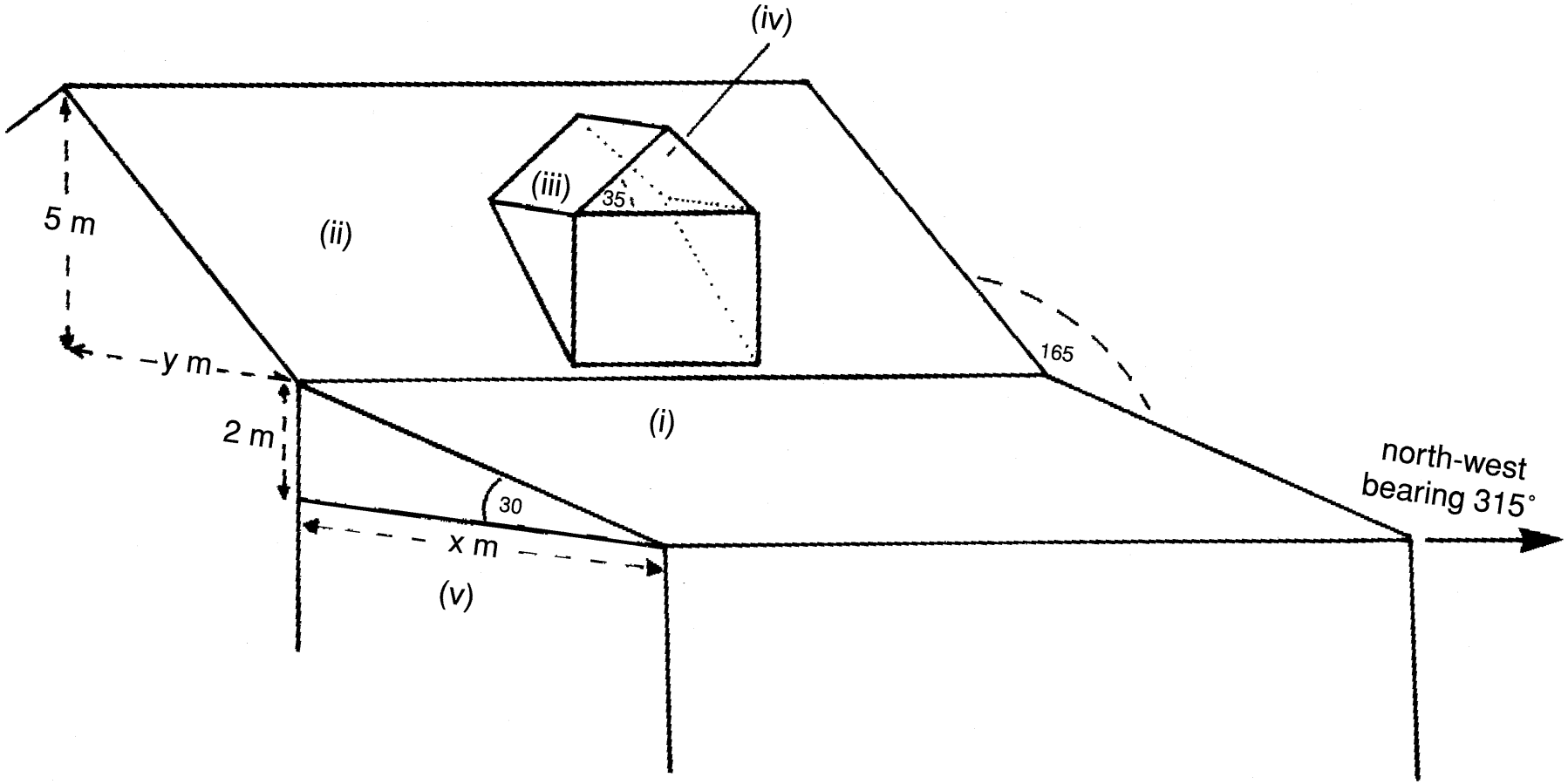
APPENDIX 1 - WORKSHEETS

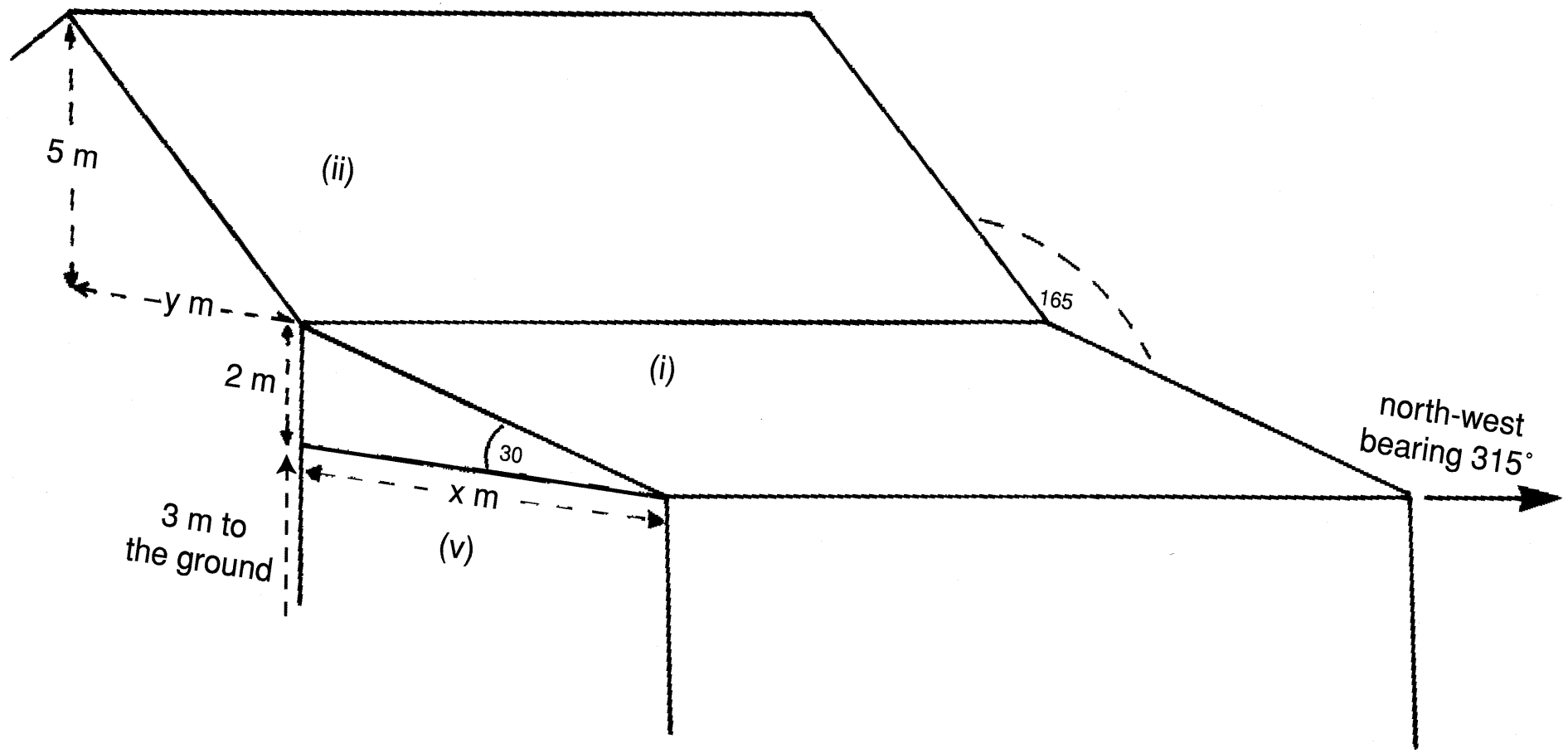
Masters for photocopying

TOPIC	WORKSHEET
2. Thinking in three dimentions	2.1 House roof with small window
3. Structure contours	3.1 House roof without small window
	3.2 Help sheet for use with Hypercard computer program
	3.3 Map from disk
	3.4 Map from disk
Quick Quiz 1	QQ1 Diagram for question 3
5. Fold types	5.1 Parallel and similar folds
7. Writing a geological history	7.1 Mapwork question
8. Foliation and lineation	8.1 Mapwork question
10. More on structure contours	10.1 Map from disk
	10.2 Map from disk
Quick Quiz 3	QQ3 Map for question 5
14. Seismology	14.1 Position of the epicentre
Quick Quiz 6	QQ6 Diagram for question 5

WORKSHEET 2.1



WORKSHEET 3.1



WORKSHEET 3.2

STUDENT 'HELP!' SHEET

GEOLOGY COMPUTER PROGRAMS

WITH REFERENCE TO STRUCTURAL GEOLOGY: WORKSHEETS 3.3, 3.4, 10.1, and 10.2.

