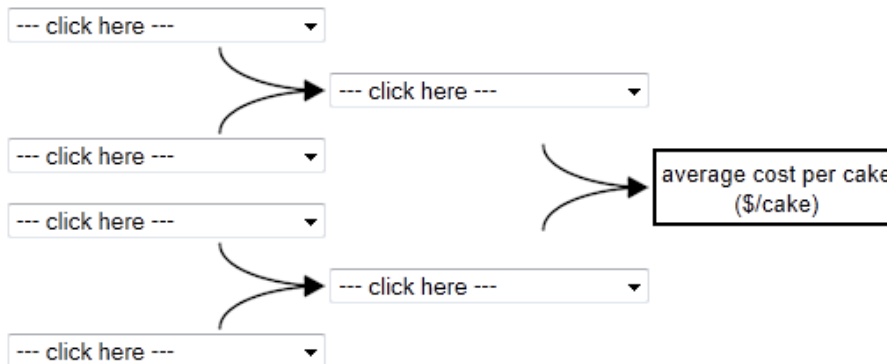
NOTE: For two inputs that go together in a calculation, it does NOT matter which input is on the top or bottom.

NOTE: You do NOT have to show the operation, but knowing what the operation is will help you answer the question.



TIP: Click on one of the down arrows --  -- next to one of the input pull-down menus to review all of your choices. The input choices for all 6 pull-down menus for each problem are the same.

Question 1: Samantha's Bakery makes yellow cakes and chocolate cakes and is evaluating how much each cake costs to produce. Arrange the steps needed to find the average cost per cake.



Choices in the pull-down menus:

- labor costs (\$)
- chocolate cakes (cakes)
- cost of ingredients (\$)
- yellow cakes (cakes)
- revenue per cake (\$/cake)
- total costs (\$)
- number of cakes (cakes)

Question 2: Following the hiring of new teachers, Reginald College is determining its student to teacher ratio for the new school year. Arrange the steps needed to find the number of students per teacher for this year.



Choices in the pull-down menus:

- *teachers per class (teachers/class)*
- *returning students (students)*
- *new teachers (teachers)*
- *teachers from last year (teachers)*
- *number of teachers (teachers)*
- *new students (students)*
- *number of students (students)*

Question 3: Halpert Paving needs to estimate the costs of repaving a parking lot to place a bid for the contract. Arrange the steps needed to find the estimated total costs.



Choices in the pull-down menus:

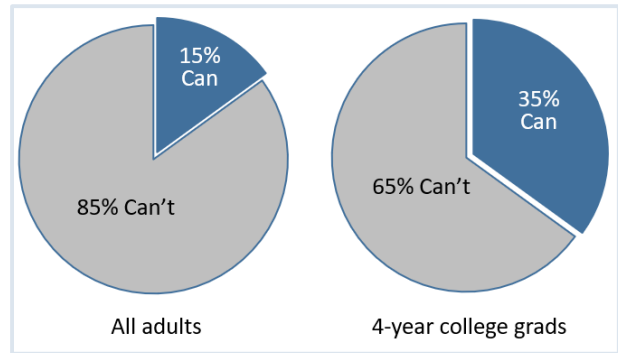
- *profit (\$)*
- *hours of labor (hrs)*
- *labor costs (\$)*
- *labor costs per hour (\$/hr)*
- *material costs (\$)*
- *material cost per square foot (\$/sq ft)*
- *size of parking lot (sq ft)*

Facts and Requirements

Part 1 of 1

Harvey is assigned the task of purchasing and installing new surfacing material. He has decided on Black Pebble I-93 surfacing and is analyzing how to use the material.

In each of the following problems, you will be given the same facts about Black Pebble I-93, along with requirements needed for a decision. For each problem, see if the facts meet the requirements.



Here are some facts about Black Pebble I-93:

- Black Pebble I-93 is not mixed grain.
- Black Pebble I-93 has a binder content of 8.
- Black Pebble I-93 accepts solvent additives.
- Black Pebble I-93 is low mesh.
- Black Pebble I-93 has an internal absorbance of 54.
- Black Pebble I-93 has a Bartowsky carbon measure of 1900.

