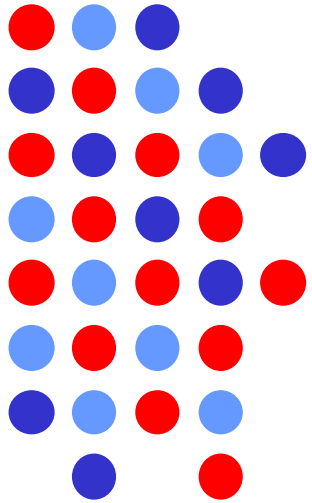
2025 M.A.T.H. Bowl

Coaches' Toolkit
Geometry/Measurement Focus



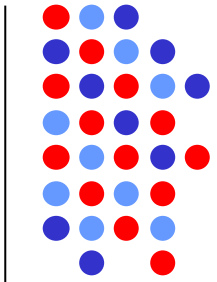
Rules Review

During the contest, students may use pencil, paper and a calculator.

Mathletes will be working with a team on questions with multiple choice answers.

No formula sheets, posters, or helpful information on team shirts are allowed.

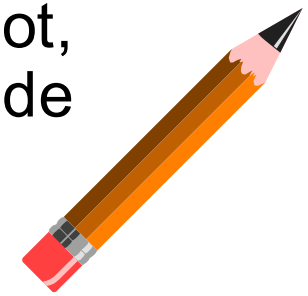
Competition Day Tips



- Mathematicians may be working with one or two other teammates.
- Sometimes it is better to check given answers than to try to solve the problem.
- In these cases, each member should check a different answer to save time.
- Sometimes an important clue is in the answer choices. Watch the units needed in the answer.

Can and should we use our calculators?

- Many questions are easier and faster using a pencil or solving mentally.
- Look at the answers, especially the units on the answers. Some answers are easy to rule out.
- Does your calculator know the Order of Operations? Try 2 + 3 X 4. If the answer is 14, not 20, then you have a calculator that follows the Order of Operations. If not, you will have to use the order of operations to decide what part to do first.



The PPDCC - Personal Powered Digital Computing Device is still the best!

Here are examples of approved calculators.

- Vendor

https://www.calculatorsinc.com

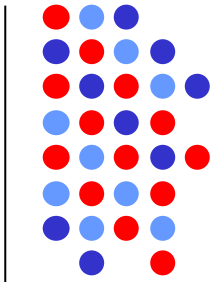
- Texas Instruments

https://education.ti.com/en/purchase/purchase

- Casio

https://www.casioeducation.com/where-to-buy

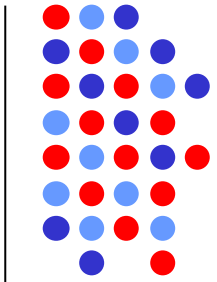
Focus: Geometry and Measurement



The 2025 MATH competition is based on the 2020 Indiana Academic Standards for Mathematics for grades 4-7.

- Process Standards – all grades
- NS - Number Sense (grades 4-6)
- C – Computation (grades 4-6)
- G – Geometry (grades 4-5)
- M – Measurement (grades 4-5)
- GM - Geometry and Measurement (grades 6-7+)
- Algebra and probability and statistics will be the focus in the next two years.

Fair Game – Standards in K-3



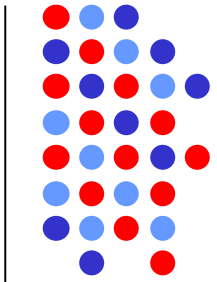
Any math topic from grades K-3 may be used in M.A.T.H. Bowl.

Simple algebra equations like 20 + 30 + x = 180 are included because you can do problems like

20 + 30 + 🍎 = 180.

Questions about range and mode from line plots or frequency tables are sometimes included.

Algebra or Data Overlaps



Know:

The sum of the angles in a triangle is 180 degrees.

Supplementary angles add to 180 degrees.

Complementary angles add to 90 degrees.

Solving 40 + ❓ = 90 is the same as solving

40 + x = 90.

Be able to use square root key on calculator.

$$\sqrt{25} = 5$$

So if we know 25^2 = x then x = 5.

GCF

Factors are divisors of the number.

Greatest Common Factor is the largest the common factors.

Factors of 12 are 1, 2, 3, 4, 6, **12**

Factors of 36 are 1, 2, 3, 4, 6, 9, **12**, 18, 36

The common factors are highlighted.

The Greatest Common Factor is circled.

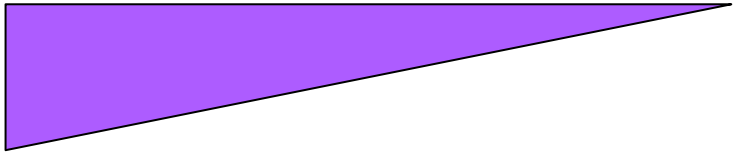
GCF of 12 and 36 is **12**.

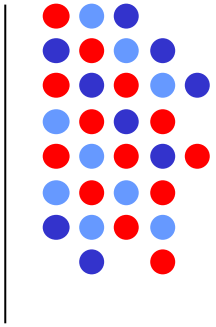
Polygons

https://www.mathsisfun.com/geometry/polygons.html

We are only learning about polygons with 3-10 sides. We need to know the names, number of sides, how to find perimeter, and the sum of the angles.

