

A Complete Guide to ...

Geometry

Geometry

Utilising the objectives as written in
MATHEMATICS in the New Zealand CURRICULUM
for

Level 4

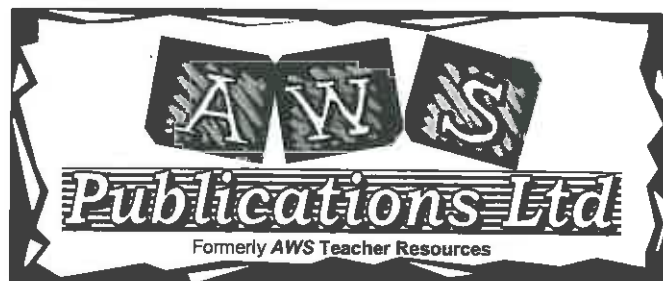
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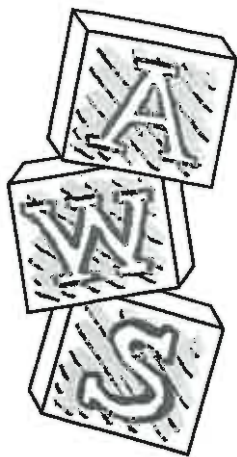
- Table of contents
- Teaching notes
- In class activity sheets involving
 - worked examples
 - basic skills
 - word problems
 - problem solving
 - group work
- Homework / Assessment activity sheets
- Answers



These resources are supplied as **PHOTOCOPY MASTERS**

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Note from the author:

This resource ...

*A Complete Guide to Geometry

is one of a series of FIVE resources written utilising the objectives as stated in

Mathematics in the New Zealand Curriculum for Level 4.

With my experiences as a specialist mathematics teacher, I enjoyed mathematics as a subject, but I am aware that not all teachers feel the same way about mathematics. It can be a difficult subject to teach, especially if you are unsure of the content or curriculum and if resources are limited.

This series of resources has been written with you in mind. I am sure you will find this resource easy to use and of benefit to you and your class.

Resources in this series:

A Complete Guide to Number

written utilising the objectives as stated in

Mathematics in the New Zealand Curriculum for Level 4

Resource Code:
L4MN

A Complete Guide to Measurement

written utilising the objectives as stated in

Mathematics in the New Zealand Curriculum for Level 4.

Resource Code:
L4MM

*A Complete Guide to Geometry

written utilising the objectives as stated in

Mathematics in the New Zealand Curriculum for Level 4.

Resource Code:
L4MG

A Complete Guide to Algebra

written utilising the objectives as stated in

Mathematics in the New Zealand Curriculum for Level 4.

Resource Code:
L4MA

A Complete Guide to Statistics

written utilising the objectives as stated in

Mathematics in the New Zealand Curriculum for Level 4.

Resource Code:
L4MSt

For more information about these and other resources, please contact ...



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Acknowledgement:

I would like to thank the staff and pupils of **Mairehau Primary School, Christchurch** for their assistance in making these resources possible.

This resource has been divided into EIGHT sections as listed below.

Although there are no page numbers, the sections follow in sequential order as listed.

Note: 'In-class' Worksheets Masters are lesson by lesson reusable worksheets that can be photocopied or copied on to an OHP.

Homework / Assessment Worksheets Masters can be used as homework to reinforce work covered in class or they can be used for pupil assessment.

Section	
1	List of Geometry Objectives: Table of 'In-class' Worksheets / Objectives covered
2	Table of Contents: 'In-class' Worksheets
3	'In-class' Worksheets Masters
4	Teaching Notes / Answers for 'In-class' Worksheets
5	Table of Contents: Homework / Assessment Worksheets
6	Homework / Assessment Worksheets Masters
7	Answers for Homework / Assessment Worksheets
8	Worksheet tracking sheets for teachers to record pupil names / worksheets covered

The following are the objectives for **Geometry, Level 4**, as written in the **MATHEMATICS** in the *New Zealand Curriculum* document, first published 1992. [REFER PAGE 104]

Exploring shape and space

Within a range of meaningful contexts, students should be able to:

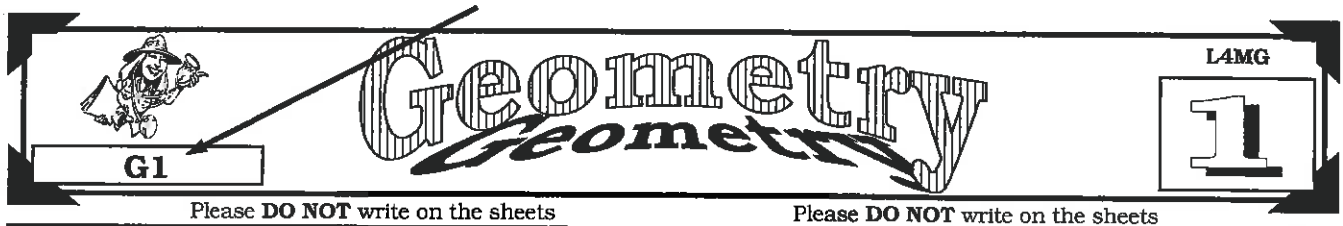
- **G1** construct triangles and circles, using appropriate drawing instruments;
- **G2** design the net and make a simple polyhedron to specific dimensions;
- **G3** make a model of a solid object from diagrams which show views from the top, front, side, and back;
- **G4** draw diagrams of solid objects made from cubes;
- **G5** specify location, using bearings or grid references.

Exploring symmetry and transformations

Within a range of meaningful contexts, students should be able to:

- **G6** apply the symmetries of regular polygons;
- **G7** describe the reflection or rotational symmetry of a figure or object;
- **G8** enlarge and reduce a 2-dimensional shape and identify the invariant properties.

At the top of each 'In-class' worksheet and Homework / Assessment worksheet, the Geometry objective(s) being covered has been indicated. EXAMPLE: **G1** means objective 1, **G2** means objective 2, etc.



The Mathematical Processes Skills:

**Problem Solving,
Developing Logic & Reasoning,
Communicating Mathematical Ideas,**

are learned and assessed within the context of the more specific knowledge and skills of number, measurement, geometry, algebra and statistics. The following are the **Mathematical Processes Objectives for Level 4**.

Problem Solving Achievement Objectives [Refer page 24]

- **MP1** pose questions for mathematical exploration;
- **MP2** effectively plan mathematical exploration;
- **MP3** devise and use problem-solving strategies to explore situations mathematically;
- **MP4** find, and use with justification, a mathematical model as a problem-solving strategy;
- **MP6** use equipment appropriately when exploring mathematical ideas.

