



Department of
Education



YEAR 7 MATHEMATICS

Multi-Strand Activity

Shirley's Shapes

PRODUCED BY A DEPARTMENT OF EDUCATION - MAWA PARTNERSHIP PROJECT
WRITTEN FOR THE YEAR 7 AUSTRALIAN CURRICULUM

TASK 238: SHIRLEY'S SHAPES

Overview

This task is an investigation into the best piece of material to buy in order to make several different kites. Students work out areas, tessellate shapes and find the amount of wasted material before deciding on which piece of material is the best for the given situation.

Students will need

- grid paper
- calculators (optional)

Relevant content descriptions from the Western Australian Curriculum

- Establish the areas of rectangles, triangles and parallelograms and use these in problem solving (AMMG159)
- Describe translations, reflections in an axis, and rotations of multiples of 90 on the Cartesian plane using coordinates. Identify line and rotational symmetries. (ACMMG181)
- Find percentages of quantities and express one quantity as a percentage of another, with and without digital technologies (ACMNA158)
- Investigate and calculate 'best buys', with and without digital technologies (ACMNA174)

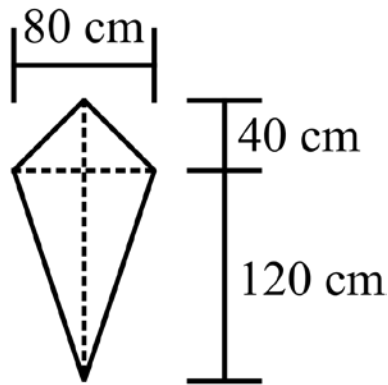
Students can demonstrate

- *fluency* when they
 - calculate accurately with integers
 - investigate best buys
- *reasoning* when they
 - apply known geometric facts to draw conclusions about shapes
- *problem solving* when they
 - solve authentic problems using numbers and measurements
 - work with transformations and symmetry

Activity 1

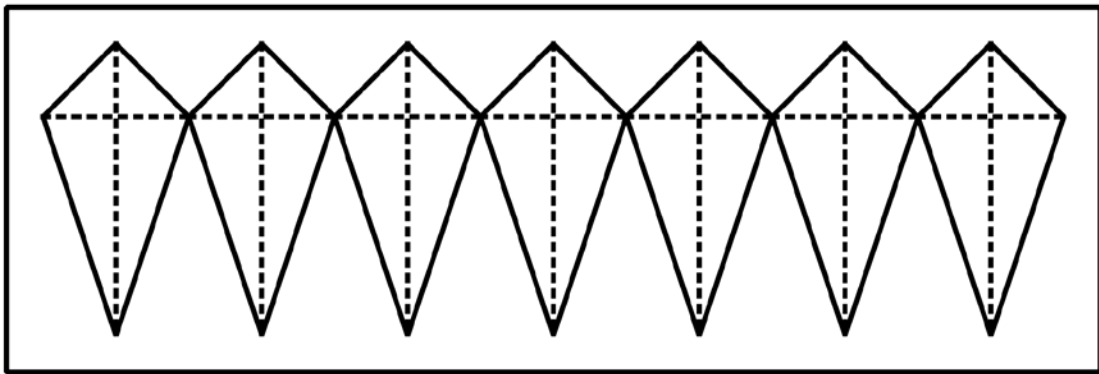
Shirley has decided to make kites as Christmas presents for all her friends.

To make a kite she is going to stretch a piece of material over two pieces of wooden dowel tied together in a cross shape. An illustration of the finished kite is shown below.