Surfacing material can only be used with EverStick 4P if the surfacing material meets **NONE** of the following requirements:

the surfacing material has a Bartowsky carbon measure of **greater than 1900**

the surfacing material is compatible with compound-container spreading machines

the surfacing material has binder content **less than 8**

Question 1: Can the surfacing be used with EverStick 4P?

- Yes
- No
- Not enough information

Surfacing material can be used on highly cracked streets if it meets the following requirements:

- the surfacing material's Tennant mass is more than 5000 **AND** the surfacing material does not accept solvent additives

OR

- the surfacing material is high mesh

Question 2: Can Black Pebble I-93 be used on highly cracked streets?

- Yes
- No
- Not enough information

Surfacing material can only be used in sandy areas if at least 3 of the following four requirements are satisfied:

- the surfacing material has a Bartowsky carbon measure of more than or equal to 1900
- the surfacing material is mixed grain
- the surfacing material contains RediStar surface-active agent
- the surfacing material is low mesh

Question 3: Can Black Pebble I-93 be used in sandy areas?

- Yes
- No
- Not enough information

Surfacing material will meet the Oregon Paving Minimum Acceptability Regulations Q only if it meets the following requirements:

- the surfacing material has an internal absorbance more than or equal to 59 OR the surfacing material is not mixed grain
- AND
- the surfacing material accepts solvent additives

Question 4: Does the Black Pebble I-93 meet the Oregon Paving Minimum Acceptability Regulations Q?

- Yes
- No
- Not enough information

Core Skills: Literacy and Information Extraction

Introduction to Literacy and Information Extraction

CSM's curriculum also covers non-quantitative reasoning.

Proofreading involves proofing paragraphs for grammatical mistakes. While some of this is the knowledge of – and application of – technical grammar rules, a secondary aspect of this skill is the close reading of text and the mindset of correctness.

Connecting Information covers inference, categories and default categories (e.g. “all other...”). In addition, given the amount and difficulty of text and the multiple passes necessary for understanding the structure of the information, text scanning is required (a difficult skill for many adults, who still vocalize during reading).

Reporting a Problem required reasoning about the most effective information to provide to a repair person (precisely what's broken; in what way it's broken; what happened before it broke; what you did to try to repair it).

Finally, **Sources** relates to the hierarchical structure of text and information, both in tables as well as chapter titles and headings. The questions are asked both in terms of extraction (given a hierarchical structure, where would certain information be?) and in terms of construction (which hierarchical structure would support desired information?).

Proofreading

Part 1 of 1

Each of the following four paragraphs has either 2 or 3 grammar and punctuation mistakes. There are 11 mistakes in all four paragraphs combined. You need to correct all 11 of these mistakes.

If you don't know how to enter your answers, read the input instructions that appear after the paragraphs.

Original paragraph: (2 errors)

The caterer hired the servers at the last minute for the wedding at Lake Winnipeg. Unfortunately, they got in a traffic jam near Victoria beach. You could hear the guests' stomachs grumbling as they waited for the tray's to be passed around.

Edit HERE:

The caterer hired the servers at the last minute for the wedding at Lake Winnipeg. Unfortunately, they got in a traffic jam near Victoria beach. You could hear the guests' stomachs grumbling as they waited for the tray's to be passed around.

Original paragraph: (3 errors)

I think you're lost. Has you're company ever made deliveries in this area before. The truck's cargo is perishable, so its important you get here soon.

Edit HERE:

I think you're lost. Has you're company ever made deliveries in this area before. The truck's cargo is perishable, so its important you get here soon.

Original paragraph: (3 errors)

I have no idea what the clinics hours are. I would really appreciate it if you'd be kind enough to ask for me. It was to late for an appointment with my regular doctor. I dont think I can let this ear infection go untreated one more night.

