FORMS OF ANSWERS

The following list explains acceptable forms for answers. Coaches should ensure that Mathletes are familiar with these rules prior to participating at any level of competition. Judges will score competition answers in compliance with these rules for forms of answers.

All answers must be expressed in simplest form. A “common fraction” is to be considered a fraction in the form \( \frac{a}{b} \), where \( a \) and \( b \) are natural numbers and GCF\((a, b) = 1\). In some cases the term “common fraction” is to be considered a fraction in the form \( \frac{A}{B} \), where \( A \) and \( B \) are algebraic expressions and \( A \) and \( B \) do not share a common factor. A simplified “mixed number” (“mixed numeral,” “mixed fraction”) is to be considered a fraction in the form \( \pm N \frac{A}{B} \), where \( N, a \) and \( b \) are natural numbers, \( a < b \) and GCF\((a, b) = 1\).

Examples:

Problem: Express 8 divided by 12 as a common fraction. Answer: \( \frac{2}{3} \) Unacceptable: \( \frac{4}{6} \)

Problem: Express 12 divided by 8 as a common fraction. Answer: \( \frac{3}{2} \) Unacceptable: \( \frac{12}{8}, \ 1 \frac{1}{2} \)

Problem: Express the sum of the lengths of the radius and the circumference of a circle with a diameter of \( \frac{1}{4} \) as a common fraction in terms of \( \pi \). Answer: \( \frac{1+2\pi}{8} \)

Problem: Express 20 divided by 12 as a mixed number. Answer: \( 1 \frac{2}{3} \) Unacceptable: \( \frac{8}{12}, \frac{5}{3} \)

Ratios should be expressed as simplified common fractions unless otherwise specified. Examples:

Simplified, Acceptable Forms: \( \frac{7}{2}, \frac{3}{\pi}, \frac{4-\pi}{6} \) Unacceptable: \( 3 \frac{1}{2}, \frac{4}{3}, 3.5, 2:1 \)

Radicals must be simplified. A simplified radical must satisfy: 1) no radicands have a factor which possesses the root indicated by the index; 2) no radicands contain fractions; and 3) no radicals appear in the denominator of a fraction. Numbers with fractional exponents are not in radical form. Examples:

Problem: Evaluate \( \sqrt{15} \times \sqrt{5} \). Answer: \( 5\sqrt{3} \) Unacceptable: \( \sqrt{75} \)

Answers to problems asking for a response in the form of a dollar amount or an unspecified monetary unit (e.g., “How many dollars...,” “How much will it cost...,” “What is the amount of interest...”) should be expressed in the form \( \$ \ a.b.c \), where \( a \) is an integer and \( b \) and \( c \) are digits.

The only exceptions to this rule are when \( a \) is zero, in which case it may be omitted, or when \( b \) and \( c \) are both zero, in which case they may both be omitted. Examples:

Acceptable: 2.35, 0.38, .38, 5.00, 5

Unacceptable: 4.9, 8.0

Units of measurement are not required in answers, but they must be correct if given. When a problem asks for an answer expressed in a specific unit of measure or when a unit of measure is provided in the answer blank, equivalent answers expressed in other units are not acceptable. For example, if a problem asks for the number of ounces and 36 oz is the correct answer, 2 lbs 4 oz will not be accepted. If a problem asks for the number of cents and 25 cents is the correct answer, $.025 will not be accepted.

Do not make approximations for numbers (e.g., \( \pi, \frac{2}{3}, \ 5\sqrt{3} \) ) in the data given or in solutions unless the problem says to do so.

Do not do any intermediate rounding (other than the “rounding” a calculator performs) when calculating solutions. All rounding should be done at the end of the calculation process.

Scientific notation should be expressed in the form \( a \times 10^n \) where \( a \) is a decimal, \( 1 \leq |a| < 10 \), and \( n \) is an integer. Examples:

Problem: Write 6895 in scientific notation. Answer: \( 6.895 \times 10^3 \)

Problem: Write 40,000 in scientific notation. Answer: \( 4 \times 10^4 \) or \( 4.0 \times 10^4 \)

An answer expressed to a greater or lesser degree of accuracy than called for in the problem will not be accepted. Whole number answers should be expressed in their whole number form. Thus, 25.0 will not be accepted for 25 nor vice versa.

The plural form of the units will always be provided in the answer blank, even if the answer appears to require the singular form of the units.

