

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

DATE: 20 APRIL 2006 (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) 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

You are the appointed Mine Surveyor on a deep level gold mine, and for the last nine months your Mine Call Factor (MCF) has dropped by 10% from historical budget levels. Your Mine Manager does not want to know what possible reasons there could be for this but instead wants to look to the future and has asked you to put a grade management protocol in place so that the MCF can be at a more consistent budget level going forward.

Give the 10 main focus areas, with explanations, you would look at to ensure a higher more consistent MCF.

[10 marks]

QUESTION 2

a) Define the following terms:

- i) Mercator's Projection
- ii) Graticule
- iii) Meridian Convergence
- iv) Azimuth
- v) Magnetic Declination
- vi) Isogonic Lines
- vii) Agonic Lines
- viii) Prime Meridian
- ix) Grid North

b) What are the three methods of map projection?

[17 marks]

QUESTION 3

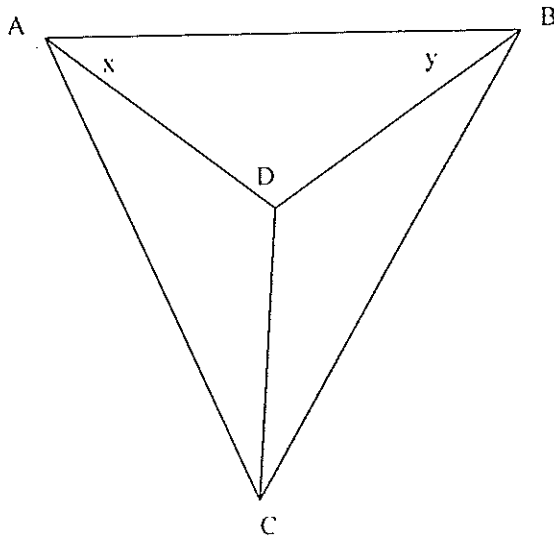
- a) Name the corrections applied to Electronic Distance Measurements.
- b) Calculate the instrument constant for an EDM that measured the following distances.

AD	=	271,512 m
AC	=	150,405 m
AB	=	50,476 m
BC	=	100,066 m
CD	=	121,252 m

[7 marks]

QUESTION 4

- a) From the figure below prove $\frac{\sin y}{\sin x} = \tan K$



- b) Using the Tan K formula and given the following:

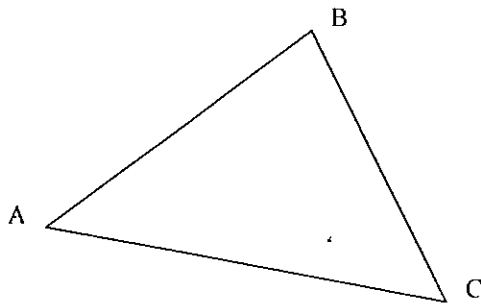
Dist AB	=	80.000m
Angle BCD	=	25°
Angle ACD	=	35°
Angle ADB	=	120°
Angle BDC	=	115°
Angle ADC	=	125°

Calculate distance DC.

[19 marks]

QUESTION 5

Derive a formula to calculate the area of the triangle below from co-ordinates.



[13 marks]

QUESTION 6

Below is an excerpt of a basic mining equation (BME) taken from a gold mine exploiting a narrow tabular ore-body. Calculate the missing information.

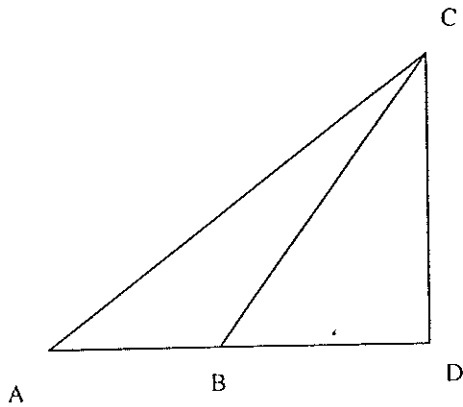
NB do not reproduce the table in your answer book: just give the answers to the corresponding letters.

	unit	JAN	FEB	MAR	APR
FACE LENGTH	m	3 645	3 882	3 609	3 706
FACE ADVANCE	m	6.93	7.35	8.16	7.56
TOTAL m ²	m ²	25 272	28 528	29 439	g)
ON REEF PERCENTAGE	%	93.41%	93.55%	e)	94.98%
REEF m ²	m ²	23 607	26 688	27 525	26 597
ON REEF cm.g/t	cm.g/t	a)	1 878	1 951	1 951
kg GOLD EX STOPES	kg	1 164	c)	1 455	1 406
VAMPING kg	kg	13	11	30	16
REEF DEVELOPMENT kg	kg	31	25	27	43
TOTAL kg BROKEN	kg	1 208	1 393	f)	1 465
U/G INVENTORY	kg	-63	37	-6	42
GOLD HOISTED	kg	1 146	1 430	1 506	1 508
SURFACE INVENTORY (SHAFT)	kg	0	33	0	0
GOLD DELIVERED TO PLANT	kg	1 146	1 463	1 506	1 508
PLANT INVENTORY	kg	-157	20	101	-22
GOLD CALLED FOR	kg	989	1 482	1 607	1 486
MINE CALL FACTOR	%	b)	84.07%	81.96%	81.59%
RECOVERY FACTOR	%	98.32%	98.48%	98.54%	h)
GOLD RECOVERED	kg	1 046	d)	1 298	1 194

Density 1m³ = 2.71 tons

[8 marks]

QUESTION 7



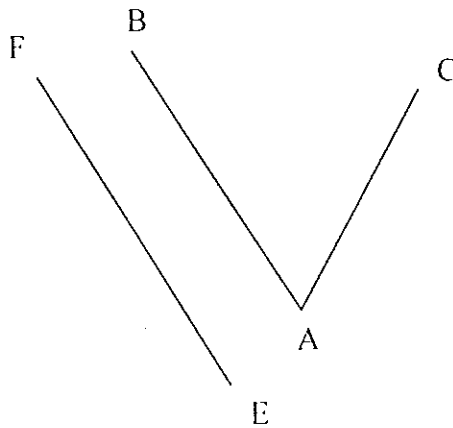
Given;

- Angle CAB = 30°
- Angle CBD = 45°
- Dist. AB = 100m

Calculate height CD.

[6 marks]

QUESTION 8



Stations A, B and C have been surveyed in a stope. The line AB is parallel to the boundary EF and B and C are on the same elevation.

- Given:
- | | | |
|----------------------|------------|------------|
| Coordinates of E | Y +194.252 | X -126.055 |
| Coordinates of A | Y +179.840 | X -138.856 |
| Direction AB or EF | = | 154.00.00 |
| Horizontal angle BAC | = | 70.00.00 |
| Dip of line AB | = | 43.15.00 |
| Dip of line AC | = | 38.13.00 |

- Calculate:
- a) The strike and dip of the reef in the stope.
 - b) The distance at right angles to the line AB to which stoping can proceed so as to leave a 9 metre boundary pillar on the plane of the reef.

[20 marks]

[Total 100 marks]