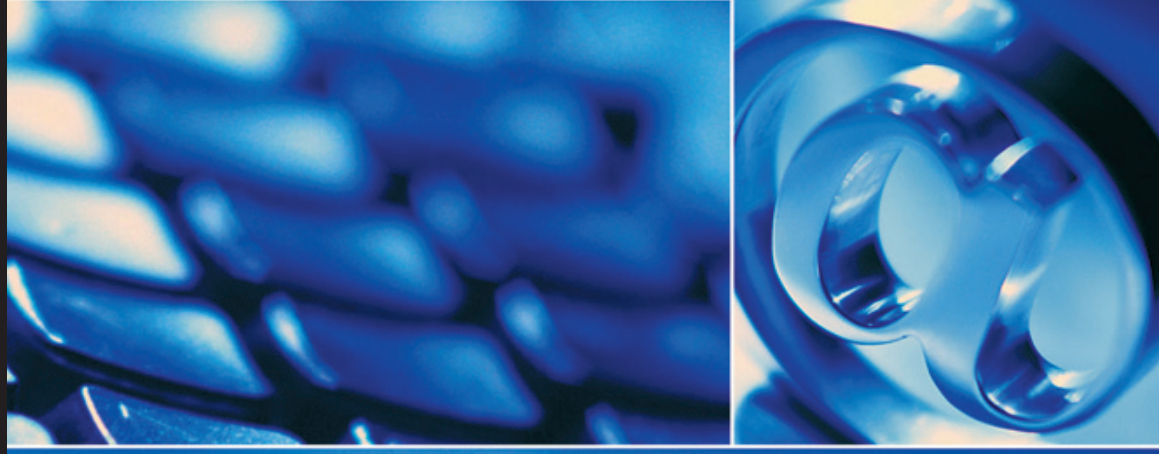
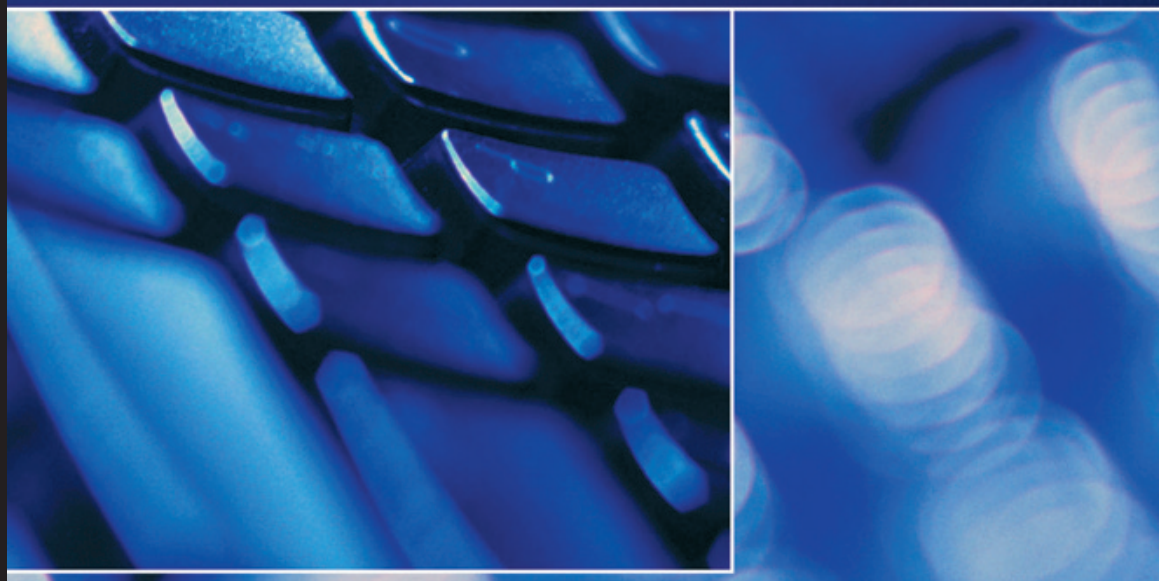


COMPASS®/ESL

Sample Test Questions—
A Guide for Students and Parents

Mathematics

College Algebra
Geometry
Trigonometry



ACT™
INFORMATION FOR LIFE'S TRANSITIONS

An ACT Program for Educational Planning

Note to Students

Welcome to the COMPASS Sample Mathematics Test!

