

# Design Investigation

Name/s \_\_\_\_\_

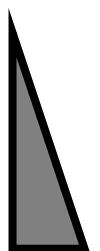
A number of different shapes have been created as part of a children's design activity. The answers to the questions in this investigation are needed in order to work out the amounts of paper needed for various numbers of children.

**Working with a partner, find the answers to the following questions. Before you begin each question, discuss the way to work out the answer. You may like to make some short notes about your method because you may be asked to share it with the group later.**

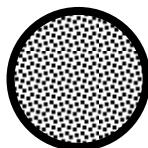
1. Can I cut one of each shape from one sheet of sample paper?  
Show me how you would lay them on one of the sample sheets.
2. If I wanted to use 1 sheet of sample paper for each shape, how many of each shape can I fit on the sample sheet?



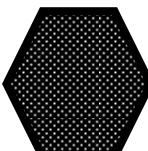
Shape Name: \_\_\_\_\_ How many? \_\_\_\_\_



Shape Name: \_\_\_\_\_ How many? \_\_\_\_\_



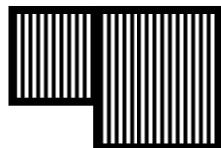
Shape Name: \_\_\_\_\_ How many? \_\_\_\_\_



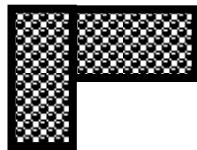
Shape Name: \_\_\_\_\_ How many? \_\_\_\_\_



Shape Name: \_\_\_\_\_ How many? \_\_\_\_\_



Shape Name: \_\_\_\_\_ How many? \_\_\_\_\_



Shape Name: \_\_\_\_\_ How many? \_\_\_\_\_

# Design Investigation

Name/s \_\_\_\_\_

3. Share with the group how you worked the answers to questions 2. Which shapes can be tessellated?
  
4. If I wanted to fit two shapes on each sample sheet, which shapes would you put together and why? I need to get as many of each shape as possible.

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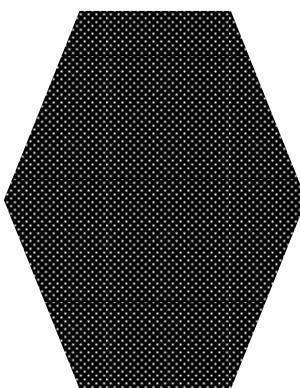
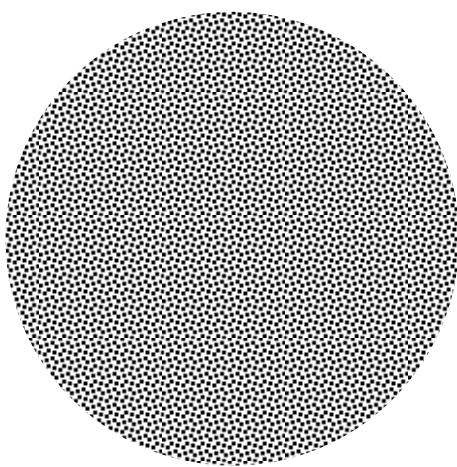
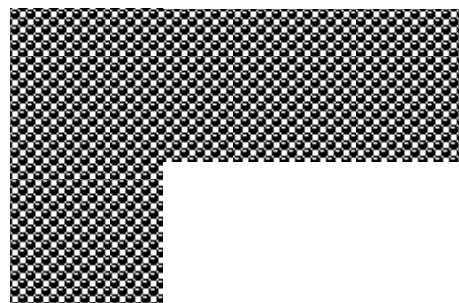
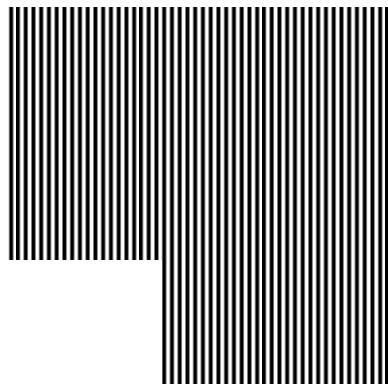
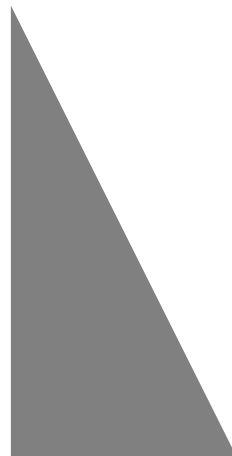
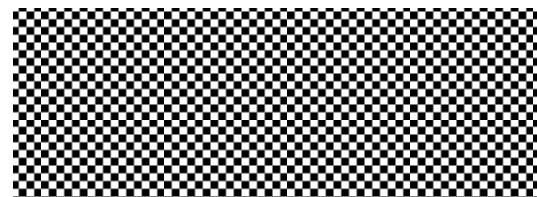
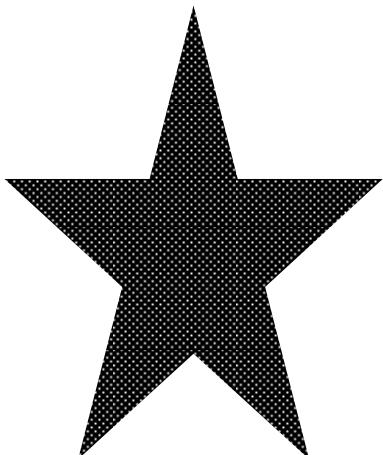
5. Design a pattern using between 3 and 5 different shapes (each type of shape can be used more than once)