Find missing sides in a right triangle

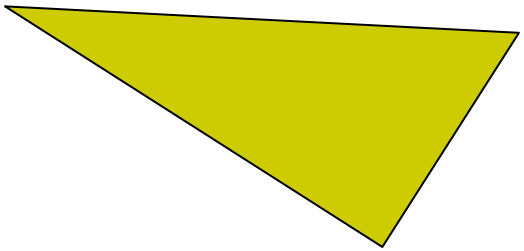




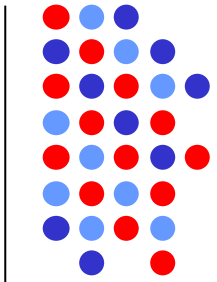
https://www.mathwarehouse.com/animated-gifs/

Watch GIF 2 to understand $a^2 + b^2 = c^2$

The click on “More on the Pythagorean theorem” to learn and practice using this important formula.



How to get the sum of the angle measures of a polygon



The sum of measures of the angles of a polygon is 180 times two less than the number of sides.

Mathematicians write that sentence this way:

$S = 180(n-2)$

Try it out with some practice here:

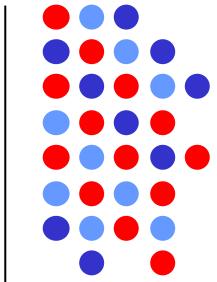
https://www.mathwarehouse.com/geometry/polygon/index.php

Area of a Circle. $A = \pi r^2$

https://www.mathwarehouse.com/animated-gifs/#area-circle-triangle-rectangle

Watch GIF 5. Then click on “More on Area of Circle” and work through the examples and practice problems.

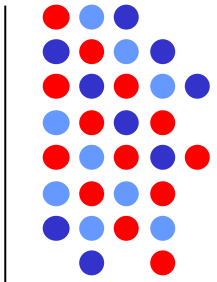
Simple Vocabulary



Understand terms such as add, sum, subtract, product, quotient, remainder, factor, less than, and greater than.

Geometry vocabulary includes polygon names, angle, isosceles, vertical angles, adjacent angles, complementary and supplementary angles etc.

Which is NOT the same as 12 cubed?



A. 12 X 12 X 12

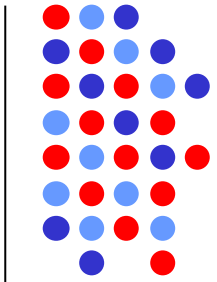
B. 12^3

C. 12 X 3

D. 144 x 12

30 seconds

Fibonnaci Sequence

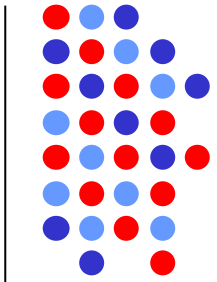


https://www.mathsisfun.com/numbers/fibonacci-sequence.html

1, 1, 2, 3, 5, 8, …

After 1, 1, all the others are found by adding the previous two terms. So 1 + 1 = 2 and 1 + 2 = 3.

Quizlet.com



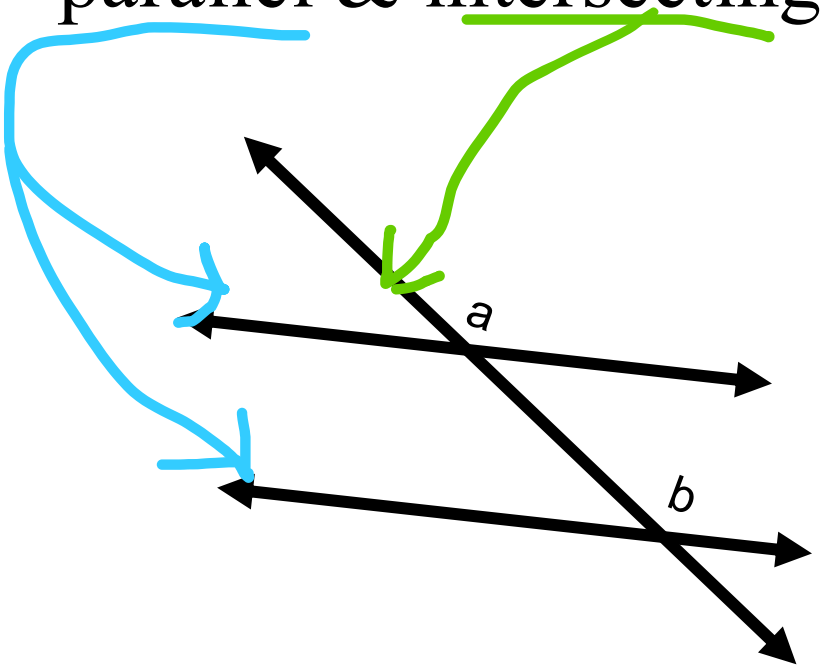
Use any term from the study list, search, find cards created by others to study.

