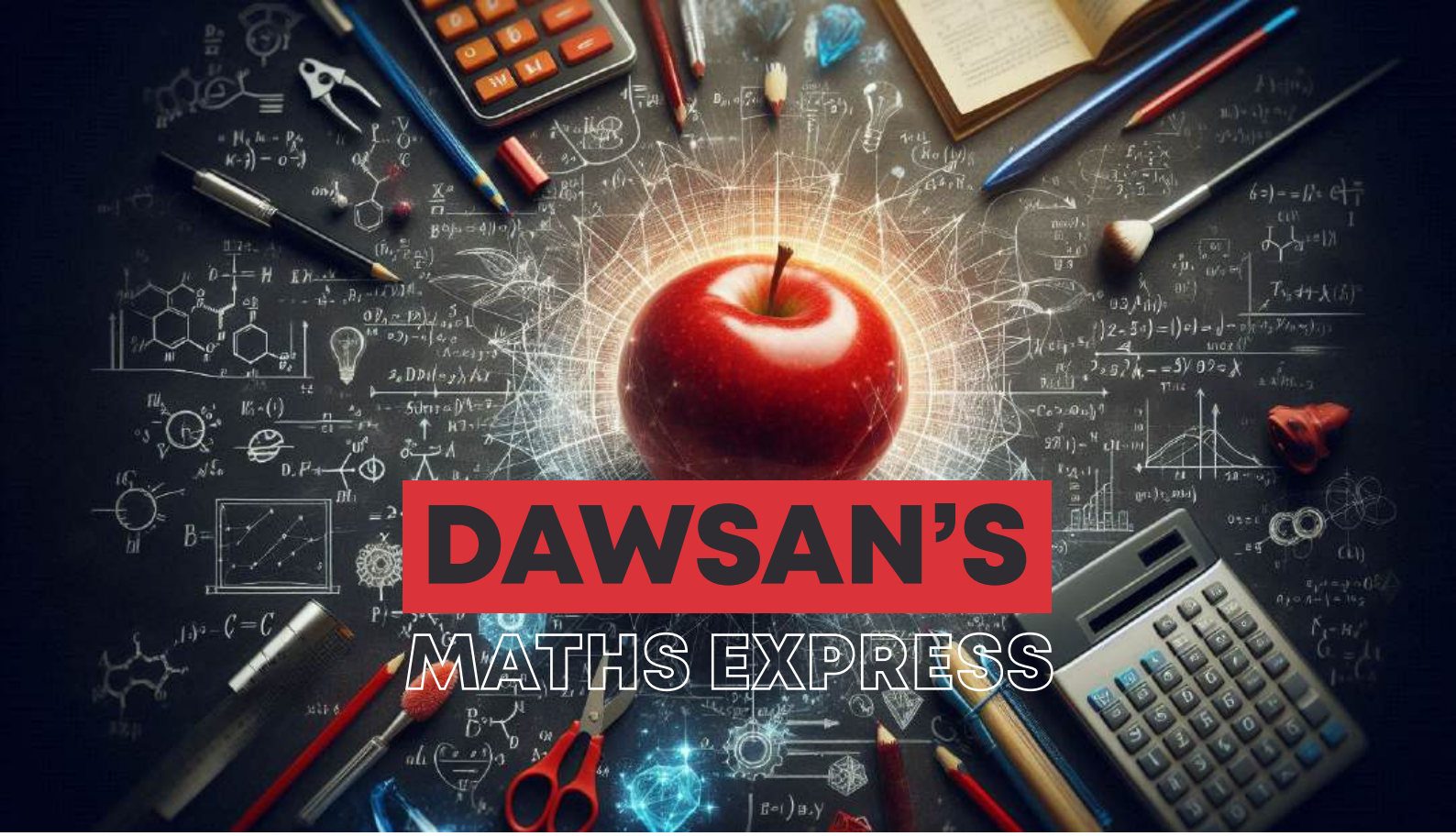
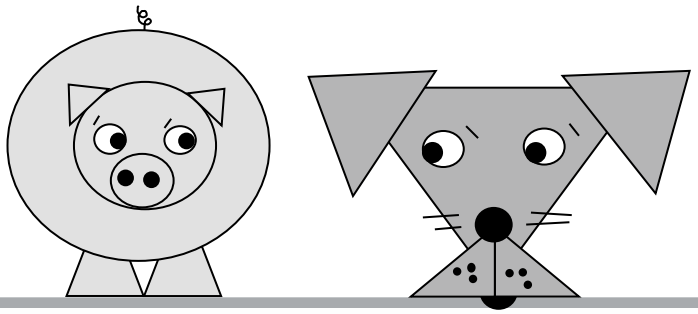


DAWSAN'S MATHS EXPRESS

D.Williams

Shapes & Symmetry



NAME

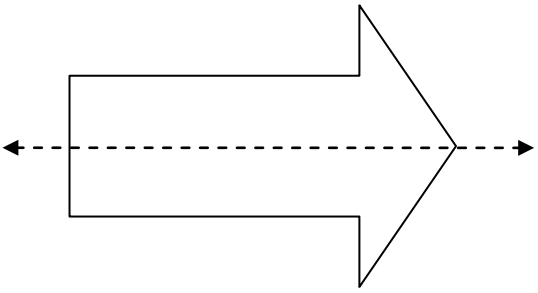
DAWSAN'S
Maths
EXPRESS

S. Edwards & D. Williams

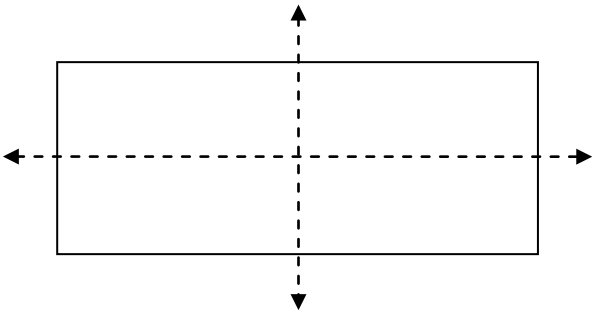
These fun calculations are devised
to be to be used in conjunction with the
Dawsan's Maths Dictionary.

LINES OF SYMMETRY

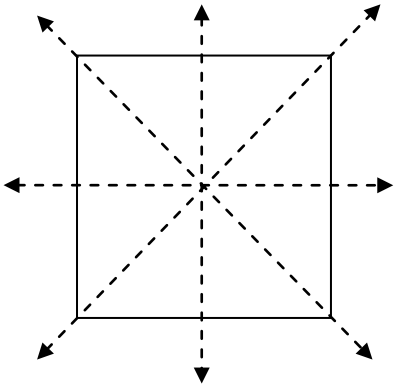
A line of symmetry is a line that divides a geometrical shape into two identical halves. This line cuts across the middle of the shape in a way that both sides of the line are mirror images of each other. A shape may have one or more lines of symmetry. A circle however has an infinite number of lines of symmetry. Examples:



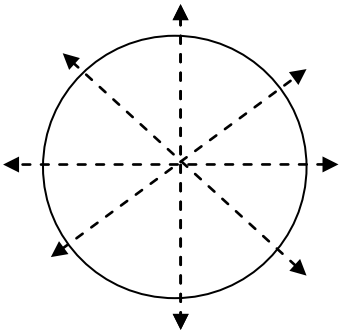
One line of symmetry



Two lines of symmetry



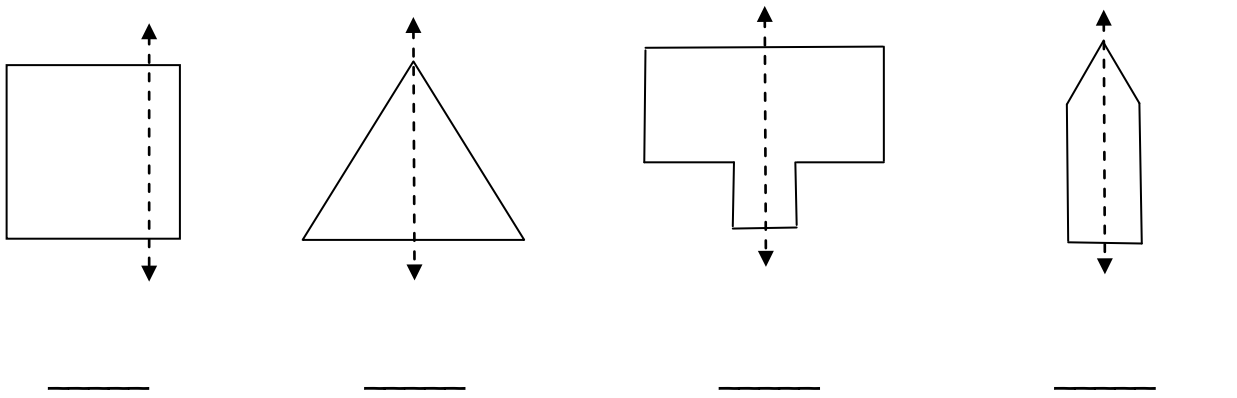
Four lines of symmetry

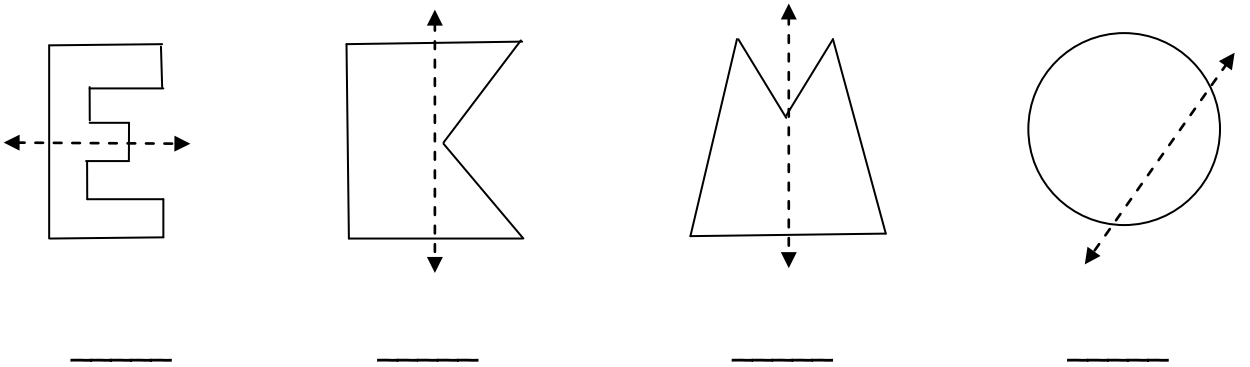


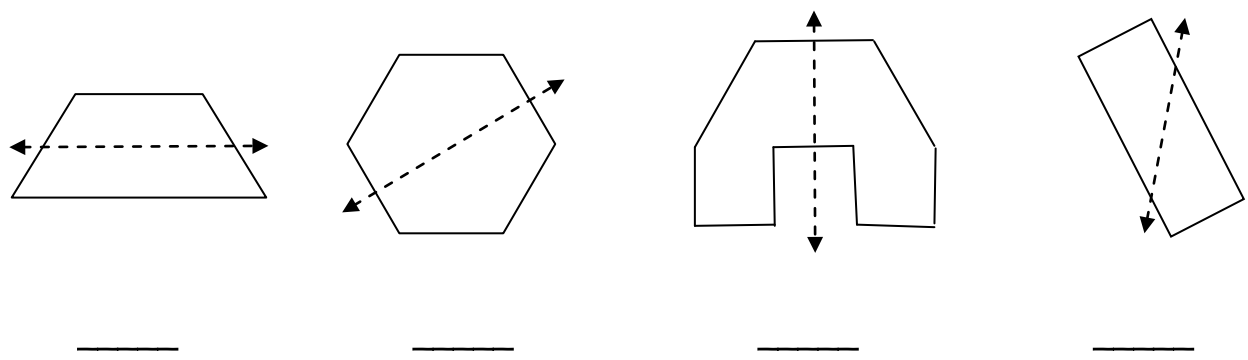
An infinite number of lines of symmetry

TASK 1: Is it Symmetrical or Not?

