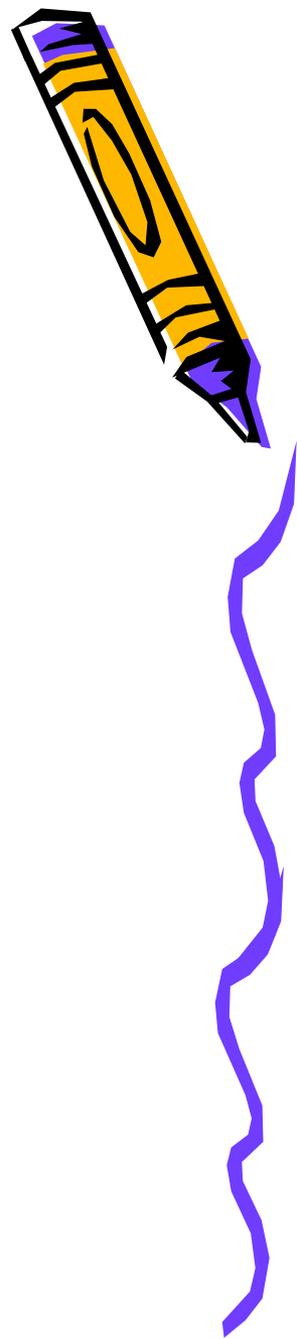


Geometry

Triangle Inequality Theorem



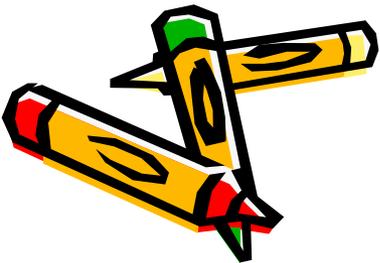
Triangle Inequality Theorem



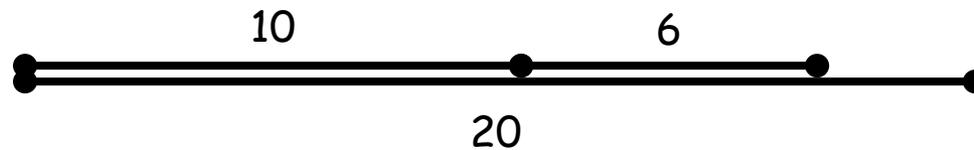
Triangles have 3 sides.

But can any 3 length sides
form a triangle?

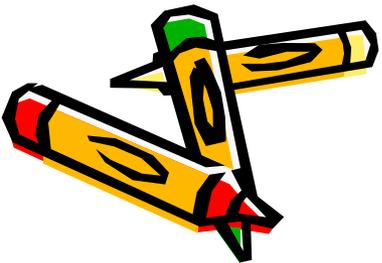
Remember: segments can only meet at their endpoints



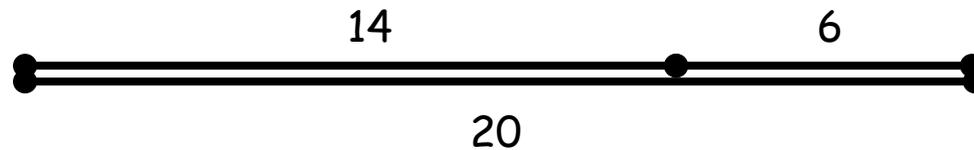
Can 3 sides with measurements
of 6, 10, and 20
form a triangle?



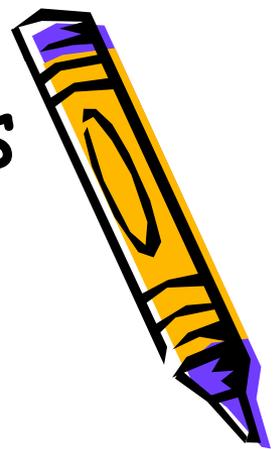
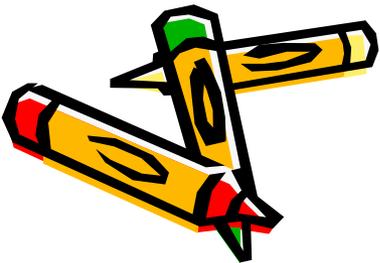
When joined at their endpoints, the two
sides of 10 and 6 will not reach the
other end of the 20 side.



