

Name

Class



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Geometric proof

(9 – 1) Topic booklet

Higher

These questions have been collated from previous years GCSE Mathematics papers.

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
– *there may be more space than you need.*
- Diagrams are NOT accurately drawn, unless otherwise indicated.
- You must **show all your working out.**
- If the question is a **1H** question you are not allowed to use a calculator.
- If the question is a **2H** or a **3H** question, you may use a calculator to help you answer.

Information

- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*

Advice

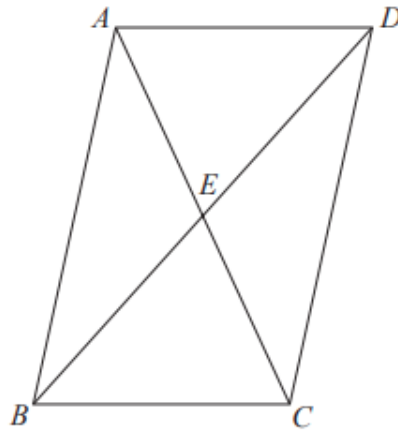
- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Answer ALL questions

Write your answers in the space provided.

You must write down all the stages in your working.

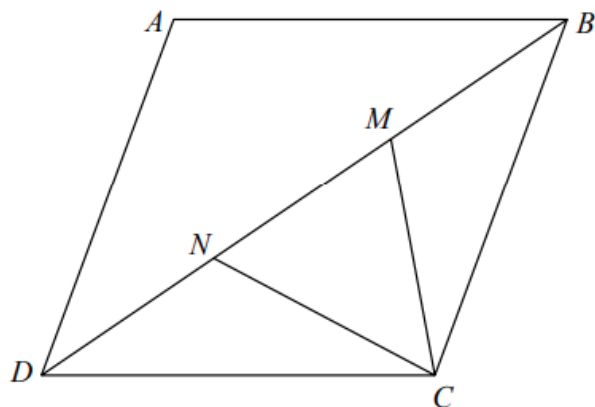
12 $ABCD$ is a parallelogram.



E is the point where the diagonals AC and BD meet.

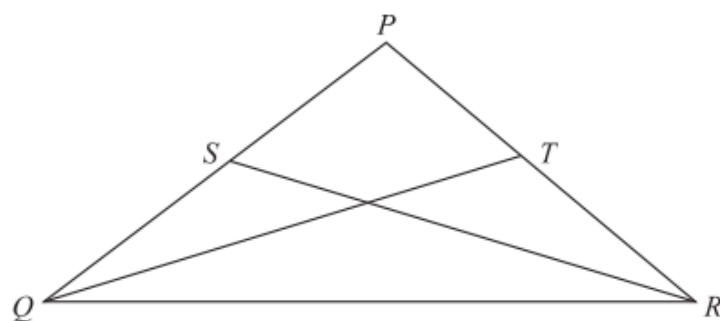
Prove that triangle ABE is congruent to triangle CDE .

13 $ABCD$ is a rhombus.



M and N are points on BD such that $DN = MB$.

Prove that triangle DNC is congruent to triangle BMC .

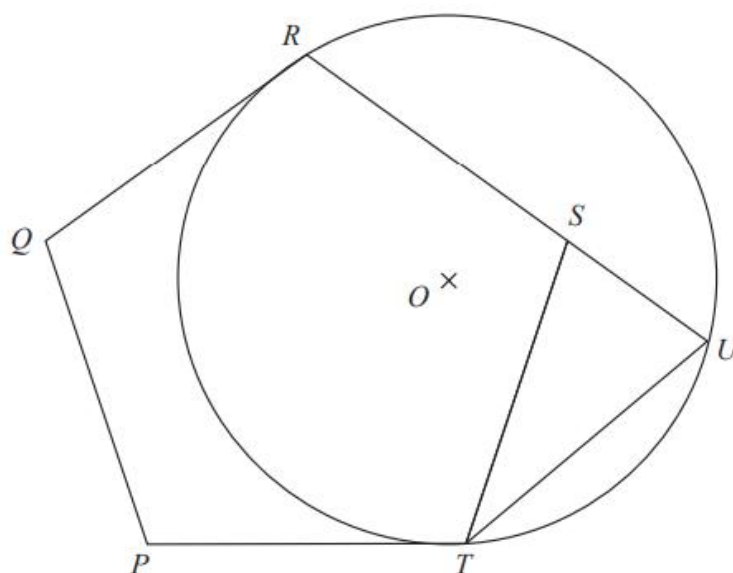


$PQ = PR$.

S is the midpoint of PQ .

T is the midpoint of PR .

Prove triangle QTR is congruent to triangle RSQ .



$PQRST$ is a regular pentagon.

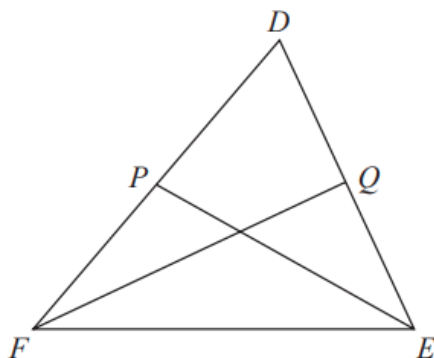
R, U and T are points on a circle, centre O .

\underline{QR} and \underline{PT} are tangents to the circle.

RSU is a straight line.

Prove that $ST = UT$.