Look at the shapes below and underneath each shape write "yes" or "no" in answer to the question : "Is the dotted line a line of symmetry?"



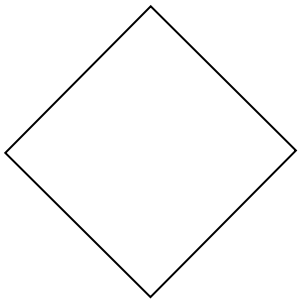


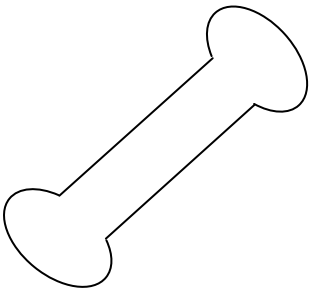


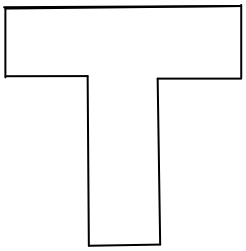
If all your answers are **palindromic** you have possibly scored 100%!

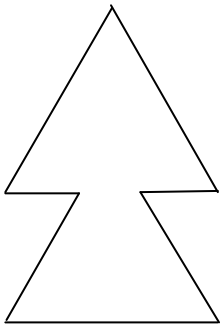
TASK 2: Drawing Lines of Symmetry

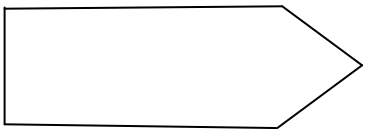
Draw lines of symmetry on the shapes below. Some shapes may have more than one line of symmetry.

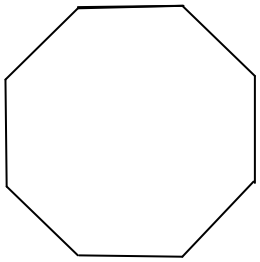


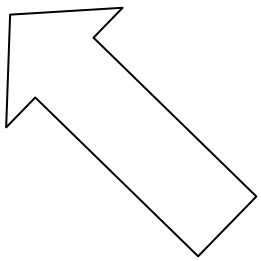


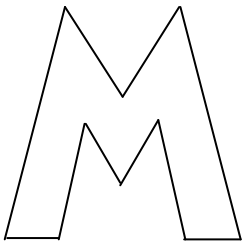


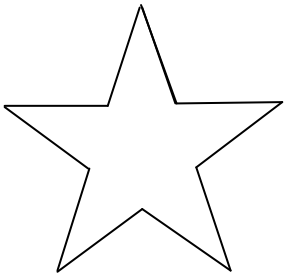






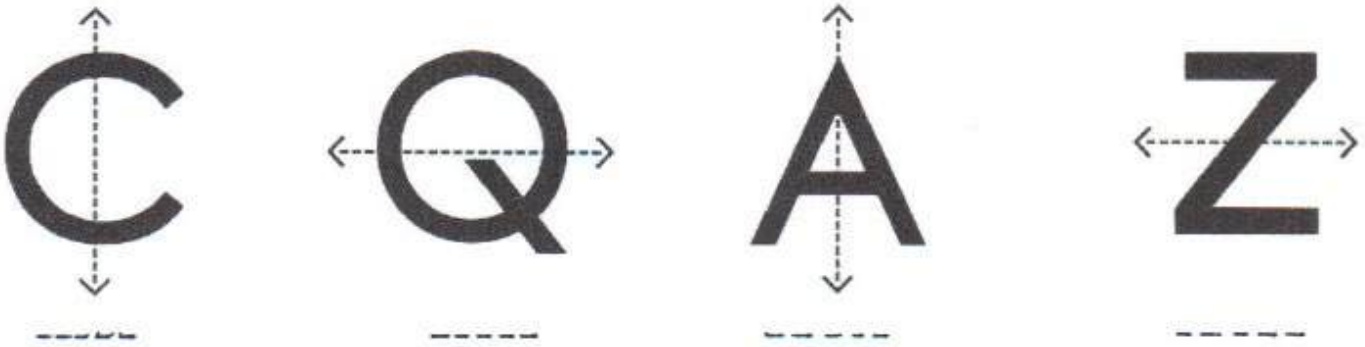






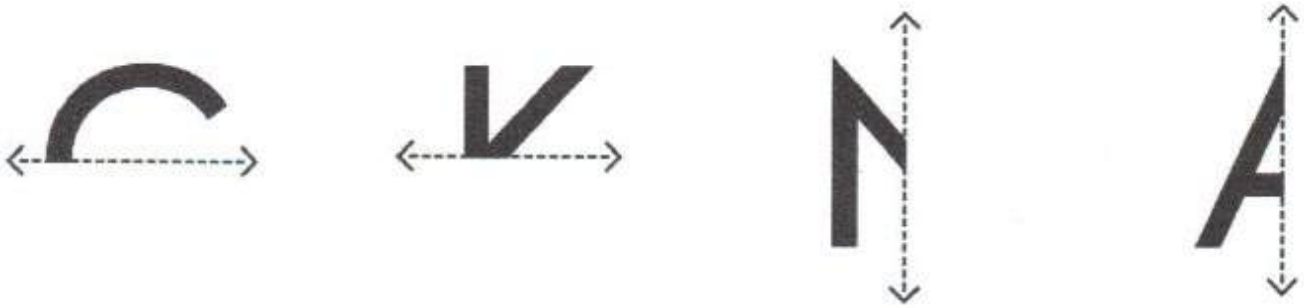
TASK 3: Symmetrical Letters

a) Say whether the dotted line on each letter represents a line of symmetry.
Write "yes" or "no".



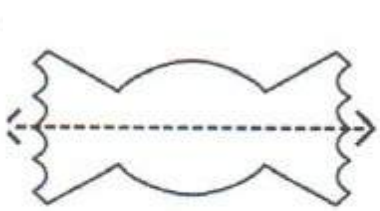
b) Draw a line of symmetry on each shape.

c) Draw the second half of each symmetrical shape.



TASK 4: Identify and Complete

a) Say whether the dotted line on each shape represents a line of symmetry. Write "yes" or "no".



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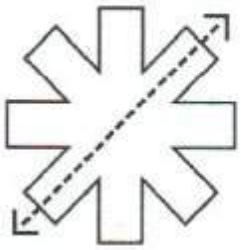
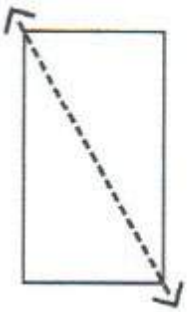
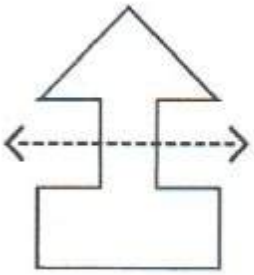


_____

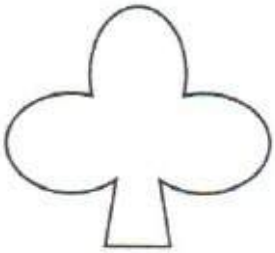


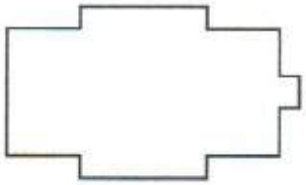
_____



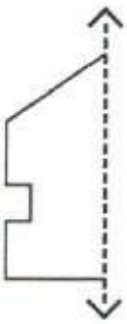
_____

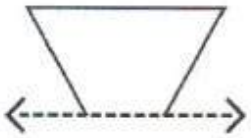
b) Draw a line of symmetry on each shape.



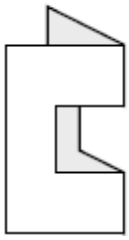


c) Draw the second half of each symmetrical shape.

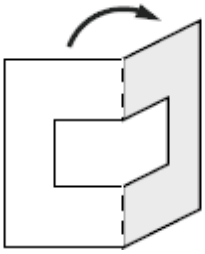




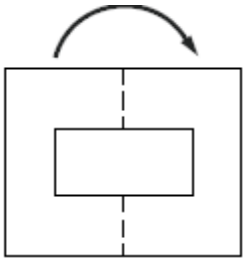
TASK 5: Folded Symmetrical Shapes



This shape has been folded on a line of symmetry.



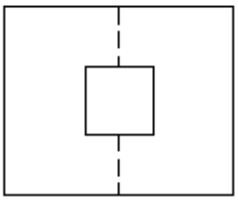
Unfold it along the line of symmetry to Find the shape.



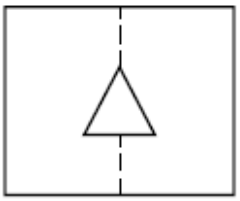
Unfolded, the shape is a rectangle.The folded line of symmetry is marked by a dotted line.

The pictures on the left have been folded on a line of symmetry. Circle the shape you would see when each paper is unfolded.

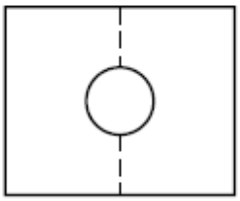
1.



a

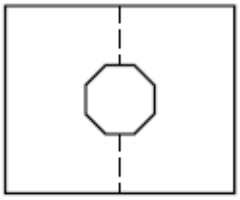


b

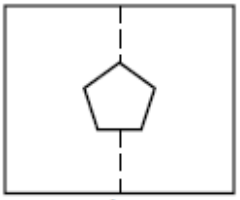


c

2.



a



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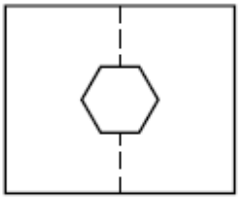
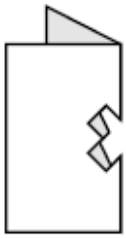
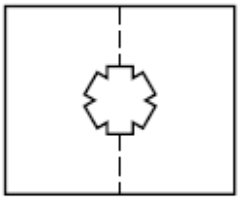


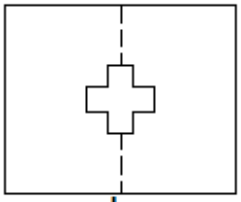
c

3.





a



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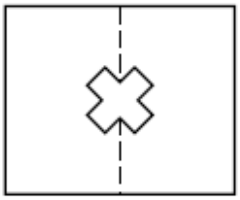
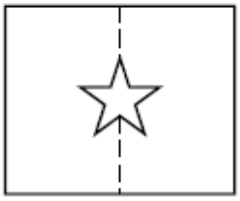
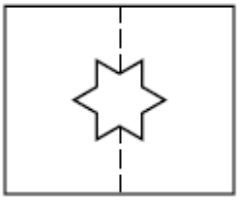


c

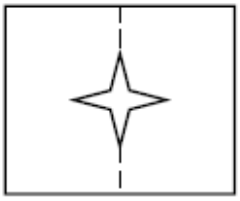
4.



a



b



c

TASK 6: Symmetrical Houses

Some of these houses are symmetrical and some are not. Colour the symmetrical houses light blue and the unsymmetrical houses light green. Then, for each symmetrical house draw the line of symmetry with a red crayon.

a.

b.

c.

d.

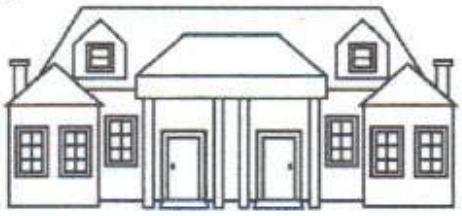
e.

f.

g.

h.

i.



j.

k.

l.