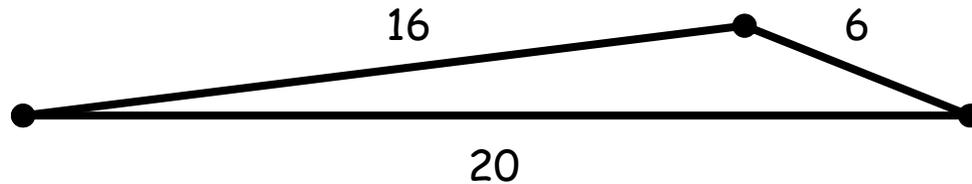
Can 3 sides with measurements of 6, 14, and 20 form a triangle?



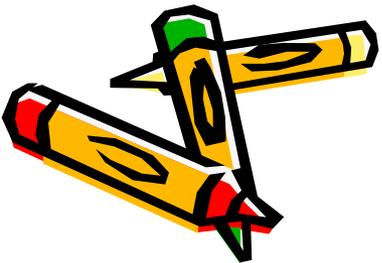
When joined at their endpoints, the two sides of 14 and 6 will reach the other end of the 20 side; however they will lie flat on top of it.



Can 3 sides with measurements
of 6, 16, and 20
form a triangle?

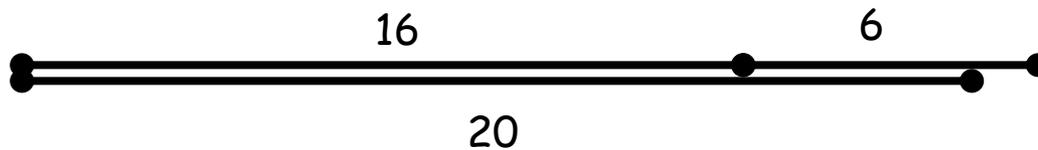


When joined at their endpoints, the two
sides of 16 and 6 will reach the other
end of the 20 side and be forced to
“pop up”, forming a triangle.

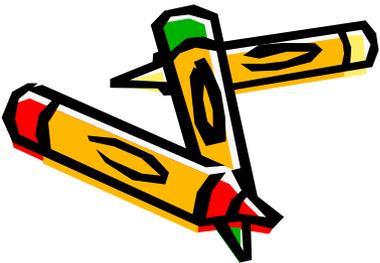
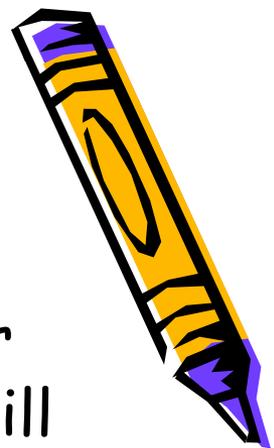
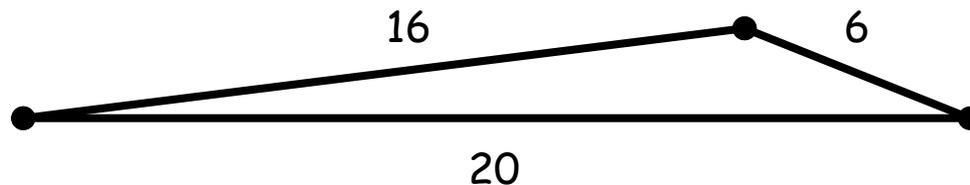


Triangle Inequality Theorem

If the sum of the 2 smaller sides is greater than the longest side, the 3 measurements will form a triangle.



