Mathematics

Geometry Review Guide

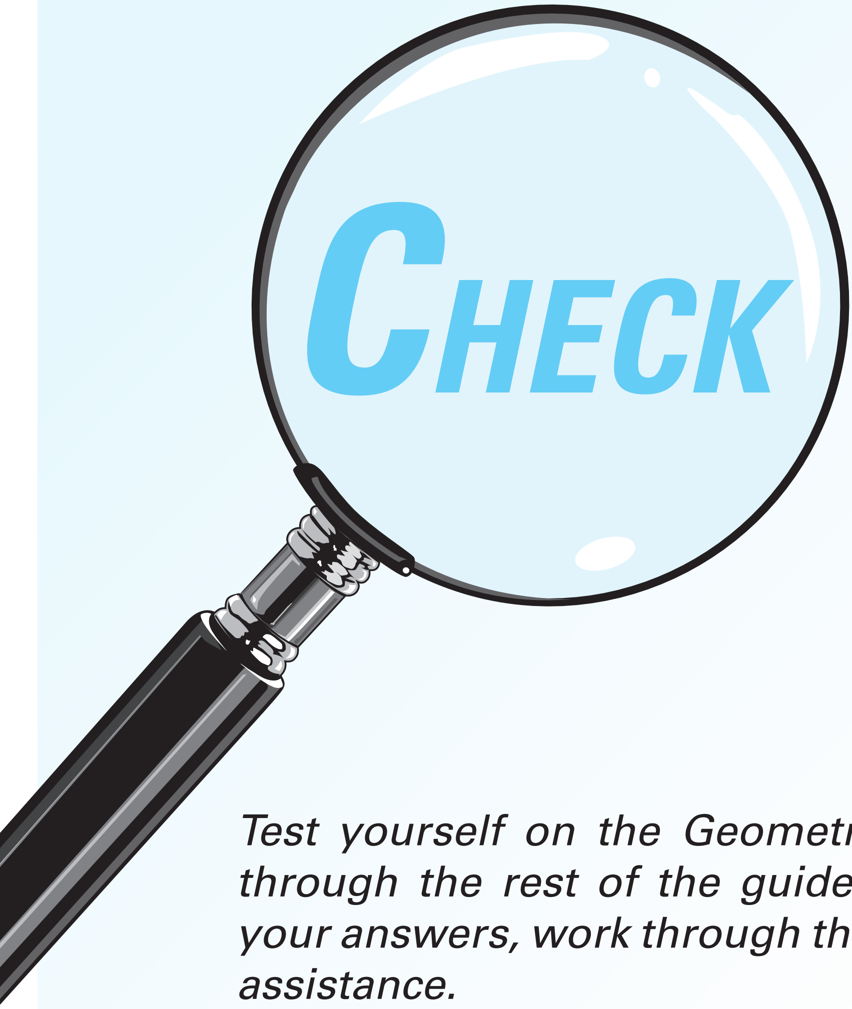
Paul Swan, Linda Marshall.

Geometry
Review Guide

*The intention of this **Review Guide** is to assist you to find your strengths and weaknesses in Geometry. The booklet is divided into aspects of Geometry: **2D Shape; 3D Shape; Similarity and Scale; Symmetry; Co-ordinates and Transformations.** Test yourself on the Geometry Check before you read through the rest of the guide. Once you have checked your answers, work through the sections where you need assistance.*

** For further information, see Bana, J., Marshall, L., and Swan, P. (2005). Maths Terms and Tables. Perth: R.I.C. Publications.*

Paul Swan, Linda Marshall.



Test yourself on the Geometry Check before you read through the rest of the guide. Once you have checked your answers, work through the sections where you need assistance.

1. The diagrams show

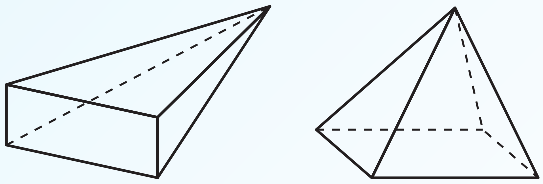
(a) triangular prisms

(b) rectangular prisms

(c) triangular pyramids

(d) rectangular pyramids

(e) none of these



2. The diagram shows a solid which has

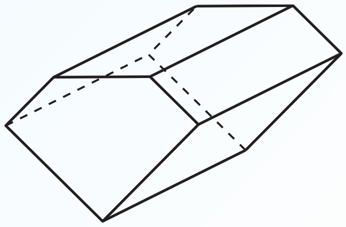
(a) 10 vertices and 15 edges

(b) 9 vertices and 12 edges

(c) 15 vertices and 7 edges

(d) 15 vertices and 10 edges

(e) none of these



3. The solid drawn here is resting on the ground. It has

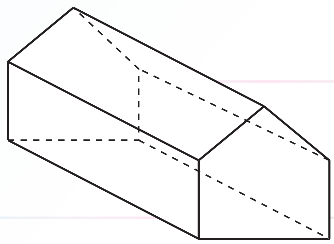
(a) 4 horizontal and 1 vertical face

(b) 1 horizontal and 2 vertical faces

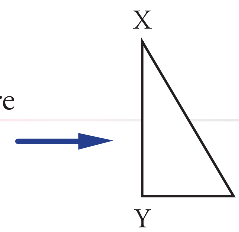
(c) 1 horizontal and 4 vertical faces

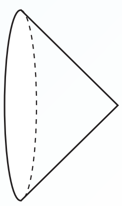
(d) 2 horizontal and 1 vertical face

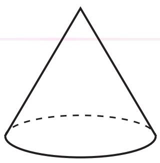
(e) none of these

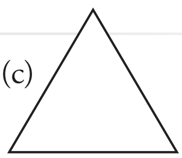


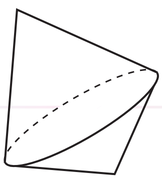
4. Which shape would be formed if the triangle drawn here is spun very fast around the axis through XY?



(a) 

(b) 

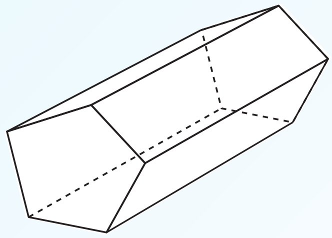
(c) 

(d) 

(e) none of these

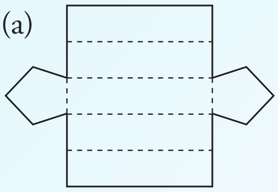
3D Objects

5. Here is a drawing of a pentagonal prism.

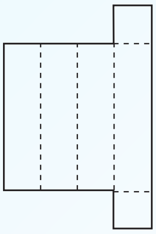


Which outline below could be cut out and folded along the dotted lines to make the best model of this pentagonal prism?

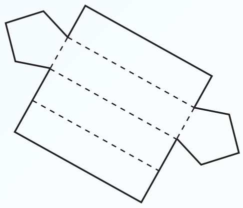
(a)



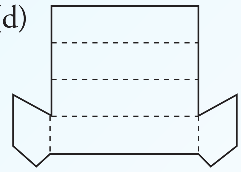
(b)



(c)



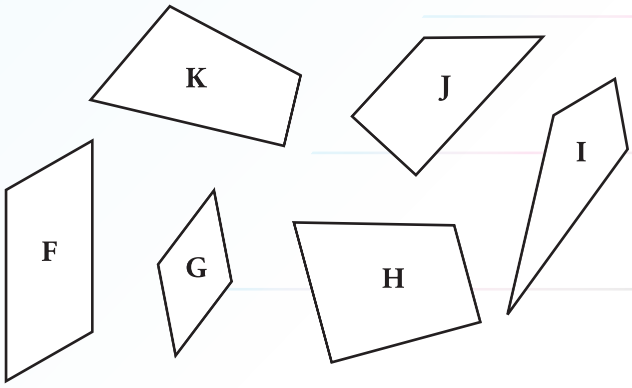
(d)



(e) None of these

2D Shape

6 Which shapes drawn here are parallelograms:



(a) all the shapes

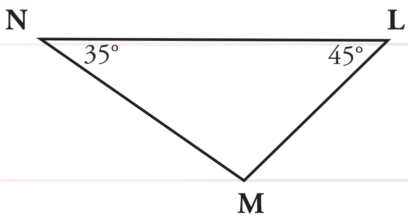
(b) all except H and I

(c) F and G only

(d) F only

(e) none of these answers

7 The size of angle M in triangle LMN is



(a) 80˚

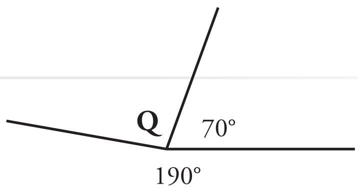
(b) 90˚

(c) 100˚

(d) 110˚

(e) none of these

8. What is the size of angle Q?



(a) 70˚

(b) 90˚

(c) 100˚

(d) 110˚

(e) none of these

9. To move the shape from position G to position H, slide it

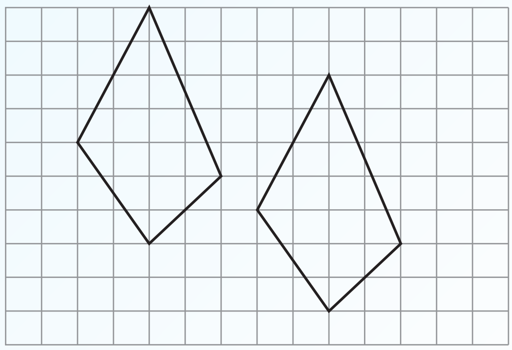
(a) down 2, right 5

(b) left 5, up 2

(c) down 1, right 1

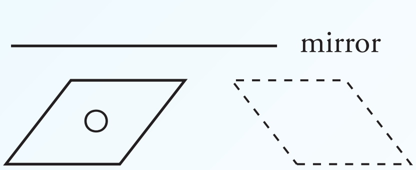
(d) down 2, right 1

(e) none of these

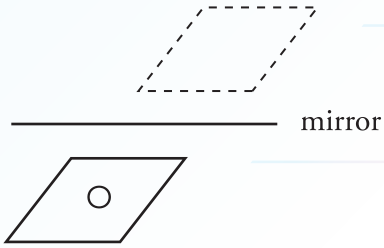


10. Which picture shows the correct position of the mirror image for the object O?

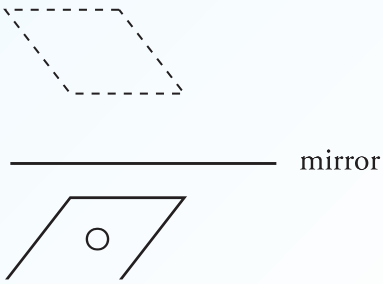
(a)



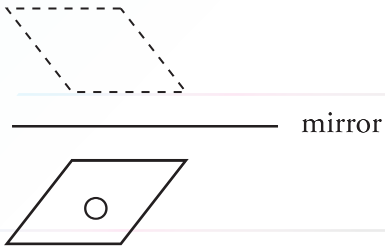
(b)



(c)



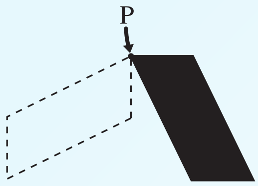
(d)

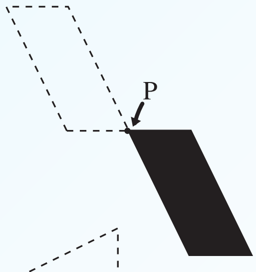


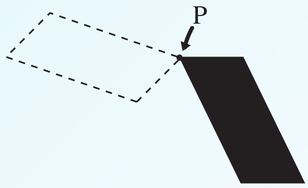
(e) none of these

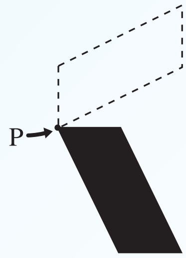
Transformations

11. The shaded part of each picture shows a cardboard shape pinned at point P. The card is given a 1/4 turn clockwise. Which dotted outline shows the new position of the card?

(a) 

(b) 

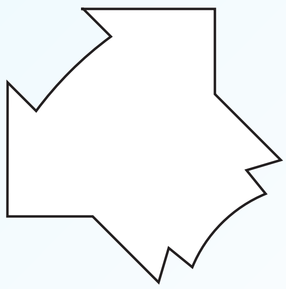
(c) 

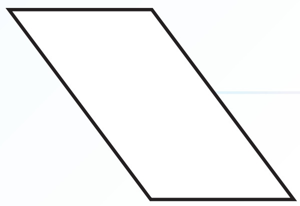
(d) 

(e) none of these

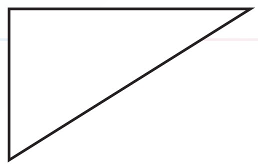
Symmetry

12. Which picture could be cut and folded so that both halves match?

(a) 

(b) 

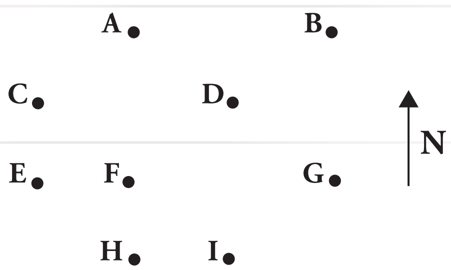
(c) 

(d) 

(e) none of these

Co-ordinates

13. Name the point southwest of D, and give the direction from D to G.



(a) E, SE

(b) F, NW

(c) H, NW

(d) F, SE

(e) none of these

Co-ordinates

14. What directions would you give to travel from X to Y along the path shown?

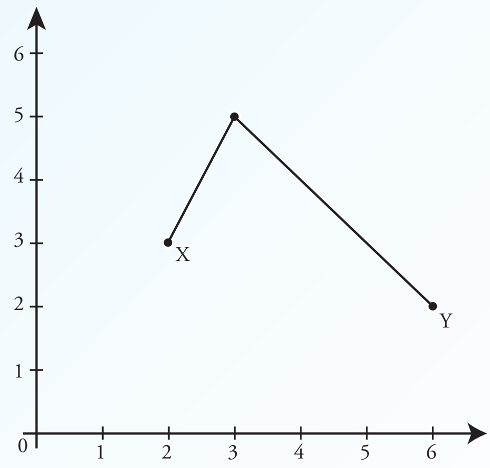
(a) Start at (2, 3) and go to (5, 3) then finish at (2, 6)

(b) Start at (2, 3) and go to (3, 5) then finish at (6, 2)

(c) Start at (3, 2) and go to (5, 3) then finish at (2, 6)

(d) Start at (6, 2) and go to (3, 5) then finish at (2, 2)

(e) none of these



15. Name the point at (4, 2) and give the co-ordinates of point D.

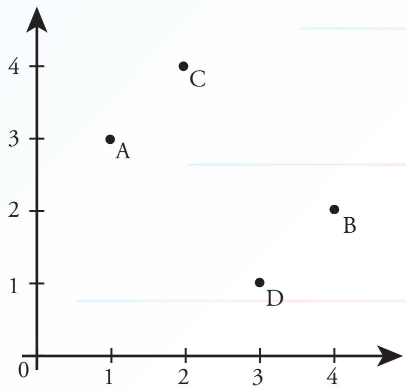
(a) B, (3, 1)

(b) C, (1, 3)

(c) B, (1, 3)

(d) C, (3, 1)

(e) none of these



Scale

16. How many of the shape N would be needed to make shape M?

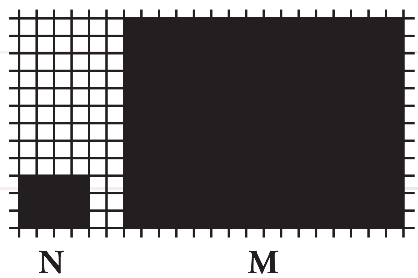
(a) 16

(b) 15

(c) 8

(d) 4

(e) none of these



End of Geometry Check...

Turn to the next page to check your answers >>>

>>> Answers to Geometry Check

1. d
2. a
3. c
4. b
5. a
6. c
7. c
8. c
9. a
10. d
11. a
12. a
13. d
14. b
15. a
16. a

How did you do?

