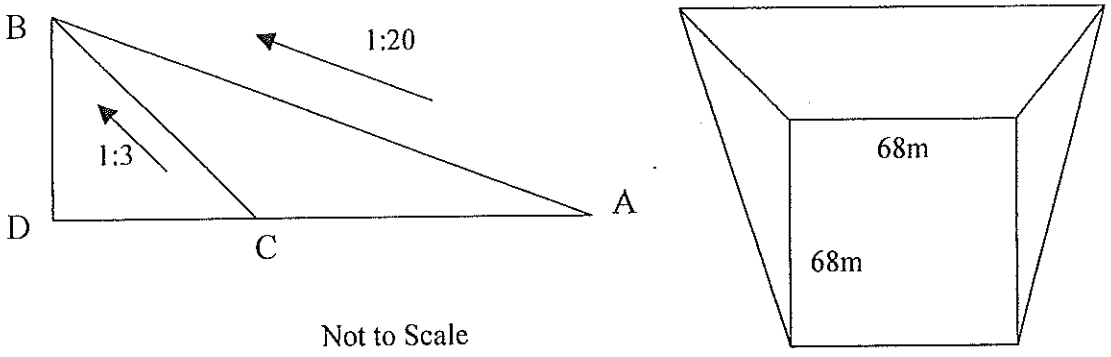
REPUBLIC OF SOUTH AFRICA
DEPARTMENT OF MINERALS AND ENERGY
EXAMINATION FOR THE MINE SURVEYORS CERTIFICATE OF COMPETENCY

DATE: 16 April 2004 (Friday) TOTAL MARKS: **100**
TIME: 08:30 to 11:30 (3 Hours) TO PASS: **50**

## SURVEY II

**Note:**
(1) Work to 1 second of arc and 0.001m.
(2) All steps and checks must be shown.
(3) Logs and 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




Not to Scale

An excavation needs to be made for the foundation of a building on ground, the surface of which slopes evenly at a grade of 1:20. The required excavation must have a level bottom of 68m square with side and back slopes of 1:3.

Calculate the volume of the excavation

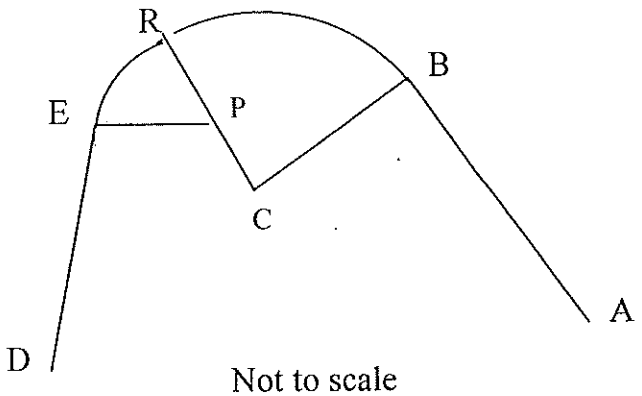
[12 marks]

### QUESTION 2

AB and ED are the centre lines of two straight portions of a railway track, which are to be connected by means of a double curve BRE.
BR is the one circular curve and RE the other.

| | | Y | X | | |
|---|---|---|---|---|---|
| Given co-ords | B | + 440,000 | + 150,000 | Radius CB | 500,000m |
| | E | + 50,000 | + 500,000 | | |

Directions: AB = 348:30:00 ED = 264:30:00



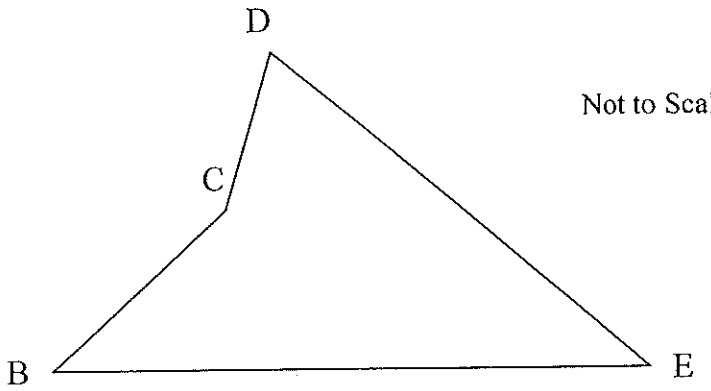

Not to scale

Calculate

a) Co-ordinates of R
b) Co-ordinates of P
c) Radius PE

[25 marks]

**QUESTION 3**




Not to Scale

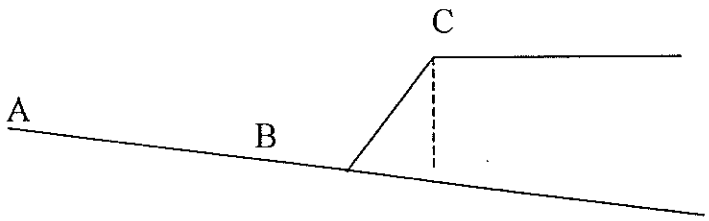
The Area of figure B C D E is 46 850,00m$^2$

From the information given in the table below you are requested to fill in the missing data.

| Angles | Sides (m) | Co-ordinates Y X |
|---|---|---|
| B = 16:29:10 | BC Missing | B) + 330,000 + 370,000 |
| C = 210:35:50 | CD Missing | C) Missing |
| D = 43:15:20 | DE Missing | D) Missing |
| E = 89:39:40 | | E) + 490,000 - 70,000 |

[24 marks]

QUESTION 4




Not to scale

An instrument was set up at point A on the ground and the vertical angle taken to point C on top of a dump. The telescope was then depressed and a mark B established on the ground in line with A and C. The vertical angle and the stadia readings were observed from A to B. At B the vertical angle was taken to C.

Data,

| | | |
|---|---|---|
| Multiplying constant of instrument | = | 100 |
| Additive constant of instrument | = | Nil |
| Elevation at point A | = | 1 712,801 m AMSL |
| Height of instrument at both A and B | = | 1,372 metres |

Instrument at A:

| | | |
|---|---|---|
| Vertical angle to C | = | + 8:10:00 |
| Vertical angle to B | = | - 7:00:00 |
| Stadia readings to B | = | 2,387 and 0,357 |

Instrument at B:

| | | |
|---|---|---|
| Vertical angle to C | = | + 36:20:00 |

Assuming the slope of the ground from A to B to continue to vertically below C, and given the data given above,

Calculate,

a) The elevation of point C
b) The vertical depth of the dump below C.

[12 marks]