Malati

Mathematics learning and teaching initiative

Geometry

Module 4

Maps and Location

Grades 4 to 7

Teacher Document

Malati staff involved in developing these materials:

Kate Bennie
Zonia Jooste
Dumisani Mdlalose
Rolene Liebenberg
Piet Human
Sarie Smit

We acknowledge the assistance of Zain Davis, Shaheeda Jaffer, Mthunzi Nxawe and Raymond Smith in shaping our perspectives.

December 1999

Introduction: Maps and Location

In this Module we develop the idea of the of **aerial view** as introduced in Module 2. In this case the focus is on large-scale space, that is, space that surrounds the individual. Examples of large-scale spaces are the classroom and the neighbourhood. Learners are required to draw their own maps and interpret given maps.

The need for a labelling system to describe the position / location of points in space is introduced. Initially learners develop their own labelling system. They are then introduced to a Cartesian system and given practice using this system.

On the Road …

1. The road ahead of each vehicle turns to the *left.* Draw the road.
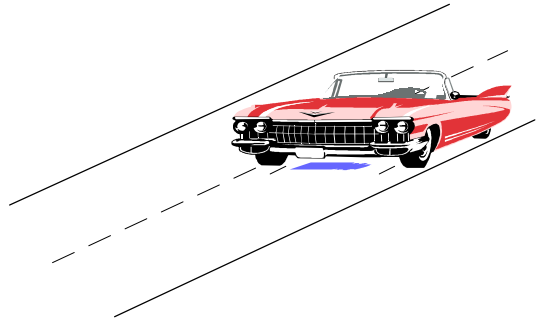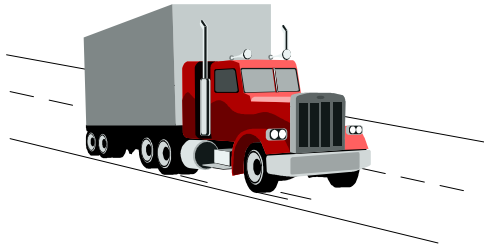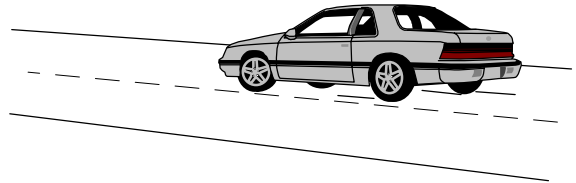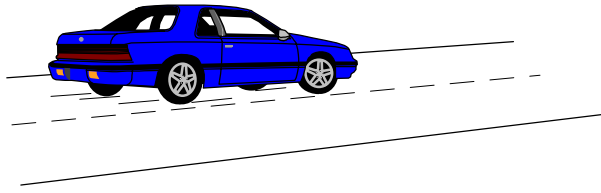
2. Each vehicle must turn *right* at the crossing. Draw how they turn.
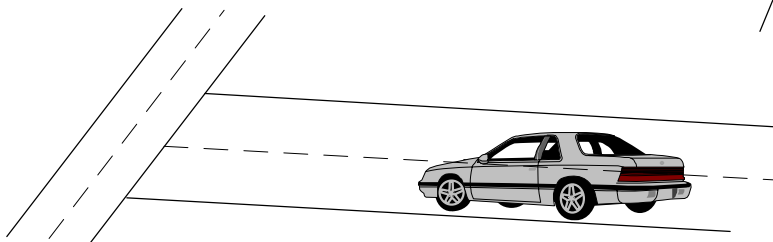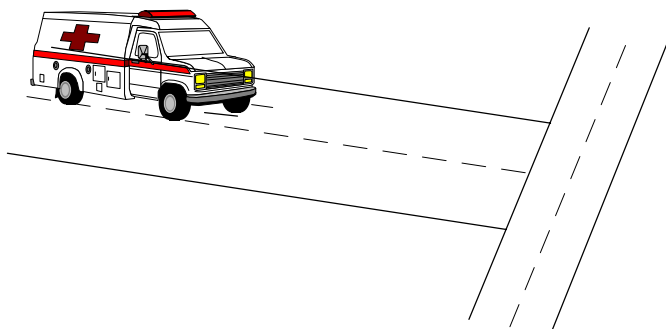
3. If these vehicles are being driven in South Africa, which of the vehicles are driving on the *wrong* side of the road?

Teacher Notes: On the Road….
This activity requires that learners identify direction (left and right) in representations. In each case the learner has to view the scene form a different orientation. Learners should be encouraged to visualise the scene. Some learners might, however, need to set up models to work with concrete objects.

<u>*Source:*</u>
Human, Olivier and Associates (1999). **Advanced Numeracy Course. Book 2: Measurement, Data, Space and Shape**. Parow-East: Ebony Books CC.

Looking from Above

Teacher Notes:

*Ask the learners to imagine that they are looking at the classroom from above. Each learner should draw a plan of the classroom. (As noted in the activity "Practice Photos" in Module 2, a plan is a drawing **convention**, so the furniture in the classroom should be drawn **directly from above**.)*

Learners should be encouraged to compare their sketches.