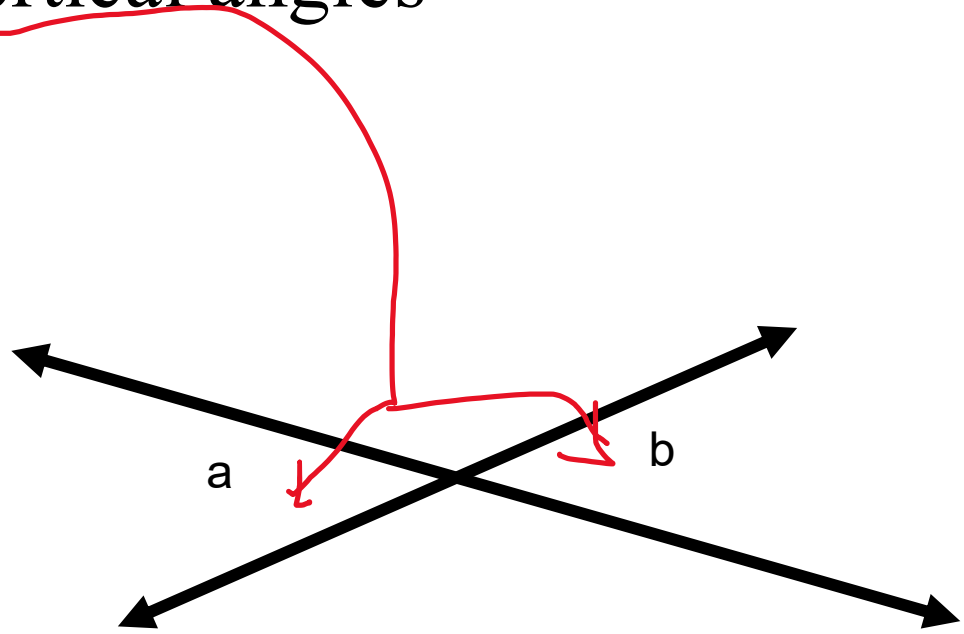
- https://quizlet.com/_bna0b Geometry terms
- https://quizlet.com/_5c7m2j Special Angle Pairs

Geometry of lines

line, segment, ray: definitions and naming

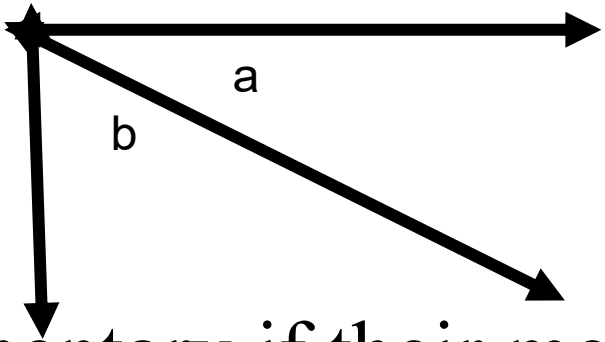
parallel & intersecting, vertical angles



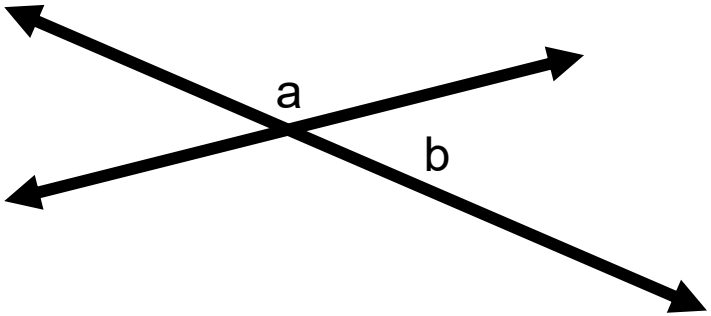


Complements vs Supplements

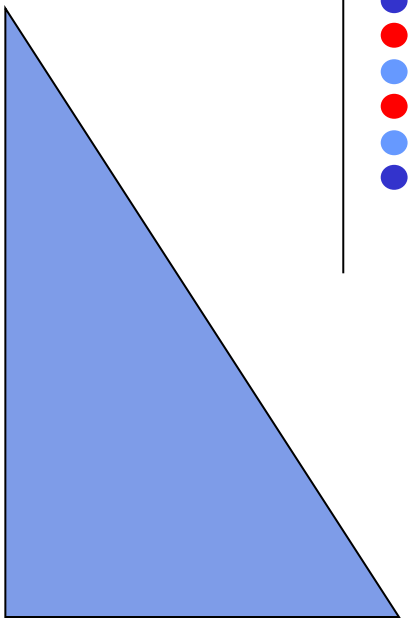
Two angles are complementary if their measures add to 90 degrees.



Two angles are supplementary if their measures add to 180 degrees.



Triangle Vocabulary



Acute, right, obtuse

Scalene, isosceles, right

Leg, hypotenuse

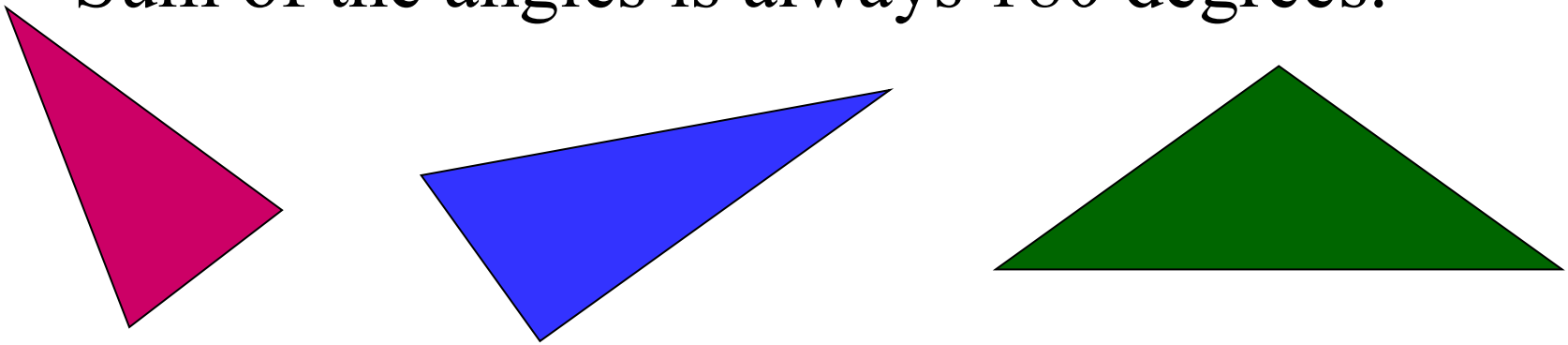
Sum of angles is 180 degrees.