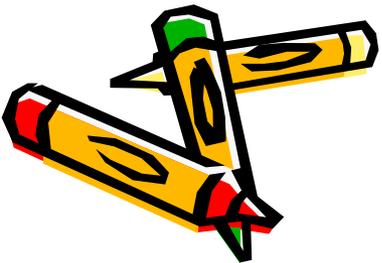
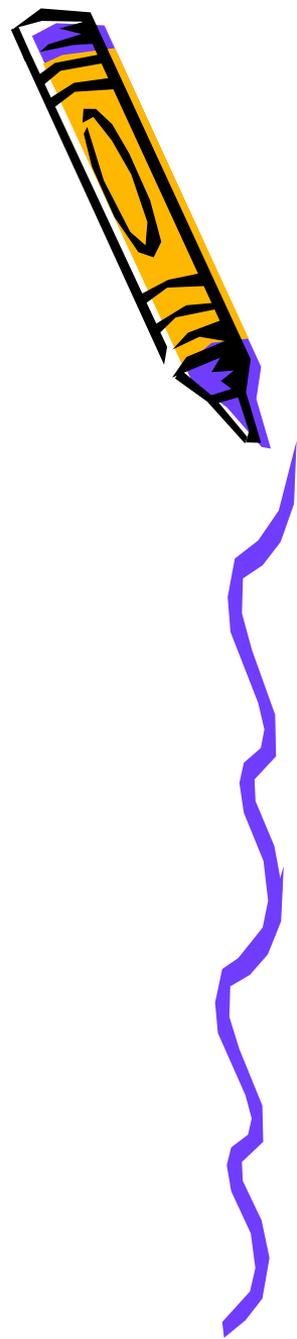
$6+16=22$. Since segments must meet their endpoints, pulling the endpoint of the 6 piece to meet the endpoint of the 20 piece will force the point where the 16 and 6 pieces meet, to "pop up".



Triangle Inequality Theorem

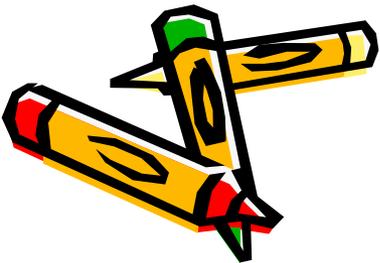
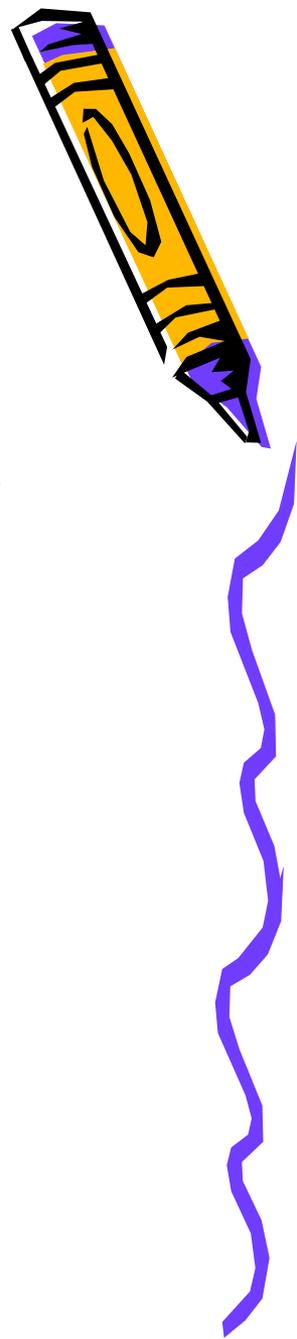
Determine if the given measurements can form a triangle:

1. 7, 10, 13
2. 12, 16, 34
3. 9, 11, 20
4. 24, 15, 8
5. 17, 42, 26
6. 7, 7, 10

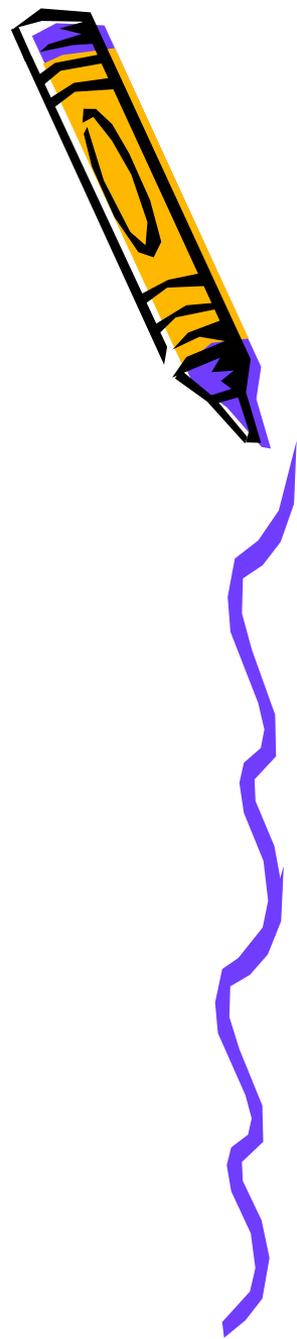


Triangle Inequality Theorem

If we know 2 of the sides, how can we use the Triangle Inequality Theorem to determine the possible values for the 3rd side?

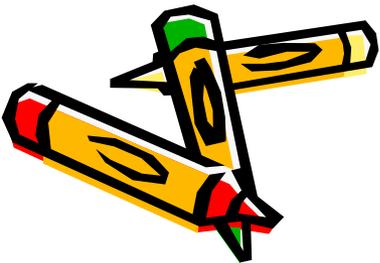


Triangle Inequality Theorem



If 2 sides of a triangle measure 10 and 15, what is the range of possible measurements for the 3rd side?

Note: We don't know if the 3rd side is the smallest, the medium length, or the longest.



Triangle Inequality Theorem

If 2 sides of a triangle measure 10 and 15, what is the range of possible measurements for the 3rd side?

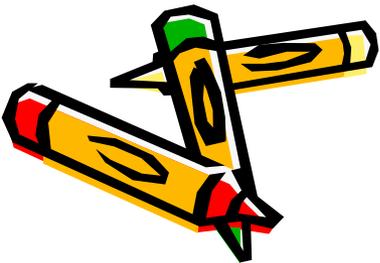
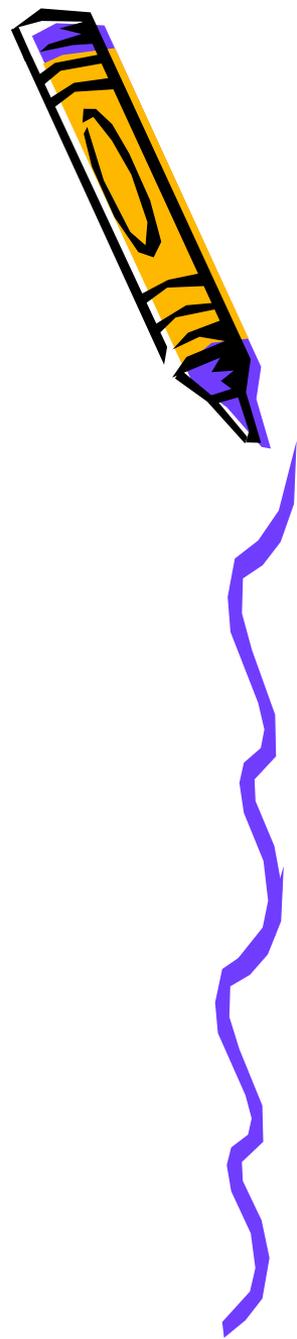
For a moment assume our 3rd side is the shortest... So our sides are x , 10, 15.
Then...