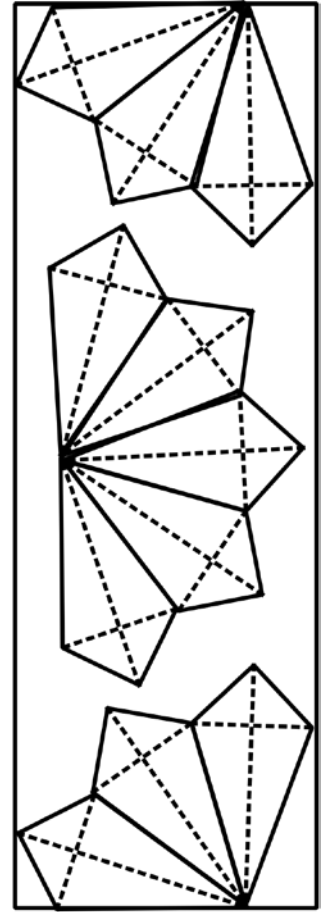
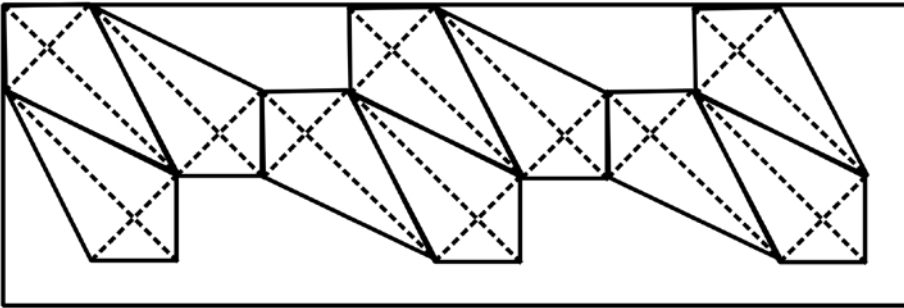
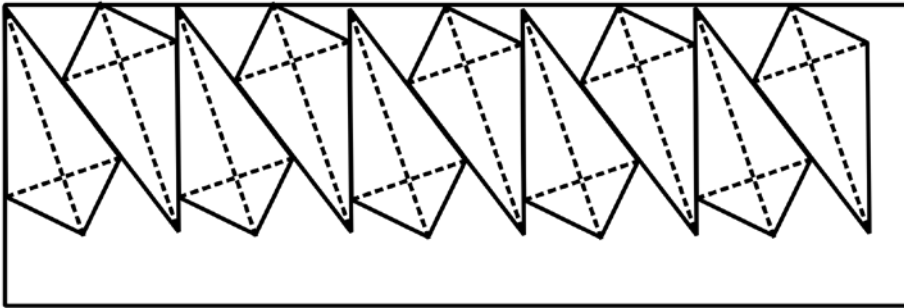
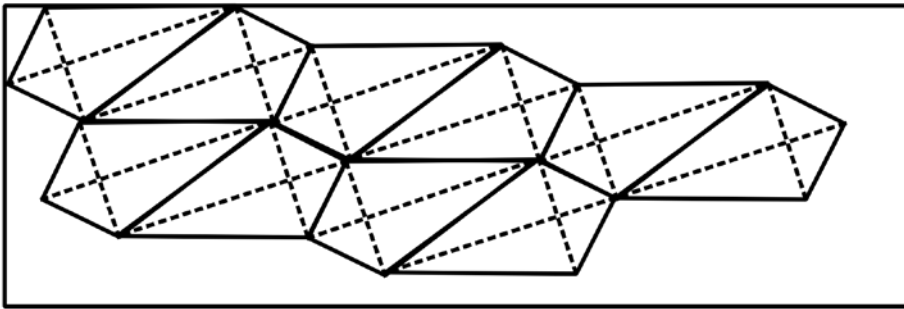
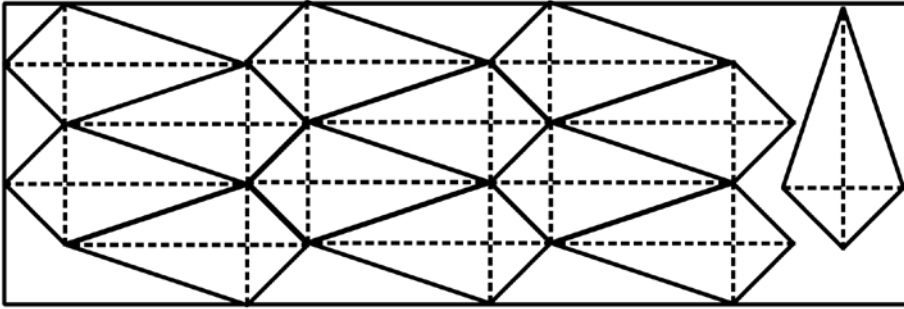
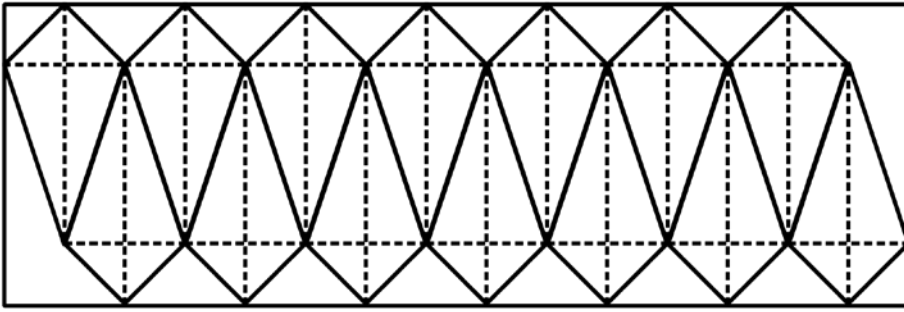
Shirley has one piece of material that is 2 m by 6 m but she is not sure which is the best way to fit the kite shapes onto her material.