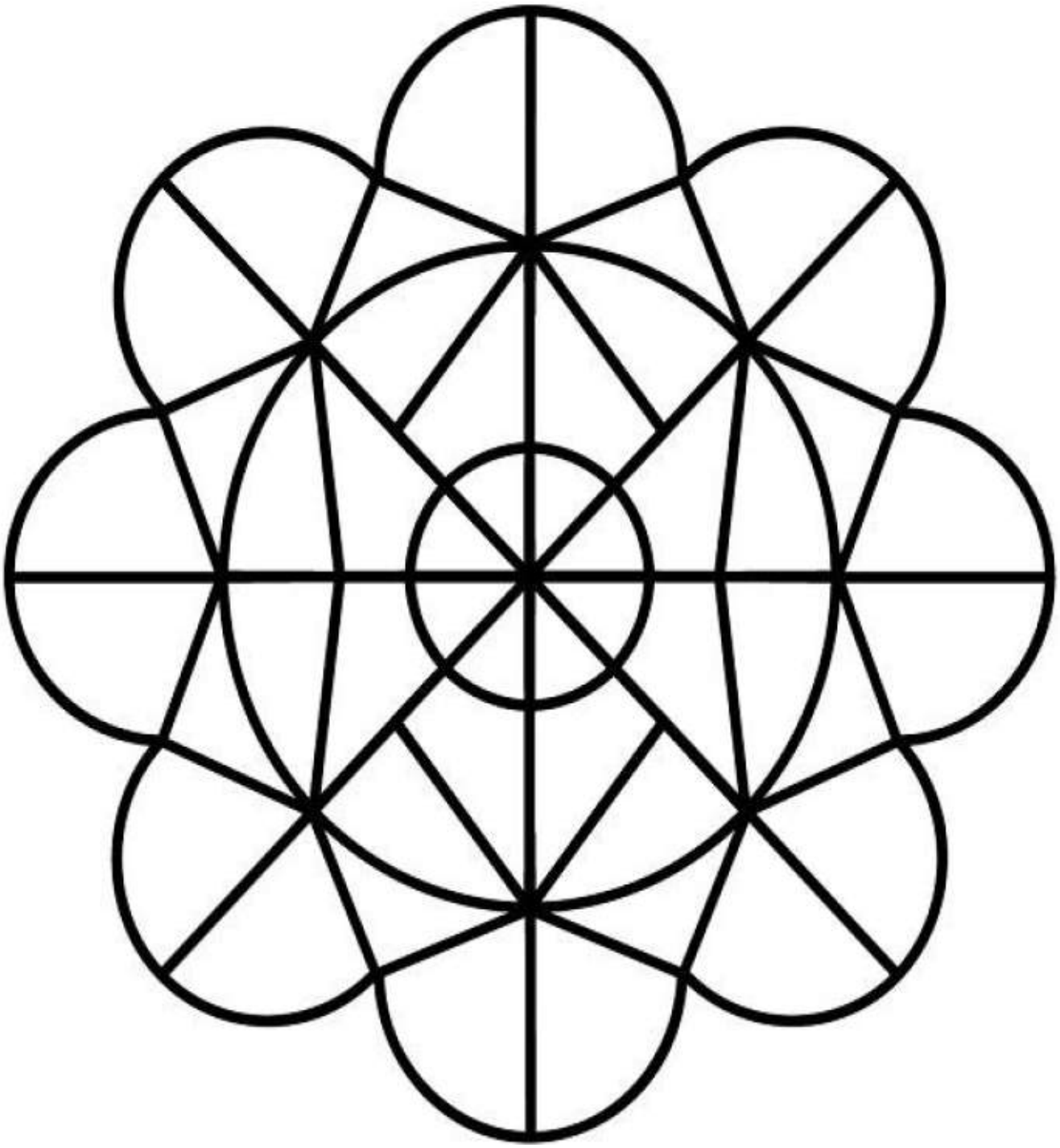
TASK 7: Symmetrical Drawings

With a pencil, draw a picture of each of the following. Once you have completed your picture, draw the line of symmetry with a red pen or marker.

Snowman	Alien
Sailboat	**Animal**

TASK 8: Colourful Symmetry

Colour the pattern to make a symmetrical design.



GEOMETRICAL SHAPES: POLYGONS

Polygons are two-dimensional shapes with straight sides. If the sides are all the same length, the name of the shape is preceded by the word REGULAR e.g. a regular hexagon. If the sides are not all the same length, it is preceded by the word IRREGULAR e.g. irregular hexagon.

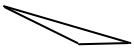
EXAMPLES OF POLYGONS:

a) TRIANGLES – 3 sides

Equilateral Triangle 

Isosceles Triangle 

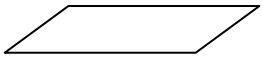
Right-angled Triangle 

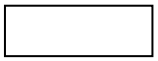
Scalene Triangle 

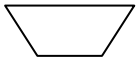
b) QUADRILATERALS – 4 sides

Square 

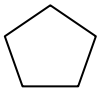
Rhombus 

Parallelogram 

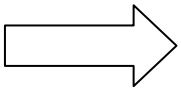
Rectangle 

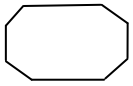
Trapezium 

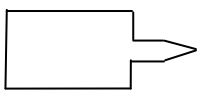
Kite 

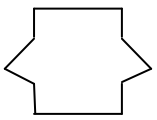
c) PENTAGON – 5 sides 

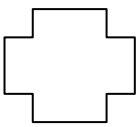
d) HEXAGON – six sides 

e) HEPTAGON – 7 sides 

f) OCTAGON – eight sides 

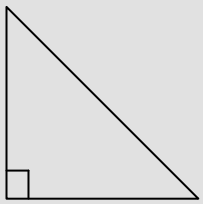
g) NONAGON – nine sides 

h) DECAGON – 10 sides 

i) DODECAGON – 12 sides 

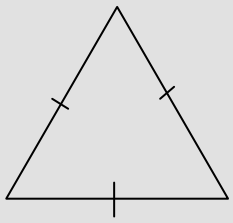
TASK 9: Triangles

Triangles are 3 sided polygons and all three angles add up to 180°.



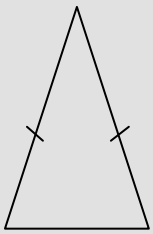
Right-Angled △

- one angle of 90°



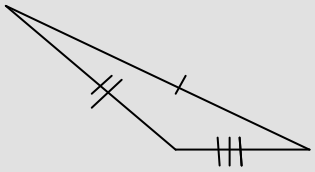
Equilateral △

- 3 equal sides
- 3 angles each equal to 60°



Isosceles △

- 2 sides equal
- 2 angles equal



Scalene △

- No sides equal
- No angles equal

1. Name each triangle by the length of its sides.

a) 3cm, 5cm, 3cm. _____ b) 14mm, 9mm, 8mm. _____

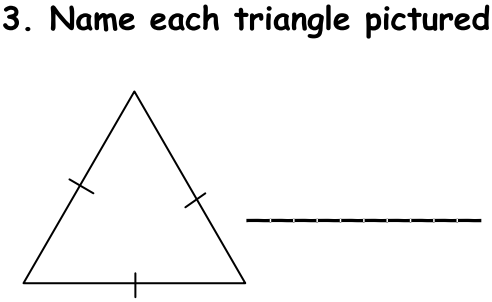
c) 24cm, 24cm, 24 cm. _____ d) 2m, 3m, 2m. _____

2. Name each triangle by the size of the angles.

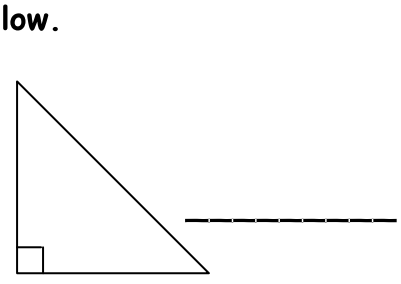
a) 60° , 60° , 60°. _____ b) 90°, 40°, 50°. _____

c) 80°, 30°, 70°. _____ d) 40°, 100°, 40°. _____

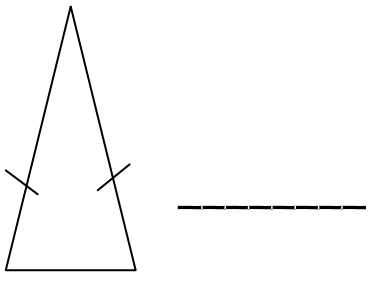
3. Name each triangle pictured below.



