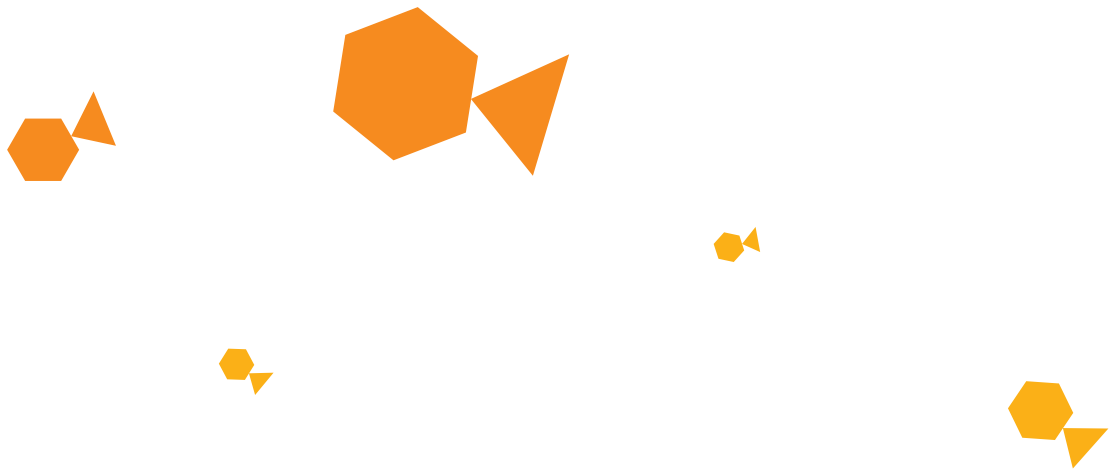
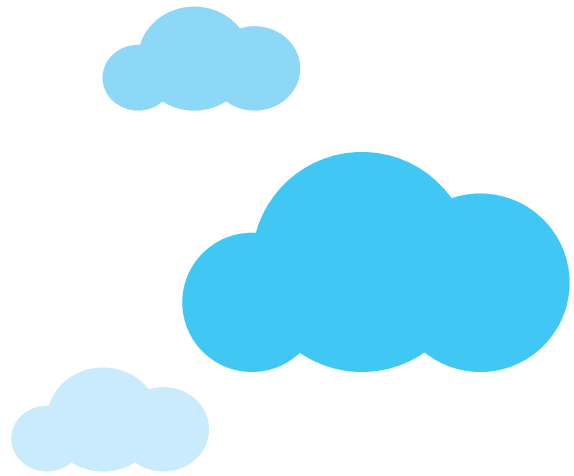


# Learner's Workbook



CONNECTED  
LEARNING  
INITIATIVE



सत्यमेव जयते

# This Handbook Belongs to

Name:

School:

## CLIX Mathematics Team

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### CLIX (2016)

TISS/CEI&AR/CLIX/HB(S)/15 June'16/03

The Connected Learning Initiative (CLIX) is a technology enabled initiative at scale for high school students. The initiative was seeded by Tata Trusts, Mumbai with Tata Institute of Social Sciences, Mumbai and Massachusetts Institute of Technology, Cambridge, as founding partners.

### Collaborators:

Centre for Education Research & Practice - Jaipur, Mizoram University - Aizawl, Eklavya - Madhya Pradesh, Homi Bhabha Centre for Science Education - Mumbai, National Institute of Advanced Studies - Bengaluru, State Council of Educational Research and Training (SCERT) of Telangana - Hyderabad, Tata Class Edge - Mumbai, UNICEF Chhattisgarh - Raipur, Govt. of Rajasthan, Govt. of Mizoram, Govt. of Chhattisgarh and Govt. of Telangana.

### [www.clix.tiss.edu](http://www.clix.tiss.edu)

Any questions, suggestions or queries may be sent to us at:  
[contact@clix.tiss.edu](mailto:contact@clix.tiss.edu)

Cover Design by : Ashwini Hiremath



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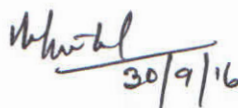
Date: 30/09/2016

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### FOREWORD

I am very happy to learn that a Learner's Workbook on Maths is being brought out.

I feel that we are very fortunate to be a partner in the implementation of CLIX in the country. It is my sincere desire and belief that this partnership will bring about positive changes towards the improvement of our education system, and that the students of Mizoram will be equipped with the required skills and competency to meet the challenges ahead as a result of this endeavor. Teachers are at the core of this important and ambitious initiative, and I hope that this Learner's Workbook will be a useful tool for them in implementing CLIX successfully.

  
30/9/16  
(K. LALTHAWMMAWIA)



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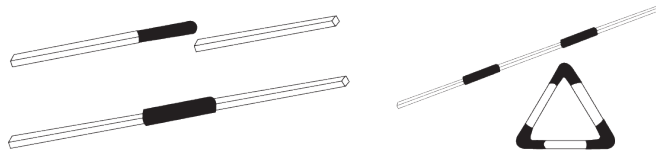
# UNIT 1- CONCEPT OF SHAPES

## Lesson 1: What is Shape

### ACTIVITY 1.1 MATCHSTICK SHAPES

*Work in your group. You will need a set of (used) matchsticks and cycle valve tubes.*

**Task 1:** Make a triangle, a square and pentagon using the matchsticks and valve tubes.



**Task 2:** Perform these actions (mentioned in the table) on the square. Discuss in your group and note whether the shape changes or not.

Action	Does the shape change?	Why do you think so?
Sliding the shape on the floor/desk		
Rotating the shape on the floor/desk		
Flipping the shape on the floor/desk		
Pressing on the opposite vertices of the shape		

**Task 3:** Try pressing on the opposite vertices of the pentagon. Does it change shape? Now try doing the same with the triangle. Does it change shape?

**Extension Task 1:** Try making as many different shapes as possible by deforming/twisting the pentagon (without breaking it or opening up the joints). In particular, try to make

- a triangle that has exactly two sides equal
- a four sided polygon
- a star shape

**Extension Task 2:** Try making a triangle in which all three sides are of different length. What would be the minimum number of matchsticks needed for this?

## ACTIVITY 1.2 CONSTRUCTING SQUARES

**Work with your group on the computer.**

**Task 1:** Construct a square of side 150 using Turtle Blocks.

- Are you sure that the shape you have made is a square? How do you know?
- Write (in your notebook) the final set of commands used to draw the square.

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**Task 2:** Construct a square which is different from the one you constructed in Task 1.

- Mention one similarity, and one difference between the squares constructed in Task 1 and Task 2.

Similarity: \_\_\_\_\_

Difference: \_\_\_\_\_

- Based on this, describe in your own words what a square is.

A Square is \_\_\_\_\_

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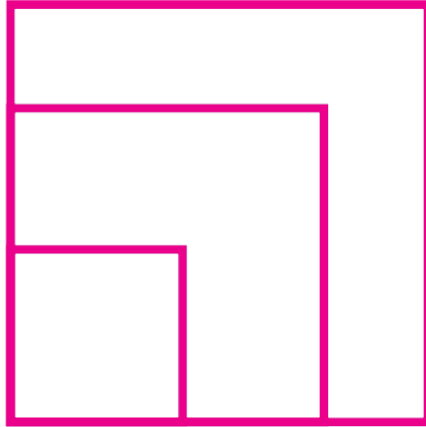
**Task 3:** Turn your turtle by any angle using the **right** or **left** command. Try to imagine what shape would be created if you now repeat the commands you typed for Task 1. Draw the shape here:



Now type in the commands on the screen.

- Does the shape created on the screen match the shape you imagined? If not, give reasons why you think they do not match.
- Is the shape obtained in Task 3 a square? Why or why not?

**Extension Task 1:** Create this design using Turtle Blocks:



**Extension Task 2:** Using Turtle Blocks, create any design using only squares. Save a screenshot of your design and upload it.



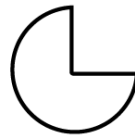
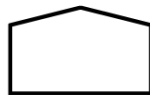
# UNIT 2-ANALYSING AND DESCRIBING SHAPES

## Lesson 2: Analysing Shapes

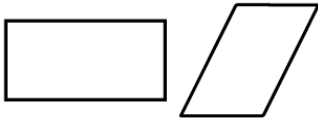

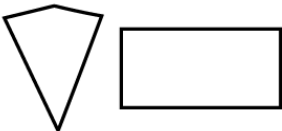

### ACTIVITY 2.1 SORTING SHAPES

*Work individually on the following tasks and then discuss with your group.*

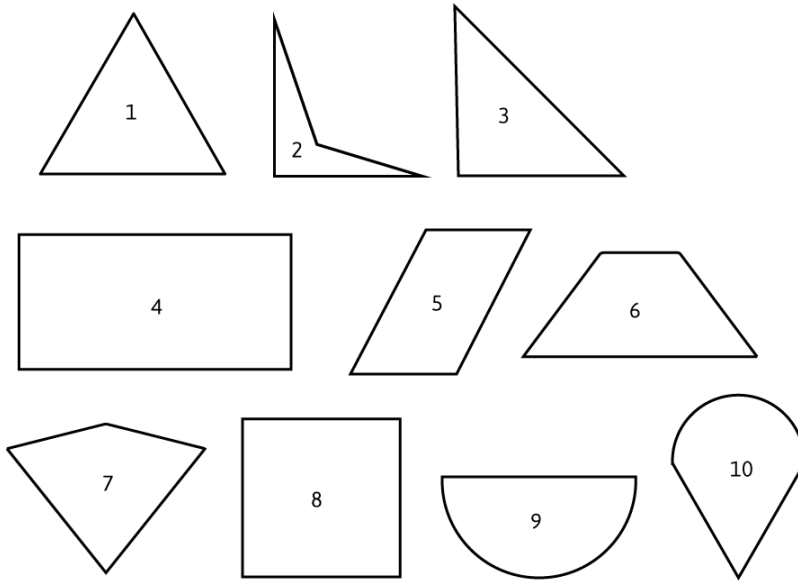
**Task 1:** Write 1- 2 lines about (or properties of) each of the following shapes.



**Task 2:** Observe the two shapes given in each of the following sets. List as many similarities and differences that you can between the two. One example is given for the first set.

Set	Similarities	Differences
	1) Both have exactly four sides 2) Both have 2 pairs of parallel sides	1) First shape has right angle, the second does not
		
		
		

**Task 3:** Look at the collection of shapes below. Based on their properties, sort them into two groups in as many different ways as you can. An example is shown in the table.



