SMILE WORKCARDS

Area and Perimeter Pack Three

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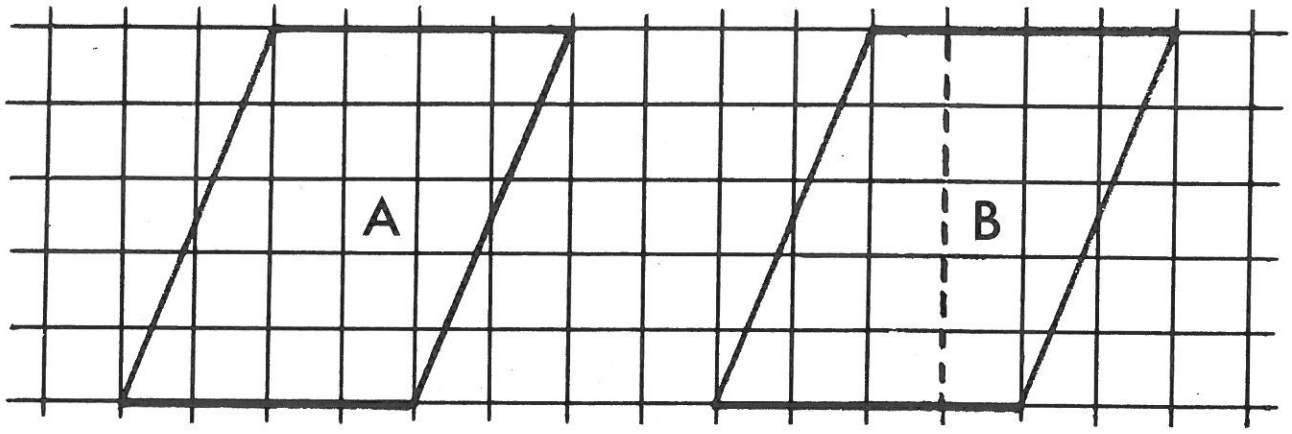
You will need: glue or sellotape, cm. squared paper, scissors

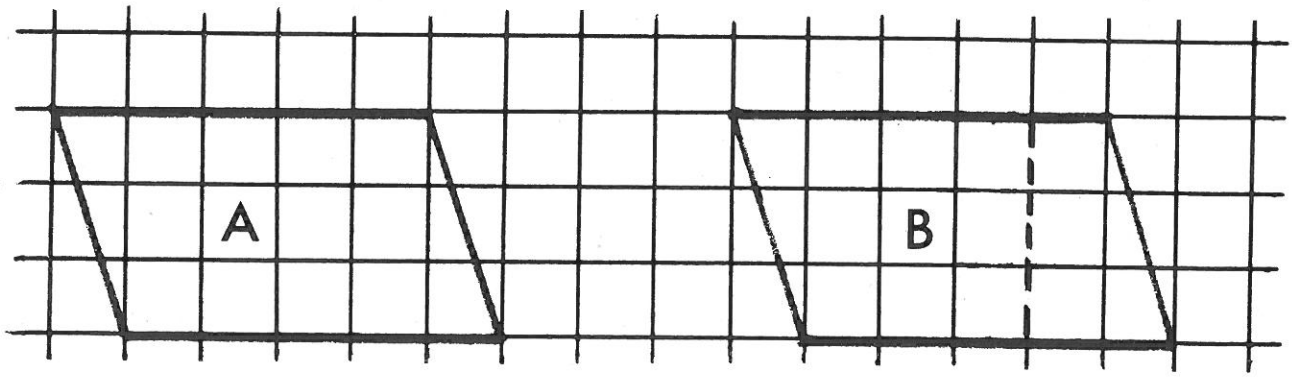
0228

From Parallelogram to Rectangle



(1) Draw 2 parallelograms like these on cm. squared paper.
(2) Cut them out.
(3) Stick A straight in your book.
(4) Cut B along the dotted line.
(5) Fit the 2 pieces of B to make a rectangle.
(6) Stick the rectangle in your book.
(7) How high is the parallelogram, A?
How long is its base?
What is its area?
(8) How high is the rectangle, B?
How long is its base?
What is its area?

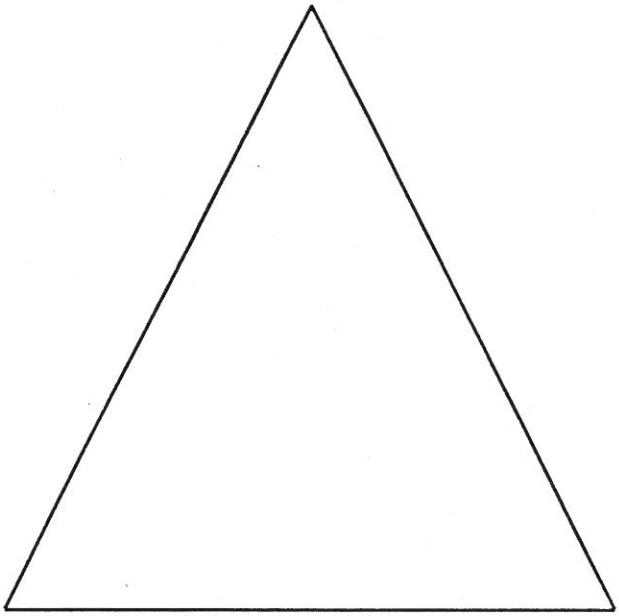
(9) Work through (1) to (8) for these parallelograms

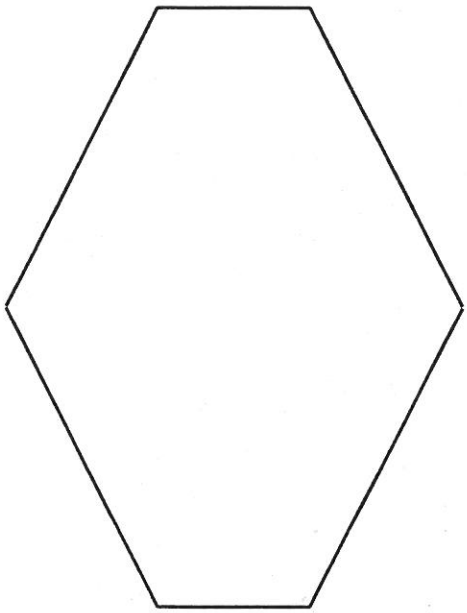


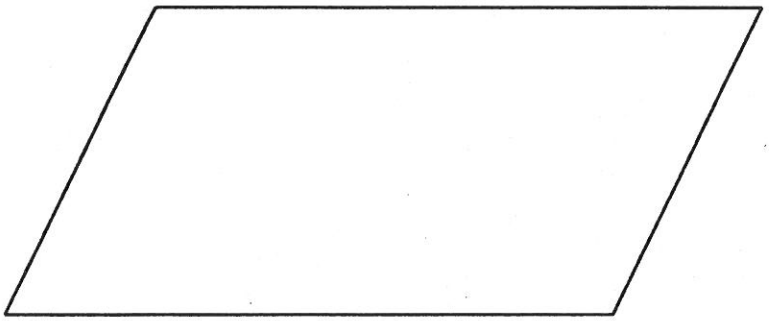
(10) Do some work like this with your own parallelograms and write what you find out about parallelograms and their rectangles.

