Geometry Unit 1 quiz 3: Inductive reasoning, Deductive reasoning, Statements and negation

Name _____ Date _____ Period _____

7 questions, 21 points

1. Rewrite "It is not the case that the point $(3, -2)$ does not lie on the line $2x + y = 4$" as a sentence with no "not" in it. Is it true? Give a reason for each answer. (2 points)

2. Claim: every point that is the same distance from the x-axis as from the y-axis lies on the line $y = x$. Diego checks the points $(2, 2)$, $(5, 5)$ and $(9, 9)$, and the claim holds for each. (3 points)

(a) What did Diego's choice of points have that the claim did not ask for?

(b) Give a counterexample and show exactly that it is one.

(c) Repair the claim by weakening its conclusion, and prove your repair.

3. A proof comes with a figure. For each fact below, say whether the proof may take it from the look of the figure, or whether it must be given or deduced. (3 points)

(a) Points A, B and C lie on one line.

(b) B is between A and C.

(c) $AB = BC$.

(d) $\angle ABD$ measures 90°.

(e) D is in the interior of $\angle ABE$.

(f) Line ℓ is parallel to line m.

(g) $\overline{AC}$ and $\overline{BD}$ cross at a point.

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4. Decide whether each sentence is a statement. For each one that is, write its negation and give the truth value of the negation. (3 points)

(a) The segment from $(0, 0)$ to $(5, 12)$ has length 13.

(b) Find the midpoint of $\overline{PQ}$.

(c) $\frac{5}{8} > \frac{2}{3}$

(d) Triangles are more interesting than circles.

5. Each argument has a step that is not a valid deduction. Say which accepted fact is being misused, why its if-part is not met, and what extra given would make the step valid. (4 points)

(a) A, B and C are three points with $AB = 5$ and $BC = 7$. By the segment addition postulate, $AC = 5 + 7 = 12$.

(b) M is in the interior of $\angle POQ$, and $m\angle POQ = 80°$. So $m\angle POM = 40°$.

6. Points A and B lie on a circle and split it into a larger arc and a smaller arc. Maya marks four points P on the larger arc and measures $\angle APB$ with a protractor each time. She reads 50°, 51°, 49° and 50°. (3 points)

(a) State the conjecture her readings suggest, precisely enough that it could be shown false.

(b) Do the readings 51° and 49° count against your conjecture? Explain.

(c) She then marks a point Q on the smaller arc and reads $m\angle AQB = 130°$. She says this refutes the conjecture. Is she right? Explain.

7. Claim: a quadrilateral with three sides of equal length is a rhombus. (A rhombus is a quadrilateral with four sides of equal length.) (3 points)

(a) Show exactly that $A(0, 0)$, $B(11, 0)$, $C(8, 4)$, $D(3, 4)$ is a counterexample.

(b) Owen notices that $ABCD$ has a pair of parallel sides, and repairs the claim: a quadrilateral with three sides of equal length and no pair of parallel sides is a rhombus. Test his repair on the convex quadrilateral $E(0, 0)$, $F(5, 0)$, $G(8, 4)$, $H(4, 7)$, and say what the result shows about his way of repairing.

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