In this case the learners will be able to view the entire scene from their position in the classroom. The teacher can extend the activity (possibly setting a short project) by requiring a plan of another room, the school grounds, or of the neighbourhood. These can be used as assessment activities.

Further Activities:

Learners can also be required to draw scale plans of the school grounds.
The teacher can set a short project in each learner must draw a map of how he/she gets to school.

Source of Ideas:
*Du Toit, D., Human, P., Murray, H. and Olivier, A. (1996). **Mathematics at Work, Standard 2**. Cape Town: Nasou.*

Giving Directions

Teacher Notes:

<u>*Part 1:*</u>

Learners should be required to provide (verbally and in writing) directions to familiar destinations. This will require that they use words for direction (left, right, north, south etc), distinguish between directions when approaching from different places and describe the distances). For example, a visitor arrives at the school office and needs directions to the school hall, or describe how you travel to school.

<u>*Part 2:*</u>

Learners can also be required to indicate the directions on the maps they have drawn in the activity "Looking from Above". Learners could draw the different routes on their maps. They should be encouraged to use their own, as well as the maps of other learners in their group.

Visiting Santie

You are visiting your friend Santie in Newtown. She gave you these directions to her house:

When you come into Newtown along Aloe Street turn left at the first road, then right at the first road, then left at the second. My house is third on the left.

1. Show on this map where Santie's house is:
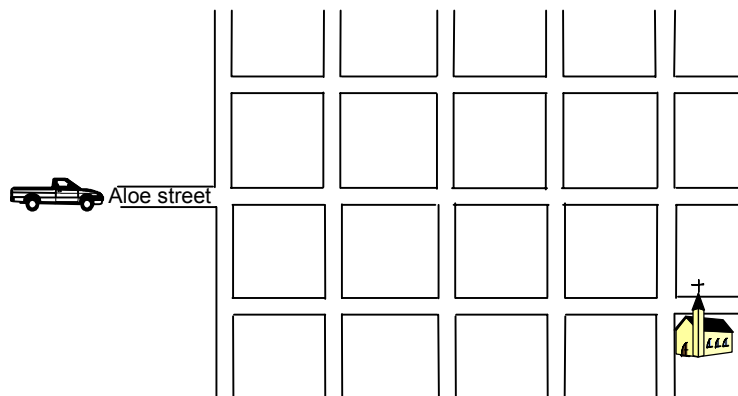
2. Describe a different route to Santie's house.

3. Draw on the map how to get from Santie's house to the church. Now give the directions in words.

4. Now give directions for someone going from the church to Santie's house.

5. How many different routes can you find from the church to Santie's house? Which is the shortest route?

6. *Think* of a house anywhere on the map. Describe to a classmate how to get from the church to this house. Let him draw the house on his map. Is he correct?

Teacher Notes: Visiting Santie

It is important that learners draw the routes on the map and describe the route in words. Street names are not given, but the learner can use the directions given at the beginning of the activity as an example. Ask learners to check one another's' written instructions – it is important that directions make sense to someone else.

<u>*Source:*</u>
Human, Olivier and Associates (1999). **Advanced Numeracy Course. Book 2: Measurement, Data, Space and Shape**. Parow-East: Ebony Books CC.

Some more maps …

1. Vivien wants to visit Sipho. This is a map of Orlando West, where they live:

    (a) Draw a route from Vivien's house to Sipho's house. Describe the route to a classmate in words.

    (b) Find a *different* route back from Sipho's house to Vivien's house. Describe the route to a classmate in words.

    (c) Which route is shorter?

2. Sipho and John work at 35 Kilkenny street. They take the taxi to the corner of Jan Smuts avenue and Westcliff street and then walk.

   Use Sipho's rough map and describe in words to a classmate how they should walk.
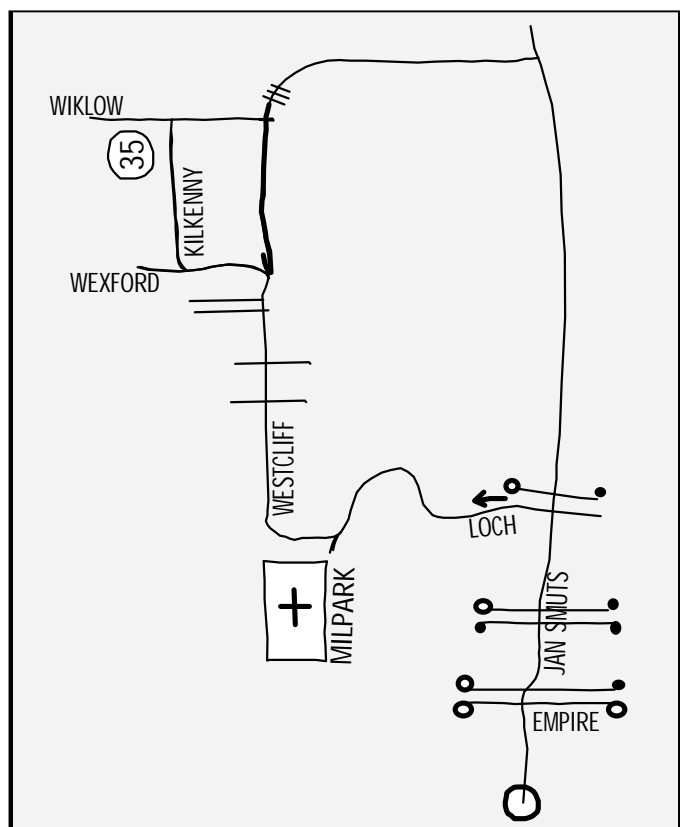
The Shopping Centre