Developing Logic and Reasoning Achievement Objectives [Refer page 26]

- **MP8** classify objects, numbers and ideas;
- **MP9** interpret information and results in context;
- **MP10** make conjectures in a mathematical context;
- **MP15** use words and symbols to describe and generalise patterns.

Communicating Mathematical Ideas Achievement Objectives [Refer page 28]

- **MP16** use their own language and mathematical language and diagrams to explain mathematical ideas;
- **MP17** devise and follow a set of instructions to carry out a mathematical activity;
- **MP20** record information in ways that are helpful for drawing conclusions and making generalisations;
- **MP21** report the results of mathematical explorations concisely and coherently.

Note:

The codes **MP1**, **MP2**, etc. have been created by numbering the **Mathematical Processes Achievement Objectives** in order as listed in the **MATHEMATICS** in the *New Zealand Curriculum* document. The numbering gaps occur as not all objectives are covered at **Level 4**. [REFER TO PAGES 23 - 29 OF THE CURRICULUM DOCUMENT]

'In-class' Geometry Worksheets

Table of Worksheet Number / Objectives Covered

See the opposite page for details of each objective.

Worksheet Number	Geometry Objectives								Mathematical Processes Objectives													
	G 1	G 2	G 3	G 4	G 5	G 6	G 7	G 8	MP 1	MP 2	MP 3	MP 4	MP 6	MP 8	MP 9	MP 10	MP 15	MP 16	MP 17	MP 20	MP 21	
1	*										*				*							
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Table of Contents for the 'In-class' Worksheet Masters for Geometry, Level 4

Worksheet Number	Topic	Geometry Objective(s)
1	Geometry key facts / Naming angles	G1
2	Measuring and drawing angles	G1
3	Adjacent angles on a straight line	G1
4	Angles around a point	G1
5	Vertically opposite angles	G1
6	Angles in a triangle	G1
7	Constructing triangles	G1
8	Creating designs involving circles	G1
9	Understanding and drawing 'nets'	G2
10	Creating and designing nets	G2
11	View diagrams and making models	G3 / G4
12	Drawing on isometric paper	G3 / G4
	Isometric paper Master Sheet	
13	Describing location using grid references	G5
	Map or grid references Master Sheet	
14	Finding location using co-ordinates	G5
15	Finding location using compass points	G5
16	Finding location using bearings measured from North	G5
17	Creating pathways (loci)	G5
18	Reflecting shapes and locating mirror lines	G6
19	Creating designs involving reflection	G6
20	Reflective symmetry	G7
21	Rotating shapes and finding the centre of rotation	G6
22	Rotational symmetry	G7
23	Describing symmetrical designs	G7
24	Finding the scale factor for an enlargement / Finding the centre of an enlargement	G8
25	Drawing enlargements	G8
	Teaching Notes / Answers	



Geometry

L4MG

1

G1

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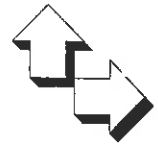
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Geometry key facts:

"Turn clockwise!" said Geoff, "Not that way, the other way!"

"What angle is that?" asked Ken, "Acute, obtuse or reflex?"

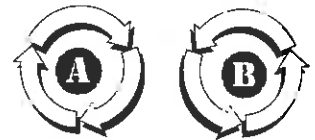
"Are these two lines parallel or perpendicular?" asked Alf.



Do you understand the meaning of these and other geometric words?

Task 1

Complete each sentence below by replacing the ♦ with one of the words from the list in the box.



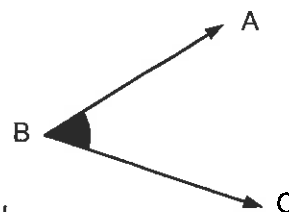
- The arrows around letter A are pointing in a ♦ direction
- The arrows around letter B are pointing in an ♦ direction.
- An ♦ is a measure of turn.
- Angle size is measured in ♦.
- A ♦ is used to measure angle size.
- A ♦ is used to draw circles.
- A ♦ is used to draw and measure straight lines.
- An angle that is 90° or a $\frac{1}{4}$ turn is called a ♦ angle.
- An angle that is 180° or a $\frac{1}{2}$ turn is called a ♦ angle.
- An ♦ angle is greater than 0° but less than 90° .
- An ♦ angle is greater than 90° but less than 180° .
- A ♦ angle is greater than 180° but less than 360° .
- Two lines that cross at right angles are ♦.
- Two lines that are the same distance apart are ♦.

straight
ruler
acute
parallel
clockwise
obtuse
protractor
compass
perpendicular
right
degrees
angle
reflex
anti-clockwise

Naming angles:

In this diagram, the vertex of the angle is B.

The arms of the angle are the lines AB and BC.



This angle can be named using three letters.

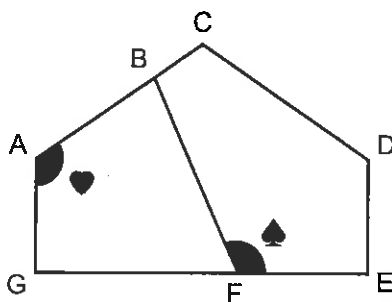
Example: $\angle ABC$ or $\angle CBA$, where the \angle symbol means angle.

If there is only one angle at the vertex, then a single letter can be used to name the angle.

Example: $\angle B$

Task 2

Copy the diagram below.



- Name the angle marked with a ♠ using three letters.
- Name the angle marked with a ♥ using one letter.
- On your diagram, mark $\angle D$ with an X.
- Name two lines that are parallel.
- Name two lines that are perpendicular.
- Name all the acute angles in this diagram.
- Name all the right angles in this diagram.
- Name all the obtuse angles in this diagram.
- On your diagram, name two reflex angles and mark each reflex angle with a ♦.
- Do the letters on this diagram label the angles in a clockwise or anti-clockwise direction?





G1

Geometry

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2

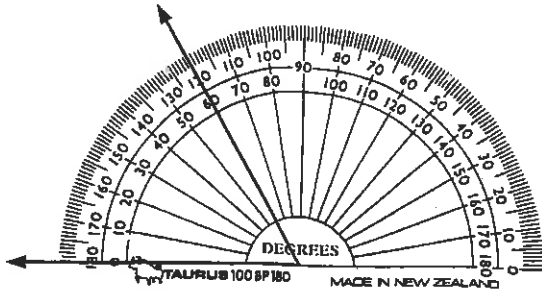
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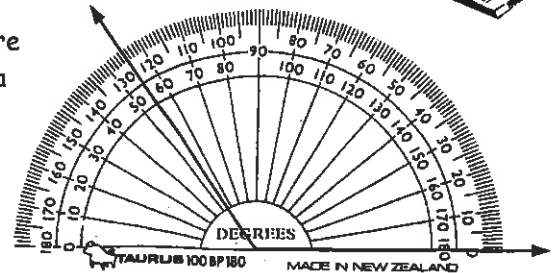
Measuring and drawing angles:

The instrument for measuring and drawing angles is called a protractor.

