Geometry Unit 1 quiz 1: Axioms, definitions and theorems, Points, lines and planes, Lines and planes in space

Name _____ Date _____ Period _____

8 questions, 19 points

1. A quadrilateral is a **kite** if its four sides can be split into two pairs, each pair made of two sides that meet at a corner and have the same length. Use the distance formula to decide whether the quadrilateral with corners $A(0,4)$, $B(3,0)$, $C(0,-2)$ and $D(-3,0)$, joined in that order, is a kite. (2 points)

2. A **right triangle** is a triangle with a right angle. In $\triangle PQR$, $\angle Q$ is a right angle. A student writes two steps.

(1) $\triangle PQR$ is a right triangle. Reason: definition of right triangle.

(2) $PQ^2 + QR^2 = PR^2$. Reason: definition of right triangle.

Which step's reason is correct? For the other step, explain what is wrong and what kind of statement must be cited instead. (2 points)

3. Say whether each sentence is a description or a postulate. Then say which of the four may be used as a reason in a proof. (2 points)

(a) A line has no thickness.

(b) Through any two different points there is exactly one line.

(c) A plane is a flat surface that goes on without end.

(d) If two different points of a line lie in a plane, the whole line lies in that plane.

4. Someone proposes this definition: "Points are **coplanar** when they are not collinear." Is it a good definition of coplanar? Test it in both directions, giving an example for each. (2 points)

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5. Three lines are $y = 2x - 1$, $y = -x + 8$ and $x - 2y = -1$. Find every point where two of the lines meet. Do all three lines pass through one point? (3 points)

6. Line ℓ lies in plane P, and line m is parallel to plane P. (3 points)

(a) Can ℓ and m intersect? Explain.

(b) Using the walls, floor and ceiling of a rectangular classroom, give one example where ℓ and m are parallel and one where they are skew.

7. Mateo tests whether $(-5, 11)$, $(1, 2)$ and $(9, -10)$ are collinear. He finds that the slope from the first point to the second is $\frac{-9}{6}$ and the slope from the second point to the third is $\frac{-12}{8}$. The fractions are different, so he says the points are not collinear. Is he right? Explain. (2 points)

8. Take this theorem as proved: **the sum of three consecutive integers is three times the middle one**, that is, $(n - 1) + n + (n + 1) = 3n$ for every integer n. An integer is a **multiple of 3** if it equals $3k$ for some integer k. (3 points)

(a) Prove the corollary: the sum of any three consecutive integers is a multiple of 3.

(b) Use the corollary to decide whether 200 is the sum of three consecutive integers.

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