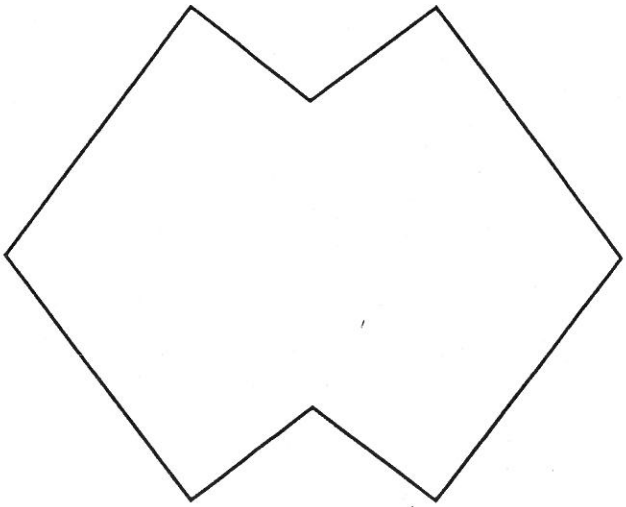
Equal Area?

Find a way to show that these **4** shapes are equal in area.





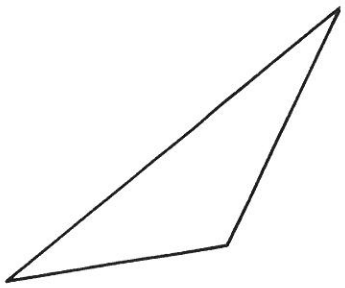




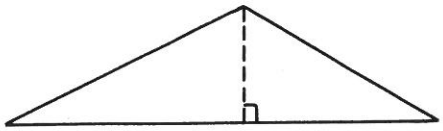
Triangle Problems

Area of a Triangle $= \frac{1}{2}$ base X height

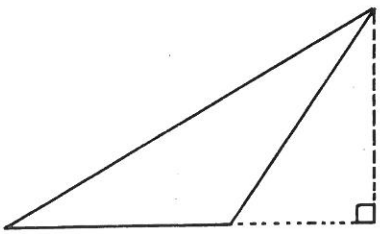
Trace this triangle

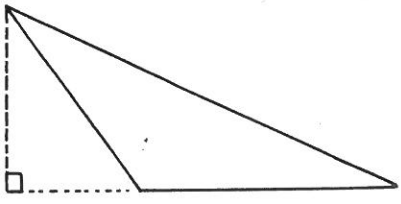


Turn you tracing so that the longest side is parallel to the bottom of this card and draw in the height.
Your diagram should look like this:-



Measure the base and the height. Work out the area. Now turn your tracing so that one of the other sides is parallel to the bottom of this card. Draw in the height. You could have either of these diagrams.





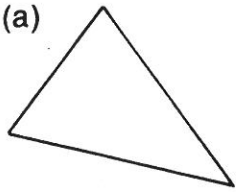
For each of these, measure the base and the height and work out the area.

Your answers should be close. Why?

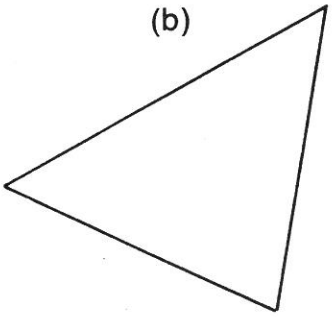
Turn over

1. Find the area of these triangles:

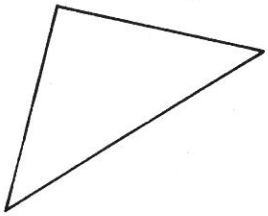
(a)



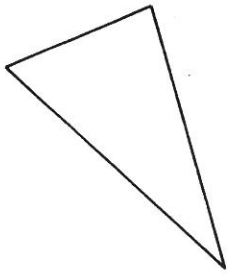
(b)



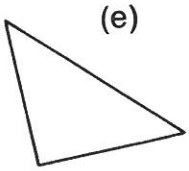
(c)



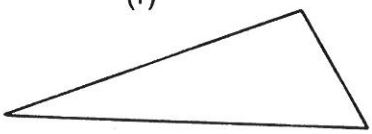
(d)



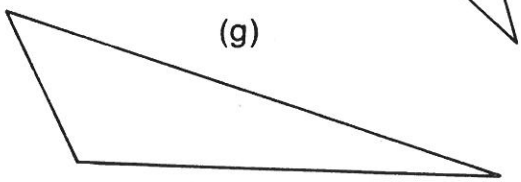
(e)



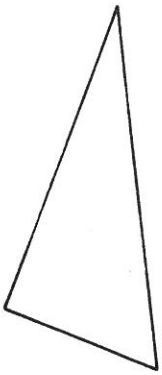
(f)



(g)

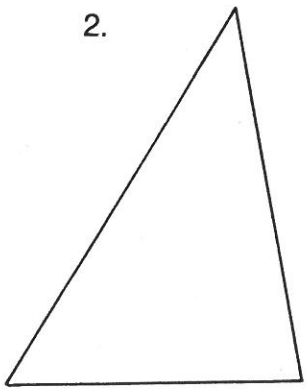


(h)

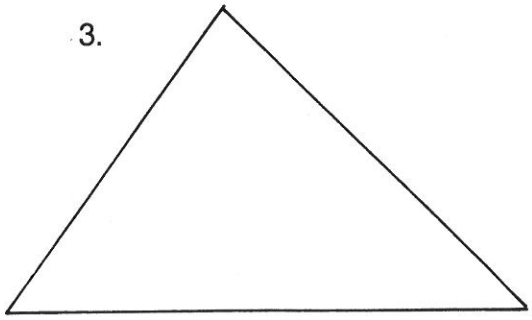


Find the area of these triangles in 3 different ways. Use each side of the triangle as the base *(as shown on the front of the card)*.

2.



3.



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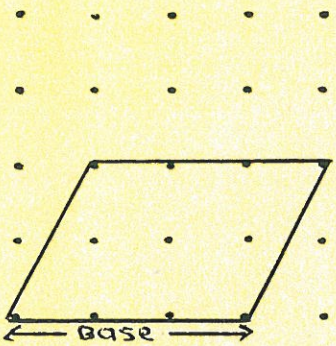
You will need: a pinboard, 2 elastic bands and dotty paper.

