



Government
of South Australia

SACE
Board of SA

External Examination 2011

2011 MATHEMATICAL APPLICATIONS, Semester 2

FOR OFFICE
USE ONLY

SUPERVISOR CHECK

RE-MARKED

ATTACH SACE REGISTRATION NUMBER LABEL
TO THIS BOX

Graphics calculator

Brand _____

Model _____

Computer software

Friday 4 November: 1.30 p.m.

Time: 1½ hours

Pages: 10
Questions: 3

Topic 1: Applied Geometry

Examination material: two question booklets
two SACE registration number labels

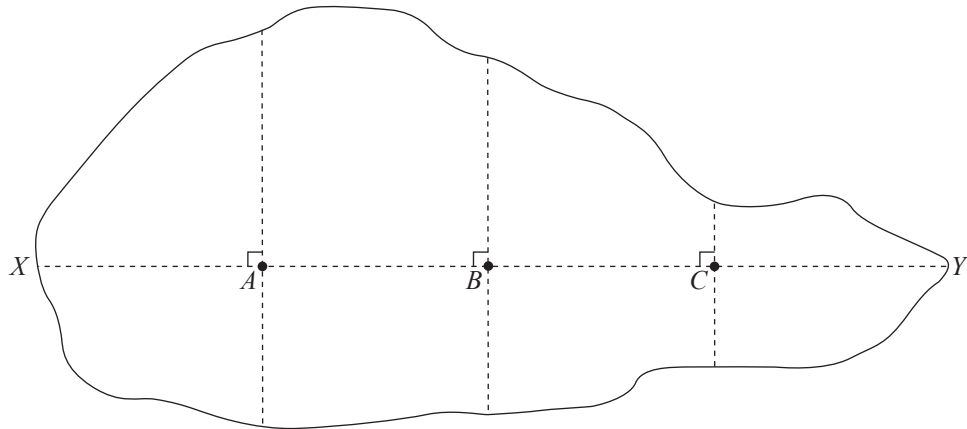
Approved dictionaries, notes, calculators, and computer software may be used.

Instructions to Students

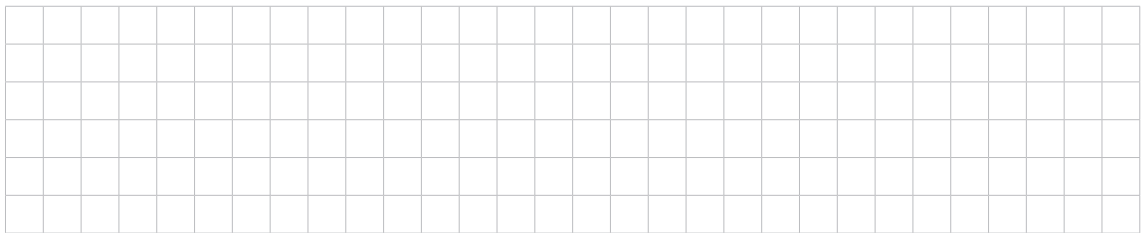
- You will have 10 minutes to read the question booklets. You must not write in your question booklets or use a calculator during this reading time but you may make notes on the scribbling paper provided.
- Each of the following five topics is printed in a separate question booklet. **Tick the boxes by the two topics you have studied in Semester 2:**
 - Topic 1: Applied Geometry
 - Topic 2: Investment and Loans
 - Topic 3: Mathematics and Small Business
 - Topic 6: Share Investments
 - Topic 7: Statistics and Working with Data.
- The total mark for each topic is 35.
- Answer **all** parts of Questions 1 to 3 in the spaces provided in this question booklet. There is no need to fill all the space provided.
- Show all working in this booklet. (You are strongly advised **not** to use scribbling paper. Work that you consider incorrect should be crossed out with a single line.)
- Write on page 5 if you need more space. Make sure to label each answer carefully.
- Use only black or blue pens for all work other than graphs and diagrams, for which you may use a sharp dark pencil.
- Appropriate steps of logic and correct answers are required.
- Marks may be deducted if you do not clearly show all steps in the solution of problems, if your answers have an inappropriate number of decimal places, or if you use incorrect units.
- Diagrams, where given, are not necessarily drawn to scale.
- Complete the box on the top right-hand side of this page with information about the electronic technology you are using in this examination.
- Attach one of your SACE registration number labels to the box at the top of this page.
- At the end of the examination, place one question booklet inside the back cover of the other question booklet.

