Name____ Date____________________________________

5.6 – Indirect Proofs (Part 2)

Complete the first step of an indirect proof of the given statement.

1) There are fewer than 11 pencils in the box.

   Assume temporarily that there are ___11___ pencils in the box.

2) If a number ends in 0, then it is not divisible by 3.
   Assume temporarily that a number that ends in 0 ___is divisible by 3___________ .

3) $4x + 3 > 12$

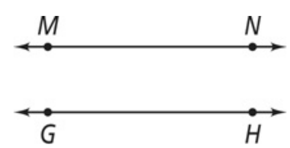
   Assume temporarily that $4x + 3$ ___=___ 12.

4) ΔRST is not an isosceles triangle.
   Assume temporarily that ___ΔRST is an isosceles triangle___ .

Circle the two statements that contradict each other.

5) I. $\overleftrightarrow{MN} \parallel \overleftrightarrow{GH}$ II. $\overleftrightarrow{MN}$ and $\overleftrightarrow{GH}$ do not intersect. III. $\overleftrightarrow{MN}$ and $\overleftrightarrow{GH}$ are skew.

6) To start, identify two conditions that cannot be true at the same time.



___Parallel___ lines must be in the same plane.

___Skew___ lines must not be in the same plane.

Therefore, two lines cannot be both ___Parallel___ and ___Skew___.

Fill in the blanks to indirectly prove the following statements.

7) If the Yoga club and Go Green Club together have fewer than 20 members and the Go Green club has 10 members, then the Yoga Club has fewer than 10 members.

   Given: The total membership of the Yoga Club and Go Green Club is fewer than 20. The Go Green Club has 10 members.

   Prove: The Yoga club has fewer than 10 members.

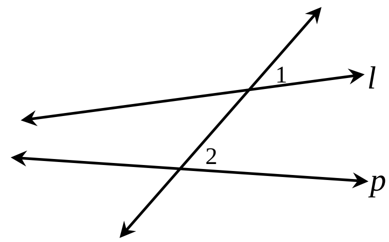
   Proof: Assume temporarily that the Yoga Club has 10 or more members. This means that together the two clubs have ___more than 20___ members. This contradicts the given information that ___together they have fewer than 20 members___. The temporary assumption is false. Therefore, it is true that ___the Yoga club has fewer than 10 members___.

Write an indirect proof for each.

8) Given: $\angle 1 \neq \angle 2$

$\neq \cong$

Prove : l is not parallel to p



Assume temporarily that l is parallel to p. If this is so, by the corresponding angles postulate, $\angle 1 \cong \angle 2$. This contradicts the given $\angle 1 \neq \angle 2$. The temporary assumption is false. Therefore, l is not parallel to p.

9) Given: ΔABC with $BC > AC$

Prove : $m\angle A \neq m\angle B$

Assume temporarily that $m\angle A = m\angle B$. If this is so, by the converse of the base angles theorem, the sides opposite of $\angle A$ and $\angle B$ must be congruent. Thus, BC=AC. This contradicts the given BC>AC. The temporary assumption is false. Therefore, $m\angle A \neq m\angle B$.

10) Given: ΔXYZ is isosceles

Prove : Neither of the base angles is a right angle.

Assume temporarily that a base angle is a right angle. Since it's an isosceles triangle and due to the base angles theorem, both angles are congruent and have to be 90 degrees. With just these two angles, their sum would be 180 degrees. This contradicts the triangle sum theorem that the sum of three angles of a triangle is 180 degrees. The temporary assumption is false. Therefore, neither of the base angles is a right angle.

For the following, write a convincing argument that uses indirect reasoning.

11) Ice is forming on the sidewalk in front of Toni's house. Show that the temperature of the sidewalk surface must be 0°C or lower.

Assume temporarily that the temperature of the sidewalk surface is above 0°C. This means that it's above freezing temperature and the water will be in liquid form. This is contradictory to the fact that ice is forming and needs to be in freezing temperature. The temporary assumption is false. Therefore, the temperature of the sidewalk surface must be 0°C or lower.

12) Your class has fewer than 30 students. The teacher divides your class into two groups. The first group has 15 students. Show that the second group must have fewer than 15 students.

Assume temporarily that the second group has 15 students. With this assumption, that means that the first and second group together group must have a total 30 students. This contradicts the fact that the class has fewer than 30 students. The temporary assumption is false. Thus, the second group must have fewer than 15 students.

13) Show that an obtuse triangle cannot contain a right angle.

Assume temporarily that an obtuse triangle has a right angle. Since an obtuse angle is an angle greater than 90 degrees and a right angle has 90 degrees, the sum of both of these angles would be greater than 180 degrees. This is contradictory to the triangle sum theorem in which all angles of a triangle must be 180 degrees. The temporary assumption is false. Therefore, an obtuse triangle cannot contain a right angle.