Shearing Parallelograms



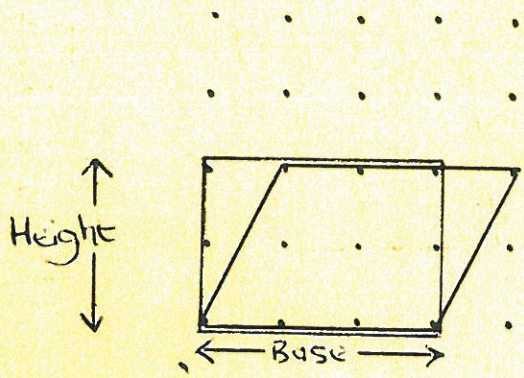
Make a parallelogram with its base along the bottom row of pins.

Work out its area.

Area of parallelogram = 6 sq. units
Area of rectangle = 6 sq. units

Using the same base, make the rectangle which has the same height.

Work out the rectangle's area



Do this for 5 more parallelograms making sure each time that the base is along the bottom row of pins.

Draw your results on spotty paper.

Write the areas of both shapes by each drawing.

They should be the same each time.

Try to explain why.

Turn over

Copy and complete these sentences:-

(1) If we make a rectangle which has the same ═══ and also the same ═══ as a parallelogram, then the 2 shapes will cover the same ═══.

(2) To find the area of a rectangle we work out ═══ x ═══.

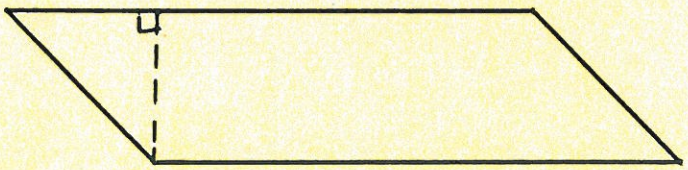
(3) So to find the area of a parallelogram we work out ═══ x ═══.

Check these sentences in the answer book.
Then measure the base and the height of these parallelograms in cms. and work out their areas.
Use your results to copy and complete the table.

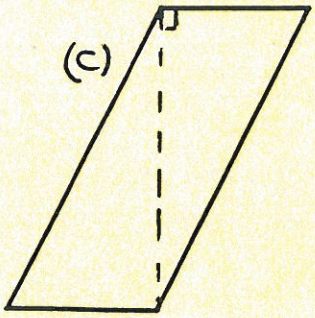
(a)

	BASE in cms.	HEIGHT in cms.	AREA in sq. cms.
a			
b			
c			
d			
e			

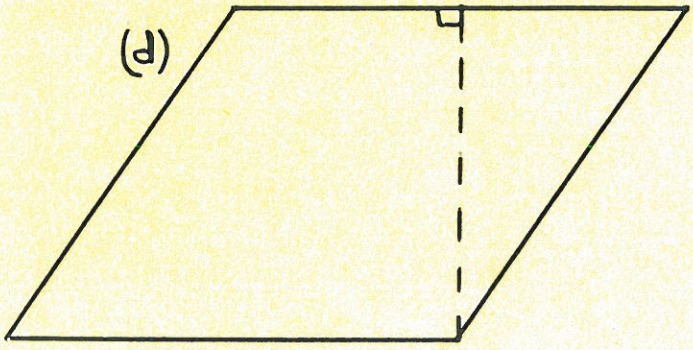
(b)



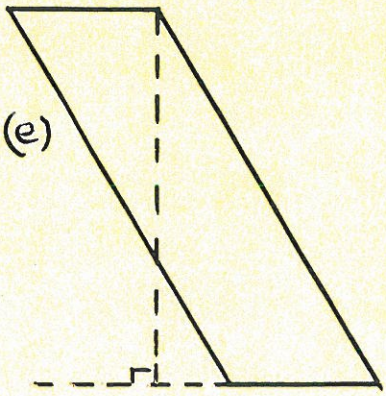
(c)



(d)



(e)



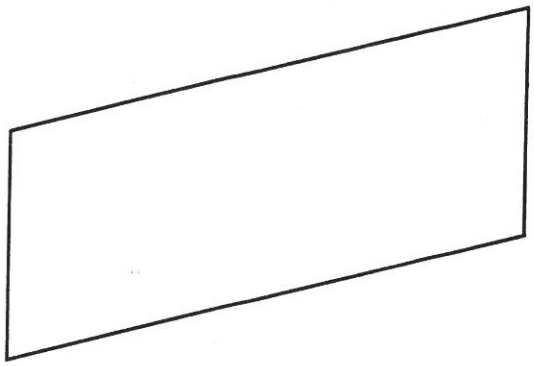
You will need tracing paper

PARALLELOGRAM PROBLEMS

To find the area of a parallelogram you will need to know the length of its base and its height.

AREA = BASE × HEIGHT

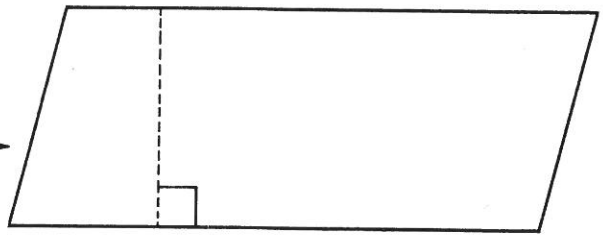
Trace this parallelogram. →



Turn the tracing paper so that the longest side is parallel to the bottom of this card.

Now draw in the height of the parallelogram.

Your tracing should look like this →

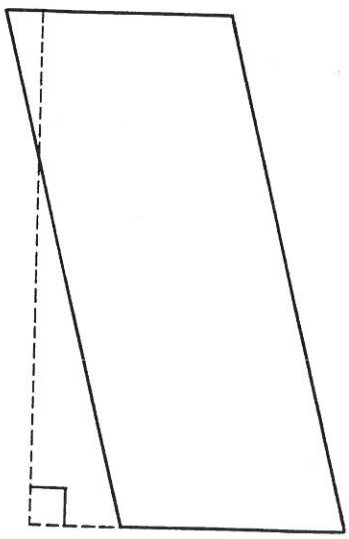


Measure the base and the height and work out the area.

Now turn the tracing so that the shorter side is parallel to the bottom of the card.

Draw in the height of the parallelogram.

Your tracing should look like this →



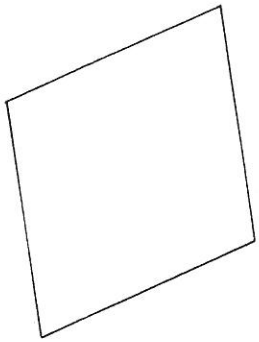
Measure the base and the height and work out the area.

It is very unlikely that you got exactly the same area for the parallelogram each time.
Can you explain why?

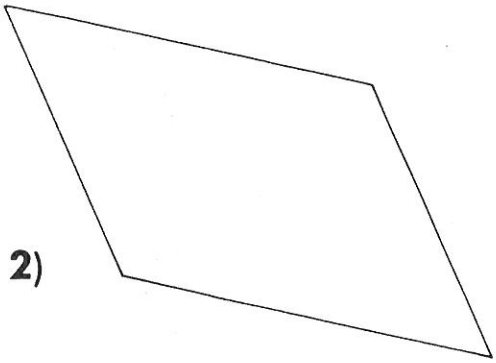
Turn over

Find the area of these parallelograms in two ways, as accurately as you can.