Use the section indicators in the left column of the Geometry check to locate the sections you would like to improve on.

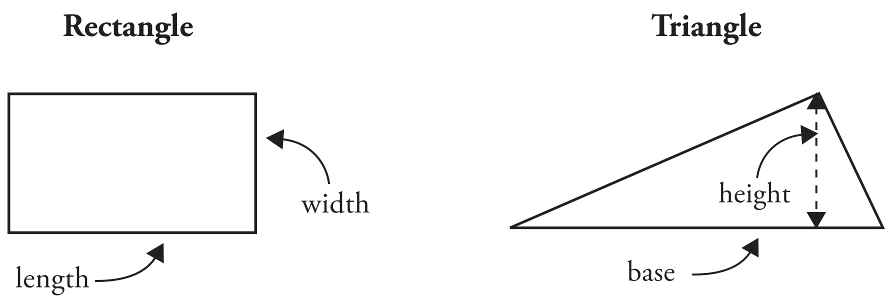
SECTION 1. TWO DIMENSIONAL SHAPES

POLYGONS

TWO DIMENSIONAL SHAPES

Two dimensional shapes that we will investigate in this section are called **polygons**. 'Poly' means **'many'** and 'gon' means **'side'**, e.g. many sided figures. Two dimensional shapes have length and width, e.g. a rectangle or square has length and width, a triangle has base and height.

Poly: "many"
Gon: "sides"



Congruent shapes have the same size and shape.

The main shapes that you should recognise are:

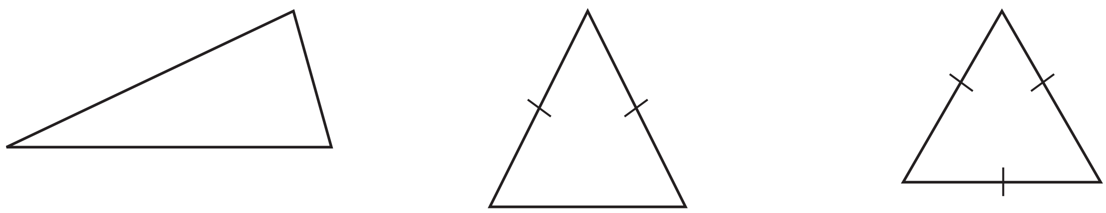
3 sides	triangles
4 sides	quadrilaterals
5 sides	pentagons
6 sides	hexagons
8 sides	octagons
10 sides	decagons

Regular polygons are those that have all sides congruent (i.e. of equal length) and all angles congruent (i.e. of equal size).

See p. 87 of Maths Terms and Tables.

3 SIDED POLYGONS

Triangles are three sided polygons.



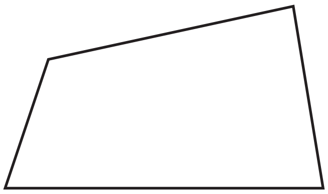
Scalene

Isosceles
(two congruent sides)

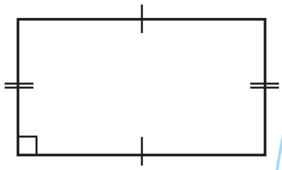
Equilateral
(all sides and angles congruent)
(this is a regular polygon)

4 SIDED POLYGONS

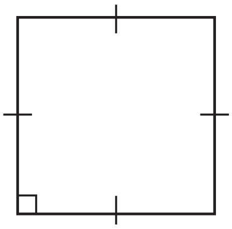
Quadrilaterals are four sided polygons.



Quadrilateral - any four sided figure

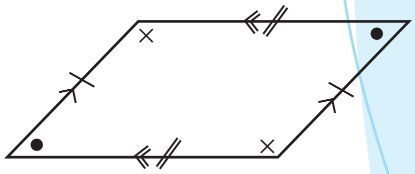


Rectangle - opposite sides congruent
each angle is 90°

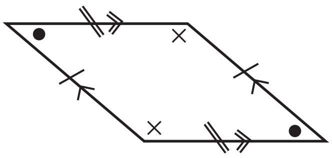


Square - all sides congruent
each angle is 90°

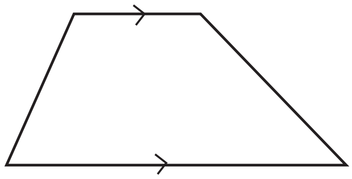
This is a regular quadrilateral.



Parallelogram - opposite sides congruent and parallel
opposite angles congruent



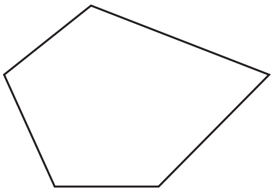
Rombus - all sides congruent
opposite sides parallel
opposite angles congruent



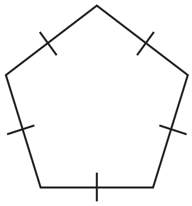
Trapezium- only one pair of parallel sides
**See p. 92 of Maths Terms and Tables.*

5 SIDED POLYGONS

Pentagons are five sided polygons.



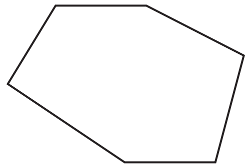
Non-regular



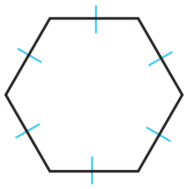
Regular - all sides congruent
all angles congruent (108°)

6 SIDED POLYGONS

Hexagons are six sided polygons.



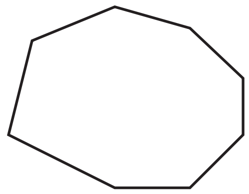
Non-regular



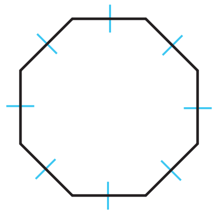
Regular- all sides congruent
all angles congruent (120°)

8 SIDED POLYGONS

Octagons are eight sided polygons.



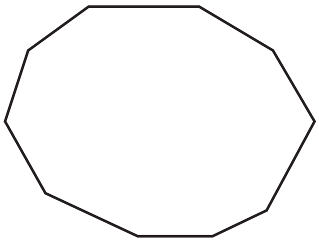
Non-regular



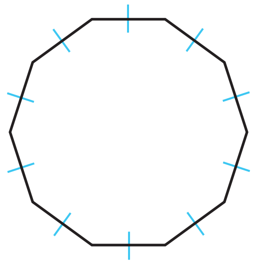
Regular- all sides congruent
all angles congruent (135°)

10 SIDED POLYGONS

Decagons are ten sided polygons.



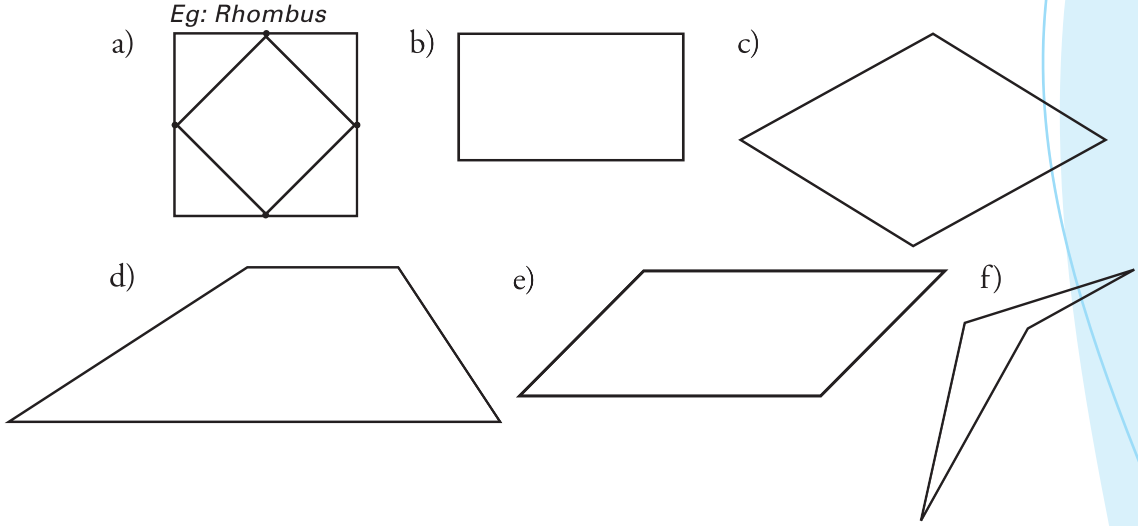
Non-regular



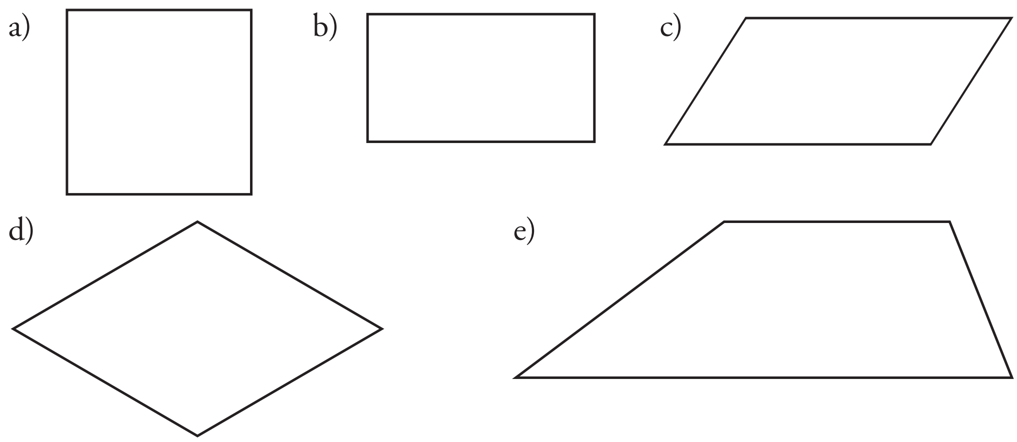
Regular- all sides congruent
all angles congruent (144°)

2D SHAPES Check Point

1.
- ***Name each of these shapes below.***
- ***Form a four sided shape by joining the mid-points of each shape.***
- ***Name these new shapes:***



2. ***Draw in the diagonals for each shape below***



3. ***Which figures have:***

(i) Congruent diagonals?

(ii) Perpendicular diagonals?

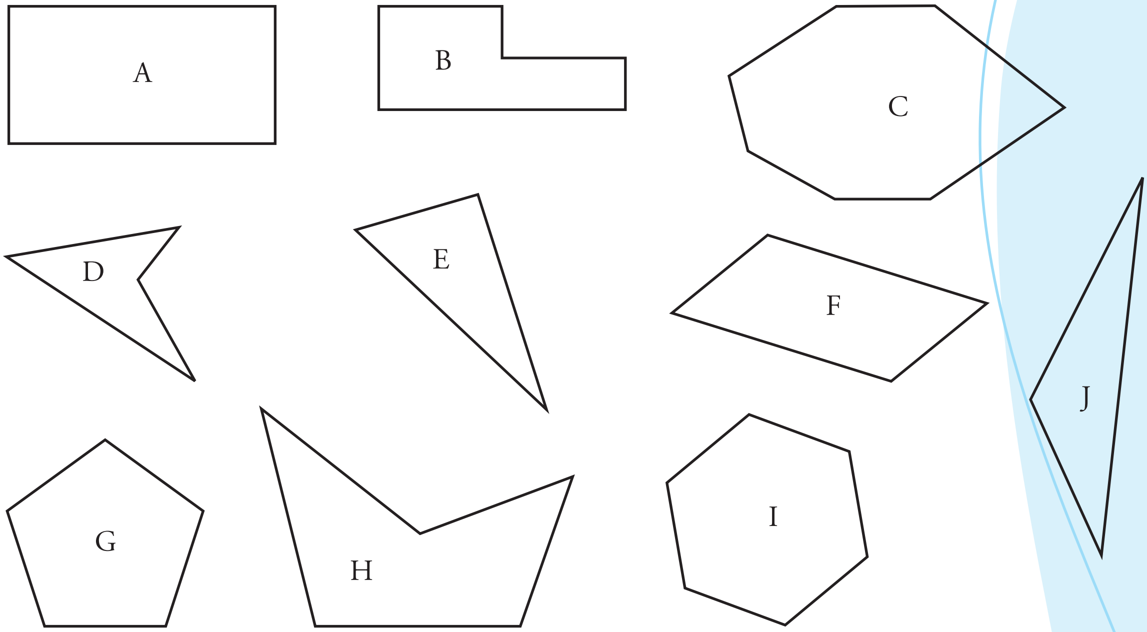
(iii) Diagonals that bisect each other?

NOTE

- *Intersecting lines are those that cross each other at any point*
- *Bisecting lines cut each other in half*

Check Point

4 ***Classify the following shapes according to the number of sides;***



a) triangles ....

b) quadrilaterals ....

c) pentagons ....

d) hexagons ....

e) none of the above ....

5 ***True or false:***

i) All trapeziums are parallelograms.

ii) All rectangles are parallelograms.

iii) All parallelograms are rhombuses.

iv) All squares are rhombuses.

v) All trapeziums are quadrilaterals.

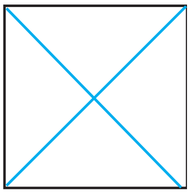
2D SHAPES-SOLUTIONS — Check Point

Pg, 5

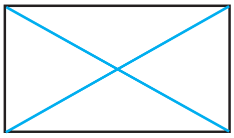
1.
- a) A square within a square
- b) rectangle, rhombus
- c) rhombus, rectangle
- d) trapezium, parallelogram
- *e)* parallelogram, parallelogram
- f) quadrilateral, parallelogram

2

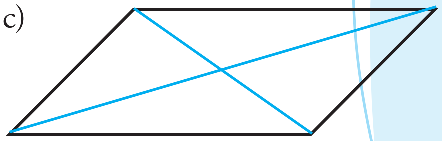
a)



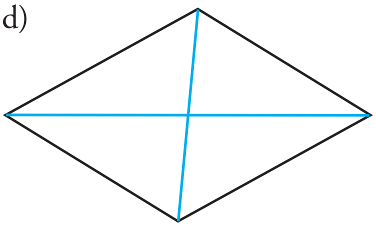
b)



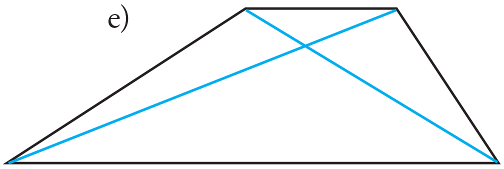
c)



d)



e)



3 i: ***a, b*** *ii*: ***a, d*** *iii*: ***a, b, c, d***

Pg, 6

4
- a) E, J
- b) A, D, F
- c) G, H
- d) B, I
- *e)* C

5
- i) False
- *ii)* *True*
- *iii)* False
- *iv)* *True*
- *v)* *True*

SECTION 2. THREE DIMENSIONAL OBJECTS

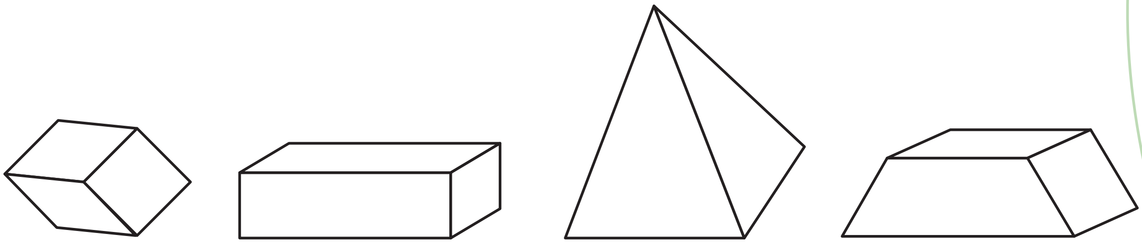
POLYHEDRA

THREE DIMENSIONAL OBJECTS

Three dimensional shapes that we will investigate in this section are called **polyhedra.**

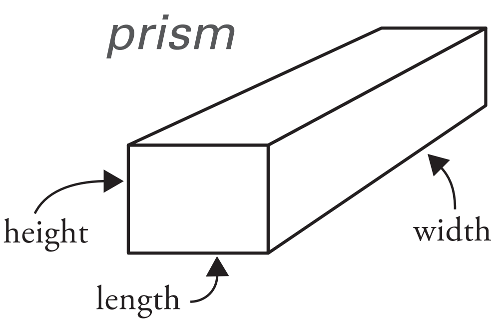
***Poly** means 'many' and **hedra** means 'faces'.*

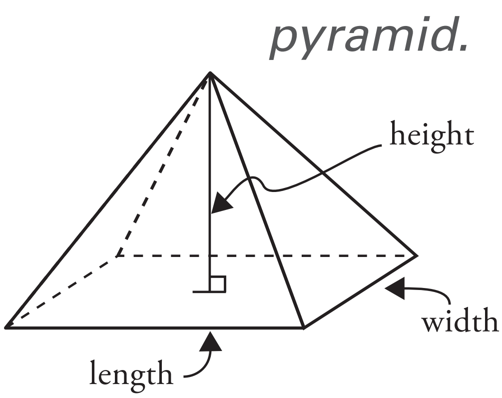
3D objects are those that have length, width, & height.