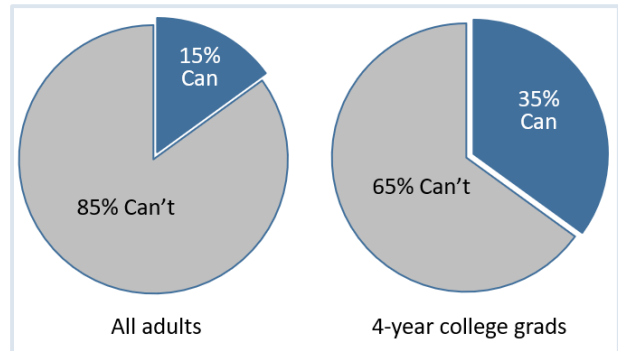
Edit HERE:

I have no idea what the clinics hours are. I would really appreciate it if you'd be kind enough to ask for me. It was to late for an appointment with my regular doctor. I dont think I can let this ear infection go untreated one more night.

Original paragraph: (3 errors)

Customer's files are all over there in the cabinet. Unfortunately, they're are a lot of them. It's too bad we don't have all of the files entered into an computer.

Customer's files are all over there in the cabinet. Unfortunately, they're are a lot of them. It's too bad we don't have all of the files entered into an computer.



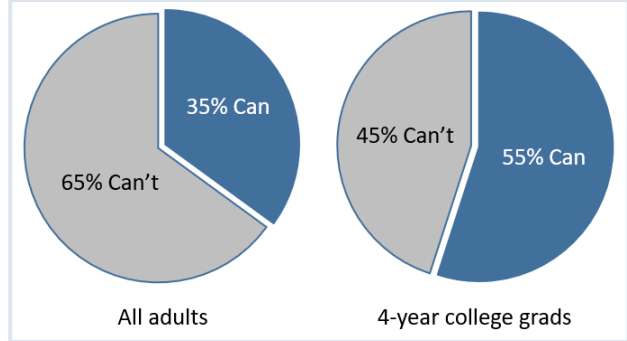
Connecting Information

Part 1 of 1

Read the memo below and answer the following two questions.

Question 1: What kind of soda free will you get if you buy Zombie Daycare?

Question 2: What kind of free snack-pack will you get if you buy My Life as a Dingo?



To all Cinematica Obscurra employees

From: Owen Livingston, Manager

Re: Free products promotion

To clear some space in the store, we will be promoting the sales of our least popular movie titles. For this promotion, we thought of a way to also get rid of the overstock of novelty snack-packs and sodas that we have. The way it will work is that each of these titles will be color-coded with a sticker. Every time a customer buys one of these movies, they can turn in this sticker at the cash register for a free snack-pack and soda.

We have many copies of these movies, so each of you must help by putting on the stickers. Copies of Escape from Capybara Island and Robot Ninjas and Cyber Pirates should all be marked with yellow stickers. All copies of My Life as a Dingo and Dude, Where's my Sandwich? should be marked with gold stickers. The silver stickers should be put on all copies of Genius Spy Brats 3 and Street Racer: 2 Fast 2 Beat. Copies of all the other movies in the promotion should be marked with green stickers.

This isn't rocket science, but be sure to take a good look at this. All customers that have a green sticker should be given a free snack-pack of Jaw Jammers. If the customers give you a gold sticker, give them a free snack-pack of Broccoli Shaped Gummies. Customers that hand in a yellow sticker should be given a free snack-pack of Neon Sugar Bombs. The snack-packs of Atomic Bitter Drops should be given to customers that give you a silver sticker. Hopefully, all the customers will be excited by these free treats.

If you are working at the register, please remember to look at the chart to figure out which free soda to give out. Any customers that hand you a gold sticker should get a free can of Mr. Paps' soda. All customers that hand you a silver sticker should get a free can of Melon & Tomato soda. A can of Meadow Rain soda should be given to the customers that hand in a yellow sticker. Finally, all of the customers that hand in a green sticker should be given a free can of Iguana Juice soda.

Be sure to remind customers about this promotion. If possible, we want to get rid of these snacks and sodas before their expiration dates.

