



# Diving Deep into ACT Math



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**2:00- 3:00 pm**

# Session Objectives

- Overview of the Math ACT
- ACT College and Career Readiness Standards
- item cloning protocol for math
- Leave with ideas on how to bring back ACT Math professional development to your school

Test	Questions	Minutes per Test
English	75	45
Mathematics	60	60
Reading	40	35
Science	40	35
Writing (optional)	1 essay	40

## Calculator

### Reporting:

Nine scores are reported for the mathematics test: a total test score based on all 60 questions and eight reporting category scores based on specific mathematical knowledge and skills. The approximate percentage of the test devoted to each reporting category is:

*Students who achieve the 28–32 level are likely able to use variables fluently so that they can solve problems with variables in the same way that they can solve the problems with numbers, and they can use variables to represent general properties.*

*The ACT College Readiness Benchmark for Mathematics is 22. Students who achieve this score on the ACT Mathematics Test have a 50% likelihood of achieving a B or better in a*



*first-year College Algebra course at a typical college. The knowledge and skills highly likely to be demonstrated by students who meet the Benchmark are shaded.*

## Preparing for Higher Mathematics (57–60%)

This category covers the more recent mathematics that students are learning, starting when they began using algebra as a general way of expressing and solving equations. This category is divided into five subcategories:

- **Number and Quantity (7–10%):** Demonstrate knowledge of real and complex number systems. Reason with numerical quantities in many forms, including expressions with integer and rational exponents, and vectors and matrices.
- **Algebra (12–15%):** Solve, graph, and model multiple types of expressions. Interpret and use many different kinds of equations, such as linear, polynomial, radical, and exponential relationships. Find solutions to systems of equations, even when represented by a simple matrix equation, and apply results to real-world contexts.
- **Functions (12–15%):** Demonstrate knowledge of function: definition, notation, representation, and application. Use functions including linear, radical, piecewise, polynomial, and logarithmic. Manipulate and translate functions, as well as interpret and use important features of graphs.
- **Geometry (12–15%):** Apply your knowledge of shapes and solids, using concepts such as congruence and similarity relationships or surface area and volume measurements. Apply your understanding to composite objects, and solve for missing values in triangles, circles, and other figures. Use trigonometric ratios and equations of conic sections.

- **Statistics and Probability (8–12%):** Describe center and spread of distributions. Apply and analyze data collection methods. Understand and model relationships in bivariate data. Calculate probabilities by recognizing the related sample spaces.

## Integrating Essential Skills (40–43%)

This category focuses on measuring how well you can synthesize and apply your understandings and skills to solve more complex problems. The questions ask you to address concepts such as rates and percentages; proportional relationships; area, surface area, and volume; average and median; and expressing numbers in different ways. Solve non-routine problems that involve combining skills in chains of steps; applying skills in varied contexts; understanding connections; and demonstrating fluency.

## Modeling

This category represents all questions that involve producing, interpreting, understanding, evaluating, and improving models. Each question is also counted in other appropriate reporting categories above. This category is an overall measure of how well you use modeling skills across mathematical topics.

# ACT Math Standards

What do you notice?  
What do you wonder?

## ▶ MATHEMATICS

These Standards describe what students who score in specific score ranges on the mathematics section of the ACT® college readiness assessment are likely to know and be able to do.

For more information about the ACT College and Career Readiness Standards in Mathematics, go to [www.act.org/standard/planact/math/mathnotes.html](http://www.act.org/standard/planact/math/mathnotes.html).

SCORE RANGE	Topics in the flow to NUMBER AND QUANTITY (N)
13-15	<p><b>N 201.</b> Perform one-operation computation with whole numbers and decimals</p> <p><b>N 202.</b> Recognize equivalent fractions and fractions in lowest terms</p> <p><b>N 203.</b> Locate positive rational numbers (expressed as whole numbers, fractions, decimals, and mixed numbers) on the number line</p>
16-19	<p><b>N 301.</b> Recognize one-digit factors of a number</p> <p><b>N 302.</b> Identify a digit's place value</p> <p><b>N 303.</b> Locate rational numbers on the number line</p> <p><i>Note: A matrix as a representation of data is treated here as a basic table.</i></p>
20-23	<p><b>N 401.</b> Exhibit knowledge of elementary number concepts such as rounding, the ordering of decimals, pattern identification, primes, and greatest common factor</p>

Students who score in the 1-12 range are most likely beginning to develop the knowledge and skills assessed in the other ranges.