These are polyhedra. Notice that all the **faces** are **polygons**.

The main 3-dimensional shapes that you should recognise are *prisms* and *pyramids.*

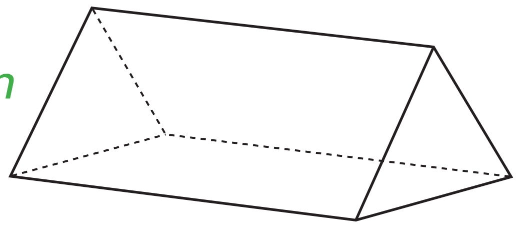




3D OBJECTS - PRISMS

Prisms are shapes with two opposite ends being congruent polygons and all other faces being rectangles. Notice that the two triangles are the same shape and size (.i.e. congruent) and the other three sides are rectangles.

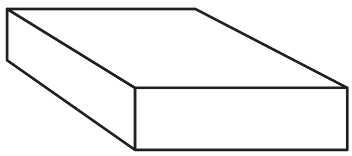
Triangular prism



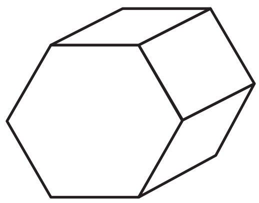
An example of a prism is a shape like a tent.

Prisms are named by their congruent faces.

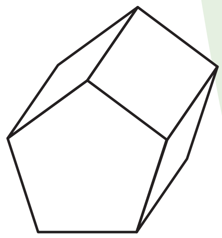
Some other prisms are:



rectangular prism



hexagonal prism



pentagonal prism

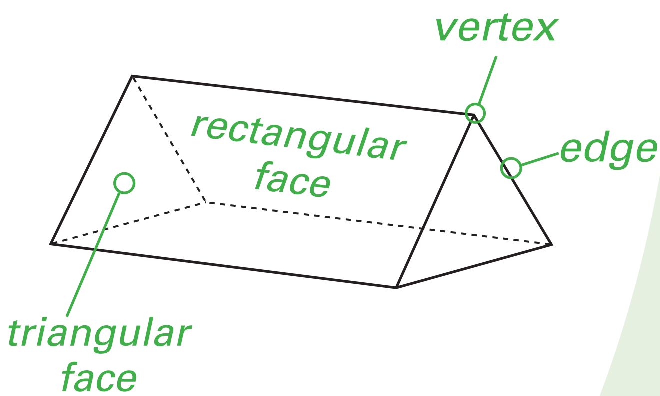
An important aspect of your prism is the number of ***vertices*** (corners), ***edges*** and ***faces***. You need to be able to recognise these properties.

For example: the triangular prism has:

6 vertices or corners
(a vertex is where three faces meet)

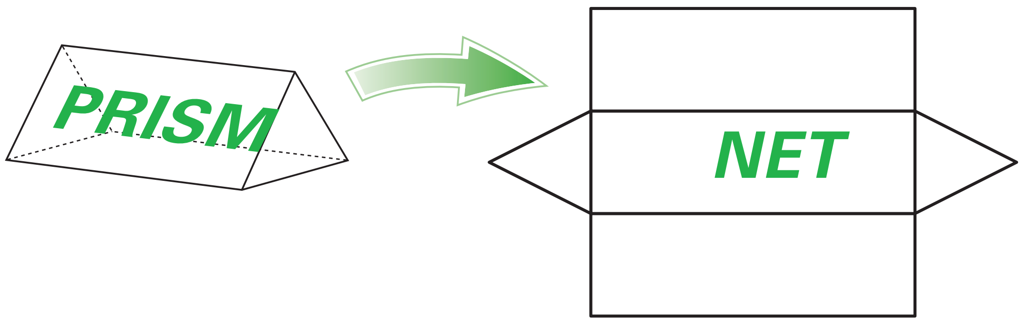
5 faces
(3 rectangular faces and 2 triangular faces)

9 edges
(an edge is where two faces meet)



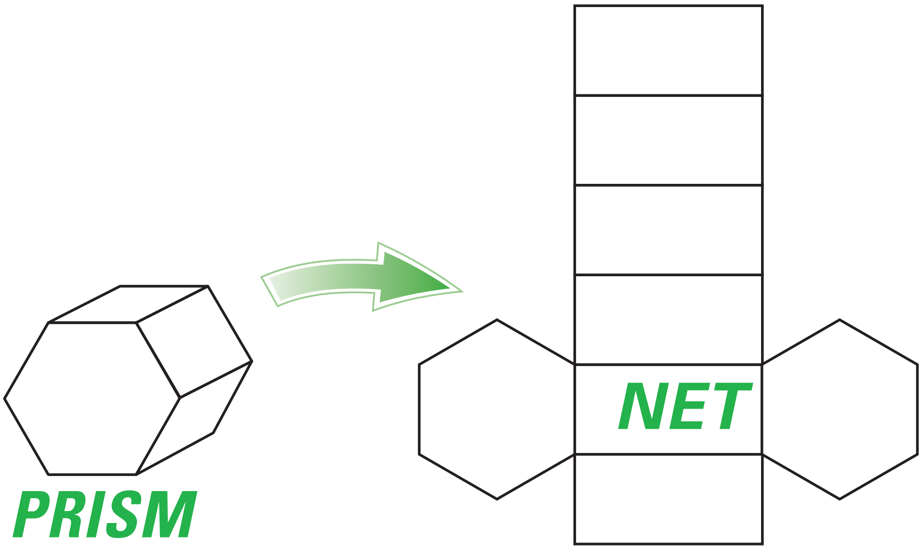
3D OBJECTS - NETS

If we decide to unfold the triangular prism we would obtain the following shape:



This is called a **NET** and it is a **two dimensional representation** of a **three dimensional object**.

Here is another example of a **NET** created from a **hexagonal prism**



3D OBJECTS Check Point Prisms

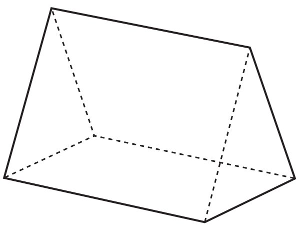
Name each shape below and determine the number of vertices, faces and edges.

The information for the triangular prism has been completed for you.

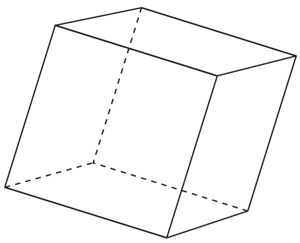
Name	No. of Vertices	No. of Faces	No. of Edges
A. **Triangular Prism**	6	5	9
B.			
C.			
D.			
E.			

Challenge 1: Examine the numbers in the columns and see if you can discover a relationship between them.

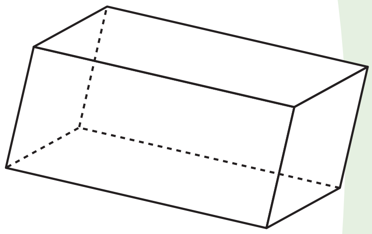
A



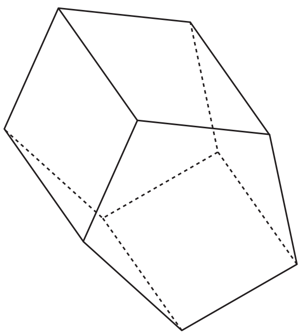
B



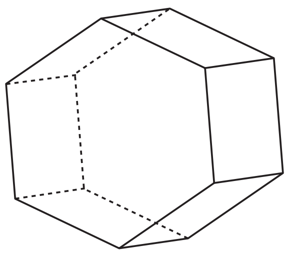
C



D



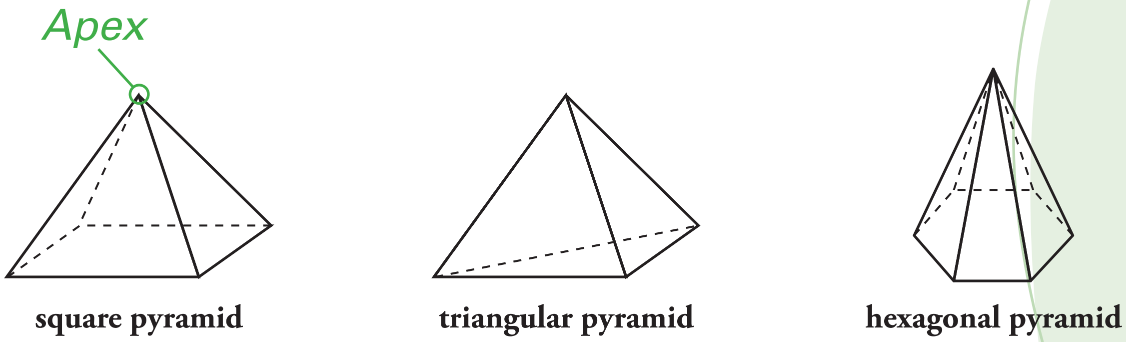
E



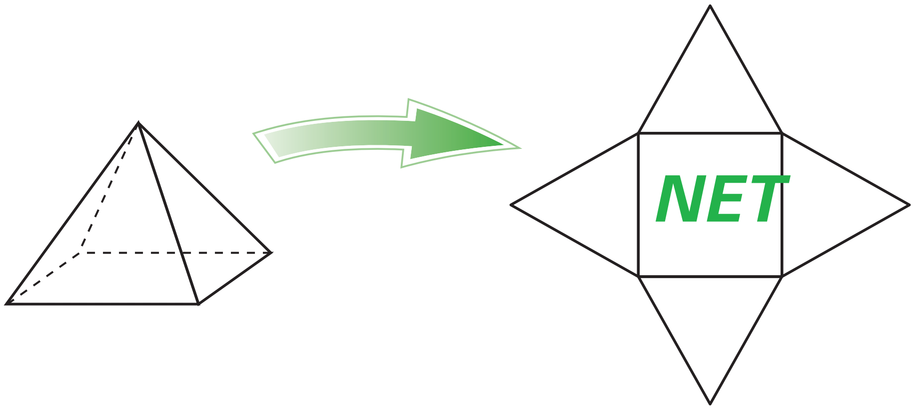
3D OBJECTS - PYRAMIDS

A pyramid consists of a base (a polygon) and triangular faces which meet at a point called an apex.

Pyramids are named by their bases



If we decided to unfold the square pyramid we would have the following net:



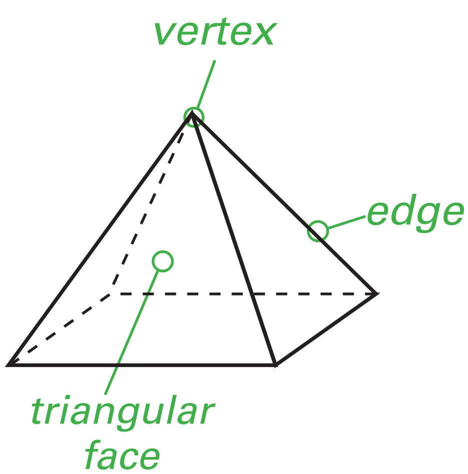
An important aspect of your pyramid is the number of ***vertices*** (corners), ***edges*** and ***faces***.

For example: the square pyramid has:

5 vertices or corners

5 faces

8 edges



3D OBJECTS

Check Point Pyramids

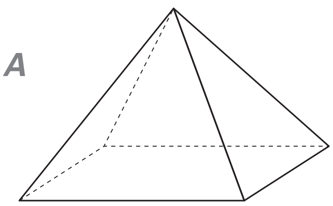
Name each shape below and determine the number of vertices, faces & edges.

The information for the square pyramid has been completed for you.

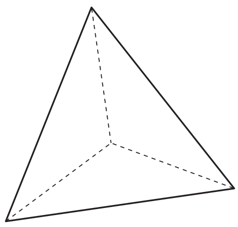
Name	No. of Vertices	No. of Faces	No. of Edges
A. Square Pyramid	5	5	8
B.			
C.			
D.			
E.			

Challenge 2: If you discovered the relationship between the numbers for the prisms, can it be applied here?

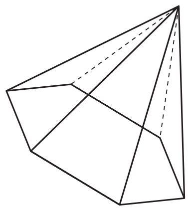
A



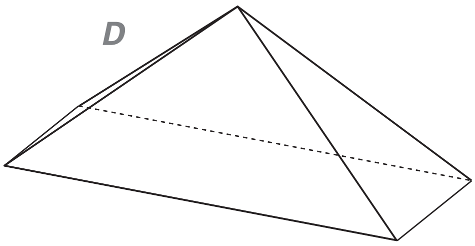
B



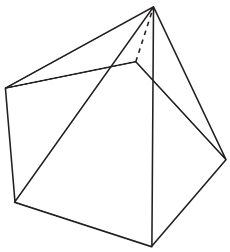
C



D



E

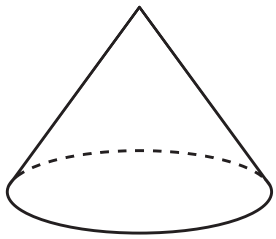


** Euler's Law indicates the relationship between Vertices, Faces and Edges*
V + F = E + 2

3D OBJECTS - OTHER

Besides pyramids and prisms you should be able to recognise ***cones, cylinders*** and ***spheres***.

CONES

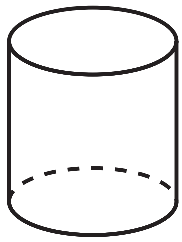


Cones are like pyramids.

They have a circular base.

THEY ARE EASY TO REMEMBER - JUST THINK OF ICE-CREAM CONES

CYLINDERS

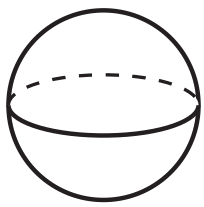


Cylinders are like prisms.

They have two congruent circular ends.

A COOL DRINK CAN IS AN EXAMPLE OF A CYLINDER

SPHERES



Spheres aren't like prisms and pyramids.

A BALL IS A GOOD EXAMPLE OF A SPHERE.

