MATH1225 Introduction to Geometry, 2017/2018

Tutorial Sheet 1

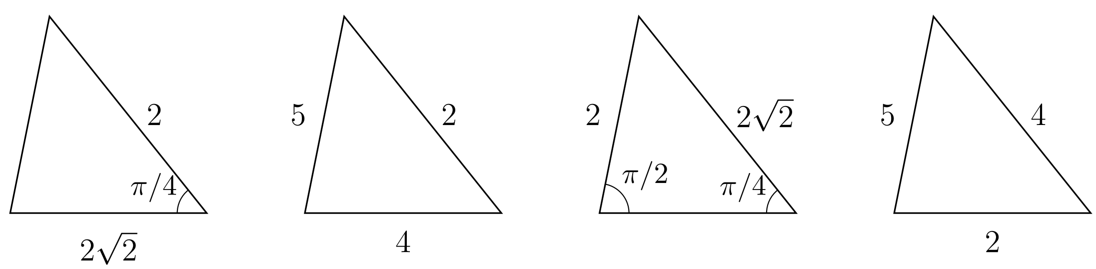
For discussion in the tutorial on Wednesday 11/Thursday 12 October.

1. Consider the statement "Let T be a triangle. If T has an acute angle then T has a right angle." Explain why this statement is **not** true.

Write down the converse to the above statement, and explain why the converse **is** true.

2. Give an example of a statement and its converse (not the same as in Question 1).

3. Determine, with reasons, which of the following triangles are congruent, given the sides and angles shown. (Note that the triangles are not drawn to scale).



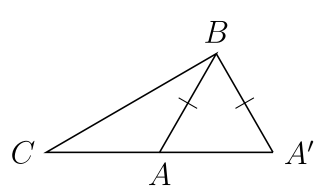
(a) (b) (c) (d)

4. Consider the following statement, which is similar (but different) to the statements (SSS) and (SAS) from the lectures.

(SSA=Side-Side-Angle).

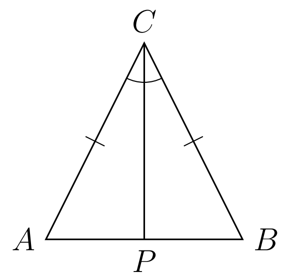
Let ABC and $A'B'C'$ be triangles. Assume that $AB = A'B'$, $BC = B'C'$ and $\angle BCA = \angle B'C'A'$. Then the triangles ABC and $A'B'C'$ are congruent.

By considering the triangles ABC and $A'BC$ in the following diagram, or otherwise, determine whether or not (SSA) is true, giving a careful proof for your answer.



5. Given an angle $\angle ABC$, the *bisector* of the angle is a ray starting at B which cuts the angle $\angle ABC$ into two equal parts.

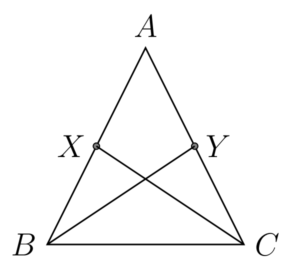
Let ABC be a triangle with $AC = BC$ (recall that a triangle with two sides the same length is called an *isosceles triangle*). Prove that the angles $\angle BAC$ and $\angle CBA$ are equal. (*Hint:* Consider the bisector of the angle $\angle ACB$).



What can you say if all three sides of ABC have the same length? Prove your statement.

6. In the situation in Question 5, show that $AP = BP$ and that the angles $\angle CPA$ and $\angle BPC$ are both right angles.

7. Consider the following figure, and suppose that $AB = AC$ and $AX = AY$. Show that $XC = YB$.



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