

**REPUBLIC OF SOUTH AFRICA**  
**DEPARTMENT OF MINERALS AND ENERGY**  
**EXAMINATION FOR THE MINE SURVEYORS CERTIFICATE OF COMPETENCY**

DATE: 11 October 2007 (Thursday)  
TIME: 8:30 to 11:30 (3 Hours)

TOTAL MARKS: 100  
TO PASS: 50

**SURVEY I**

- Note:**
- (1) Work to 1 second of arc and 0,001m except where stated otherwise.
  - (2) All steps and checks must be shown.
  - (3) Functions must be shown to six (6) decimal places.
  - (4) Sketches are not drawn to scale.
  - (5) The make and model number of your calculator **must** be written on the front cover of your answer book.

**QUESTION 1**

- a) Briefly describe what is meant by the following terms
  - i. Datum plane
  - ii. Line of sight
  - iii. Parallax
  - iv. Benchmark
  - v. Back sight
- b) Name four different types of levels.
- c) Name three methods of levelling.
- d) Mention two objectives of levelling.

[17 marks]

**QUESTION 2**

- a) What is Tacheometry
- b) Name two main systems or methods used in Tacheometry.
- c) A Tacheometer was set up over a benchmark R and the following observations were taken to station S.

	Height of instrument	Vertical Angle	Reading on staff
Stadia	1,463	8:46:00	1,701
			1,463
			1,225
Tangential	1,463	11:45:00	3,964
		08:06:10	0,912

Given: Elevation of benchmark R = 1 134,373 metres AMSL  
Multiplying constant of instrument = 100

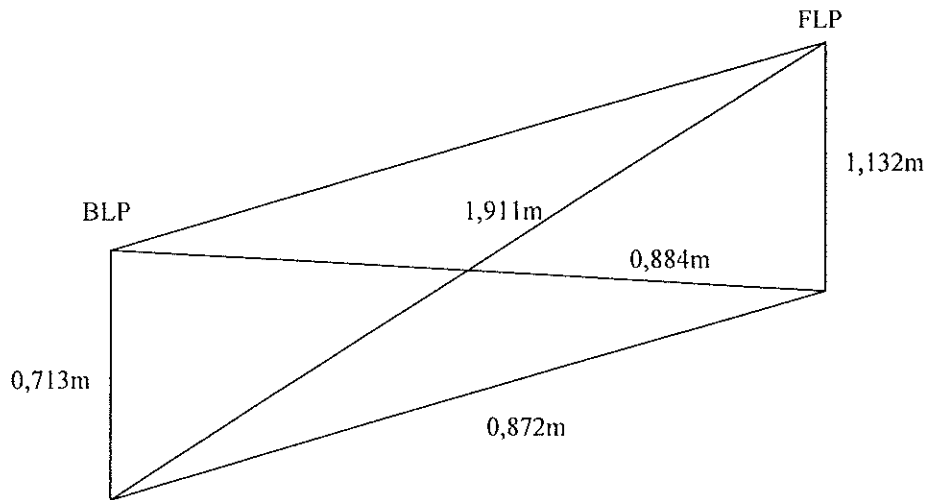
Calculate by both Stadia and Tangential methods, the horizontal distance from R to S and the Elevation of S.

[15 marks]

**QUESTION 3**

a) What do you understand by the term “grading” with reference to flat and inclined ends?

b) Two line pegs BLP and FLP were installed in an ore pass underground and measurements were taken as shown on the sketch. Grade chains must be cut for the line pegs to give a grade of +50 degrees. If you make the chain length at BLP, 1 metre in length, calculate the chain length at the FLP, showing all checks.



[17 marks]

**QUESTION 4**

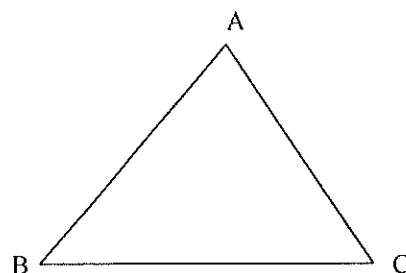
A planimeter set to read square centimeters was used to get an area on a plan of a field. The reading on the planimeter was 6,34. If the scale of the plan is a) 1: 200, b) 1: 500, c) 1: 1 000, d) 1: 1 500, e) 1: 2 500, what would the respective areas be ?

[11 marks]

**QUESTION 5**

Given the following  
 $BC = 29,360m$   
 $BA = 33,500m$   
 $\text{Angle } B = 53:15:06$

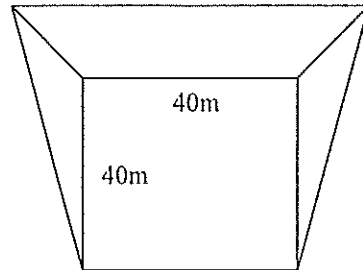
Calculate Angles A and C and area ABC



[15 Marks]

### QUESTION 6

A building site is to be excavated on a hill sloping at 10 degrees to the horizontal. If the horizontal base of the site is to be 40m by 40m, and the sides of the excavation are to slope at 1m vertical for 1,5m horizontal, calculate the volume of earth to be excavated. Answer to the nearest  $m^3$ .



[12 marks]

### QUESTION 7

Five closed contour lines at 2,0m intervals of a rock dump drawn on a plan to a scale of 1:1 000 are planimetered with the following results.

Top contour	=	32,3 $cm^2$
2 <sup>nd</sup> contour	=	37,5 $cm^2$
3 <sup>rd</sup> contour	=	44,1 $cm^2$
4 <sup>th</sup> contour	=	50,3 $cm^2$
Bottom contour	=	57,0 $cm^2$

Calculate the total tons of the rock in this dump, given that the relative density of broken rock = 1,67  $t/m^3$ .

[13 marks]

[Total 100 marks]