MATHCOUNTS 2010–2011 19
VOCABULARY AND FORMULAS

The following list is representative of terminology used in the problems but should not be viewed as all-inclusive. It is recommended that coaches review this list with their Mathletes.

absicssa  
absolute value  
acute angle  
additive inverse (opposite)  
adjacent angles  
algorithm  
alternate interior angles  
alternate exterior angles  
altitude (height)  
area  
arithmetic mean  
arithmetic sequence  
base 10  
binary  
bisect  
box-and-whisker plot  
center  
chord  
circle  
circumference  
circumscribe  
coefficient  
collinear  
combination  
common denominator  
common divisor  
common factor  
common fraction  
common multiple  
complementary angles  
composite number  
compound interest  
concentric  
cone  
congruent  
convex  
coordinate plane/system  
coordinates of a point  
corresponding angles  
counting numbers  
counting principle  
cube  
cylinder  
data  
decimal  
degree measure  
denominator  
diagonal of a polygon  
diagonal of a polyhedron  
diameter  
difference  
digit  
digit-sum  
direct variation  
dividend  
divisible  
divisor  
directrix  
dependence  
equation  
equilateral  
evaluate  
expected value  
exponent  
expression  
exterior angle of a polygon  
factor  
factorial  
Fibonacci sequence  
fraction  
finite  
formula  
frequency distribution  
frustum  
function  
GCF  
geometric mean  
geometric sequence  
height (altitude)  
hemisphere  
hexagon  
hypotenuse  
image of a point (under a transformation)  
improper fraction  
inequality  
infinite series  
inscribe  
integer  
interior angle of a polygon  
intersection  
inverse variation  
irrational number  
isosceles  
lateral surface area  
lateral edge  
lattice point(s)  
LCM  
linear equation  
mean  
median of a set of data  
median of a triangle  
midpoint  
mixed number  
mode(s) of a set of data  
multiple  
mutiplicative inverse  
(negative)  
natural number  
numerator  
obtuse angle  
octagon  
octahedron  
odds (probability)  
opposite of a number (additive inverse)  
ordered pair  
ordinate  
origin  
palindrome  
parallel  
parallellogram  
Pascal’s triangle  
pentagon  
percent increase/decrease  
perimeter  
permutation  
perpendicular  
planar  
polygon  
polyhedron  
prime factorization  
prime number  
principal square root
prism
probability
product
proper divisor
proper factor
proper fraction
proportion
pyramid
Pythagorean Triple
quadrant
quadrilateral
quotient
radius
random
range of a data set
rate
ratio
rational number
ray
real number
reciprocal (multiplicative inverse)
rectangle
reflection
regular polygon
relatively prime
remainder
repeating decimal
revolution
rhombus
right angle
right circular cone
right circular cylinder
right polyhedron
right triangle
rotation
scalene triangle
scientific notation
segment of a line
semicircle
sequence
similar figures
simple interest
slope
slope-intercept form
solution set
sphere
square
square root
stem-and-leaf plot
sum
supplementary angles
system of equations/
inequalities
tangent figures
tangent line
term
terminating decimal
tetrahedron
total surface area
transformation
translation
trapezoid
triangle
triangular numbers
trisect
union
unit fraction
variable
vertex
vertical angles
volume
whole number
x-axis
x-coordinate
x-intercept
y-axis
y-coordinate
y-intercept

The list of formulas below is representative of those needed to solve MATHCOUNTS problems but should not be viewed as the only formulas that may be used. Many other formulas that are useful in problem solving should be discovered and derived by Mathletes.

**CIRCUMFERENCE**
Circle \[ C = 2 \pi r = \pi d \]

**AREA**
Square \[ A = s^2 \]
Rectangle \[ A = lw = bh \]
Parallelogram \[ A = bh \]
Trapezoid \[ A = \frac{1}{2}(b_1 + b_2)h \]
Circle \[ A = \pi r^2 \]
Triangle \[ A = \frac{1}{2}bh \]
Triangle \[ A = \frac{s(s-a)(s-b)(s-c)}{4} \]
Equilateral triangle \[ A = \frac{s^2 \sqrt{3}}{4} \]
Rhombus \[ A = \frac{1}{2}d_1 d_2 \]

**SURFACE AREA & VOLUME**
Sphere \[ SA = 4 \pi r^2 \]
Sphere \[ V = \frac{4}{3} \pi r^3 \]
Rectangular prism \[ V = lw \]
Circular cylinder \[ V = \pi r^2 \]
Circular cone \[ V = \frac{1}{3} \pi r^2h \]
Pyramid \[ V = \frac{1}{3} Bh \]

Pythagorean Theorem \[ c^2 = a^2 + b^2 \]

Counting/ Combinations \[ \binom{n}{r} = \frac{n!}{r!(n-r)!} \]