These activity sheets require you to use a computer program that has been produced especially for the Higher Grade Mapping. This program is supplied on a disk, although it may have been transferred onto a file server or hard disk. You should ask your teacher or lecturer where to find it.

The program is written for the software application Hypercard 2.0.

Insert the disk into the disc drive and double-click on the disk icon, a window showing the contents of the disk will open on screen.

The program you require is called **'Structural Geology'**.

Double-clicking on the icon should open the stack up within the application Hypercard.

If this does not happen, check that the application is available by looking on the hard disk.

You may have to open the application and then choose 'open stack' from the file menu.

The program is run by pointing and clicking with the mouse.

The main menu offers you four options, click on the correct one as indicated on the activity sheet. By clicking on the arrows you can progress through the sequence, or return to the start whenever necessary. The quit button will close down the stack and the application Hypercard.

The notepad facility is available only if you have that item showing on the apple menu at the top left hand corner of the screen. You can use this to make notes on the mapping constructions and then copy and paste them into a word processing application such as Works to save and print out.

WORK SHEET 3.3

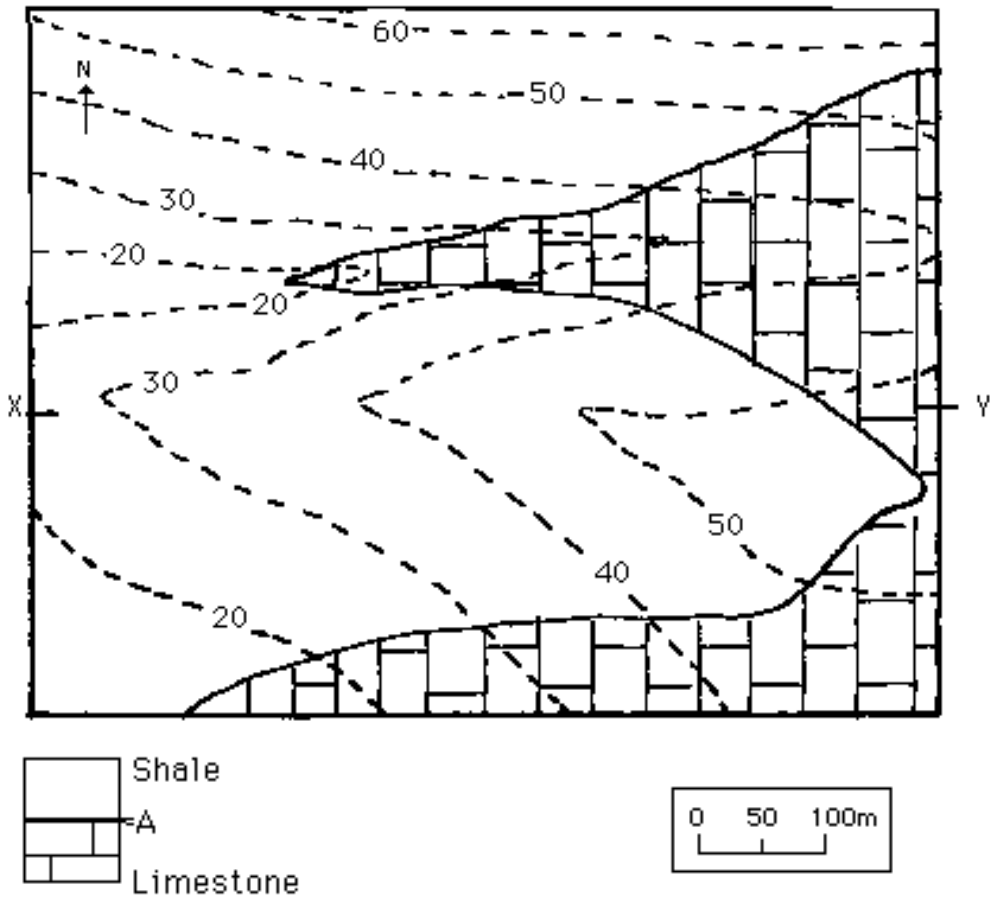
This sheet is to be used with question 2 section 3.
The computer program for this activity is to be found on the disk supplied. This will require application, Hypercard 2.

Open the stack called 'Structural Geology' by double-clicking on the icon.
From the menu choose 'Introduction to Structure Contours: e.g.' This will give you 'Example for Worksheet 3.3'.

If you need any help with using the computer program refer to the Student 'Help!' Sheet, worksheet 3.2.

This map shows the outcrop pattern of two different rock types, limestone and shale, with the topographic contours, at intervals of 10m, as dashed lines.

As structure contours connect places of equal height, it is first necessary to identify at least two points on the structure at the same height. The topographic contours are used for this.



WORKSHEET 3.4

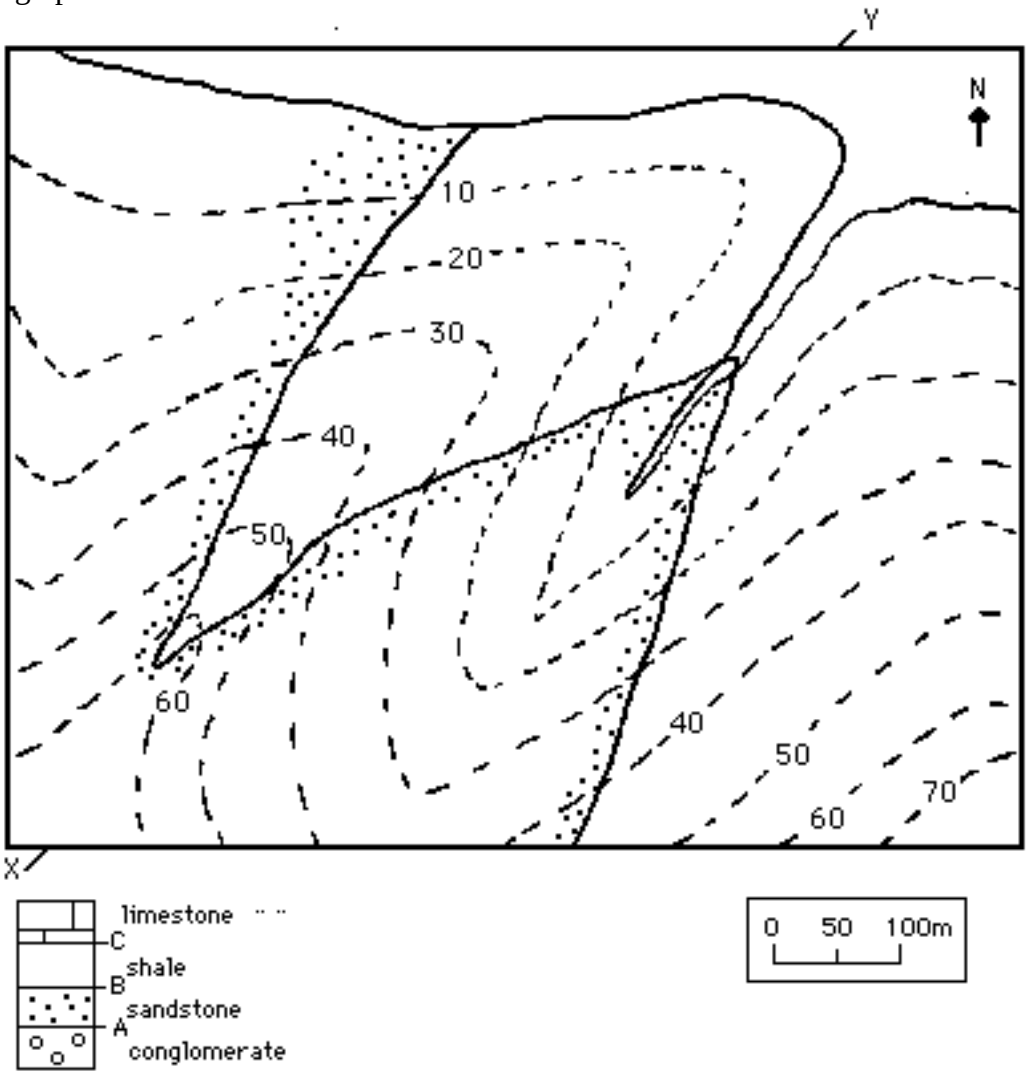
Exercise for the structure contours computer program.