Isosceles have *at least* two congruent sides and two congruent angles so an equilateral triangle is also isosceles. Try drawing an isosceles right triangle and a scalene right triangle.

Geometry of Triangles

Acute, right, obtuse, isosceles, equilateral, scalene classifications.

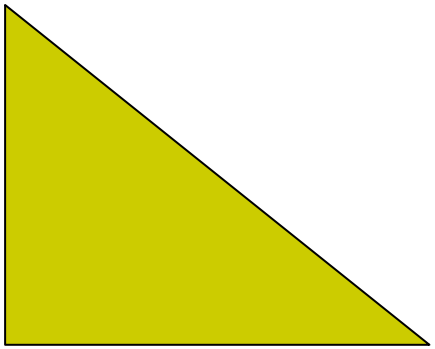
Sum of the angles is always 180 degrees.

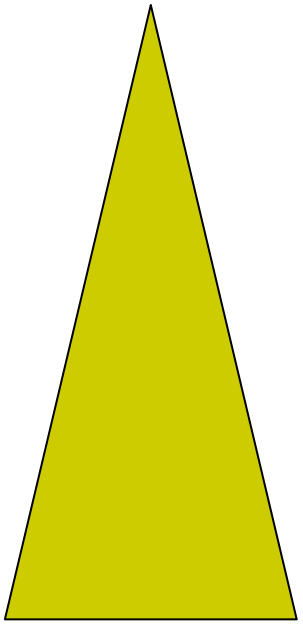


Try Triangle Mutilation – rip 2 corners off your favorite triangle and lay next to third. You always get a straight line.

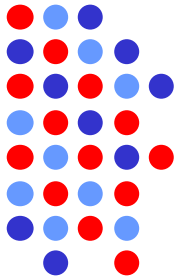
Isosceles Triangles

- 2 congruent angles
- 2 congruent sides
- May also be equilateral



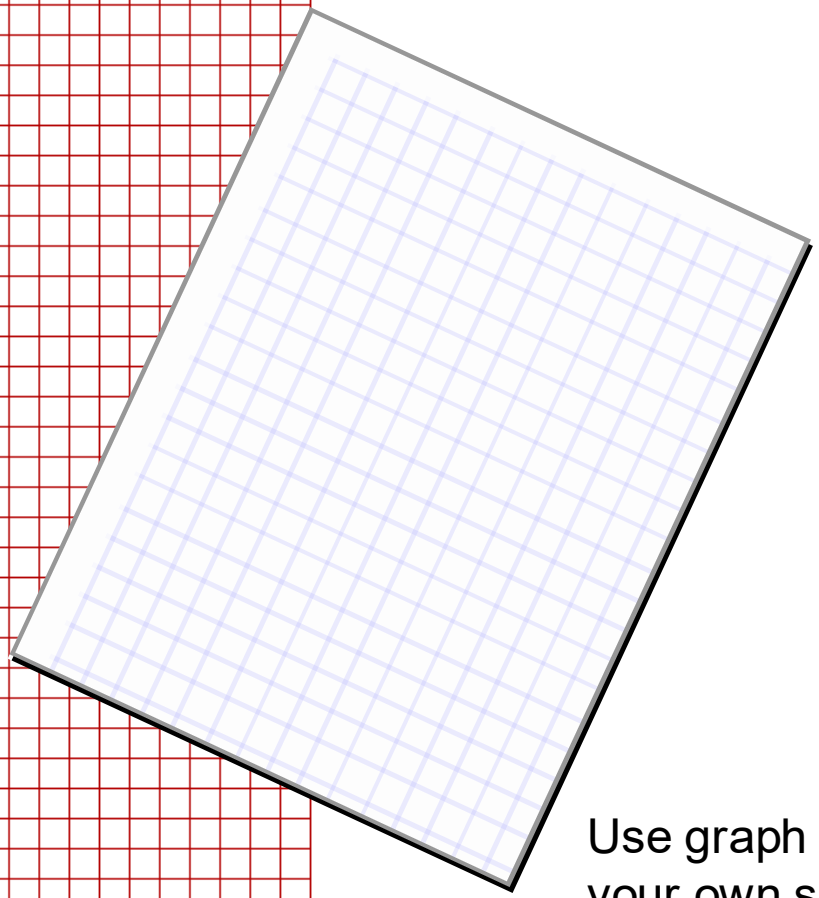


Some websites with great standards based activities



- http://coolmath-games.com/
- http://aplusmath.com/
- http://mathwire.com/
- http://xtramath.org/
- http://www.senteacher.org/
- http://www.iplaymathgames.com/
- http://math.about.com/
- http://superteacherworksheets.com/
- http://multiplication.com/ Learn those facts!