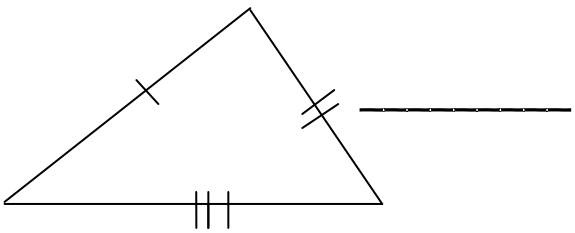
_____



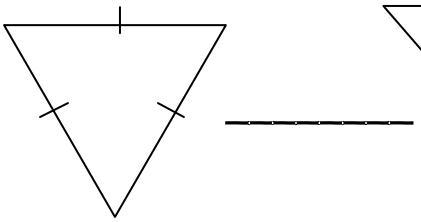
_____



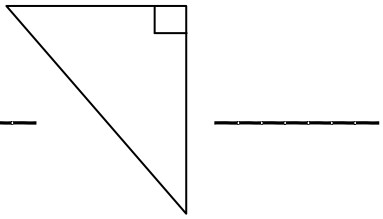
_____



_____



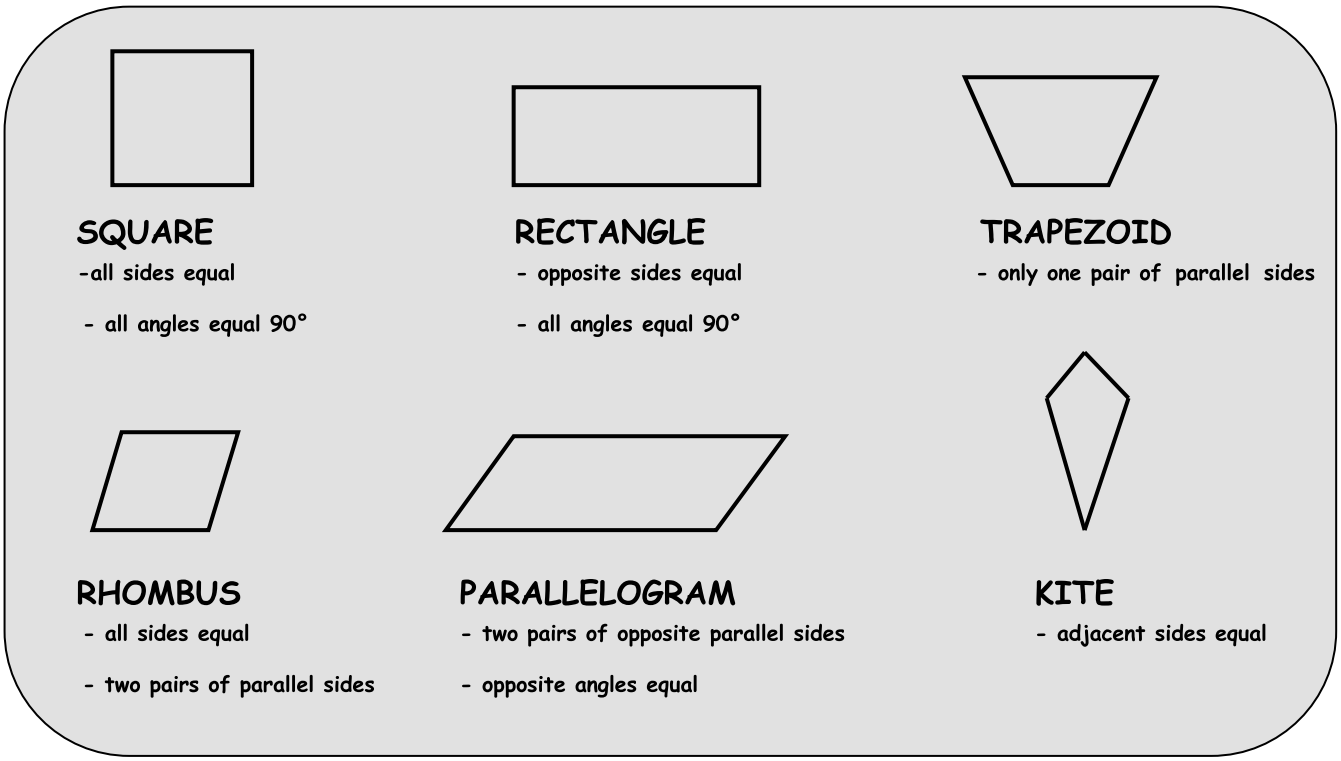
_____



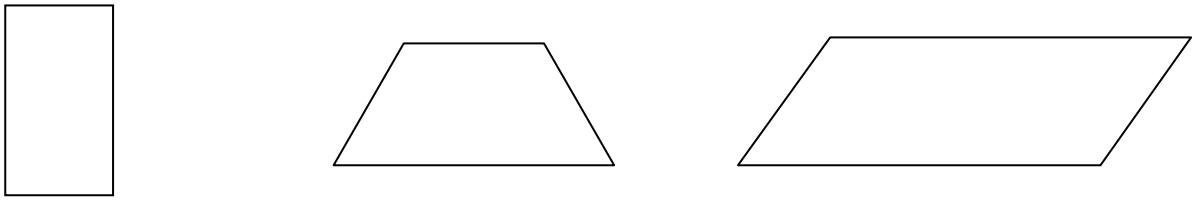
_____

TASK 10: Quadrilaterals

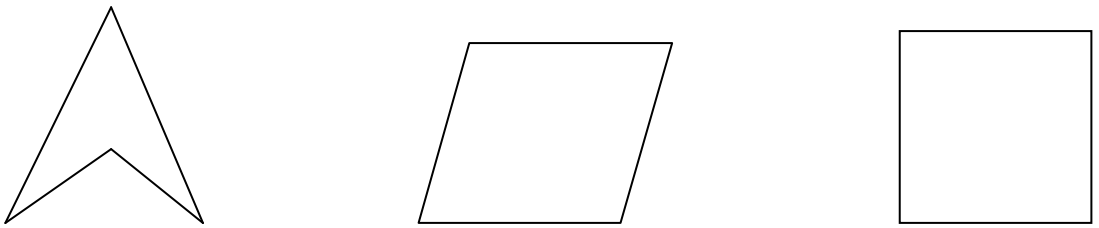
A quadrilateral is a 4 sided polygon with 4 angles which add up to 360°.



1. Name each quadrilateral.



_____ _____ _____



_____ _____ _____

2. How can you tell the difference between a parallelogram and a trapezoid?

_____

3.How can you tell the difference between a rectangle and a rhombus?

_____

TASK 11: Quadrilateral Questions

1. How many sides does a quadrilateral have? _____

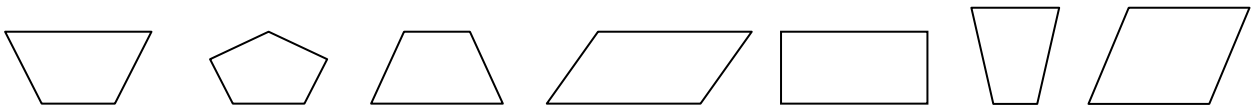
2. How many pairs of parallel lines does a rectangle have? _____

3. How many pairs of parallel lines does a trapezoid have? _____

4. Name 2 quadrilaterals with all sides equal in length. _____

5. Name 2 quadrilaterals that each has 4 right angles. _____

6. Circle the trapezoid that is next to the rhombus.



7. List three ways a rectangle and a square are alike.

_____

_____

_____

8. List one way a parallelogram and a rhombus are different.

_____

9. Name the quadrilateral that has opposite sides parallel and all sides the same length.

_____

10. List two ways a rectangle and a square are alike and one way in which they are different.

_____

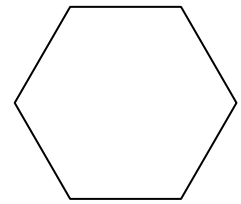
_____

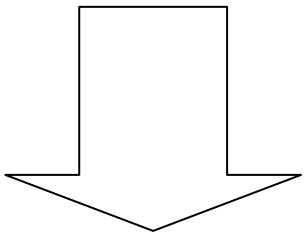
_____

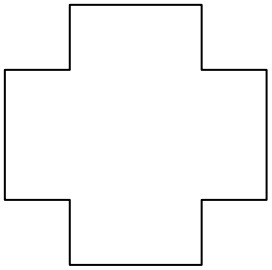
TASK 12: Other Polygons

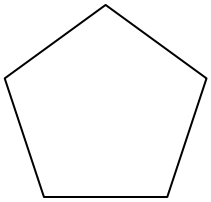
The following polygons have all got more than 3 or 4 sides. Using the words given below, label each of the polygons.
If all the sides of the polygon are equal in length it is called a REGULAR polygon. If they are not all equal in length it is called an IRREGULAR polygon. Next to the name of each polygon write an 'R' if it is REGULAR or an 'I' if it is IRREGULAR.

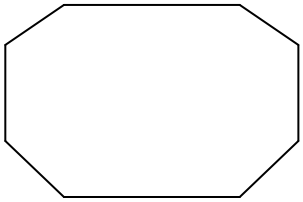
DECAGON	OCTAGON	HEPTAGON	NONAGON
DODECAGON	HEXAGON	PENTAGON	

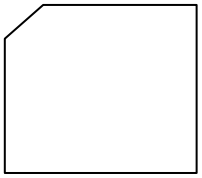


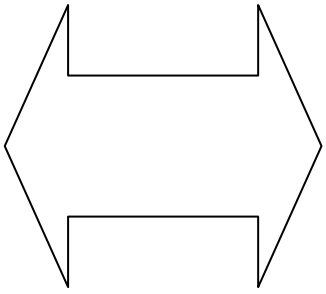


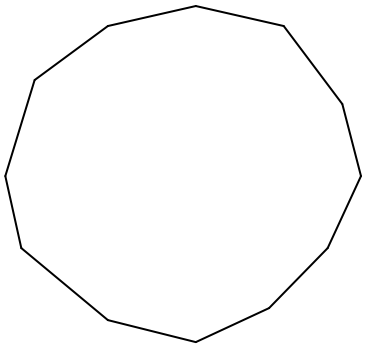


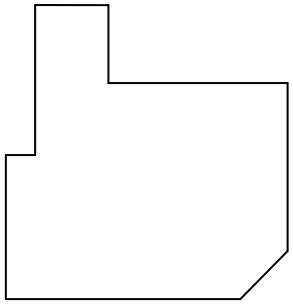






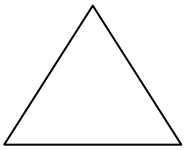




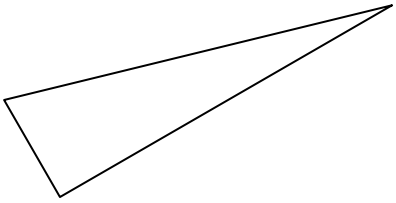


TASK 13: Regular and Irregular Polygons

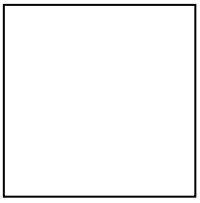
Name the following REGULAR and IRREGULAR polygons.



Regular_____

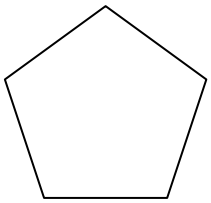


Irregular_____

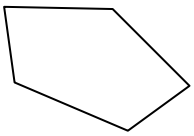


_____ Quadrilateral

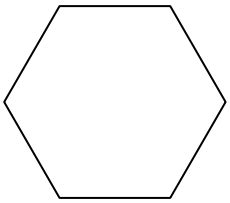
_____ Quadrilateral



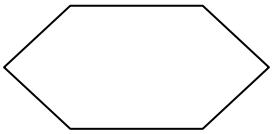
Regular _____



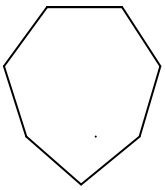
Irregular _____



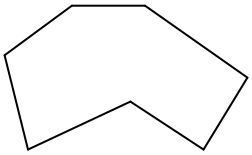
_____ Hexagon



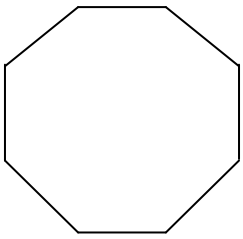
_____ Hexagon



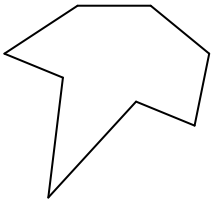
Regular _____



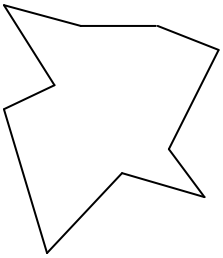
Irregular _____



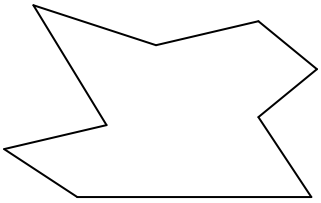
Regular _____



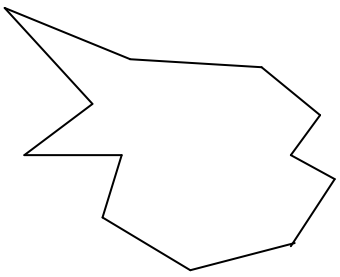
Irregular _____



Irregular _____



Irregular _____



Irregular _____

ASK 14: Polygon Questions

How many sides does an octagon have? _____

How many angles does a triangle have? _____

How many sides does a pentagon have _____

Which has more sides a hexagon or a pentagon? _____

How many **pairs** of parallel lines does a trapezoid have?_____

How many **pairs** of parallel lines does a square have? _____

How many **pairs** of parallel lines does a triangle have? _____

Which polygon has 12 sides and 12 angles? _____

Find the total number of sides on a decagon, a pentagon, a hexagon and a heptagon. _____

Find the difference between the number of sides on a dodecahedron and a heptagon. _____

Find the product of the number of sides on a triangle and the number of sides on a nonagon.

_____

. What is the total of the number of degrees in a triangle and the number of degrees in a square? _____

. Which has the greater number of sides? A nonagon or a heptagon

_____

. Name the polygon with the least number of sides. _____

TASK 15: Polygons on a Grid.

On the grid provided you are given two axes, the X (horizontal) axis and the Y (vertical) axis. Plot the co-ordinates on the grid in order to reveal the hidden polygons. Colour triangles blue, quadrilaterals green, pentagons red, hexagons orange, and octagons purple.

