Geometry Unit 1 worksheet: The midpoint formula

Name _____ Date _____ Period _____

1. In each part M is the midpoint of $\overline{AB}$. Find the missing endpoint.

(a) $A = (2, 5)$, $M = (6, 8)$

(b) $A = (-3, 4)$, $M = (1, -2)$

(c) $A = (7, -1)$, $M = (0, 3)$

(d) $A = (-2.5, 6)$, $M = (1, 1.5)$

(e) $A = \left(\frac{3}{2}, -4\right)$, $M = \left(-1, \frac{1}{2}\right)$

(f) $B = (4, -9)$, $M = (-2, -3)$

2. A **median** of a triangle runs from a corner to the midpoint of the opposite side. Triangle ABC has $A = (-1, -2)$, $B = (8, 3)$ and $C = (2, 9)$.

(a) Find the midpoint M of $\overline{BC}$.

(b) Find the length of the median $\overline{AM}$.

3. On a park map, one grid unit stands for 20 m. A straight boardwalk across a marsh starts at the visitor center $V = (-4, 3)$. A bird hide stands at the exact middle of the boardwalk, at $H = (0, 6)$.

(a) Find the coordinates of the far end E of the boardwalk.

(b) How long is the boardwalk, in meters?

4. Diego is told that $M = (5, -1)$ is the midpoint of $\overline{AB}$ and that $A = (2, -6)$. To find B, he averages A and M and gets (3.5, −3.5).

(a) Show that Diego's point cannot be B.

(b) Diego did find the midpoint of some segment. Which segment?

(c) Find B.

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5. (a) The point $M = (k+2, 2k)$ is the midpoint of the segment from $A = (1, 7)$ to $B = (3k-1, k+5)$. Find k. Then use the other coordinate to check that the same k works, and give B and M.

(b) Can the point (k, k) be the midpoint of the segment from $(2, 6)$ to $(k+4, 0)$ for some number k? Explain.

6. Decide whether the line is the perpendicular bisector of the segment. If it is not, say which condition fails: passing through the midpoint, or being perpendicular to the segment.

(a) The line $y = 2x - 3$ and the segment from $(-1, 4)$ to $(5, 1)$.

(b) The line $y = -x + 5$ and the segment from $(-2, 1)$ to $(4, 7)$.

(c) The line $y = \dfrac{1}{3}x + 2$ and the segment from $(-3, 0)$ to $(3, 4)$.

7. In the complex plane, the numbers $1 + 4i$ and $7 - 2i$ are the ends of a diameter of a circle.

(a) Find the center of the circle, as a complex number, and the radius.

(b) The number $7 + 4i$ is also on the circle. Find the other end of the diameter that starts at $7 + 4i$.

8. Reflecting a point P **through** a point C gives the point P' for which C is the midpoint of $\overline{PP'}$.

(a) Reflect $P = (-2, 5)$ through $C = (1, 3)$ to get P'. Then reflect P' through $D = (4, -1)$ to get P''.

(b) Compare the move from P to P'' with the move from C to D.

(c) Explain why the comparison in (b) holds for every starting point P and every two points C and D.

9. Three corners of a parallelogram are $A = (1, 1)$, $B = (5, 2)$ and $C = (3, 6)$, but you are not told the order of the corners around the shape. The fourth corner D can be in three different places. Find all three.

(Hint: in each parallelogram, one of A, B, C is the corner opposite D, and the diagonals bisect each other.)

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