Free online Graph Paper



Use graph paper to draw your own shapes. Then find the area.

http://incompetech.com/graphpaper/plain/

Which is NOT a quadrilateral?

A. trapezoid

B. rectangle

C. rhombus

D. pentagon

This is a 30 second kind of question because it is testing simple ideas or vocabulary.

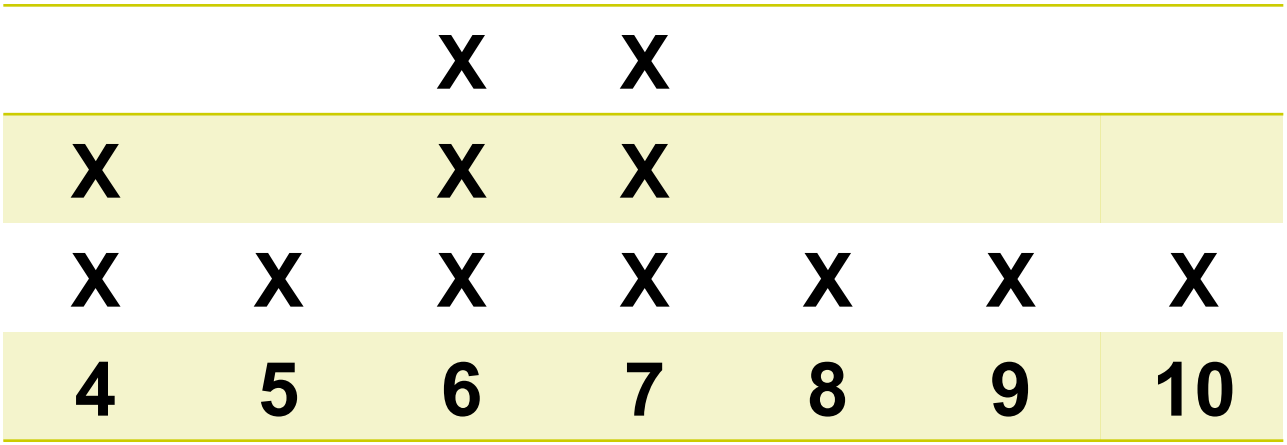
What is the sum of largest and smallest number on the line plot?

A. 4

B. 10

C. 6

D. 14



Questions like this might allow only 30 seconds because the math is easy if you know how to read the line plot! 10 – 4 = 6

What is the measure of the third angle in a triangle with angles of 101° and 47°?

A. 128°

B. 90°

C. 33°

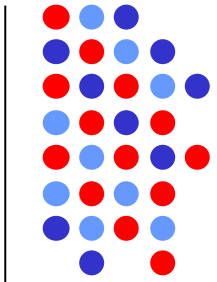
D. 32°

This kind of question may have a time limit of 45 seconds. You need to know how to do it and then do the two steps. Add the two angles given and subtract that from 180 degrees in the sum of the angles.

101+ 47 = 48

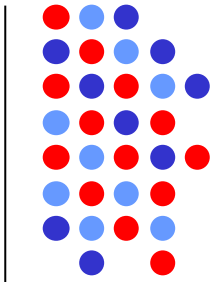
180 - 148 = 32

60 second questions



Questions with many steps to solve will have time limits of 60 seconds. They usually happen later in the round. The wrong answers might be the answer to one of the earlier steps. Be sure you have the final answer to the question being asked.