X	Y
10	10
13	15
16	10
10	10

STOP

X	Y
1	16
7	16
9	19
3	19
1	16

STOP

X	Y
7	1
7	3
5	3
5	1
7	1

STOP

X	Y
3	11
6	11
8	8
6	5
3	5
1	8
3	11

STOP

X	Y
6	12
6	14
8	15
10	14
10	12
6	12

STOP

X	Y
18	5
16	7
14	7
12	5
12	3
14	1
16	1
18	3
18	5

STOP

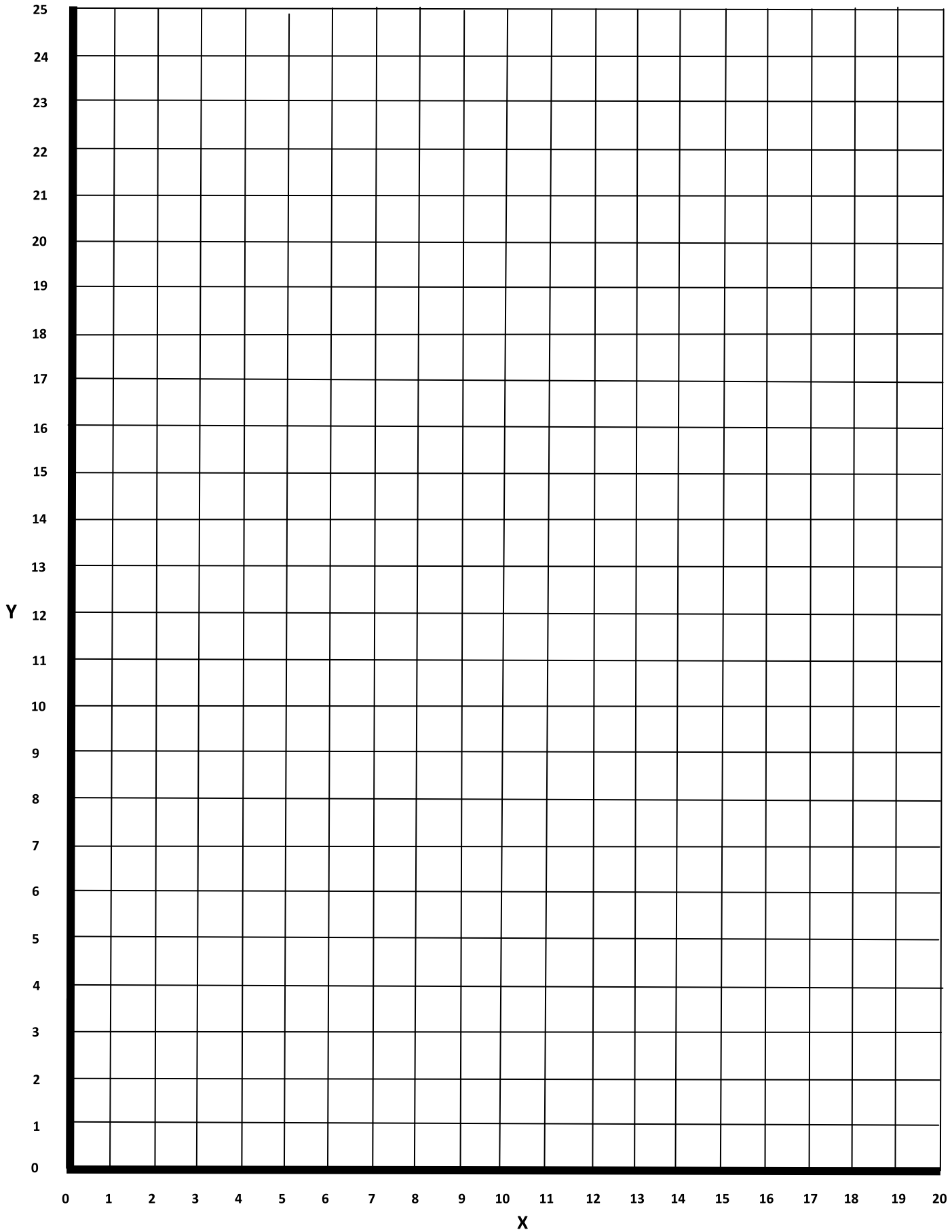
X	Y
15	16
19	19
17	23
13	23
11	19
15	16

STOP

X	Y
2	21
8	21
9	24
2	21

STOP

TASK 15: Grid for plotting co-ordinates



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Maths

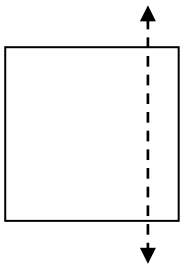
EXPRESS

S. Edwards & D. Williams

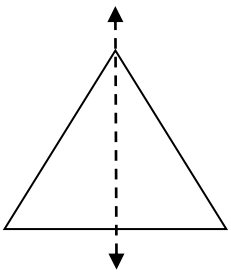
Answers

TASK 1: Is it Symmetrical or Not?

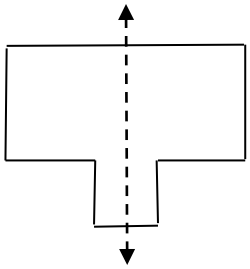
Look at the shapes below and underneath each shape write "yes" or "no" in answer to the question : "Is the dotted line a line of symmetry?"



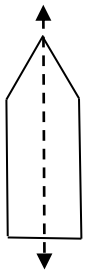
No



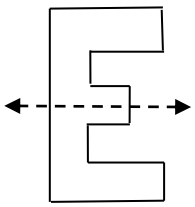
Yes



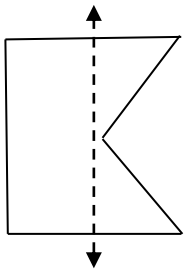
Yes



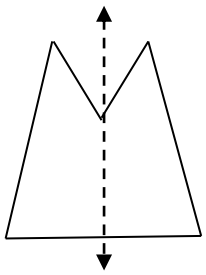
Yes



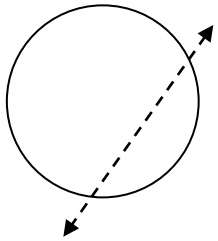
Yes



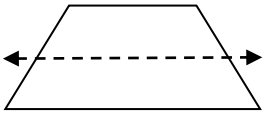
No



Yes



No



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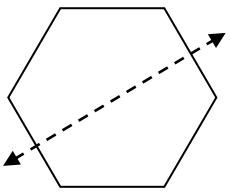
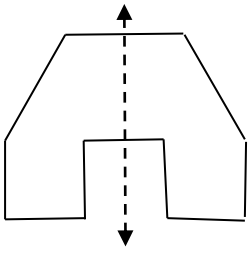
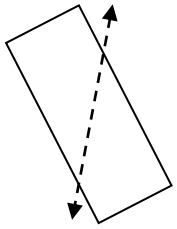


Yes



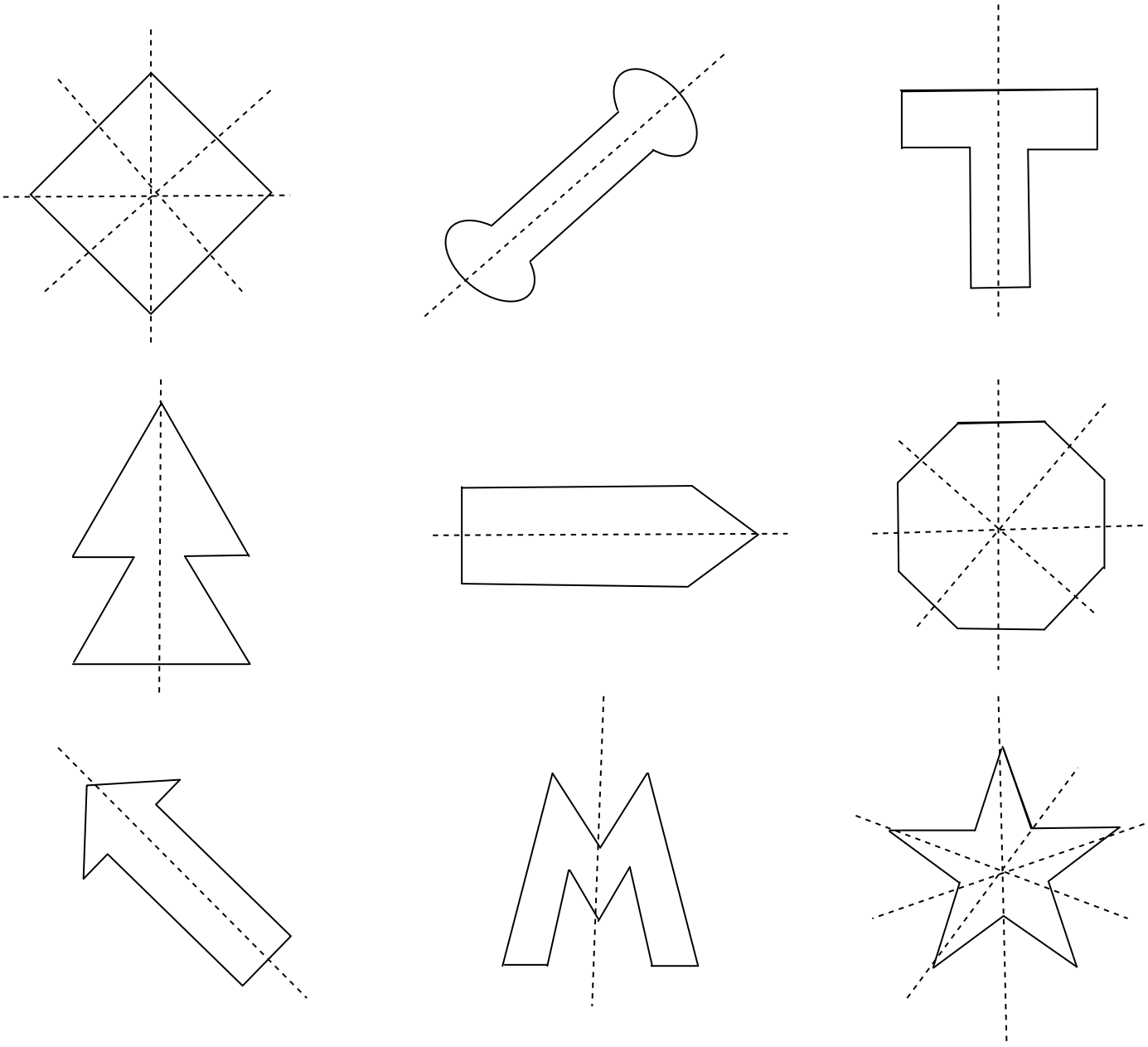
Yes



No

TASK 2: Drawing Lines of Symmetry

Draw lines of symmetry on the shapes below. Some shapes may have more than one line of symmetry.



TASK 3: Symmetrical Letters

a) Say whether the dotted line on each letter represents a line of symmetry.
Write "yes" or "no".

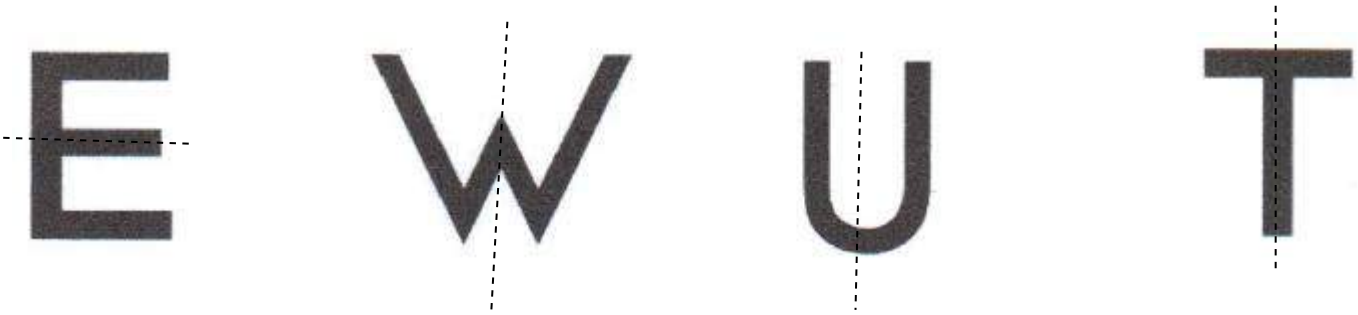
No

No

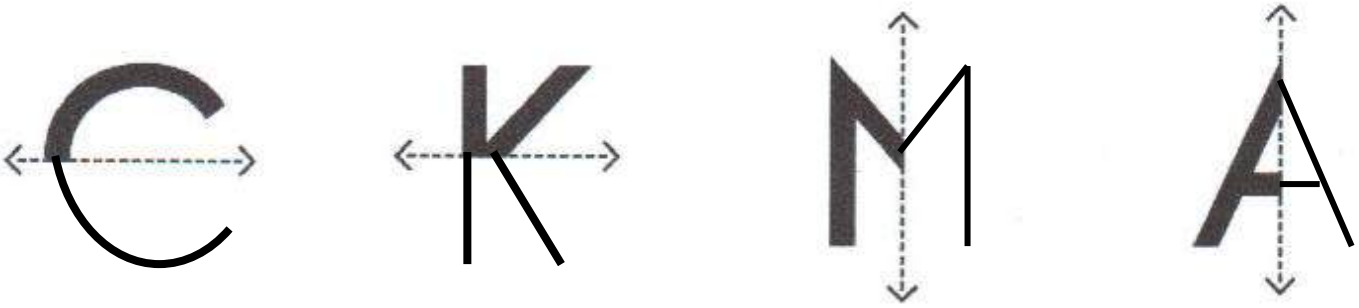
Yes

No

b) Draw a line of symmetry on each shape.

