Synthetic Geometry

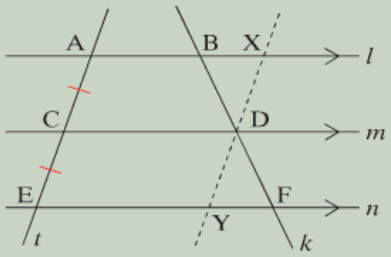
On Paper 2, there will be at least one full question on synthetic geometry, Question 6, and you will have to answer either 6A or 6B. This will be the only choice that you have on Paper 2.

Question 6A will cover the material outlined on the new syllabus for synthetic geometry. This can be summarised as follows.

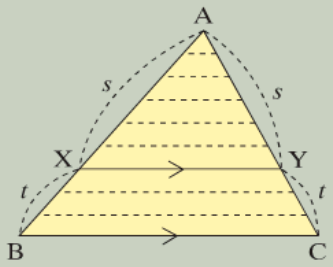
(i) Perform all 22 constructions on the course.
(ii) Explain and give examples of the nine terms in the language of proof outlined by the syllabus.
(iii) Prove theorems 11, 12, and 13.
(iv) Be able to use theorems 7, 8, 11, 12, 13, 16, 17, 18, 20, 21 and corollary 6 to solve problems.

It is likely that Question 6A will deal with one or more of the first three points listed above.

***Theorem 11** If three parallel lines make segments of equal length on a transversal, then they will also make segments of equal length on any other transversal.

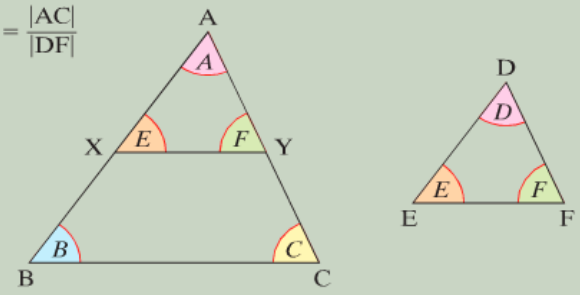


***Theorem 12** Let ABC be a triangle. If a line XY is parallel to BC and cuts [AB] in the ratio $s:t$, then it cuts [AC] also in the same ratio.



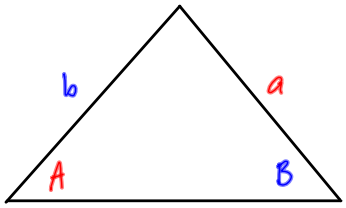
***Theorem 13** If two triangles ABC and DEF are similar, then their sides are proportional in order:

$$\frac{|AB|}{|DE|} = \frac{|BC|}{|EF|} = \frac{|AC|}{|DF|}$$



Theorem 7

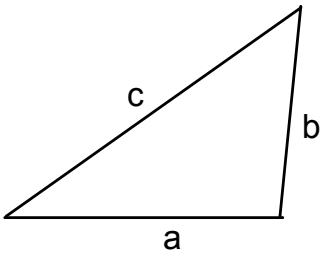
The size of opposite angles and sides are related.



If $\angle A > \angle B$ then $a > b$

Theorem 8

In a triangle the sum of any two sides is greater than the third side.



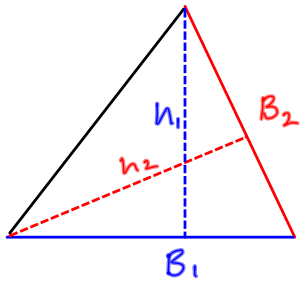
$a + b > c$

$a + c > b$

$b + c > a$

Theorem 16

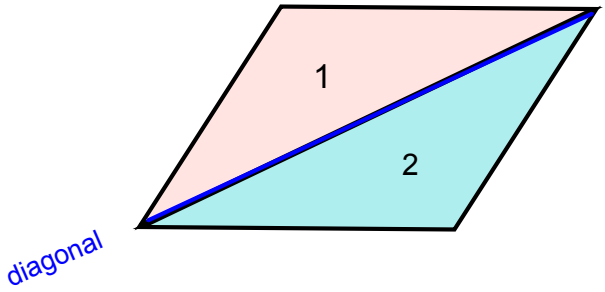
The area of a triangle is half the base times the height regardless of the base chosen.



$$\text{Area} = \frac{B_1 h_1}{2} = \frac{B_2 h_2}{2}$$

Theorem 17

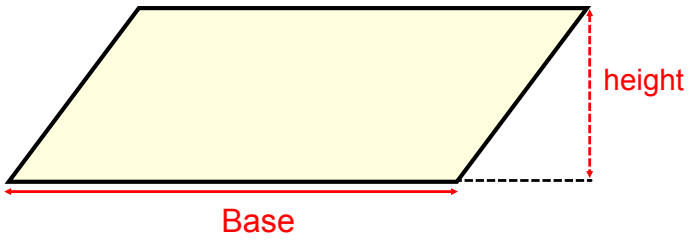
The diagonal bisects the area of a parallelogram.