This is an aerial map of the shopping centre:

KEY	
1	Value Clothing
2	McDoodall's Hamburgers
3	Payless Supermarket
4	Brown's Books
5	Musicworld
6	Allie's Take-aways
7	Cindy's Shoes
8	Dressrite
9	Surf is Up
10	Toilets
11	Mall Management
12	ATM's
13	Toys Galore
14	Cinema
15	Rapidphoto
16	Realsports
17	Knowles Pharmacy
18	Star Jewellery
19	Rico's Coffee
20	Flower Sellers
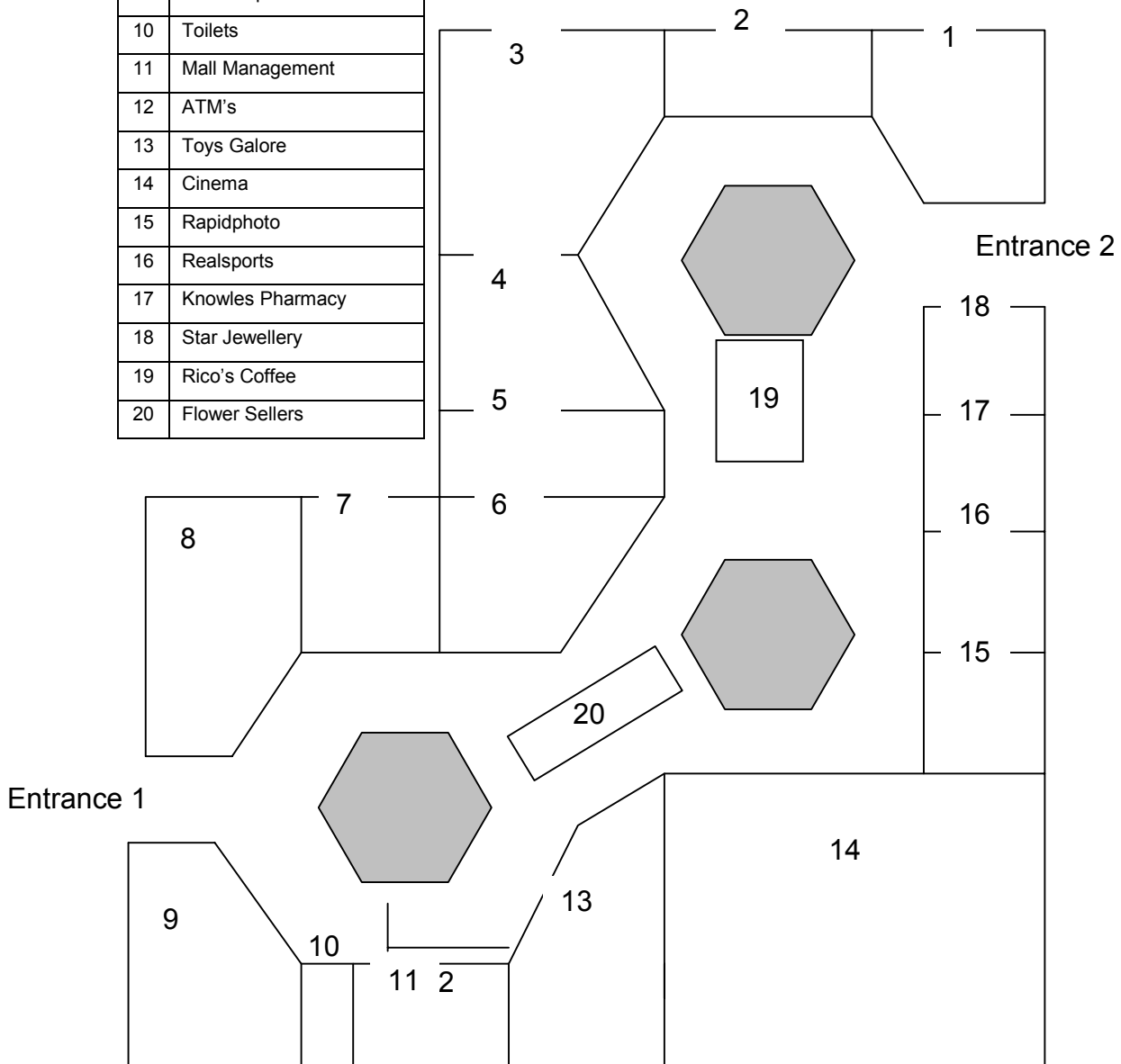
Sandy is spending the day at the shopping. **She enters at Entrance 2**.