Property	These shapes have it	These shapes don't have it
Has exactly 4 straight sides	2, 4, 5, 6, 7, 8	1, 3, 9, 10

**Extension Task 1:** Draw 3 different shapes that have the following property 'all sides equal'. 'All sides equal' is one way in which the shapes that you got are similar. What is one difference between them?

**Extension Task 2:** Draw a shape that has both these properties:

- i. exactly 5 sides
- ii. exactly 2 right angles

**Extension Task 3:** Draw a shape that has all these properties:

- i. exactly 4 sides
- ii. exactly 2 right angles
- iii. exactly 1 pair of sides parallel

### ACTIVITY 2.2 - POLICE QUAD MISSION 1

*Work with your group on the computer to play Mission 1 of the Police Quad game.*

## Lesson 3 : Describing Shapes

### ACTIVITY 2.4 - POLICE QUAD MISSION 2

*Work with your group on the computer to play Mission 2 of the Police Quad game..*

# UNIT 3 - CLASSIFYING AND DEFINING SHAPES

## Lesson 4 : Classifying Shapes

### ACTIVITY 3.1 - POLICE QUAD MISSION 3

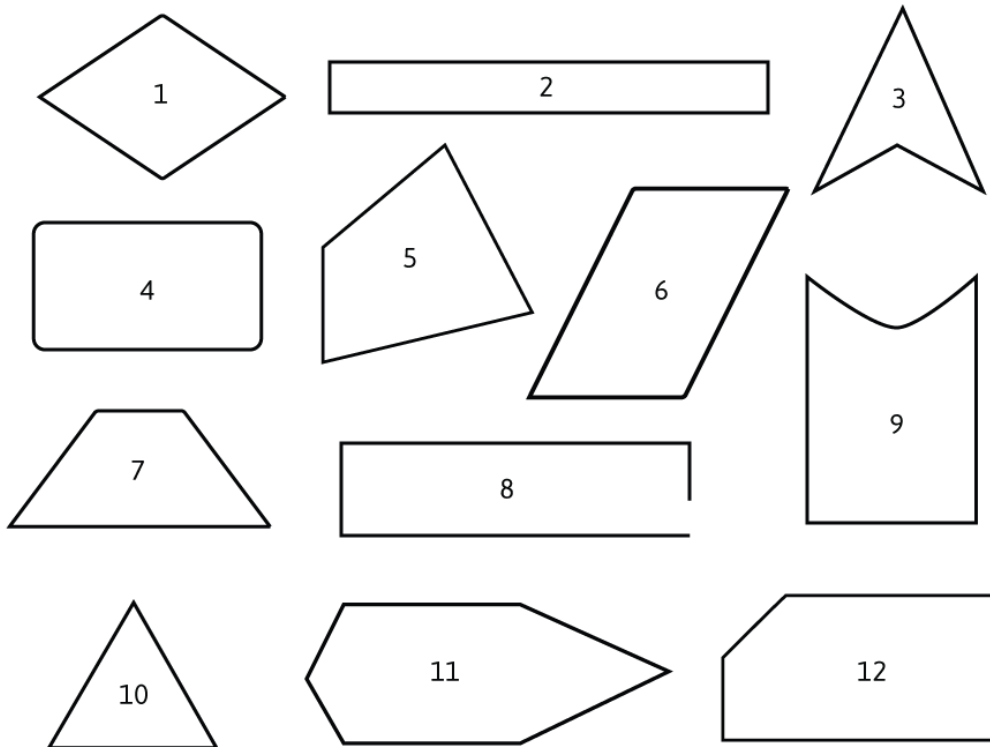
*Work with your group on the computer to play Mission 3 of the Police Quad game.*

## Lesson 5: Defining Shapes

### ACTIVITY 3.3 - WHAT IS A QUADRILATERAL?

*Work individually on the following task and then discuss with your group.*

**Task 1:** Look at the collection of shapes and sort them based on their properties into two groups 'Quadrilaterals' and 'Not quadrilaterals'.



These are Quadrilaterals	These are not Quadrilaterals

For each shape, discuss why you think it is a quadrilateral, or not. Now complete the following:  
I think 'a quadrilateral is

\_\_\_\_\_

\_\_\_\_\_

## Lesson 6: Defining Special Quadrilaterals

### ACTIVITY 3.4 CONSTRUCTING RECTANGLES

*Work with your group on the computer.*

**Task 1:** Recall how you constructed a square using Turtle Blocks in an earlier lesson. Now use the Blocks to construct a rectangle with sides 60 units and 90 units.

- Write (in your notebook) the final set of commands used to construct the rectangle.
- Are you sure that the shape you have made is a rectangle? How do you know?

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**Task 2:** Construct any rectangle which is different from the one you constructed in Task 1, and also a square.

- Mention one similarity and one difference between the command set given to construct a square and a rectangle?

Similarity: \_\_\_\_\_

Difference: \_\_\_\_\_

- Look around you. Does everyone's rectangle look the same? Why or why not? What are the properties that are same across everyone's rectangle and what differs?

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- Based on this, describe in your own words what a rectangle is.

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**Extension Task 1:** Construct a rhombus whose side length is 70 units and one of the angles is  $130^\circ$ . Write (in your notebook) the final set of commands used to construct the shape.

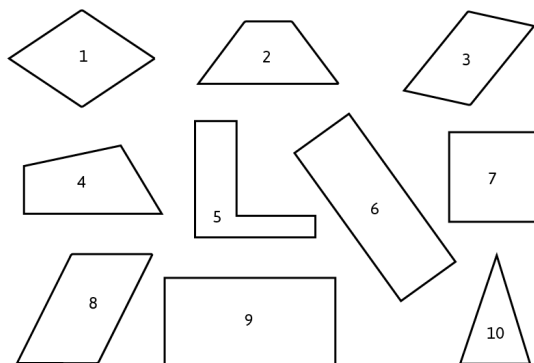
- Explain each step of the construction.
- Are you sure that the shape you have made is a rhombus? How do you know?

**Extension Task 2:** Construct a parallelogram.

### ACTIVITY 3.5 EXPLORING SPECIAL QUADRILATERALS

Work individually on the following tasks and then discuss with your group.

**Task 1:** Look at the collection of shapes and sort them into those that are parallelograms and those that are not. Fill in the table.



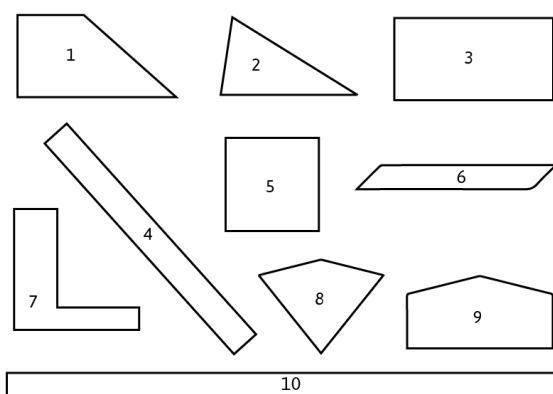
These are parallelograms	These are not parallelograms

For the shapes which are not parallelograms, explain why. Based on this, write your definition of a parallelogram.

I think a parallelogram is \_\_\_\_\_

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**Task 2:** Look at the collection of shapes and sort them into those that are rectangles and those that are not. Fill in the table.



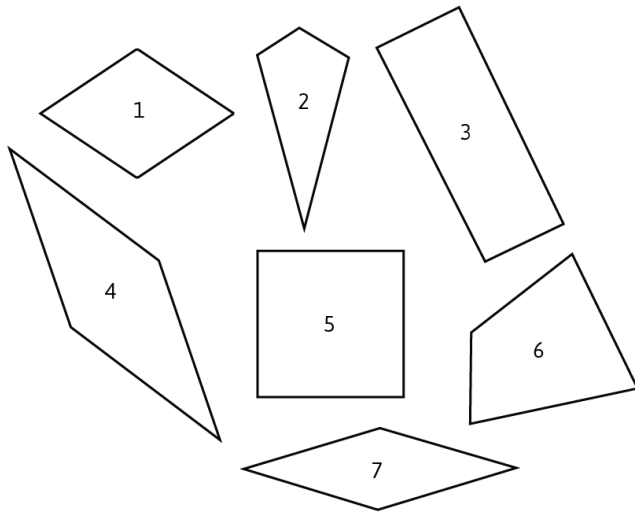
These are rectangles	These are not rectangles

Based on this, write your definition of a rectangle.

I think 'a rectangle is \_\_\_\_\_

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**Task 3:** Look at the collection of shapes and sort them into those that are rhombuses and those that are not.



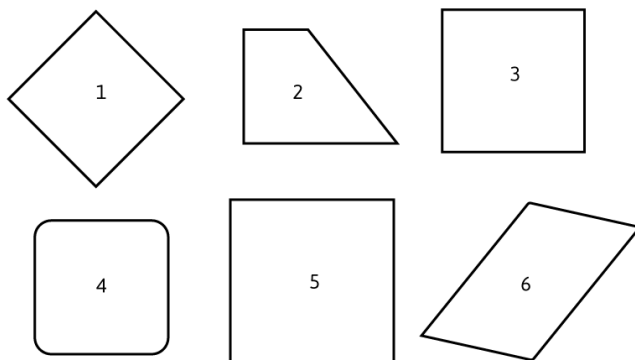
These are rhombuses	These are not rhombuses

Based on this, write your definition of a rhombus.

I think 'a rhombus is \_\_\_\_\_

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**Task 4:** Look at the collection of shapes and sort them into those that are squares and those that are not. Fill in the table.



These are square	These are not square

Based on this, write your definition of a square.

I think 'a square is \_\_\_\_\_

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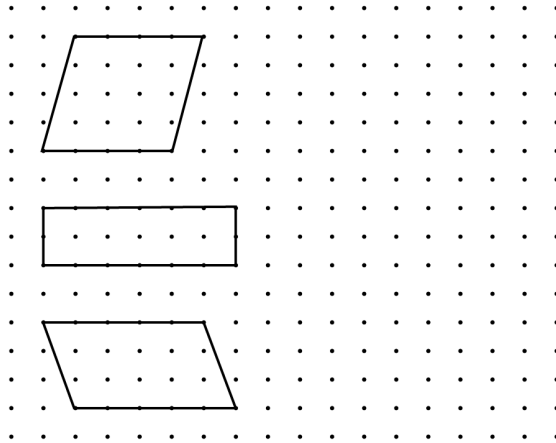
# Lesson 7: Properties of Special Quadrilaterals

## ACTIVITY 3.7 MAKING PROPERTY LISTS

Work individually on the following tasks and then discuss with your group.

### Task 1

a. Shown here are some examples of parallelograms. Draw 2 more examples of parallelograms on the dot paper. (Make sure that your parallelograms are different from the ones already given!)



b. Write down the ways in which these parallelograms are different from each other.