This sheet is to be used with question 3, section 3.
This exercise should be carried out on the map given below.
If, at any point, you wish to check your work the computer program for this activity is to be found on the disk supplied. This will require software application, Hypercard 2.

Open the stack called 'Structural Geology' by double-clicking on the icon.
From the menu choose 'Introduction to Structure Contours: ex.' This will give you 'Exercise for Worksheet 3.4'.

If you need any help with using the computer program refer to the Student 'Help!' Sheet.

This map shows the outcrop pattern for boundary B, between sandstone and shale with topographic contours at 10m intervals.



Exercise for map of Worksheet 3.4

1. Construct the structure contours for boundary B.

2. If the shale is 20m thick, re-label the structure contours for boundary C. Add the structure contours for 10m and 0m.

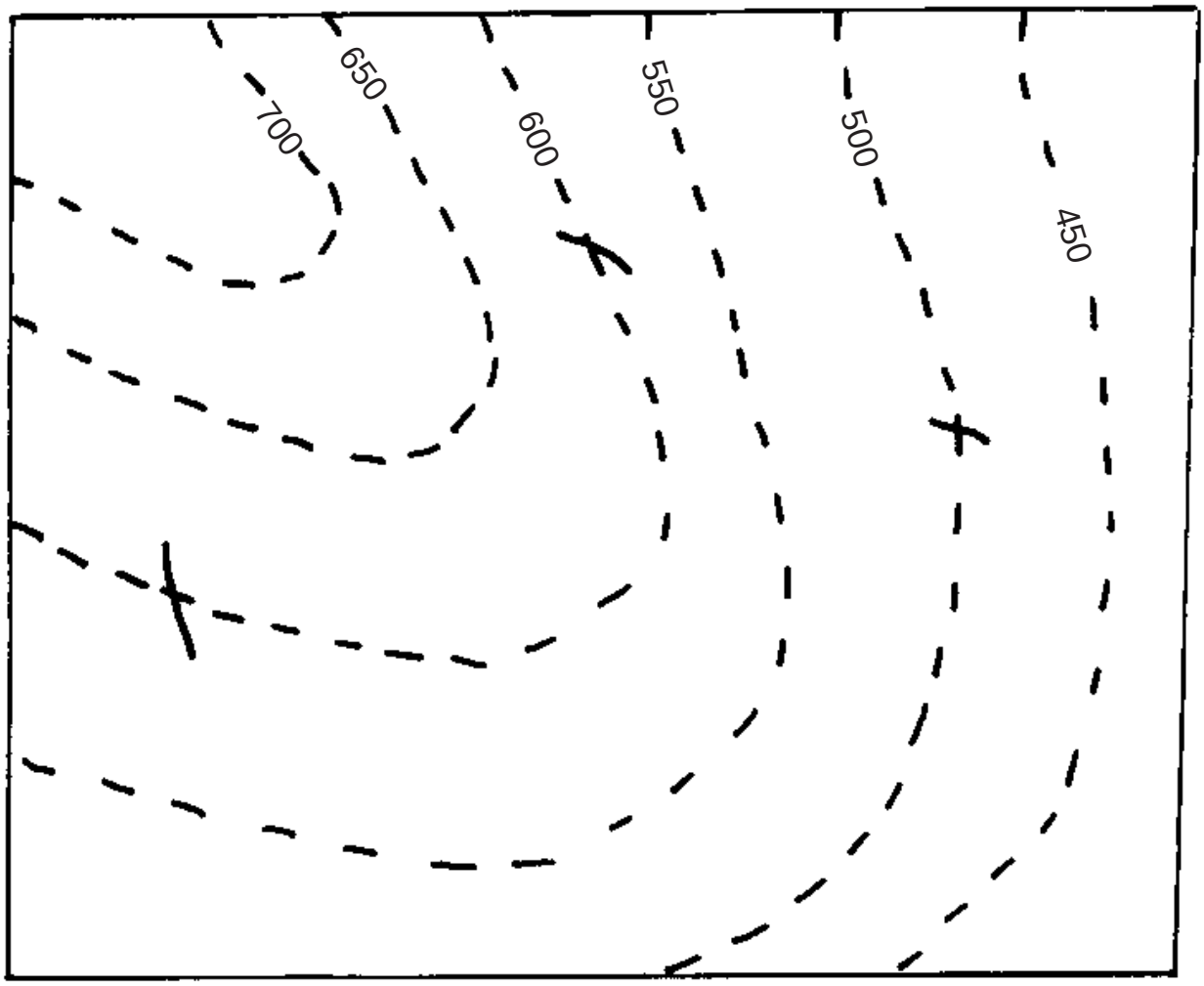
3. Draw in the outcrop of the boundary C, between the shale and limestone.

4. If the sandstone is 10m thick, re-label the structure contours and draw in the outcrop of the conglomerate/sandstone boundary A.

5. Construct the cross section along XY from the topographic contours and the structure contours, using the scale provided.

6. Using the cross section drawn, measure the dip of the bedding plane and then calculate the dip using data from the map as a check.

WORKSHEET QQ1



Key

outcrop of base of sill

500 surface contour with height in metres

WORKSHEET 5.1

Parallel and Similar Folds

Parallel Folds

The thickness of the bed at right angles to the bedding plane remains constant.

Similar Folds

The thickness of the bed parallel to the fold axial surface remains constant.

In practice folds can be perfectly parallel, perfectly similar or somewhere between the two.

Instructions

1. Draw in the hinge line (fold axis) for each of the four examples overleaf.

2. Choose the wide bed in example (A) and take up to 8 measurements parallel with the hinge line and 8 measurements at right angles to the bedding plane at various points around an anticline and syncline.

3. Draw up a result table to hold this information and similar information for (B), (C) and (D).

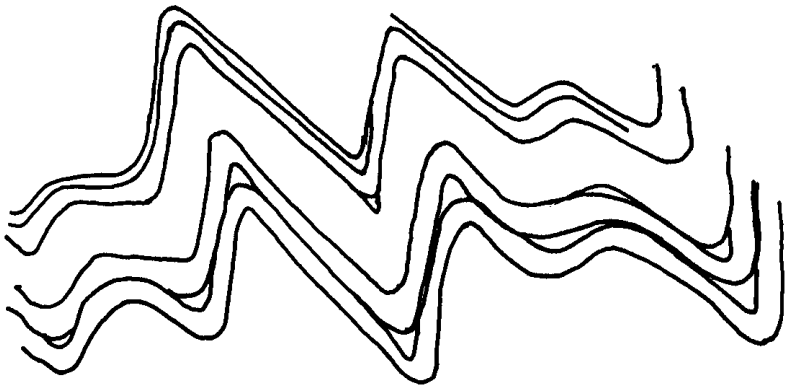
4. Complete the measurements for (B), (C) and (D) as you did in question 2 above.