Area 1 = Area 2

Theorem 18

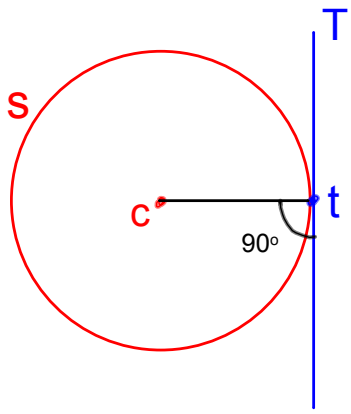
The area of a parallelogram equals the base times the perpendicular height.



$$\text{Area} = Bh$$

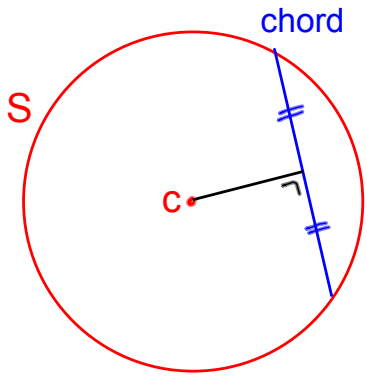
Theorem 20

A tangent is perpendicular to the radius that goes to the point of contact.



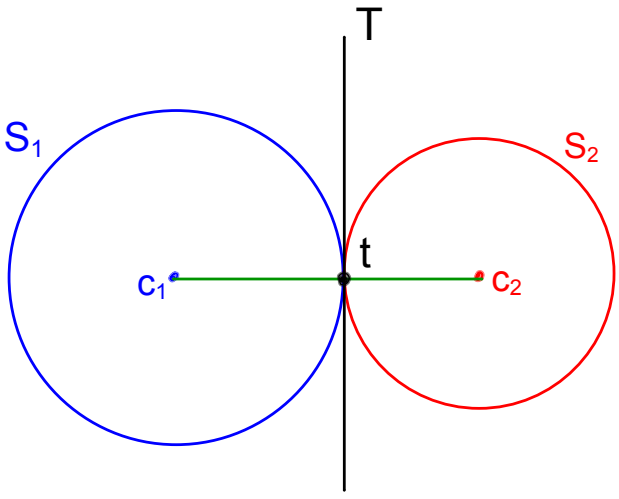
Theorem 21

The perpendicular from the centre of a circle to a chord bisects the chord.



Corollary 6

If 2 circles share a common tangent at one point then the 2 centres and the point are collinear.