Vocabulary of Solids



Base: 1 for pyramid, 2 for prisms

Face: flat surface

Vertex: corners

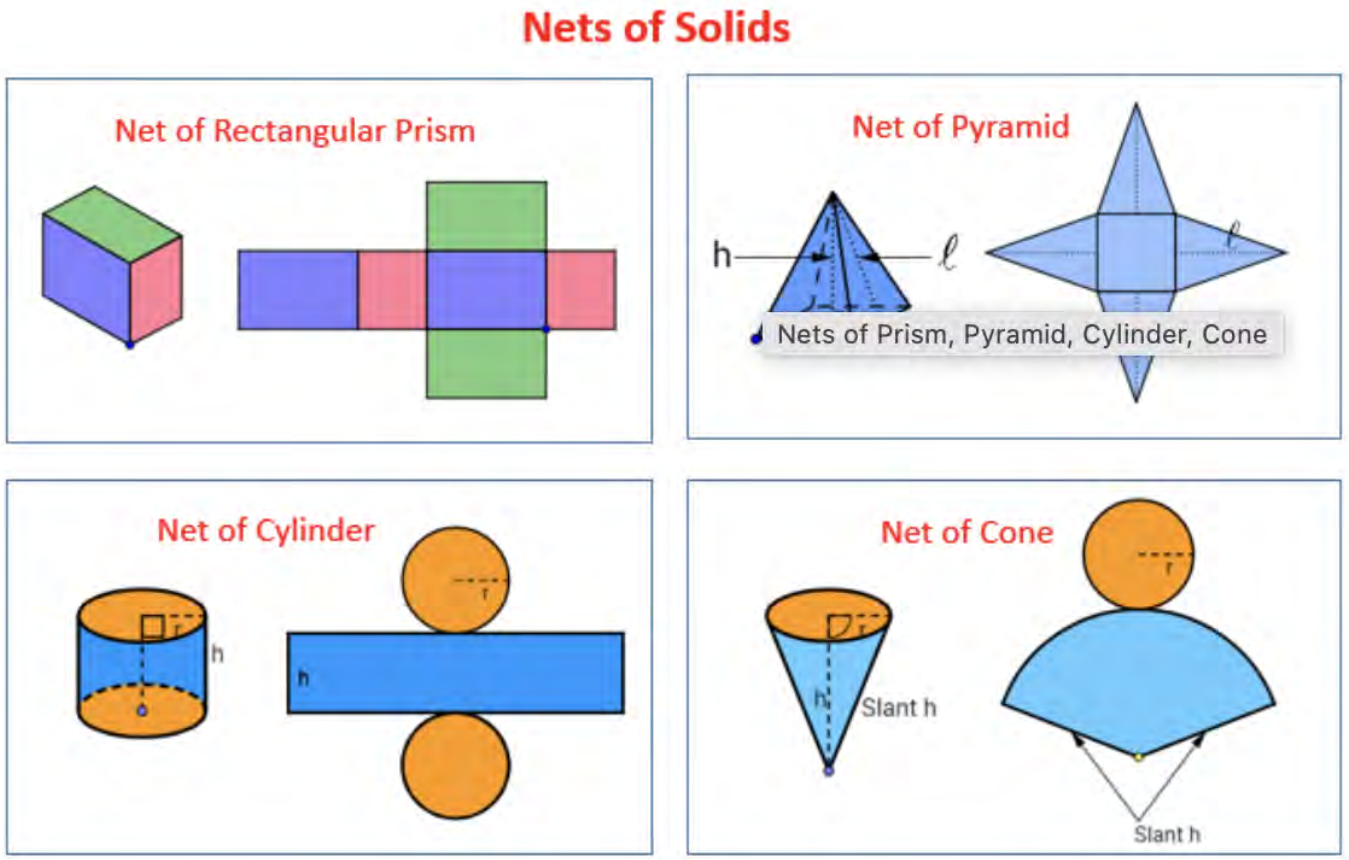
Edge: where faces meet in segment

Be able to name the 3D object based on shape of base and sides.

Be able to find the surface area and volume of rectangular solids.

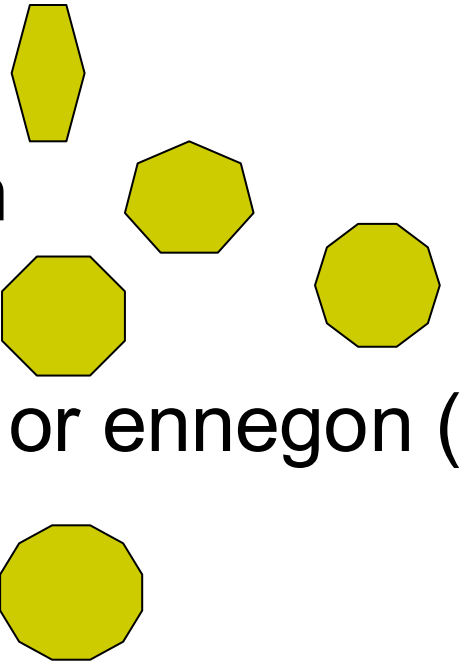
Net for Solids

https://www.onlinemathlearning.com/geometry-nets.html



Polygon Vocabulary

- Triangles have 3 sides
- Quadrilaterals have 4 sides
- Pentagon
- Hexagon
- Heptagon
- Octagon
- Nonagon or ennegon (HINT)
- Decagon

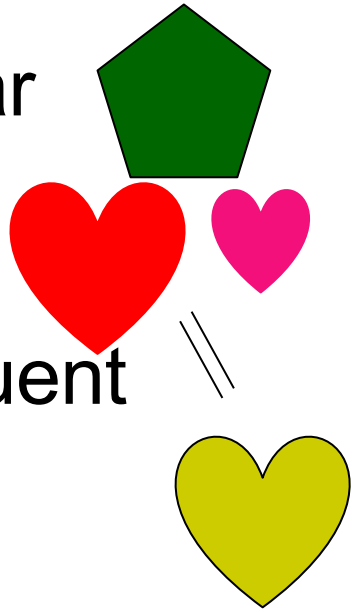


Related Terms

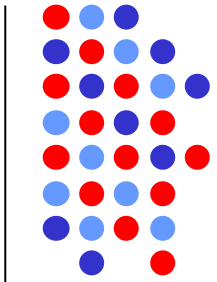
Regular

Similar

Congruent



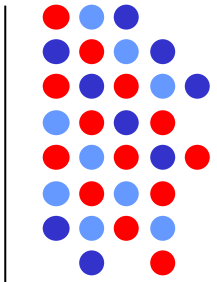
Measurement



- Objects have measurable properties
- "How long?" and "How heavy?")
- Terms of comparison such as longer, heavier, shorter, wider.
- Use appropriate units and processes for measurement
- Use standard units of measurement
- Use formulas and appropriate units

www.primary-education-oasis.com/teaching-measurement.html#.ULKNCaUxrTQ

M - Standard Measurement Units

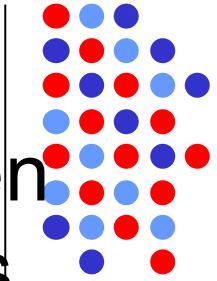


- Time: second, minute, day, week, month, year
- Length: inch, foot, yard
- Weight: ounce, pound, ton

Students should be able to convert units within the standard system of measures using the units above.