Questions

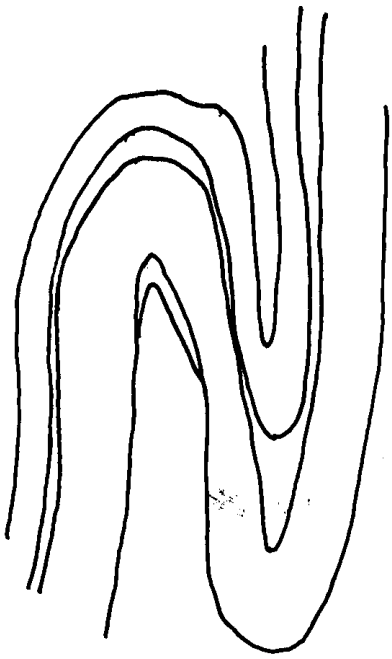
(i) Which of the examples is a parallel fold?
(ii) Which of the examples is a similar fold?
(iii) Can all the beds in a parallel fold have the same geometry?
(iv) Can all the beds in a similar fold have the same geometry?

WORKSHEET 5.1 CONTINUED

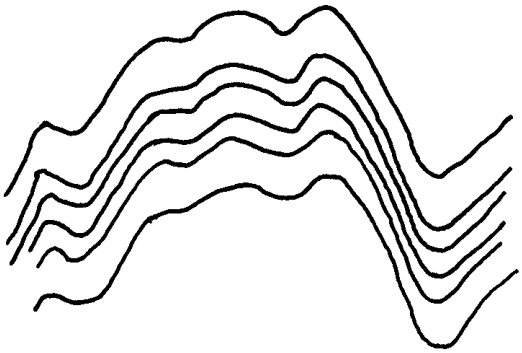
A



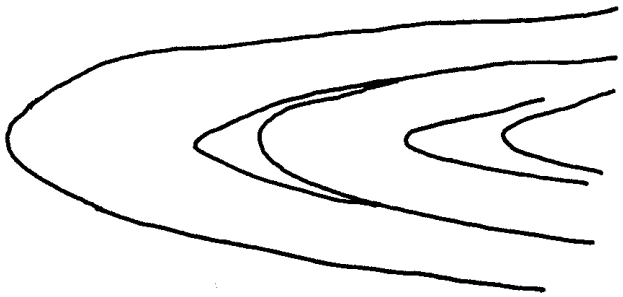
B



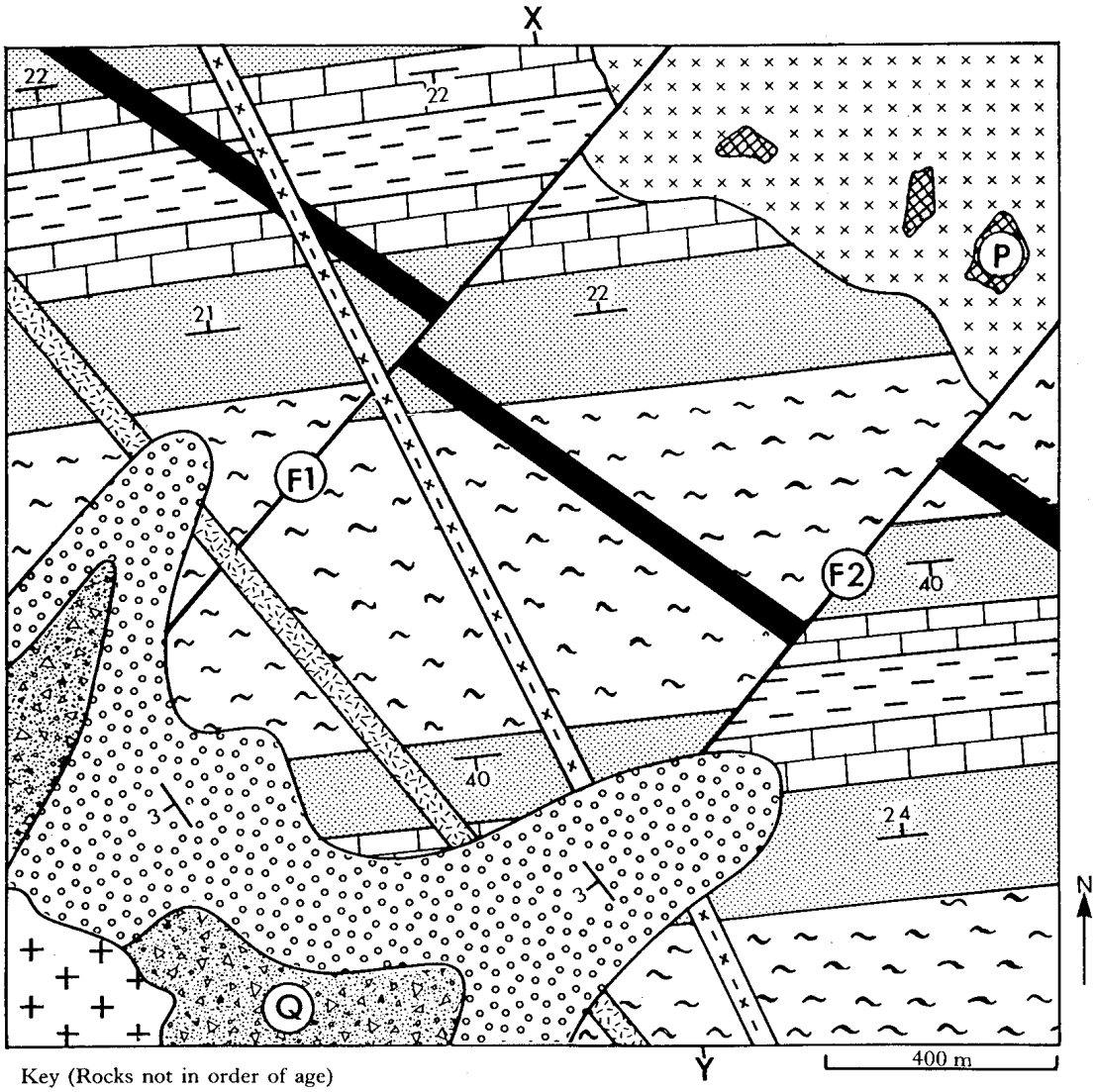
C



D



WORKSHEET 7.1

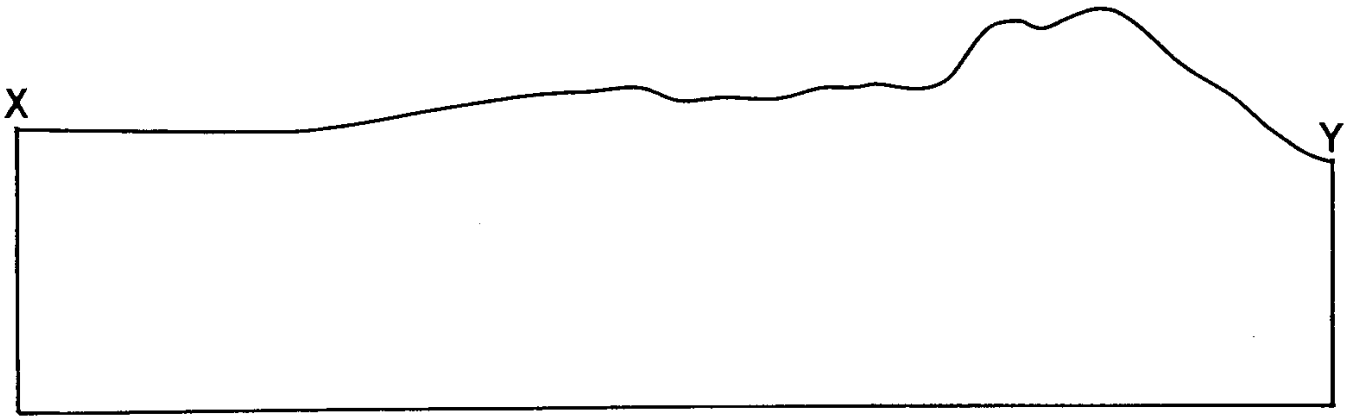


Key (Rocks not in order of age)

- sandstone
- limestone
- conglomerate
- granite
- diorite
- schist
- felsite
- dolerite
- microgranite
- rock P
- rock Q
- mudstone

24 strike of bedding with dip in degrees

F1 fault



1. Study the map on worksheet 7.1 and answer the questions based on it.

   (a) How can you tell that the following statements are correct?