Geometry revision

Quizlet

Geometry Terms

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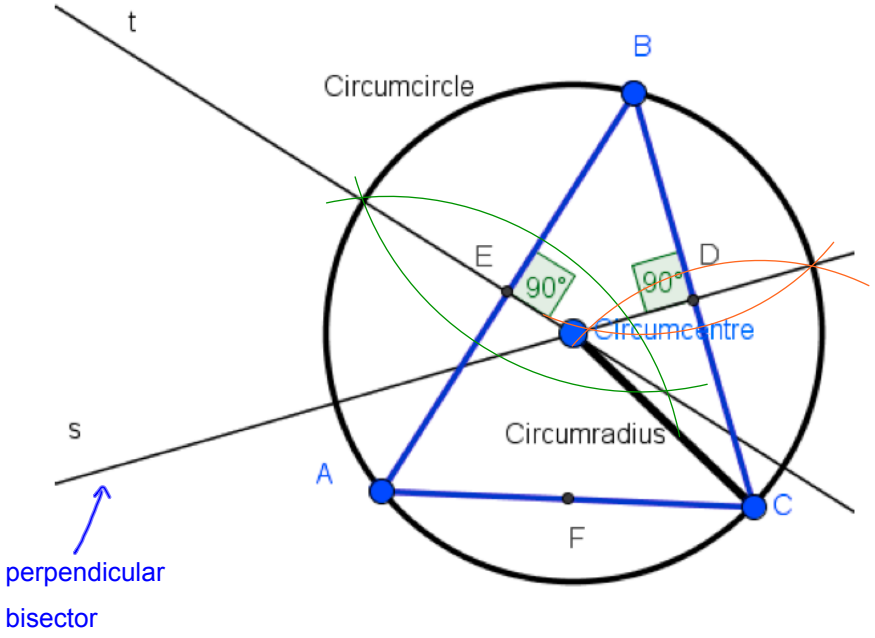
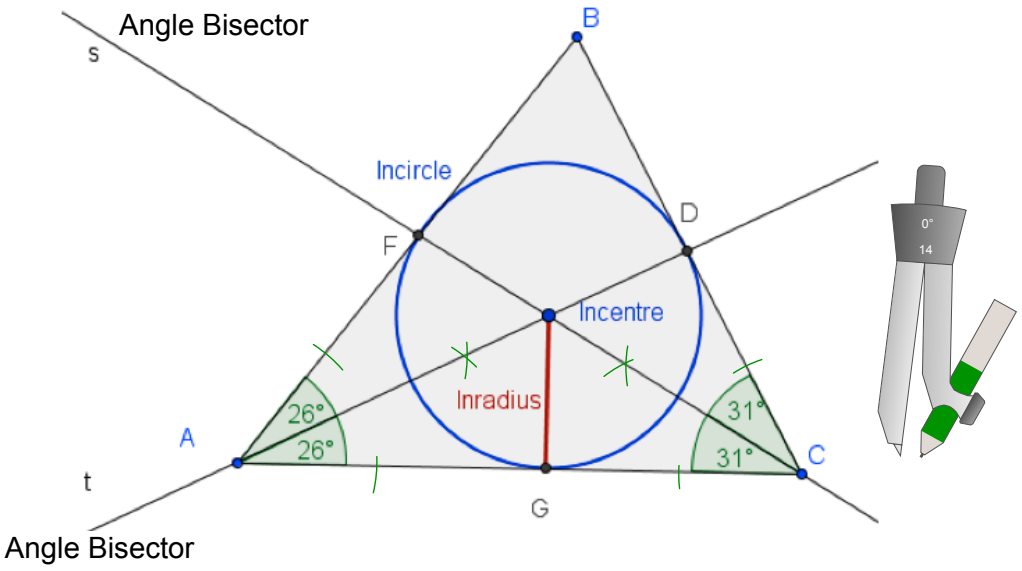
1.	**Axiom**	A statement that is assumed to be true without any proof.
2.	**Congruent**	Two things are congruent if they are identical in size and shape.
3.	**Converse**	The converse of a theorem is a statement that switches the hypothesis and conclusion.
4.	**Corollary**	A statement that is true because it applies an already proven theorem.
5.	**Equivalent**	Two things are equivalent if the have the same value but different forms.
6.	**If and only if**	The first statement is true if and only if the second statement is true, so both statements are true or both statements are false.
7.	**Implies**	If the first statement is true then the second statement is also true.
8.	**Proof**	A logical argument which uses known truths to establish the truth of a statement.
9.	**Proof by contradiction**	A proof that establishes the truth of a statement by showing that the statement being false would imply a contradiction.
10.	**Theorem**	A mathematical statement which we can prove to be true by logical argument of accepted truths.

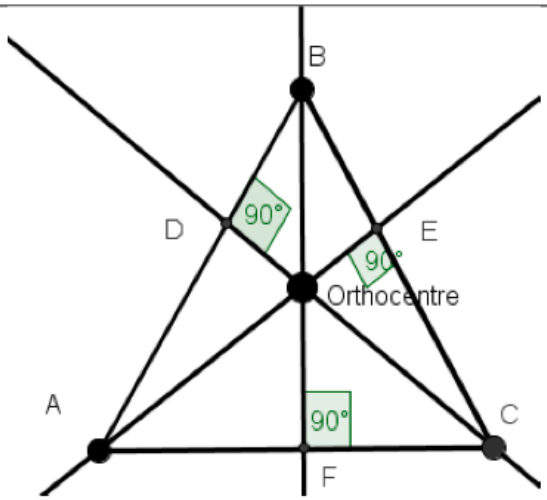
Construction 16: To construct a circumcentre and circumcircle of a given triangle, using only straight edge and compass.



Construction 17: To construct an Incentre and incircle of a given triangle, using only straight edge and compass.



Construction 22: To construct an orthocentre of a triangle.



Construction 21: To construct a centroid of a triangle.