You are about to look at some sample test questions as you prepare to take the actual COMPASS test. The examples in this booklet are similar to the kinds of test questions you are likely to see when you take the actual COMPASS test. Since this is a practice exercise, you will answer just a few questions and you won't receive a real test score. The answer key follows the sample questions.

Once you are ready to take the actual COMPASS test, you need to know that the test is computer delivered and *untimed*—that is, you may work at your own pace. After you complete the test, you can get a score report to help you make good choices when you register for college classes.

We hope you benefit from these sample questions, and we wish you success as you pursue your education and career goals!

Note to Parents

The test questions in this sample set are similar to the kinds of test questions your son or daughter will encounter when they take the actual COMPASS test. Since these questions are only for practice, they do not produce a test score; students answer more questions on the actual test. The aim of this booklet is to give a sense of the kinds of questions examinees will face and their level of difficulty. There is an answer key at the end.

COMPASS Mathematics Tests

The COMPASS Mathematics Tests are organized around five principal content domains: numerical skills/prealgebra, algebra, college algebra, geometry, and trigonometry. To ensure variety in the content and complexity of items within each domain, COMPASS includes mathematics items of three general levels of cognitive complexity: basic skills, application, and analysis. A basic skills item can be solved by performing a sequence of basic operations. An application item involves applying sequences of basic operations to novel settings or in complex ways. An analysis item requires students to demonstrate a conceptual understanding of the principles and relationships relevant to particular mathematical operations. Items in each of the content domains sample extensively from these three cognitive levels.

Students are permitted to use calculators on all current Windows® and Internet versions of COMPASS Mathematics Tests. Calculators must, however, meet ACT's specifications, which are the same for COMPASS and the ACT Assessment. These specifications are updated periodically and can be found at ACT's website at
http://www.act.org/aap/taking/calculator.html

College Algebra, Geometry, and Trigonometry Placement Tests

College Algebra Placement Test

Items in the College Algebra Test focus on algebra knowledge and skills in a variety of content areas. The majority of items come from the following content areas:

Functions
Exponents
Complex Numbers
Arithmetic and Geometric Sequences and Series
Matrices (basic operations, equations, and determinants)

Sample items for each of these categories are presented later in this section.

Geometry Placement Test

Primary content areas included in the Geometry Placement Test include:

Triangles (perimeter, area, Pythagorean theorem, etc.)
Circles (perimeter, area, arcs, etc.)
Angles (supplementary, complementary, adjacent, vertical, etc.)
Rectangles (perimeter, area, etc.)
Three-dimensional concepts
Hybrid (composite) shapes

Sample items for each of these categories are presented later in this section.

Trigonometry Placement Test

The primary content areas assessed by the Trigonometry Placement Test include:

Trigonometric functions and identities
Right-triangle trigonometry
Trigonometric equations and inequalities
Graphs of trigonometric functions
Special angles (multiples of 30 and 45 degrees)

Sample items for each of these categories are presented later in this section.

College Algebra

1. What is the next term in the geometric sequence 16, –4, 1, $-\frac{1}{4}$, … ?

   A. $-\frac{1}{8}$
   B. 0
   C. $\frac{1}{16}$
   D. $\frac{1}{8}$
   E. $\frac{1}{2}$

2. A manufacturing company processes raw ore. The number of tons of refined material the company can produce during t days using Process A is $A(t) = t^2 + 2t$ and using Process B is $B(t) = 10t$. The company has only 7 days to process ore and must choose 1 of the processes. What is the maximum output of refined material, in tons, for this time period?

   A. 8
   B. 10
   C. 51
   D. 63
   E. 70

3. For the 2 functions, $f(x)$ and $g(x)$, tables of values are shown below. What is the value of $g(f(3))$?

x	$f(x)$
–5	7
–2	–5
1	3
3	2

x	$g(x)$
–2	3
1	–1
2	–3
3	–5

   A. –5
   B. –3
   C. –1
   D. 2
   E. 7

4. For positive real numbers x, y, and z, which of the following expressions is equivalent to $x^{\frac{1}{2}}y^{\frac{2}{3}}z^{\frac{5}{6}}$?

   A. $\sqrt[3]{xy^2z^3}$
   B. $\sqrt[6]{xy^2z^5}$
   C. $\sqrt[6]{x^3y^2z^5}$
   D. $\sqrt[6]{x^3y^4z^5}$
   E. $\sqrt[11]{xy^2z^5}$

5. If $A = \begin{bmatrix} 2 & -4 \\ 6 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} -2 & 4 \\ -6 & 0 \end{bmatrix}$, then $A - B$ = ?

