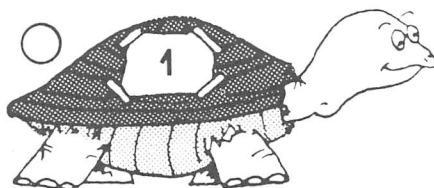
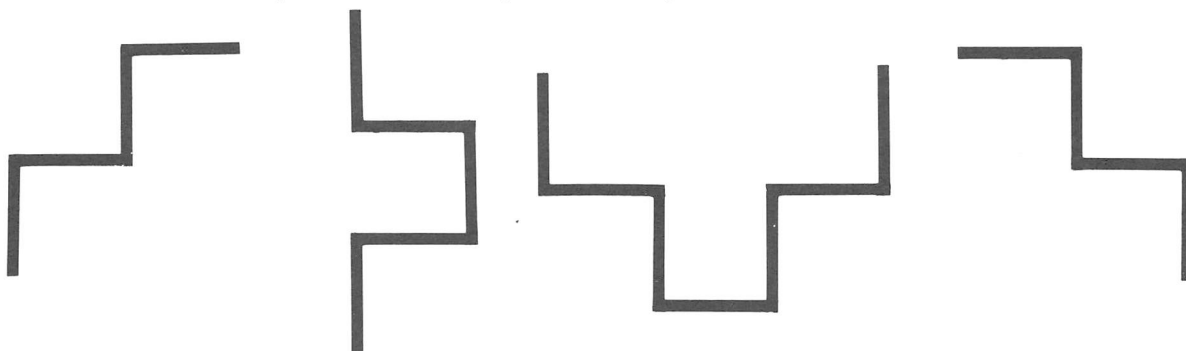


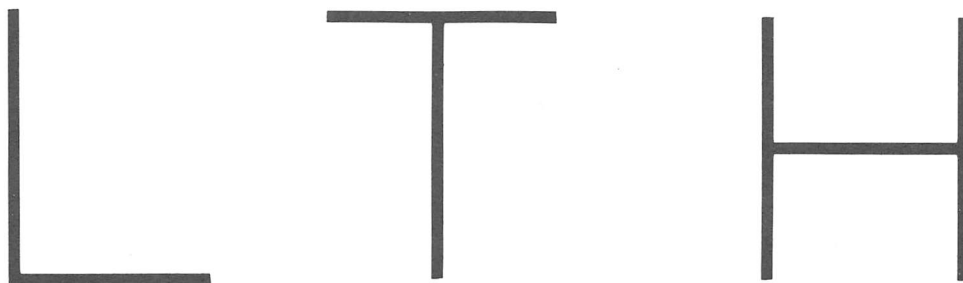
TURTLE CARD ○ ○ ○ ○



1. Here are some patterns for you and your turtle to draw.



2. Draw these letters on the screen.



Can you draw any other letters?

3. Look at these lists of commands.

Draw on a piece of paper the shape you think each list will make.

FD 160
BK 160
LT 90
FD 160
BK 320

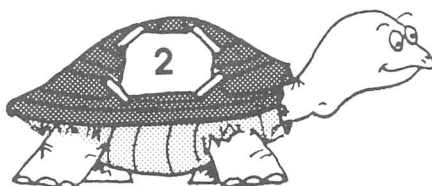
BK 140
RT 90
FD 100
LT 90
FD 80
RT 90
FD 60

LT 90
FD 160
RT 90
FD 60
RT 90
FD 80
RT 90
FD 140

Now type in the commands.

Did your shapes match those on the screen?

TURTLE CARD ○ ○ ○ ○

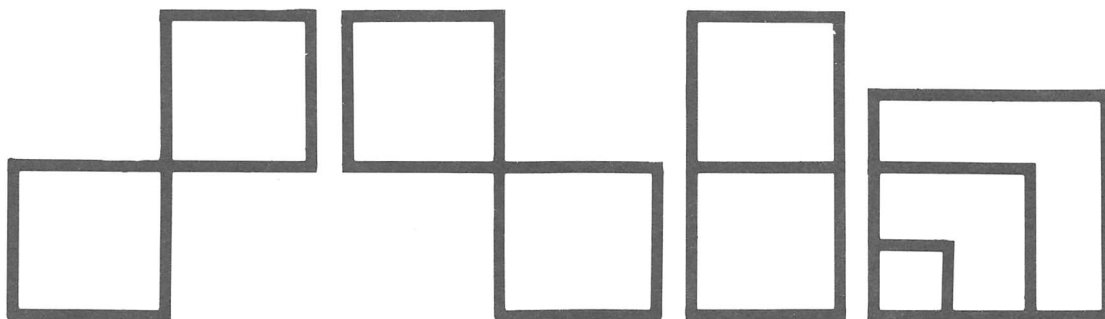


```
LT 90
FD 120
LT 90
FD 120
LT 90
FD 120
LT 90
FD 120
```

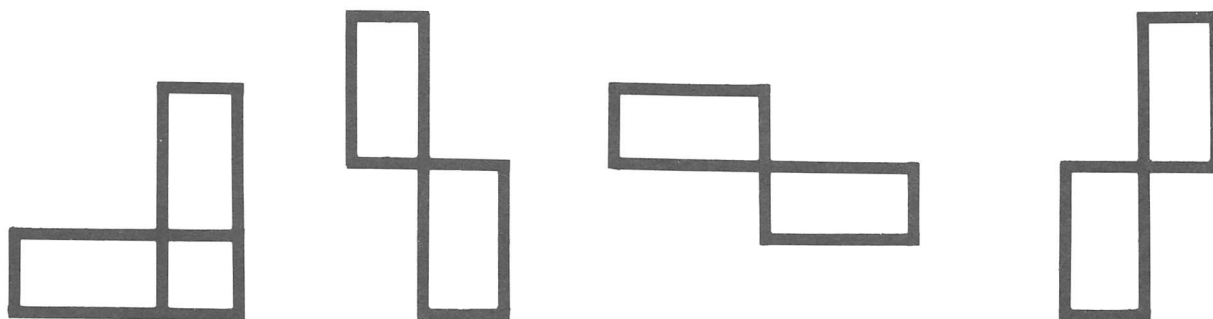
Look at this list of commands to draw a square and decide where it will come on the screen.
Try it.

You can now command your turtle to draw squares of different sizes and in different positions on the screen.

Use what you know to draw some of these patterns.

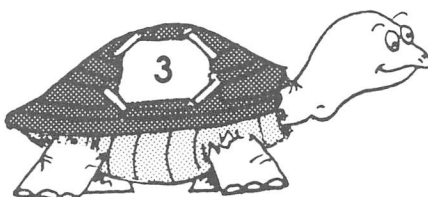


Draw some of these 'box' patterns or make up some of your own.



Remember to plan your commands before you draw on the screen.