Example: What is the size of each angle drawn below?



Note: There are two scales on a protractor.

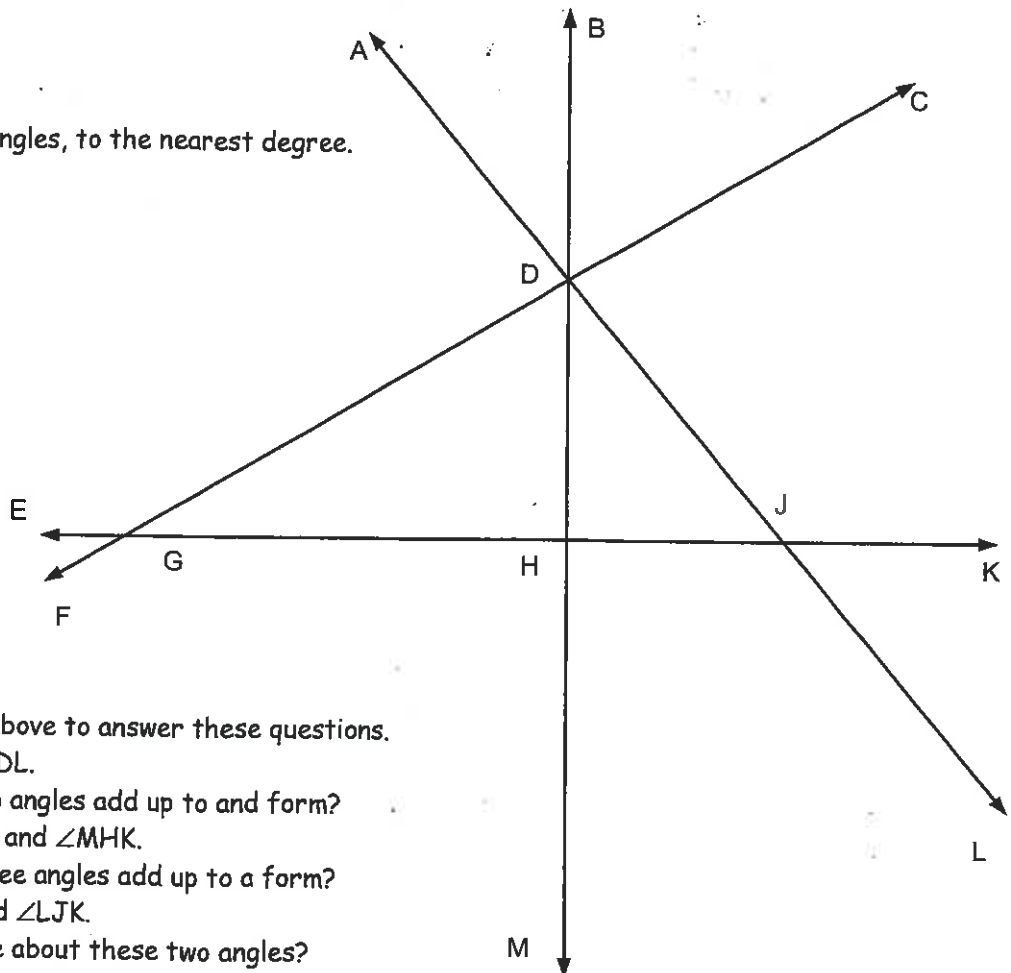


Answer: 60° and 125°

Task 3

Measure the following angles, to the nearest degree.

- $\angle AJE$
- $\angle FDL$
- $\angle EHM$
- $\angle KGC$
- $\angle CDM$
- $\angle EHK$
- $\angle ADC$
- $\angle MHK$
- $\angle LJK$
- $\angle CDL$



Use your angle answers above to answer these questions.

- Add $\angle ADC$ and $\angle CDL$.
What do these two angles add up to and form?
- Add $\angle EHK$, $\angle EHM$ and $\angle MHK$.
What do these three angles add up to a form?
- Compare $\angle AJE$ and $\angle LJK$.
What do you notice about these two angles?

Task 4

Draw the following angles, to the nearest degree, using a protractor.

- | | | | |
|----------------|-----------------|-----------------|-----------------|
| 1. 40° | 2. 75° | 3. 90° | 4. 120° |
| 5. 145° | 6. 43° | 7. 76° | 8. 108° |
| 9. 165° | 10. 143° | 11. 168° | 12. 182° |
13. How can you draw a reflex angle using a protractor that measures only up to 180° ?

Draw the following angles, to the nearest degree, using a protractor.

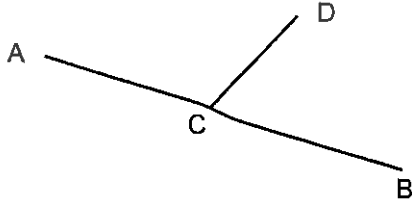
- | | | | |
|-----------------|-----------------|-----------------|-----------------|
| 14. 270° | 15. 195° | 16. 315° | 17. 267° |
|-----------------|-----------------|-----------------|-----------------|

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Adjacent angles on a straight line:

There are many angle rules.

Example: David drew a straight line AB. At a point C on this line, he drew another line CD.



Line AB is a straight line and is also known as a straight angle therefore it equals 180° .

What would $\angle ACD$ and $\angle DCB$ add up to?

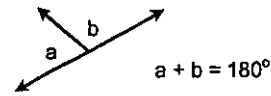
Answer: 180° as the angles are on a straight line.



The two angles, $\angle ACD$ and $\angle DCB$, on this line are called **adjacent angles**. Adjacent means 'next to' and these two angles are next to each other. From this, an angle rule has been created.