1. Sandy wants to go to shop 7. What will she buy at this shop? Draw a route that she can take to shop 7.

2. Now explain to Sandy **in words** how she can get from Entrance 2 to shop 7.

3. Is there another route she can take?

4. Now Sandy wants to go to the cinema. What is the shortest route from shop 7?

5. Sandy's friend Nosipho is meeting her at the cinema. Nosipho enters at Entrance 2. Give Nosipho directions to the cinema.

6. After watching a movie Sandy and Nosipho are hungry. Explain where they can go for lunch.

7. After lunch, Sandy needs to draw money at the ATM and then buy groceries at Payless Supermarket. Draw the route she should follow and describe this route in words.

8. Nosipho is walking from Value Clothing to the flower sellers. Is Knowles Pharmacy on her left- or right-hand side?

9. Sandy is walking from Payless Supermarket to Entrance 2. Is McDoodall's on her left or right hand side?

10. Now choose any shop in the shopping centre. Describe to a classmate how to get from Entrance 1 to this shop. And from Entrance 2?

Teacher Notes: Shopping Centre
In this activity learners are required to read both the map with the key. In question 10 learners should be encouraged to set one another different questions.

Baxter Street

This is a drawing of part of Baxter Street.

1. Sipho lives in number 271 in Baxter Street. Which house it?

2. Number all the houses in the street.

3. The people in the kombi are looking for number 308. On which side of the street is it? Explain how you know?

Teacher Notes: Baxter Street
This activity requires that learners interpret the numbering system used to label the position of houses in a street. The even numbers are on one side of the road and the odd numbers are on the other.

A Block of Flats

This is a diagram of a block of flats that is 9 storeys high and on each floor there are six flats.
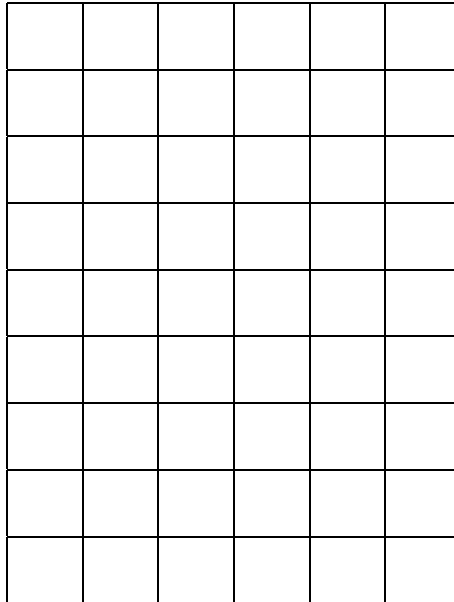
1. Think of a way to number the flats so that a visitor will know exactly where to go.

2. Using your numbering system, is it possible to say:

   (a) on what floor a flat is?

   (b) whether a flat is at the end of a passage (floor) or in the middle?

   If not, create another numbering system that would help you to answer these questions.

3. Discuss your method in your group. Decide which method you think is the easiest to use.

4. Use your numbering system to number all the flats in this building that is 4 storeys high and has 12 flats on each floor.

5. If a new block of flats was built that is much larger, say 30 storeys high and 35 flats on each floor, would your numbering system still work?
If not, change your numbering system to make it work.

6. Where did you start your numbering system from? Why did you start from this position?

This starting point is called the '*point of reference*'.

Choose a different point of reference. Will your numbering system work if you use this new point of reference? If not, try to adapt your numbering system.

Teacher Notes: Block of Flats
This activity is designed to indicate the need for a representation system that gives the location of an object in space. The representation system should be precise enough so that each object has a unique label.

Learners should be encouraged to develop their own labelling system and then to adapt this as they proceed through the activity and in discussion with others.

A class discussion should be held after Question 5 so that ideas can be shared. The uses and limitations of different methods should be discussed so that learners can proceed towards a more useful definition

In Questions 1 to 5 the learners will be able to use both letters and numbers but this will not be possible in Question 6. The teachers should encourage the use of numbers for both axes as in a co-ordinate system and should discuss an appropriate way of distinguishing between the two axes.

Question 7: learners are most likely to have numbered the grid from the bottom left but the teacher should look out for other approaches. In answering this question pupils could choose a point in at the top or in the middle. Negative numbers might be necessary.

In the activities that follow learners are required to work with given representation systems.

Bafana Bafana

'Bafana Bafana', the South African Soccer Team, is playing Nigeria in the final of the Africa Cup of Nations at the FNB Soccer Stadium in Johannesburg.

Your school soccer team is helping with the seating arrangements for the game. You and your friends are responsible for showing the invited guests to their seats in the main stand.
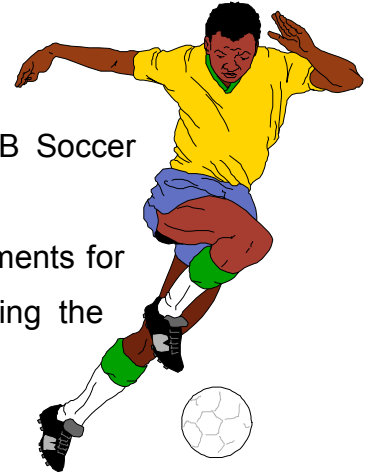
The picture below shows how the seats are arranged.

