

## Math 460: Homework # 1.

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### Rules for writing up proofs on the homework:

- Any fact you use must be from the Course Notes or from previous homework.
  - You must give a justification for every step in your proof (but there are three exceptions: when you draw in a line you don't have to mention BF 7, when you extend a line you don't have to mention BF 9, and when you know two lines are parallel you can assume that any segments on those lines are parallel.)
  - If you are using a definition, say which one it is (that is, say "definition of parallelogram" or "definition of congruent triangles"). If you are using a Basic Fact or Theorem, refer to it by number. If you are using a fact from a previous homework problem, say which problem it was, and make it clear what fact you have in mind.
  - When you use a definition, Basic Fact, or Theorem, say how it applies to your situation. For example, if you use BF 5 or Theorem 2, say what pair of lines you are using and what the transversal is; if you use BF 4, say what pair of similar triangles you are using; if you are using Theorem 7, say what triangle you are applying it to and what the base is.
  - For an if and only if ( $\iff$ ) proof you must say specifically what the given and to prove are for both directions.
  - You must sum up at the end of the proof to show that you proved what was required.
  - If your proof is too complicated for the grader to follow, you may lose points.
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For this assignment you may use anything in the course notes up to Theorem 13.

1. Give the proof of Theorem 2(c).
2. Give the proof of Theorem 12.
3. Give the proof of Theorem 13.

4. (See Figure 1) Given:  $ABCD$  is a parallelogram, and the lines that look straight are straight. To prove:  $E$  is the midpoint of  $FG$ .

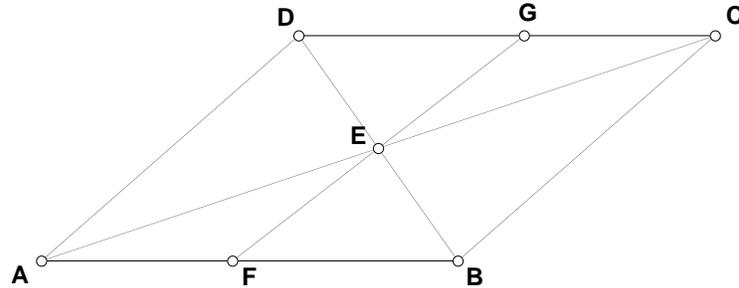


Figure 1

5. (See Figure 2) Given:  $MK = MQ$ ,  $\angle K = \angle Q$ ,  $PM \perp MK$  and  $LM \perp MQ$ . To prove:  $\angle L = \angle P$ .

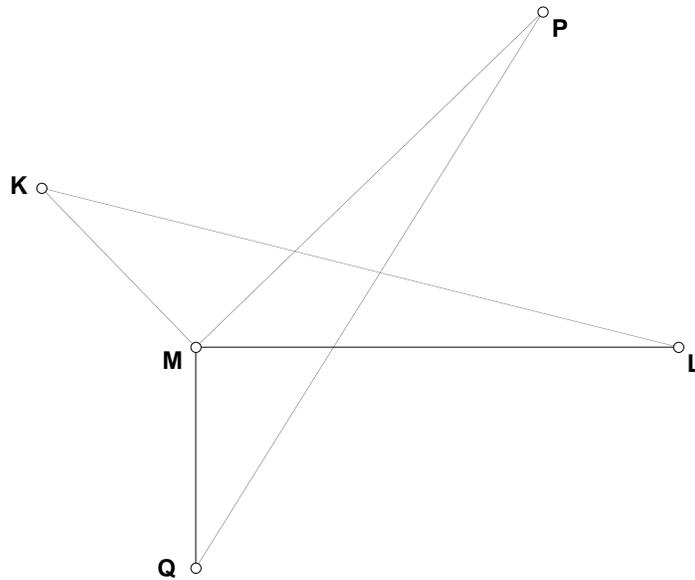


Figure 2

6. (See Figure 3) Given that  $AB$  is perpendicular to  $AC$ , that  $AD$  is perpendicular to  $BC$ , and that  $AB = EB$ , prove that  $\angle 1 = \angle 2$ .

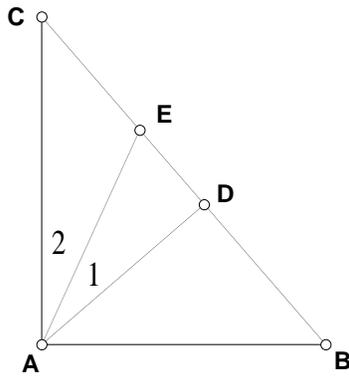


Figure 3

7. (See Figure 4) Given:  $AB$  is parallel to  $CD$ . To prove:  $\triangle ACD$  has the same area as  $\triangle BCD$ .