Draw it here

# Design Investigation

## Design Shapes

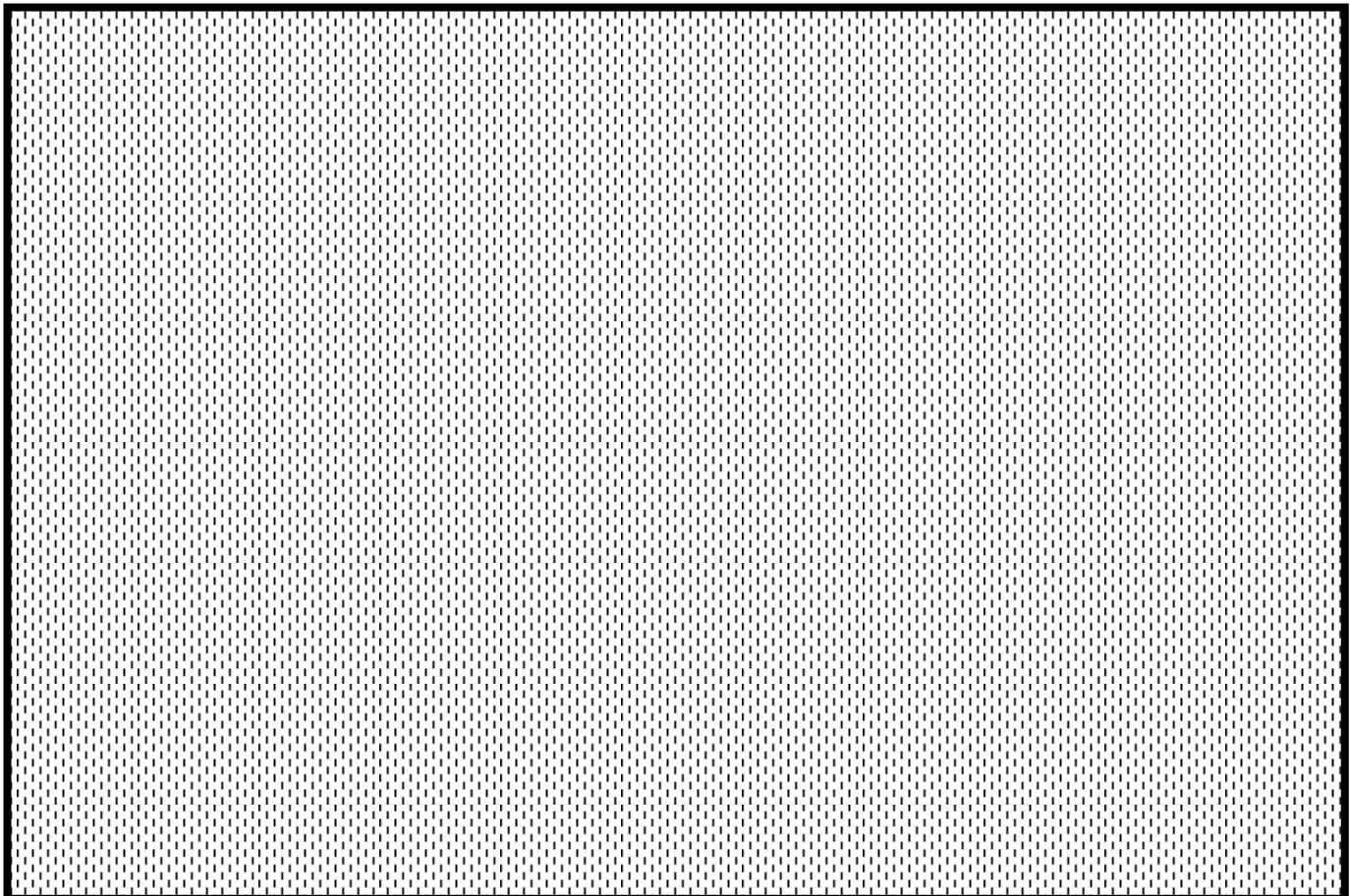