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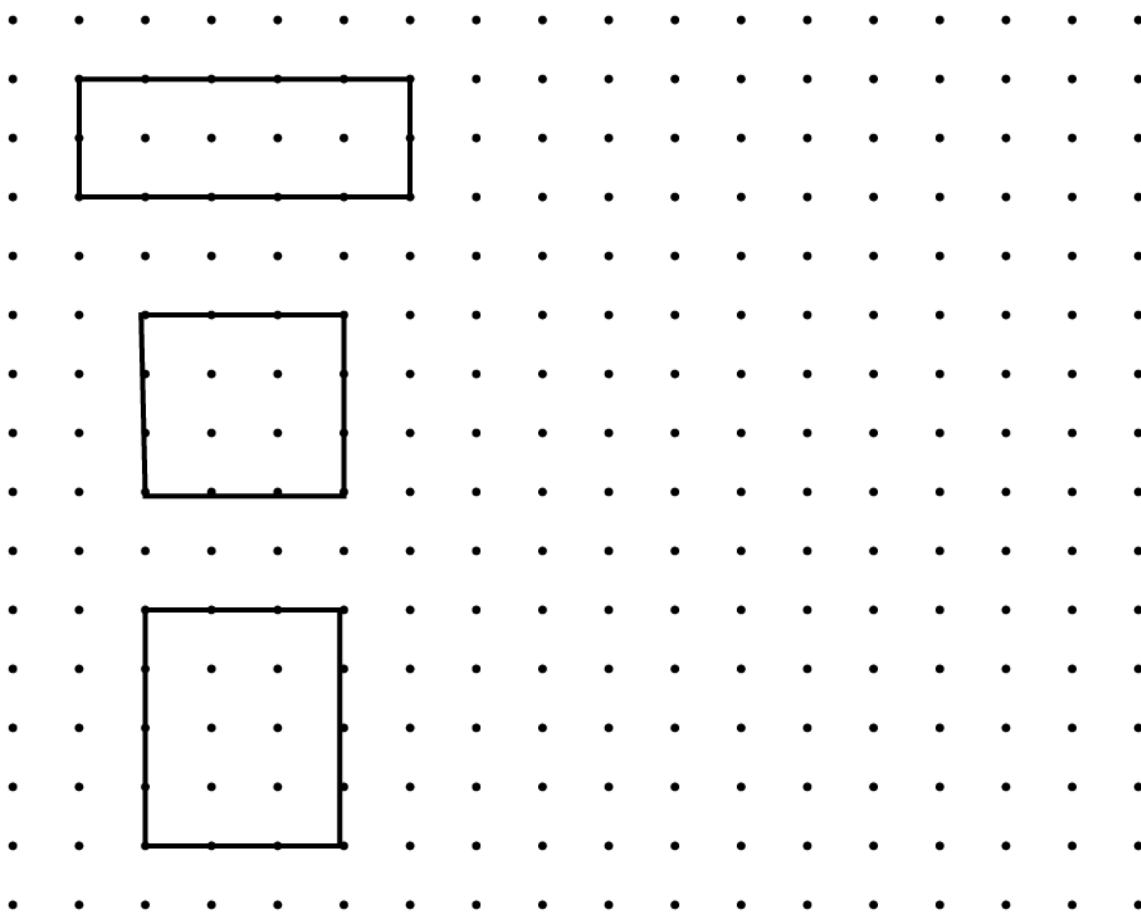
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**Task 2:** Observe the parallelograms in Task 1 and make a list of as many properties as you can. Remember, the properties should be common to ALL the examples!

Properties of a Parallelogram		
Side Properties	Angle Properties	Diagonal Properties

**Task 3**

a. Shown here are some examples of rectangles. Draw 2 more examples of rectangles on dot paper. (Make sure that your rectangles are different from the ones already given!)



b. Write down the ways in which these rectangles are different from each other.

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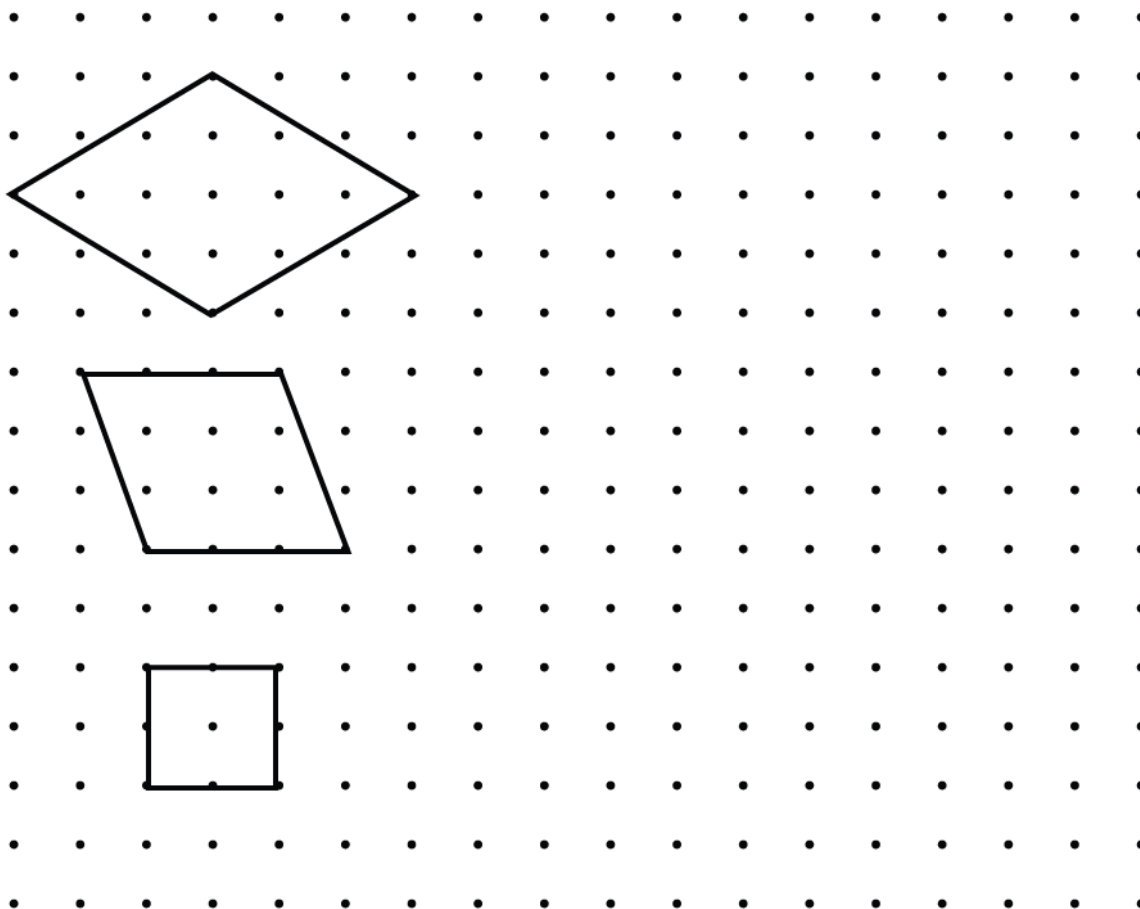
**Task 4:** Observe the rectangles in Task 3 and make a list of as many properties as you can. Remember, the properties should be common to ALL the examples!

Properties of a Rectangle		
Side Properties	Angle Properties	Diagonal Properties



**Task 5**

a. Shown here are some examples of rhombuses. Draw 2 more examples of rhombuses on dot paper. (Make sure that your rhombuses are different from the ones already given!)



b. Write down the ways in which these rhombuses are different from each other.

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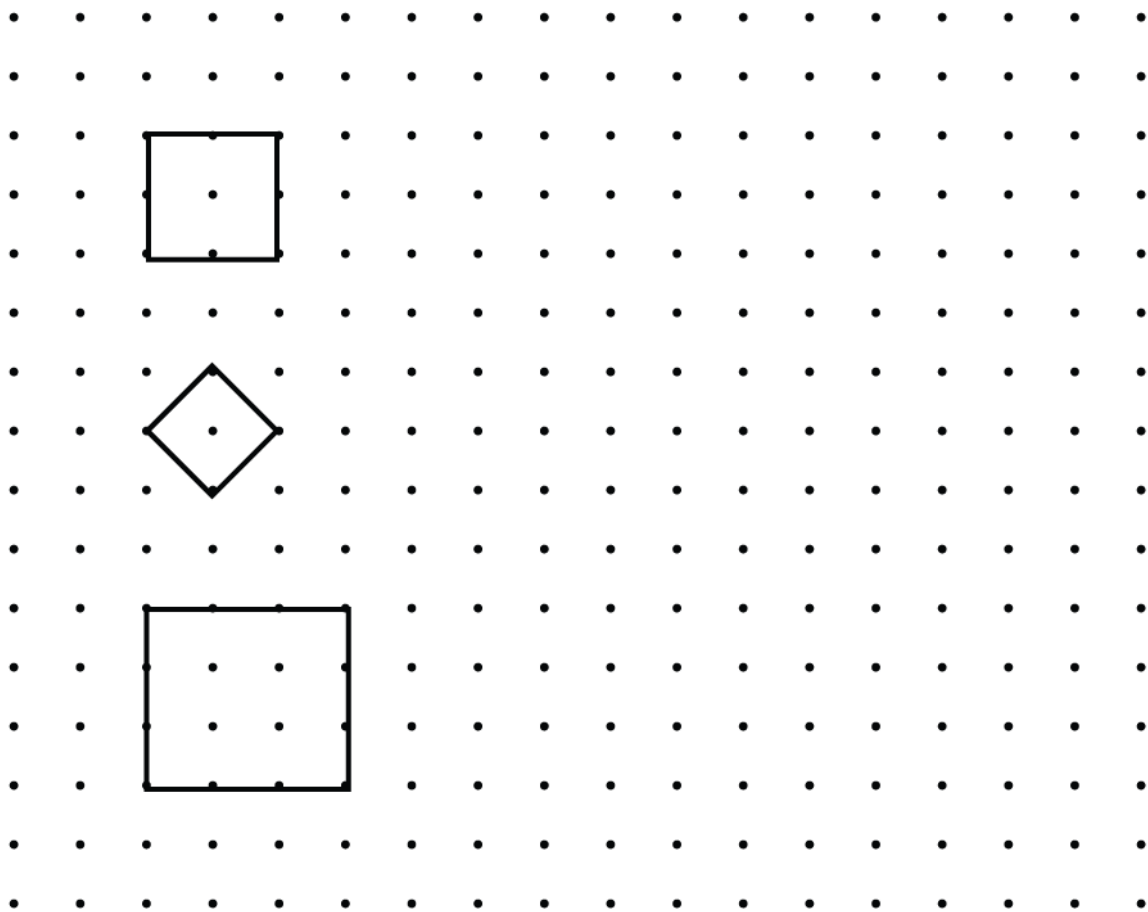
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**Task 6:** Observe the rhombuses in Task 5 and make a list of as many properties as you can. Remember, the properties should be common to ALL the examples!