QUESTION 1

The goldfish in an aquarium are to be moved into a pond. A *scaled* plan of the pond is shown below:

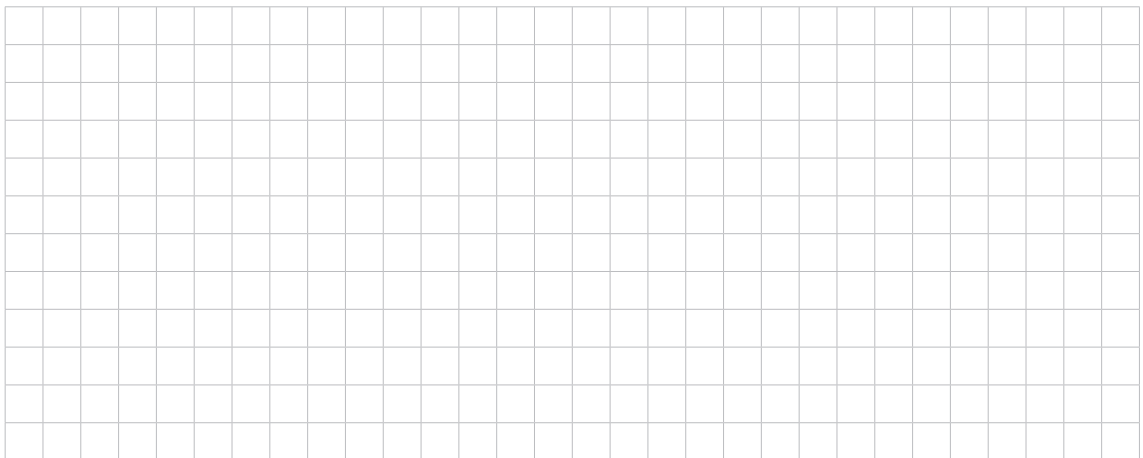


- (a) (i) The length of the pond, XY , is 4.8 metres. Show that the scale of the diagram is 1:40.



(1 mark)

- (ii) On the plan above, measure the length of the perpendicular offsets through points A , B , and C to the edges of the pond. Hence find the actual length of each offset in metres.



(2 marks)

(iii) Calculate an estimate of the surface area of the pond in square metres.

(3 marks)

(b) Goldfish live off oxygen dissolved in water. To have enough oxygen to survive, an adult goldfish needs 370 square centimetres of surface area for each centimetre of its length.

(i) Calculate the surface area needed by one adult goldfish that is 20 centimetres in length.

(1 mark)

(ii) Assume that this pond has a surface area of 6 square metres.

How many adult goldfish could live in the pond?

(2 marks)

(c) Assuming that the measurements are correct, identify *one other* assumption that has been made in part (b).

(1 mark)

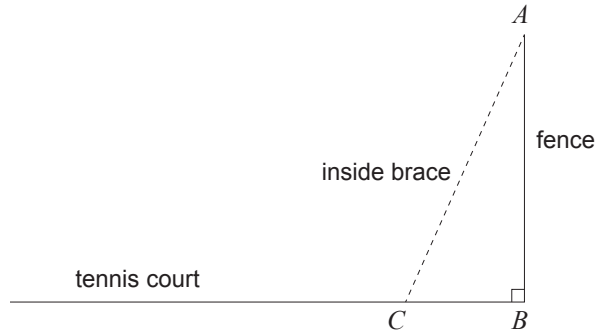
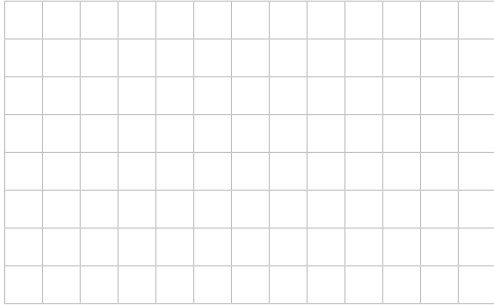
You may write on this page if you need more space to finish your answers to Topic 1. Make sure to label each answer carefully (e.g. 'Question 3(c) continued').



