

1

91031



910310



NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

SUPERVISOR'S USE ONLY

Level 1 Mathematics and Statistics, 2012

91031 Apply geometric reasoning in solving problems

9.30 am Wednesday 14 November 2012

Credits: Four

Achievement	Achievement with Merit	Achievement with Excellence
Apply geometric reasoning in solving problems.	Apply geometric reasoning, using relational thinking, in solving problems.	Apply geometric reasoning, using extended abstract thinking, in solving problems.

Check that the National Student Number (NSN) on your admission slip is the same as the number at the top of this page.

You should attempt ALL the questions in this booklet.

Show ALL working.

If you need more space for any answer, use the page(s) provided at the back of this booklet and clearly number the question.

Check that this booklet has pages 2–15 in the correct order and that none of these pages is blank.

YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.

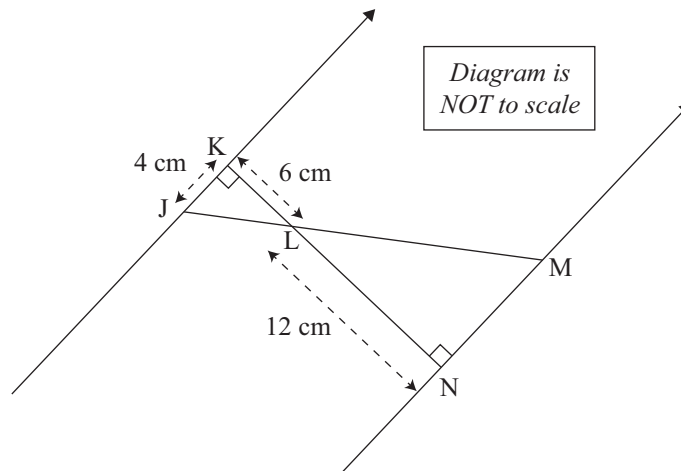
TOTAL

ASSESSOR'S USE ONLY

You are advised to spend 60 minutes answering the questions in this booklet.

QUESTION ONE

- (a) Marcus is investigating the angles in the diagram below:



- (i) Marcus calculates that angle KJL is 56.3° (1dp).

Is he correct?

Explain your reasoning clearly.

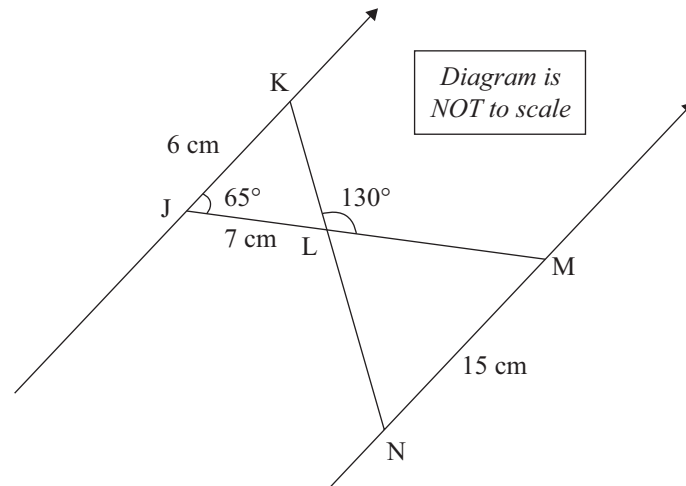
- (ii) Find the size of angle MLN.

Give geometric reasons.

- (iii) Find the length of the line MN.

You must show your working and give reasons.

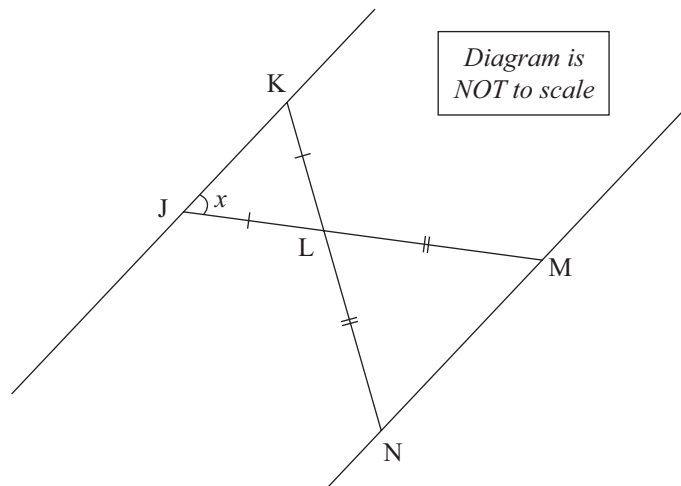
(b) Marcus draws another diagram:



Find the size of angle LNM.