# Mathematics Curriculum Review Worksheet

## Mathematics Curriculum Review Worksheets

Table 1. ACT Mathematics College and Career Readiness Standards for Score Range 13-15

Mathematics College and Career Readiness Standards			For each skill, knowledge, or process:		
			Is it <b>included</b> in your Mathematics curriculum?	At what grade level (or in which course) are students <b>first introduced</b> to it?	At what grade level (or in which course) are students <b>expected to demonstrate proficiency</b> ?
N	201	Perform one-operation computation with whole numbers and decimals			
N	202	Recognize equivalent fractions and fractions in lowest terms			
N	203	Locate positive rational numbers (expressed as whole numbers, fractions, decimals, and mixed numbers) on the number line			
AF	201	Solve problems in one or two steps using whole numbers and using decimals in the context of money			
A	201	Exhibit knowledge of basic expressions (e.g., identify an expression for a total as $b + g$ )			
A	202	Solve equations in the form $x + a = b$ , where $a$ and $b$ are whole numbers or decimals			
F	201	Extend a given pattern by a few terms for patterns that have a constant increase or decrease between terms			
G	201	Estimate the length of a line segment based on other lengths in a geometric figure			
G	202	Calculate the length of a line segment based on the lengths of other line segments that go in the same direction (e.g., overlapping line segments and parallel sides of polygons with only right angles)			

# Discussion

How do you see using the ACT Math Standards and Curriculum Review worksheets in your school?

# Item Cloning

Sample Item:	Cloned Item
<p>When <math>x = 3</math> and <math>y = 5</math>, by how much does the value of <math>3x^2 - 2y</math> exceed the value of <math>2x^2 - 3y</math>?</p> <p>F. <input type="radio"/> 4</p> <p>G. <input type="radio"/> 14</p> <p>H. <input type="radio"/> 16</p> <p>I. <input type="radio"/> 20</p> <p>J. <input type="radio"/> 50</p>	<p>When <math>x=2</math> And <math>y=3</math>, by how much does the value of <math>4x^2 + 3y</math> exceed the value of <math>3x^2 + 4y</math></p> <p>a. 1</p> <p>b. 7</p> <p>c. 24</p> <p>d. 25</p> <p>e. 49</p>

[bit.ly/ACTItemCloningBank](https://bit.ly/ACTItemCloningBank)

# When cloning make sure to:

- Start from a “Real ACT question”
- Use the same prompt and format as the original. Just change the numbers or the scenario/shape if applicable.
- Do not list random numbers for the answer options. Think through what are common mistakes? Find out what would be the answer if a student made that common mistake and use it as a possible answer.
- Try to figure out what were the mistakes made for each answer in the sample item and duplicate that mistake for the cloned item.
- Always order answer options from lowest to largest value.
- Challenge yourself to make 3-4 versions of each sample item with at least one cloned item at a similar difficulty level as the sample item. (Ex. the next cloned item perhaps I would use  $x^3$  and  $y^2$  instead of  $x^2$  and  $y$  or add a third variable to increase the level of difficulty)
- Add your items to [bit.ly/ACTItemCloningBank](https://bit.ly/ACTItemCloningBank) so all teachers can add to your work.

# Additional Resources

[EdReady Montana](#) is a program for all students in Montana from middle school through college who want to:

- prepare for upcoming local math classes or curriculum
- supplement their skills while taking a math class
- revisit possible gaps in general math skills
- become better prepared for college math
- practice math skills needed for a desired career path
- study and review math concepts for a standardized exam, such as the ACT

[ACT Academy](#)- The ACT Academy offers a practice test, as well as specific subject area quizzes. Students and teachers can analyze student data. ACT Academy also offers resources for students to use to study and sharpen the skill sets they need.



# ACT Test Prep

- Plug In- When a variable is in an answer
- Back Solve- when numerical answers, start with “c”
- Guesstimate- angles/lengths

# ACT Test Prep

## Plug In- When a variable is in answer

**Bob has 4 dollars more than Lisa does. If Lisa has  $x$  dollars, how much would Bob have if he doubled his money?**

- A.  $x + 4$
- B.  $x + 8$
- C.  $2x$
- D.  $2x + 4$
- E.  $2x + 8$

1. Pick a number for  $x$
2. Do the problem with your number
3. Put the numbers into the choices

# ACT Test Prep

Back Solve- when numerical answers, start with “c”

**Gerry’s age is 5 more than three times Carol’s age. If the sum of their ages is 45, how old is Carol?**

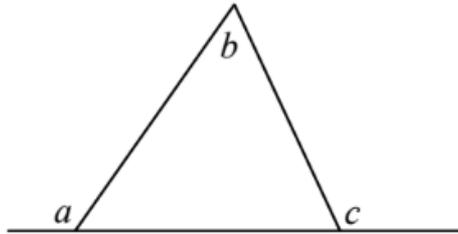
- A. 10**
- B. 12**
- C. 14**
- D. 16**
- E. 18**

1. Make the middle number the answer to the question
2. Do the problem and see if it fits
3. If C fails, figure out if you need a bigger or smaller number and repeat

# ACT Test Prep

## Guesstimate- angles/lengths

57. In the figure below,  $c$  is equal to 5 less than twice  $b$ . What is the value of  $a + b$ ?



- A. 60
- B. 90
- C. 100
- D. 135
- E. 185

“Figures are not drawn to scale”

1. Look at the pictures and guess the values you want



Thank you

## **OPI Helpdesk**

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## **Professional Development Questions:**

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