   (i) Fault F1 is a tear fault.

   .....

   ..... (1)

   (ii) Fault F1 is older than fault F2.

   .....

   ..... (1)

   (iii) Felsite forms the oldest dyke. Microgranite forms the youngest dyke.

   .....

   .....

   ..... (1)

   (iv) Movement on fault F2 has taken place on more than one occasion.

   .....

   .....

   ..... (2)

WORKSHEET 7.1 continued

(v) The granite is younger than the diorite.

.....

.....

..... (1)

(b) (i) How many unconformities are shown on the map?

..... (1)

(ii) Write the letter U on the oldest or older unconformity.

(1)

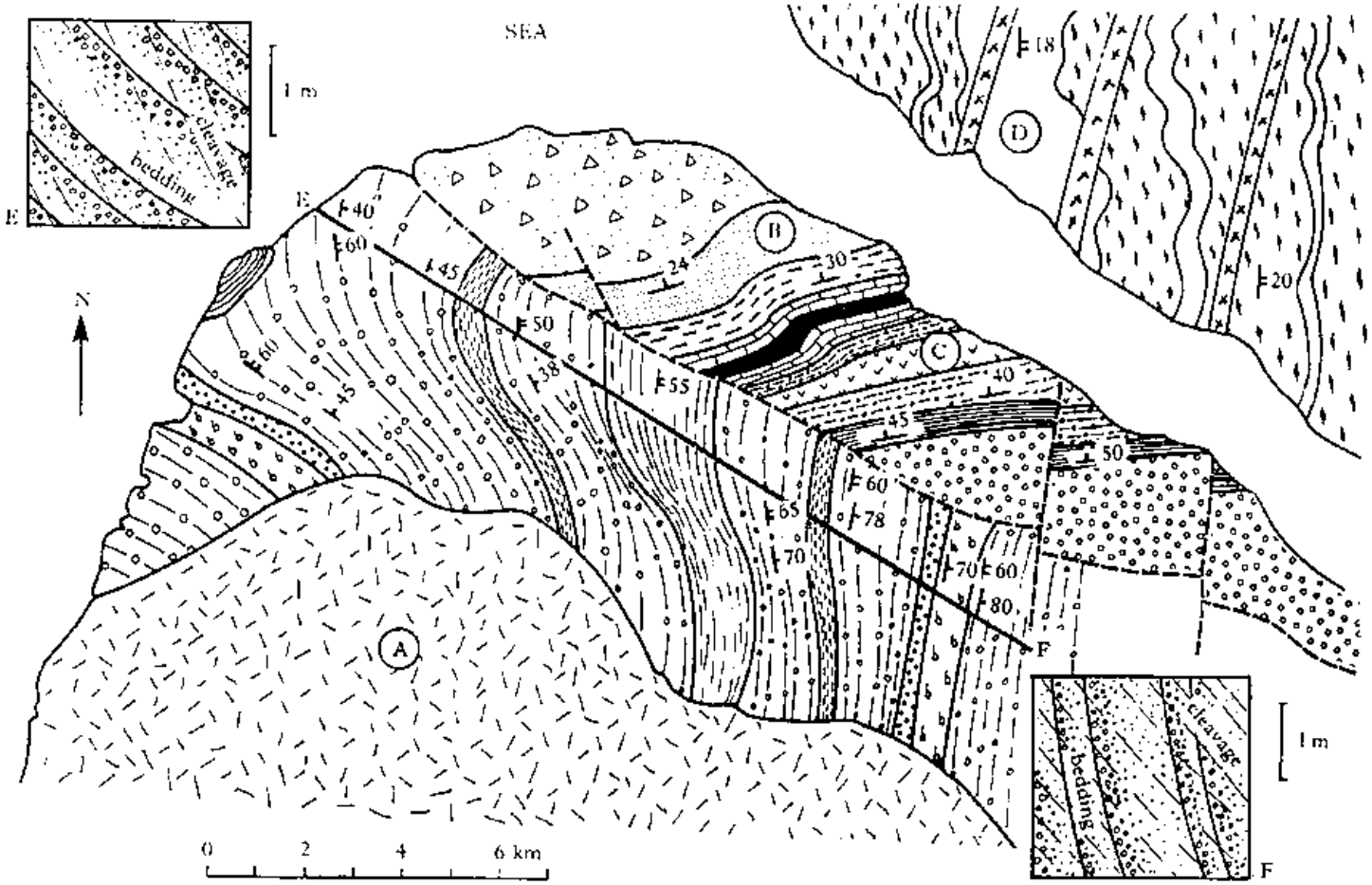
(c) On the topographic profile provided on worksheet 7.1 continued, draw a geological section from X to Y.

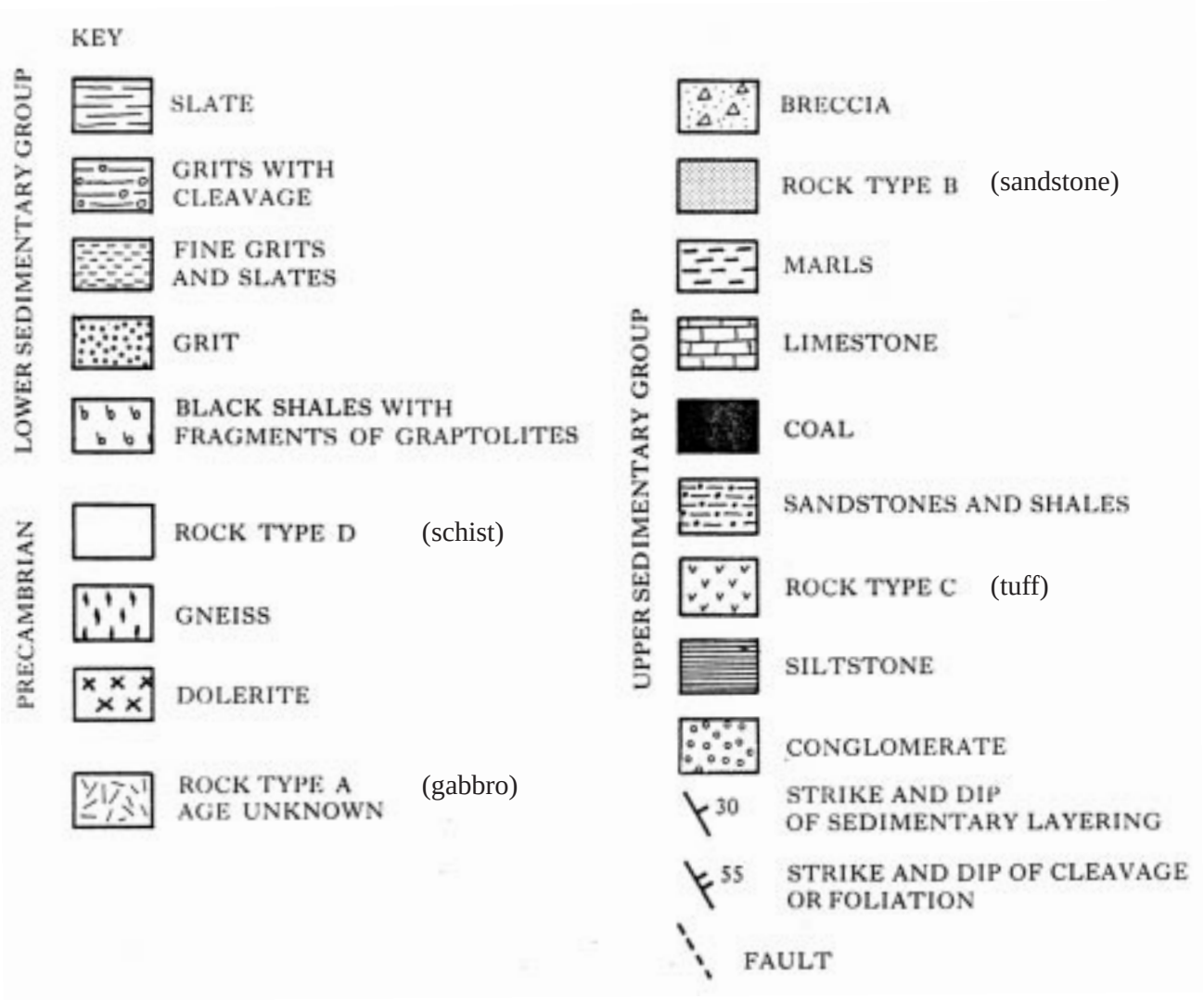
(4)

(d) Give an account of the geological history of the area shown in the map.