Properties of a Rhombus		
Side Properties	Angle Properties	Diagonal Properties

**Task 7**

a. Shown here are some examples of squares. Draw 2 more examples of squares on dot paper. (Make sure that your squares are different from the ones already given!)



b. Write down the ways in which these squares are different from each other.

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**Task 8:** Observe the squares in Task 7 and make a list of as many properties as you can. Remember, the properties should be common to ALL the examples!

Properties of a Square		
Side Properties	Angle Properties	Diagonal Properties

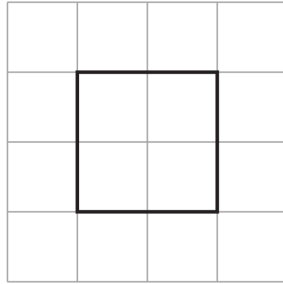
# UNIT 4: PROPERTY-BASED REASONING

## Lesson 8: Relationships among Special Quadrilaterals

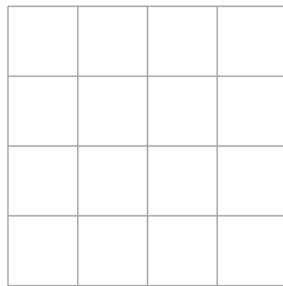
### ACTIVITY 4.1 POLICE QUAD MISSION 4

*Work with your group on the computer. Then complete the following tasks.*

**Task 1:** In a computer game when a computer had to generate the rectangle, this is what it generated. Do you think the computer is cheating? Why or why not?



**Task 2:** Draw all the possible rhombuses on this grid. How many did you get?



### ACTIVITY 4.2 CREATING PROPERTY STACKS

*Work individually on the following task and then discuss with your group.*

**Task 1:** Study the table of properties below. Put a tick ( ✓ ) mark in a cell if the corresponding shape has the given property. Leave the cell blank if it doesn't. The first row is done for you.

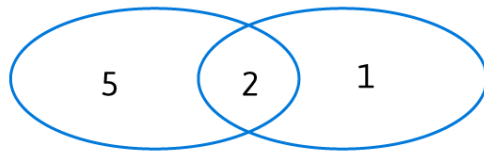
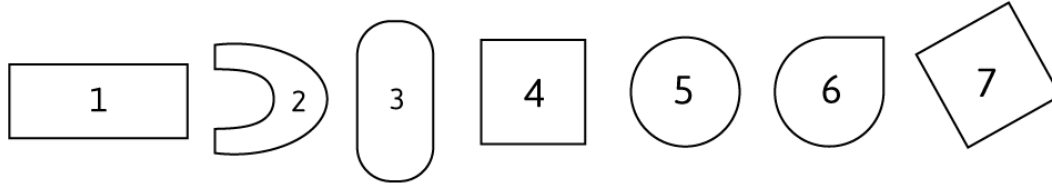
	Properties	Square	Rectangle	Parallelogram	Rhombus	Quadrilaterals
1	Closed figure made of 4 line segments only	✓	✓	✓	✓	✓
2	Pairs of opposite sides equal in length					
3	Pairs of opposite sides equal in length					
4	Opposite angles are equal					
5	Diagonals bisect each other					
6	All angles are right angles/ are equal					
7	Adjacent angles are equal					
8	Diagonals are equal in length					
9	Adjacent sides are equal in length					
10	All 4 sides are equal in length					
11	Diagonals are perpendicular to each other					

# Lesson 9: Representing Relationships

## ACTIVITY 4.4 REPRESENTING RELATIONSHIPS 1

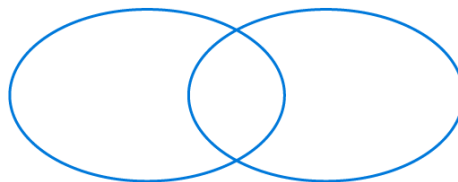
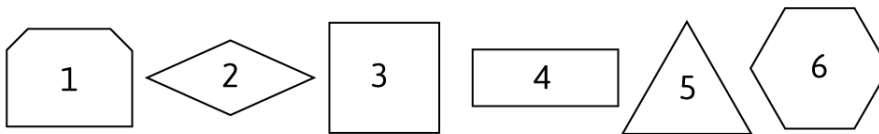
Work individually on the following tasks and then discuss with your group.

**Task 1:** Write the numbers corresponding to each of the shapes below in the appropriate place in the given Venn diagram. Some are done for you.



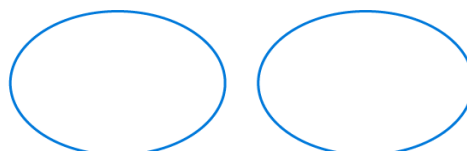
At least one curved side      At least one straight side

**Task 2:** Write the numbers corresponding to each of the shapes below in the appropriate place in the given Venn diagram



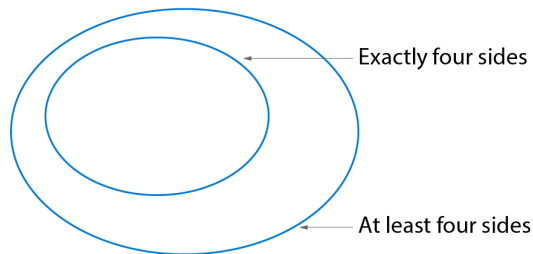
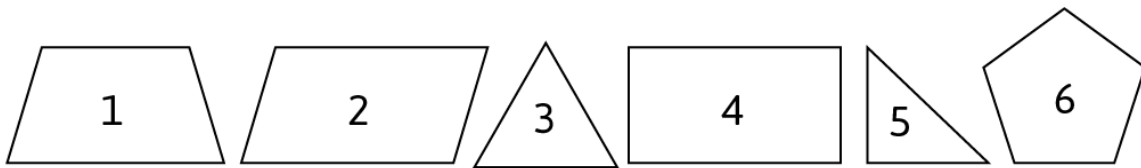
Exactly four sides      All angles equal

**Task 3:** Write the numbers corresponding to each of the shapes below in the appropriate place in the given Venn diagram.

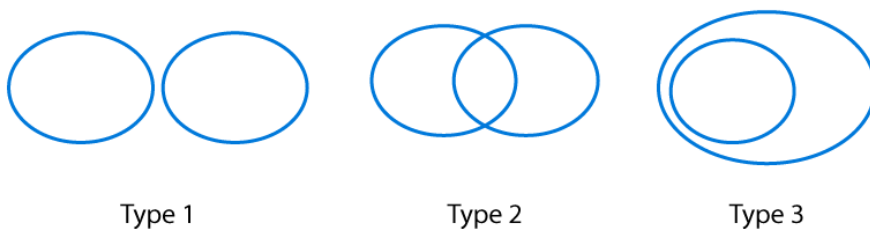


At least one obtuse angle      No obtuse angle

**Task 4:** Write the numbers corresponding to each of the shapes below in the appropriate place in the given Venn diagram



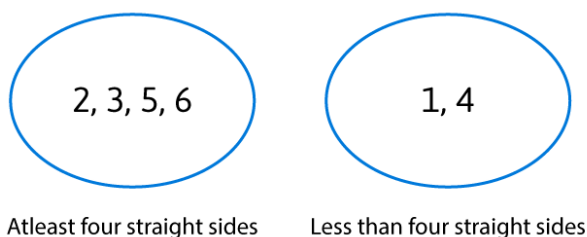
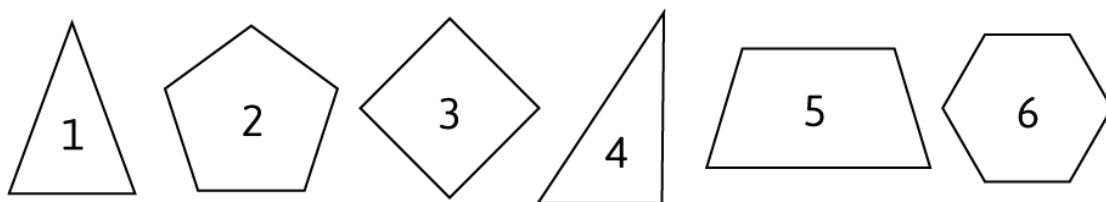
For Tasks 5-8, consider the three types of Venn diagrams Type 1, Type 2 or Type 3 shown below.



**Task 5:** Consider two groups of shapes:

- Group 1: has at least 4 straight sides
- Group 2: has less than 4 straight sides

- Which type of Venn (Type 1, 2 or 3) would be the most appropriate to classify a group of shapes by these two properties? Justify your choice. Draw it in the space provided below.
- Now classify these shapes into the Venn diagram you selected. (Write the numbers in the appropriate place. Some are done for you.)



**Task 6:** Consider two groups of shapes:

- Group 1: has all sides equal
- Group 2: has at least 1 right angle

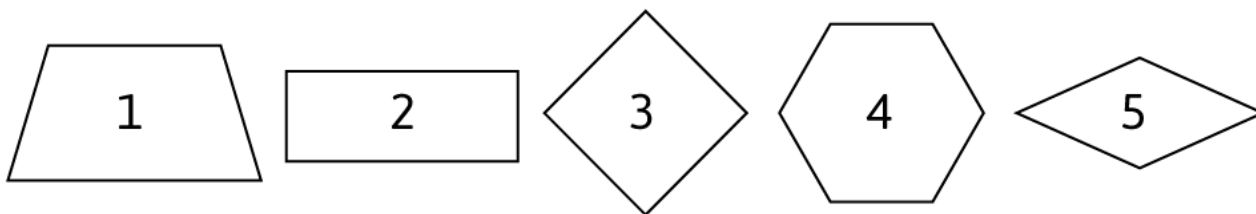
a. Which type of Venn (Type 1, 2 or 3) would be the most appropriate to classify a group of shapes by these two properties? Justify your choice. Draw it in the space provided below.  
 b. Now classify these shapes into the Venn diagram you selected. (Write the numbers in the appropriate place.)