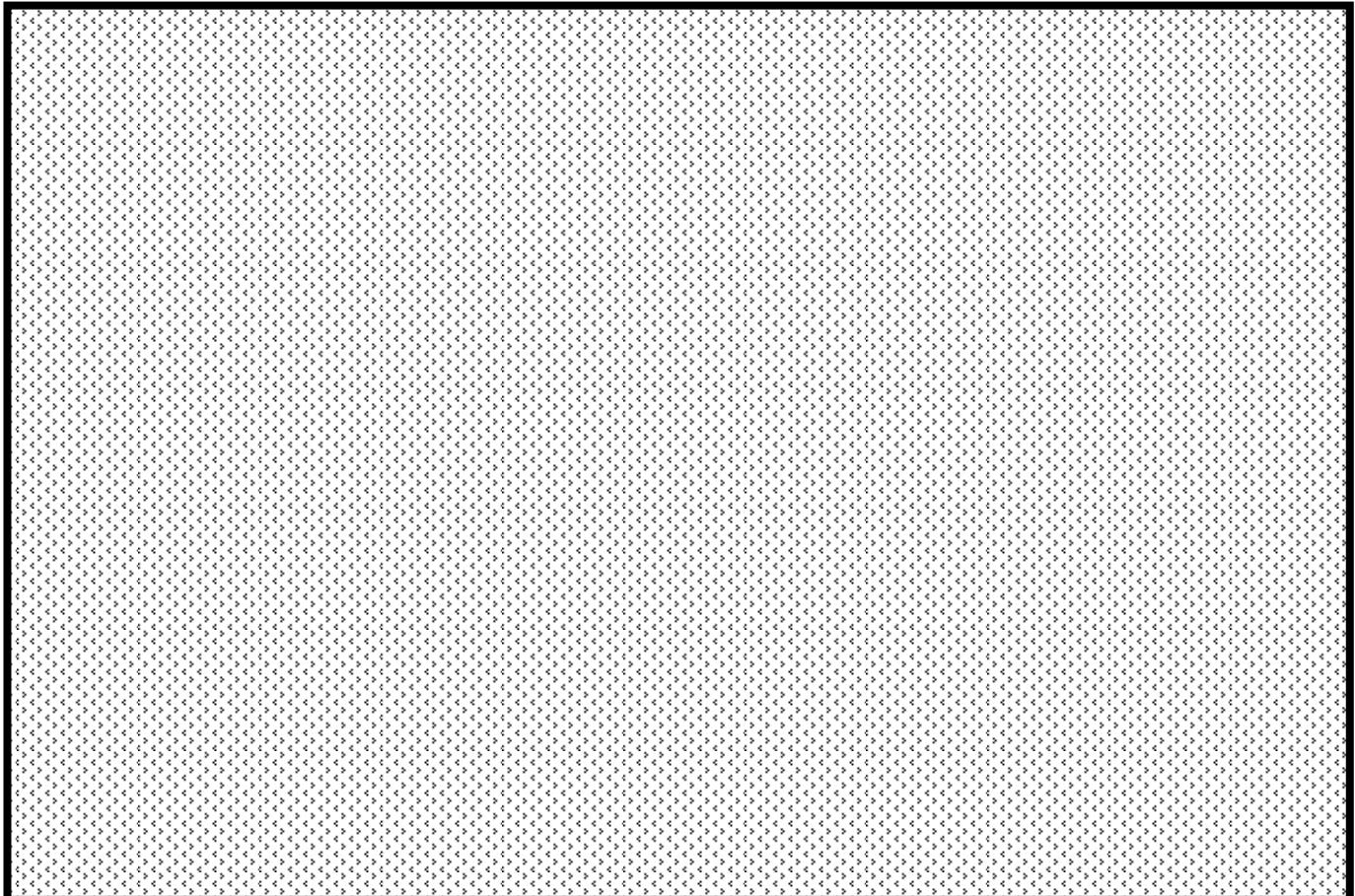
Name/s \_\_\_\_\_