TURTLE CARD ○ ○ ○ ○



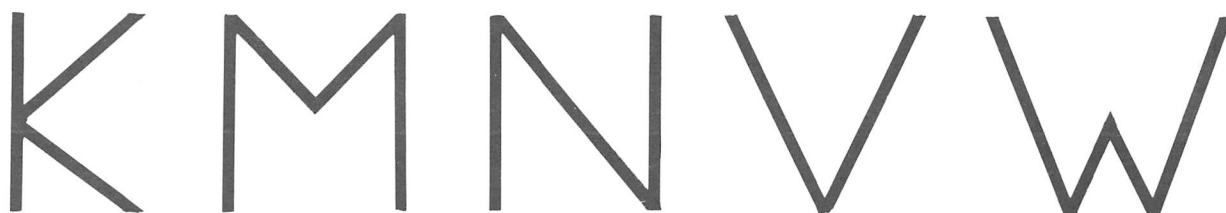
You know how to tell your turtle to turn any corner you need by typing a number after RIGHT or LEFT.

If you are not sure whether to turn RIGHT or LEFT, be a turtle, stand up and walk round the corner yourself!

You could even make a large drawing on a piece of paper, put it on the floor and walk along the lines.

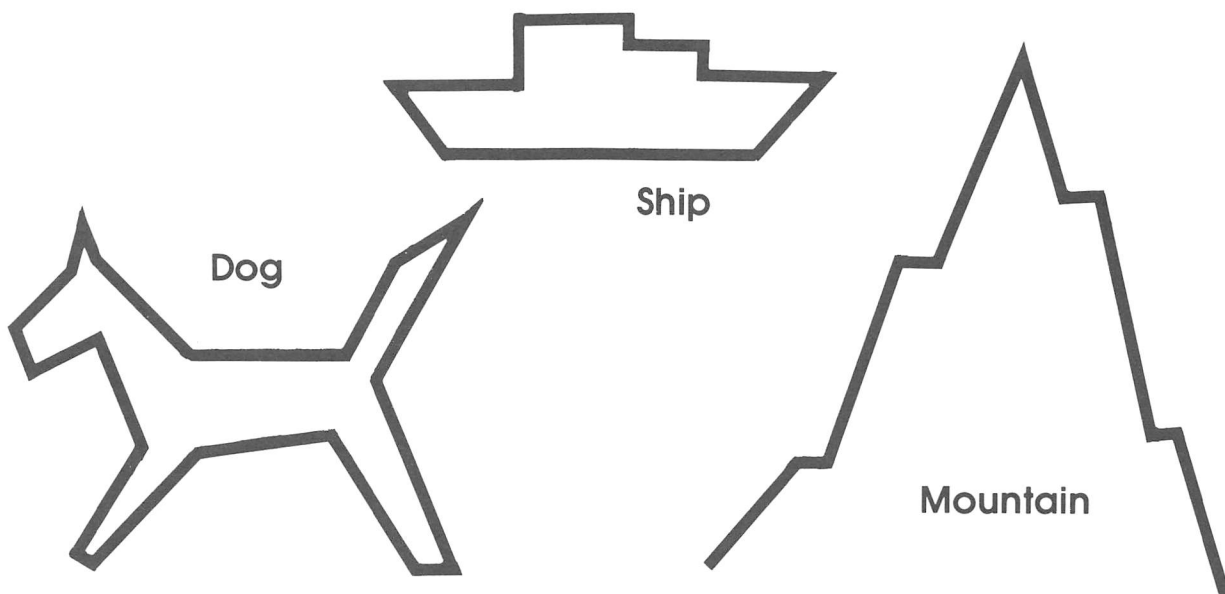
Deciding what number to put after RIGHT or LEFT will become easier with practice.

Choose one of these letters to draw on your screen.

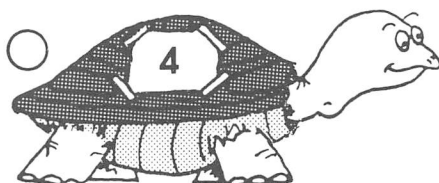


Draw one of these pictures or try one of your own.

Remember to plan your work on paper before drawing on the screen.



TURTLE CARD



Type this list.

FD 140

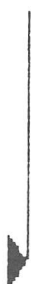
BK 140

RT 90

Turtle moves FORWARD 140

Turtle moves BACK 140

Turtle turns RIGHT 90



Look at which way your turtle is facing.

What would happen if you typed the list again ... and again ... and again without clearing your screen? Try it!

Did you draw a cross?

Notice that your turtle is back in its home position.

Try this one.

FD 140

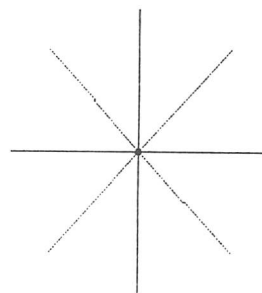
BK 140

RT 45

Without clearing your screen, repeat the list until your turtle is back home.

Have you made a star with eight points?

How many times did you type the list?



Type these 'angle' lists.

Keep a record of how many points each star has and how many times you typed the list to bring your turtle home.

FD 150

BK 150

RT 120

Repeat?

FD 80

BK 80

RT 30

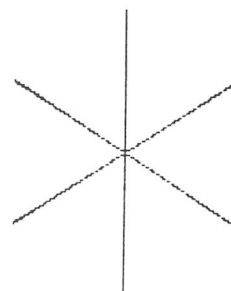
Repeat?

Draw this star.

Make each point 100 screen units long.

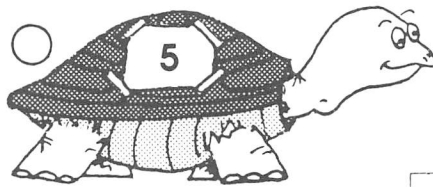
Find out how to draw a star with 10 points and a star with five points.

Draw some of your star patterns on paper and decorate them by adding bits and colouring.

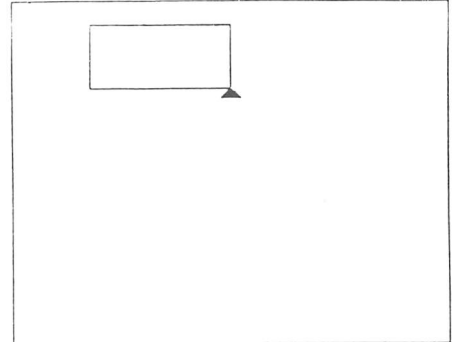


Save your 'star' lists in your 'lists' notebook.

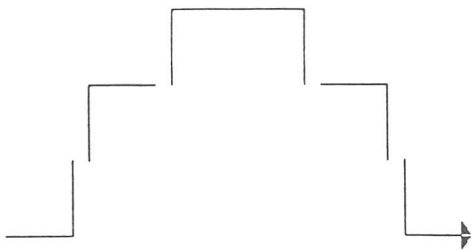
TURTLE CARD



Draw the biggest 'box' shape which will fit on the screen.
Put a smaller 'box' anywhere inside it but not touching it.



What is another name for the 'box' shape?