Give geometric reasons.

- (c) Marcus wonders if some of the properties in the diagram on the previous page are **always** true. He investigates by renaming angle KJL as x .



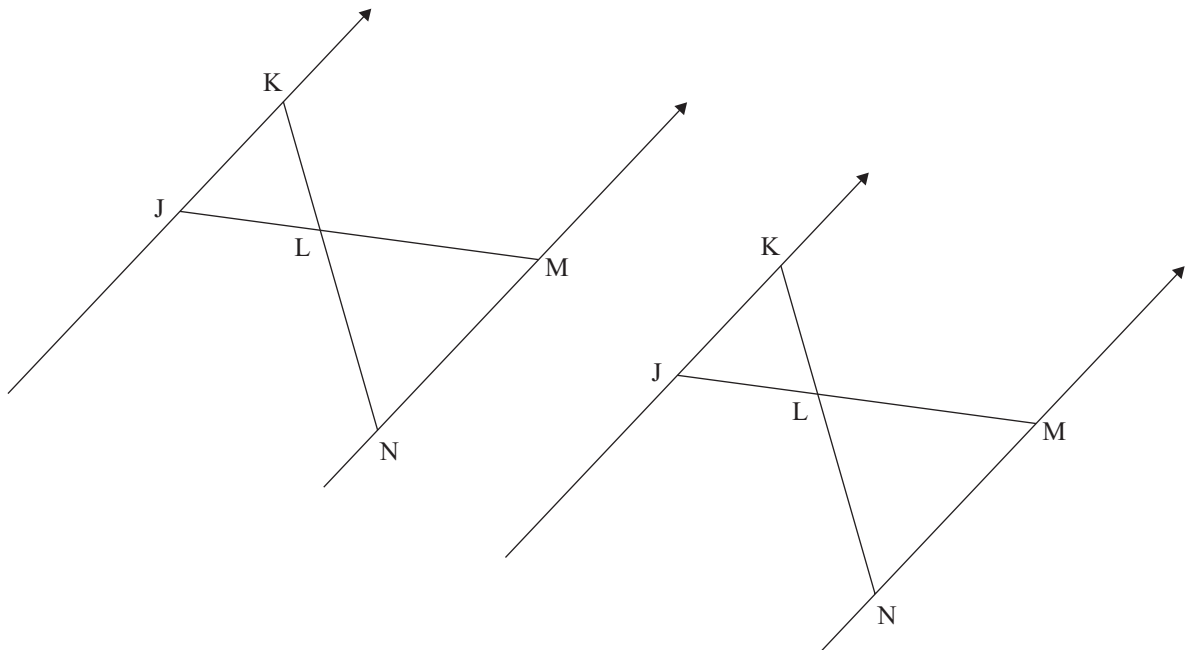
- (i) Both triangle JKL and triangle LMN are isosceles.

Show that JK must be parallel to NM.

(ii) From part (i) we know that if triangle JKL is isosceles, JK must be parallel to NM.

If JK is parallel to NM, must triangle JKL always be isosceles?

You may wish to use the diagrams supplied.



