

MATH 5: HOMEWORK 02

1. Is it true that any rectangle is also a parallelogram? Is it true that any parallelogram is a rectangle? Try to argue as carefully as you can.
2. To check whether a piece of paper is a square, John folds it along a diagonal. If the corners match, he decides it is a square. Is he right? What if he folds along both diagonals?
3. Cut two identical paper triangles (easiest way: fold a sheet of paper in two and then cut). Can you put them together so that they form a parallelogram? Will your method always work? Why?
4. A boat has speed of 8 miles per hour (mph).
 - (a) Two towns, A and B, are on the shores of a lake. How long would it take the boat to go from A to B and back if the distance between the towns is 10 miles?
 - (b) Two other towns, C and D, also 10 miles apart, are on a river: C is upstream, D is downstream. The river flows at 2 mph. How long will it take the boat to go from C to D? from D to C?
5. A boat travels with a speed of 15 mph in still water. In a river flowing at 5 mph, the boat travels some distance downstream and then returns. What is the ratio of average speed to the speed in still water?

1. EXTRA PROBLEMS (FOR FUN)

1. Consider any four points on the plane such that no three of them are collinear and so that they do not form a rectangle. Any subset consisting of three points form a triangle. (a) How many triangles can you make out of four points? (b) What is the minimum and maximum possible number of obtuse triangles (having an angle $> 90^\circ$) defined by any such four points? Draw examples to exhibit this.
2. Find the angle between the two clock hands at 12:20.
3. Cut a triangle into 4 triangles, **any two** of which have a common boundary (not just a point, but a whole segment!).