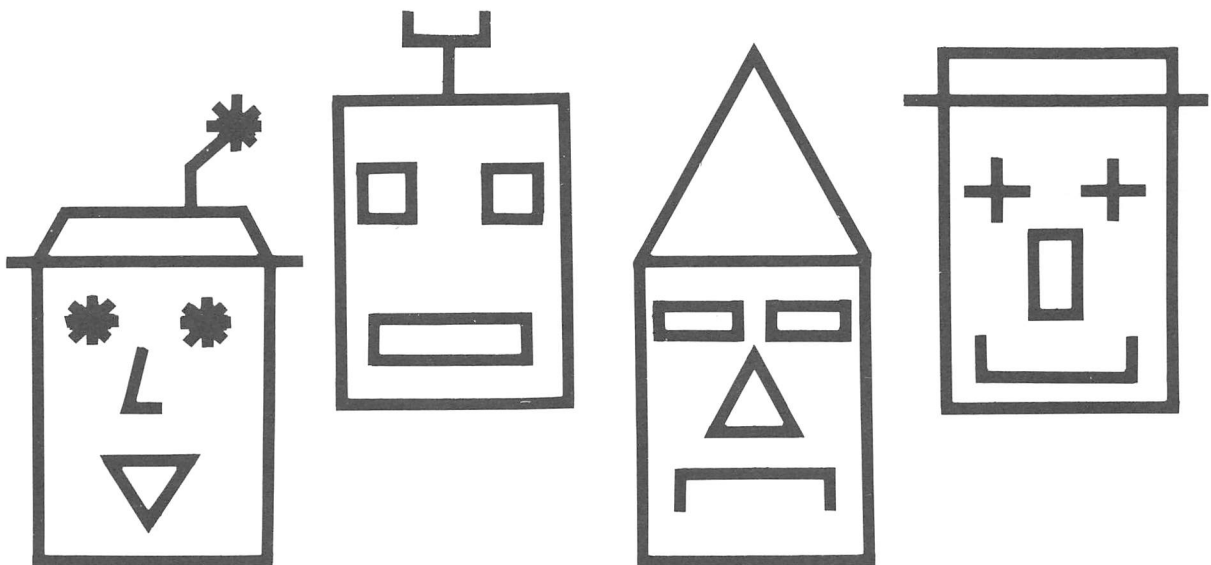


Arrange some angles on the screen so that they don't touch each other.
Either try this pattern or make up one of your own.

Draw a pattern using a number of squares, triangles or stars.

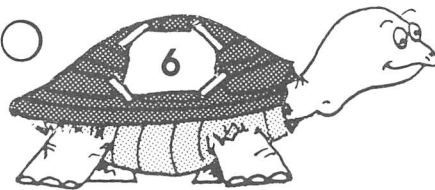
Plan your pattern and your list of commands on paper first. You have lists for these shapes in your notebook but you may have to make the sides shorter.

Choose a face to draw:



or design another member of the 'Blockhead' family.

TURTLE CARD ○ ○ ○ ○



Define a procedure for a TRIANGLE with sides 150 units long.

Define a procedure for a SQUARE with sides 170 units long.

Define a procedure for a BOX shape of width 160 units and length 180 units.

Draw on paper the pattern you think your turtle would draw if you typed:

SQUARE

BOX

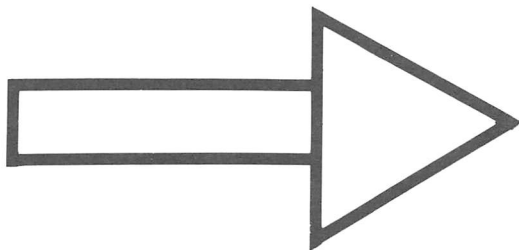
TRIANGLE

Try it on your screen.

You can speed up your drawing by calling a procedure and adding to it.

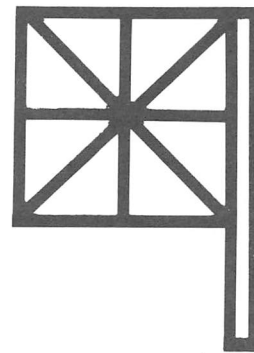
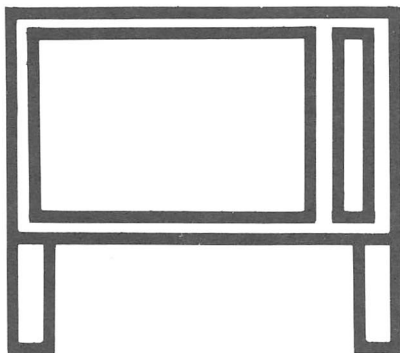
Type: TRIANGLE.

Now make it into an arrow.



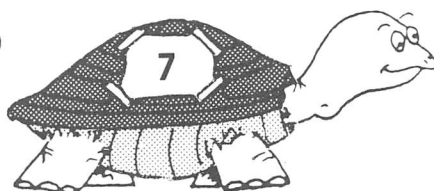
Remember that you can use
PENUP(PU) and PENDOWN(PD)

Call BOX and make it into a television set.



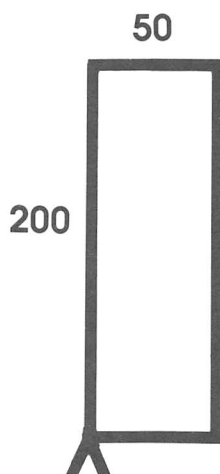
Call SQUARE and make it into a flag.

TURTLE CARD ○ ○ ○ ○

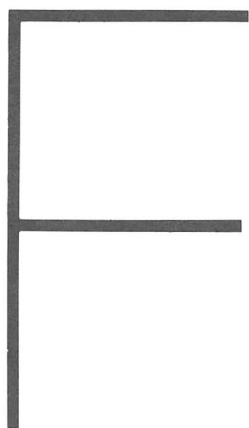


EDIT this BOX procedure to make it draw this BOX.

```
TO BOX
FD 200
RT 90
FD 100
RT 90
FD 200
RT 90
FD 100
RT 90
END
```

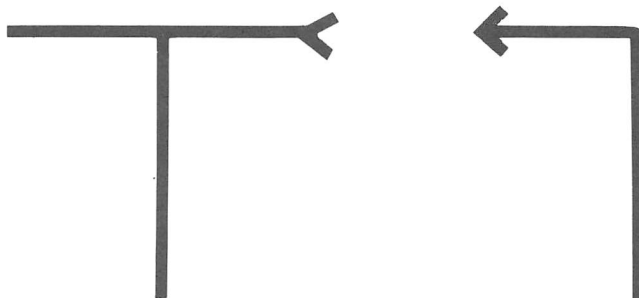


EDIT this procedure to make it draw the letter F.



```
TO F
FD 200
RT 90
FD 100
BK 100
LT 90
BK 100
FD 100
END
```

Write a procedure to draw the letter T... then EDIT it so that it draws the number 7.



TURTLE CARD



Draw on paper what you think this repeat line will tell your turtle to draw on the screen.

REPEAT 4 (FD 200 BK 200 RT 90)

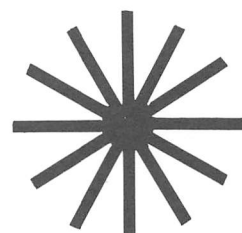
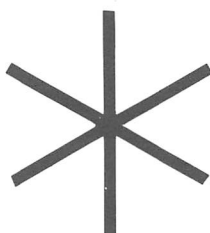
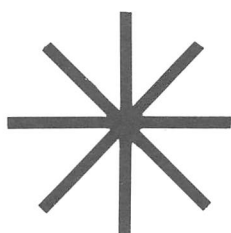
Try it on your screen.