# Design Investigation

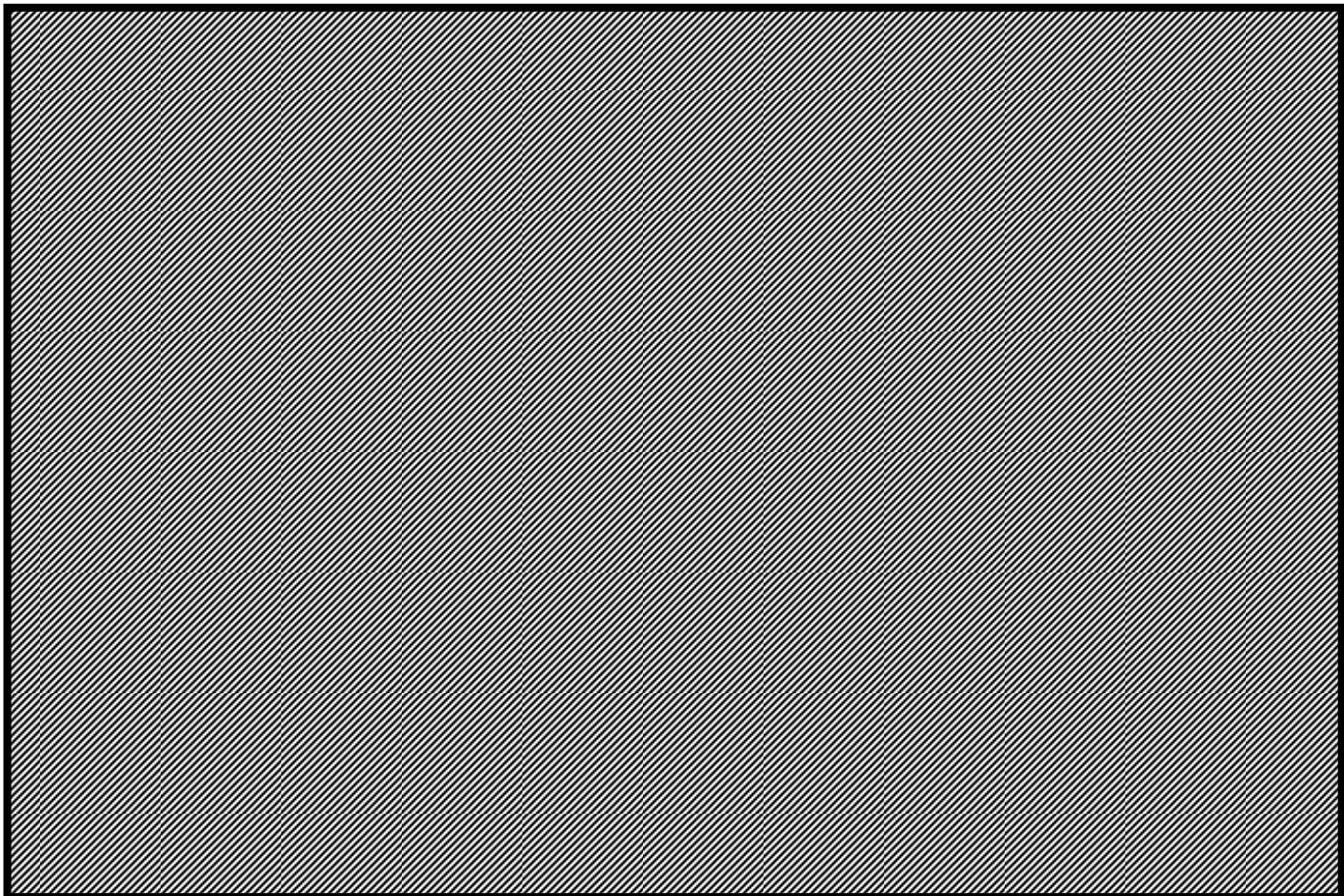
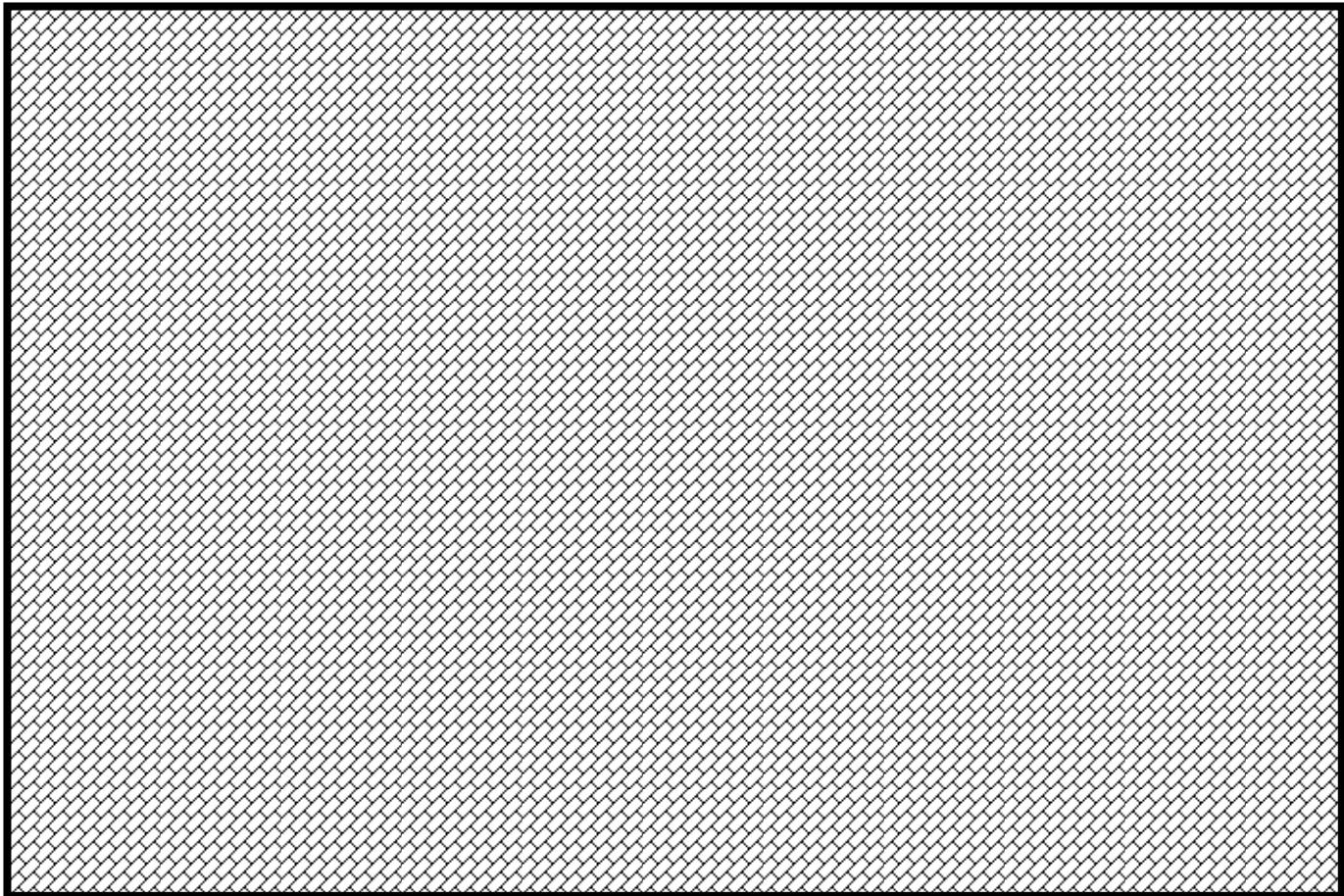
## Sample Sheets