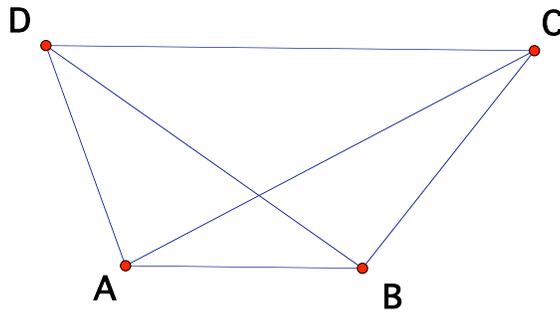


Figure 4

8. (See Figure 5) Given:  $\triangle ABC \sim \triangle DEF$  and  $\frac{AC}{DF} = r$ . To prove: the area of  $\triangle ABC$  is  $r^2$  times the area of  $\triangle DEF$ .

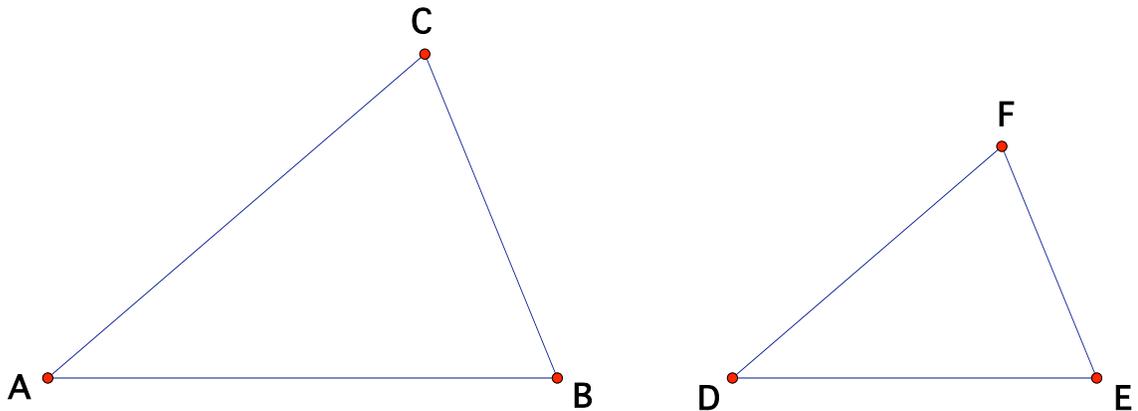


Figure 5

9. (See Figure 6) Given:  $D$  is the midpoint of  $AC$  and  $DE$  is parallel to  $AB$ . To prove:  $\frac{AF}{FE} = 2$ . (Hint: Use similar triangles.)

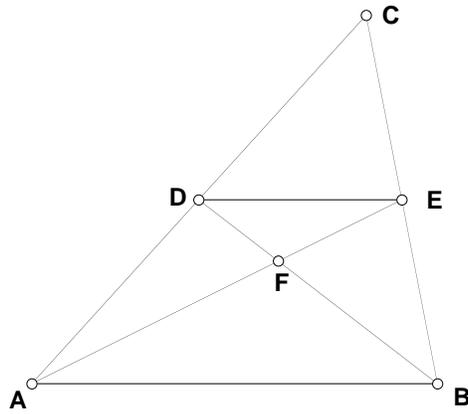


Figure 6

10. (See Figure 7) Given:  $CD$  is parallel to  $AB$ ,  $AD = BC$ , and  $AD$  is **not** parallel to  $BC$ . To prove:  $AE = BE$ .

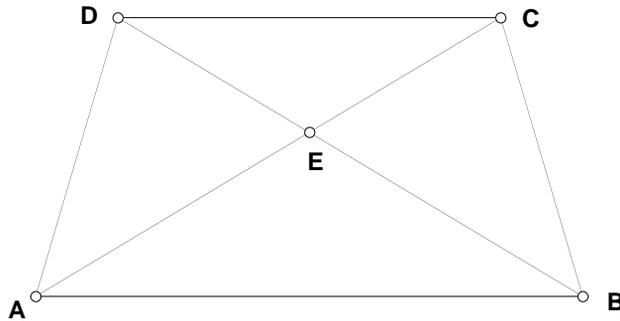


Figure 7