**Task 7:** Consider two groups of shapes:

- Group 1: has at least one pair of opposite sides parallel
- Group 2: has no sides parallel

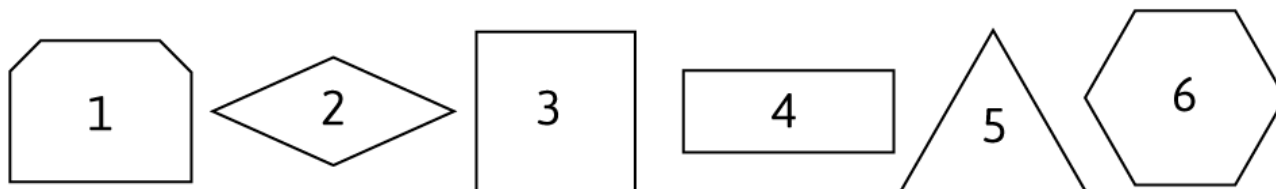
a. Which type of Venn (Type 1, 2 or 3) would be the most appropriate to classify a group of shapes by these two properties? Justify your choice. Draw it in the space provided below.  
 b. Now classify these shapes into the Venn diagram you selected. (Write the numbers in the appropriate place.)



**Task 8:** Consider the property set

- at least 3 straight sides
- exactly 4 straight sides

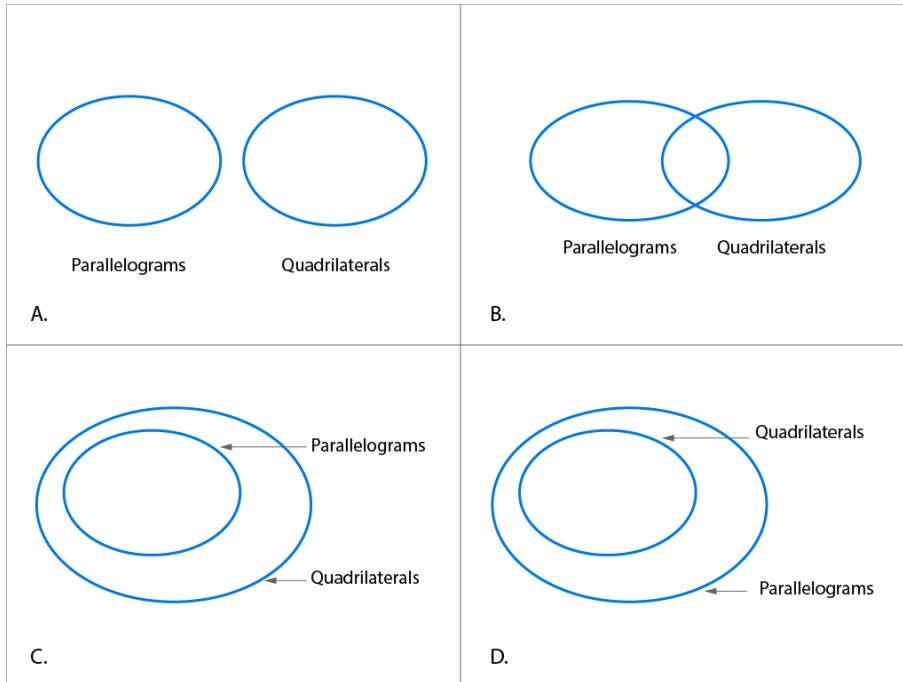
a. Which type of Venn (Type 1, 2 or 3) would be the most appropriate to classify a group of shapes by these two properties? Justify your choice. Draw it in the space provided below.  
 b. Now classify these shapes into the Venn diagram you selected, by the given properties.



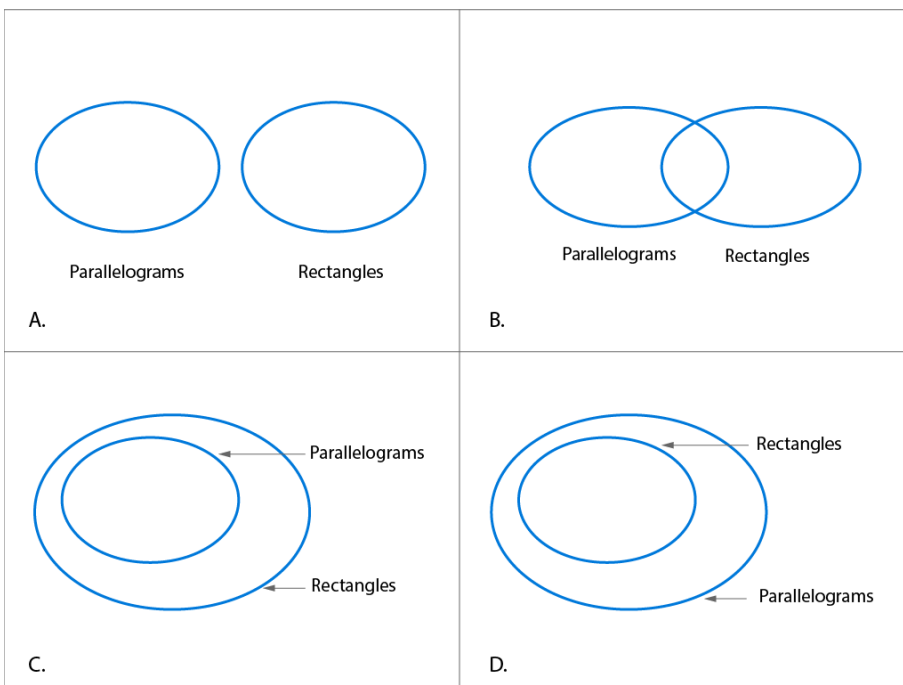
Task 6	Task 7	Task 8

## ACTIVITY 4.5 REPRESENTING RELATIONSHIPS 2

**Task 1:** Which of these is the correct representation of the set of parallelograms and quadrilaterals, and why? (You may want to use the definition of quadrilaterals and parallelograms and their properties to see how they are related.)



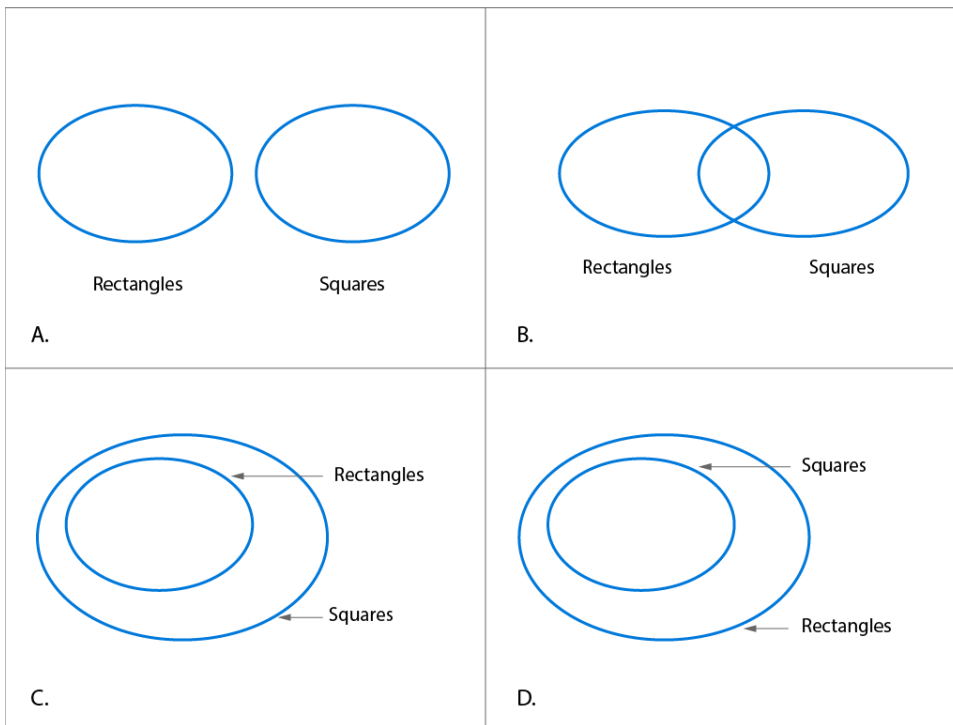
**Task 2:** Which of these is the correct representation of the set of parallelograms and rectangles, and why? (You may want to use the definition of parallelograms and rectangles and their properties to see how they are related.)



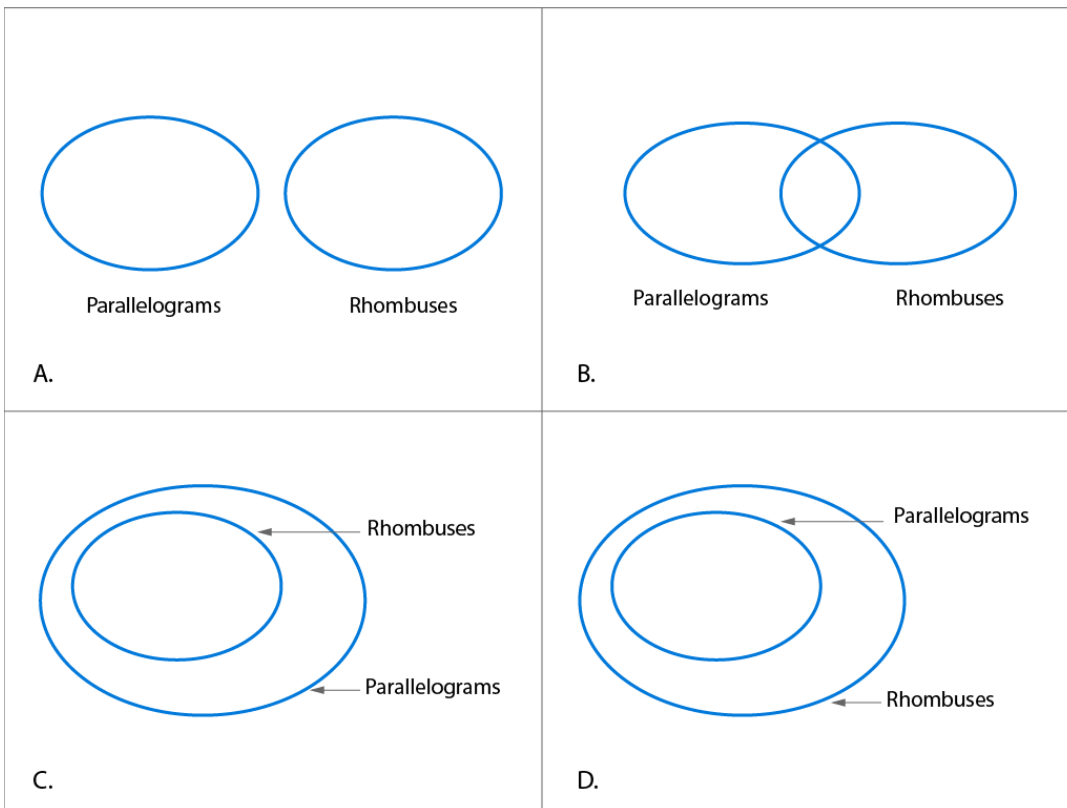
**Task 3:** Based on task 2, which of the following statements is correct? And why?