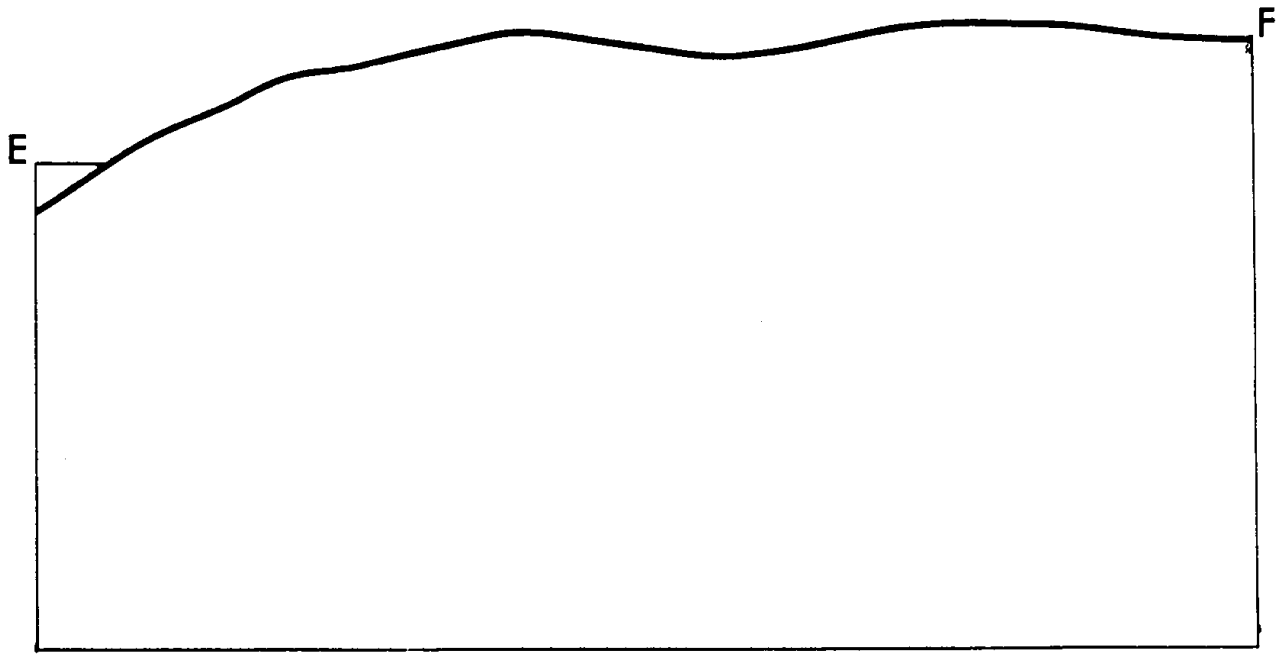
(6)

WORKSHEET 8.1




KEY
LOWER SEDIMENTARY GROUP
SLATE
GRITS WITH CLEAVAGE
FINE GRITS AND SLATES
GRIT
BLACK SHALES WITH FRAGMENTS OF GRAPTOLITES
PRECAMBRIAN
ROCK TYPE D (schist)
GNEISS
DOLERITE
ROCK TYPE A (gabbro)
AGE UNKNOWN
UPPER SEDIMENTARY GROUP
BRECCIA
ROCK TYPE B (sandstone)
MARLS
LIMESTONE
COAL
SANDSTONES AND SHALES
ROCK TYPE C (tuff)
SILTSTONE
CONGLOMERATE
30
STRIKE AND DIP OF SEDIMENTARY LAYERING
55
STRIKE AND DIP OF CLEAVAGE OR FOLIATION
FAULT

WORKSHEET 8.1 continued



WORKSHEET 8.1 continued

1. (a) Cleavage-bedding relationships at positions E and F are shown beside the map on worksheet 8.1.

   (i) Write the letter Y on the youngest bed in both E and F. (1)

   (ii) At E and F how does the dip of the bedding compare with the dip of the cleavage?

   .....

   ..... (1)

   (iii) On worksheet 8.1 continued, complete the figure to show a geological cross section from E to F.

   (5)

   (iv) Name the major structure shown in your section.

   ..... (1)

   (b) Write a geological history of the events which produced the rocks and structures shown on the map.

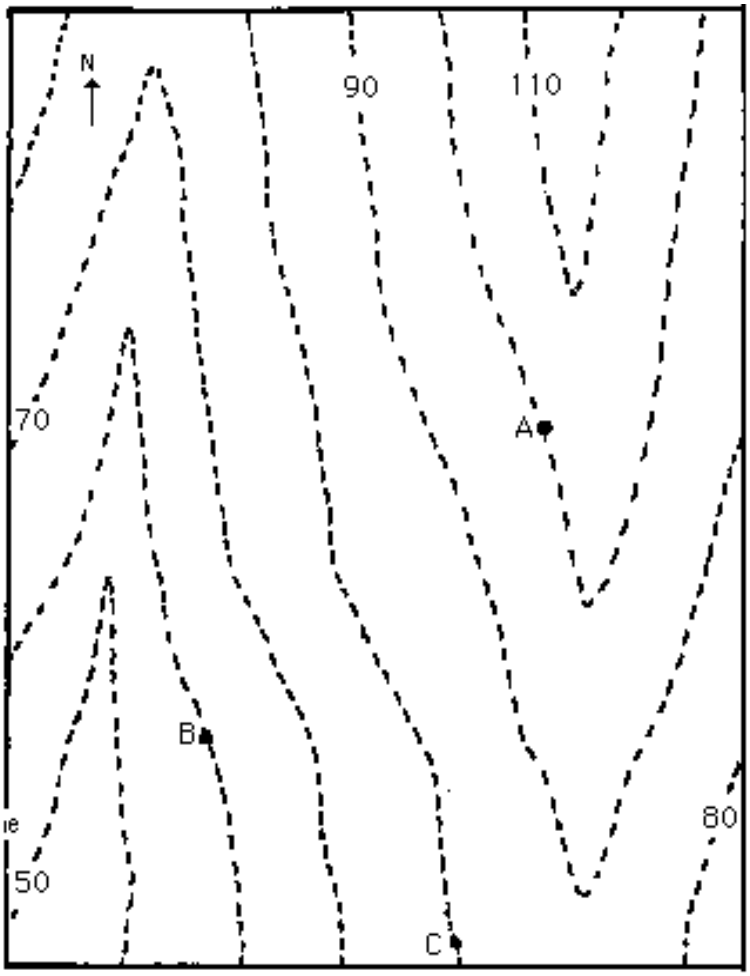
   (6)

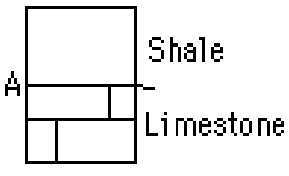
WORKSHEET 10.1

To use with the example for the second part of the structure contours computer program

The computer program for this activity is to be found on the disk supplied. This will require a computer with software application Hypercard 2.
Open the stack called 'Structural Geology' by double-clicking on the icon.
From the menu choose 'Three point problems to construct structure contours: e.g.'