   A. $\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$
   B. $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$
   C. $\begin{bmatrix} 0 & -8 \\ 0 & 0 \end{bmatrix}$
   D. $\begin{bmatrix} -4 & 0 \\ -12 & 0 \end{bmatrix}$
   E. $\begin{bmatrix} 4 & -8 \\ 12 & 0 \end{bmatrix}$

6. Listed below are 5 functions, each denoted $g(x)$ and each involving a real number constant $c > 1$. If $f(x) = 2^x$, which of these 5 functions yields the greatest value for $f(g(x))$, for all $x > 1$?

   A. $g(x) = cx$
   B. $g(x) = \frac{c}{x}$
   C. $g(x) = \frac{x}{c}$
   D. $g(x) = x - c$
   E. $g(x) = \log_c x$

7. If the function f satisfies the equation $f(x + y) = f(x) + f(y)$ for every pair of real numbers x and y, what are the possible values of $f(0)$?

   A. Any real number
   B. Any positive real number
   C. 0 and 1 only
   D. 1 only
   E. 0 only

8. The imaginary number i is defined such that $i^2 = -1$. What does $i + i^2 + i^3 + \cdots + i^{23}$ equal?

A. i
B. $-i$
C. -1
D. 0
E. 1

9. In an arithmetic series, the terms of the series are equally spread out. For example, in $1 + 5 + 9 + 13 + 17$, consecutive terms are 4 apart. If the first term in an arithmetic series is 3, the last term is 136, and the sum is 1,390, what are the first 3 terms?

A. 3, 10, 17

B. 3, 23, 43

C. $3, 36\frac{1}{3}, 70$

D. $3, 69\frac{1}{2}, 136$

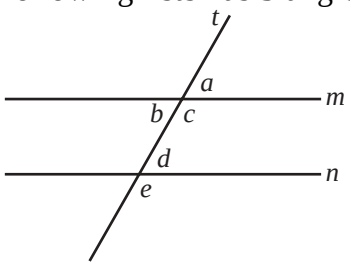
E. 3, 139, 1,251

Correct Answers for Sample College Algebra Items

Item #	Correct Answer	Content Category
1	C	Arithmetic and Geometric Sequences and Series
2	E	Functions
3	B	Functions
4	D	Exponents
5	E	Matrices (basic operations, equations, and determinants)
6	A	Functions
7	E	Functions
8	C	Complex Numbers
9	A	Arithmetic and Geometric Sequences and Series

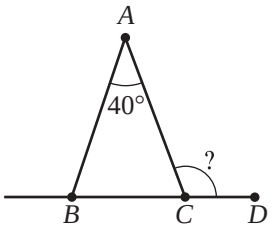
Geometry

1. In the figure below, line *m* is parallel to line *n*, and line *t* is a transversal crossing both *m* and *n*. Which of the following lists has 3 angles that are all equal in measure?



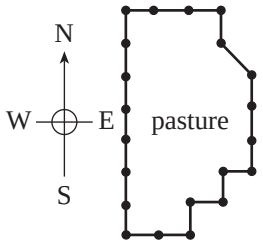
A. $\angle a, \angle b, \angle d$
B. $\angle a, \angle c, \angle d$
C. $\angle a, \angle c, \angle e$
D. $\angle b, \angle c, \angle d$
E. $\angle b, \angle c, \angle e$

2. As shown in the figure below, ΔABC is isosceles with the length of $\overline{AB}$ equal to the length of $\overline{AC}$. The measure of $\angle A$ is 40° and points *B*, *C*, and *D* are collinear. What is the measure of $\angle ACD$?



A. 70°
B. 80°
C. 110°
D. 140°
E. 160°

3. The diagram below shows a pasture which is fenced in. All but 1 section of fence run straight north-south or east-west. Consecutive fence posts are 10 feet apart except for the 1 diagonal section. Which of the following statements best describes *P*, the perimeter of the pasture, in feet?

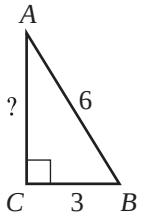


A. $P > 210$
B. $P = 210$
C. $P < 210$
D. $P > 230$
E. $P = 240$

4. A person had a rectangular-shaped garden with sides of lengths 16 feet and 9 feet. The garden was changed into a square design with the same area as the original rectangular-shaped garden. How many feet in length are each of the sides of the new square-shaped garden?