- All parallelograms are rectangles
- All rectangles are parallelograms
- Some rectangles are parallelograms (and some are not).
- No parallelogram is a rectangle.

**Task 4:** Which of these is the correct representation of the set of rectangles and squares, and why? (You may want to use the definition of quadrilaterals and parallelograms and their properties to see how they are related.)



**Task 5:** Which of these is the correct representation of the set of parallelograms and rhombuses, and why? (You may want to use the definition of parallelograms and rhombuses and their properties to see how they are related.)

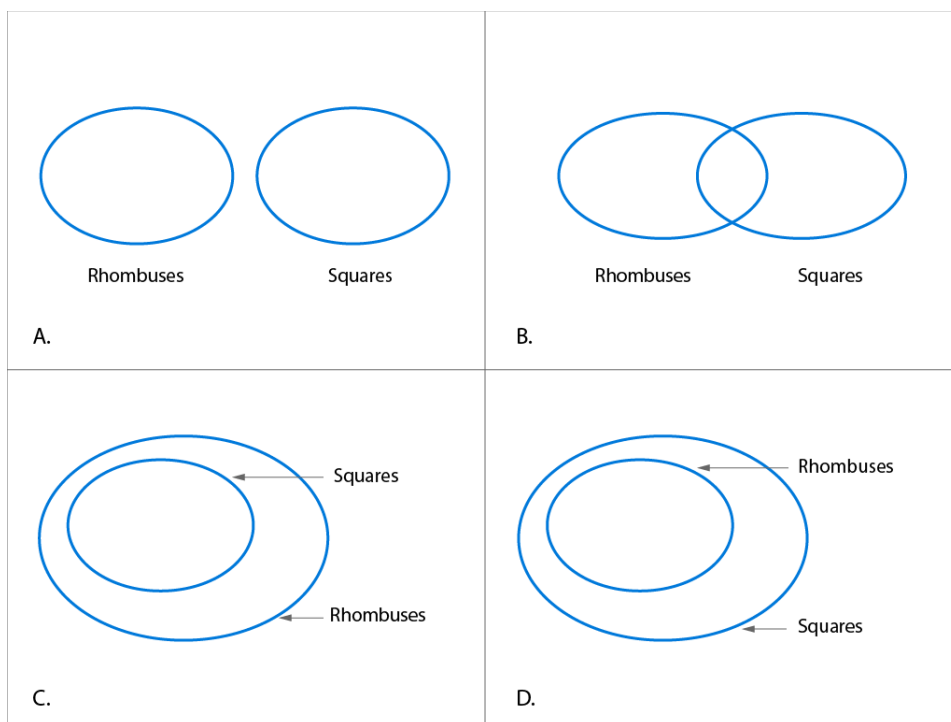


**Task 6:** Based on task 4, which of the following statements is correct?

- a) All parallelograms are rhombuses
- b) All rhombuses are parallelograms
- c) Some rhombuses are parallelograms (and some are not).
- d) No parallelogram is a rhombus.



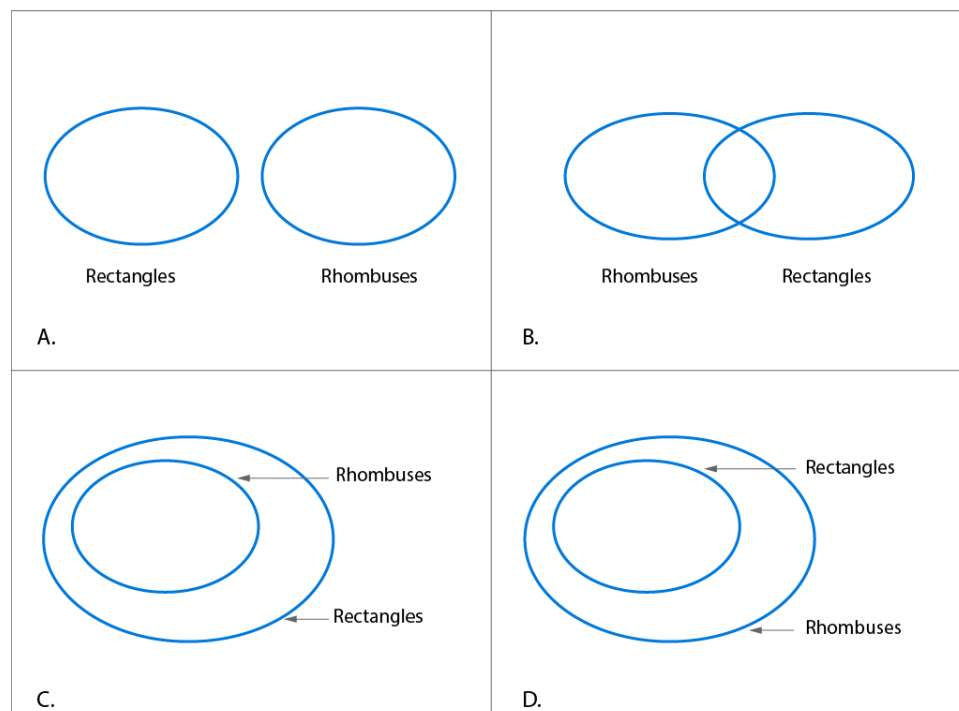
**Task 7:** Which of these is the correct representation of the set of rhombuses and squares, and why? (You may want to use the definition of rhombuses and squares and their properties to see how they are related.)



Based on this choose the correct word that completes the sentence.

- i) \_\_\_\_\_ rhombuses are squares. (All/ Some/ No)
- ii) \_\_\_\_\_ squares are rhombuses (All/ Some/ No)

**Task 8:** Which of these is the correct representation of the set of rectangles and rhombuses, and why? (You may want to use the definition of parallelograms and rhombuses and their properties to see how they are related.)



**Task 9:** Using the representations chosen in the above tasks, represent quadrilaterals, parallelograms, rhombuses, rectangles and squares in one diagram. Represent quadrilaterals using a rectangle and use appropriate circles to represent the remaining quadrilaterals.

# Lesson 10: DISCUSSING DEFINITIONS

## ACTIVITY 4.6 WHAT IS A TRAPEZIUM?

**Task 1:** Discuss with others and choose one of the definitions that your class would like to use as a shared definition of trapezium.

- A. Kanasu's definition: A trapezium is a quadrilateral with exactly one pair of sides parallel.
- B. Zo's definition: A trapezium is a quadrilateral with at least one pair of sides parallel.
- C. Sahir's definition: A trapezium is another name for a quadrilateral
- D. None of these. I have my own definition.

**My definition is:** \_\_\_\_\_

\_\_\_\_\_

**Task 2:** Give reasons for choosing the definition.

\_\_\_\_\_

\_\_\_\_\_

**Task 3:**

i) Do you think a concept/term can be defined in more ways than one?

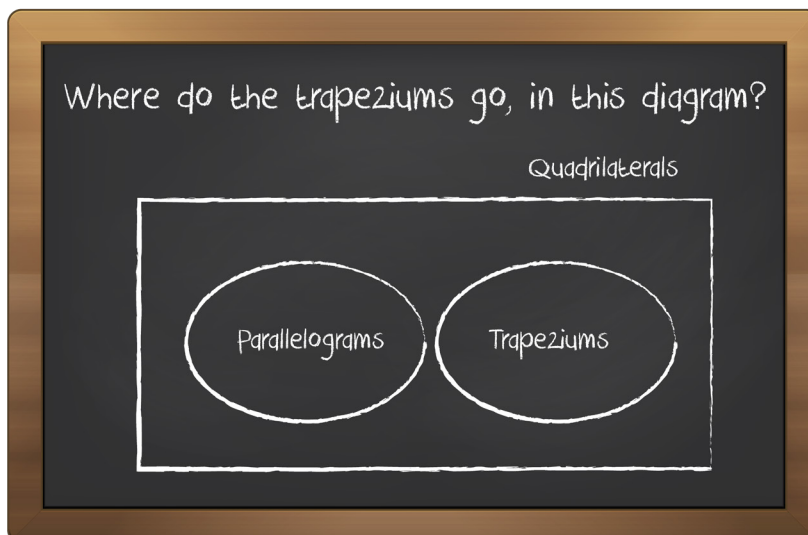
- A. Yes
- B. No
- C. I am not sure

ii) Why?

\_\_\_\_\_

\_\_\_\_\_

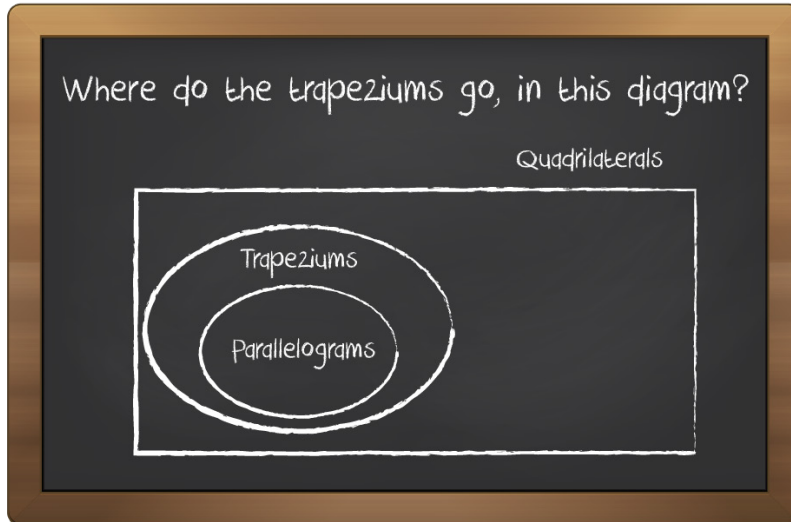
**Extension Task 1:** Going by Kanasu's definition, this is how parallelograms and trapeziums are represented.



According to this, which of the following is correct?

- A. All trapeziums are parallelograms.
- B. All parallelograms are trapeziums.
- C. Some trapeziums are parallelograms.
- D. No trapezium is a parallelogram.

**Extension Task 2:** Going by Zo's definition, this is how parallelograms and trapeziums are represented.



According to this, which of the following is correct?

- A. All trapeziums are parallelograms.
- B. All parallelograms are trapeziums.
- C. Some trapeziums are parallelograms.
- D. No trapezium is a parallelogram.