If you need any help with using the computer program refer to the Student 'Help!' Sheet, Worksheet 3.2.





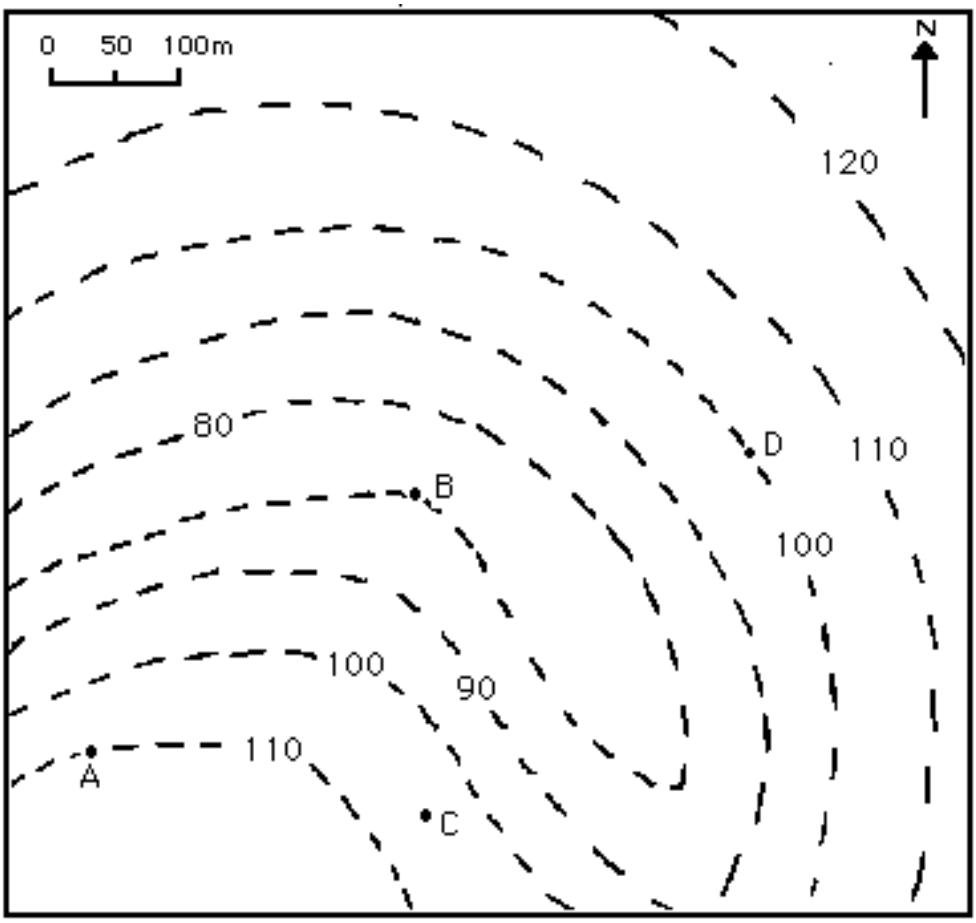
BOREHOLE	DEPTH BELOW SURFACE	HEIGHT ABOVE SEA LEVEL
A	30 m	
B	10 m	
C	40 m	

WORKSHEET 10.2

Exercise for the three point construction method for structure contours computer program

This exercise should be carried out on the map given below.
If, at any point, you wish to check your work the computer program for this activity is to be found on the disk supplied. This will require a computer with software application Hypercard 2.

Open the stack called **Structural Geology** by double-clicking on the icon.
From the menu choose **Three-point problems for structure contours: ex**. This will give you **Exercise for Worksheet 10.2**.

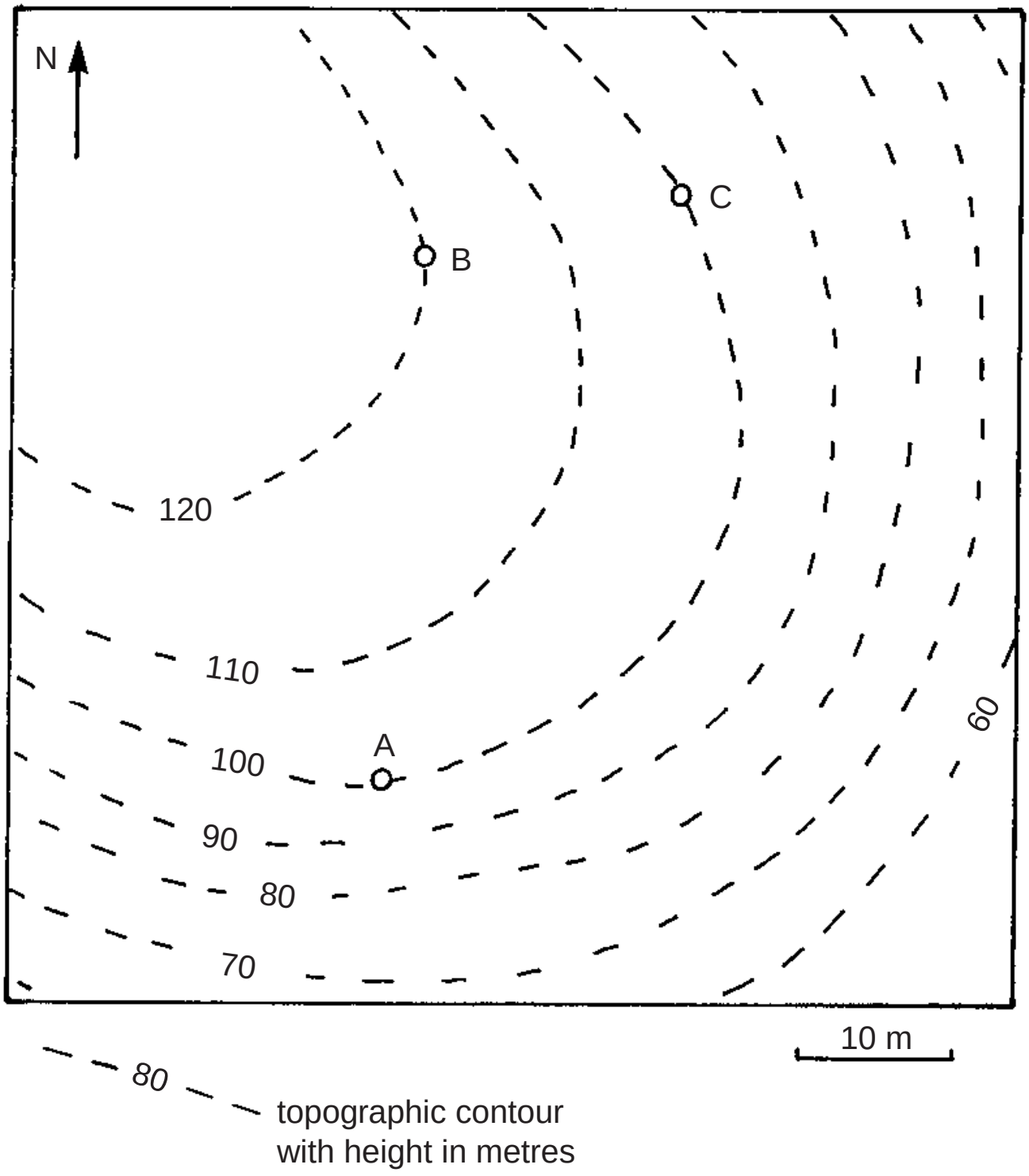


A sill outcrops at B and is at a depth of 10 m in a borehole at A.