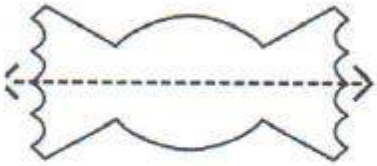


c) Draw the second half of each symmetrical shape.

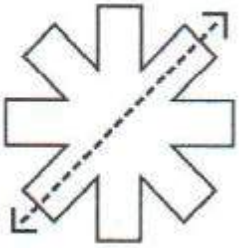


TASK 4: Identify and Complete

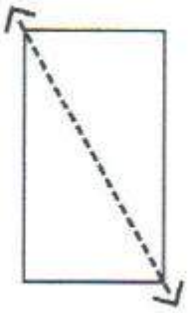
a) Say whether the dotted line on each shape represents a line of symmetry. Write "yes" or "no".



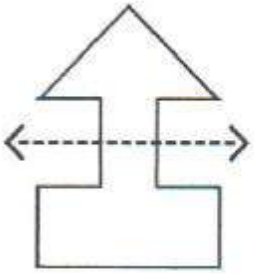
Yes



Yes

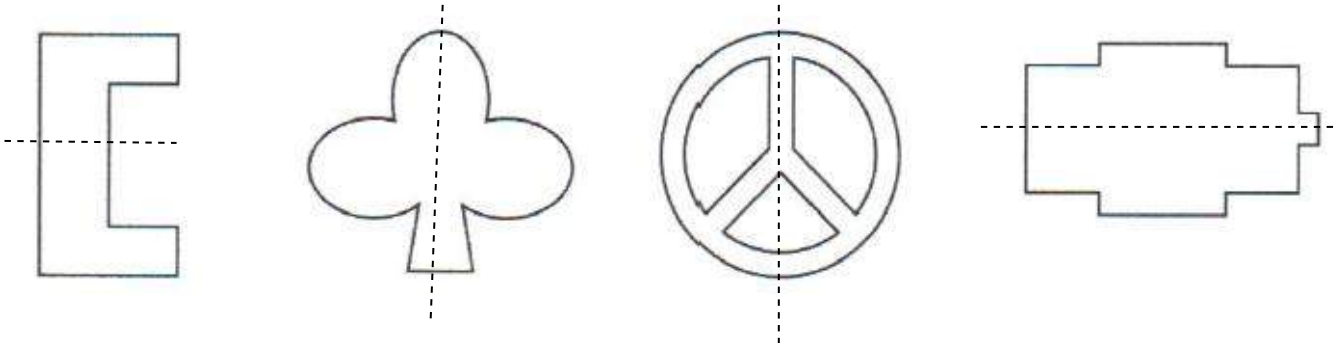


No

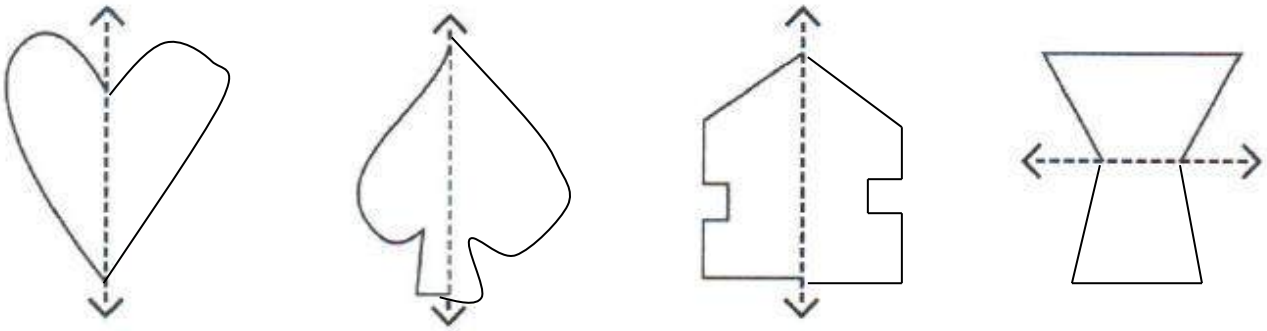


No

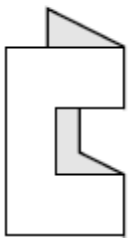
b) Draw a line of symmetry on each shape.



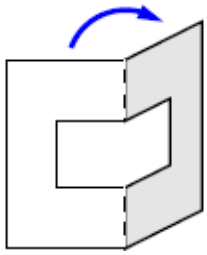
c) Draw the second half of each symmetrical shape.



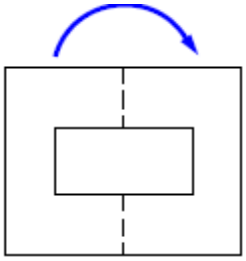
TASK 5: Folded Symmetrical Shapes



This shape has been folded on a line of symmetry.



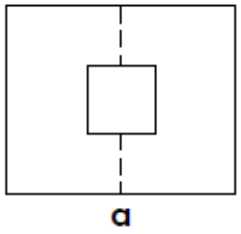
Unfold it along the line of symmetry to Find the shape.



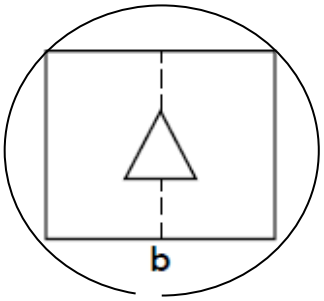
Unfolded, the shape is a rectangle.The folded line of symmetry is marked by a dotted line.

The pictures on the left have been folded on a line of symmetry. Circle the shape you would see when each paper is unfolded.

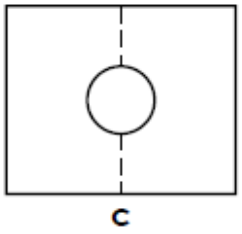
1.



a

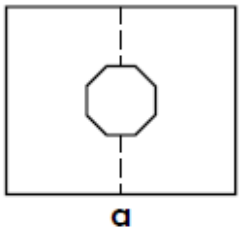


b

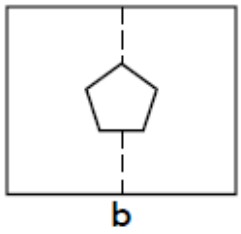


c

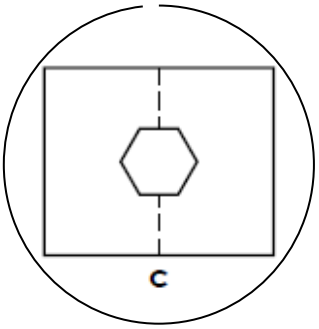
2.



a

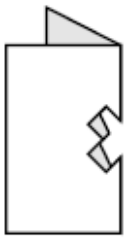


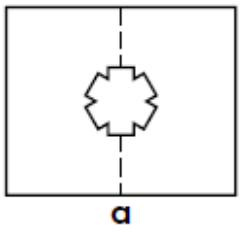
b



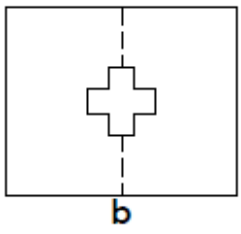
c

3.

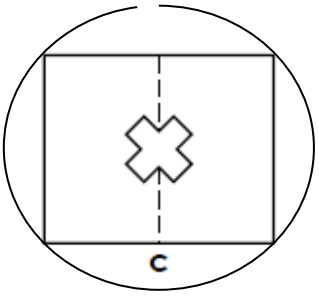




a

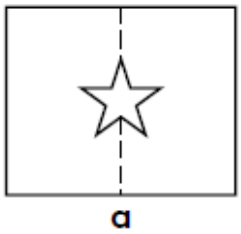


b

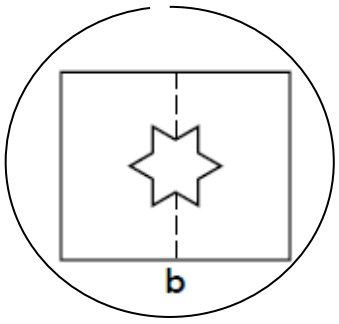


c

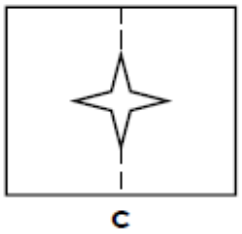
4.