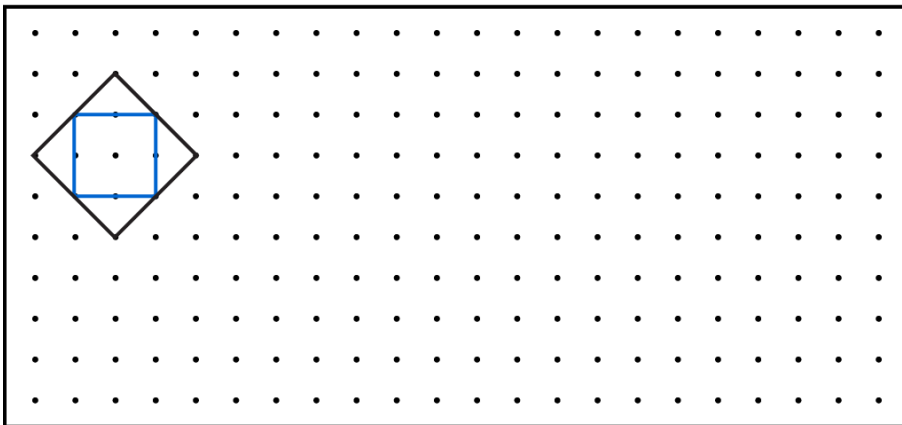
# UNIT 5 - UNDERSTANDING THE NEED FOR PROOF

## Lesson 11: MidPoint Explorations

### ACTIVITY 5.1 MIDPOINT EXPLORATIONS

*Work individually on the following task and then discuss with your group.*

**Task 1:** On the dot paper below, draw different squares. Join the midpoints of the sides of each of these squares (in order) to create a new quadrilateral. The first one is shown as an example.

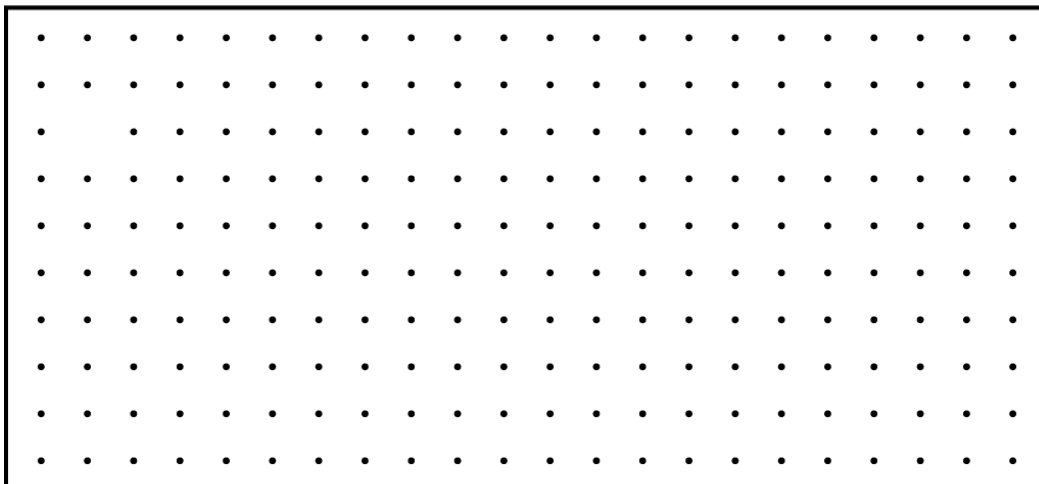


Observe each of the new quadrilaterals formed, and complete the following: The quadrilateral formed by joining the midpoints of sides of a square is a \_\_\_\_\_.

**Task 2:** Suppose you were to join the midpoints of sides of a rectangle in a similar fashion. What shape do you think you might get? Think about it, and write your conjecture here:

The quadrilateral formed by joining the midpoints of sides of a \_\_\_\_\_ is a \_\_\_\_\_.

**Task 3:** Now verify your conjecture by drawing different rectangles on the dot paper below and joining the midpoints of the sides.



**Task 4:** Based on Task 3 does your conjecture hold? If not, how would you modify it?

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**Task 5:** Now make similar conjectures about other special quadrilaterals rhombus and parallelogram, and verify them. Write your conjectures in the space provided, and use the dot grid for verifying.

Conjecture 1

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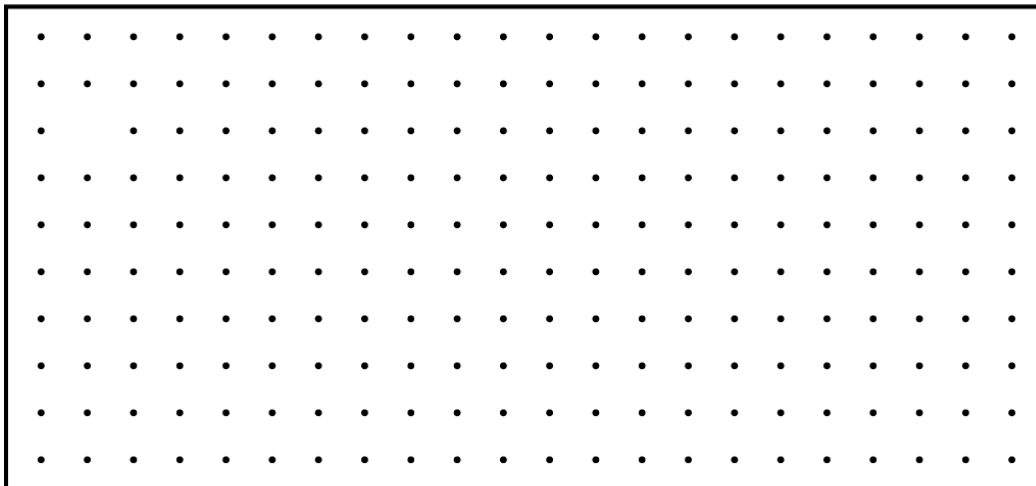
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Conjecture 2

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**Task 6:** Drawing on your observations in the 5 previous tasks, make a conjecture about the shape formed by joining the midpoints of sides of any quadrilateral.

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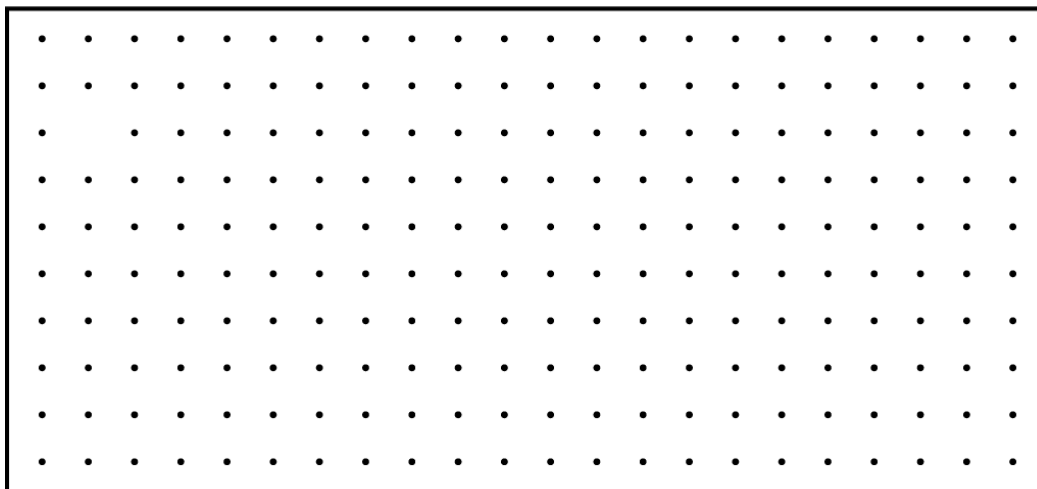
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**Points to think about:** Would this be true for ALL quadrilaterals? How do you know? Explain your reasoning here. Use the dot grid below if necessary.

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**Extension Task 1:** If possible, draw a quadrilateral, joining whose midpoints of sides in order gives a figure that is NOT a parallelogram. If not possible, explain why?

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## Lesson 12: Angle Sum Property

### ACTIVITY 5.2 ANGLE SUM PROPERTY OF QUADRILATERALS

*Work individually on the following task and then discuss with your group.*

**Task 1:** Draw a quadrilateral ABCD and measure its (interior) angles. Record in the table below.

$\angle A$	$\angle B$	$\angle C$	$\angle D$	Sum of all (interior) angles

**Task 2:** Compare your quadrilateral with those of others in your class.

- a. Do they appear the same?
- b. Do you observe a pattern/regularity across all the quadrilaterals? Write observation in the form of a conjecture:

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**Task 3:** Refer to the pattern observed in Task 2.

- a. Do you think this pattern will hold true for ALL quadrilaterals?
- b. Why or why not?

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**Task 4:** Draw a quadrilateral and join any one of its diagonals. *Without* measuring, can you say what the sum of the interior angles of this quadrilateral will be? Write your reasons.

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**Extension Task 1:** Do you think this property (sum of interior angles) will hold true for all ***parallelograms***? Why or why not?





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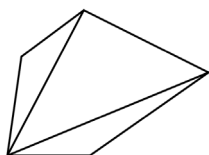
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## ACTIVITY 5.3 EXPLORING ANGLE SUM PROPERTY OF POLYGONS

*This activity is to be done on the computer. Work in your group. Take turns to explore, and then record your observations in your workbook.*

- Regular polygon tool  : To draw a regular polygon. Click on it and enter the number of sides.
- Line segment  : To draw a line segment.
- Angle tool  : Display the measure of interior angles
- Polygon tool  : To create a polygon. Select points in *anti-clockwise* direction. (Hint: To close the polygon click on the first vertex again)

**Task 1:** Draw a regular polygon of 4 sides. Using angle tool measure interior angles of the polygon. Fill in the relevant columns in the table below. Now using line segment tool, divide it into nonoverlapping triangles, and fill the table.



Repeat this task for regular polygons with 5, 6, 7 sides, and complete the table. The first row is done as an example.

Number of sides in regular polygon	Sum of interior angles of polygon	Number of nonoverlapping triangles formed	Sum of angles in all nonoverlapping triangles
4	360 degrees	2	360 degrees
5			
6			
7			

### Task 2

a) Observe the corresponding values in columns 2 and 4 carefully. Do you notice any pattern? Write down what you observe.

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b) Observe the corresponding values in columns 1 and 3 carefully. Do you notice any pattern? Write down what you observe.

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**Task 3:**

a) Based on the patterns observed, come up with a general rule that would give the sum of angles in a regular polygon of  $n$  sides. Justify your rule.

