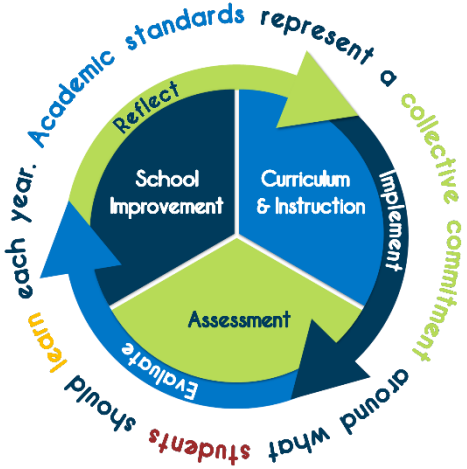
ILLINOIS STATE BOARD OF EDUCATION

Samples to Success

Sample items provide valuable insight into how students engage with different texts, tasks, and contexts by highlighting the types of opportunities they need for success in the classroom. These items offer a shared reference point for understanding proficiency expectations, complementing the assessment's role in measuring learning. Analyzing items alongside performance data can enable educators to gain a deeper understanding of students' strengths and areas for growth. Students thrive in environments rich with diverse materials, challenges that vary in task type, and multiple avenues for demonstrating understanding. High-quality instruction, aligned with the learning goals, is the most effective way to support students' growth and prepare them for success.



MATHEMATICS HIGH SCHOOL FUNCTIONS

The sample questions included in this rubric are a blend of those typical of the ACT and others that are suitable for classroom instruction, aimed at reinforcing and developing the skills assessed on the ACT. The questions in the functions category test knowledge of function definition, notation, representation, and application. Questions may include but are not limited to linear, radical, piecewise, polynomial, and logarithmic functions. Students will manipulate and translate functions, as well as find and apply important features of graphs. This document contains ACT items and includes excerpts from ACT alignment guides:

Functions

Below Proficient

If $f(x) = (3x + 7)^2$, then $f(1) =$?

A. 10

B. 16

C. 58

D. 79

E. 100

Approaching Proficient

Let the function f be defined as $f(x) = 5x^2 - 7(4x + 3)$. What is the value of $f(3)$?

A. -18

B. -26

C. -33

D. -60

E. -75

Proficient

In the standard (x, y) coordinate plane, a line intersects the y-axis at (0,2) and contains the point (8,5). What is the slope of the line?

A. $\frac{3}{8}$

B. $\frac{2}{3}$

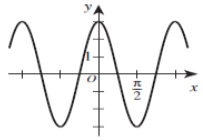
C. $\frac{5}{6}$

D. $\frac{6}{5}$

E. $\frac{8}{3}$

Above Proficient

A cosine function is shown in the standard (x, y) coordinate plane below.



One of the following equations represents this function. Which one?

A. $y = \cos\left(\frac{x}{3}\right)$

B. $y = 2\cos(3x)$

C. $y = 3\cos\left(\frac{x}{3}\right)$

D. $y = 3\cos\left(\frac{x}{2}\right)$

E. $y = 3\cos(2x)$

Functions

Below Proficient

The 1st term in the geometric sequence below is -13. If it can be determined, what is the 6th term?

-13, 26, -52, 104, -208 …

A. -416

B. -312

C. 312

D. 416

E. Cannot be determined from the given information

Approaching Proficient

The function $f(c) = \frac{9}{5}c + 32$ gives the temperature, $f(c)$ degrees Fahrenheit, that corresponds to c degrees Celsius. To the nearest $0.1°\text{F}$, what Fahrenheit temperature corresponds to $13°\text{C}$?

A. $33.8°\text{F}$

B. $45.0°\text{F}$

C. $46.8°\text{F}$

D. $55.4°\text{F}$

E. $81.0°\text{F}$

Proficient

Manish drove from Chicago to Baton Rouge. At 8:00 a.m., he was 510 km from Baton Rouge. At 1:00 p.m., he was 105 km from Baton Rouge. Which of the following values is closest to Manish's average speed, in kilometers per hour, from 8:00 a.m. to 1:00 p.m.?

A. 58

B. 68

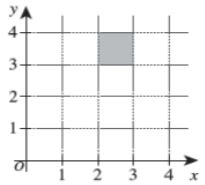
C. 81

D. 94

E. 102

Above Proficient

In the standard (x, y) coordinate plane below, a shaded square is shown with vertices at (2,3), (2,4), (3,3), and (3,4). Two lines, $y = rx$ and $y = sx$, each intersect the shaded square at exactly 1 point. Given that $r \neq s$, what is the positive difference of r and s?



A. $\frac{1}{6}$

B. $\frac{1}{3}$

C. $\frac{1}{2}$

D. $\frac{2}{3}$

E. 1

Functions			
Below Proficient	**Approaching Proficient**	**Proficient**	**Above Proficient**
If $f(x) = 2x + 3$, what is $f(5)$? A. 10 B. 13 C. 15 D. 17 E. 19	Given the function $f(x) = \sqrt{x-2}$, which of the following represents the domain of $f(x)$? A. $x \geq 0$ B. $x \leq 0$ C. $x \geq 2$ D. $x > 2$ E. $x < 2$	Let $f(x) = x^2 + 1$ and $g(x) = 2x - 4$. What is $(f \circ g)(x)$, the composition of f and g? A. $2x^2 - 3$ B. $4x^2 - 4x - 3$ C. $(2x-4)^2 + 1$ D. $2x^2 - 4x + 1$ E. $x^2 + 2x + 5$	If $f(x) = 3x - 5$, what is the inverse function $f^{-1}(x)$? A. $\frac{x+5}{3}$ B. $\frac{x-5}{3}$ C. $\frac{3x+5}{5}$ D. $\frac{3x-5}{5}$ E. $\frac{x+3}{5}$