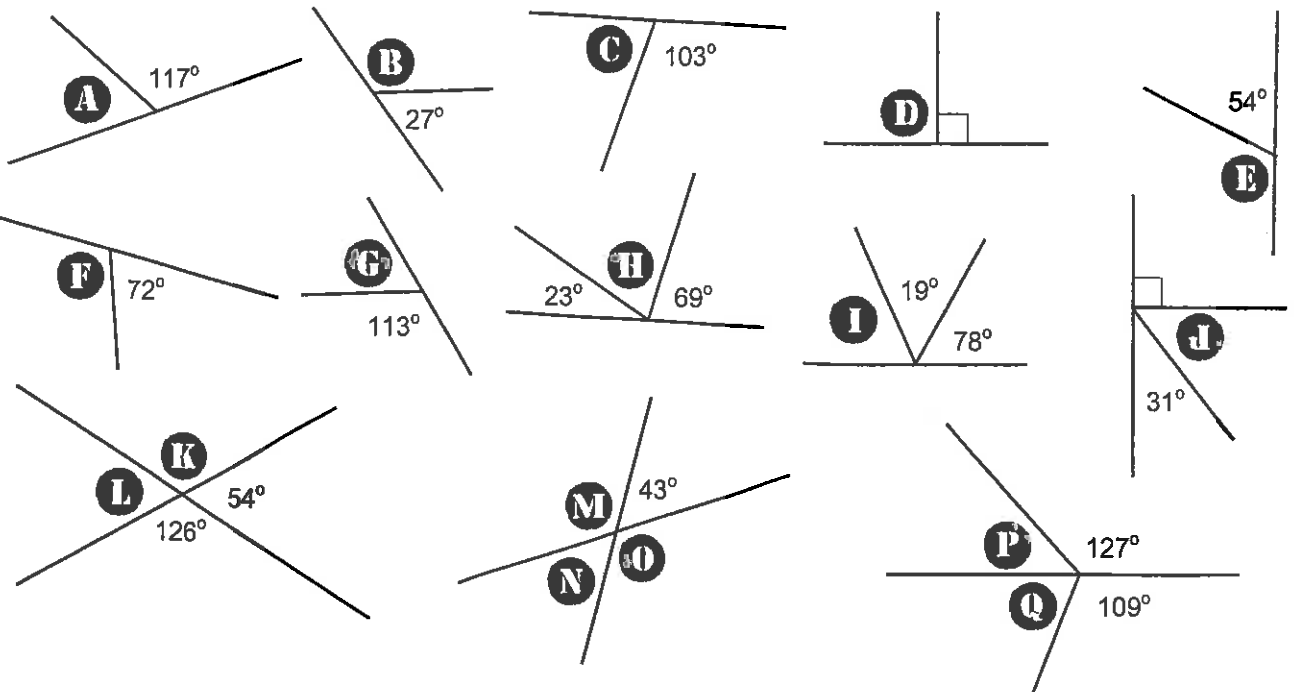
Adjacent angles on a straight line add up to 180°

Example:



Task 5

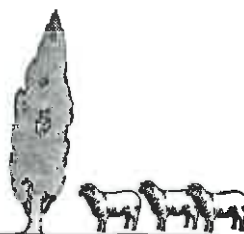
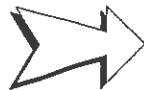
1. Calculate the missing angles (A to Q) in these diagrams. Note: The diagrams are not drawn to scale.



A farmer planted some trees along a fence line to provide shelter for his sheep. Trees normally grow perpendicular to the ground but in this case, wind has forced the trees to lean 7° to the right.

2. What obtuse angle does this row of trees make with the ground?

Wind direction





G1

Geometry

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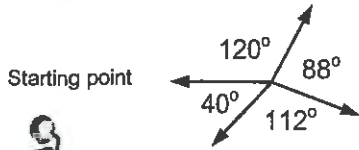
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Angles around a point:

Example: Kylie turned or rotated through various angles, stopping several times until she was facing the same way as she started. Through how many degrees did Kylie rotate?

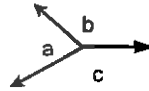


Answer: One complete revolution, therefore 360° .



Angles around a point add up to 360°

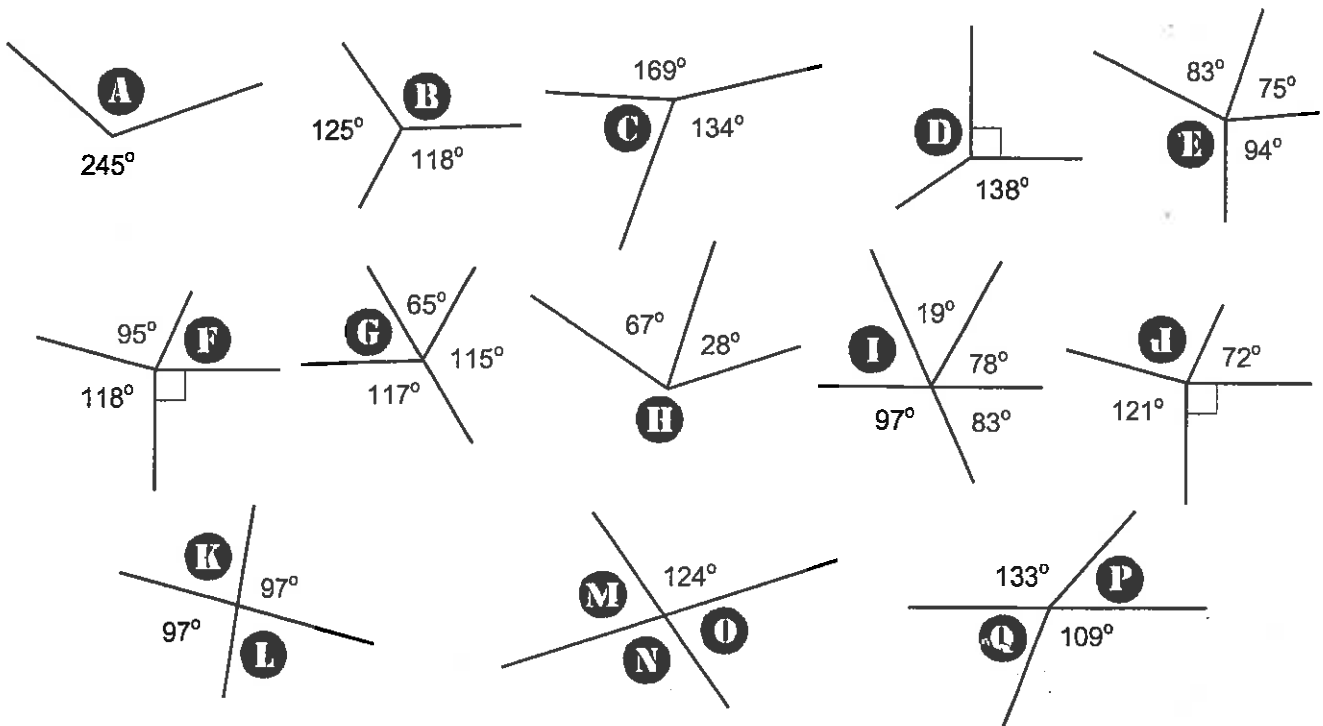
Example:



$$a + b + c = 360^\circ$$

Task 6

1. Calculate the missing angles (A to Q) in these diagrams. Note: The diagrams are not drawn to scale.



Calculate the size of the smaller of the two angles formed by the hands of these clocks.