Owen Livingston, Manager

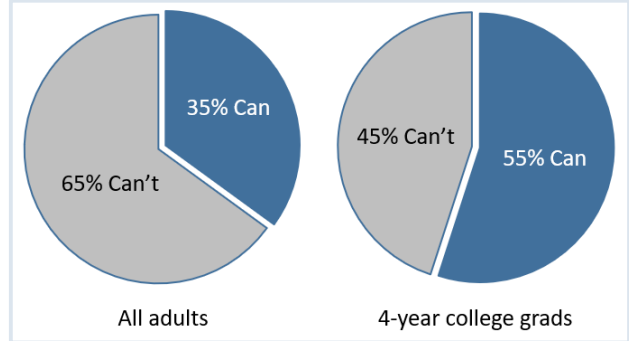
Cinematica Obscurra

Reporting a Problem

Part 1 of 1

Lee is a house builder that runs her own small business. She recently noticed that the jig saw is not working properly and wants to send an email to the saw's manufacturer to see what should be done to fix it.

Question 1: Below are seven pieces of information, all of which are true. Click on the boxes in front of the 4 most important pieces of information to include in the email.



- This is our most expensive jig saw.
- The jig saw spins unevenly.
- We are having a problem with our N/11-474 Jig Saw.
- I spilled a can of varnish on the saw.
- A buddy of mine lost his finger a year ago using this same saw.
- I asked my friend to look for a replacement jig saw on sale.
- I opened the jig saw up and looked for loose connections.

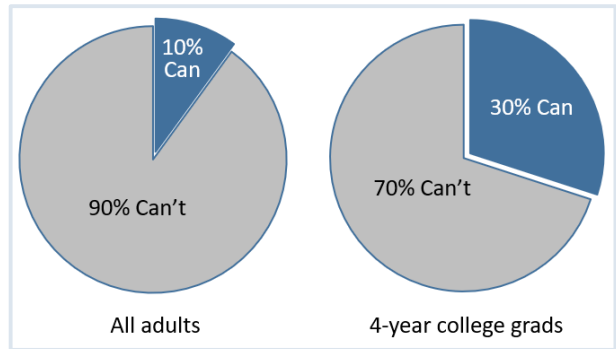
Sources

Part 1 of 3

Nathan Fleming is in charge of purchasing for the Rio Grande cafeteria food service.

On the food supply website, he sees a link to a table labeled Larkspur Farm Vegetable Products.

The types of information people are often interested in when ordering vegetables for a food service are the price per pound, whether the vegetable is fresh or frozen, and the number of pounds of vegetables in each crate.



Question 1: Which of the following is the best identifier column for the table?

- Larkspur Farm
- Fresh/Frozen
- \$1.66 per Pound
- Type of Vegetable

Question 2: Which of the following could be information column headings in the table?

- 20 Pounds per Crate
- Products
- Pounds per Crate
- Crate
- Price per Pound

Part 2 of 3

In a table of contents to a business report, you see the title to a line graph: Avalanche Market Monthly Sales by Department, 2008.

Avalanche Market is looking at sales of Meat, Dairy, and Fish.

Question 1: Which of the following could be the title of the horizontal axis?

- Sales Tax
- Department
- March
- Dairy
- Dollars of Sales

Question 2: Which of the following could be the title of the vertical axis?

- \$756
- Sales of Meat
- Dollars of Sales
- Department
- Cash Register

Question 3: If there were multiple lines on the graph, which of the following could be the label of one of the lines on the graph?

- September
- Delivery
- Meat
- \$1218

Part 3 of 3

You see a reference to a report titled Inventory Values and Revenues for 2004 for the Lodging Division of FunTime Luxury Resort.

The FunTime Luxury Resort has the following departments, each of which has different responsibilities:

- Lodging Division
 - Reservations Department
 - Front Desk
 - Housekeeping Department
 - Maintenance Department
- Restaurant Division
 - Lobby Bar
 - Cafe
 - Steakhouse
 - Catering Department
- Recreation Division
 - Golf Course
 - Pool
 - Fitness Center
 - Spa

Question 1: Which of these are likely to be topics that will be part of the main section titles for this report?

- Values
- Lobby Bar
- Recreation Division
- Lodging Division
- Front Desk

Question 2: Which of the following pieces of information are likely going to be present in the report?