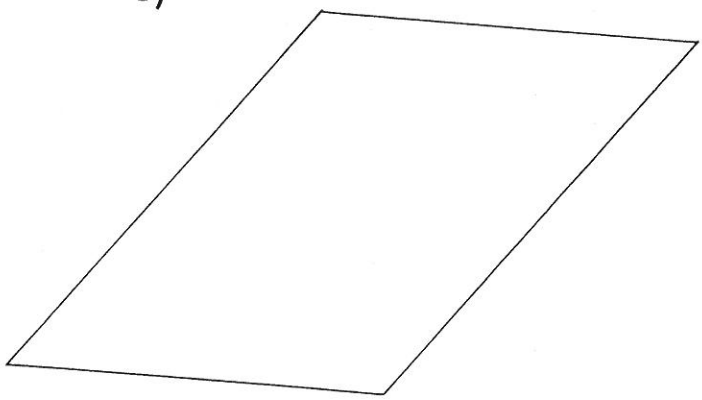
1)



2)

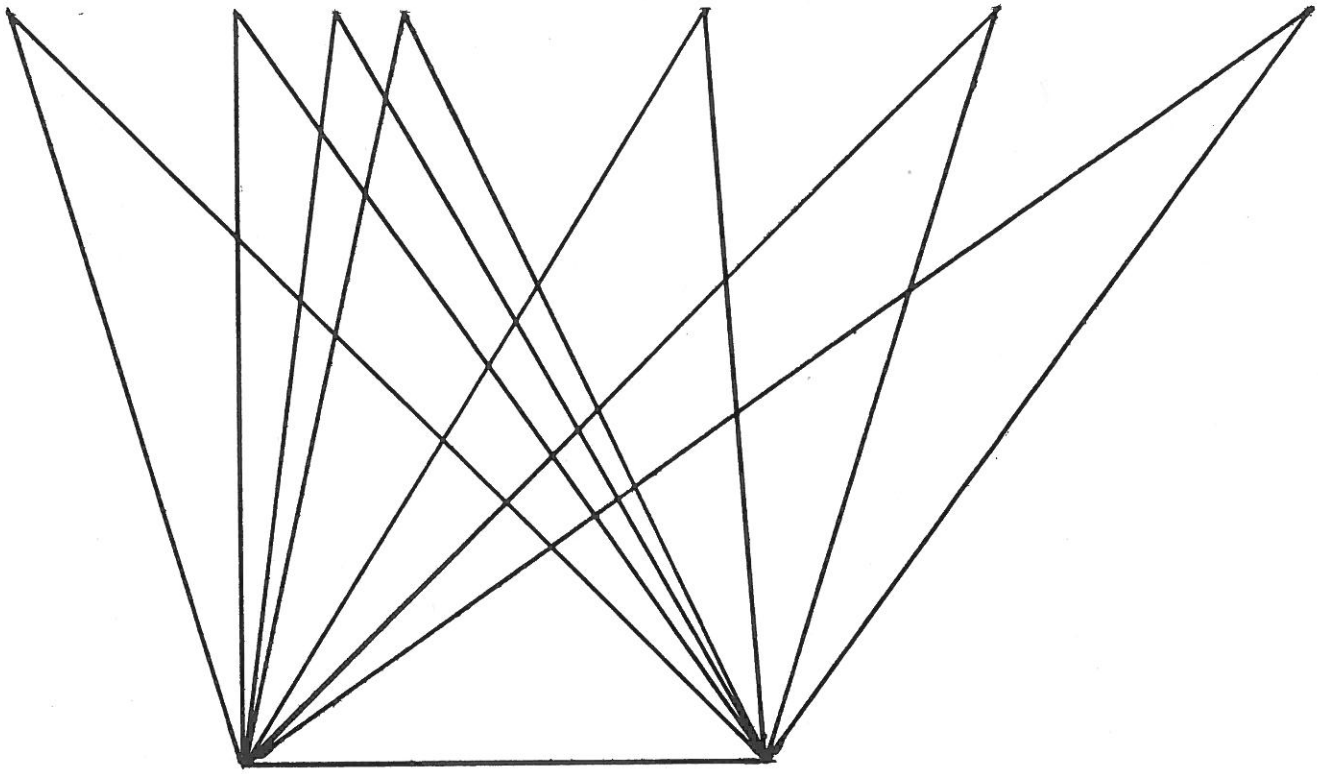


3)

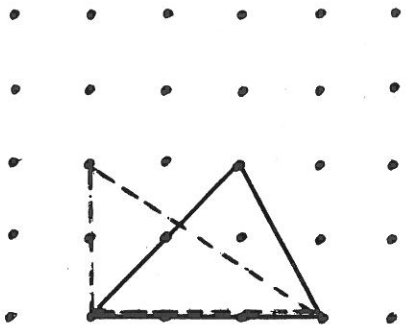


You will need: 5x5 pinboard, spotty paper

Shearing a Triangle



Make 2 triangles on the pinboard.
Make sure that:-
(1) They have the same base.
(2) Their bases are along the bottom row of pins.
(3) They have the same height.

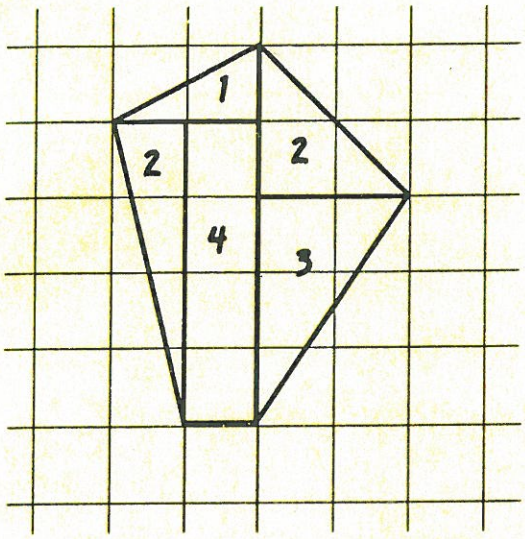


Work out their areas.
Do this for 5 more pairs of triangles.
Record your results using spotty paper.

Write something about your results.
Think of reasons if you can.

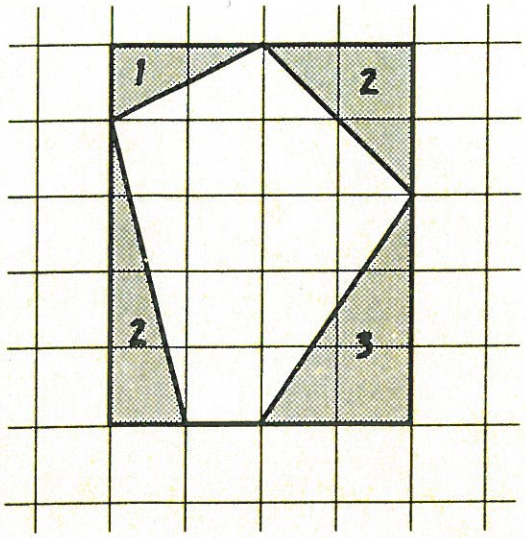
POLYGON AREAS

Here are two methods for finding the area of a polygon.