3D OBJECTS-SOLUTIONS Check Point

Pg. 12

Name	No. of Vertices	No. of Faces	No. of Edges
A. Triangular Prism	6	5	9
B. Square Prism (cube)	8	6	12
C. Rectangular Prism	8	6	12
D. Hexagonal Prism	12	8	18
E. Pentagonal Prism	10	7	15
Challenge 1: V + F = E + 2 or V + F - E = 2			

Pg. 14

Name	No. of Vertices	No. of Faces	No. of Edges
A. Square Pyramid	5	5	8
B. Triangular Pyramid	4	4	6
C. Hexagonal Pyramid	7	7	12
D. Rectangular Pyramid	5	5	8
E. Pentagonal Pyramid	6	6	10
Challenge 1: Yes, V + F = E + 2			

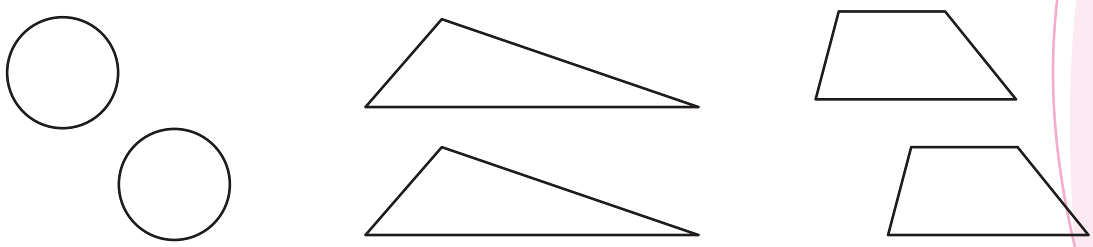
SECTION 3.

CONGRUENCE, SIMILARITY & SCALE

CONGRUENCE, SIMILARITY, AND SCALE

CONGRUENCE

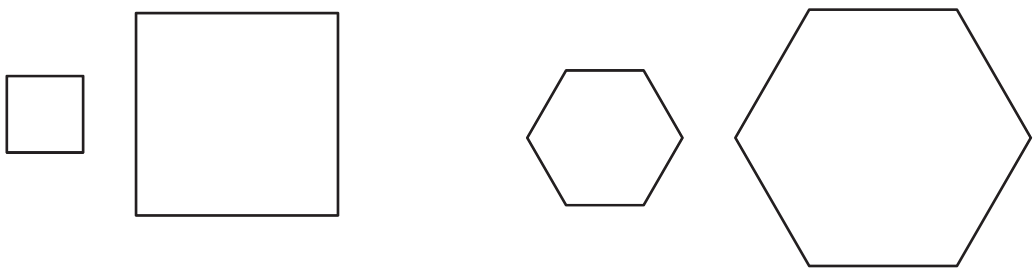
Two shapes are said to be **congruent** if they are the ***same shape and size***.
The following pairs of shapes are congruent:



You can test for congruence by measuring or more simply in two dimensions by super-imposing one shape on top of the other.

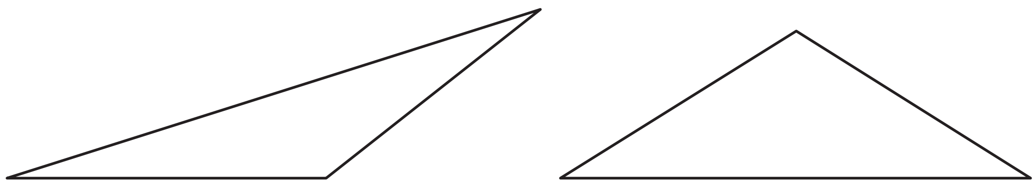
SIMILARITY

Two shapes are said to be **similar** if they have the ***same shape***. The same shape means that the corresponding angles are congruent and the corresponding sides are in the same proportions. More simply one is a larger scale model of the other, e.g.



Notice that all squares and *regular* hexagons would be similar.

Not all triangles are similar, e.g.



- the corresponding angles aren't congruent and the corresponding sides are not proportional.

SIMILARITY

However, some triangles may be similar, e.g.

$\angle A \cong \angle D$
$\angle B \cong \angle E$
$\angle C \cong \angle F$
(angles congruent)

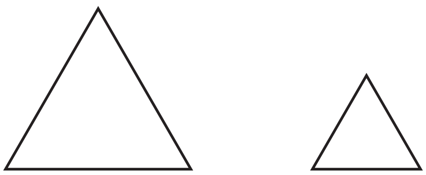
$$\frac{AB}{DF} = \frac{AC}{DE} = \frac{BC}{EF}$$
(sides proportional)

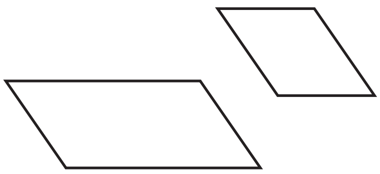
$\Delta ABC \sim \Delta DEF$
(is similar to)

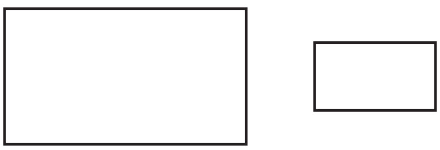
$\cong$ ***means "congruent to"***

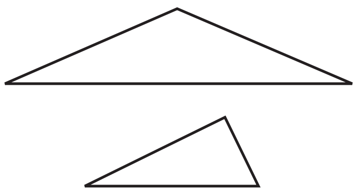
CONGRUENCE SIMILARITY Check Point

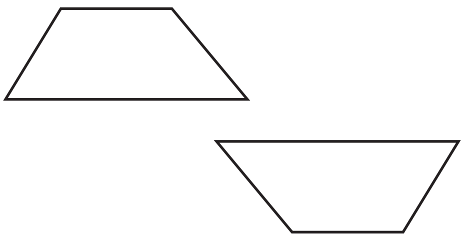
Are these figures similar, congruent or neither?
Give reasons for your answers:

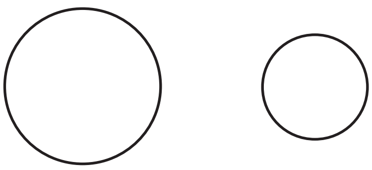
a)


b)


c)


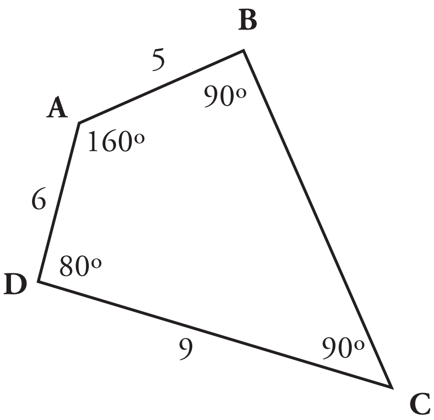
d)


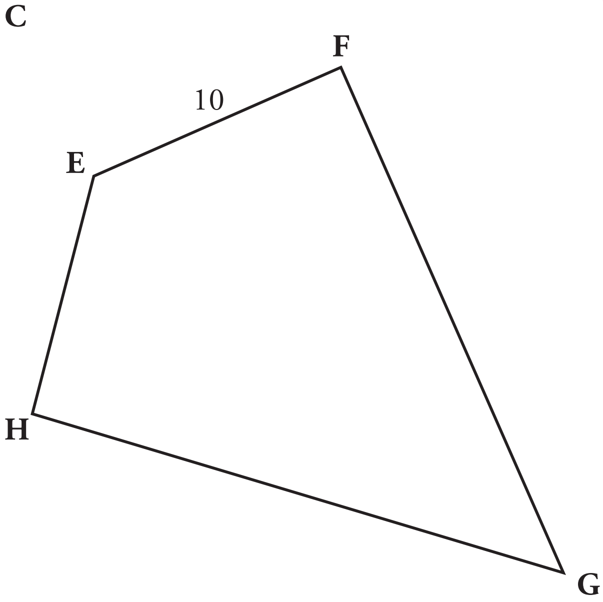
e)


f)


SIMILARITY Check Point

ABCD is similar to EFGH



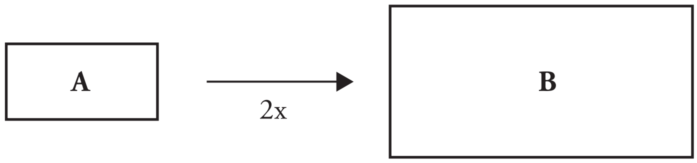


a) How large is the angle H?

b) How long is EH? HG?

SCALE

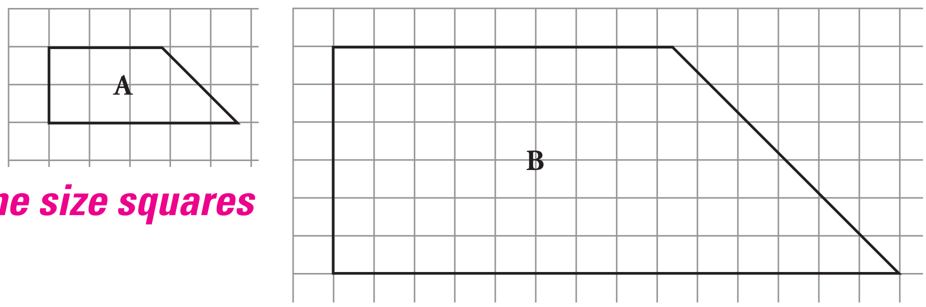
A practical and realistic way in which you can be introduced to the idea of similarity is by scaling. Most people are familiar with the world of scale in two and three dimensions through model making, maps and photographs, e.g.



Rectangle B is a **double scale** model of rectangle A. Notice that the lengths of sides of rectangle B are twice as long as the sides of rectangle A. **How many rectangles the size of A would fit into B? Therefore what is the increase in area?**

Two ways of constructing scale diagrams, in two dimensions are:
1. ***use of grids*** *2.* ***use of centre of enlargement***

1) Use of grids

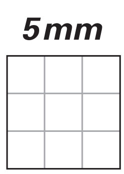


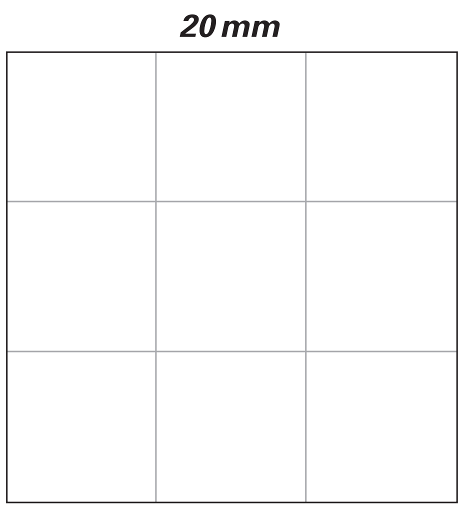
a. Same size squares

Shape B is a treble scale (3x) model of shape A.

The lengths of the sides of B are ....?.... times those of A and the area of B is ....?.... times that of A.

b. Different size squares





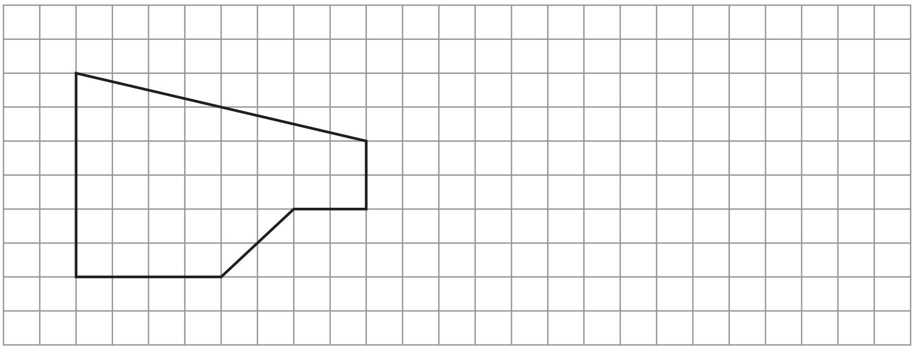
Grids of two different sizes may be used to enlarge or reduce figures.

Scale Check Point

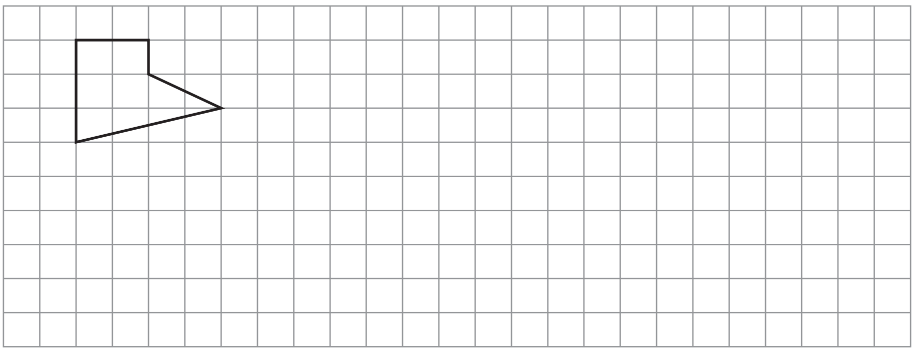
1. Using grid paper make the required scale models of the following:

a) double scale

b) half scale



c) treble scale



2. Complete this table

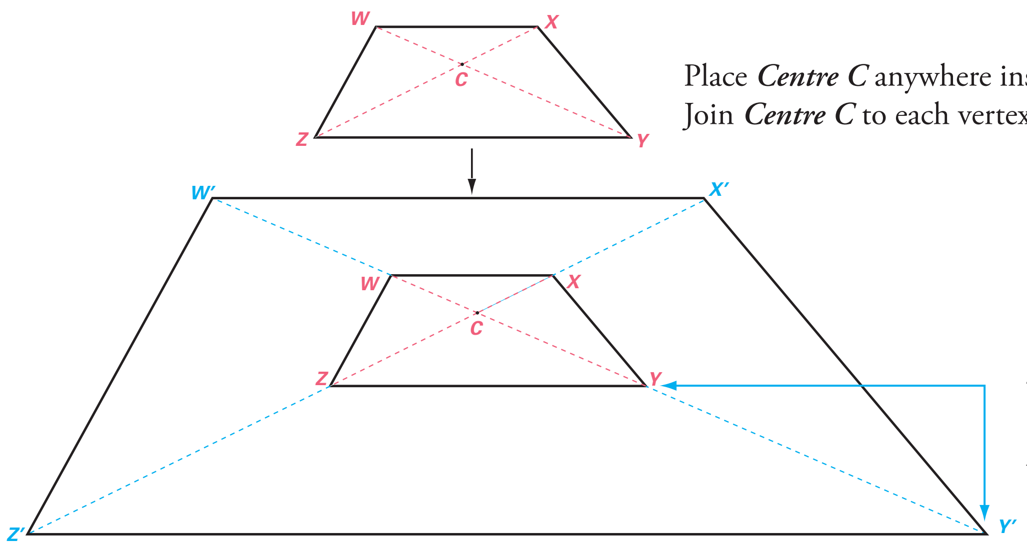
Scaling Factor	Length of Side	Area
2	doubles (2 x)	quadruples (4 x)
3		
	4 x	
	5 x	
$^1/_2$		
$^1/_3$		

2) Use of centre of enlargement

From a point inside or outside the figure (called the centre of enlargement) we can draw a scaled model of the figure. E.g.

(i) Inside the figure

Double scale model of WXYZ

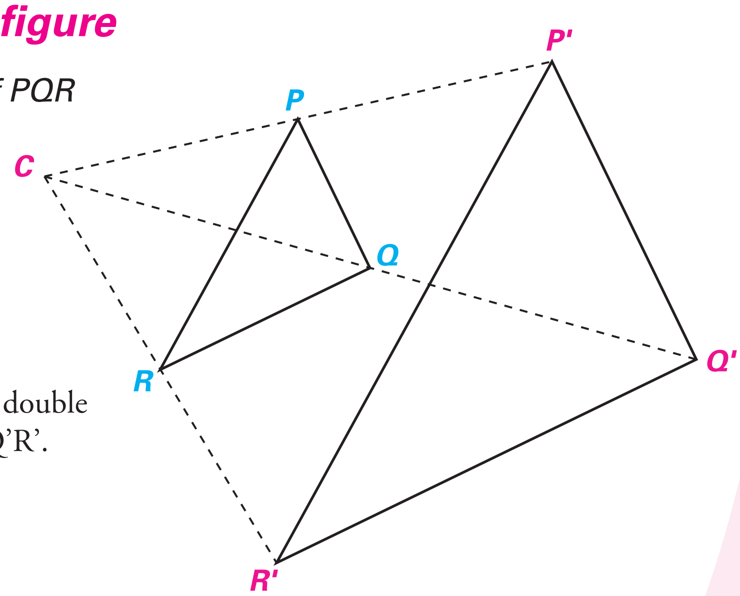


Place *Centre C* anywhere inside the figure.
Join *Centre C* to each vertex.