$x+10$ must be greater than 15

$$x+10 > 15$$

And

$$x > 5$$

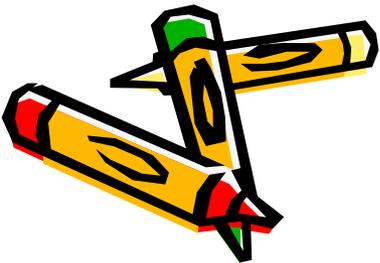
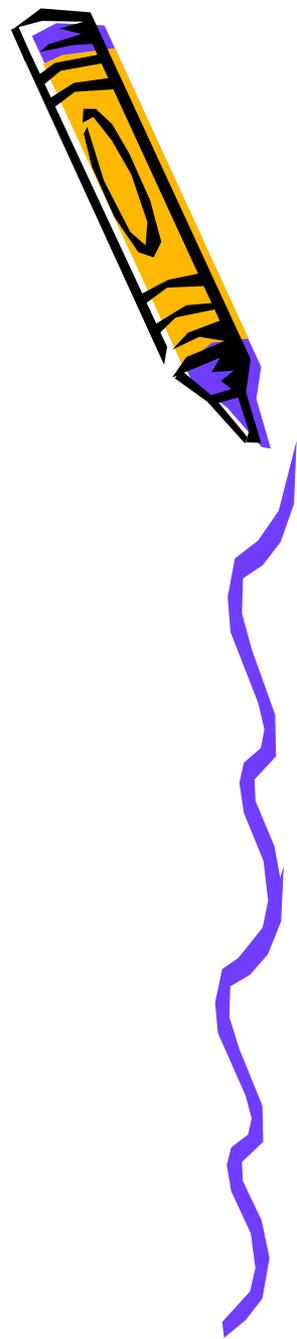


Triangle Inequality Theorem

If 2 sides of a triangle measure 10 and 15, what is the range of possible measurements for the 3rd side?

For a moment assume our 3rd side is the medium length... So our sides are 10, x , 15.
Then...

$x+10$ must be greater than 15
This is the same test we just did, so it serves no real purpose to do it again.



Triangle Inequality Theorem

If 2 sides of a triangle measure 10 and 15, what is the range of possible measurements for the 3rd side?

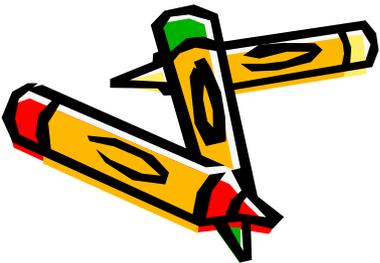
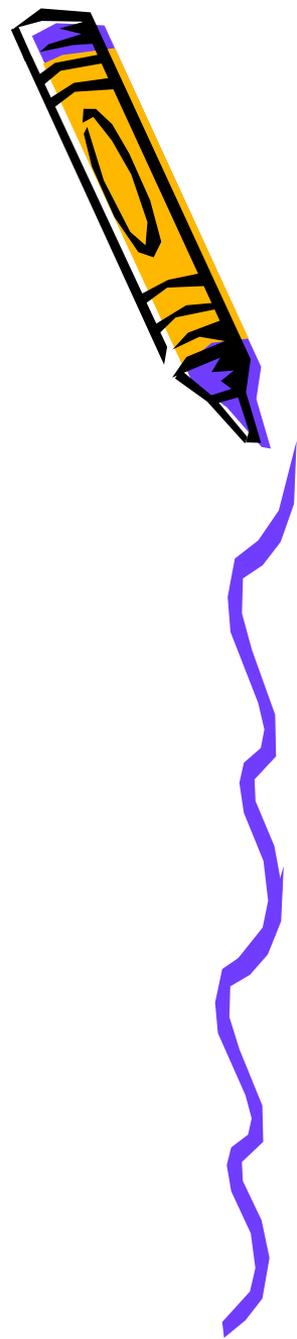
For a moment assume our 3rd side is the longest... So our sides are 10, 15, x .
Then...

10+15 must be greater than x

$$10+15 > x$$

And

$$25 > x \text{ or } x < 25$$



Triangle Inequality Theorem

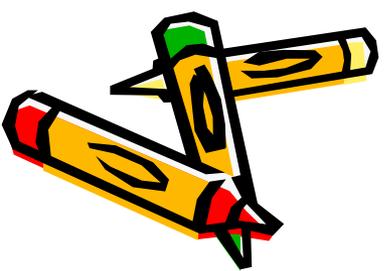
If 2 sides of a triangle measure 10 and 15, what is the range of possible measurements for the 3rd side?