- The total revenues for the Lodging Division in 2004
- The inventory value of the Fitness Center in 2004
- The total revenues of the Front Desk in 2004
- Total inventory value of the FunTime Luxury Resort in 2004

Question 3: Which of the following will you be able to calculate from information in the report?

- The sum of the value of the inventory for the Housekeeping Department and the Maintenance Department in 2004
- The difference between the revenues generated by the Pool and the Golf Course in 2004
- The sum of the 2004 revenues from the Reservations Department and from the Pool
- The sum of the 2004 revenues for the Catering Department and the Maintenance Department
- The fraction of all of the revenues for the Lodging Division that were generated by the Reservations Department in 2004

Appendix A – Short Description of Core and Supporting Skills

Core Skills	
Percent and Prediction	Calculate percentages of errors from quality control information given in a table. Predict future errors rates.
L-shaped Figures	Calculate missing side lengths through addition and subtraction, find the area and perimeter of an L-shaped figure, and calculate a cost (using a conversion of area units).
Reading a Ruler	Measure using a ruler scale divided into sixteenths of an inch, and fully reduce the measurement.
Reading Meters	Read the value of a meter to the closest tick mark. Includes interpolation and negative values.
Conversions and Person-Hours	Read data from bar graph, do multi-step conversions, use concept of people-hours.
Averaging and Prediction	Use information from a line graph to calculate an average. Then, use the average to predict the future.
Decimal Number Relationships	Identify numbers that are larger/smaller than a given number, order decimals and fractions, change mixed numbers to decimals, and place decimals on a number line.
Using Time Schedules	Use a time schedule to find the earliest and latest times to do a task. Calculate the difference between two times.
Invoice	Fill out an invoice and calculate discount, tax and total.
Fractions, Decimals, Percents	Know the corresponding decimal numbers, percents, and common fractions like $\frac{1}{4}$ or $\frac{1}{3}$.
Proof-reading	Correct errors in grammar, punctuation and word usage in short paragraphs.
Reporting a Problem	Choose important information for a problem report: 1) what is broken, 2) what is wrong, 3) what happened just before the problem started, 4) what has been tried.
Conversions	Convert lengths using US and metric units, including in, ft, yd, mi, mm, cm, m, km.
Facts and Requirements	Determine whether the facts of a situation meet a set of requirements. Requirement types include X of Y (e.g., 2 of 3 requirements), all/none, multiple ands/ors (e.g., a AND b, OR c).
Connecting Information	Connect multiple pieces of information from a memo and use inference (e.g., all men are mortal, Socrates is a man => Socrates is mortal) to answer questions about the memo.

Advanced percents	Calculate percents less than 1% and more than 99% in your head. Interpret pie charts as percents.
Money Planning	Calculate how much would be saved by paying off a loan early based on interest rates, choose between payment plans, and understand a multi-line graph showing how money grows in accounts with different interest rates.
Length	Memorize common length conversions including both English and metric units, and show relative knowledge of length units on number lines.
Weight	Memorize common weight conversions including both English and metric units, show relative knowledge of weight units on number lines, and know weights of common objects in various units.
Volume	Memorize common volume conversions including both English and metric units, show relative knowledge of volume units on number lines, and know volumes of common objects in various units.
Graphs Without Numbers	Learn what types of information can be determined from a graph with no numbers on the vertical axis. Includes relative positioning and slope.
Estimations	Use rounding to estimate addition, subtraction, multiplication, and division problems in your head. Problems include large numbers and small decimal numbers.
Multistep Problems	Given sentences with conversion factors with the numbers blanked out (e.g., each cabin is constructed from X planks is a conversion factor between cabins and planks), create a plan for getting from a start to a goal. No calculations necessary.
Answer Units	Pick which choices could answer question based on whether the units are compatible. E.g., "How long is a wongblum?" could have answers in ft or m, but not in qts or m/sec. Includes lengths, volumes, weights, rates, ratios and speeds.
Information Relevance	Given a situation and a list of pieces of information, identify which pieces of information are important to know to answer a specific question.
Strategic Planning	Create a plan for calculating a goal by working backwards from the goal to intermediate stages to inputs. Operations used are addition, subtraction, creating conversion factors, and using conversion factors. No calculations required.
Sources	Predict how information is likely to be organized in tables and graphs using their titles. Predict what will be in a corporate report from the title of a report and the organizational outline of the company that the report is about.
Add/Subtract Medium Difficulty	Add and subtract numbers with one or two digits with decimal points and ending zeros, such as $610 + 80$, $2.0 + 3.5$, $340 - 30$. Problems do not have carries.