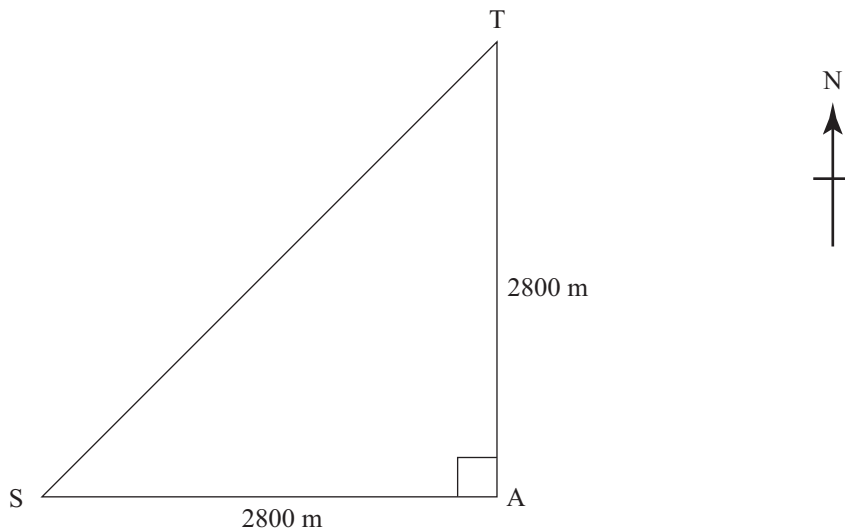
QUESTION TWO

Pita is working on designs for a triangular course for a jet-boat race. On each course, S marks the start and the finish of the course.

- (a) His first design has the boats travelling for 2800 m due East (on a bearing of 090°) from S to marker A.

Then they travel North for another 2800 m to marker T, before returning to S.

This course is drawn below:

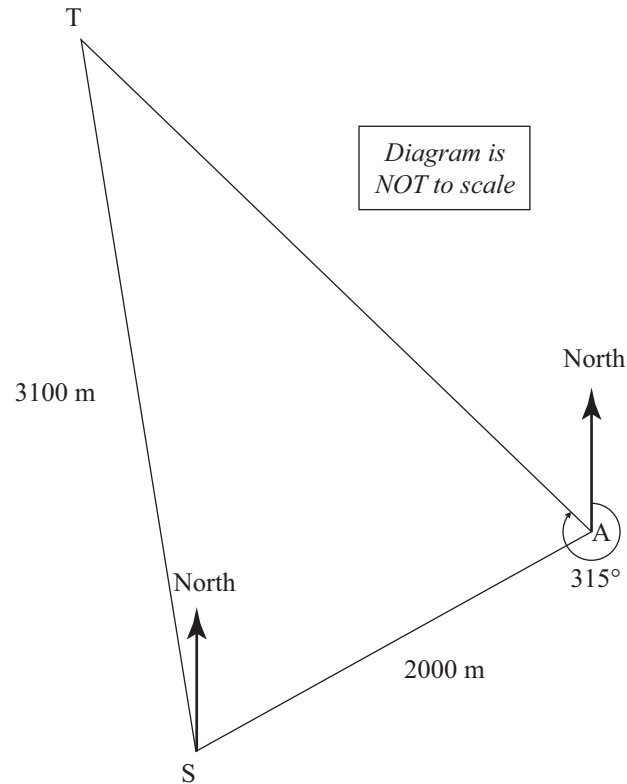


- (i) What is the total length of the course?

- (ii) Explain why the bearing of T from S is 045° .

Give geometrical reasons.

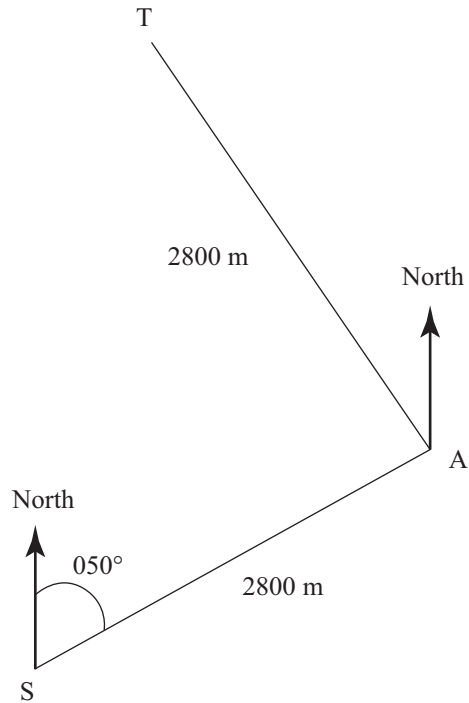
- (b) Pita's second design is constructed as follows:
 Start at S, travel for 2000 m on a bearing of 045° to reach A.
 From A, travel on a bearing of 315° to reach T.
 Finally, travel the 3100 m straight back to S.



