Miscellaneous number types

Odious—a nonnegative number that has an odd number of 1s in its binary expansion. The first few odious numbers are therefore 1, 2, 4, 7, 8, 11, 13, 14, 16, 19.

Evil—nonnegative integers that have an even number of 1s in their binary expansions, the first few of which are 0, 3, 5, 6, 9, 10, 12, 15, 17, 18, 20

Economical— the number of digits in the prime factorization of n (including powers) uses fewer digits than the number of digits in n. Examples are 125, 128, 243, 256, 343, 512, 625, 729

Wasteful--A number n is called wasteful if the number of digits in the prime factorization of n (including powers) uses more digits than the number of digits in n. The first few wasteful numbers are 4, 6, 8, 9, 12, 18, 20, 22, 24

Perfect—a positive integer that is equal to the sum of its proper positive divisors, that is, the sum of its positive divisors excluding the number itself. The first four are 6, 28, 496 and 8128.

Lucky—The first is the lucky numbers of Euler. (2, 3, 5, 11, 17, and 41)

The second is obtained by writing out all odd numbers: 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, ... The first odd number > 1 is 3, so strike out every third number from the list: 1, 3, 7, 9, 13, 15, 19, ... The first odd number greater than 3 in the list is 7, so strike out every seventh number: 1, 3, 7, 9, 13, 15, 21, 25, 31, ...

Numbers remaining after this procedure has been carried out completely are called lucky numbers. The first few are 1, 3, 7, 9, 13, 15, 21, 25, 31, 33, 37

Mersenne Prime: prime numbers that are 1 less than a power of 2 ($2^n - 1$). The first five Mersenne primes are 3, 7, 31, 127 and 8191.

FORMULAS AND IDENTITIES

LAW OF COSINES $c^2 = a^2 + b^2 - 2ab\cos C$ c **is the side opposite of the known angle**

$$\cos C = \frac{a^2 + b^2 - c^2}{2ab}$$

$$\cos^2 \theta + \sin^2 \theta = 1$$ $$\frac{\sin \theta}{\cos \theta} = \tan \theta$$

$$1 + \tan^2 \theta = \sec^2 \theta$$

$$1 + \cot^2 \theta = \csc^2 \theta$$ $$\frac{\cos \theta}{\sin \theta} = \cot \theta$$

ACUTE $\triangle : a^2 + b^2 > c^2$ **OBTUSE** $\triangle : a^2 + b^2 < c^2$ **RIGHT** $\triangle : a^2 + b^2 = c^2$

➔ To balance a see-saw, $W_1 d_1 = W_2 d_2$ W = **weight** d = **distance from center**

SOME FAMOUS MATHEMATICIANS

Maria **AGNESI:** Italian. She wrote the first book discussing differential and integral calculus.

Gottfried von **LEIBNIZ:** German who was believed by some to have discovered calculus independently of Isaac Newton.

Rene **DESCARTES:** French mathematician who developed the Cartesian (xy) plane, and also developed the complex number system. He also was known as the father of analytical geometry (geometry using a coordinate system).

Johann Carl **GAUSS:** German mathematician; proved the Fundamental Theorem of Algebra and contributed significantly to many areas of mathematics and science.

George **BOOLE:** English mathematician; introduced Boolean algebra, the branch of algebra in which the values of the variables are the truth values *true* and *false*, usually denoted 1 and 0 respectively.

HYPATIA: Greek mathematician. She wrote a commentary on the book *Arithmetica* and also of Euclid's *Elements.*

EUCLID: Greek mathematician known as the "Father of Geometry." His book *Elements* was the primary book used in the teaching of mathematics, geometry in particular, until the late 1800s/early 1900s.

Leonhard **EULER:** Swiss mathematician known for developing much of the modern mathematical notation, such as the notion of a mathematical function. The number *e* is in honor of Euler.

Georg **RIEMANN:** German mathematician best known for his contributions to topology and number theory, as well as introducing what is known as the Riemann integral.

ARCHIMEDES: Greek mathematician noted for his contributions to plane geometry. He was the first to prove Heron's formula for the area of a triangle.
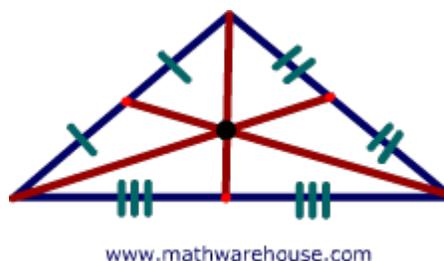
➔ More can be found at this site: http://fabpedigree.com/james/mathmen.htm
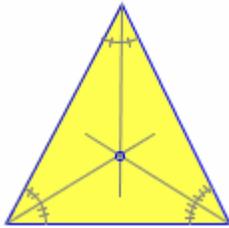
GEOMETRY TERMS

**Segment (of a circle)—**the region bounded by an arc and the chord of the arc (see shaded part below)
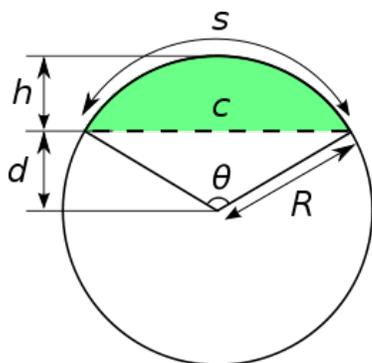
Centroid—the point where all 3 medians intersect. **Useful fact: The centroid is 2/3 of the way along any median.**

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Incenter-- the point where the angle bisectors meet.

Orthocenter—the intersection of the 3 altitudes of a triangle. If the triangle is ACUTE, the orthocenter is INSIDE the triangle. If the triangle is OBTUSE, the orthocenter is OUTSIDE the triangle.

Obtuse Triangle
Orthocenter - exterior

Acute Triangle
Orthocenter - interior

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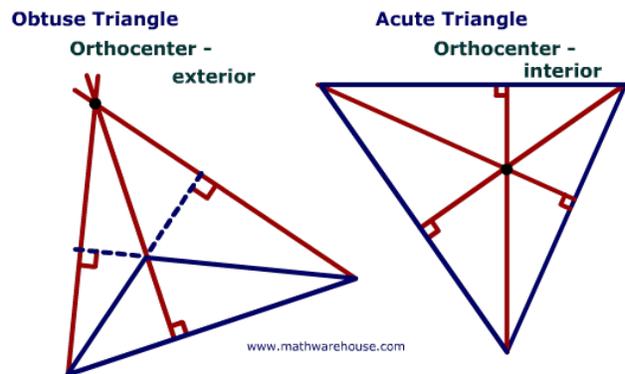
Circumcenter-- The point where the three perpendicular bisectors of the sides of a triangle meet.