a



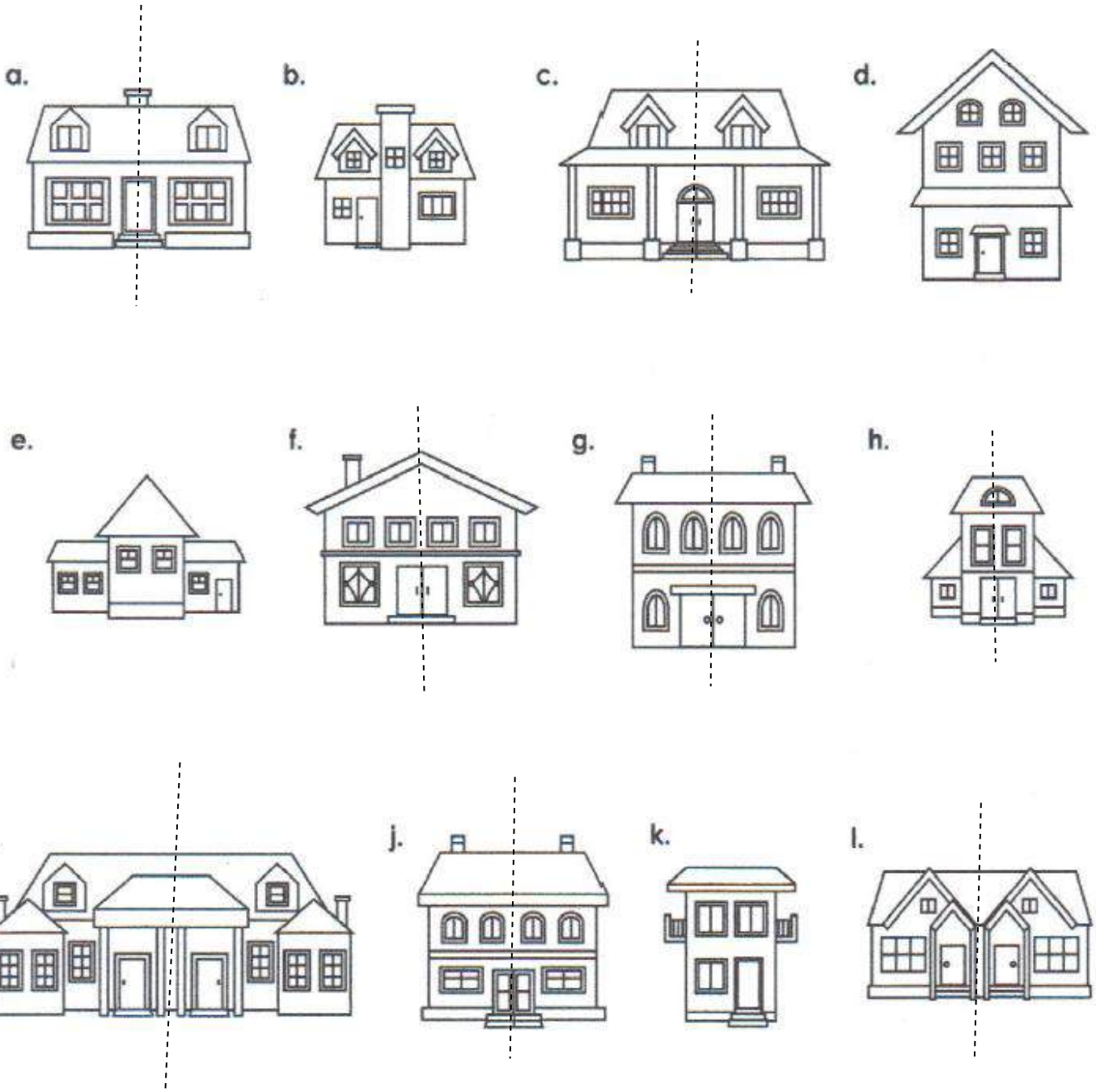
b



c

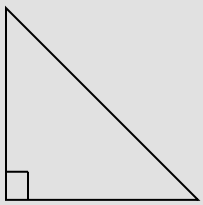
TASK 6: Symmetrical Houses

Some of these houses are symmetrical and some are not. Colour the symmetrical houses light blue and the unsymmetrical houses light green. Then, for each symmetrical house draw the line of symmetry with a red crayon.



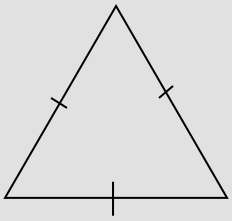
TASK 9: Triangles

Triangles are 3 sided polygons and all three angles add up to 180°.



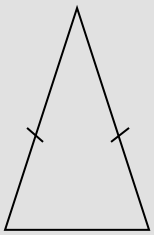
Right-Angled △

- one angle of 90°



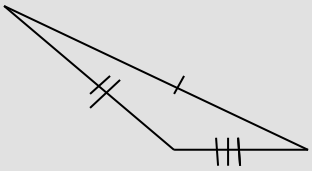
Equilateral △

- 3 equal sides
- 3 angles each equal to 60°



Isosceles △

- 2 sides equal
- 2 angles equal



Scalene △

- No sides equal
- No angles equal

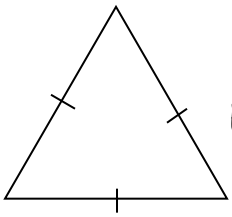
1. Name each triangle by the length of its sides.

a) 3cm, 5cm, 3cm. Isosceles
b) 14mm, 9mm, 8mm. Scalene
c) 24cm, 24cm, 24 cm. Equilateral
d) 2m, 3m, 2m. Isosceles

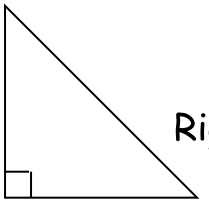
2. Name each triangle by the size of the angles.

a) 60° , 60° , 60°. Equilateral
b) 90°, 40°, 50°. Right angle triangle
c) 80°, 30°, 70°. Scalene
d) 40°, 100°, 40°. Isosceles

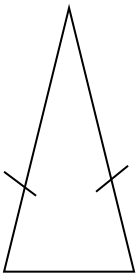
3. Name each triangle pictured below.



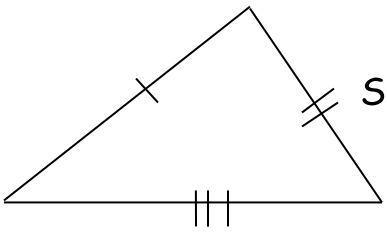
Equilateral



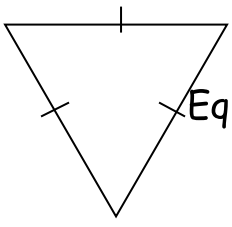
Right angle Δ



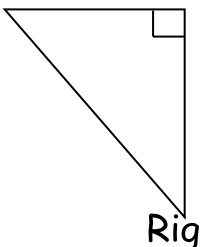
Isosceles



Scalene



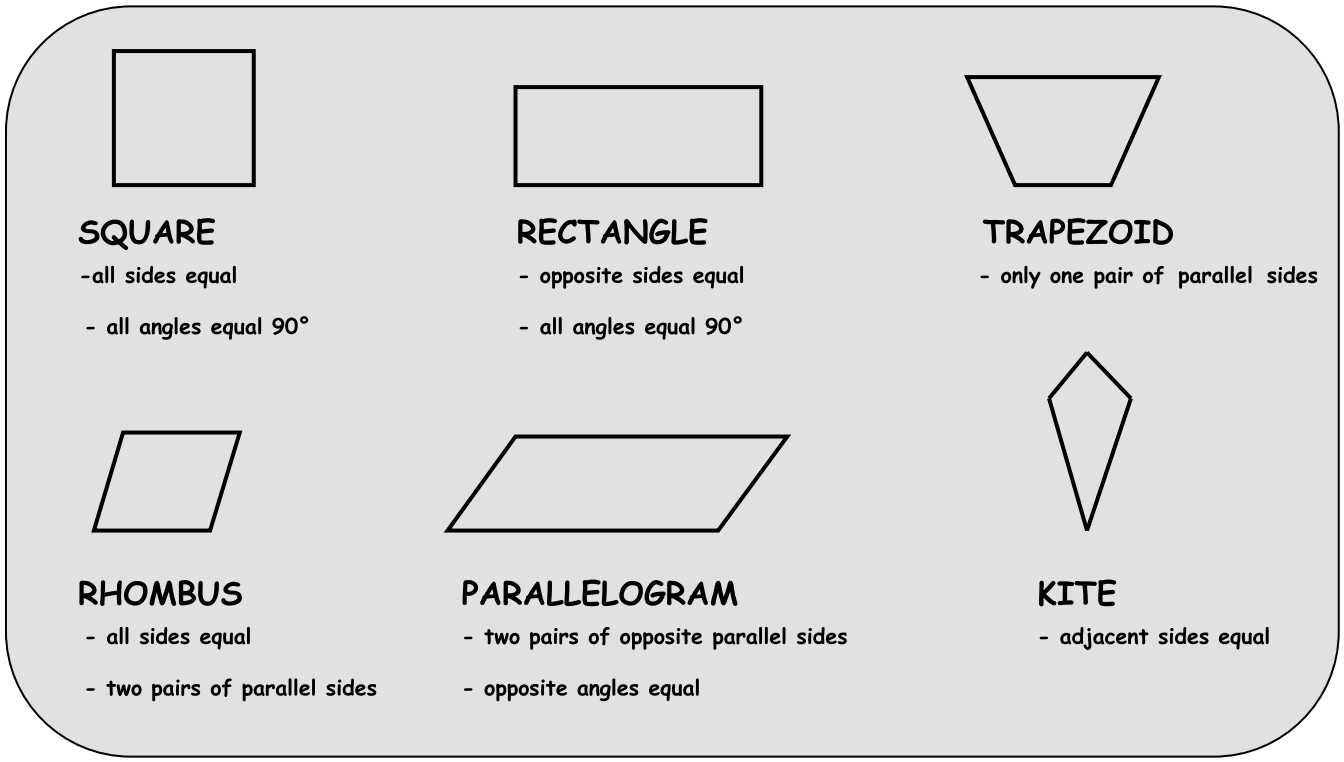
Equilateral



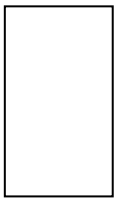
Right angle Δ

TASK 10: Quadrilaterals

A quadrilateral is a 4 sided polygon with 4 angles which add up to 360°.



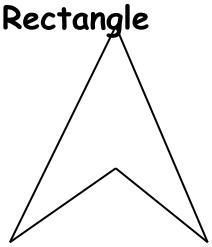
1. Name each quadrilateral.



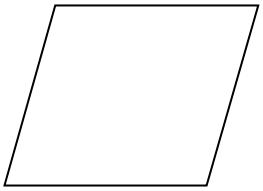
Rectangle

Trapezoid

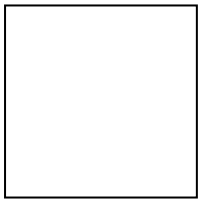
Parallelogram



Kite



Rhombus



Square

2. How can you tell the difference between a parallelogram and a trapezoid?
   Parallelogram both pairs of sides are parallel. Trapezoid only one pair of sides parallel.

3. How can you tell the difference between a rectangle and a rhombus.
   A rectangle has four 90° angles with all angles equal. A rhombus has no 90° angles and opposite angles are equal.

TASK 11: Quadrilateral Questions

1. How many sides does a quadrilateral have? 4

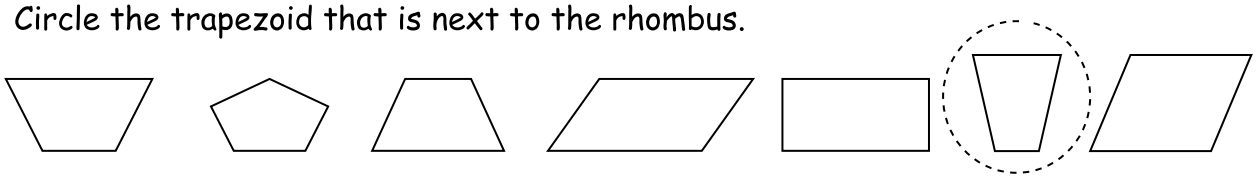
2. How many pairs of parallel lines does a rectangle have? 2

3. How many pairs of parallel lines does a trapezoid have? 1

4. Name 2 quadrilaterals with all sides equal in length. Square and a rhombus

5. Name 2 quadrilaterals that each has 4 right angles. Square and a rectangle

6. Circle the trapezoid that is next to the rhombus.



7. List three ways a rectangle and a square are alike.
   Both have 4 right angles. Both have opposite sides equal. Both have opposite sides parallel.

8. List one way a parallelogram and a rhombus are different.
   Rhombus has all sides equal in length. Parallelogram has opposite sides equal in length

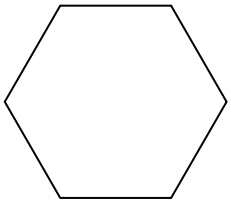
9. Name the quadrilateral that has opposite sides parallel and all sides the same length.
   Rhombus (Can accept Square).

10. List two ways a rectangle and a square are alike and one way in which they are different.
    Both have four 90° angles. Both have opposite sides equal and parallel. A square has all four sides equal but a rectangle has opposite sides equal.

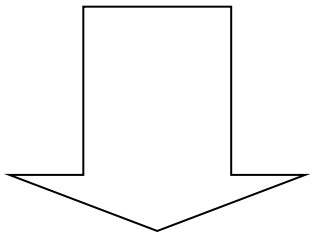
TASK 12: Other Polygons

The following polygons have all got more than 3 or 4 sides. Using the words given below, label each of the polygons.
If all the sides of the polygon are equal in length it is called a REGULAR polygon. If they are not all equal in length it is called an IRREGULAR polygon. Next to the name of each polygon write an 'R' if it is REGULAR or an 'I' if it is IRREGULAR.