- *There are 16 seats in each row with an aisle down the middle and 8 rows (labeled A to H). Each seat has a label.*
- *Visitors can enter from the lower gate (Gate L) or the top gate (Gate T).*

Gate T

A	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
B	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
C	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
D	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
E	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
F	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
G	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
H	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Gate L

1. Mr Mandela is to sit in the seat labelled F12. Show on the diagram where he will be sitting.

2. Mr and Mrs Mbeki are to sit in seats H2 and H3. Mark off these seats on your diagram.

3. Marks Maponyane is to sit in the seat on Mr Mandela's right. What is the number of the seat in which he will sit?

4. You are standing at Gate L. Shakes Mashaba is in seat B7. Will this seat be on your left or right?

5. Hansie Cronje enters at Gate T and has a ticket for seat E12. Will this seat be on Hansie's left or right?

6. Chester Williams has a ticket for seat E13. Will he be on Hansie's left or right?

Teacher Notes: Bafana Bafana

In this activity learners are given particular labelling system in which the rows are labelled with letters and the columns with numbers.

In Question 3 the learners will have to make the distinction between Mr Mandela's right and his/her own right side. This and Questions 5 and 6 are likely to generate discussion.

<u>*Further Activities:*</u>
This activity can also be done using the seating in a school hall. Learners could design their own seating plan.

<u>*Source of Ideas:*</u>
Du Toit, D., Human, P., Murray, H. and Olivier, A. (1996). **Mathematics at Work. Standard 1.** *Cape Town: Nasou.*
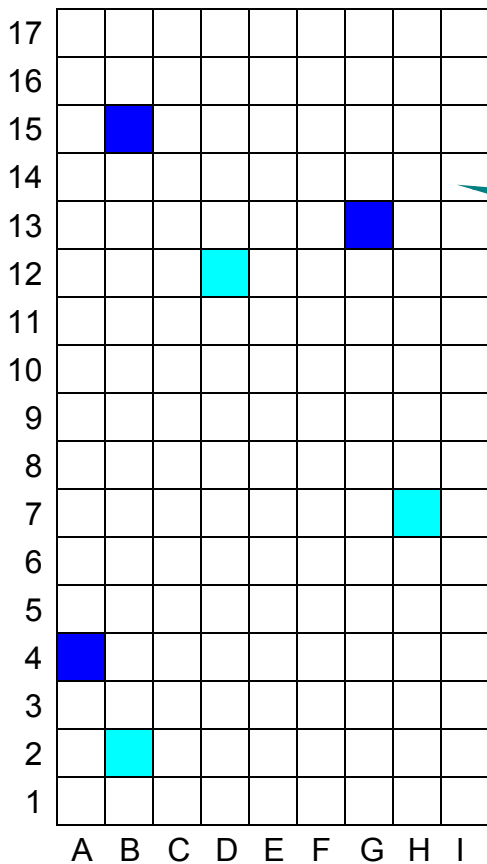
Pretty Tiling

The *Pretty Tilings* company specialises in decorative tiling of floors. They also fix or replace damaged tiles on floors.

When a customer calls for repair work, the company first send out a tile inspector to identify the tiles that must be repaired or replaced. The inspector then gives the repairman a written description of what needs to be done.

Here is an example of such a floor repair description:

Repair:	A4	B15	G13
Replace:	B2	D12	H7

This means that in the drawing below the tiles that are marked dark (blue) should be replaced, and the tiles marked light (blue) should be repaired.

Such a system to indicate *position* is called a **co-ordinate system**.

1. The tile repairman receives the following description from the tile inspector.

Repair: B14   D1   F10   `S18   V7   S17

Replace: C12   E15   G4   M20   H8

On the drawing given below, shade the tiles that must be repaired dark, and shade the tiles that must be replaced lightly.