Here is a repeat line which will instruct your turtle to draw a star.
How many points will the star have?

REPEAT 5 (FD 100 BK 100 RT 72)

Try it on your screen.

Write a repeat line which will instruct your turtle to draw each of these stars and try them on your screen.



Are there any other stars you can draw using a repeat line?

Look at your 'star' repeat lines.

Can you see any connection between the number of REPEATS and the amount of turn RIGHT?

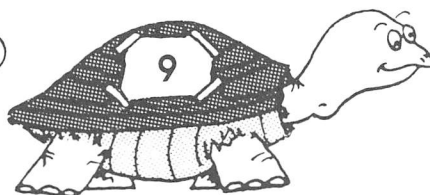
Draw on paper the shape you think your turtle will draw when you type this repeat line.

REPEAT 6 (FD 150 BK 150 LT 90 FD 60 RT 90)



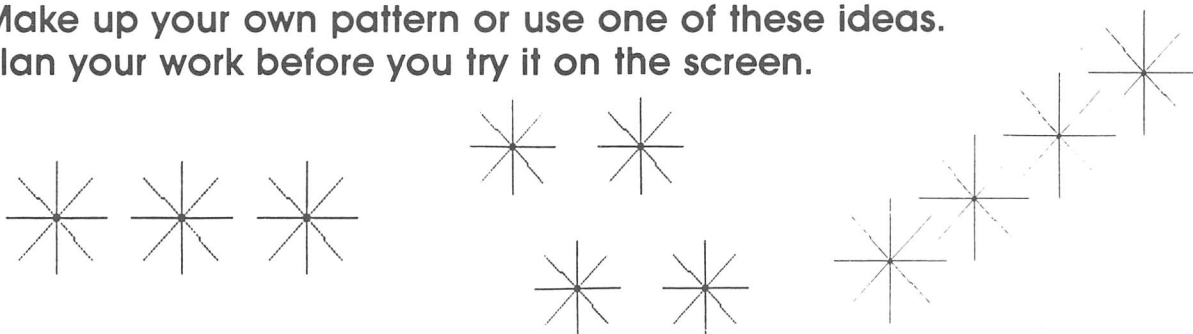
Write a repeat line for this letter F.

TURTLE CARD



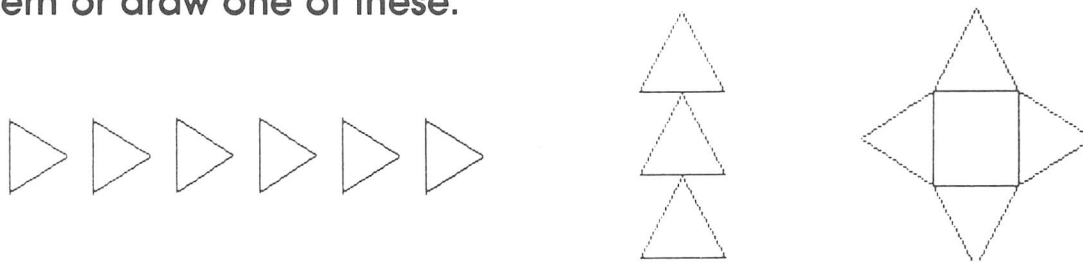
Using a repeat line, define a procedure for a star with points 130 units long. Decide for yourself how many points you would like your star to have. Call your procedure TO TWINKLE.

Use your procedure to draw a 'starry' pattern.
Make up your own pattern or use one of these ideas.
Plan your work before you try it on the screen.



Define a procedure for a triangle with all three sides 130 units long.

Use your procedure to draw a pattern of triangles. Design your own pattern or draw one of these.



Draw on paper the pattern you think this list would instruct your turtle to draw on the screen.

TRIANGLE

PU

RT 90

FD 160

LT 90

PD

TWINKLE

PU

RT 90

FD 140

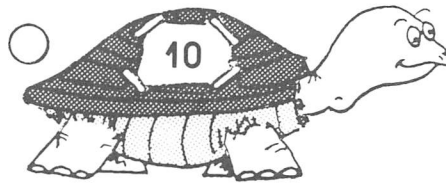
LT 90

PD

TRIANGLE

Design a pattern using both stars and triangles.

TURTLE CARD

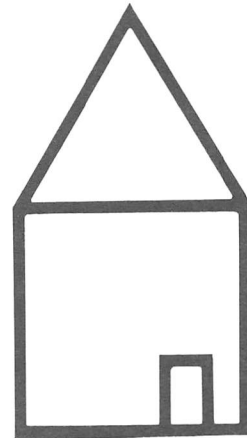


Make a **BETTER** house by adding a door.

Type: **HOUSE**.

Decide on the size of the door.
Work out how to put the door in position.

Try it on the screen.



Use this information to define a procedure for **DOOR**.

Use **HOUSE** and **DOOR** as subprocedures inside a procedure for a better house.

Call it **BETTER**.

Now make a **MUCH** better house by adding a window.

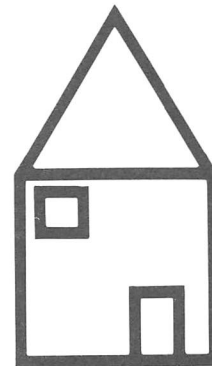
Think where the turtle was when it finished drawing **DOOR**.

Use squared paper to work out the size of the window and how to put it into position.

Type: **BETTER**

and try your window on the screen.

Draw a house on squared paper to help you in working out the size and position of the door.



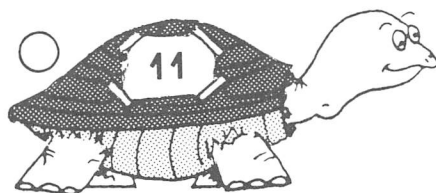
Use the information you have to define a procedure for **WINDOW**.

Use **BETTER** and **WINDOW** as subprocedures inside a procedure for your much better house. Call it **MUCHB**.

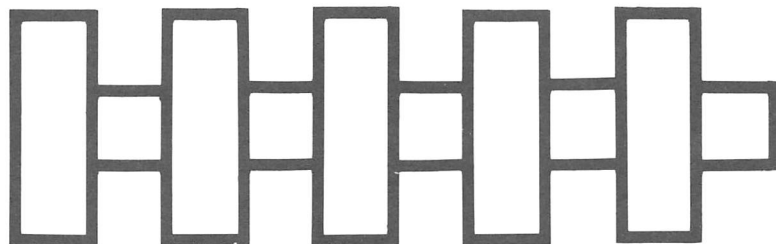
Remember **PENUP (PU)** and **PENDOWN (PD)**.

You may like to make even more improvements.
You could define a procedure for **BEST** house.

TURTLE CARD



Look at this fence pattern.