Name/s \_\_\_\_\_



# Design Investigation

Name/s \_\_\_\_\_



# Design Investigation

Name/s \_\_\_\_\_

## Answers and teachers' notes

Note: sample sheets should measure 12cm x 18 cm.

To ensure accurate sizes of the shapes and the sample papers when printing this PDF file set the 'page scaling' option on the print dialogue box to 'none' (the default option is often set to 'fit to printable area').

### Design Investigation - Answers

1. Yes (various arrangements possible)
- 2.

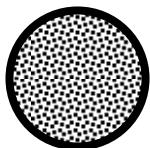
Shapes  
are not  
drawn  
to scale



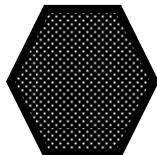
Shape Name: rectangle      How many? 9



Shape Name: triangle      How many? 24



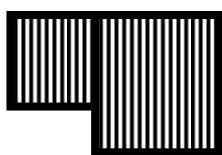
Shape Name: circle      How many? 6



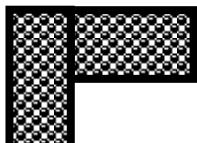
Shape Name: hexagon      How many? 8



Shape Name: star      How many? 6



Shape Name: corner shape 1      How many? 6



Shape Name: corner shape 2      How many? 12

3. Rectangle, triangle, corner shape 2, and the hexagon all tessellate but none completely cover the entire sheet.
4. Individual answers.
5. Any pattern.

# Design Investigation

## Level Two Extension Activities

Name/s \_\_\_\_\_

- a. The star shape is 5 cm x 6 cm. The paper is 21 cm wide and 30 cm long.

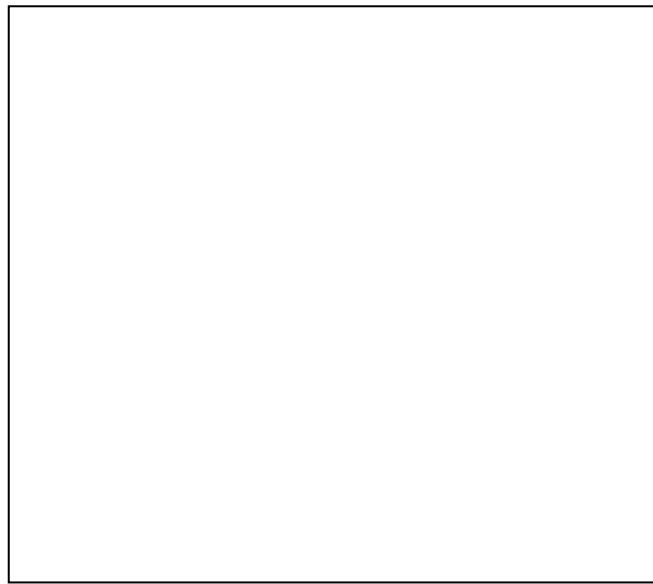
How many stars will fit across the paper? \_\_\_\_\_