2. Sophie Lekeur, the floor designer at *Pretty Tiling*, has designed this floor pattern. Write a description for the tile-laying team to make the floor.
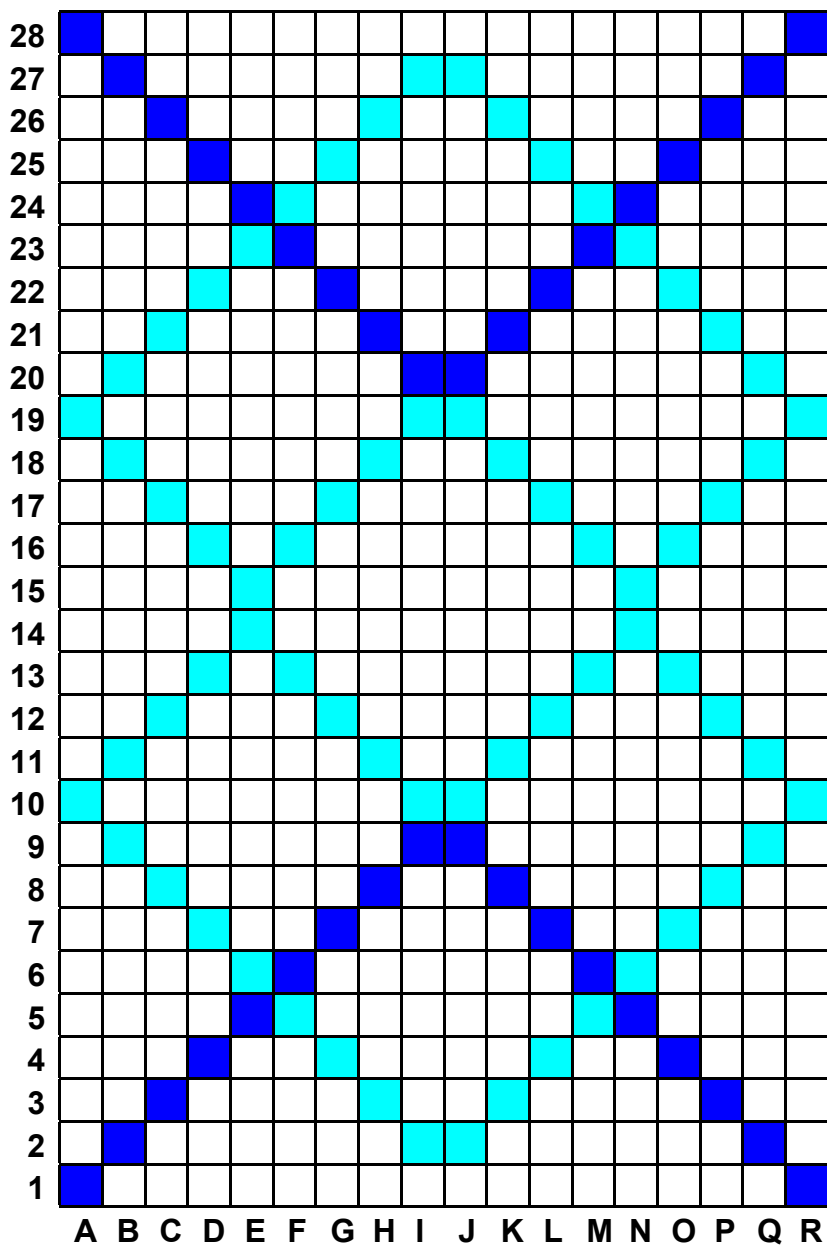
3. The description for a tile floor is given below. Use your pencil for light gray and dark gray and a pen for black to make a drawing of the floor on the next page.

Dark gray tiles:

A1	B1	C1	D1	E1	F1	G1	H1	I1	J1	K1	L1
M1	N1	O1	P1	Q1	R1	S1	T1	U1	A3	B3	C3
D3	E3	F3	G3	H3	I3	J3	K3	L3	M3	N3	O3
P3	Q3	R3	S3	T3	U3						

H11 to H15 (this means H11, H12, H13, H14 and H15)
N10 to N15
U4 to U22
A4 to A22

H10	I10	J10	K10	L10	M10	N10				
H16	I16	J16	K16	L16	M16	N16				
A23	B23	C23	D23	E23	F23	G23	H23	I23	J23	K23	L23
M23	N23	O23	P23	Q23	R23	S23	T23	U23	A25	B25	C25
D25	E25	F25	G25	H25	I25	J25	K25	L25	M25	N25	O25
P25	Q25	R25	S25	T25	U25						

Light gray tiles:

B2	C2	D2	E2	F2	G2	H2	I2	J2	K2	L2	M2
N2	O2	P2	Q2	R2	S2	T2	I11	J11	K11	L11	M11
I15	J15	K15	L15	M15	I12	I13	I14`	M12	M13	M14	B24
C24	D24	E24	F24	G24	H24	I24	J24	K24	L24	M24	N24
O24	P24	Q24	R24	S24	T24						

Black tiles

A2	U2	A24	U24	J12	K12	L12	J14	K14	L14	E7	F7
G7	H7	I7	J7	K7	L7	M7	N7	O7	P7	Q7	E19
F19	G19	H19	I19	J19	K19	L19	M19	N19	O19	P19	Q19

E8 to E18
Q8 to Q18

White tiles: All the other tiles.

25 24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1

A B C D E F G H I J K L M N O P Q R S T U

Teacher Notes: Pretty Tiling
This activity gives learners practice using a co-ordinate system. In questions 1 and 3 learners must identify given co-ordinates on a grid, and in question 2 learners must name the co-ordinates of given points on a grid.

Further activities of this nature can be given for additional practice, for example, using a knitting pattern.