Treble the distance from the centerpoint to each vertex to obtain W'X'Y'Z'.

(ii) Outside the figure

Double scale model of PQR

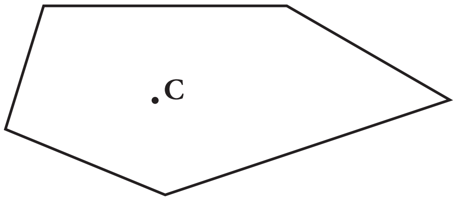


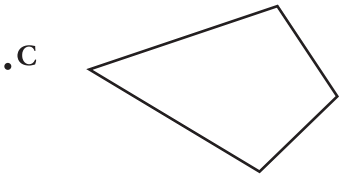
- Place *Centre C* anywhere outside the figure.
- Join *C* to each vertex and double the distance to obtain P'Q'R'.

SCALE Check Point

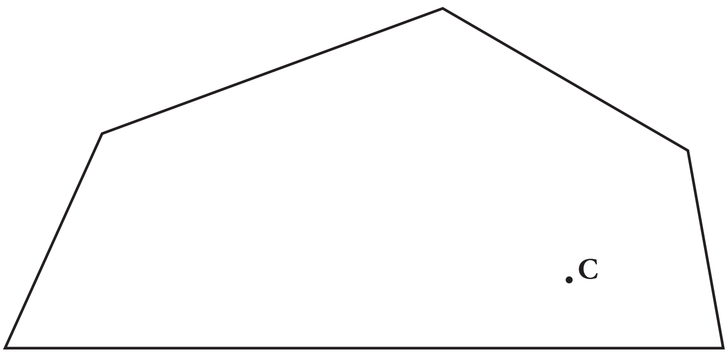
1. Using C as the centre of enlargement, draw in the indicated scale model of the following.

a) double scale





b) treble scale



c) half scale

SCALE-SOLUTION Check Point

Pg. 19

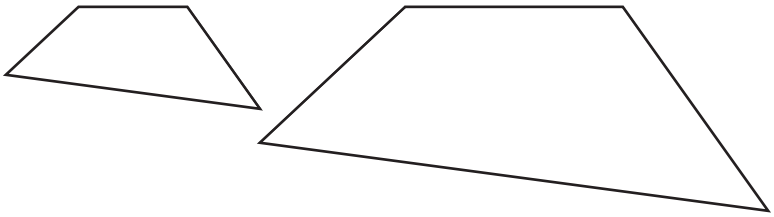
a) similar *(congruent angles)*
b) neither *(sides not in proportion)*
c) similar *(sides in proportion)*
d) neither *(sides not in proportion)*
e) congruent *(have same shape and size)*
f) similar *(same shape)*

Pg. 20

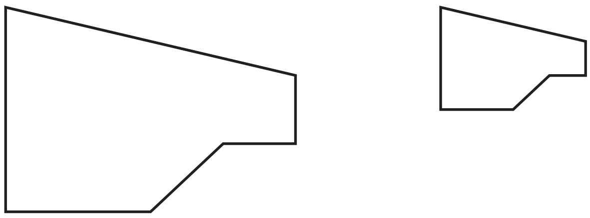
a) $\angle H = 80^\circ$ b) EH = 12 cm, HG = 18cm

Pg, 22

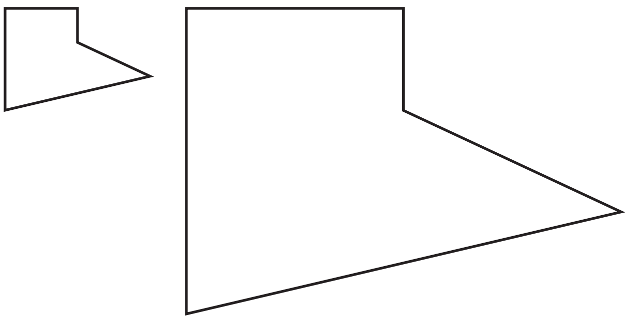
1a)



1b)



1c)



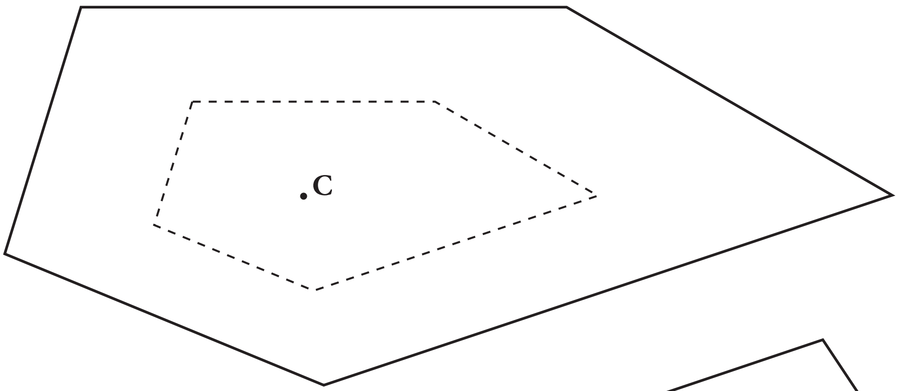
SCALE-SOLUTION Check Point

Pg, 22

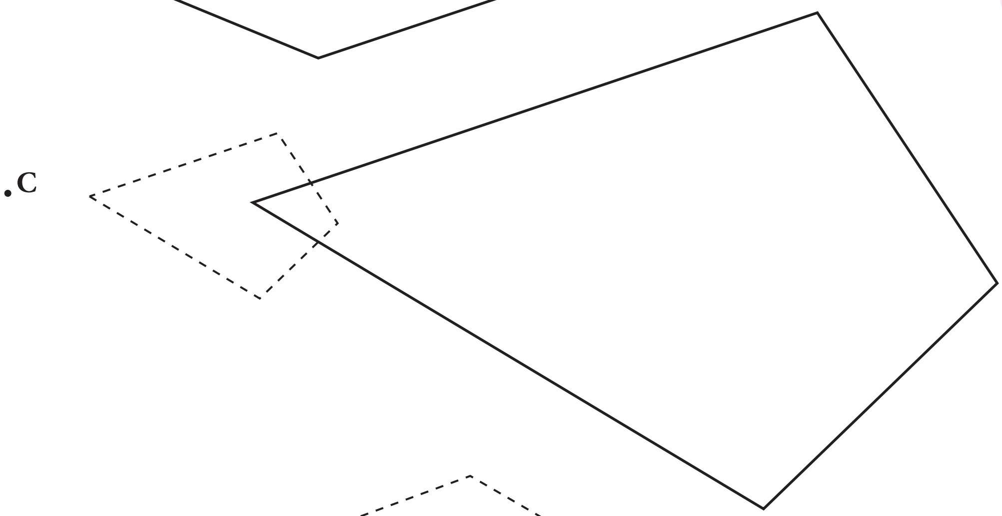
Scaling Factor	Length of Side	Area
2	doubles (2 x)	quadruples (4 x)
3	trebles (3 x)	nine times (9 x)
4	4x	sixteen times (16 x)
5	5x	twenty five times (25 x)
$^1/_2$	halves ($^1/_2$)	one quarter ($^1/_4$ x)
$^1/_3$	third ($^1/_3$)	one ninth ($^1/_9$ x)

Pg, 24

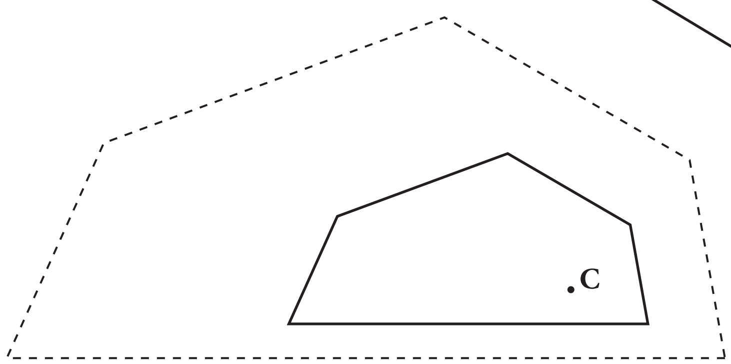
1a)



1b)



1c)

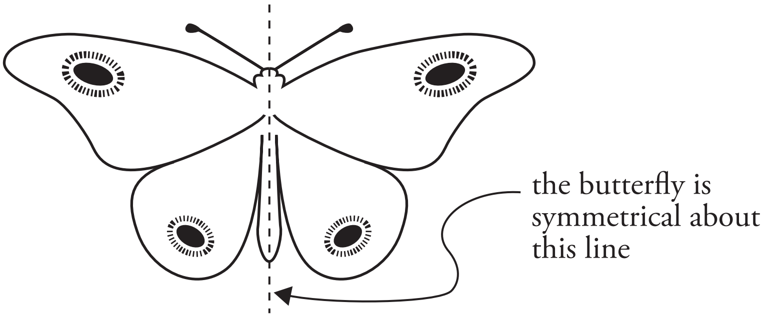


SECTION 4.

SYMMETRY

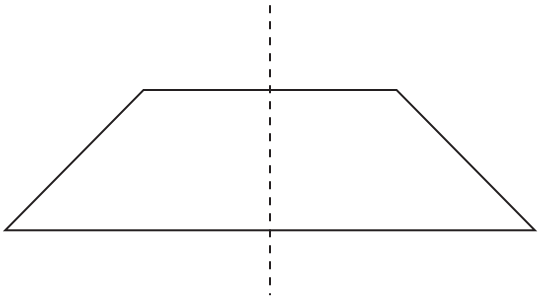
SYMMETRY

Many shapes in the environment are symmetrical.
Consider this picture of a butterfly:



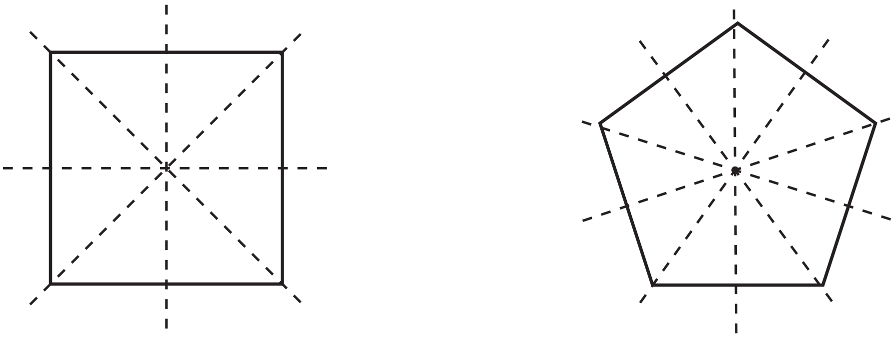
LINE OF SYMMETRY OR REFLECTION / BILATERAL SYMMETRY

Shapes that have reflection symmetry are those where one half of the shape is a mirror reflection of the other half, e.g.



The reflection line is called the line or axis of symmetry.

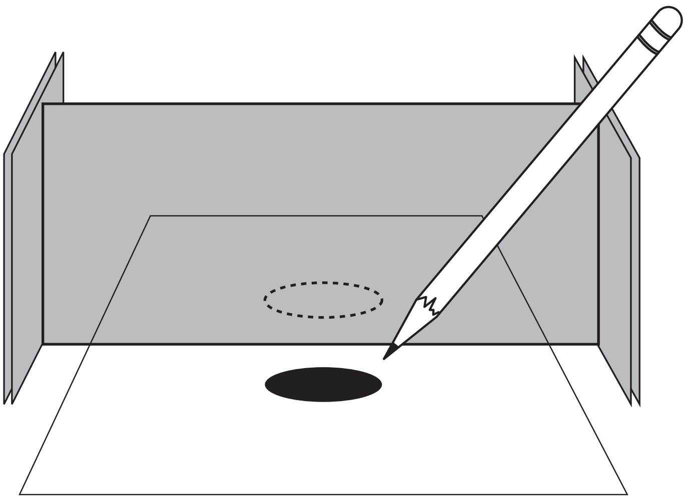
Some shapes have more than one line of symmetry, e.g.

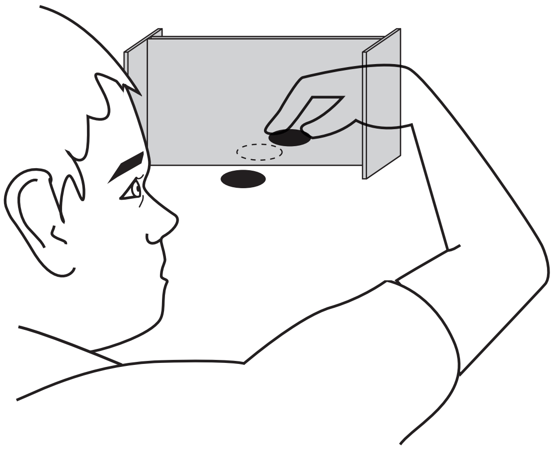


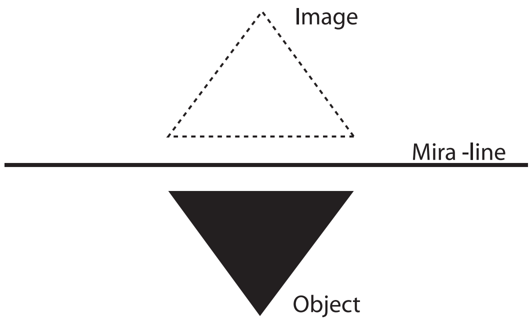
LINE OF SYMMETRY

To test for reflection symmetry you can:

a) Use a mirror or ***mira*** to see if one half can be reflected onto the other half.



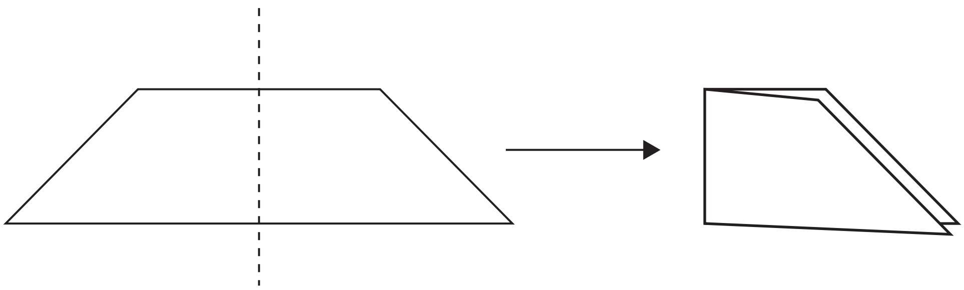




MIRA
This is a small plastic device that is used to help students gain an understanding of the concept of reflections.

The object is reflected in the plastic, enabling the student to draw the mirror image by looking through the plastic.

b) Try to fold one half onto the other half.

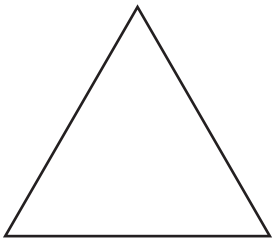


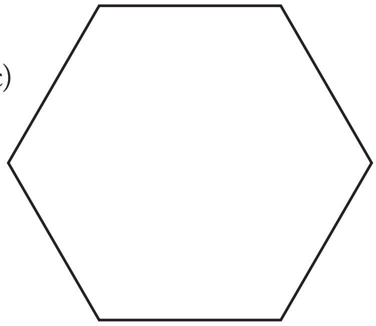
If this is possible then the fold line is the line of symmetry.