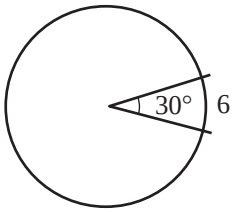
A. 7
B. 9
C. 12
D. $5\sqrt{7}$
E. 16

5. In the figure below, ΔABC is a right triangle. The length of $\overline{AB}$ is 6 units and the length of $\overline{CB}$ is 3 units. What is the length, in units, of $\overline{AC}$?



A. 5
B. $3\sqrt{3}$
C. $3 + \sqrt{5}$
D. $3\sqrt{5}$
E. $3\sqrt{6}$

6. If a central angle of measure 30° is subtended by a circular arc of length 6 meters, as is illustrated below, how many meters in length is the radius of the circle?

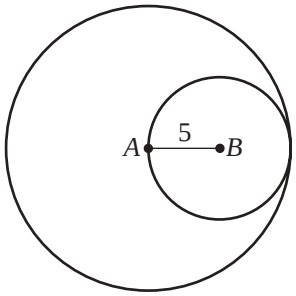


A. $\frac{\pi}{36}$
B. $\frac{1}{5}$
C. π
D. $\frac{36}{\pi}$
E. 180

7. A rectangular box with a base 2 inches by 6 inches is 10 inches tall and holds 12 ounces of breakfast cereal. The manufacturer wants to use a new box with a base 3 inches by 5 inches. How many inches tall should the new box be in order to hold exactly the same volume as the original box? (Note: The volume of a rectangular box may be calculated by multiplying the area of the base by the height of the box.)

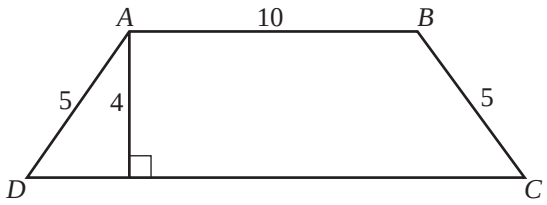
A. 8
B. 9
C. 10
D. 11
E. 12

8. In the figure below, the circle centered at *B* is internally tangent to the circle centered at *A*. The smaller circle passes through the center of the larger circle and the length of $\overline{AB}$ is 5 units. If the smaller circle is cut out of the larger circle, how much of the area, in square units, of the larger circle will remain?



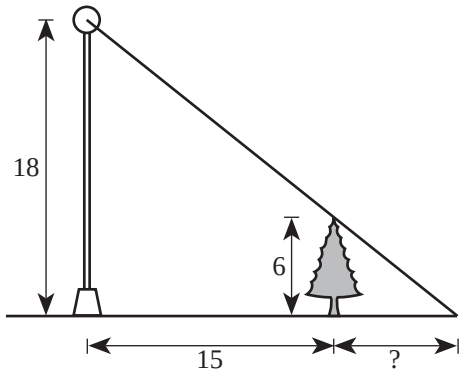
A. 10π
B. 25π
C. 75π
D. 100π
E. 300π

9. In the figure below, $\overline{AB}$ and $\overline{CD}$ are parallel, and lengths are given in units. What is the area, in square units, of trapezoid *ABCD* ?



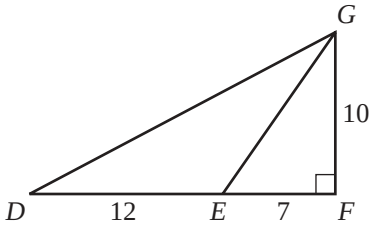
A. 36
B. 52
C. 64
D. 65
E. 104

10. A 6-foot spruce tree is planted 15 feet from a lighted streetlight whose lamp is 18 feet above the ground. How many feet long is the shadow of that tree?



A. 5.0
B. 7.5
C. 7.8
D. 9.6
E. 10.0

11. In the figure below, the lengths of $\overline{DE}$, $\overline{EF}$, and $\overline{FG}$ are given, in units. What is the area, in square units, of ΔDEG ?