<u>*Source of Ideas:*</u>
Human, P.G., Olivier, A.I., le Roux, A., Sethole, G.I. & Murray, H. (1999). **Mathematics at Work. Grade 7.** *Cape Town: Nasou.*
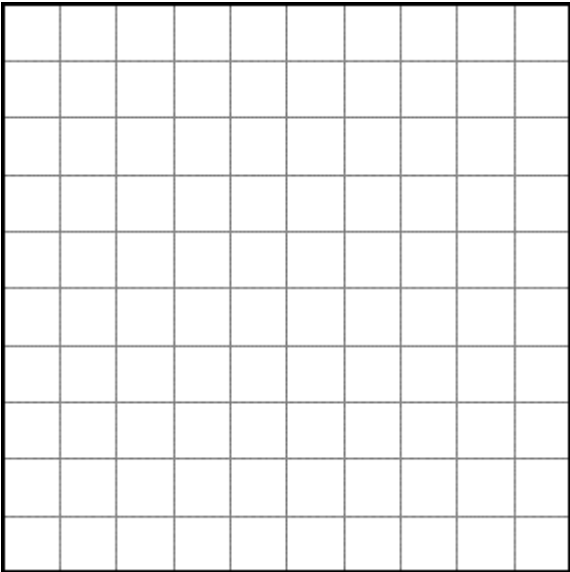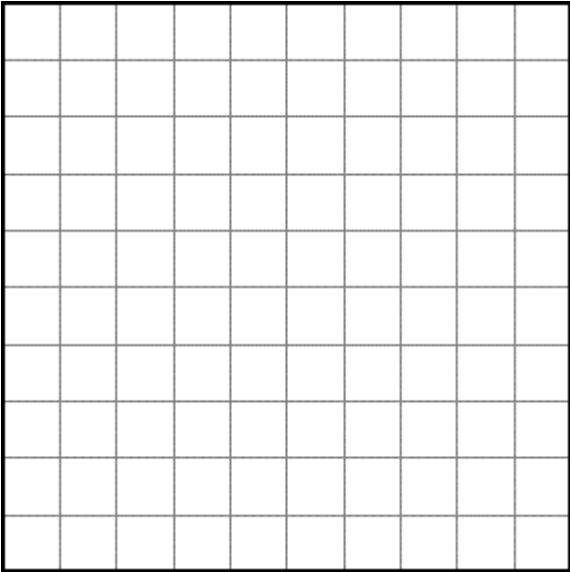
T-shirts

The design below is going to be used on a T-shirt. You friend Richard needs the design urgently. He does not have a fax, so you must call him on the telephone and tell him very precisely how to draw the design. He has a 10 by 10 grid just like yours, see below.

Prepare for the phone call by writing out your directions clearly, ready to read over the telephone.
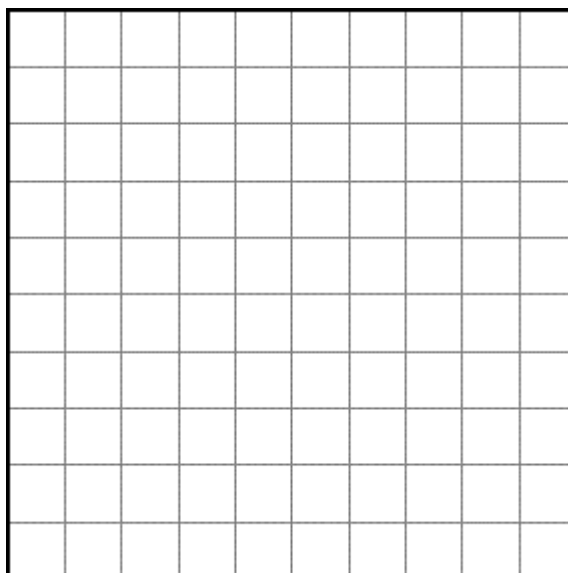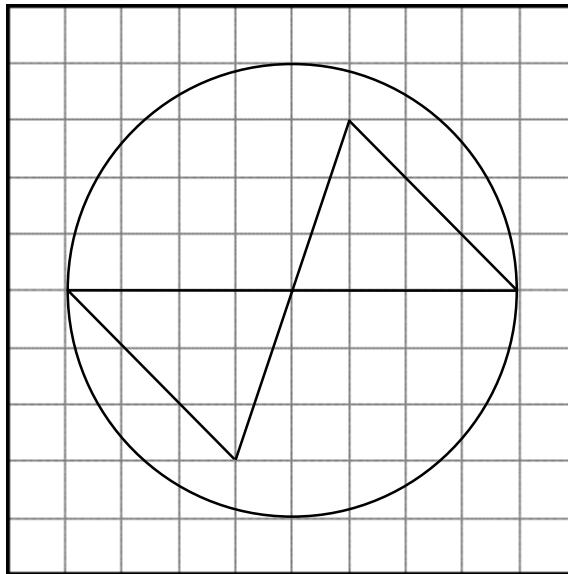
This is the grid that Chris has in front of him.

Now draw your own design for a T-shirt on this grid. Describe your design to a classmate and ask her to draw it on a grid. Is her the design that she draws correct?

Teacher Notes: T-shirts

Learners must use co-ordinates to give a precise description of the T-shirt design. This activity can be used as an assessment activity.