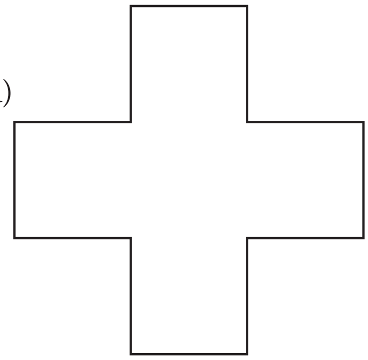
SYMMETRY Check Point

1. *Show all the lines of symmetry for the following shapes:*

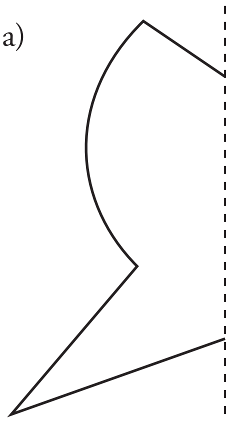
a) 

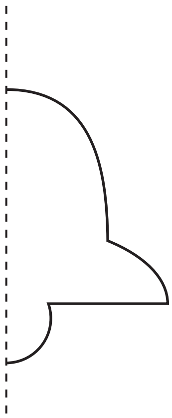
b) 

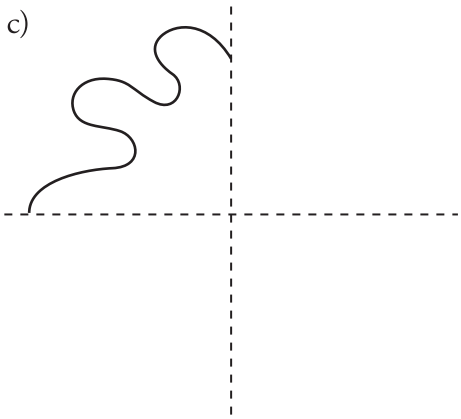
c) 

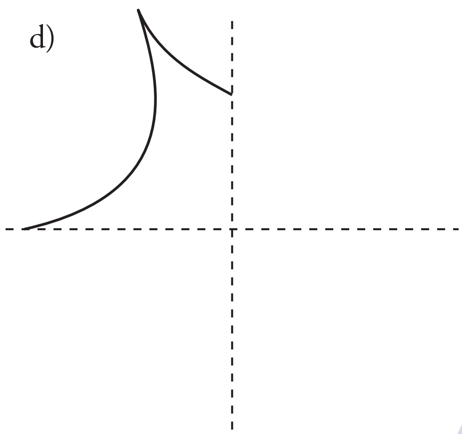
d) 

2. *Complete the following symmetric shapes.*

a) 

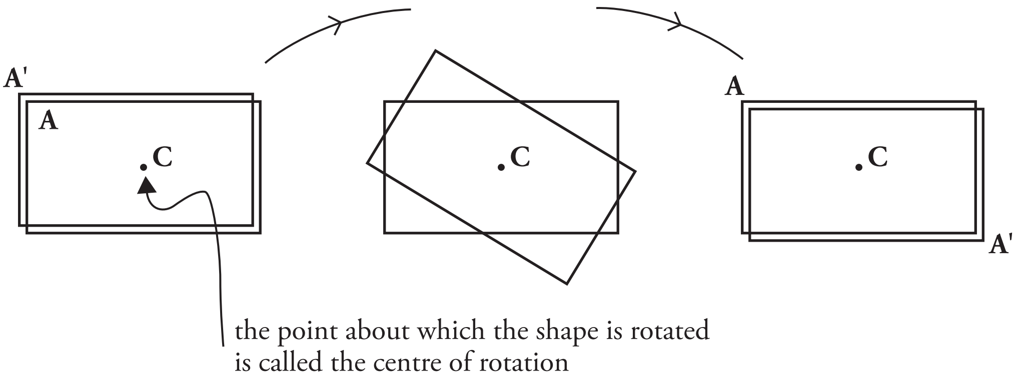
b) 

c) 

d) 

ROTATIONAL SYMMETRY OR TURN SYMMETRY

Fans and windmills are examples of objects with rotational symmetry. A shape can be tested for rotational symmetry by tracing the shape, and rotating the tracing around the original shape. If the shape matches other than in the original position then the shape has rotational symmetry.



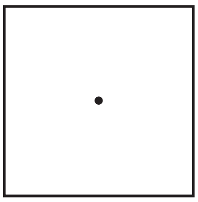
The rectangle has an order of rotational symmetry of 2, i.e. if you turn the rectangle through 180° it will match the original shape.

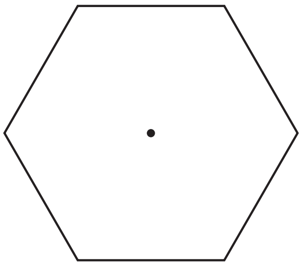
NOTE:
All shapes will match if you turn the tracing through 360°. If this is the only place where they match, then these shapes don't have rotational or turn symmetry.

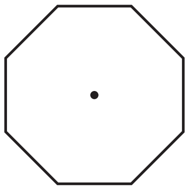
Order of Rotation
The number of times a figure appears to retain its original orientation during one complete rotation about a fixed point.

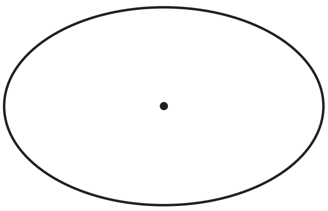
ROTATIONAL SYMMETRY Check Point

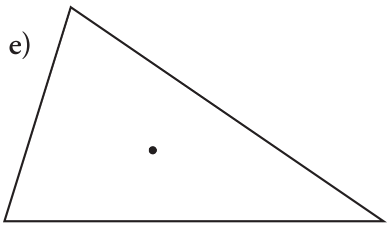
1 *Determine whether the following shapes have rotational or turn symmetry. (Trace them and move the tracing around a point to see if they match). How many times did you turn the tracing to get back to the original orientation?*

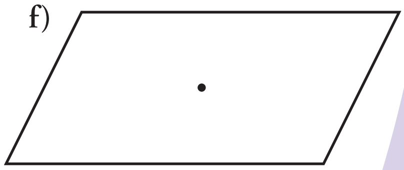
a) 

b) 

c) 

d) 

e) 

f) 

Symmetry Check Point

2 Decide which letters have:

a) reflectional symmetry only
b) rotational symmetry only
c) both reflectional and rotational symmetry
d) no symmetry

A B C D E

F G H I J

K L M N O

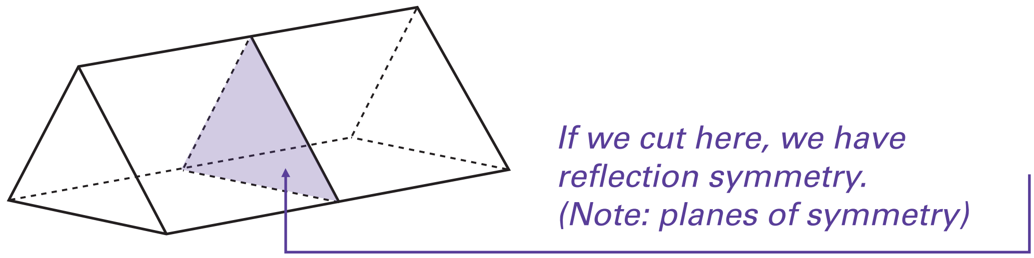
P Q R S T

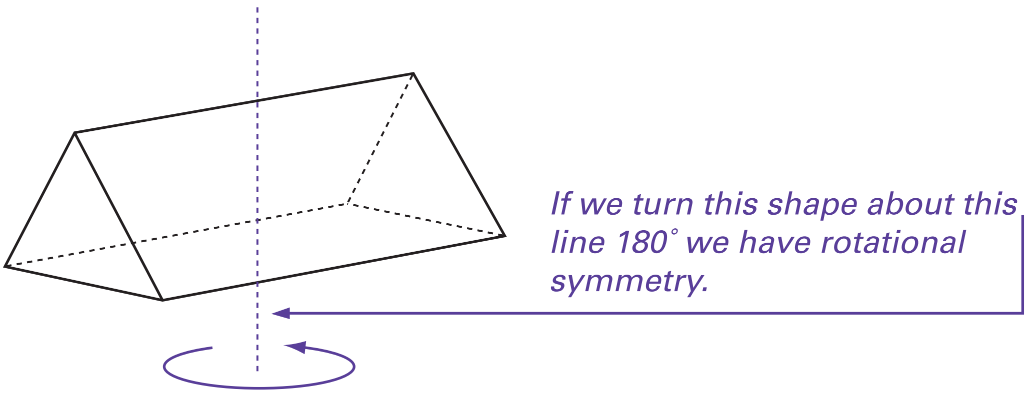
U V W X Y Z

3 Would the font style affect your results?

SYMMETRY & 3D OBJECTS

Three dimensional shapes may also have reflection symmetry and/or rotational symmetry, eg.





SYMMETRY & 3D OBJECTS

1. *List some three dimensional shapes or objects in the environment with:*

   a) ***reflection symmetry***

   b) ***rotational symmetry***

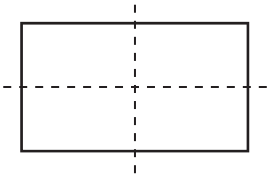
2. *How does symmetry differ for three dimensional objects in comparison to two dimensional shapes?*

SYMMETRY-SOLUTIONS

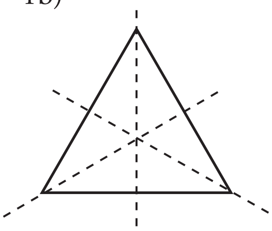
Check Point

Pg, 30

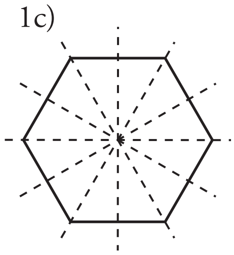
1a)



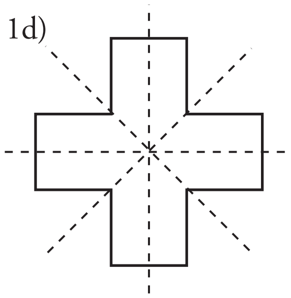
1b)



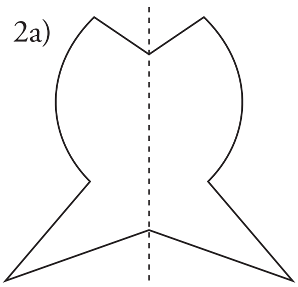
1c)



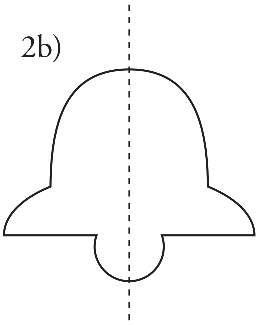
1d)



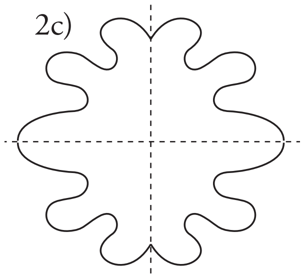
2a)



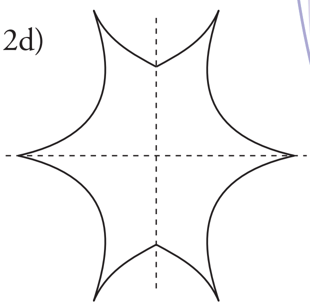
2b)



2c)



2d)



Pg, 31

1a) rotational symmetry of 90˚
1b) rotational symmetry of 60˚
1c) rotational symmetry of 45˚
1d) rotational symmetry of 180˚
1e) no rotational symmetry
1f) rotational symmetry of 180˚

Pg, 32

2a)	reflectional symmetry only	***ABCDEKMTUVWY***
2b)	rotational symmetry only	***NSZ***
2c)	reflectional & rotational symmetry	***HIOX***
2d)	no symmetry	***BFGJLPQR***

3) yes- the type of font will make a difference, eg. B , ***B***

Pg, 33

1a) Depends on the shapes, eg. doors, desks, cupboards.
1b) Fans, windmills, pipes

2)

	2D	3D
Reflectional Symmetry	line of symmetry	plane of symmetry
Rotational Symmetry	centre of rotation	line or axis of rotation

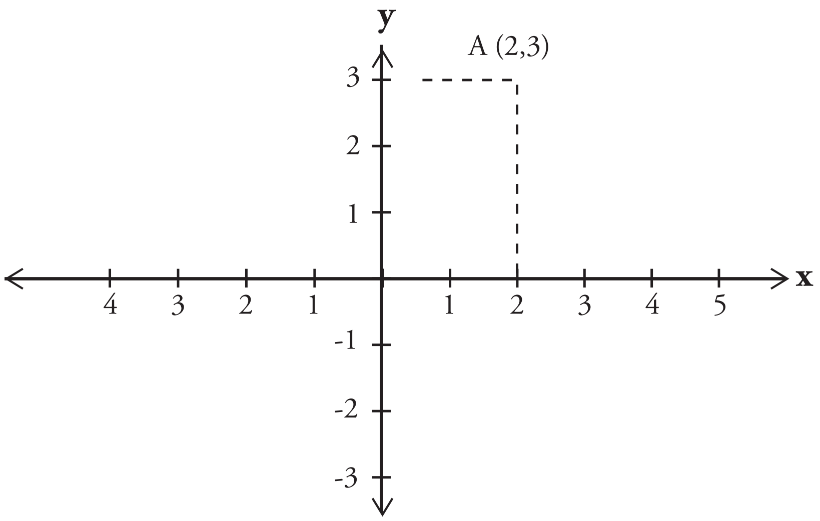
SECTION 5.

CO-ORDINATES

CO-ORDINATES

Co-ordinates are a way of assigning numbers (or letters) to points on a plane. Co-ordinates are met frequently in real life situations such as, in maps and street directories.

In locating the point A(2,3) by convention, the first number is the horizontal co-ordinate (x co-ordinate) and the second number is the vertical co-ordinate (y co-ordinate).



CO-ORDINATES Check Point

1 *On a sheet of grid paper, plot the following sets of points joining consecutive points as you go.*

a) (1, 7), (-4,3), (-5, -2), (0,2), (1, 7)

b) (-5, -2), (0,-6), (5, -2), (6,3), (1, 7), (0,2), (5, -2)

c) (-4,3), (1,-1), (6, 3)

d) (1,-1), (0, -6)

What is the resultant shape?

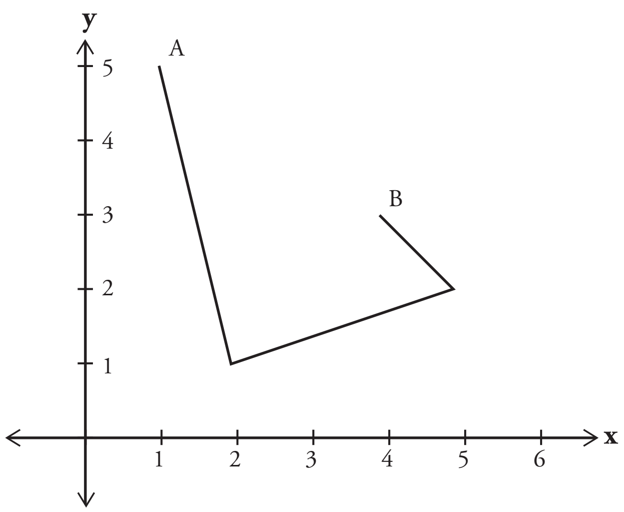
CO-ORDINATES Check Point

2 On a sheet of grid paper, plot the points:

A(-3,5), B(3, 7), C(7,-3), D(-5, -1)

a) What is the resultant shape?
b) List the co-ordinates of the mid points of AB, BC, DC, and AD.
c) What shape is formed by joining these mid points?

3 Describe the directions you would give using co-ordinates, if you travelled from A to B along the path shown.



4 On a sheet of grid paper, plot the points: A(2,6), B(4, -4), C(-6,-2)

What are the co-ordinates of:
a) M, the mid-point of AB?
b) N, the mid-point of AC?
c) What type of figure is NMBC?
d) How does the length of MN compare with BC?