Area = 1 + 2 + 2 + 3 + 4

= 12cm²



Shaded area = 1 + 2 + 2 + 3 = 8

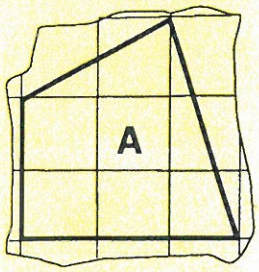
Unshaded area = 20 - 8

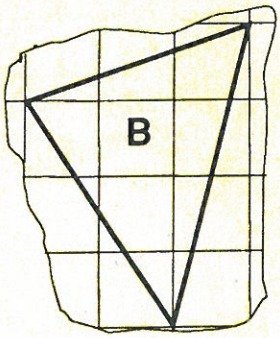
= 12cm²

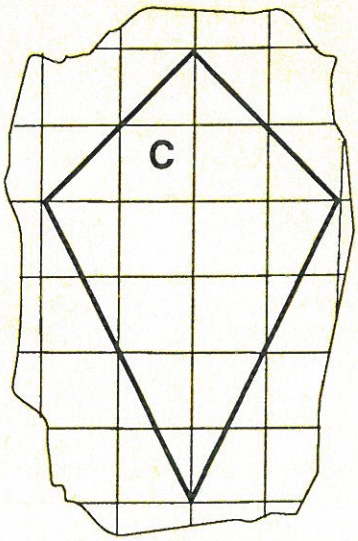
Turn over

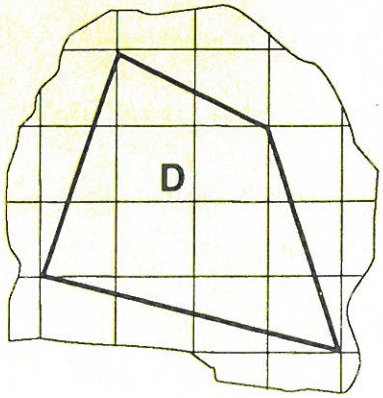
Copy these shapes on to squared paper.

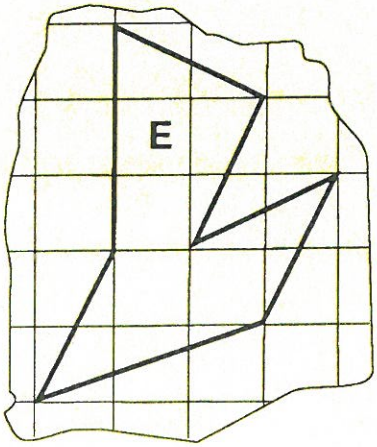
Choose one of the methods or your own to find the areas of these shapes.

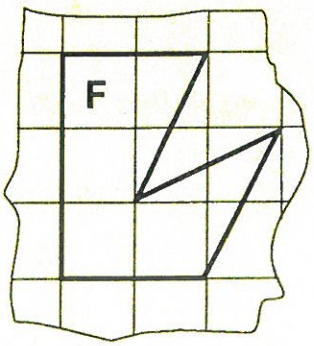












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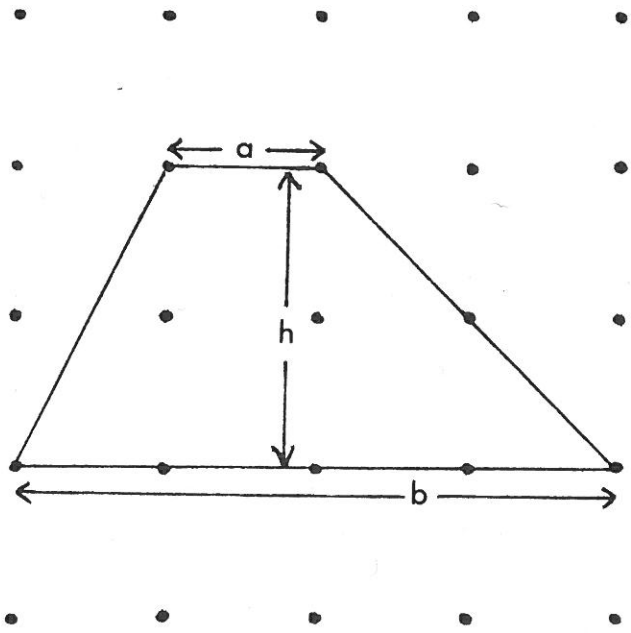
You will need: pinboard, elastic band, dotty paper

THE TRAPEZIUM



A trapezium is a quadrilateral which has 2 sides which are parallel.

(1) Make this trapezium on a pinboard.

(2) Call the lengths of the parallel sides a and b, and the distance between them h.

Write:

a = ■ units, b = ■ units, h = ■ units.

(3) Find the area of the trapezium.

---

(4) Make at least 5 more trapezia on your pinboard.

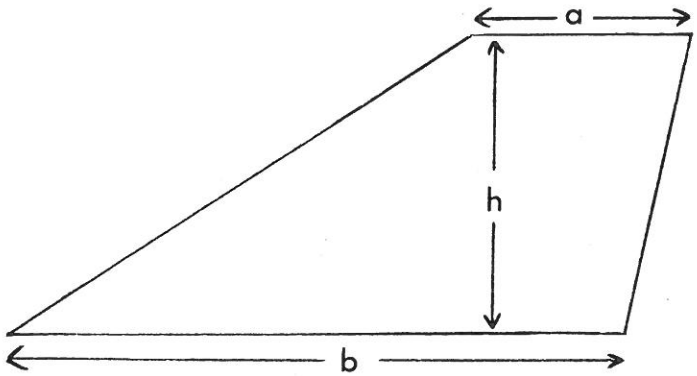
Draw them on dotty paper, find their areas and record your results.

a	b	a+b	h	Area
1	4	5	2	5

(5) Can you see a pattern in the table? If not, record some more results and look again.

(6) Find a formula for the area of a trapezium.

— TURN OVER —



The area of a trapezium is

$$\frac{(a+b)\ h}{2}$$

(7)

Find the areas of trapezia with the following lengths:-

(a) $a = 4$, $b = 2$, $h = 2$

(b) $a = 3$, $b = 1$, $h = 4$

(c) $a = 3$, $b = 4$, $h = 3$

(8)

Draw 2 different trapezia for each of (a), (b) and (c) above - it may be helpful to use a pinboard first.

(9)

Draw a trapezium in which a is very small.

If $a = 0$, what shape does the rapezium become?