2.



3.



4.



Several new bicycle wheels are being designed with a different number of equally spaced spokes.

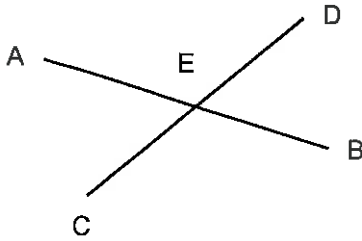
- If there are eight spokes, what is the angle size between each spoke?
- If the spokes of a new wheel have an angle of 30° between them, how many spokes does this wheel have?



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Vertically opposite angles:

Example: Carl drew two straight lines, AB and CD, that crossed at point E.



Consider these two statements.

The two angles, $\angle AED$ and $\angle DEB$ are adjacent angles on the line AB.

The two angles, $\angle DEB$ and $\angle CEB$ are adjacent angles on the line CD.

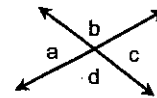
As $\angle DEB$ is common to both pairs of angles, what does that tell us about the angles $\angle AED$ and $\angle CEB$? These angles are directly opposite each other and are called **vertically opposite angles**.

Answer: angles $\angle AED$ and $\angle CEB$ are both the same size.

In the diagram above, name two other angles that are vertically opposite.

Vertically opposite angles are equal

Example:

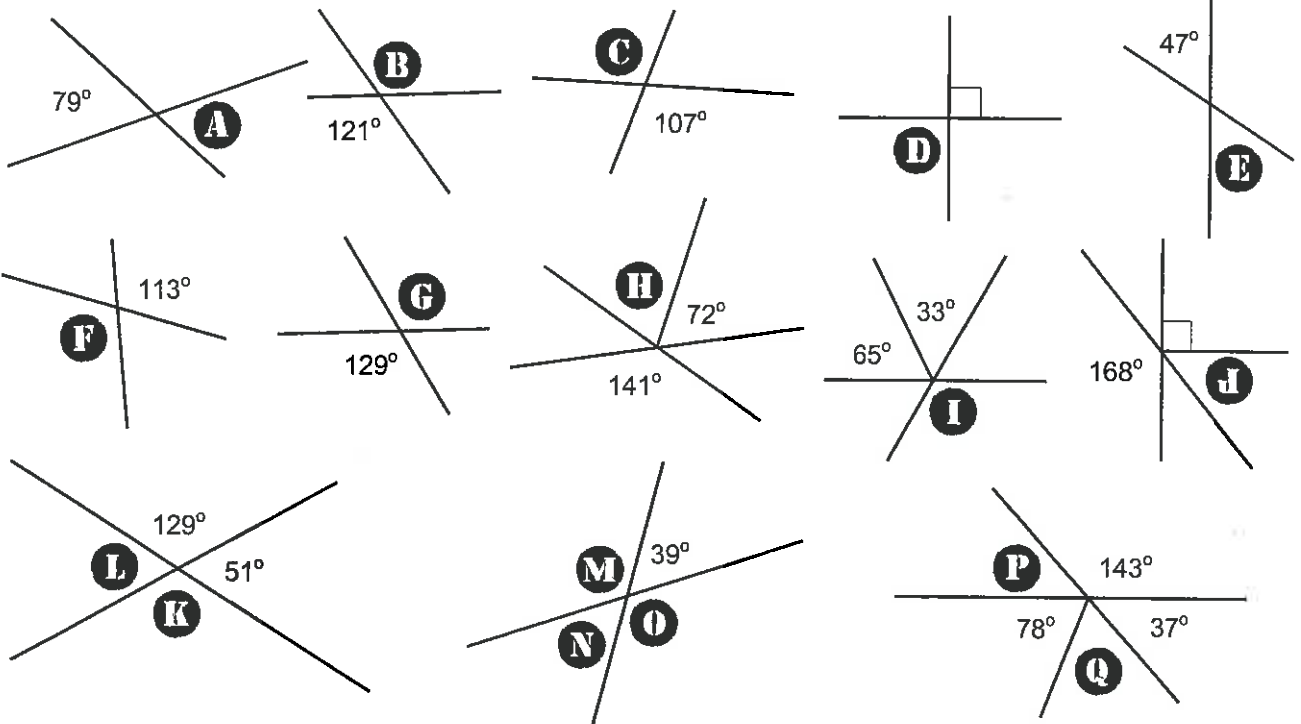


$$\begin{aligned} a &= c \\ b &= d \end{aligned}$$

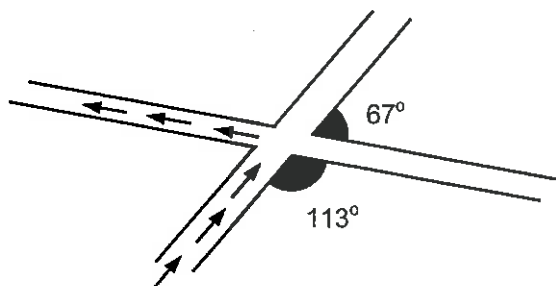


Task 7

1. Calculate the missing angles (A to Q) in these diagrams. Note: The diagrams are not drawn to scale.



Two cross roads intersect as shown in the diagram.



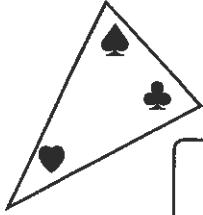
The arrows show which way Mr Davidson drove his car around the corner.

2. Through what angle did he turn, as he drove around this corner?

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Angles in a triangle:

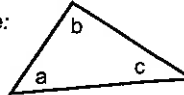
Example: Kylie cut a triangle out of paper. She ripped off each corner and joined them together. What do the three angles of a triangle add up to, if they formed a straight line?



Corners joined together.

Answer: 180° .