How many stars will fit down the paper? \_\_\_\_\_

How many stars can I cut from the paper? \_\_\_\_\_

Draw a diagram to show

your working out.



How many sheets of paper would I need for the following number of stars?

25 stars \_\_\_\_\_ 90 stars \_\_\_\_\_

367 stars \_\_\_\_\_ 719 stars \_\_\_\_\_

- b. I buy 7 sheets of gold, 5 sheets of silver, 10 red and 8 green.

Estimate the cost: \_\_\_\_\_

How much will it really cost me?

A graphic of a speech bubble containing a special offer for paper. The text inside the bubble reads:

**SPECIAL OFFER  
ON SHEET PAPER**

**Gold 32p  
Silver 24p  
Red, blue & green 17p**

# Design Investigation

## Level Two Extension Activities

Name/s \_\_\_\_\_

- c. The rectangles (which will be used to make labels) are 7 cm x 2.5 cm.

The paper is 21 cm wide and 30 cm long.

How many labels will fit across the paper? \_\_\_\_\_

How many labels will fit down the paper? \_\_\_\_\_

How many labels can I cut from the paper? \_\_\_\_\_

Draw a diagram to show

your working out.



How many sheets of paper would I need for the following number of labels:

60 labels \_\_\_\_\_

95 labels \_\_\_\_\_

305 labels \_\_\_\_\_

629 labels \_\_\_\_\_

- d. I buy 9 sheets of gold, 10 sheets of silver, 30 red and 11 green.

Estimate the cost: \_\_\_\_\_

How much will it really cost me?



# Design Investigation

## Level Two Extension Activities

Name/s \_\_\_\_\_

A garden border is 200 cm deep by 400 cm long.

a. I want to plant some daffodils at the back in 3 rows.

Each daffodil needs 10cm of the length to grow in.

Draw a diagram to show your working out.

How many daffodils will fit along the border? \_\_\_\_\_

How many rows? \_\_\_\_\_

How many daffodil bulbs will I need? \_\_\_\_\_

b. In the same flower bed, I want to plant 5 rows of dahlias next.

Each dahlia needs a 30cm of the length to grow in.

Draw a diagram to show your working out.

How many dahlias will fit along the border? \_\_\_\_\_

How many rows? \_\_\_\_\_

How many dahlia bulbs will I need? \_\_\_\_\_

c. In the same flower bed, I want to plant 7 rows of a variety of small flowering plants.

Each of these plants need 25cm of the length to grow in.

Draw a diagram to show your working out.

How many flowering plants will fit along the border? \_\_\_\_\_

How many rows? \_\_\_\_\_

How many flowering plants will I need? \_\_\_\_\_

# Design Investigation

## Level Two Extension Activities

Name/s \_\_\_\_\_

**d. I have decided to add a path in front of the flower bed. I want the path to be 1 metre wide and 4 metres long I can not decide which slab to use.**

Work out the quantities needed of the following slabs.

(It might help to think in rows and to draw some diagrams.)

If I used a slab that measures 50 cm long by 100 cm wide, how many would I need?

If I used a slab that measures 25 cm long by 100 cm wide, how many would I need?

If I used a slab that measures 25 cm long by 50 cm wide, how many would I need?

If I used a slab that measures 20 cm long by 50 cm wide, how many would I need?

If I used a slab that measures 25 cm long by 25 cm wide, how many would I need?

# Design Investigation

## Level Two Extension Activities

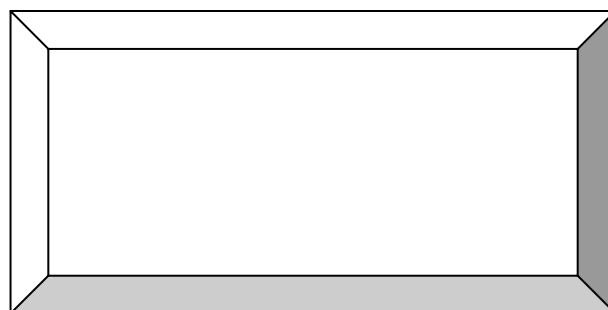
e.