Put $a = 0$ in the formula for the area. Comment.

(10)

Describe the special cases when:-

(a) $b = 0$

(b) $h = 0$

(c) $a = b$

(d) $a = b = h$

Find the formula for the area in each case.

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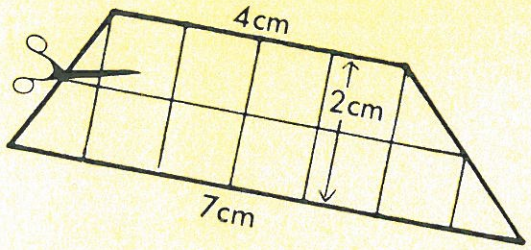
SMILE

You will need:- squared paper, scissors

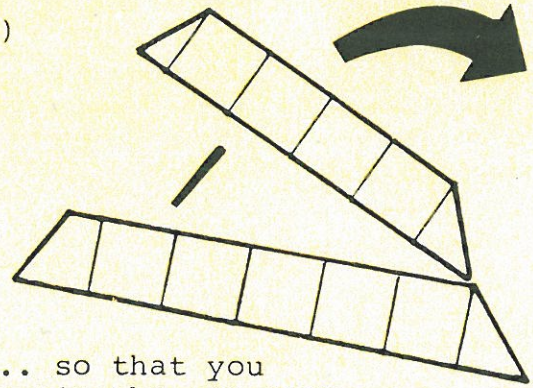
Trapezium to Parallelogram

(1)



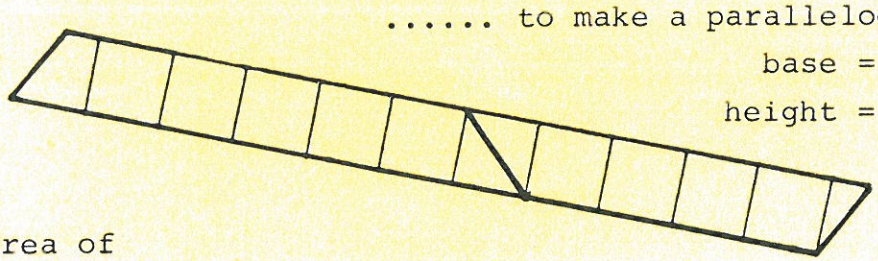
Cut along the middle.....

(2)



.... so that you
can tip the top over.....

(3)



..... to make a parallelogram

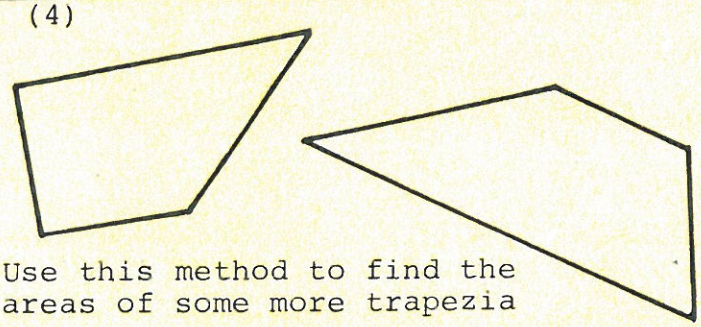
base = (7 + 4) cm

height = 1 cm

area of
parallelogram = base x height

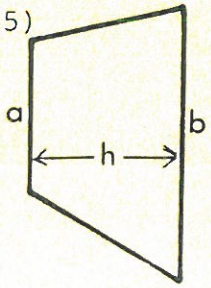
So area = ■

(4)



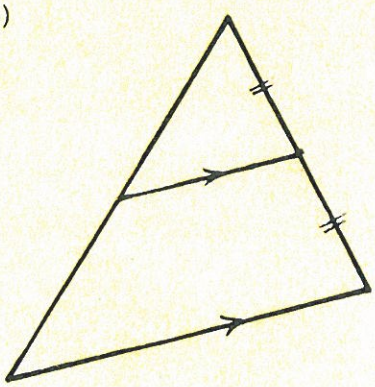
Use this method to find the
areas of some more trapezia

(5)



Can you use this
method to find a
formula for the area
of a trapezium?

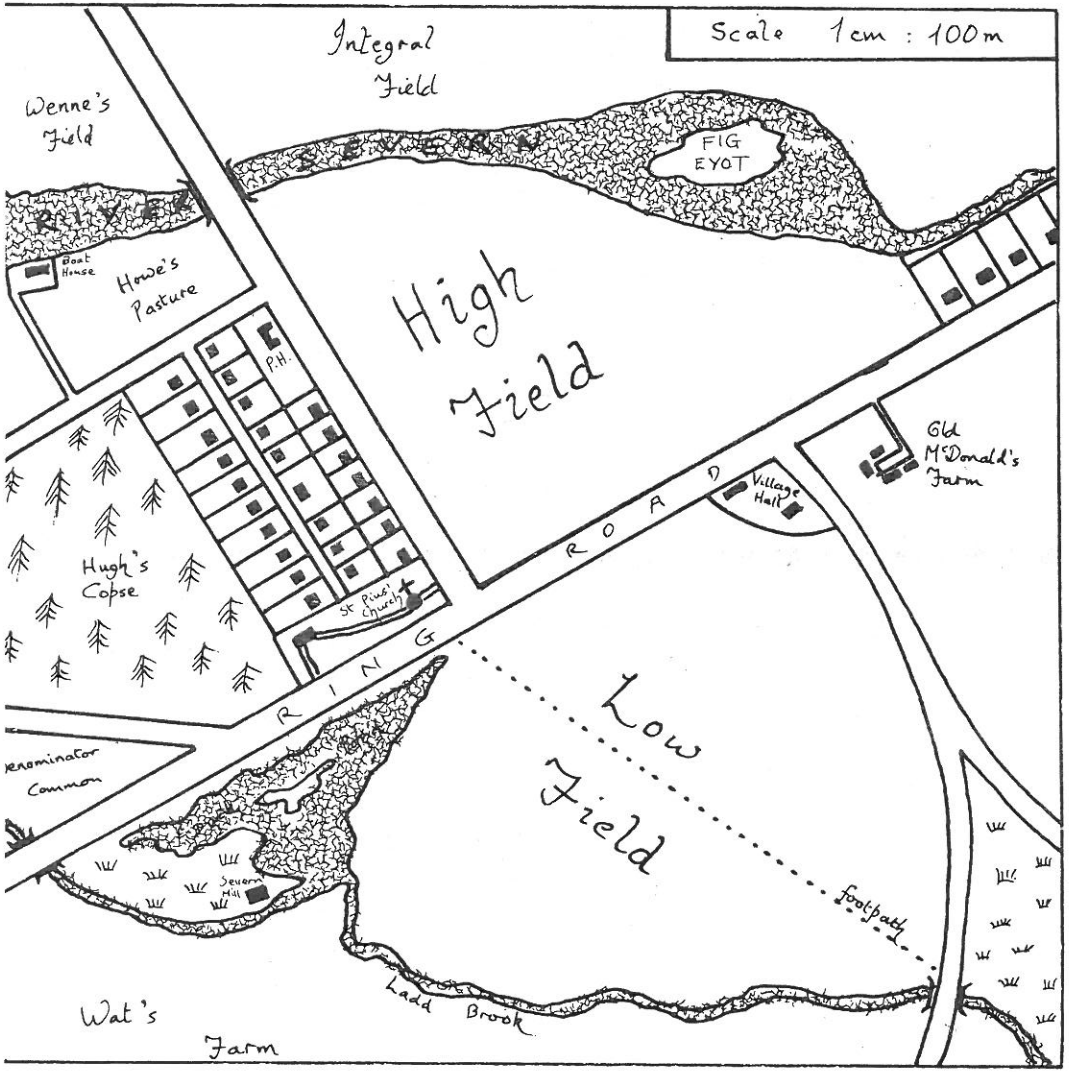
(6)