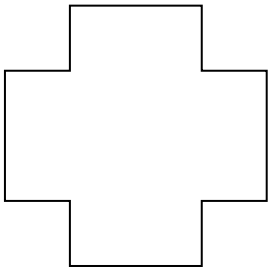
DECAGON OCTAGON HEPTAGON NONAGON
DODECAGON HEXAGON PENTAGON



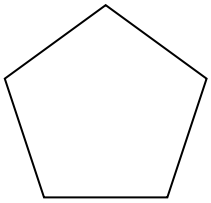
Regular Hexagon



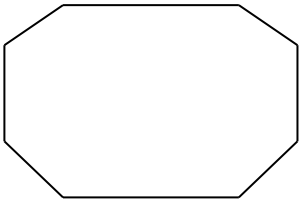
Irregular Heptagon



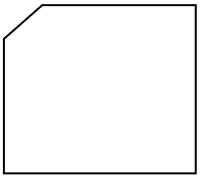
Irregular Dodecagon



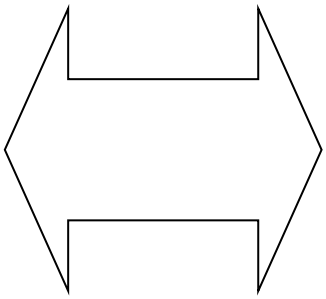
Regular Pentagon



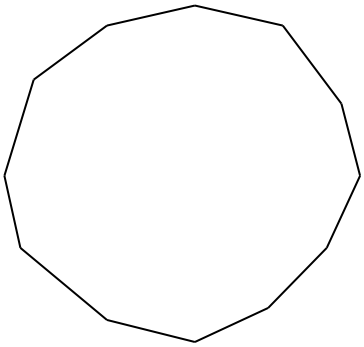
Irregular Octagon



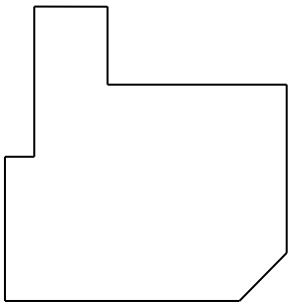
Irregular Pentagon



Irregular Decagon



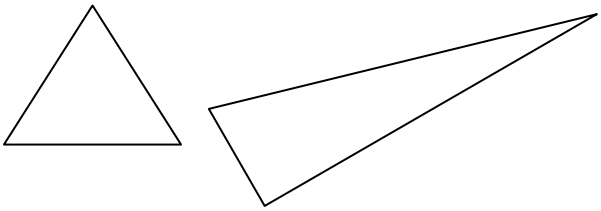
Irregular Dodecagon



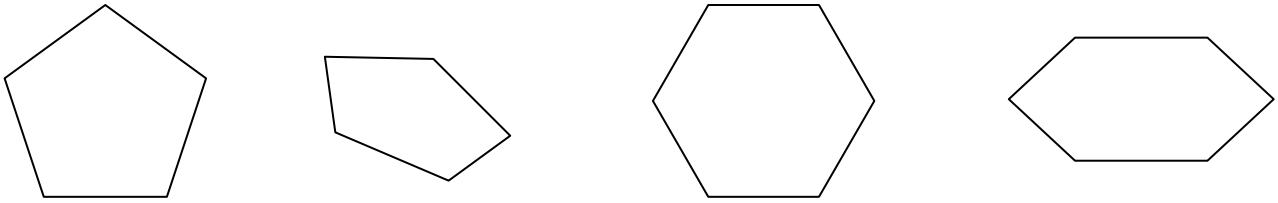
Irregular Nonagon

TASK 13: Regular and Irregular Polygons

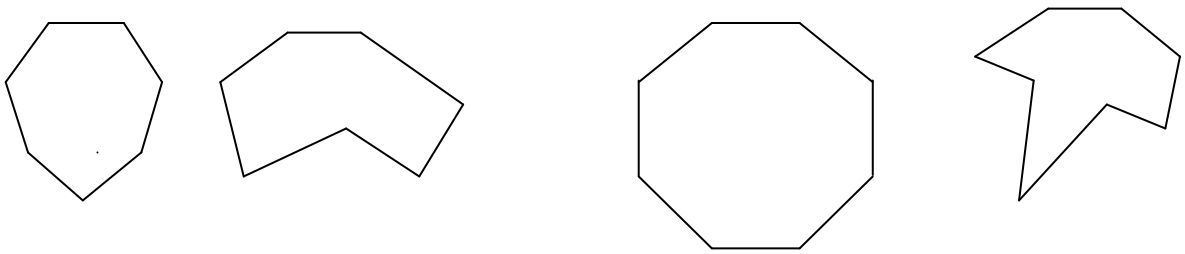
Name the following REGULAR and IRREGULAR polygons.



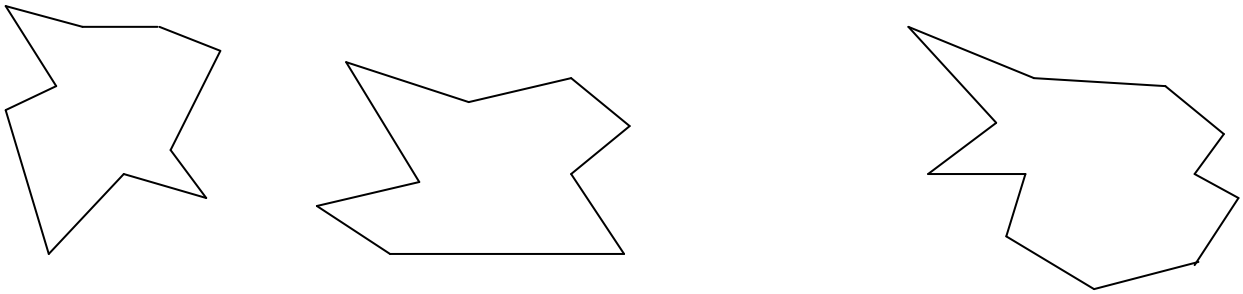
Regular Triangle Irregular Triangle Regular Quadrilateral Irregular Quadrilateral



Regular Pentagon Irregular Pentagon Regular Hexagon Irregular Hexagon



Regular Heptagon Irregular Heptagon Regular Octagon Irregular Octagon



Irregular Decagon Irregular Nonagon Irregular Dodecagon

ASK 14: Polygon Questions

How many sides does an octagon have? 8

How many angles does a triangle have? 3

How many sides does a pentagon have 5

Which has more sides a hexagon or a pentagon? Hexagon

How many **pairs** of parallel lines does a trapezoid have? One

How many **pairs** of parallel lines does a square have? Two

How many **pairs** of parallel lines does a triangle have? None

Which polygon has 12 sides and 12 angles? Dodecagon

Find the total number of sides on a decagon, a pentagon, a hexagon and a heptagon. 10 + 5 + 6 + 7 = 28

Find the difference between the number of sides on a dodecahedron and a heptagon. 12 – 7 = 5

Find the product of the number of sides on a triangle and the number of sides on a nonagon.

3 x 9 = 27

. What is the total of the number of degrees in a triangle and the number of degrees in a square? 180 + 360 = 540

. Which has the greater number of sides? A nonagon or a heptagon

Nonagon

. Name the polygon with the least number of sides. Triangle

TASK 15: Polygons on a Grid.

On the grid provided you are given two axes, the X (horizontal) axis and the Y (vertical) axis. Plot the co-ordinates on the grid in order to reveal the hidden polygons. Colour triangles blue, quadrilaterals green, pentagons red, hexagons orange, and octagons purple.

X	Y
10	10
13	15
16	10
10	10

STOP

X	Y
1	16
7	16
9	19
3	19
1	16

STOP

X	Y
7	1
7	3
5	3
5	1
7	1

STOP

X	Y
3	11
6	11
8	8
6	5
3	5
1	8
3	11

STOP

X	Y
6	12
6	14
8	15
10	14
10	12
6	12

STOP

X	Y
18	5
16	7
14	7
12	5
12	3
14	1
16	1
18	3
18	5

STOP

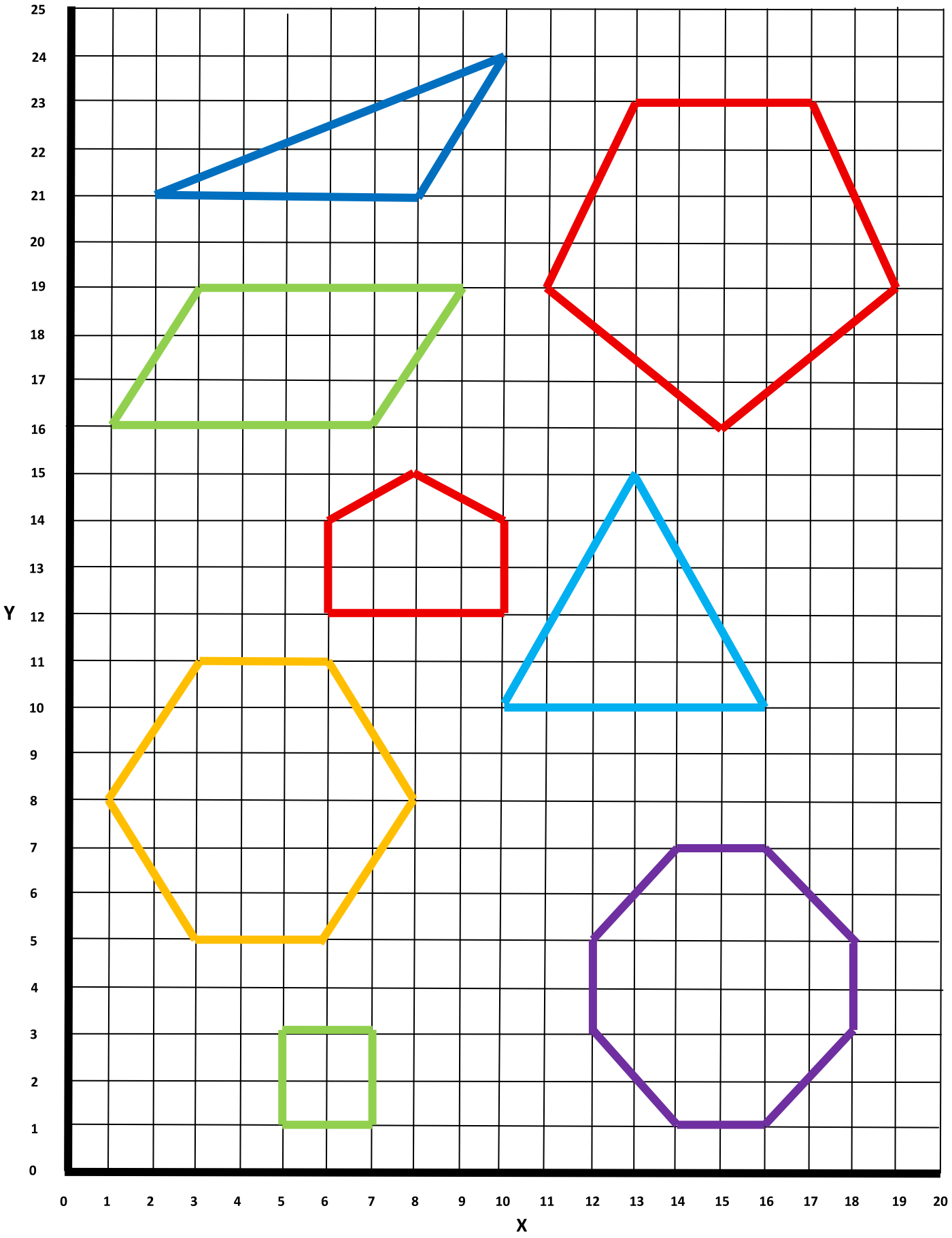
X	Y
15	16
19	19
17	23
13	23
11	19
15	16

STOP

X	Y
2	21
8	21
9	24
2	21

STOP

TASK 15: Grid for plotting co-ordinates



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