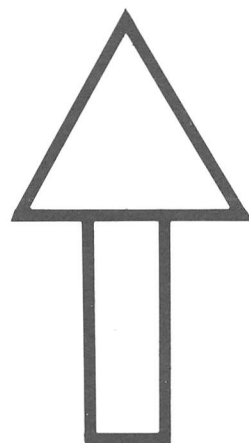
It is made up of two shapes, a tall 'box' shape and a small square.
Define a procedure for each shape.
You could call them TALLBOX and SMALLSQ.

Use TALLBOX and SMALLSQ inside a procedure which will draw FENCE.

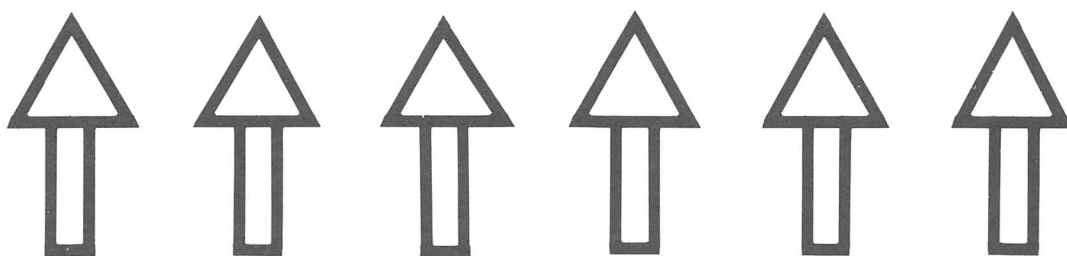
Define a procedure for this fir TREE.

Again it contains two shapes, a box and a triangle.

Remember to choose new procedure names for the box and the triangle.
You could call them TRUNK and BRANCH.



Now you have a TREE, you can grow a FOREST.



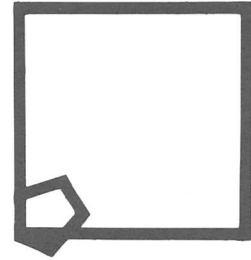
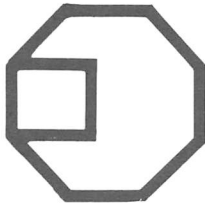
Build a row of TENTS. You could call it CAMP.



TURTLE CARD ○ ○ ○ ○

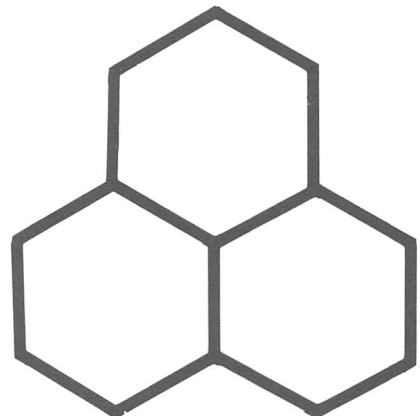
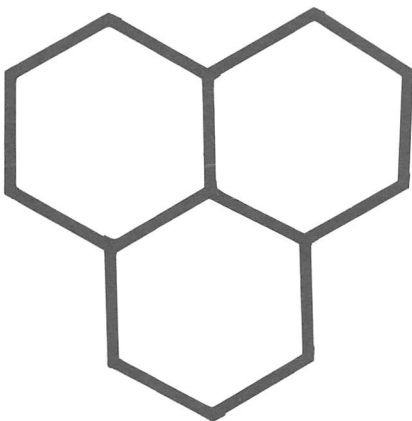


Use repeat lines to draw these patterns.

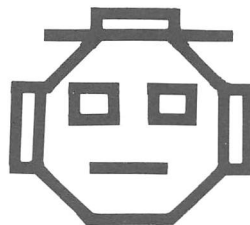


What would happen if you changed the RIGHT commands for LEFT commands in a repeat line? Try one.

Define a procedure for a HEXAGON and use it to draw one of these patterns.

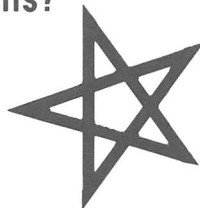


Draw an OCTAGON and use it to make a face.



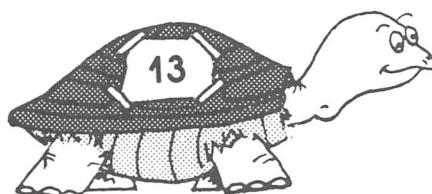
Here's an extra tricky one!

You know how to draw a polygon with five sides. Can you think how to draw this star with five points?



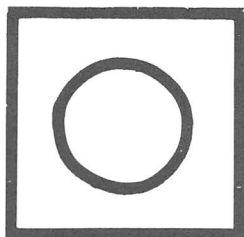
Look at the shape in the middle of the star.

TURTLE CARD ○ ○ ○ ○



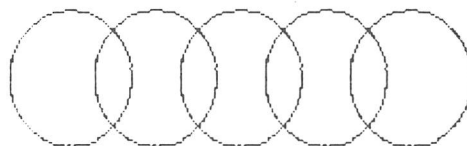
Show your turtle the way round some of these drawings.

Put a circle inside a square.



Make a chain.

OR

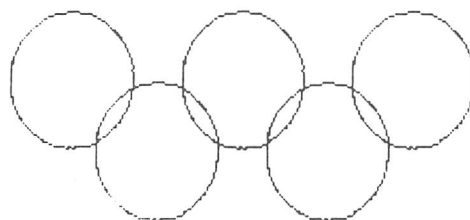


Draw a balloon on a string.

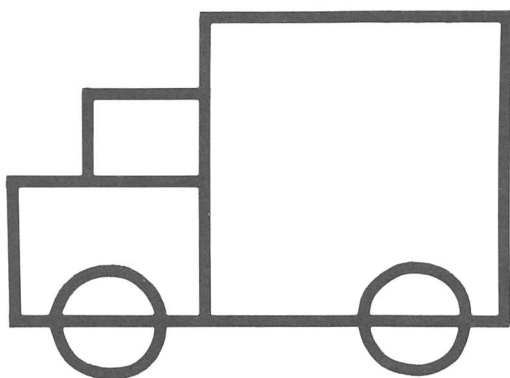


The Olympic rings.

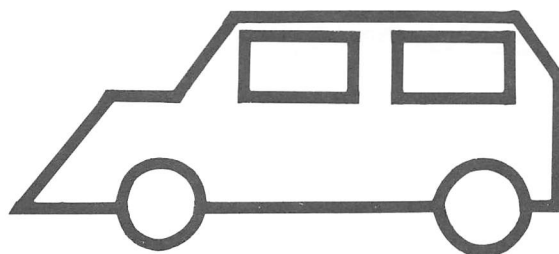
OR



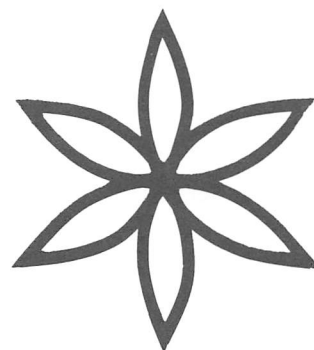
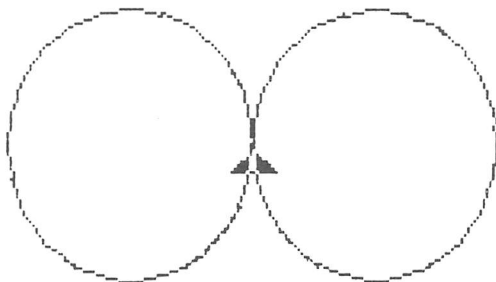
Design a vehicle.