Add/Subtract Highest Difficulty	Add and subtract numbers with one or two digits with decimal points and ending zeros, such as $630 + 80$, $2.5 + 0.8$, $340 - 80$. Problems DO have carries.
Multiplication Introduction	Multiply single digits with ending zeros, such as 30×600 . Multiply decimal numbers by 10, 100, and 1000, such as 7.41×100 or 94.67×10
Division Introduction	Divide double digits with ending zeros by single digits with ending zeros, such as $3600 / 90$. Divide decimal numbers by 10, 100, or 1000, such as $9.89 / 100$
Multiply/Divide by 0.1, 0.01	Multiply and divide by 0.1, 0.01 and 0.001, such as 97.2×0.1 or $0.43 / 0.01$
Most Difficult Multiply/Divide	Multiply and divide combinations of decimal numbers, such as 0.04×300 , $2400 / 0.3$, 0.3×0.8 , and $2.7 / 9$
Thousands and millions	Multiplying thousands by tens, hundreds or thousands. Dividing millions and thousands by thousands.

Supporting Skills	
Total Cost	Given a unit price and the number of items, find the total cost.
Equal Fractions	Understand orders of magnitude, and the relationships between multiples of 2, multiples of 5, and multiples of 10.
Changing Units	Use conversion factors to describe the same quantity using different units.
Percent	Learn the % identity: X out of 100 = $X\%$
Mixed Numbers	Writing mixed fractions.
There / Their / They're	Correctly use the words that sound alike: there, their, and they're.
Your / You're	Correctly use the words that sound alike: your and you're.
Its / It's	Correctly use the words that sound alike: its and it's.
Two / Too / To	Correctly use the words that sound alike: two, too, and to.
A / An	Correctly use 'a' and 'an'.
Fractions	Read and write fractions. Identify fractions from pictures. Determine which fraction is larger.
Changing Area Units	Convert between square feet, square yards, and square inches.
Parts and Wholes	Given a total and a size of a part, calculate the size of the other part. Integer example: if there are 78 employees and 27 of them are women, how many are men? Percent example: if 56% of shoes are imported, what percent are not imported?
Percent of a Number	Calculate whole and decimal percents of whole and decimal numbers.

Taxes and Discounts	Calculate taxes, discounts, and total costs using taxes and discounts given as percentages.
Rounding to Nearest Whole	Round decimal numbers with tenths, hundredths, thousandths, and ten-thousandths to the nearest whole number.
Calculating Time Intervals	Calculate the interval (or difference) between two times, including across a 1:00 boundary.
Adding Times	Add amounts of time given in minutes and hours together.
Reading Scales	Read values from horizontal, vertical, and circular scales, meters, and gauges, including reading values of unlabeled tick marks.
Bar and Line Graphs	Understand bar and line graphs, including titles and axis labels.
Calculating Averages	Calculate averages, including groups containing 0 values.
Predicting with Averages	Predict future results based on past averages.
Tables	Find and compare values in simple tables with row and column headings.
Proper Noun Capitalization	Correctly capitalize proper nouns, including place names, businesses, organizations, institutions, and brand names.
Question Marks	Correctly use question marks and periods.
Contractions	Correctly create and use common contractions (including the irregular contractions won't and can't).
Possessives	Correctly identify and use apostrophes in possessives and plural possessives.
Fractions of an Inch	Read and reduce eighths and sixteenths of an inch.
Reducing Even Fractions	Determine the most reduced form of simple fractions
Area of Rectangles	Find the area of a rectangle, given the height and width. Find area of square, given length of one side.
Converting Fractions to Decimals	Convert fractions to decimal numbers. Memorize the fractions for some common decimals.
Ordering Decimals by Size	Put decimal numbers in size order. Place decimal numbers on number lines.
Requirements With And/Or	Determine if the facts meet requirements that include one AND or OR.
Meeting Simple Requirements	Determine whether facts meet a requirement. Introduces the concept of not enough information , where there is not enough information to know if the requirement is met.
Rounding to Tenths/Hundredths	Round decimal numbers to the nearest tenth, hundredth or penny
Rounding to 10's 100's 1000's	Round decimal numbers to the nearest ten, hundred or thousand