Conversions students should know and be able to use in a proportion.

- 16 oz = 1 lb
- 2000 lb = 1 ton
- 1 yd = 3 ft
- 8 oz = 1 cup
- 12 months = 1 year
- 60 seconds = 1 minute
- 1 gallon = 4 quarts



- Others MAY be given to use in proportions.

- There is a phone or tablet app called UNITS students can use in self-quizzing while learning.

Find perimeter of **regular** hexagon with one side measuring 83 cm.

A. 4.98 m

B. 581 cm

C. 415 cm

D. 216 cm^3

45 seconds

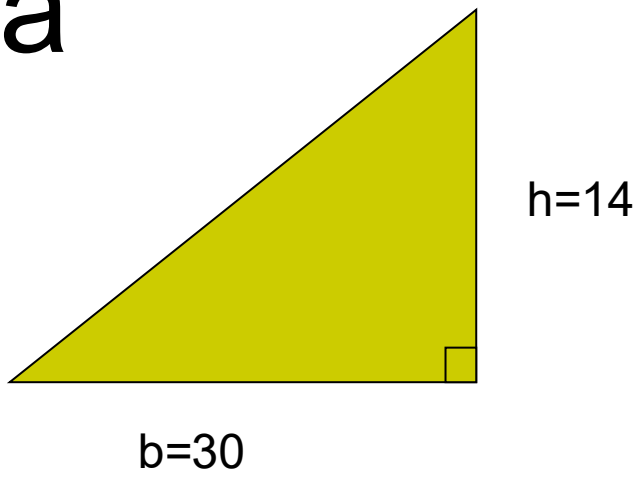
G - Find the area of the triangle.

A. 91.11

B. not enough data

C. 210

D. 420



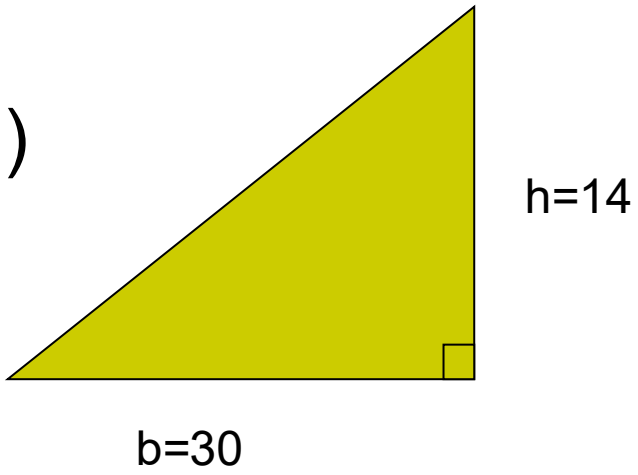
45 seconds

G - Find the area of the triangle.

A=1/2 bh
= 0.5(30)14
= 0.5(420)
= 210

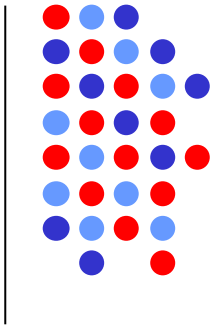
A=1/2 bh
= (1/2)(30)14
= 15(14)
= 210

A=1/2 bh
= (½)(30)14
= (1/2)(14)(30)
= 7(30)
= 210



These are all correct methods of computation because ½ = 0.5 and multiplication can be done in any order. You should also be able to identify base and height in various triangles.

G - Which is NOT a value for π?



A. 3.14

B. 22/7

C. 3 1/7

D. 2.141

Pi is an irrational number that goes on forever and has no repeating pattern in the digits. It is a little more than three. We use an approximate value from A, B, or C.

30 seconds

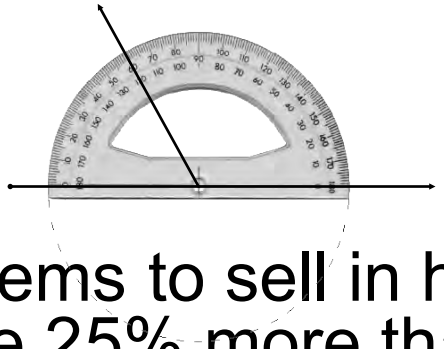
MathCounts from 2008-9 Handbook – simplified for us

What is the product of

(1 - 1/2)(1 - 1/3)(1 - ¼)(1 – 1/5)(1 - 1/6)?

$\frac{1}{2} * \frac{2}{3} * \frac{3}{4} * \frac{4}{5} * \frac{5}{6} = \frac{1}{6}$

Angles A and B are supplementary. If the measure of angle A is 2 times angle B, what is the measure of angle A?



A + B = 180

2B + B = 180

3B = 180

B = 60

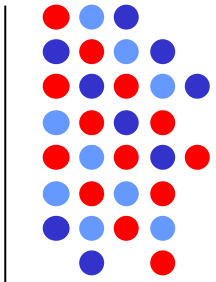
A = 120

Raymond buys items to sell in his store. He prices each item to be 25% more than the wholesale cost. What price should he put on an item with a wholesale cost of $40.00?