What do these five rings stand for?

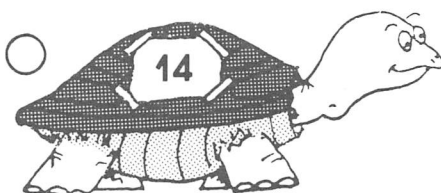


Find an easy way to draw these two 'touching' circles.



Use your petal to draw a flower.

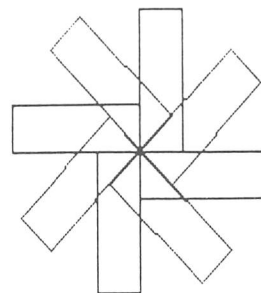
TURTLE CARD ○ ○ ○ ○



On what shape is this pattern based?

Write the repeat line which will produce it.

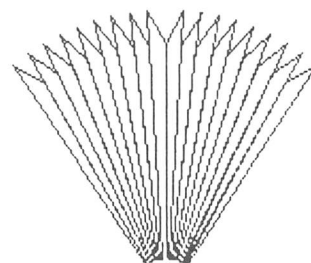
This repeat line produces an unusual pattern.



REPEAT 6 (HEXAGON RT 60)

Look at the shapes inside the pattern.

What can you see?



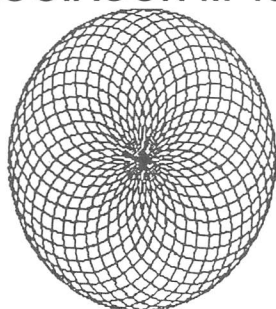
Use a TRIANGLE to draw a fan similar to this one.

Here are two repeat lines which look similar.

Before you try them, think how the patterns will differ.

REPEAT 10 (OCTAGON RT 36)

REPEAT 36 (OCTAGON RT 10)



Circles make flowery patterns.
Try one.

This shape makes interesting patterns when repeated and so does the five-pointed star you drew on TURTLE CARD 12.

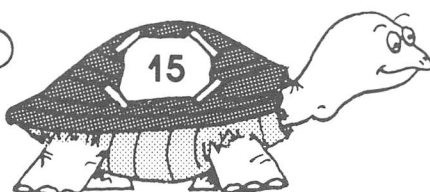


You can use two shapes in one pattern.

Type: REPEAT 8 (SQUARE TRIANGLE RT 45)

Use another pair of shapes in a pattern.

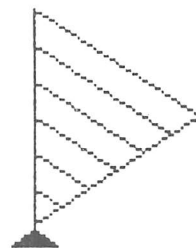
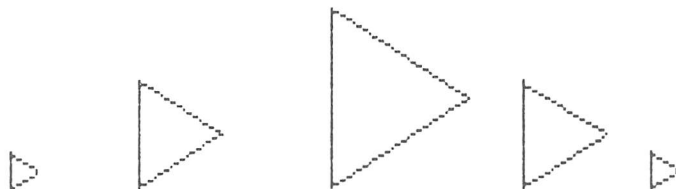
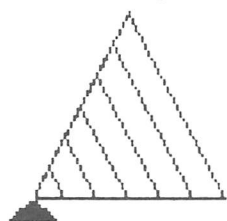
TURTLE CARD



Change your old TRIANGLE procedure to define a new procedure for a TRIANGLE with variable side length.

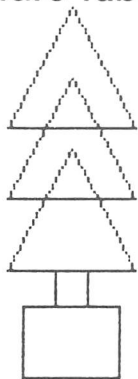
Will the size of the RIGHT turns change?

Now you have a TRIANGLE with variable SIDE (or LENGTH), try one of these drawings.



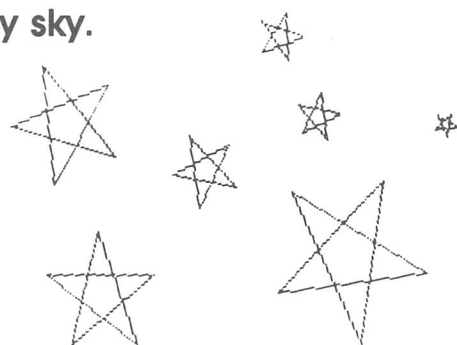
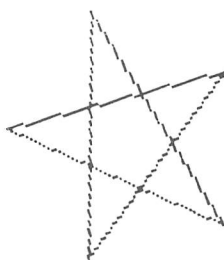
Here are more ideas – try one of them.

Draw a Christmas tree in a square tub.



Define a procedure with variable side length for this five-pointed star.

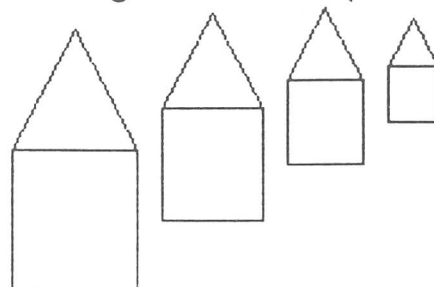
Draw a starry sky.



Define a new HOUSE procedure making the side length variable (TO HOUSE :SIDE).

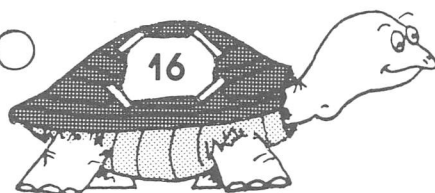
Remember that you already have the procedures

TO SQUARE :SIDE and TO TRIANGLE :SIDE

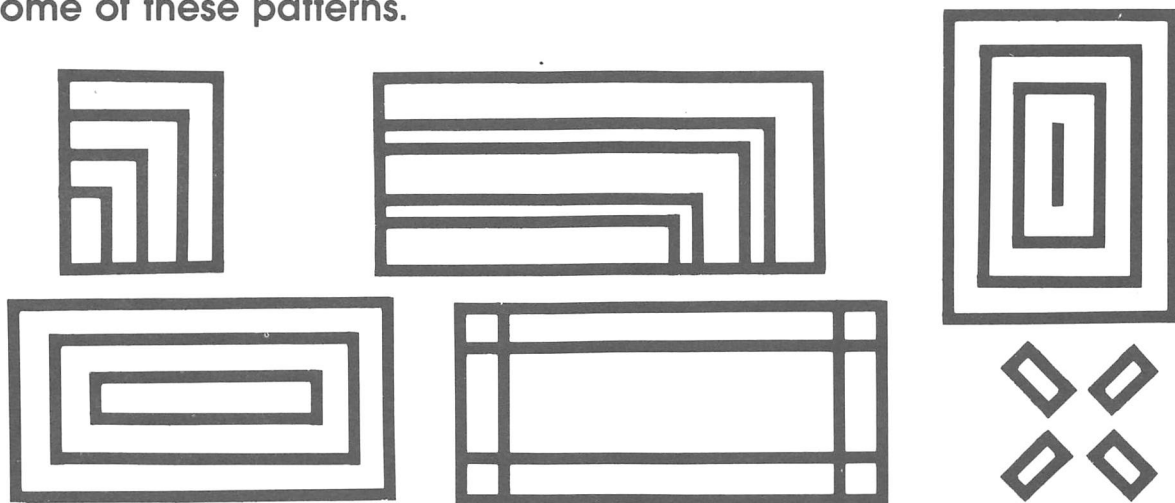


Now draw this street.