Name/s \_\_\_\_\_

### Slabs for Sale

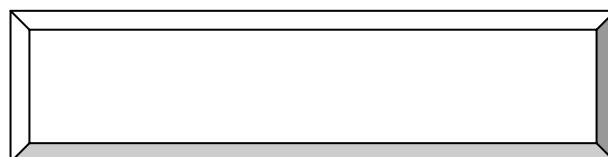
Slab A: 50cm X 100 cm

Price: £ 6.25 each



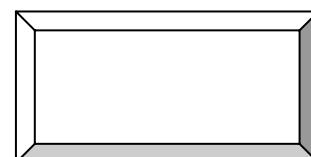
Slab B: 25 cm X 100 cm

Price: £4.10 each



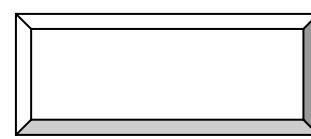
Slab C: 25 cm X 50 cm

Price: £2.75 each



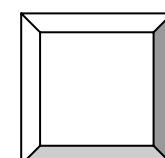
Slab D: 20 cm X 50 cm

Price: £1.29 each



Slab E: 25 cm X 25 cm

Price: £1.05 each



**Work out the cost of building the path for each set of slabs.**

**A**

**B**

**C**

**D**

**E**

Kindly contributed by Gaye Noel [g.noel@parklanecoll.ac.uk](mailto:g.noel@parklanecoll.ac.uk) Park Lane College, Leeds.

MSS2/L2.2 Solve problems involving mathematical properties, 2-D shapes & parallel lines, e.g. in laying down carpet tiles / paving stones. MSS2/L2.3 Draw 2-D shapes in different orientations using grids. Also ideal for L2 Functional Mathematics - Recognise and use common 2D representations of 3D objects, for example in maps and plans. Download our separate sheet for general help with teaching L1-2 Functional Maths.

# Design Investigation

## Level Two Extension Activities

### Answers

a. The star shape is 5 cm wide and 6 cm long. The paper is 21 cm wide and 30 cm long.

Stars across = 3 (lengthwise, i.e.  $3 \times 6\text{cm} = 18\text{ cm}$ )

Stars down = 6 widthwise, i.e.  $6 \times 5\text{cm} = 30\text{cm}$

Total stars = 18

How many sheets of paper?

25 stars = **2 sheets**      90 stars = **5 sheets**

367 stars = **21 sheets**      719 stars = **20 sheets**

b. Estimate the cost:  $7 \times 30\text{p} + 5 \times 25\text{p} + 18 \times 20\text{p} = £2.10 + 1.25 + 3.60 = £6.95$

Real cost:  $7 \times 32\text{p} + 5 \times 24\text{p} + 18 \times 17\text{p} = £2.24 + 1.20 + 3.06 = £ 7.50$

c. The labels are 7 cm wide and 2.5cm long. The paper is 21 cm wide and 30 cm long.

Labels across = 3

Labels down = 12

Total labels =  $3 \times 12 = 36$

How many sheets of paper?

60 labels = **2 sheets**      95 labels = **3 sheets**

305 labels = **9 sheets**      729 labels = **21 sheets**

d. Estimate the cost:  $9 \times 30\text{p} + 10 \times 25\text{p} + 40 \times 20\text{p} = £2.70 + 2.50 + 8.00 = £13.20$

Real cost:  $9 \times 32\text{p} + 10 \times 24\text{p} + 41 \times 17\text{p} = £2.88 + 2.50 + 6.97 = £ 12.35$

The garden border is 200 cm deep by 400 cm.