21 DEF is a triangle.

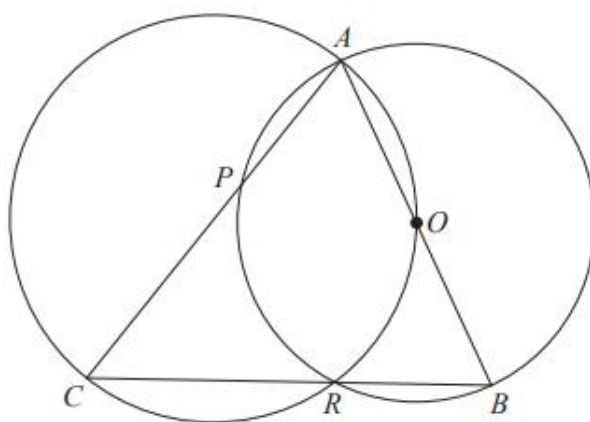


P is the midpoint of FD .

Q is the midpoint of DE .

$$\overrightarrow{FD} = \mathbf{a} \quad \text{and} \quad \overrightarrow{FE} = \mathbf{b}$$

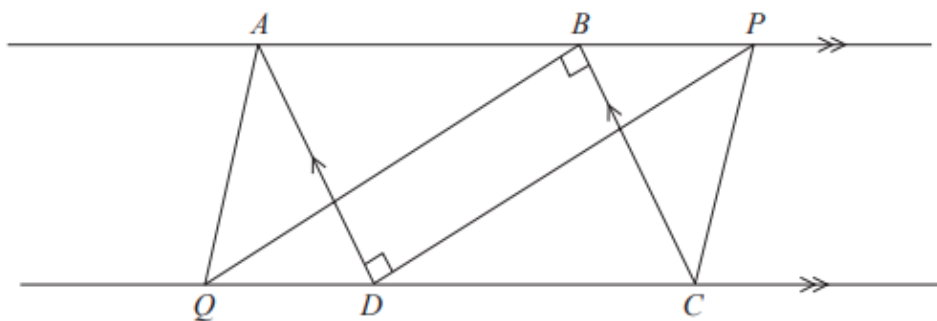
Use a vector method to prove that PQ is parallel to FE .



A , B , R and P are four points on a circle with centre O .
 A , O , R and C are four points on a different circle.
The two circles intersect at the points A and R .

CPA , CRB and AOB are straight lines.

Prove that angle $CAB =$ angle ABC .



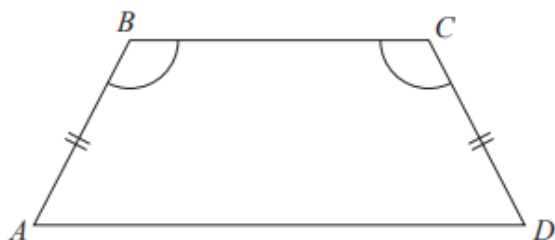
(a) Prove that triangle ADP is congruent to triangle CBQ .

(3)

(b) Explain why AQ is parallel to PC .

(2)

21 $ABCD$ is a quadrilateral.

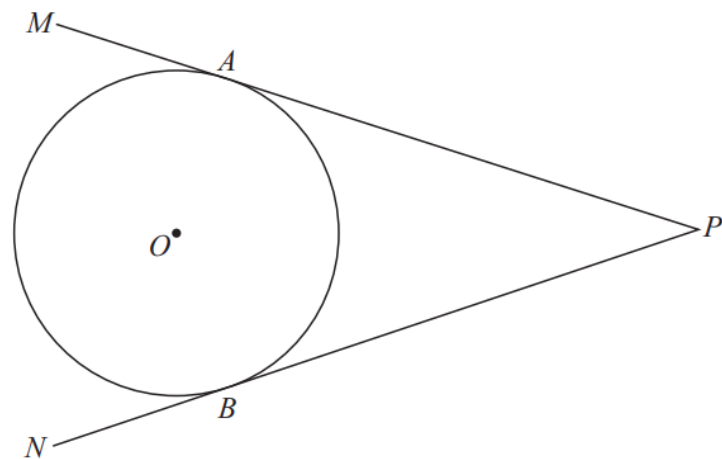


$AB = CD$.

Angle $ABC = \text{angle } BCD$.

Prove that $AC = BD$.

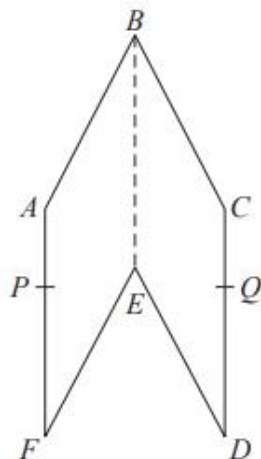
22 A and B are points on a circle, centre O .



MAP and NBP are tangents to the circle.

Prove that $AP = BP$

22 The diagram shows a hexagon $ABCDEF$.

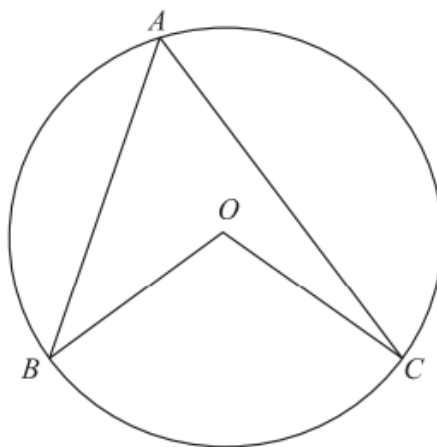


$ABEF$ and $CBED$ are congruent parallelograms where $AB = BC = x$ cm.
 P is the point on AF and Q is the point on CD such that $BP = BQ = 10$ cm.

Given that angle $ABC = 30^\circ$,

prove that $\cos PBQ = 1 - \frac{(2 - \sqrt{3})}{200}x^2$

24 A , B and C are points on the circumference of a circle centre O .



Prove that angle BOC is twice the size of angle BAC .