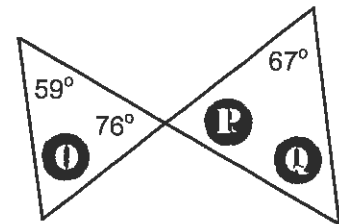
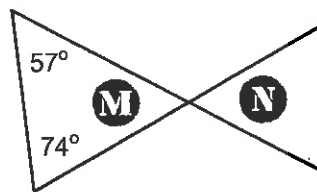
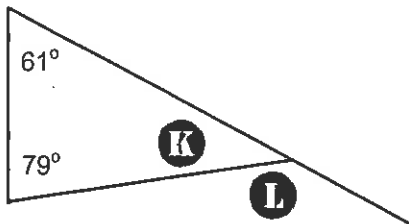
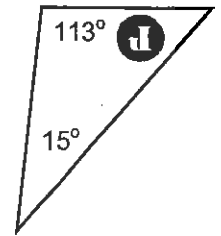
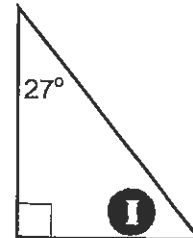
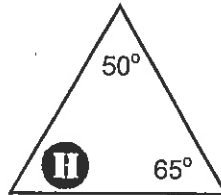
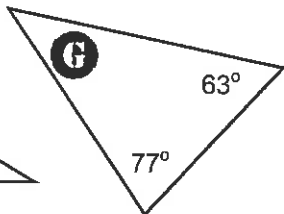
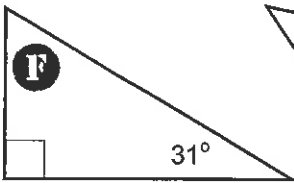
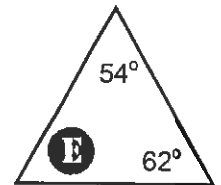
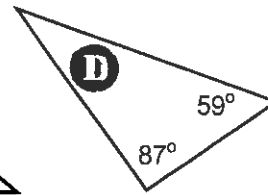
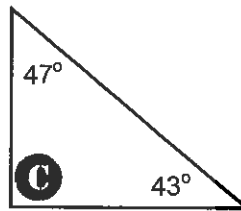
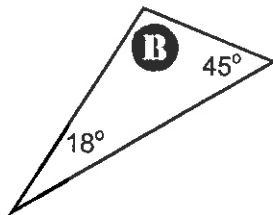
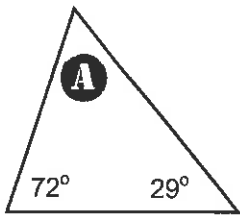
Angles in a triangle
add up to 180°

Example:

$$a + b + c = 180^\circ$$

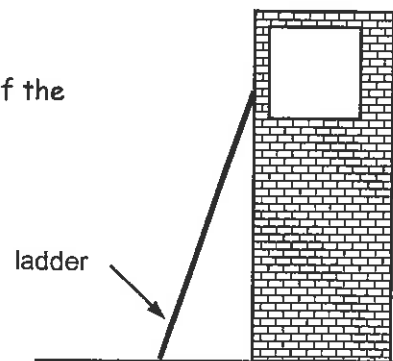
Task 8

1. Calculate the missing angles (A to Q) in these diagrams. Note: The diagrams are not drawn to scale.



A fireman leans a ladder up against a building. The angle the bottom of the ladder makes with the ground must be 75° .

2. What angle does the top of the ladder make with the building?



Task 9

Create angle diagrams similar to those of Tasks 5, 6, 7 and 8, involving the four angle rules.

Adjacent angles on a straight line add to 180°
Vertically opposite angles are equal

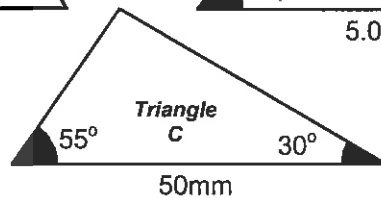
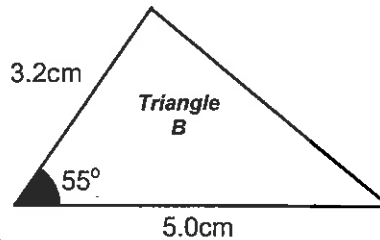
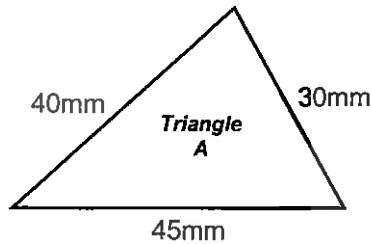
Angles around a point add to 360°
Angles in a triangle add to 180°

Exchange your diagrams with a classmate, for him / her to work out the missing angles. Justify each answer by stating the angle rule used. *Example:* Answer is 45° . Rule: \angle 's on a st. line add to 180° .

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Constructing triangles:

Example: Rangi constructed three triangles. The instruments he could use were a ruler, a protractor and a compass, but not the compass you use for measuring compass bearings.



Look at each triangle and discuss how Rangi drew each triangle.

Which instruments would he have used?

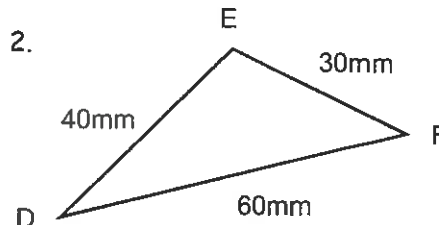
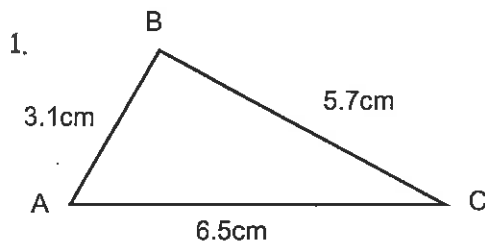
See if you can reconstruct these triangles.

Write down the steps you would follow as you construct each triangle. (See teaching notes for details)

Answer: *Triangle A* was drawn using a compass and ruler.
Triangles B & C were drawn using a compass, a ruler and a protractor.

Task 10

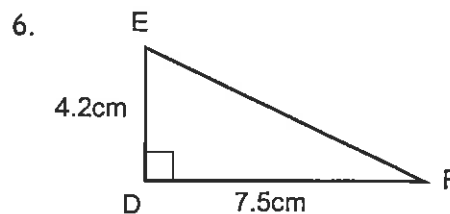
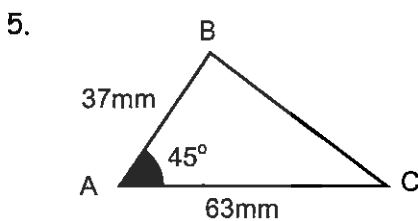
Construct these triangles using a compass and a ruler. Show your construction marks.



