Name ______________________________ Class ____________ Date ____________

Practice

Form G

Indirect Proof

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

1. A number g is divisible by 2.
Assume temporarily that g is not divisible by 2.

2. There are more than three red houses on the block.
Assume temporarily that there are at most three red houses on the block.

3. $\triangle ABC$ is equilateral.
Assume temporarily that $\triangle ABC$ is not equilateral.

4. $m\angle B < 90$
Assume temporarily that $m\angle B \geq 90$.

5. $\angle C$ is not a right angle.
Assume temporarily that $\angle C$ is a right angle.

6. There are less than 15 pounds of apples in the basket.
Assume temporarily that there are 15 or more pounds of apples in the basket.

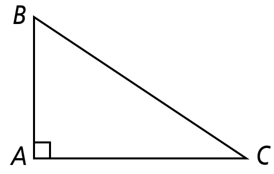
7. If the number ends in 4, then it is not divisible by 5.
Assume temporarily that a number that ends in 4 is divisible by 5.

8. If $\overline{MN} \cong \overline{NO}$, then point N is on the perpendicular bisector of $\overline{MO}$.
Assume temporarily that point N is not on the perpendicular bisector of $\overline{MO}$.

9. If two right triangles have congruent hypotenuses and one pair of congruent legs, then the triangles are congruent. **Assume temporarily that there are two right triangles that are not congruent but have congruent hypotenuses and one pair of congruent legs.**

10. If two parallel lines are intersected by a transversal, then alternate interior angles are congruent. **Assume temporarily that there are two parallel lines intersected by a transversal, with alternate interior angles that are not congruent.**

11. **Developing Proof** Fill in the blanks to prove the following statement: In right $\triangle ABC$, $m\angle B + m\angle C = 90$.



Given: right $\triangle ABC$

Prove: $m\angle B + m\angle C = 90$

Assume temporarily that $m\angle B + m\angle C$ __**$\neq 90$**__. If $m\angle B + m\angle C$ __**$\neq 90$**__, then $m\angle A + m\angle B + m\angle C$ __**$\neq 180$**__. According to the Triangle Angle-Sum Theorem, $m\angle A + m\angle B + m\angle C =$ __**180**__. This contradicts the previous statement, so the temporary assumption is __**false**__.
Therefore, __**$m\angle B + m\angle C = 90$**__.

12. Use indirect reasoning to eliminate all but one of the following answers. In what year was Barack Obama born? **C**

(A) 1809 (B) 1909 (C) 1961 (D) 2000

Name ______________________ Class ____________ Date ____________

Practice (continued)

Form G

Indirect Proof

Identify the two statements that contradict each other.

13. **I.** $\triangle ABC$ is acute. **II.** $\triangle ABC$ is scalene. **III.** $\triangle ABC$ is equilateral. **II and III**

14. **I.** $m\angle B \leq 90$ **II.** $\angle B$ is acute. **III.** $\angle B$ is a right angle. **II and III**

15. **I.** $\overline{FA} \parallel \overline{AC}$
II. $\overline{FA}$ and $\overline{AC}$ are skew.
III. $\overline{FA}$ and $\overline{AC}$ do not intersect. **I and II**

16. **I.** Victoria has art class from 9:00 to 10:00 on Mondays. **I and III**
II. Victoria has math class from 10:30 to 11:30 on Mondays.
III. Victoria has math class from 9:00 to 10:00 on Mondays.

17. **I.** $\triangle MNO$ is acute. **II and III**
II. The centroid and the orthocenter for $\triangle MNO$ are at different points.
III. $\triangle MNO$ is equilateral.

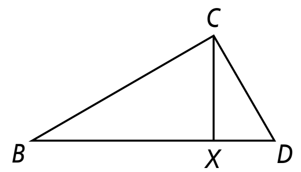
18. **I.** $\triangle ABC$ such that $\angle A$ is obtuse. **I and II**
II. $\triangle ABC$ such that $\angle B$ is obtuse.
III. $\triangle ABC$ such that $\angle C$ is acute.

19. **I.** The orthocenter for $\triangle ABC$ is outside the triangle. **I and III**
II. The median for $\triangle ABC$ is inside the triangle.
III. $\triangle ABC$ is an acute triangle.

Write an indirect proof.

20. **Given:** $m\angle XCD = 30$, $m\angle BCX = 60$, $\angle XCD \cong \angle XBC$

Prove: $\overline{CX} \perp \overline{BD}$



**Assume temporarily that $\overline{CX}$ and $\overline{BD}$ are not perpendicular.
Then, $m\angle BXC \neq 90$.
$m\angle BCX + m\angle BXC + m\angle XBC = 60 + m\angle BXC + 30 + 90 + m\angle BXC$.
If $m\angle BXC \neq 90$, then $m\angle BCX + m\angle BXC + m\angle XBC \neq 180$. The Triangle Angle-Sum Theorem yields $m\angle BCX + m\angle BXC + m\angle XBC = 180$. This contradicts $m\angle BCX + m\angle BXC + m\angle XBC \neq 180$. So, $m\angle BXC = 90$ and $\overline{CX} \perp \overline{BD}$.**

21. It is raining outside. Show that the temperature must be greater than 32°F.

Answers may vary. Sample: Suppose that the temperature is less than or equal to 32°F and it is raining. Because 32°F is the freezing point of water, any precipitation will be in the form of sleet, snow, or freezing rain. This contradicts the original statement. Therefore, the temperature must be above 32°F for it to rain.