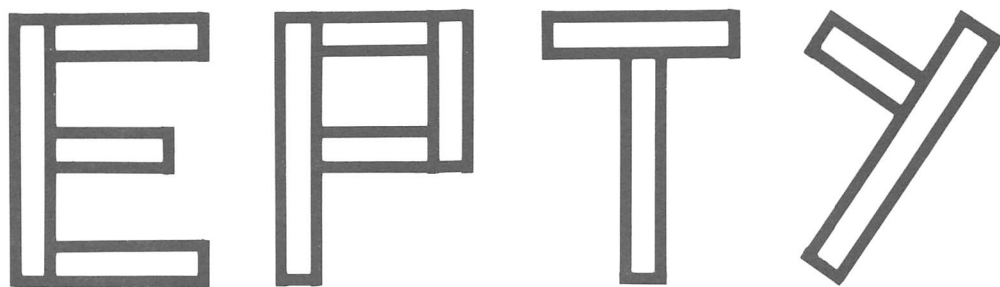
TURTLE CARD ○ ○ ○ ○



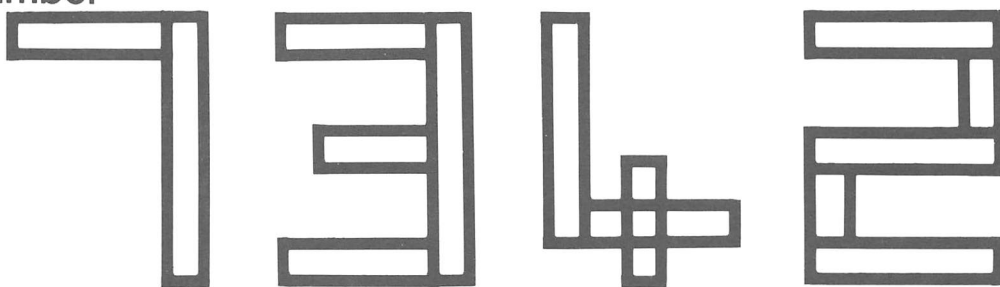
Use your BOX procedure with variable LENGTH and WIDTH to draw some of these patterns.



Try a letter:



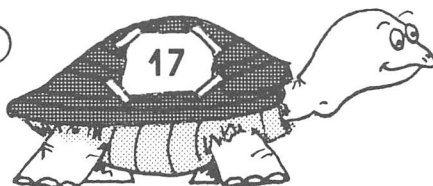
or a number



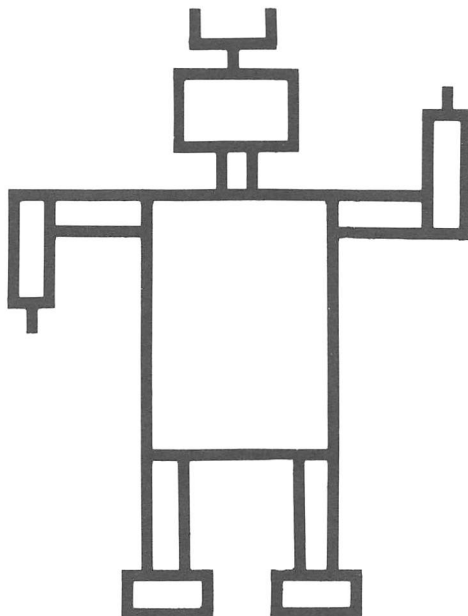
or say hello to a friend!



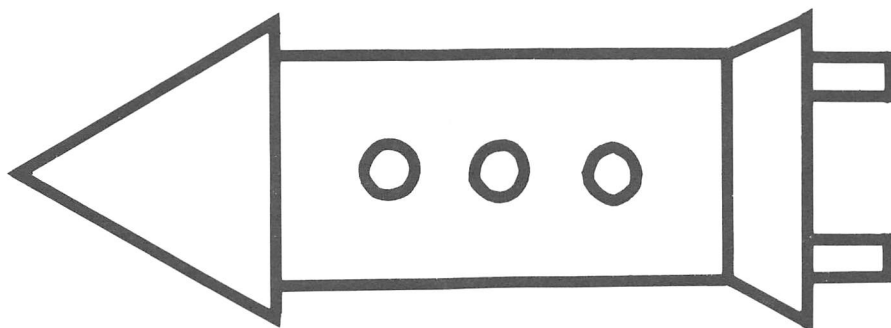
TURTLE CARD ○ ○ ○ ○



Write the shortest program you can to draw a robot ...



OR a space rocket

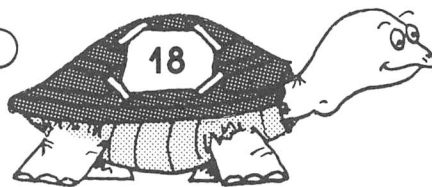


Write your name

KAREN
DAVID

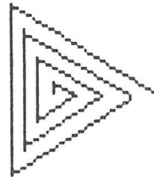
OR design your own picture or pattern.

TURTLE CARD ○ ○ ○ ○



Define a procedure for a TRIANGULAR SPIRAL like this one.

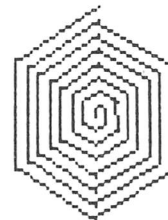
You could call it TRIRAL.



EDIT TRIRAL to draw the lines closer together or farther apart.

EDIT TRIRAL to start on the outside and draw inwards.

Define a procedure for this HEXAGONAL SPIRAL.
Think of a suitable name for your procedure.



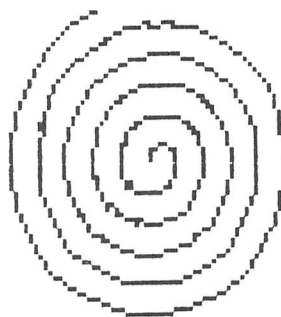
Think of some other spirals you can draw.

Define a procedure to draw a spiral using multiplication (\times) instead of addition (+).

HINT! Try out some numbers just bigger than 1.
For example $\times 1.1$ $\times 1.3$ $\times 1.5$.

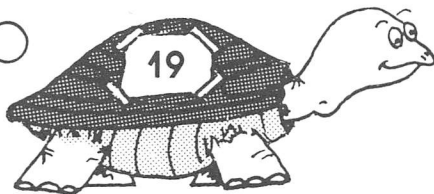
Here is a tricky one!