<u>*Source of Ideas:*</u>
Balanced Assessment Project: http://www.educ.msu.edu/mars

Walking in Cape Town

It is Thabo's first visit to Cape Town. He arrived by bus and went straight to the Tourism Gateway where he was given this map of the city:
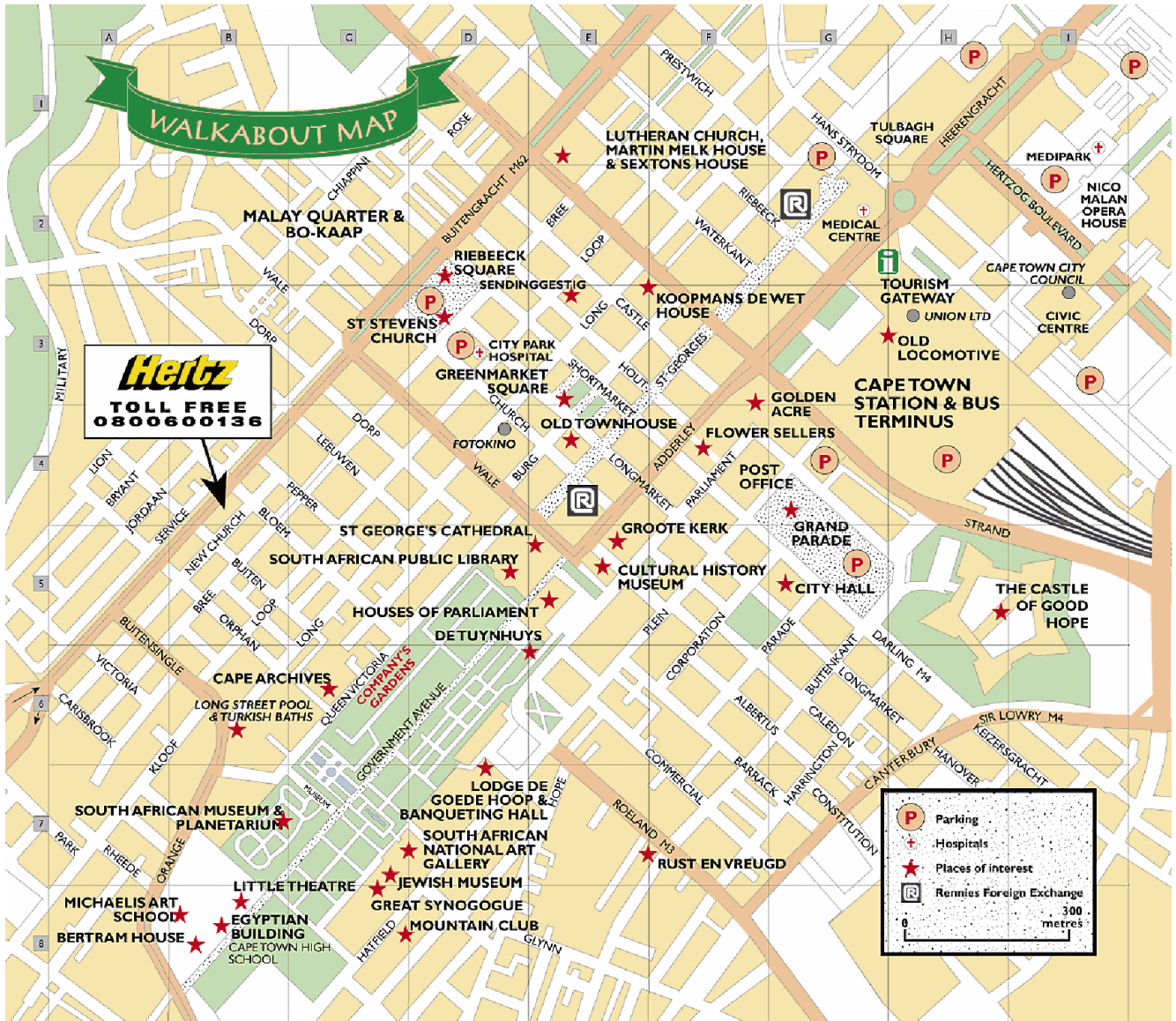
1. Find these places on your map. Write the correct letter on the map.

   (a) The flower sellers
   (b) The Castle of Good Hope
   (c) Government Avenue
   (d) Two hospitals (give the names of the hospitals)

2. Were these places difficult to find? One way to make it easier to find and describe the **location** or **position** of places on a map, is to divide a map up into blocks. This map is divided into 9 rows (**horizontal**) labelled A to I and 4 columns (**vertical**) and labelled 1 to 8.

The City Hall is in block G5 and the Long Street Pool is in block B6. In which blocks are these places?

(a) The South African Public Library

(b) The Michaelis Art School

(c) Barrack Street

3. (a) Name one place of interest in block E5.

(b) Name one street that runs through block C4.

(c) Name two streets that run through block F4.

4. Through which blocks does Buitengracht Street (M62) run?

5. Thabo wants to visit these places:
   - St George's Cathedral
   - The Planetarium
   - The Grand Parade
   - The Houses of Parliament
   - Greenmarket Square
   - A house in Dorp Street in the Bo-Kaap

   Thabo is going to start at the Tourism Gateway. Plan the route for Thabo. Draw the route on your map and describe in words where Thabo should go.

6. Think of other situations in which a grid is used to describe the location of objects.

Teacher Notes: Walking in Cape Town
This activity introduces the use of a grid to describe the position / location of places on a map. The teacher can use different maps to provide learners with additional practice where necessary.