Number Puzzles and Sequences

A. Fill in the Blanks

1. Perpendicular lines intersect to form a _____ angle.
2. In a coordinate plane, a horizontal line and a vertical line are always _____.
3. The diagonals of a _____ are perpendicular, but the diagonals of a rectangle are not. (Hint: a four-sided shape)
4. If two lines are perpendicular, the four angles they create at the intersection each measure _____ degrees.
5. If line a ⊥ b and line b || c, then line a must be _____ to line c.

B. Match the Following;

Column A	Column B
1. Perpendicular Lines	A. Lines that never intersect.
2. Right Angle	B. ⊥
3. Parallel Lines	C. Lines that intersect to form 90° angles.
4. Perpendicular Symbol	D. An angle that measures exactly 90°.
5. Intersecting Lines	E. Lines that cross at any angle.

C. Find the missing term(s) and describe the rule for each sequence.

1. 3, 8, 13, 18, ___, 28
2. 100, 50, 25, 12.5, ___
3. 7, 3, -1, -5, ___, ___
4. 1, 2, 4, 7, 11, 16, ___
5. 2, 3, 5, 8, 13, ___

D. Find the next term in each sequence.

1. 4, 8, 12, 16, ___
2. 30, 27, 24, 21, ___
3. 2, 4, 8, 16, ___
4. 1, 4, 9, 16, 25, ___
5. 5, 11, 17, 23, 29, ___

E. Challenge Questions

1. In the figure, EF ⊥ GH and ∠EJG = 145°. Find the measure of ∠HJI.
   ∠HJI = _____
2. Line a is perpendicular to line b. Line c is also perpendicular to line b. What is the relationship between line a and line c? Explain your reasoning.
3. A line, L1, passes through the points (1, 2) and (3, 6). Another line, L2, passes through the points (0, 5) and (4, 3). Are these two lines perpendicular? (Hint: Find the slope of each line. The slope $m = (y_2 - y_1) / (x_2 - x_1)$).
4. In the diagram, AC ⊥ BD and ∠BPE = 130°. Find the measure of ∠PCB. (Hint: Angles on a straight line add up to 180°).
   ∠PCB = _____
5. The corners of a cube represent points. The edges represent lines. If you are at one corner of a cube, how many edges connected to that corner are perpendicular to each other?

F. Word Problems & Application

1. A carpenter is building a rectangular window frame. He measures one corner and finds it is 90°. What does this tell him about the two pieces of wood that form that corner?
2. On a city map, 1st Avenue runs perfectly North-South and Washington Street runs perfectly East-West. What is the geometric relationship between the avenue and the street?
3. You are programming a robot to draw a plus sign (+). You program it to draw a vertical line segment. What instruction must you give the robot to draw the second line segment to complete the sign correctly?
4. A sailboat's mast is perpendicular to its deck. If the deck is perfectly flat and represents the x-axis on a coordinate plane, what kind of line does the mast represent?
5. To ensure a wall is perpendicular to the floor, a builder uses a tool to check if the angle is 90°. If she measures an angle of 88°, is the wall perpendicular? What might be a consequence of this?

G. True or False

1. Any two lines that cross are perpendicular. _____
2. Two lines are perpendicular if their slopes are equal. _____
3. The adjacent sides of a perfect square are perpendicular. _____
4. It is possible for two lines to be both parallel and perpendicular. _____
5. A line with a slope of 0 is perpendicular to a line with an undefined slope. _____