Special Rounding Situations	Decide in special cases whether to round up or down
Work and Required Resources	Understand the concept of person-hours , that if a job takes 70 person-hours to do, it can be done by 1 person working for 70 hours, or 70 people working for 1 hour each, or any combination in between.
Cents and Dollars	Understand the relationships between cents and dollars, and the many ways that money amounts can be written. Also, understand how to do and read calculations with money on calculators.
Perimeter	Calculate the perimeter of rectangles and L-shaped areas
Unlabeled Blueprints	Find the length of the unlabeled sides in an L-shaped blueprint
Requirements with 2 ANDs/ORs	Determine whether sets of facts meet rules. Rules have both an AND and an OR in them, like (A AND B) OR C . Answers can be YES, NO, or NOT ENOUGH INFORMATION.
Requirements All/None/Number	Determine whether sets of facts meet rules. Rules have lists of requirements, and either all, none, or some of the rules must be met. Answers can be YES, NO, or NOT ENOUGH INFORMATION.
Decimal Numbers	Understand decimal numbers and value.
Requirements with Comparisons	Understand the concepts of less than, less than or equal to, greater than, and greater than or equal to.
Introduction to Decimals	Understand decimals on number lines.
Time Schedules	Use schedules with cyclical events (e.g., a bus schedule, a tour route, etc). Find times in the schedule according to specific needs: next time after a given time, latest time before a given time, and so on.
Converting Percents to Fractions	Memorize the fractions that correspond to common percents. Identify percents of a circle.
Target Words	Find the best target words to scan text for when looking for an answer to a question.
Inputs and Operations	Given a goal to calculate, create a plan. Choose the inputs to the calculation, and the action that should be used. Actions used are addition, subtraction, use conversion factor, and make conversion factor. Calculations not necessary.
Basic Operations	Given a goal, make a plan for the calculation. Actions are add, subtract, use conversion factor, and make conversion factor. Calculations not necessary. Teaches actions and common schema (e.g., profits, assets, totals).
Drawing Conclusions from Facts	Combine multiple pieces of information using inference. E.g., if cupcakes are baked in Oven 3, and Oven 3 is set to 350 degrees, then cupcakes bake at 350 degrees.
Scanning for Information	Quickly find information in text by scanning, without reading.

Introduction to Scanning	Scan text for instances of target words. Text may be nonsense or real words. Targets may be words or words with a given characteristic.
Scanning Paragraphs	Scan paragraphs for words, or types of words (e.g., names of vegetables).
Information Importance	Decide whether various pieces of information are important to know by answering the question would the answer to the question be different if this piece of information were different?
Linking Steps	Plan the sequence of conversion steps needed to get from a start to a goal by working forwards and backwards. Introduces the concept of conversion factors as links . No calculations are necessary, just planning.
Add/Subtract below 20	Add single digit numbers. Subtract single digit numbers from numbers less than 20.
Add/Subtract Introduction	Add numbers that have similar decimal points or ending zeros, such as $200 + 500$ or $0.08 + 0.07$. Also, similar subtractions, such as $1200 - 700$ or $0.8 - 0.3$
Subtract from 100,1000,10000	Subtract from 100, 1000, and 10000, such as $100 - 0.6$, $100 - 98.2$, $1000 - 9$ and $10,000 - 48$
Multiplication & Division Tables	Multiply single digit numbers, such as 4×8 . Divide numbers under 100 by single digit numbers, such as $27 / 3$