- (i) What is the total length of this course?

- (ii) What is the bearing of T from S?

- (c) Pita's final design has these directions for the boats:
 Start at S and travel for 2800 m on a bearing of 050° to marker A
 From A, travel for another 2800 m on a bearing of 330° to T
 Finally, head straight back to S.



- (i) Pita calculates that angle SAT is 100° .
 Use geometric reasoning to explain why he is correct.

- (ii) Find the total length of this course. Show your working clearly.

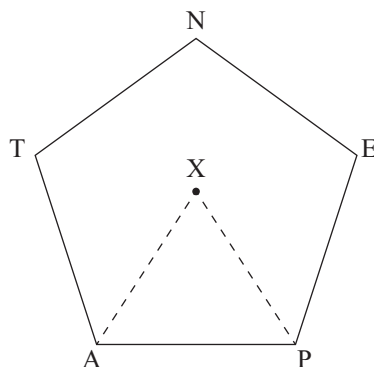
**This page has been deliberately left blank.
The examination continues on the following page.**

QUESTION THREE

Amy constructs a regular pentagon.

Each side is 10 cm long.

X is the centre of the pentagon.



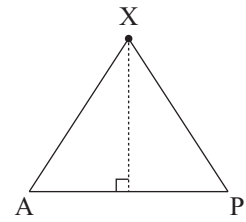
- (a) Amy measures the angle APE and finds it to be exactly 110° .

Is this correct?

Give geometric reasons.

- (b) What type of triangle is triangle APX? (Give geometric reasons.)

- (c) (i) Find the height of triangle APX.



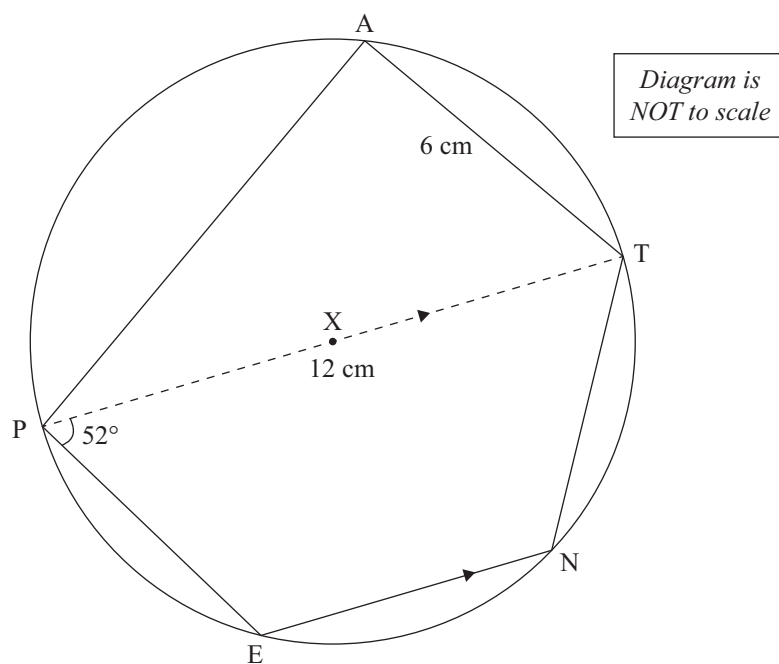
- (ii) Find the area of the whole pentagon. (Area of a triangle = $\frac{1}{2}$ base \times height.)

- (iii) Suppose a regular **polygon** has n sides and each side is 10 cm long.

Find an expression for the area of the polygon.

Explain your reasoning clearly.

- (d) Amy draws another pentagon which is cyclic but not regular.
 PT is parallel to EN.
 PXT is a diameter.
 X is the centre of the circle.



- (i) Amy thinks that angle PAT is 90° .

Is she correct?

Give a geometric reason.

- (ii) Calculate the size of angle NXE.

Give geometric reasons.

91031