CO-ORDINATES-SOLUTIONS Check Point

Pg. 42

1) A cube

Pg. 43

2a) a quadrilateral
2b) (0,6), (5,2), (1,-2), (-4,2)
2c) parallelogram

3) Start at (1,5) then go to (2,1), then go to (5,2) and then finish at (4,3).

4a) M (3,1)
4b) N (-2,2)
4c) Trapezium
4d) a half

SECTION 6

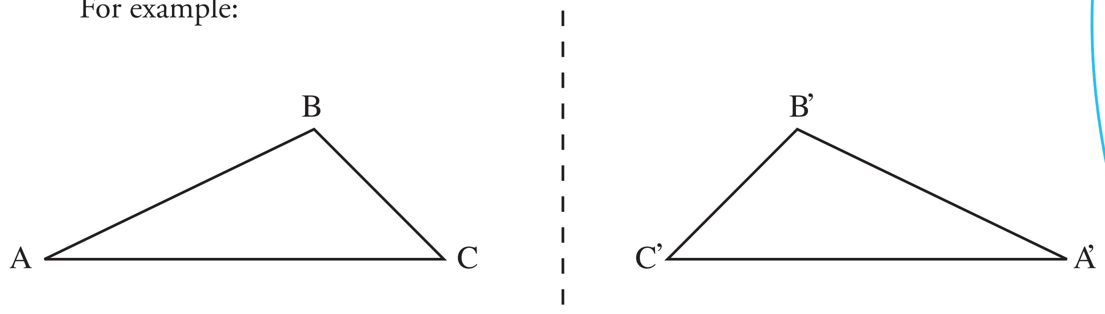
TRANSFORMATIONS

TRANSFORMATIONS

A transformation is the movement of a shape from one position to another. The movement of shapes can be derived from three basic moves:

i) A ***reflection*** or ***flip*** is where a shape is reflected (or flipped) about a line, called the line of reflection, to a new position.

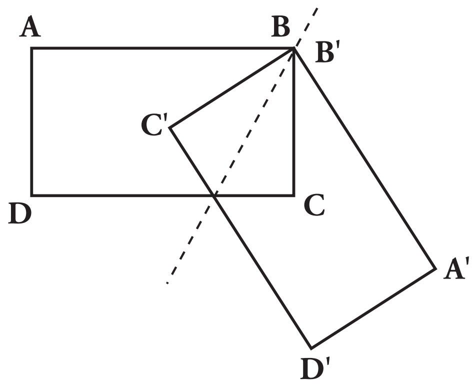
For example:



Old position ***Line of reflection*** ***New Position***

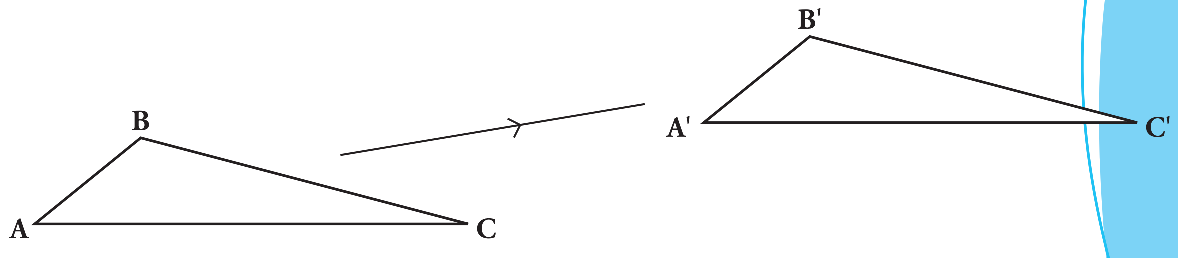
The shape is just as far in front of the line of reflection as behind it. A good example of a reflection or flip is when you look in the mirror. So another way of describing a reflection is by calling it a mirror image.

*Note that the line if intersection may intersect the shape.



ii) A ***translation*** or ***slide*** is where a shape is translated or slid, to a new position.

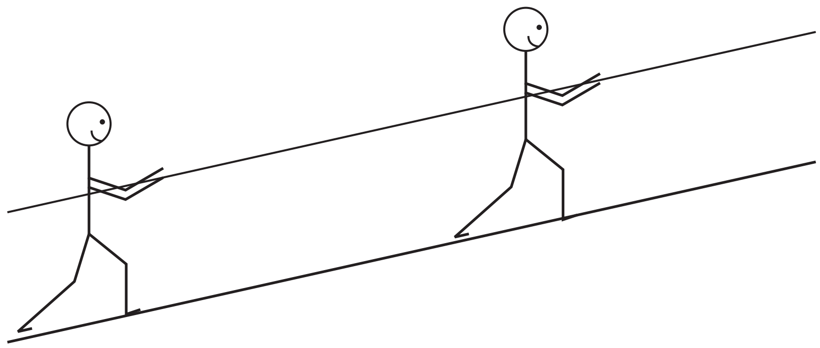
For example:



Old position ***New Position***

The shape is not 'turned' or 'twisted' in any way and that the slide can be in any direction.

An example of a translation or slide would be an escalator in a shopping centre. People are translated from one level to another.

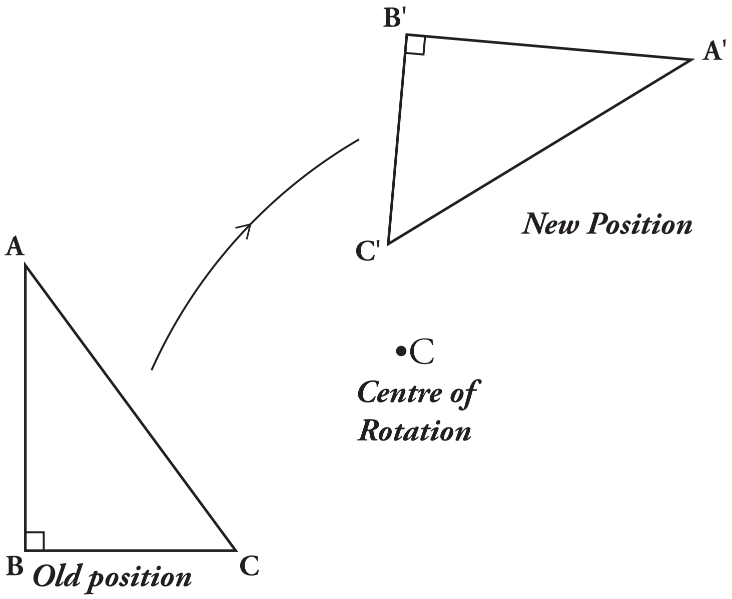


Old position ***New Position***

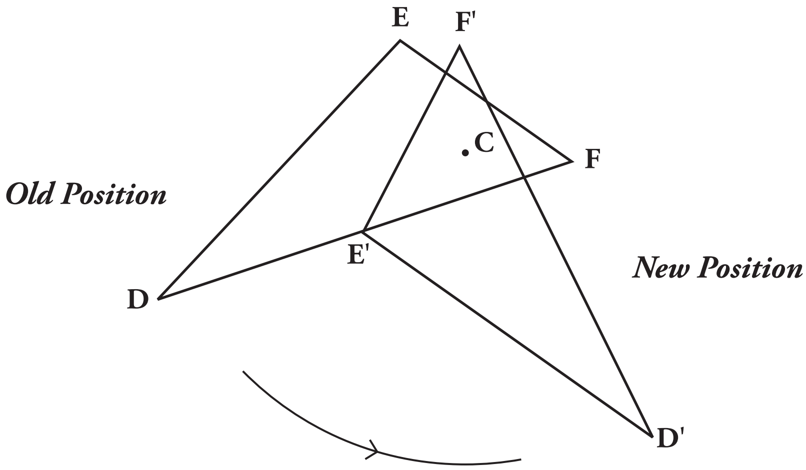
Another example would be children on a slide in a playground.

iii) A shape may be rotated or turned.

For example:



*Note that the centre of rotation may be inside the shape.



Good examples of rotations or turns in the environment would be the fan blades of windmills. fans, propellers, etc.

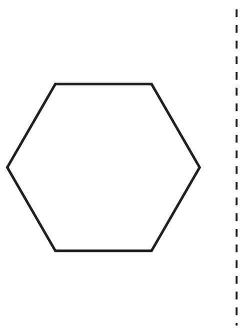
Translations, rotations and reflections involve changes in location only and do not involve changes in size and shape. The shape is not changed, therefore the two shapes are congruent.

TRANSFORMATIONS Check Point

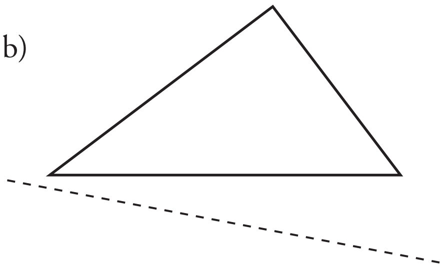
1. *Reflect the following shapes about the lines of reflection given.*

Note: *A Mira or tracing paper would be helpful.*

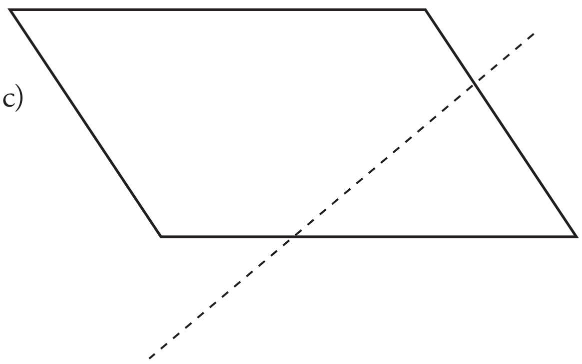
a)



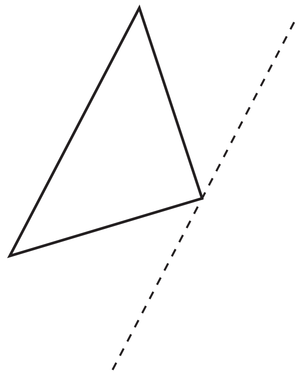
b)



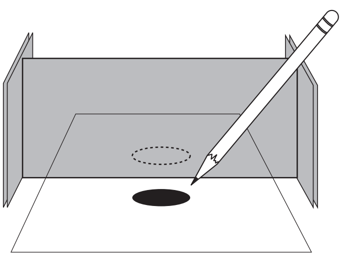
c)

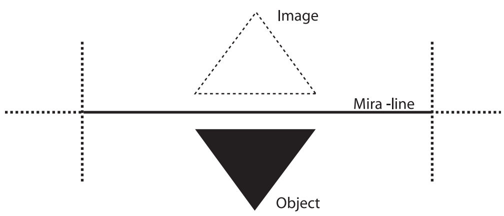


d)



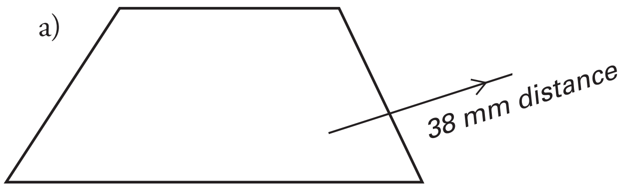
Mira



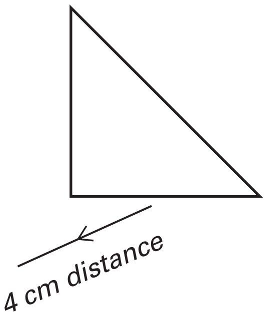


2. *Slide the following shapes in the given direction and distance to a new position.*

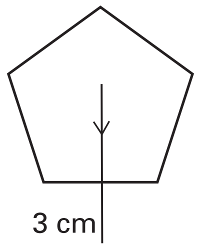
a)



b)



c)

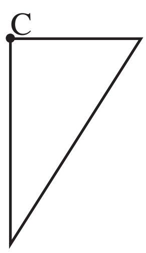


3. *Rotate the following shapes about the given centre of rotation and direction to a new position (again tracing paper would be helpful).*

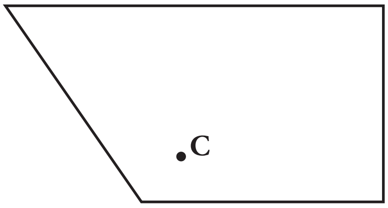
a)

180˚ Clockwise

b)



90˚ Anti-clockwise

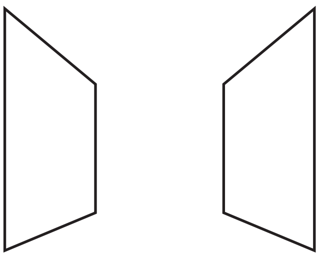
c) 

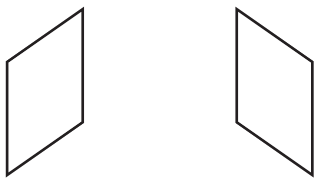
270° Anti-clockwise

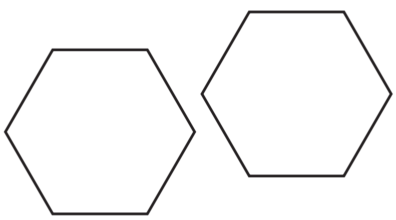
4. *Classify the following movements as reflections, rotations or translations*

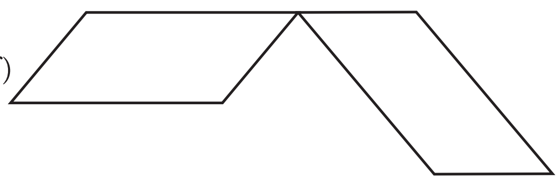
a) 

b) 

c) 

d) 

e) 

f) 

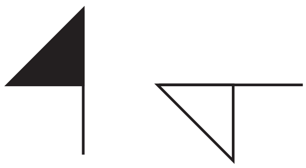
TRANSFORMATIONS Check Point

5. In each of these sketches, the shaded flag has been moved to a new position. Decide in each case whether the transformation is a reflection, a rotation, a translation, or some combination of these. Use a mira, mirror, or tracing paper if you wish.