3. On your constructions, use a protractor to measure $\angle ABC$ and $\angle DEF$.

4. Construct a triangle with all sides 7cm long. Measure the angles of your triangle. Name this type of triangle.

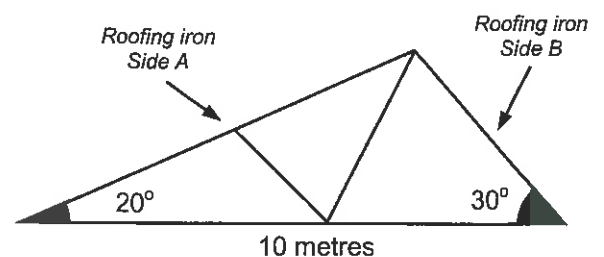
Construct these triangles using a compass, a ruler and a protractor. Show your construction marks.



7. On your constructions, measure the length of line BC and line EF, and measure $\angle CBA$ and $\angle DFE$.

8. A builder is trying to work out the length of roofing iron required for *Side A* and *Side B* of a new building. (See diagram).

Construct a scale diagram, using a scale of 1cm = 1m, to work out the length of roofing iron required for *Side A* and *Side B*.



9. Draw your own construction diagrams and have a classmate try to reconstruct them.



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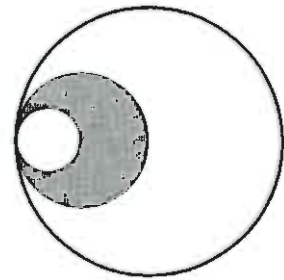
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Creating designs involving circles:

Example: Julie created this design made out of three circles, using a compass.

How did Julie create this design?

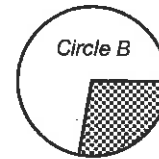
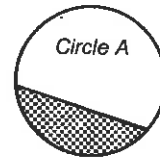
Before we can answer this question, we need to know the names of various parts of a circle.



Task 11

Complete each sentence below by replacing the ♦ with one of the words from the list in the box.

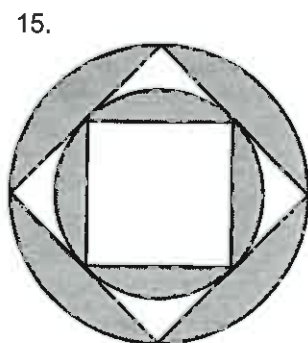
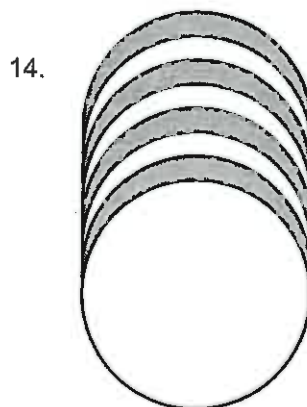
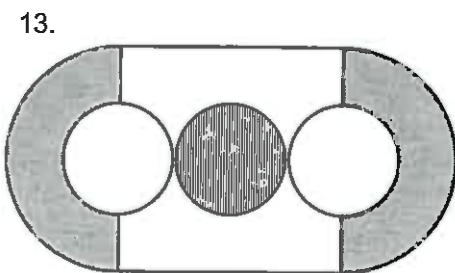
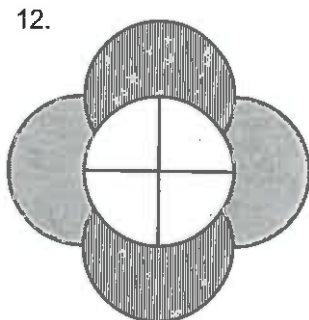
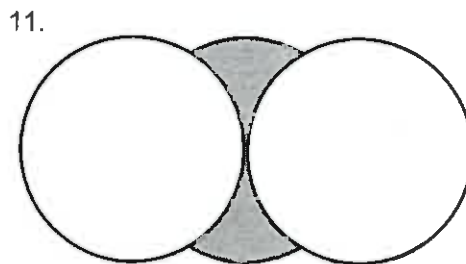
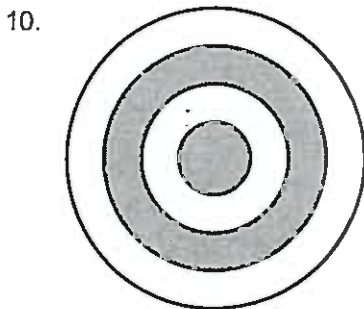
- The outside of a shape with straight lines is called the perimeter, but the outside of a circle is called the ♦ .
- The middle of the circle is called the ♦ and every point on the circumference is the same distance from this point.
- A part of the circumference is called an ♦ .
- A line drawn from the centre of the circle to a point on the circumference is called the ♦ . The plural of radius is ♦ .
- A line, passing through the centre of the circle, drawn from one side of the circle to the other is called the ♦ .
- A diameter divides a circle into two halves called ♦ .
- The shaded part of circle **A** is called a ♦ .
- The shaded part of circle **B** is called a ♦ .



- | |
|---------------|
| segment |
| arc |
| radius |
| centre |
| circumference |
| sector |
| diameter |
| radii |
| semicircles |

- Look again at the design at the top of this page. Describe how this design was created using the circle words above. See if you can accurately redraw the design.

Look at each design below and see if you can recreate the design using drawing instruments.



- Create some designs of your own and have a classmate try to recreate them.



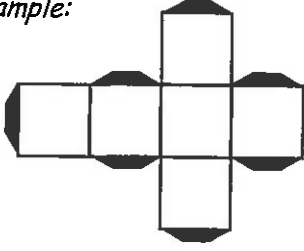
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Understanding and drawing 'nets':

A cardboard box has been unfolded and laid out flat.

Example:

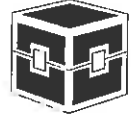


The diagram of the unfolded cube is called a **net**. The small black strips on the sides are the flaps needed to hold the cube together.

If this net was refolded back into the box, what 3D object would it form?

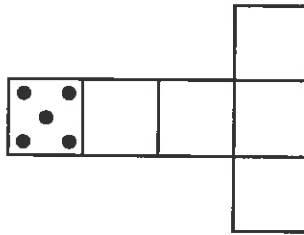
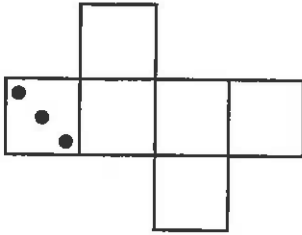
Answer: A cube.

There are many different sized boxes. Each will have its own net diagram.



Task 12

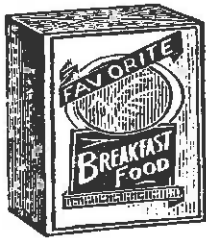
Below are two nets for a six sided die (dice). Some of the dots for the die have been drawn. Remember that the dots on opposite sides of a die must add up to 7. There will be more than one correct way to draw in the dots.