Our 3rd side, x , is between 5 and 25

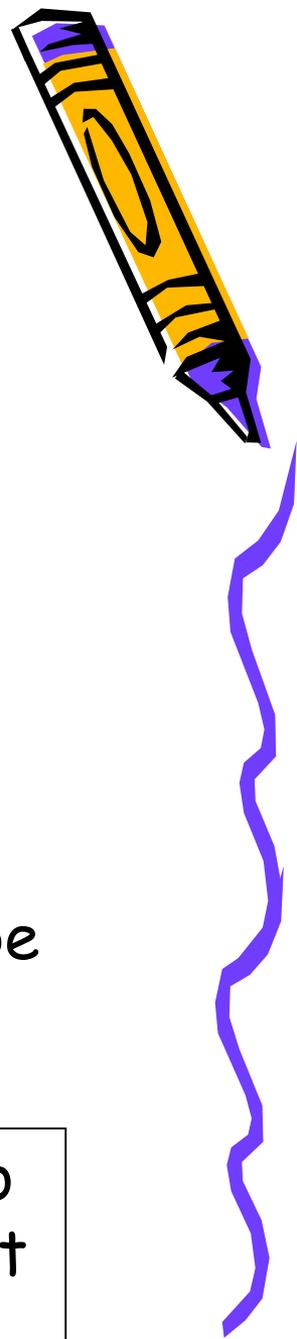
$$x > 5 \text{ and } x < 25$$

$$5 < x < 25$$

The 3rd side may not be 5 or 25, but must be greater than 5 and less than 25



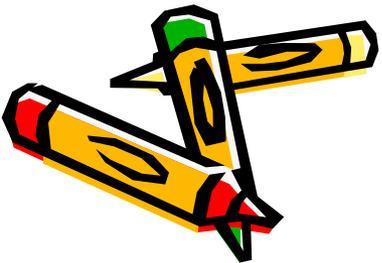
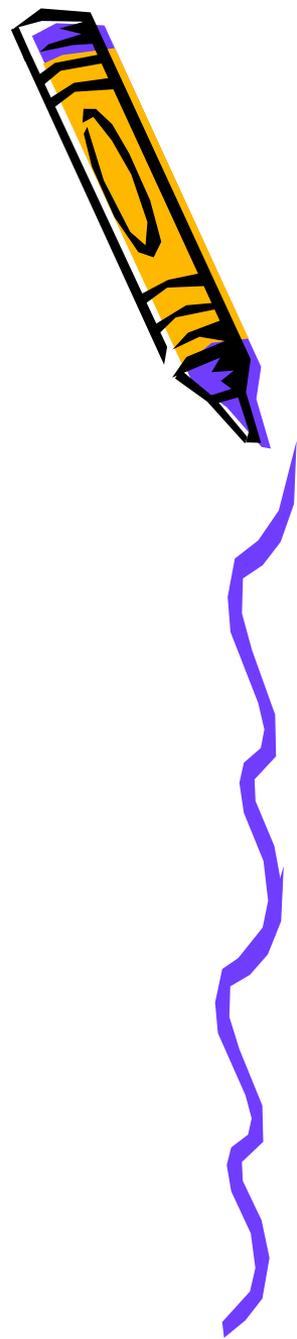
Subtract the 2 known measurements to get the lower limit (5). Add them to get the upper limit (25).



Triangle Inequality Theorem

Determine the possible measurements for the 3rd side of the triangle, given the measurements of 2 sides:

1. 10, 13
2. 12, 34
3. 9, 11
4. 24, 8
5. 17, 26
6. 7, 10



Triangle Inequality Theorem

Do the given set of points form a triangle?

1. $(6, 3), (-2, -4), (2, 4)$
2. $(-5, -3), (-1, 1), (4, 6)$