Can you use this method
to find the area of a
triangle?.....
and the formula for
the area or a triangle?

IRREGULAR AREAS

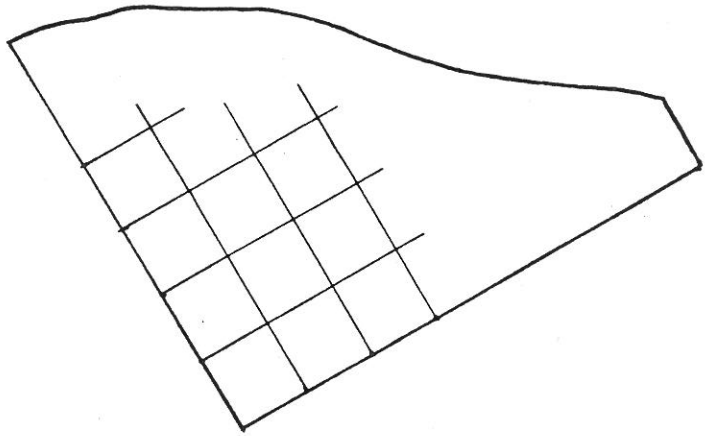
SMILE 0812



High Field is bounded by two roads at right-angles and a river.

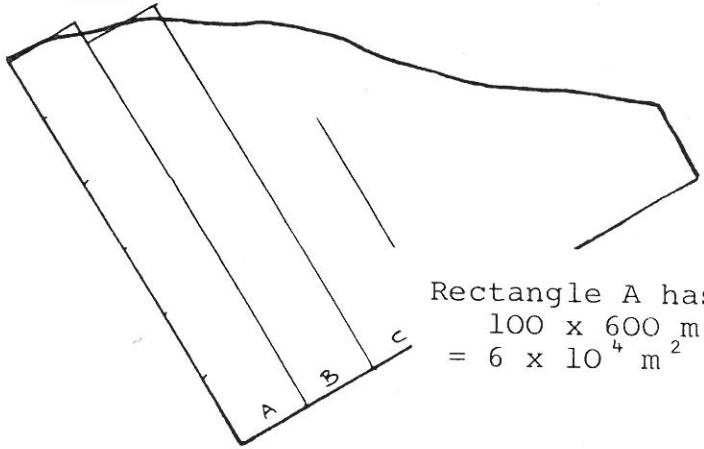
How would you find the area of High Field?

SQUARES



(1) Trace the map, place the tracing over centimetre squared paper and find the area by counting squares.

RECTANGLES



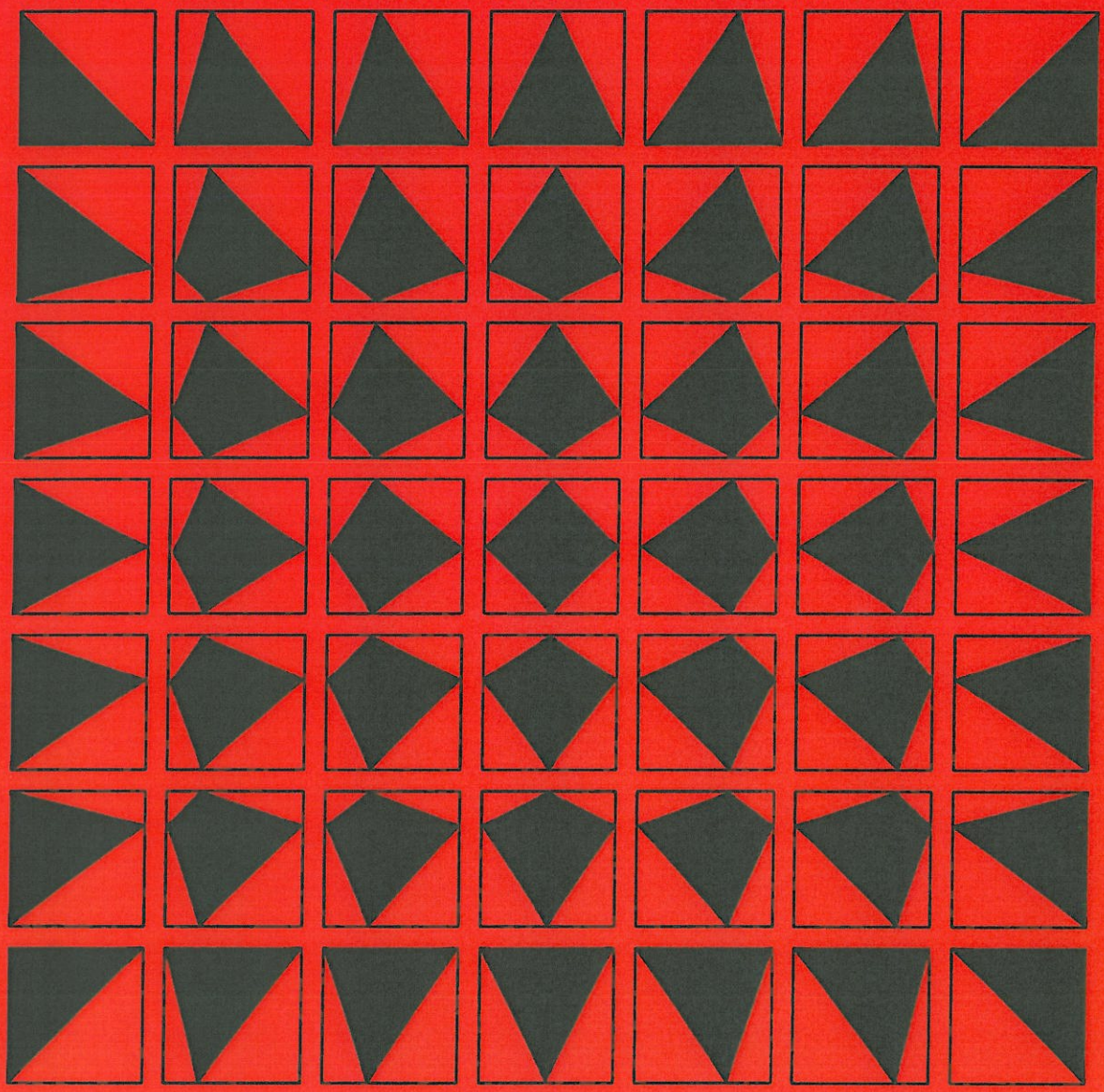
Rectangle A has area
$100 \times 600\ m^2$
$= 6 \times 10^4\ m^2$

(2) Work out the area of each rectangle and add them together.