One option that Shirley has come up with is shown below...



... but she thinks that there may be a better way to mark out the kites on her material.

1. What is the total area of Shirley's piece of material?
12 m²
2. What is the total area of each kite in square metres?
0.64 m²
3. Using grid paper, and a scale of 1:10, draw as many different ways of laying out the kites as possible.



4. For each design, including Shirley's original one, complete the following table.

Design #	Total Number of Kites Made	Total Area of Kites (m ²)	Total Area of Waste	Waste as a % of Total Material
Shirley's Design	7	4.48	7.52	63%
1	14	8.96	3.04	25%
2	13	8.32	3.68	31%
3	10	6.40	5.60	47%
4	10	6.40	5.60	47%
5	10	6.40	5.60	47%
6	11	7.04	4.94	41%

5. Which design would you recommend Shirley use? Why?

Answers will vary. Here, Design Number 2 has the least wastage.

6. Shirley's first set of kites were so popular, she has decided to make some more. She has enough money to buy 12 m² and she can buy the material in 1.2 m, 2.4 m or 3 m widths.

What would the dimensions be if Shirley bought -

a. The 1.2 m fabric?

1.2 m x 10 m

b. The 2.4 m fabric?

2.4 m x 5 m

c. The 3 m fabric?

3 m x 4 m

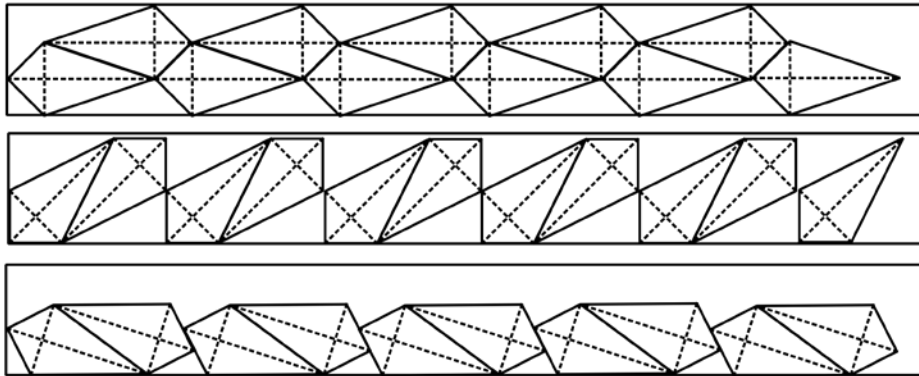
7. Which piece of fabric should Shirley buy? For each piece of fabric identified in Question 6 -

a. Use grid paper and a scale of 1:40, and draw as many different ways of laying out the kites as possible.

b. For each of the designs in part (a), complete a table with the following headings.

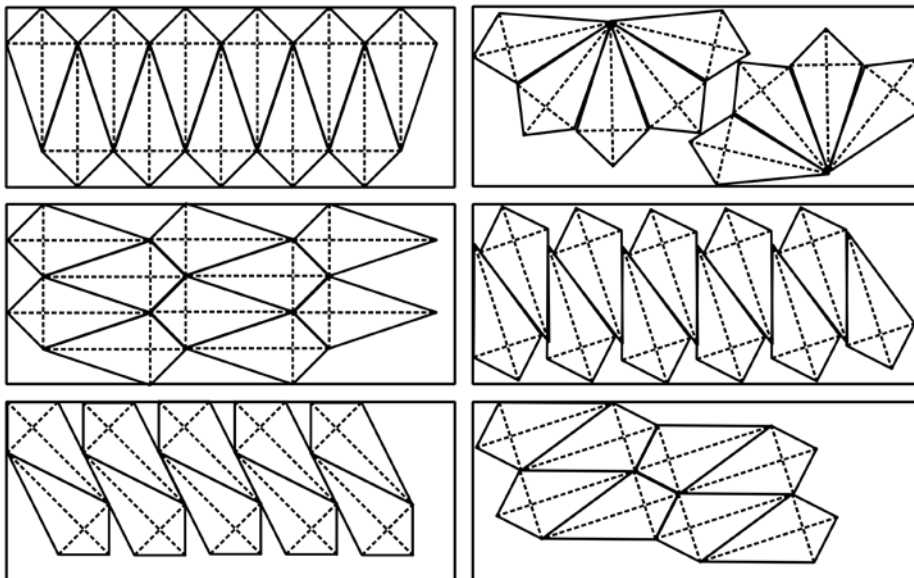
Design #	Total Number of Kites Made	Total Area of Kites	Total Area of Waste	Waste as a % of Total Material

