

Activity 4: Drawing shapes

Teacher's notes

Framework reference: Page 12

Strand: Using and applying mathematics to solve problems.
Topic: Applying mathematics and solving problems
Pupils should be taught to: Solve word problems and investigate in a range of contexts.
Year group: 7
Objectives: Use coordinates to draw shapes.
Key Vocabulary: Coordinates, quadrilateral, parallelogram, cube.
Resources required: Class set of calculators plus Viewscreenor TI-SmartView emulator. Link cables (to share pictures) and TI-Graph Link to print them.

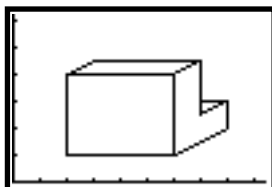
Summary

This activity introduces the two different ways of drawing straight lines on the calculator. Both methods offer opportunities for stressing the importance of coordinates.

Instructions for the teacher

Before the lesson, create a friendly graphing window on the demonstration calculator. Press **[WINDOW]** and enter the values shown here.

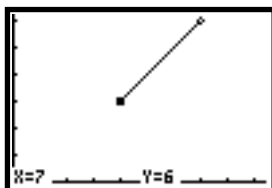
```
WINDOW
Xmin=0
Xmax=9.4
Xscl=1
Ymin=0
Ymax=6.2
Yscl=1
Xres=1
```



Also prepare a drawing to display, which will attract attention as students arrive for the lesson.

Show students how to enter on their calculators the friendly window settings shown above. Explain how to carry out *direct* drawing:

- Press **[GRAPH]** (you *must* start on the graphing screen) and then **[2nd] [DRAW] 2** to choose **Line(** from the menu.
- Use the cursor keys to move to the point where the line will start and press **[ENTER]**.



- Move to the point where the line will end and press **[ENTER]** again. Use the coordinates at the bottom of the screen to make sure the end points are where you want them to be.
- Continue moving and pressing **[ENTER]** until the shape is complete.

Explain how to clear the drawings:

press **[2nd] [DRAW] 1** to choose **ClrDraw** from the menu.

Explain *indirect* drawing, which will be used later. Here you *must* start on the home screen, so press **[2nd] [QUIT]**.

Press **[2nd] [DRAW] 2** to choose **Line(** and then complete the command by entering the coordinates of the end points, separated by commas.

```
Line(1,1,5,5)
Line(5,3,3,5)
Line(5,3,5,5)
```

To enter another similar command you can save time by using **[2nd] [ENTRY]** and editing.

Students can then be asked to create their own drawings using both direct and indirect drawing. Direct drawing is more fun but the difficulty is then to ensure that students are using the coordinates at the bottom of the screen, rather than just producing the drawing by eye. There are activities on the handouts that retain the fun aspect, while shifting attention to the coordinates.

In a final plenary, you may want to display some of the students' drawings. They can store their pictures and then transfer them to the demo calculator using the link cable.

There may be other important issues to discuss which the activities may have highlighted, e.g. the use of coordinates, the properties of shapes and representing 3-D shapes.

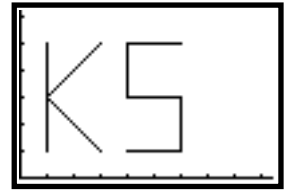
This activity was first published in **30 Calculator Lessons for Key Stage 3 (A+B Books)**.

Another way of drawing shapes is to specify coordinates as two lists and then drawing a scatterplot or line graph. This is a particularly powerful idea and opens up the possibility of transforming the shape. See **Calculator Maths: Shape** (pages 36-39)

1) Initial activity

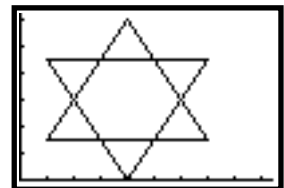
Use direct drawing to produce your initials on the screen.

Make sure they are exactly right by keeping an eye on the coordinates at the bottom of the screen.

**2) Follow the star**

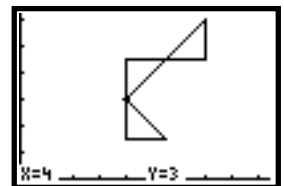
What are the coordinates of the corners of this six-pointed star?
Use direct drawing to produce it on your calculator.

Now try making a similar eight-pointed star.

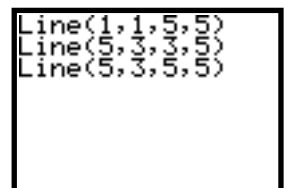
**3) Triangle tangle**

This shape is made using three identical triangles that only touch at the corners.

Can you make a better one using lots of identical triangles?

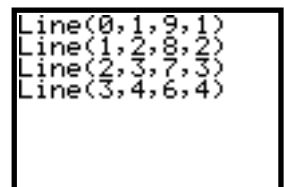
**4) Heading north-east**

What shape is produced by the commands shown here?
Enter a fourth line to complete a symmetrical shape.

**5) Line pattern**

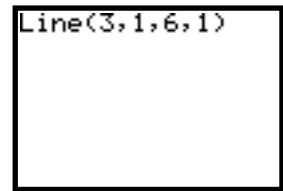
Can you spot the pattern of numbers in these commands?
Can you predict the pattern of lines they will draw?
Enter the commands to check your prediction.

What should the next Line command be and what line in the drawing will be produced?
And the next? Why does the line pattern go wrong?



6) A sound base

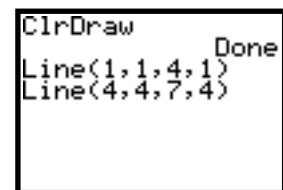
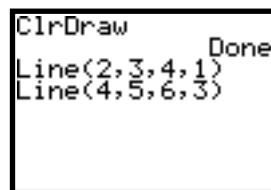
Enter the command shown here.
 Now imagine that this is the base of a square
 Draw the rest of the square using indirect drawing.



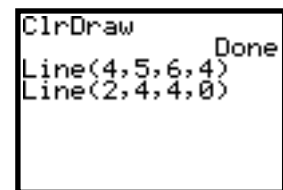
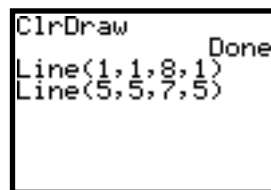
Clear the screen and enter **Line(3,1,6,1)** again.
 Now imagine that the line is the base of a parallelogram that is
 twice as high as the square.
 Draw the rest of such a parallelogram using indirect drawing.

7) Name the shape

Each of these four screens will draw the
 opposite sides of a quadrilateral.

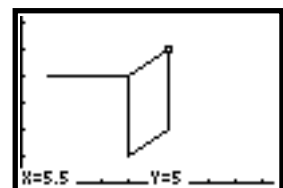


In each case see if you can predict the
 shape, then enter the commands, draw the
 other two sides and see if your prediction
 was right.



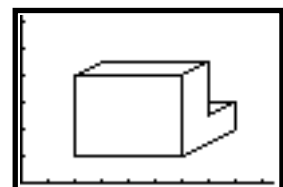
8) Skeleton cube

Use your calculator to draw the complete outline of the skeleton
 cube that has been started here,



9) Taking a different view

Try to imagine the three-dimensional shape represented here.
 Now imagine the shape turned round or stood on its end. What
 would it look like?



Try to draw it on your calculator.