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b) Verify the rule for a regular polygon of  
i) 10 sides ii) 20 sides.

**Task 4:** Do you think the above rule will hold true for other polygons, which are not regular? Verify for convex polygons. Enter the details of your constructions in the table below. (A convex polygon has all angles measuring less than 180 degrees).

Number of sides in convex polygon	Sum of interior angles of polygon	Number of nonoverlapping triangles formed	Sum of angles in all nonoverlapping triangles

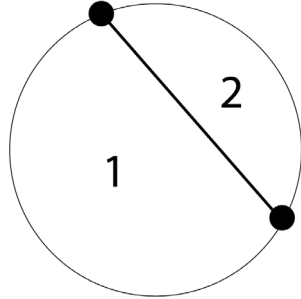
**Extension Task 1:** Do you think the rule will hold true for polygons that are concave? Verify it, and record your observations and findings here: (A concave polygon contains at least one reflex angle).

# Lesson 13: Need For Proof

## ACTIVITY 5.4 NEED FOR PROOF

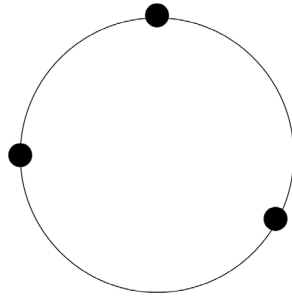
*Work individually on the following task and then discuss with your group.*

**Task1:** Mark 2 distinct points on a circle and join them. Note how many separate regions the circle is divided into.



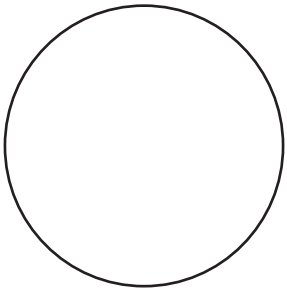
- Number of points on circle : \_\_\_\_\_
- Number of separate regions : \_\_\_\_\_

**Task 2:** Now draw another circle. Mark 3 distinct points on it. Join all possible pairs of points. How many separate regions is the circle divided into?



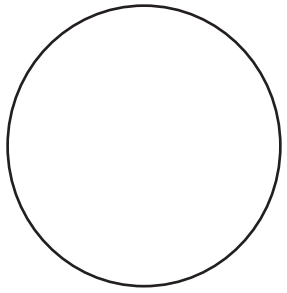
- Number of points on circle : \_\_\_\_\_
- Number of separate regions : \_\_\_\_\_

**Task 3:** Mark 4 distinct points on one circle, join all possible pairs of points. Note the number of (separate) regions the circle is divided into. In the other circle, do the same with 5 distinct points.



For four points on the circle

- Number of points on circle : \_\_\_\_\_
- Number of separate regions : \_\_\_\_\_



For five points on the circle

- Number of points on circle : \_\_\_\_\_
- Number of separate regions : \_\_\_\_\_

**Task 4:** Now record your observations from Tasks 13 in the table below.

Number of points on circle	2	3	4	5
Number of separate regions				

**Task 5:** What is the pattern you observe? Write it down. (You could write it as a ‘rule’ about the relationship between the number of points taken on the circle, and the number of separate regions the circle is divided into.)

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**Task 6:** Do you think your ‘rule’ will hold true for ANY number of points taken on the circle? Why or why not?

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**Task 7:** Verify your ‘rule’ by taking:

- 1) 1 point on a circle  
Number of separate regions:\_\_\_
- 2) 6 points on a circle  
Number of separate regions:\_\_\_

**Task 8:** Does your rule hold true? Based on this, would you like to change your response to Task 7? If yes, put the new response here.

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*Point to think about*

How many examples do you think are ‘enough’ to **prove** a conjecture?

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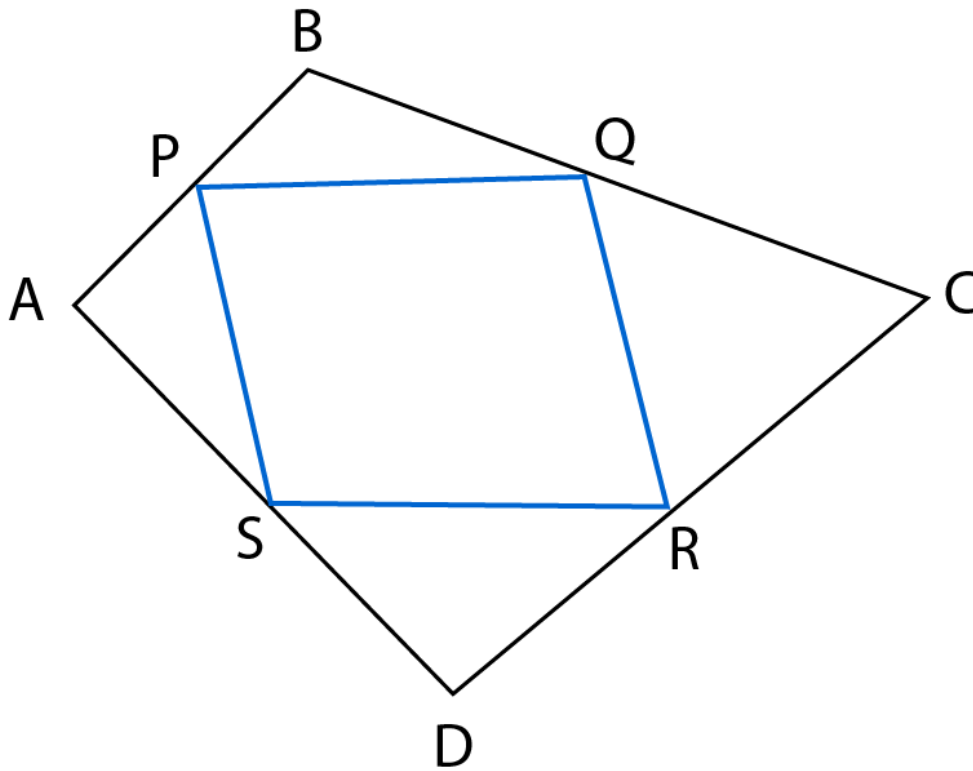
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How many examples do you think are ‘enough’ to **disprove** a conjecture?

## Lesson 14: Writing A Proof

### ACTIVITY 5.5 PROVING MIDPOINT RESULT FOR QUADRILATERALS

**Task 1:** In the figure, PQRS is formed by joining the midpoints of a quadrilateral ABCD. Prove that PQRS is a parallelogram.



(Hint: Use the result of the Midpoint Theorem. The line joining the midpoints of two sides of a triangle is parallel to the third side and half of it.)

# Lesson 15: Proving And Disproving

## ACTIVITY 5.6 TRUE AND FALSE STATEMENTS

*Work these out in your group, and then present your solution to the class. Use the space provided for working out your solution.*

**Task1:** Examine each statement and state if it is true or false. In each case, work out the reasons for your answer. You could write, draw diagrams, tables etc. in the space provided to support your answer.

1. If you double a whole number, you get an even number.

True  False

2. If you add two odd numbers you will get an even number.

True  False

3. If you multiply two odd numbers you get an even number.

True  False

4. If you add 1 to a whole number you get a number less than 1,000,000,000,000,000,000,000.

True  False

5. If a parallelogram has one pair of adjacent sides equal, it is a rectangle.

True  False

6. If a parallelogram has at least one right angle, it is a rectangle.

True  False

7. If a quadrilateral has one pair of opposite sides equal, and the other pair parallel then it is a parallelogram.

True  False

8. If a quadrilateral has one pair of opposite sides both equal and parallel, then it is a parallelogram.

True  False

9. If a parallelogram has at least one right angle, it is a rectangle.

True  False

# Reflections

Lesson No.	Learnt in this lesson	Still not clear to me
Lesson 1		
Lesson 2		
Lesson 3		
Lesson 4		
Lesson 5		
Lesson 6		
Lesson 7		

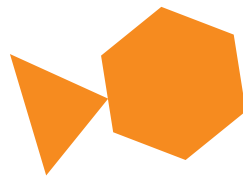
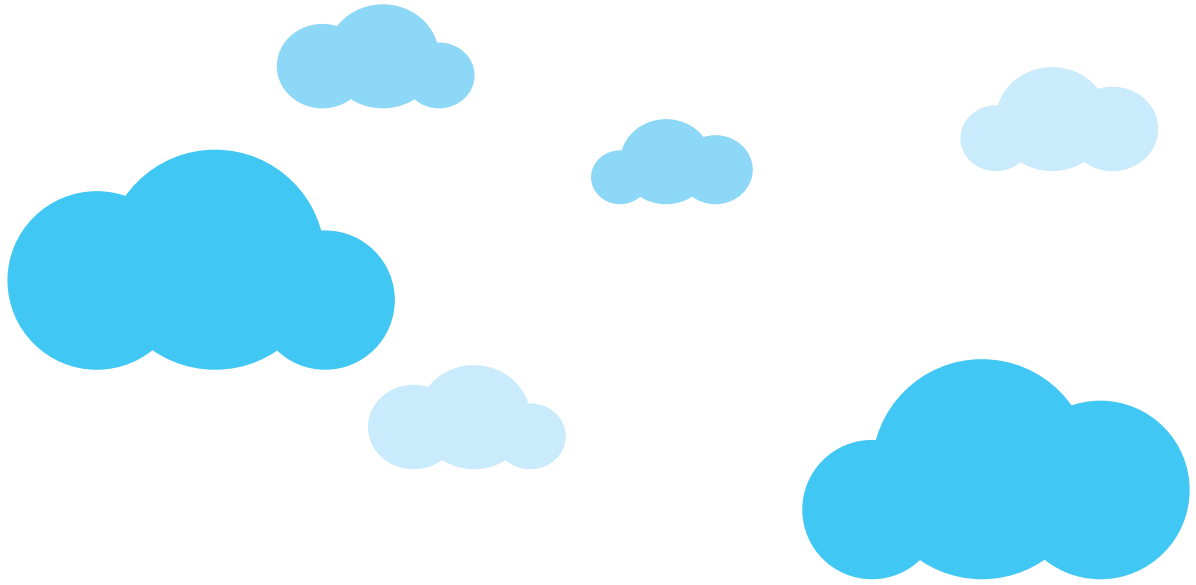


# Reflections

Lesson No.	Learnt in this lesson	Still not clear to me
Lesson 8		
Lesson 9		
Lesson 10		
Lesson 11		
Lesson 12		
Lesson 13		
Lesson 14		
Lesson 15		

# Notes

# Notes



**CLI** 

CONNECTED  
LEARNING  
INITIATIVE



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