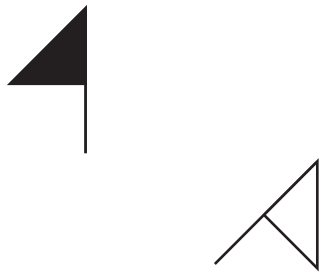
a)

b)

c)

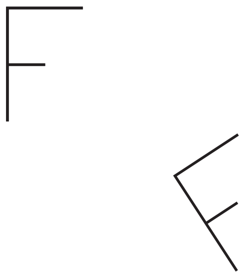


d)

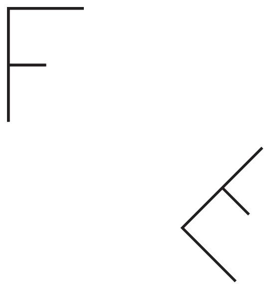


6. Show how the shape in each case can be moved from position 1 to position 2.

a)



b)



7. In summary, what information must be given for a shape to under go:

a) a reflection

b) a translation

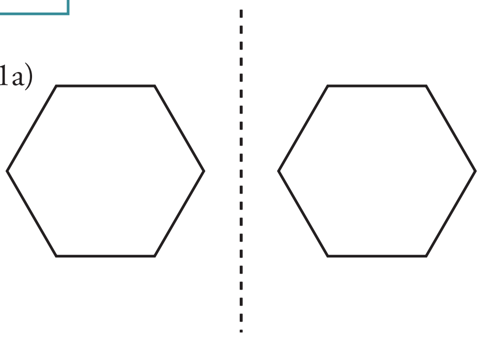
c) a rotation

TRANSFORMATIONS-SOLUTIONS

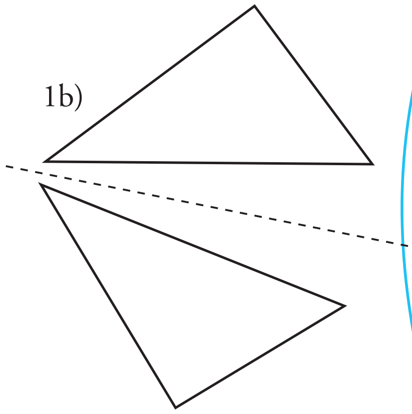
Check Point

Pg. 49

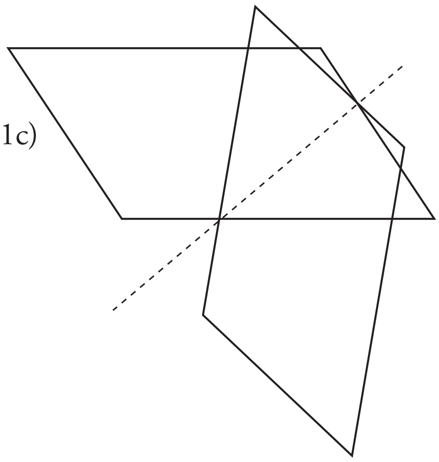
1a)



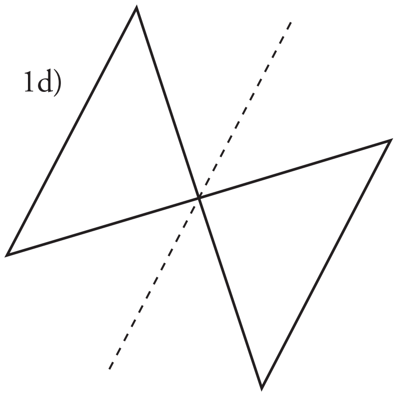
1b)



1c)

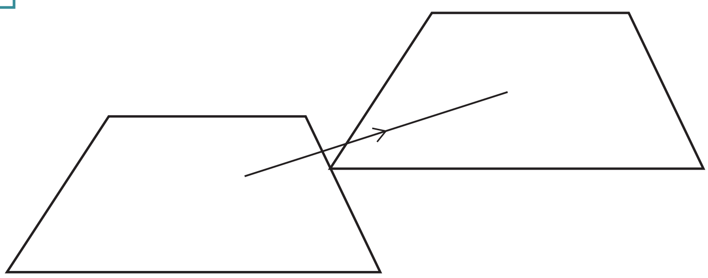


1d)

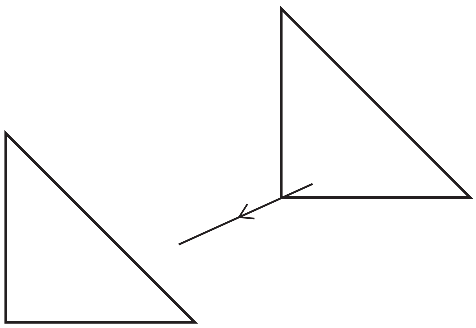


Pg. 50

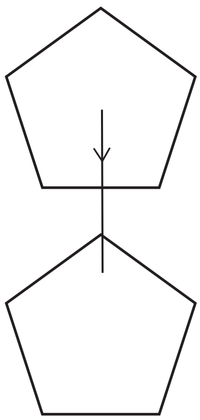
2a)



2b)



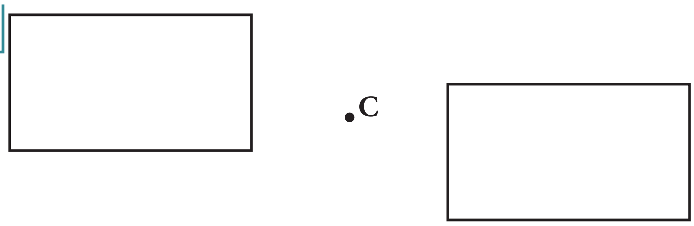
2c)



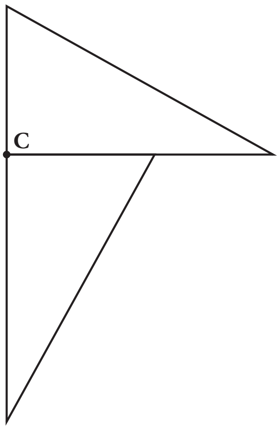
TRANSFORMATIONS-SOLUTIONS
Check Point

Pgs. 50-51

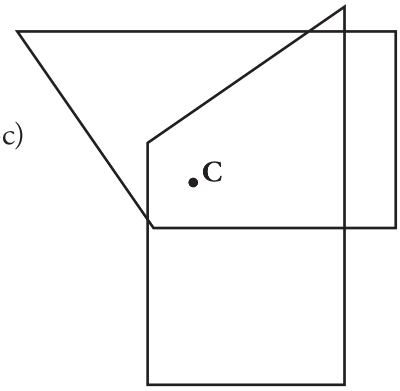
3a)



3b)



3c)



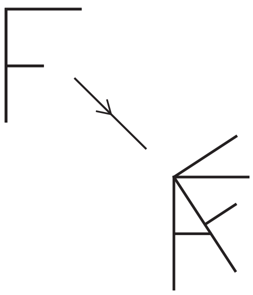
Pg. 51

4a)	translation	4b)	rotation
4c)	reflection	4d)	reflection
4e)	translation	4f)	rotation

Pg. 52

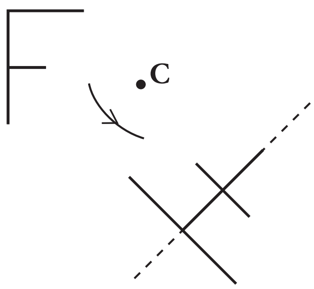
5a)	translation	5b)	reflection and translation
5c)	rotation and translation	5d)	reflection, translation and rotation

6a)



translation
then
rotation

6b)



rotation
then
reflection

7a) the position of the line if reflection
7b) the direction and distance of the translation
7c) the centre and the angle of rotation

SECTION 7

ANGLES

ANGLES

Measuring Angles

An angle is made up of two arms (or rays) and a corner (or vertex).

Figure 1

∠ABC, or ∠CBA

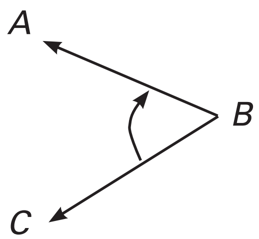
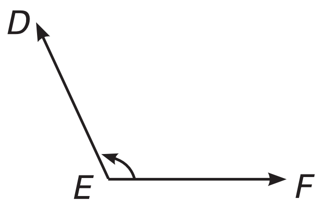


Figure 1

∠DEF, or ∠FED



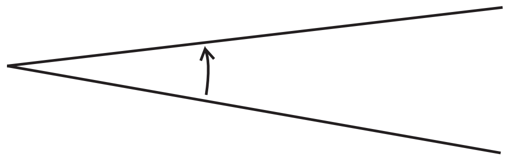
Notice how the angles are named

∠ABC is a 'sharp' point

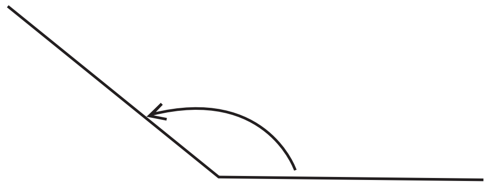
∠DEF is a 'blunt' point

Angles are given particular names associated with their size.

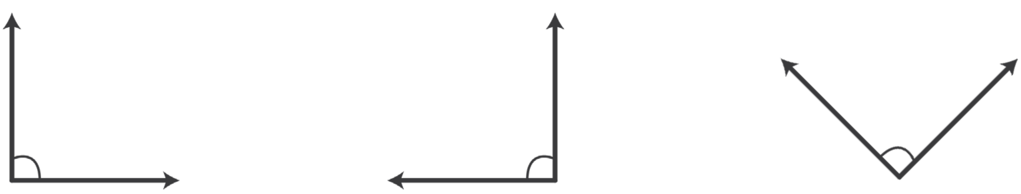
Sharp angles between 0-90° are called acute angles.



Blunt angles between 90° - 180° are called obtuse angles.

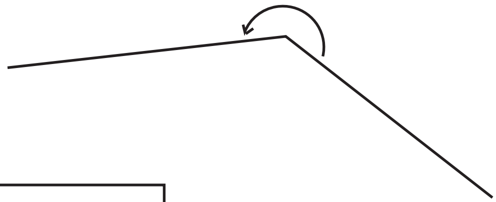


The most common angle we use is the right angle or 90° angle. We see it where a floor meets the ceiling, in corners of rooms, in squares and rectangles, etc. The angles below are all right angles.



180° angles are straight angles.

Angles between 180° - 360° are called reflex angles.

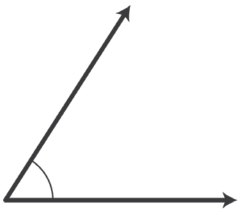


An angle can be measured using a protractor.

Semi-circular protractors may be found in many classes. However it makes more sense to use a full-circle protractor, when measuring reflex angles.

ANGLES

1. *Write the correct label for each of these angles:*



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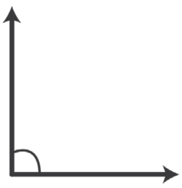

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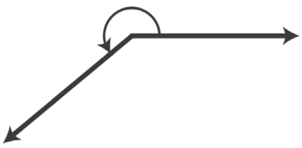

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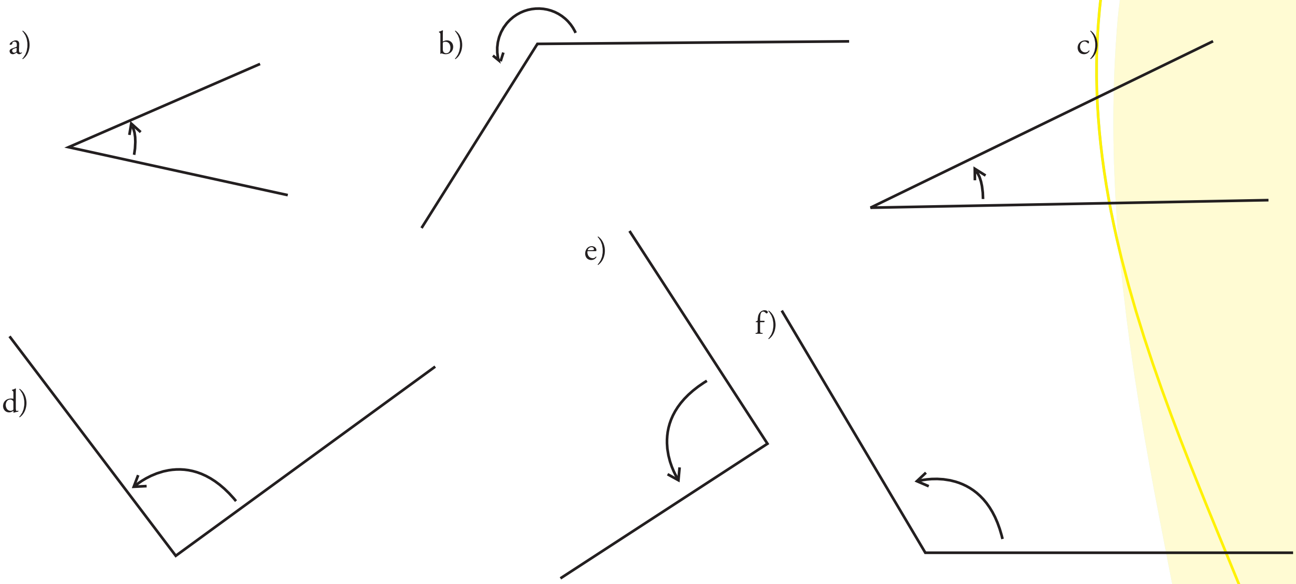
ANGLES

Check Point

2. *Estimate the size of these angles and write the type of angle next to each of them.*



3. *Now measure the actual size of each angle.*

______________ ______________ ______________

______________ ______________ ______________

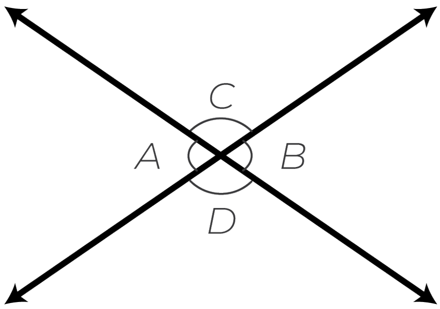
4. *Construct each of these angles.*

a) 90° *b) 82°*

c) 125° *d) 173°*

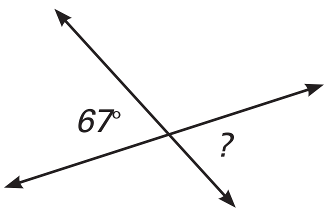
ANGLES Check Point

When two straight lines cross each other, there are pairs of angles formed. The opposite angles are always the same size. They are called vertically opposite angles. The 'vertically' refers to the vertex or the point where the lines cross each other.



Angle a = Angle b ($\angle a = \angle b$)
Angle c = Angle d ($\angle c = \angle d$)

5. *Write the correct angle size for both of these.*



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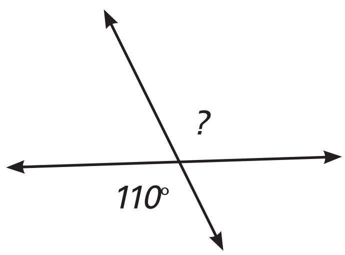

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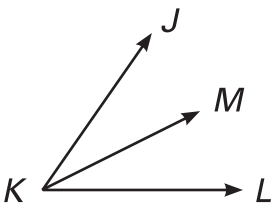
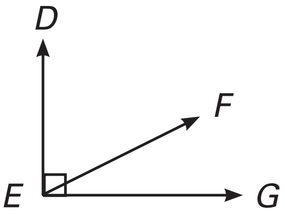
ANGLES

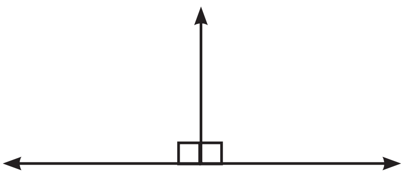
Adjacent angles are two angles in the same plane with a common side and a common vertex (point). Angles JKM and MKL are adjacent angles.

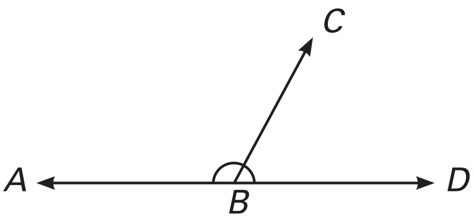


Complementary angles are two angles that together make a right angle (90°). Angles DEF and FEG are complementary.



Supplementary angles are two angles that together make 180°; e.g. two right angles are supplementary; angles ABC and CBD are supplementary.

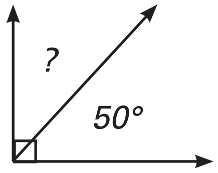




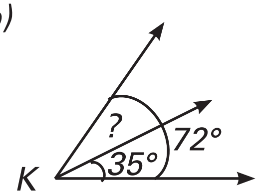
ANGLES Check Point

6. Name the size of these angles.

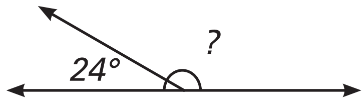
a)



b)

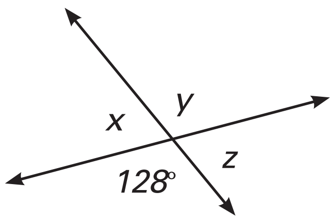


c)



__________ __________ __________

7. What size are angles x, y and z?



ANGLES-SOLUTIONS

Check Point

Check Point 1

1. Answers as per angles in pics.
2. Compare estimates with actual measures (below).
3. a) 37° b) 242° c) 27° d) 89°
e) 90° f) 119°
4. Correct angle sizes.
5. 67° 110°
6. a) 40° b) 37° c) 156°
7. ∠x = 52°; ∠y = 128°; ∠z = 52°