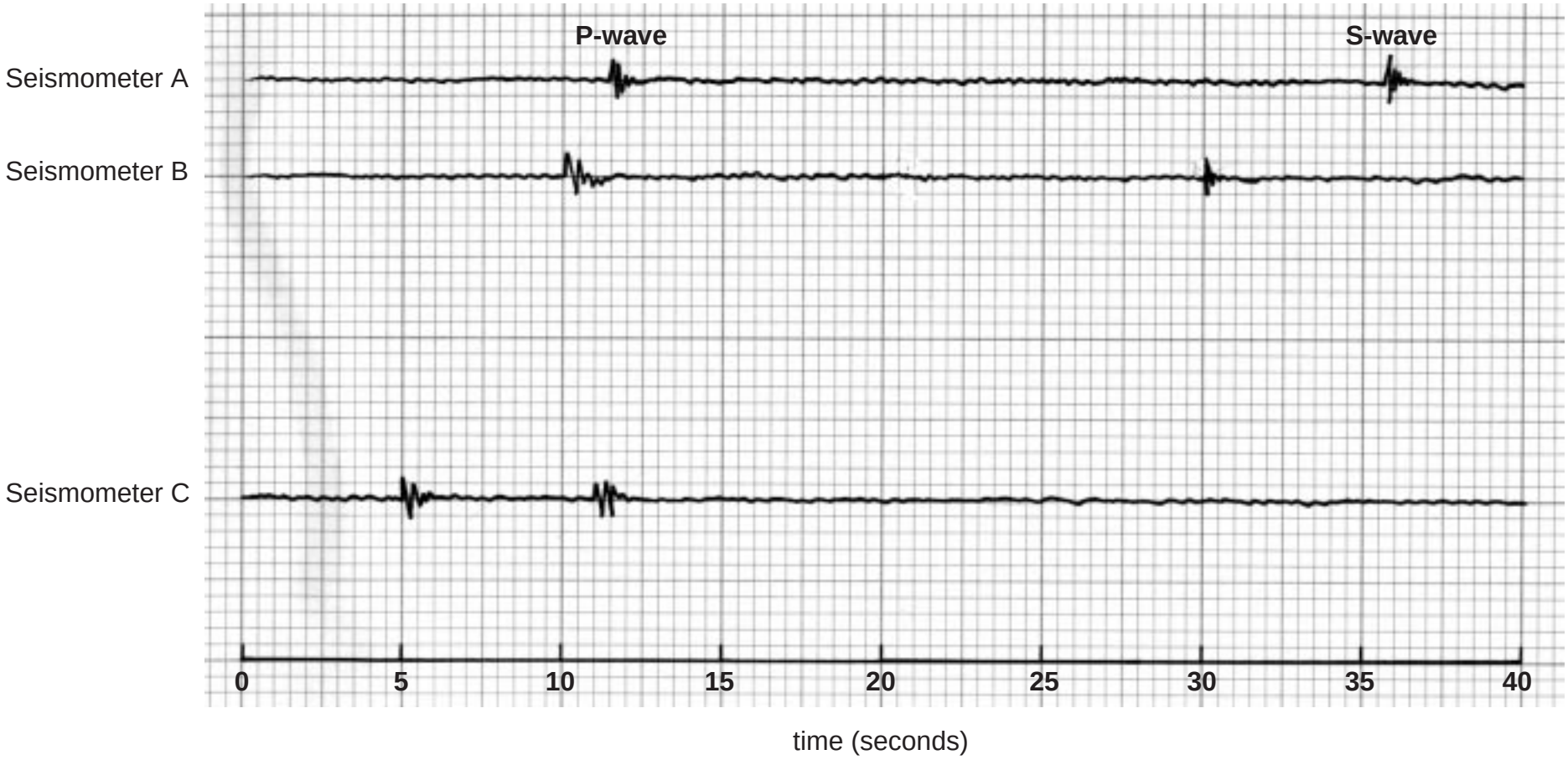
A borehole C reaches the sill at a depth of 55 m.

1. Using the 3-point technique, construct the structure contours for the sill.
2. Complete the outcrop pattern for the sill.
3. Calculate the direction and amount of dip of the sill.
4. At what depth will the sill be encountered in a borehole drilled at position D?

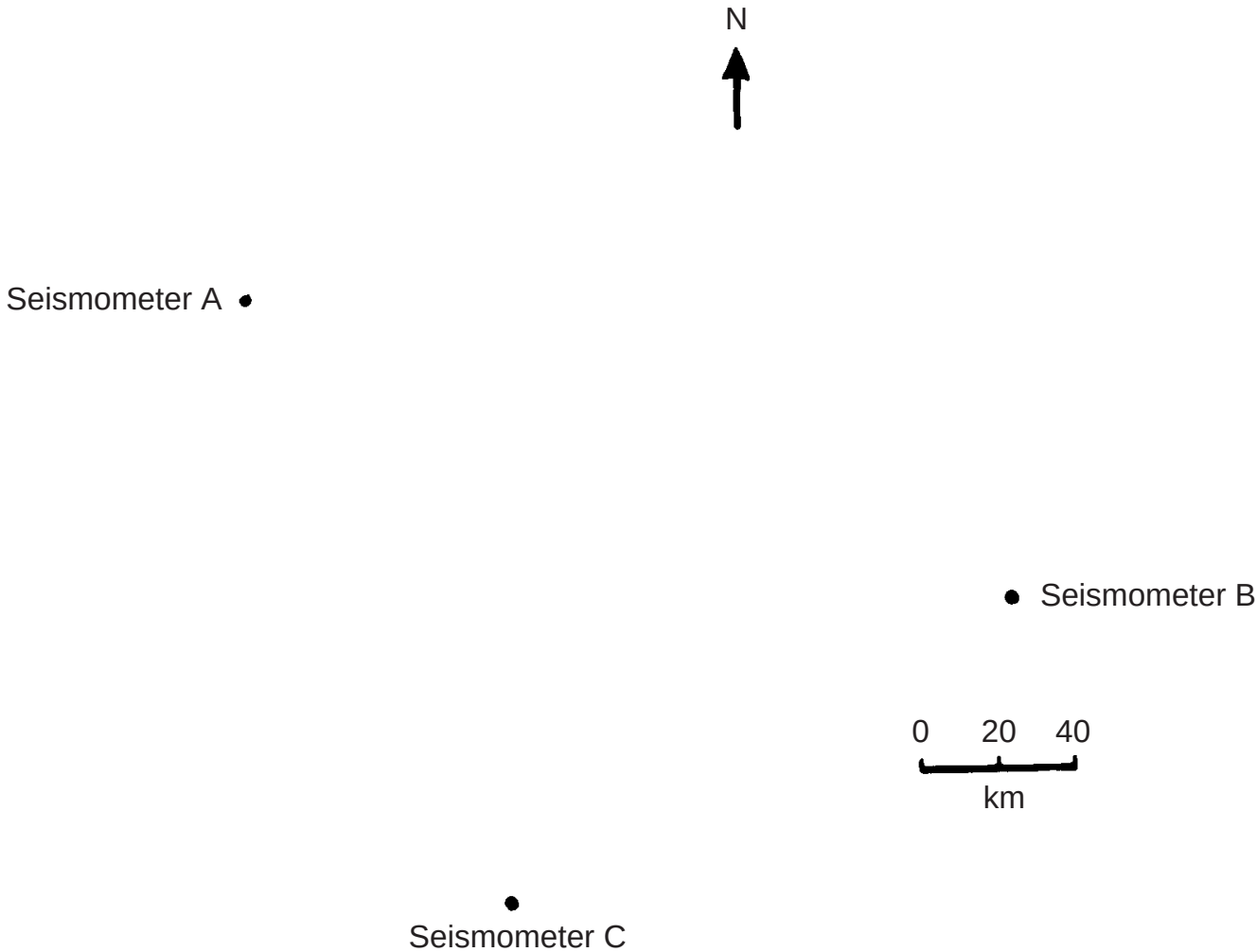
WORKSHEET QQ3



WORKSHEET 14.1



WORKSHEET 14.1 continued



WORKSHEET QQ6