1.2 m material



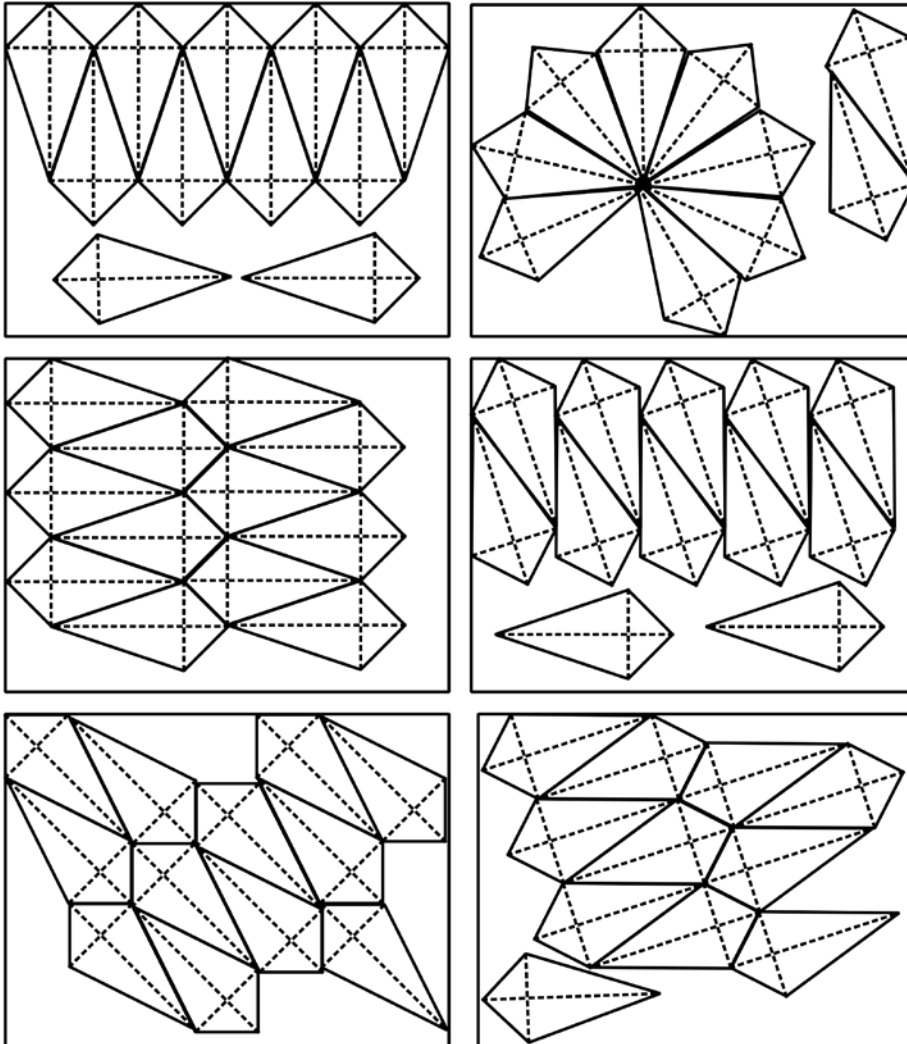
Design #	Total Number of Kites Made	Total Area of Kites	Total Area of Waste	Waste as a % of Total Material
1	11	7.04	4.94	41%
2	11	7.04	4.94	41%
3	10	6.4	5.6	47%

2.4 m material



Design #	Total Number of Kites Made	Total Area of Kites	Total Area of Waste	Waste as a % of Total Material
4	11	7.04	4.94	41%
5	10	6.4	5.6	47%
6	10	6.4	5.6	47%
7	11	7.04	4.94	41%
8	10	6.4	5.6	47%
9	8	5.12	6.88	57%

3 m material



Design #	Total Number of Kites Made	Total Area of Kites	Total Area of Waste	Waste as a % of Total Material
10	11	7.04	4.94	41%
11	10	6.4	5.6	47%
12	12	7.68	4.32	36%
13	12	7.68	4.32	36%
14	12	7.68	4.32	36%
15	11	7.04	4.94	41%

- c. Based on your research, make a recommendation to Shirley about which piece of material she should buy.