40(.25)=$10 markup

40 + 10 = $50 retail price

2025 topics from questions



Order of operations

Prime, composite, prime factorization

Place value – reading & writing, ordering

Names of polygons, classify triangles, quadrilaterals

Similar, regular, equilateral polygons

Perimeter and area of polygons

Area of polygons that can be cut into smaller simpler polygons

Converting customary units, know in/ft/yd, t/T/c/p/qt/gal

Angle vocabulary – acute, obtuse, right, straight, supplementary, complementary, vertical. adjacent

Triangle Inequality Theorem

Circle area and circumference

Volume of rectangular prism

Surface area of rectangular prism

2025 topics from questions

Double, triple, quadruple, square, cube

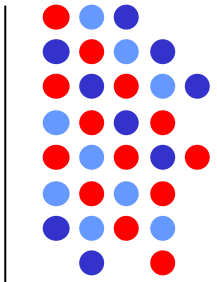
LCM, GCF

Finding total wages for time given in hours and minutes

Transformations – rotations, rotational symmetry

Elapsed time

Problem Solving Strategies



Make a sketch

Work backward

Check to eliminate answers

Logic puzzles

Find the price with a discount

Fibonnaci numbers

Faces, edges, vertices – count from sketch or name of prism

Sum of angles in polygon = 180(n-2) where n is number of sides

Setting up and solving proportions

You may use these topics in a Google search to find more information and practice problems. Your library or coach may have old textbooks where you can search for these topics in the index.

Formulas to know ☺

$A = s^2$ Area of square

$A = lw$ Area of rectangle

$A = \frac{1}{2}\, bh$ Area of triangle

$A = \frac{1}{2}(b_1 + b_2)h$ Area of trapezoid

$A = \pi r^2$ Area of circle

$C = 2\pi r$ or $C = \pi d$ Circumference

Surface area is the sum of areas of all surfaces.

$V = lwh$ volume of rectangular prism

Perimeter is the sum of the measures of the sides of a polygon.

No Formula Sheets may be used during this contest!

Helpful series to know ☺

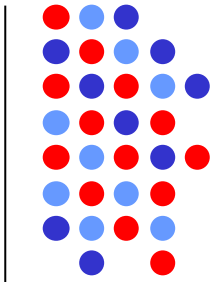
Squares of 1-20: 1, 4, 9, 16, 25, 36, 49, 64, … 361, 400

Cubes of 1- 10: 1, 8, 27, 64, 125, 216, 343, 512, 729, 1,000

Fibonacci 1, 1, 2, 3, 5, 8, 13, …

Fraction to decimal and decimal to fractions with denominators up to 10 plus powers of ten:
½ = 0.5, 1/3 = 0.333, ¼ = 0.25, 1/5 = 0.2, 1/6 ≅ 0.1667, 1/8 = 0.125, 1/9 = 0.999, 1/10 = 0.1, 1/100 = 0.01. 1/1,000 = 0.001

National Library of Virtual Manipulatives

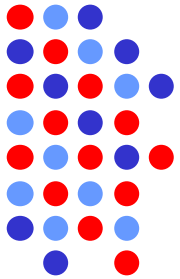


http://nlvm.usu.edu/en/nav/category_g_2_t_3.html

Teachers of mathematics for centuries have helped students understand mathematics using **"manipulatives"**-- visual objects that help illustrate mathematical relationships and applications. Manipulatives allow students to visually examine, explore and develop concepts.

The National Library of Virtual Manipulatives (NLVM) has transported these **powerful teaching tools i**nto the virtual dimension of the computer. The NLVM collection of **over 100 interactive software programs**, called "applets,"is an effective means for accelerating and deepening students' understanding of math.

National Library of Virtual Manipulatives



Congruent Triangles – Build similar triangles by combining sides and angles.

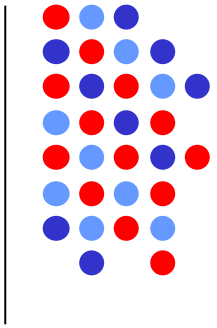
Geoboard – Use geoboards to illustrate area, perimeter, and rational number concepts.

Geoboard - Circular – Use circular geoboards to illustrate angles and degrees.

Pattern Blocks – Use six common geometric shapes to build patterns and solve problems.

Transformations - Reflection – Dynamically interact with and see the result of a reflection transformation.

Shape Tool

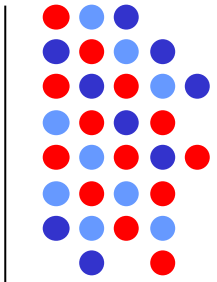


http://illuminations.nctm.org/activitydetail.aspx?id=35

This tool allows you to create any geometric shape imaginable. Squares, triangles, rhombi, trapezoids and hexagons can be created, colored, enlarged, shrunk, rotated, reflected, sliced, and glued together. What design can you create?

When you share your design, be sure to use math vocabulary to describe how you created it.

Ask Rose
Homework Hotline Resources



http://askrose.org Rose-Hulman Institute of Technology's AskRose Homework Help is a **free** math and science tutoring service for Indiana students and other students in grades 6-12. Students can call **877-ASK-ROSE**, email, video, or chat live with a friendly tutor to work through and better understand homework assignments. More information is at http://askrose.org.

These tutors can help with M.A.T.H. Bowl questions too!