QUESTION 2

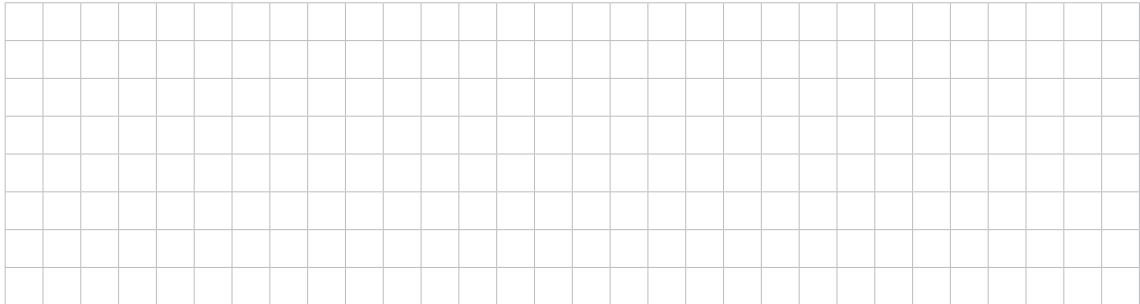
The fence around a tennis court needs to be strengthened with braces. The height of the fence is 4.8 metres.

- (a) Find the length of the brace needed on the inside of the tennis court (AC in the diagram below) if the length of BC is 1.1 metres.



(1 mark)

- (b) Find the angle between the brace and the fence ($\angle CAB$).



(2 marks)

QUESTION 3

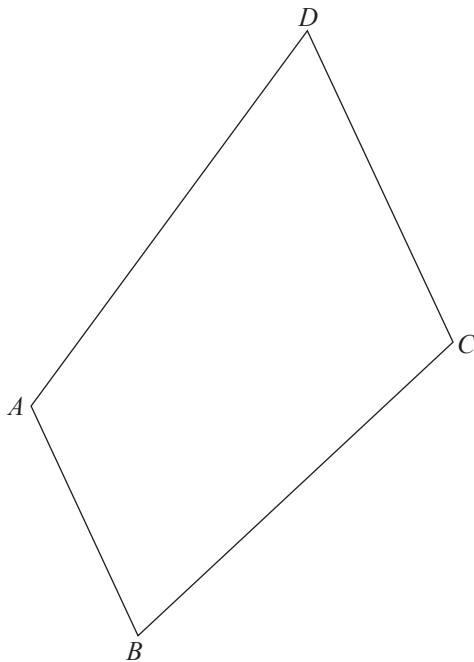
Andrew is a farmer. He has decided to lease a paddock from his neighbour and needs to know the size of the paddock. He has driven his utility alongside the four fences shown in the diagram below and obtained the following measurements:

$$A \text{ to } B — 340 \text{ m} \quad B \text{ to } C — 570 \text{ m} \quad C \text{ to } D — 450 \text{ m} \quad D \text{ to } A — 610 \text{ m}$$

At corner B , Andrew also used a magnetic compass to take bearings along the two adjacent fences, with the following results:

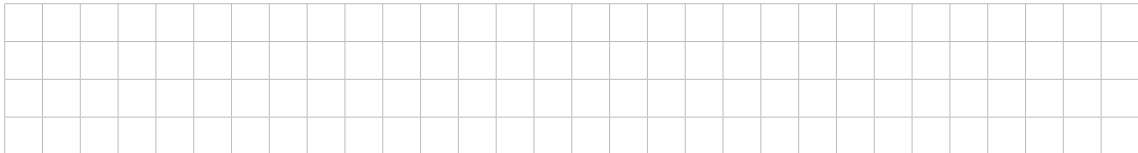
$$B \text{ to } A — 335^\circ\text{T} \quad B \text{ to } C — 47^\circ\text{T}$$

(a) Add to the diagram below (*not to scale*) the information that Andrew obtained.



(2 marks)

(b) Show that the angle between the fences that meet at corner B is 72° .



(1 mark)

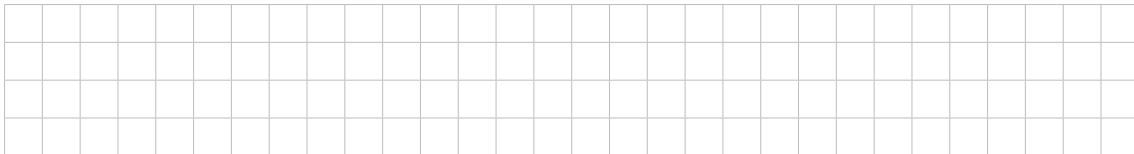
(c) Calculate the distance diagonally across the paddock from corner A to corner C .