Shirley should buy the 3 x 4 m piece of material, as she can make the most kites/have the least wastage with this piece.

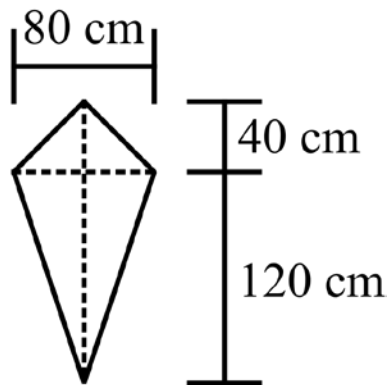
However, if she can find another store that supplies 2 m wide material, 2 m by 6 m is even better.

Activity 1

Shirley has decided to make kites as Christmas presents for all her friends.

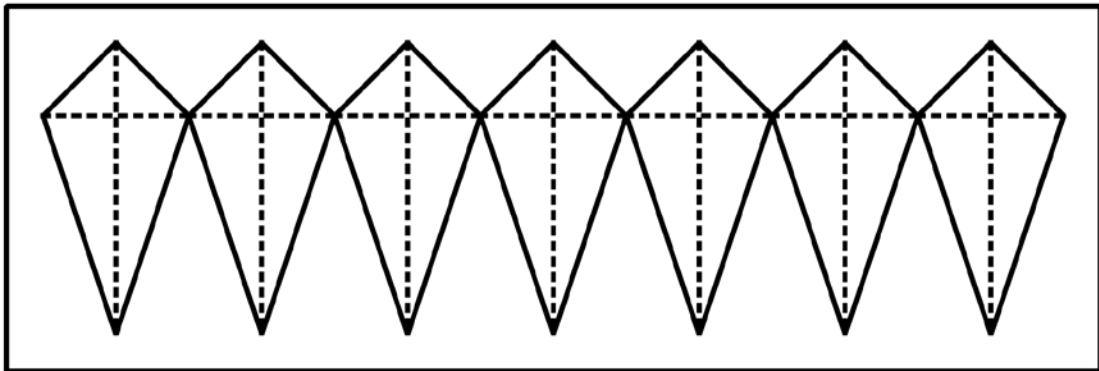
To make a kite she is going to stretch a piece of material over two pieces of wooden dowel tied together in a cross shape. An illustration of the finished kite is shown below.

To make a kite she is going to stretch a piece of material over two pieces of wooden dowel tied together in a cross shape. An illustration of the finished kite is shown below.



Shirley has one piece of material that is 2m by 6m but she is not sure which is the best way to fit the kite shapes onto her material.

One option that Shirley has come up with is shown below...



... but she thinks that there may be a better way to mark out the kites on her material.

1. What is the total area of Shirley's piece of material?
2. What is the total area of each kite in square metres?

3. Using grid paper, and a scale of 1:40, draw as many different ways of laying out the kites as possible.

4. For each of your designs, complete the following table.

Design #	Total Number of Kites Made	Total Area of Kites	Total Area of Waste	Waste as a % of Total Material

5. Which design would you recommend Shirley use? Why?

6. Shirley’s first set of kites was so popular, she has decided to make some more. She has enough money to buy 12 m² and she can buy the material in 1.2 m, 2.4 m or 3 m widths.

What would the dimensions be if Shirley bought -

a. The 1.2 m fabric?

b. The 2.4 m fabric?

c. The 3 m fabric?

7. Which piece of fabric should Shirley buy? For each piece of fabric identified in Question 6 -

a. Use grid paper and a scale of 1:40, and draw as many different ways of laying out the kites as possible.

b. For each of the designs in part (a), complete a table with the following headings.

Design #	Total Number of Kites Made	Total Area of Kites	Total Area of Waste	Waste as a % of Total Material

c. Based on your research, make a recommendation to Shirley about which piece of material she should buy.