(3) Why is the answer inaccurate?

Squares

The pattern has been developed from the MicroSMILE program TAKEHALF.

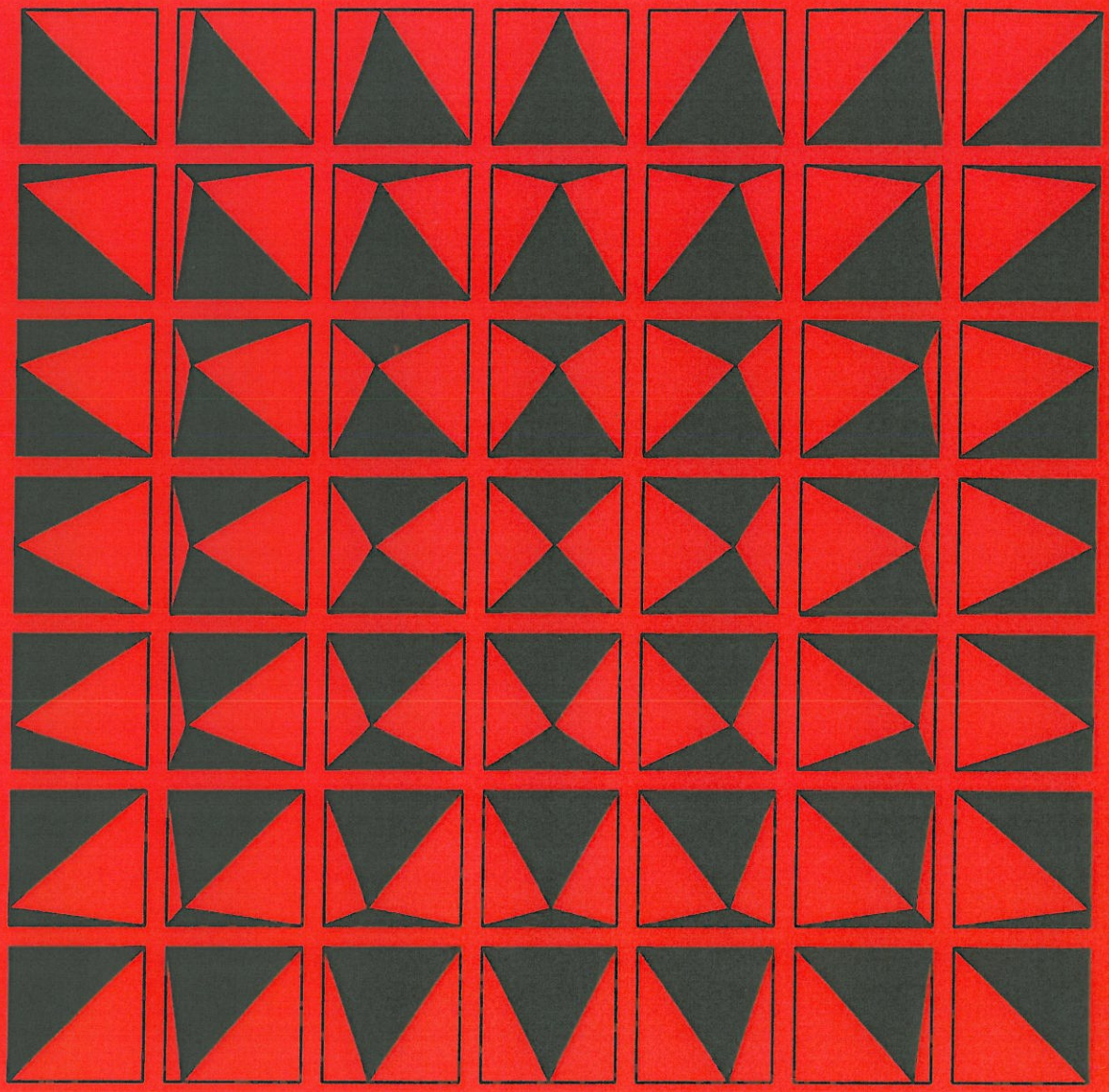


- Describe the rule used to create one row of the pattern.
  How can your rule be adapted so that it will describe the whole pattern?

- Which squares have more black than red?
  Which squares have more red than black?

  Justify your answers.

Turn over



- Describe the rule used to create one row of the pattern.
  How can your rule be adapted so that it will describe the whole pattern?

- How many lines of symmetry does the pattern have?
  Which lines of symmetry reflect black on to red and red on to black?

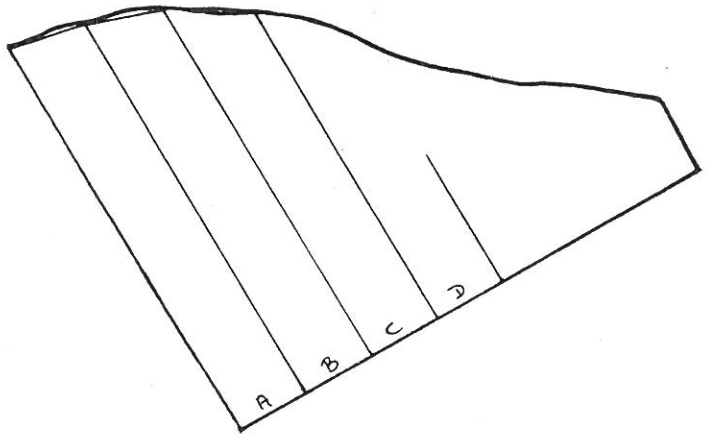
- Does the pattern have rotational symmetry?

- You can see this pattern as a 'bird's eye view' of square based pyramids.
  Which of these pyramids are identical?

You may like to create your own poster.

TRAPEZIA

This is a more accurate method:



Trapezium A has area

$\frac{1}{2}.100.(600+590)$ m^2

Trapezium B has area

$\frac{1}{2}.100.(590+540)$ m^2

(4) Find the total area.

The trapezium method is the most accurate, but calculating each area separately takes a long time. If each strip has the same width there is a much quicker way:

$\frac{1}{2}.100\ (600+590)$

$\frac{1}{2}.100\ (590+540)$

$\frac{1}{2}.100\ (540+.....$

Do the adding first.

$\frac{1}{2}.100\ (600+590+590+.....$

(5) Find the area of Low Field by drawing trapezia 1cm wide on each side of the footpath.