Work out how to draw a circular spiral similar to this one.

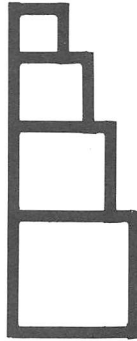


Remember that you can use numbers which are smaller than 1 by using decimals like .5 or .1 or even .05.

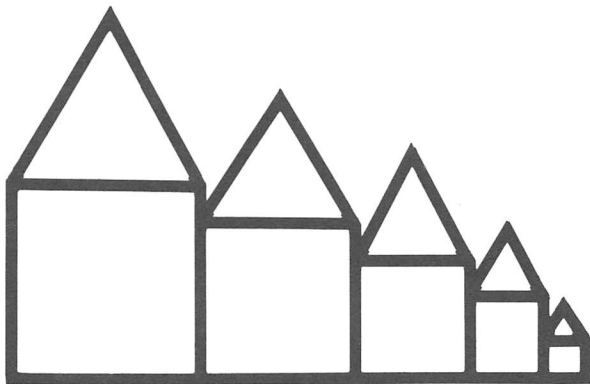
TURTLE CARD ○ ○ ○ ○



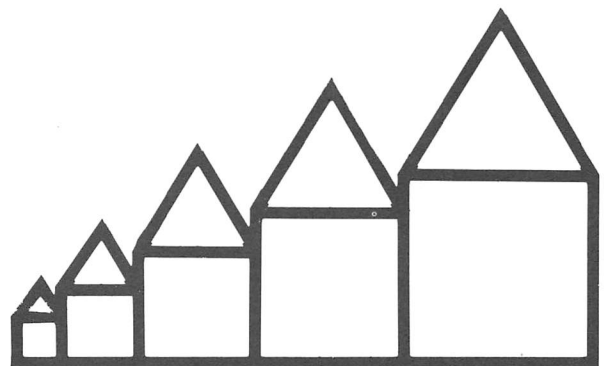
Use your procedure `SQUARE :LENGTH` as a subprocedure inside a recursive procedure which will draw this pile of parcels. You could call your procedure `TO PILE :LENGTH`.



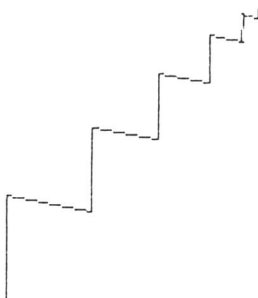
Use `HOUSE :LENGTH` as a subprocedure inside a recursive procedure which will draw this row of houses.



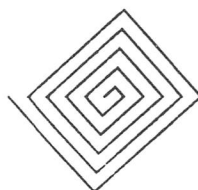
Edit your procedure to draw your row of houses like this.



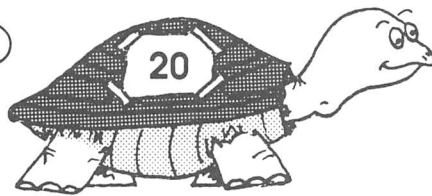
Define a recursive procedure which will draw a ZIGZAG pattern similar to one of these.



Draw a diamond spiral.



TURTLE CARD ○ ○ ○ ○



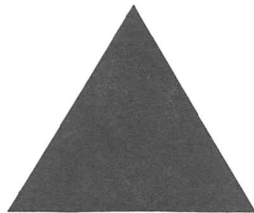
Design a pattern made up of colour blocks of different sizes.

Choose any background colour.

Don't forget to use `PENUP(PU)` and `PENDOWN(PD)` to move your turtle into position.

HINT: Hide your turtle (`HT`) when you draw colour blocks.

Devise a recursive procedure which will draw a coloured in triangle.

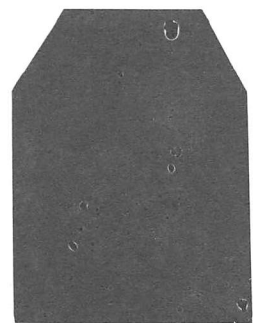


Either edit your triangle procedure to draw this roof shape or write a new procedure called `ROOF`.

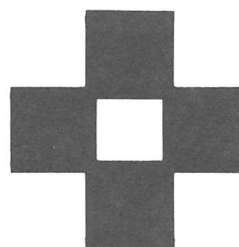
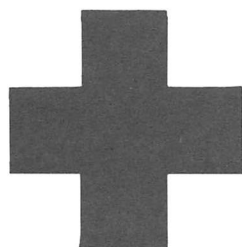


Draw this house in any colour.
Choose a suitable background colour.

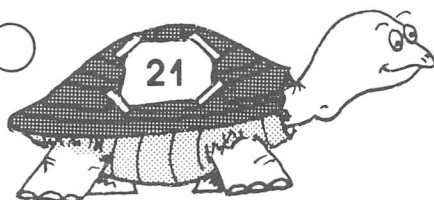
Write a recursive procedure which will draw a right-angled triangle to use in your drawings.



Draw a red cross or a blue cross with a white hole in the middle.



TURTLE CARD ○ ○ ○ ○



Estimate where these commands will set your turtle before you type them to see how near you were.

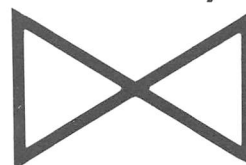
SETPOS (200 150)

SETPOS (-400 -300)

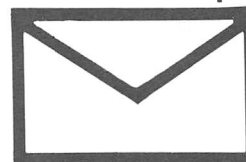
SETPOS (-300 200)

Choose your own PEN and
BACKGROUND colours for these
drawings.

Use X and Y co-ordinates
to draw a butterfly shape.



and an envelope.



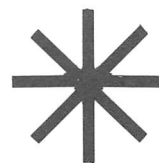
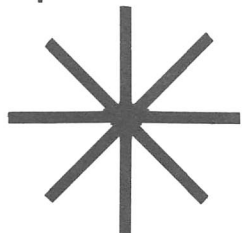
What shape do you think this list will instruct your turtle to draw? Try it.

SETPOS (160 240)

SETPOS (280 128)

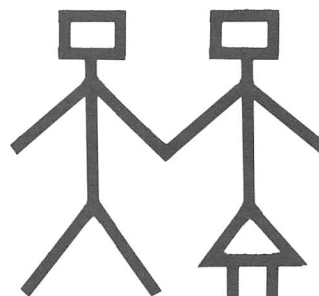
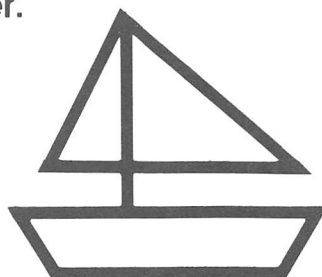
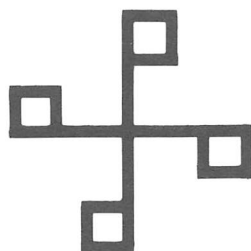
SETPOS (160 128)

Draw an eight-pointed star shape using the SETPOS and HOME
commands.



EITHER:

Use your new commands to draw one of these pictures. Plan your
work on squared paper.



OR:

Design a picture or pattern of your own using SETPOS and HOME.