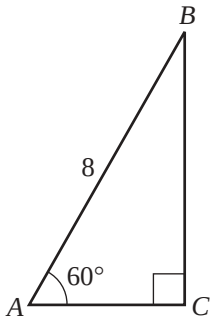
A. 29
B. 47.5
C. 60
D. $6\sqrt{149}$
E. 120

Correct Answers for Sample Geometry Items

Item Number	Correct Answer	Content Category
1	A	Special Angles
2	C	Isosceles Triangles
3	A	Perimeter of Hybrid Shapes
4	C	Area of Rectangles
5	B	Triangles
6	D	Arc of a Circle
7	A	Three-Dimensional Concepts
8	C	Area of a Circle
9	B	Area of a Trapezoid
10	B	Similar Triangles
11	C	Area of a Triangle

Trigonometry

1. In the right triangle shown below, the length of $\overline{AB}$ is 8 units, $\angle A$ measures 60°, $\sin 60° \approx 0.866$, $\cos 60° \approx 0.5$, and $\tan 60° \approx 1.73$. Approximately how many units long is $\overline{BC}$, to the nearest hundredth of a unit?



A. 4.00
B. 4.61
C. 4.80
D. 6.93
E. 9.23

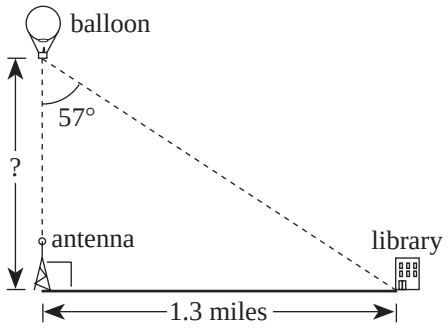
2. If $\sin \alpha = \frac{12}{13}$, and $\cos \alpha = \frac{5}{13}$, then $\tan \alpha = ?$

A. $\frac{5}{12}$
B. $\frac{7}{13}$
C. $\frac{12}{5}$
D. $\frac{17}{13}$
E. $\frac{60}{13}$

3. If $0° < x° < 90°$ and $\sin x = \frac{1}{2}$, then $\cos x = ?$

A. $\frac{1}{2}$
B. $\frac{\sqrt{3}}{2}$
C. 2
D. $\frac{\sqrt{3}}{3}$
E. $\frac{2\sqrt{3}}{3}$

4. From a hot air balloon, the angle between a radio antenna straight below and the base of the library downtown is 57°, as shown below. If the distance between the radio antenna and the library is 1.3 miles, how many miles high is the balloon?



A. $\frac{1.3}{\sin 57°}$

B. $\frac{1.3}{\cos 57°}$

C. $\frac{1.3}{\tan 57°}$

D. $1.3 \sin 57°$

E. $1.3 \tan 57°$

5. What is the smallest positive value for x where $y = \sin 2x$ reaches its maximum?

A. $\frac{\pi}{4}$

B. π

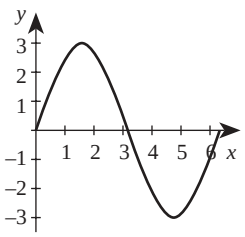
C. $\frac{3\pi}{2}$

D. 2π

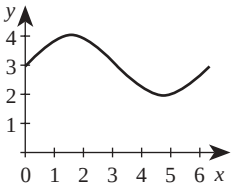
E. $\frac{5\pi}{2}$

6. One of the graphs below is that of $y = A \sin \theta$ for θ between 0 and 6.28 radians, where A is a constant. Which one?

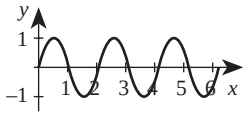
A.



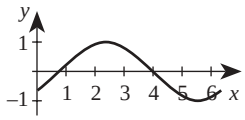
B.



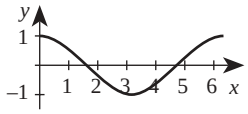
C.



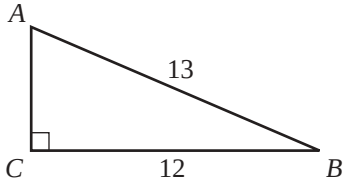
D.



E.



7. In the right triangle below, the length of $\overline{AB}$ is 13 units and the length of $\overline{CB}$ is 12 units. What is the tangent of $\angle A$?



A. $\frac{12}{5}$

B. $\frac{13}{12}$

C. $\frac{12}{13}$

D. $\frac{5}{12}$

E. $\frac{5}{13}$

Correct Answers for Sample Trigonometry Items

Item Number	Correct Answer	Content Category
1	D	Right Triangles
2	C	Functions and Identities
3	B	Special Angles
4	C	Right Triangles
5	A	Special Angles
6	A	Graphs of Functions
7	A	Right Triangle