(3 marks)

(d) Andrew intends to build a fence across the paddock from corner A to corner C . He assumes that the paddock is flat.

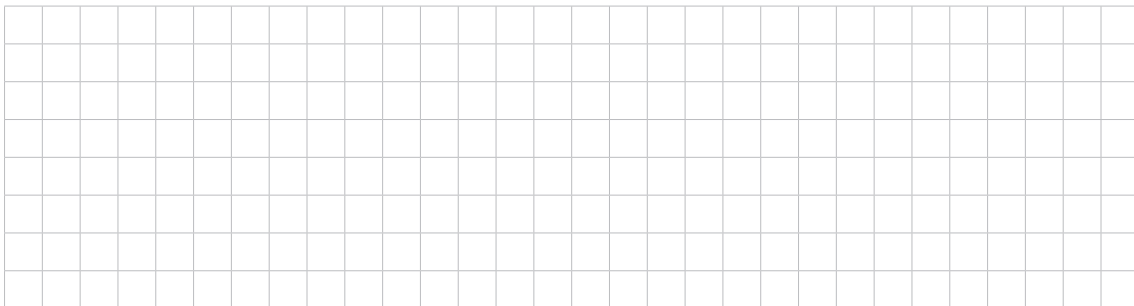
Why might this assumption leave him short of fencing material?



(1 mark)

(e) (i) Using the formula $\text{area} = \frac{1}{2}ab \sin \theta$, find the area of the part of the paddock formed by the triangle ABC , in hectares.

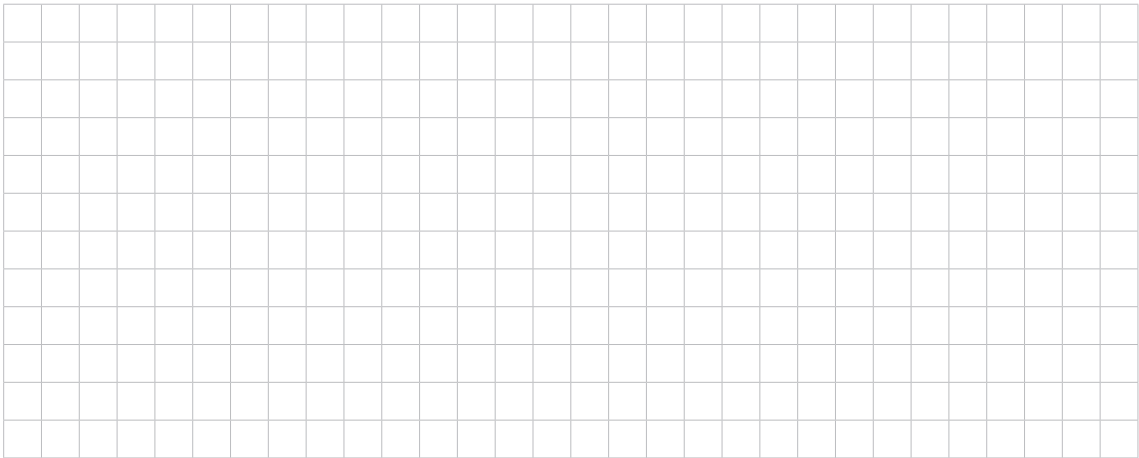
Note that 1 hectare = 10000 square metres.



(2 marks)

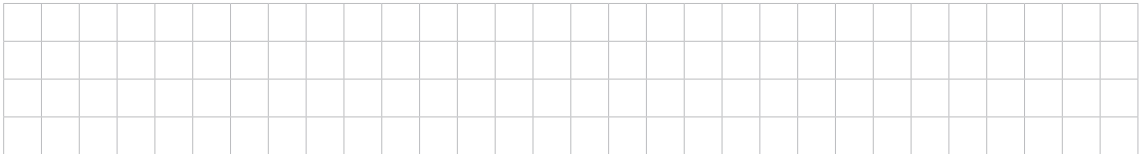
- (ii) The measurements that Andrew took were not precise. The measurements that he obtained using the utility were accurate only to within 10 metres. His reading of the magnetic compass could have varied by as much as 2° .

Using this information, find the maximum possible value for the area ABC .



(3 marks)

- (iii) Using (e) parts (i) and (ii), calculate the relative (percentage) error for the area ABC .



(1 mark)