#### a. Daffodils

How many daffodils will fit along the border?  $400 \div 10 = 40$

How many rows? **3**

How many daffodils bulbs will I need? **40 x 3 = 120 bulbs**

#### b. Dahlias

How many dahlias will fit along the border? **13**

How many rows? **5**

How many dahlia bulbs will I need? **13 x 5 = 65 bulbs**

#### c. Small flowering plants.

How many flowering plants will fit along the border? **16**

How many rows? **7**

How many flowering plants will I need? **112 plants**

#### e. Slabs for Sale

Slab A: 50cm X 100 cm

Price: £ 6.25

**Cost = 8 x 6.25 = £ 50**

Slab B: 25 cm X 100 cm

Price: £4.10

**Cost = 16 x 4.10 = £ 65.60**

Slabs C: 25 cm X 50 cm

Price: £2.75 each

**Cost = 2 x 2.75 = £88.00**

Slab D: 20 cm X 50 cm

Price: £1.29

**Cost = 40 x 1.29 = £51.60**

Slab E: 25 cm X 25 cm

Price: £1.05 each

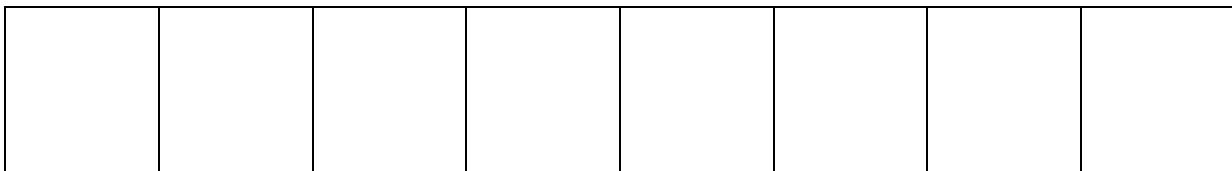
**Cost = 64 x 1.05 = £**

## Design Investigation

### Level Two Extension Activities

d. If I used a slab that measures 50 cm long by 100 cm wide, how many would I need?

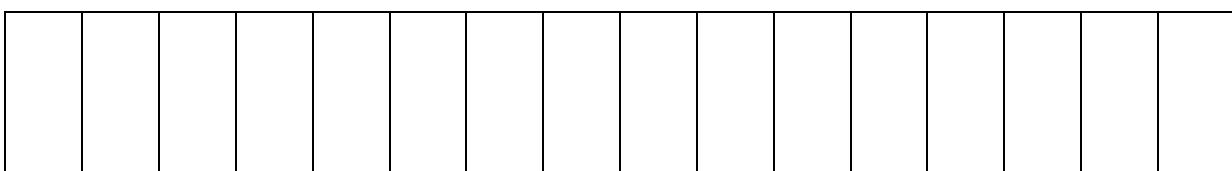
Diagram for Path with slab A



**Area in slabs = 1 x 8 slabs**

If I used a slab that measures 25 cm long by 100 cm wide, how many would I need?

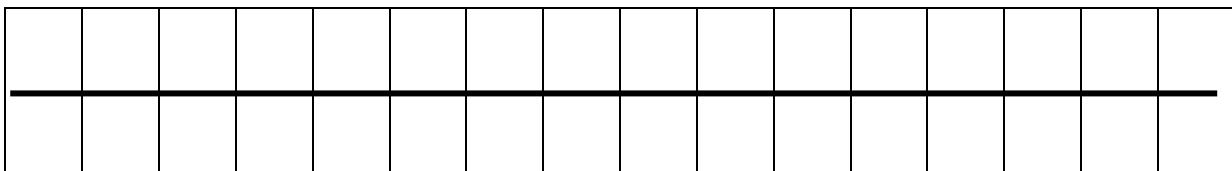
Diagram for Path with slab B



**Area in slabs = 1 x 16 = 16 slabs**

If I used a slab that measures 25 cm long by 50 cm wide, how many would I need?

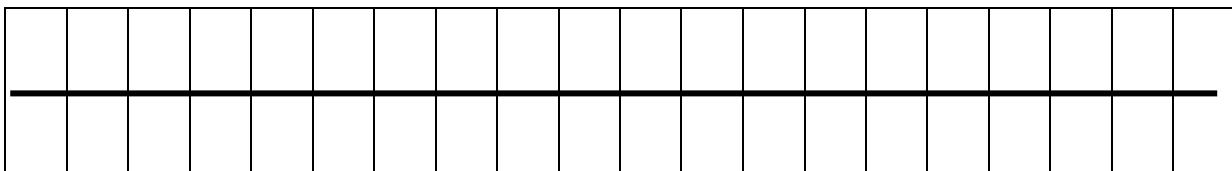
Diagram for Path with slab C



**Area in slabs = 2 x 16 = 32 slabs**

If I used a slab that measures 20 cm long by 50 cm wide, how many would I need?

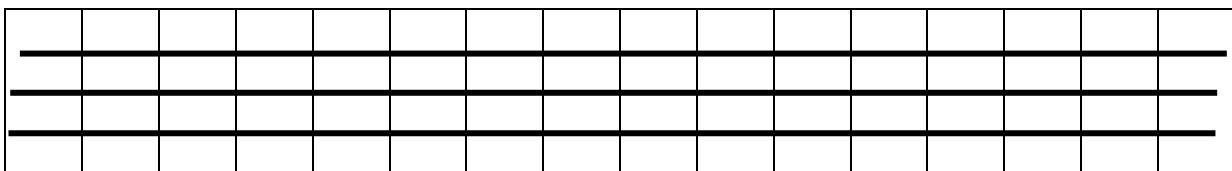
Diagram for Path with slab D



**Area in slabs = 2 x 20 = 40 slabs**

If I used a slab that measures 25 cm long by 25 cm wide, how many would I need?

Diagram for Path with slab E



**Area in slabs = 4 x 16 = 64 slabs**