1. Copy each net and add the other dots.
2. Draw two others nets that when folded will also create two dice. Remember to draw in the dots.
3. Make your own die out of cardboard, using one of your nets.

Draw the nets for each object below. There may be more than one way to draw the net.

4.



5.



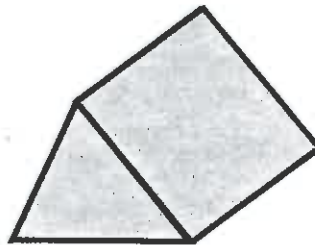
6.



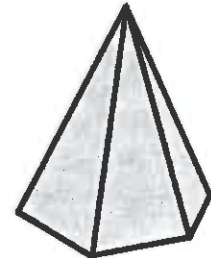
7.



8.



9.



(This object has an hexagonal base.)

Task 13

Collect some cardboard packaging for various items such as ...
 food items,
 packaging around toys,
 shoe boxes,
 envelopes ... etc.

Carefully pull the packaging apart and draw the nets.

Do you think all this fancy packaging is necessary? Explain your answer.





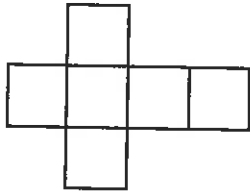
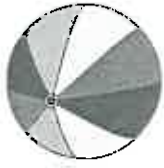
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Creating and designing nets:

Using mathematical instruments, accurate diagrams of nets for various objects can be drawn.

Example: Draw the net for a cube that would fit a ball that has a radius of 5 centimetres.



What would be the dimensions of the cube?

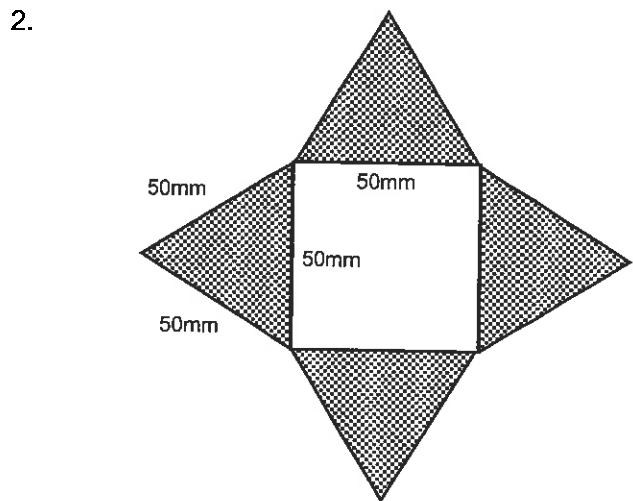
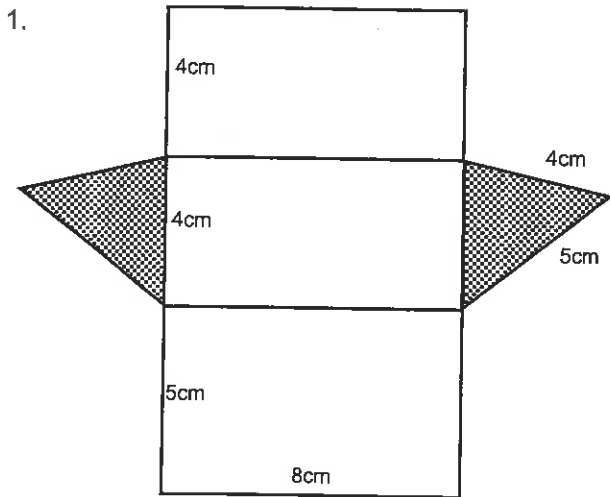
Answer: The radius is half the diameter of the ball, therefore all sides would be 10cm long.



Task 14

Use mathematical instruments to accurately draw these nets on cardboard.

Cut out each net and fold to make the 3D object and name the 3D object you have created.



You have been asked to design the packaging for a new brand of crayons or pencils.

3. **Measure** the dimensions of a crayon or pencil.

The new packaging must be able to hold at least 8 crayons or pencils.

4. Using your measurement figures from question 3, **draw** an accurate net diagram for the crayon or pencil packaging.

5. **Decorate** your net diagram before cutting it out and constructing your packaging.



You have been asked to design an unusual 'Get Well Soon' or 'Birthday' card and the envelope for the card.

6. **Design and draw** the net for your unusual card and envelope on some cardboard and coloured paper.

7. **Decorate** your card before cutting it out, then you might like to send it to someone special.

8. **Design and create** a container, with or without a lid, that will hold an object of your choice.





Geometry

L4MG

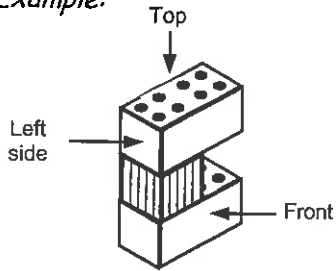
11

G3 / G4

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View diagrams and making models:

Kelly made a simple model out of Lego blocks and then drew a diagram of what the model looked like from the top, front, left, right and back.

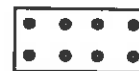
Example:

Top	Front	Left side	Right side	Back

Note:



= 4 pin blocks



= 8 pin blocks

side

top

end

side

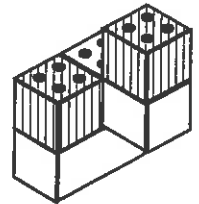
top

Task 15

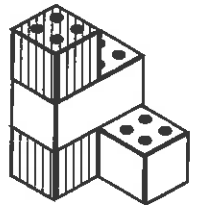
Look at the top, front, left side, right side and back view diagrams for the block structures drawn below. Match the view diagrams (1 to 5) with the block structure diagrams (A to E) in the box. Create each structure using blocks.

	Top	Front	Left side	Right side	Back
1.					
2.					
3.					
4.					
5.					

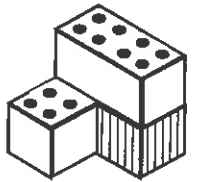
A



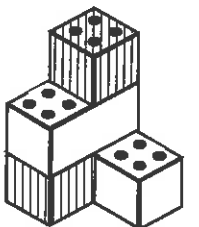
B



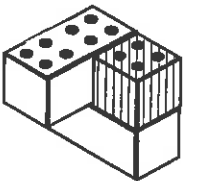
C



D



E



Task 16

Using the resource ...

'Geometry Level 4: 3-Dimensional Block Structures & Isometric / View Diagrams'

created by AWS Teacher Resources,

create more block structures given the top, front, left side, right side and back view diagrams.



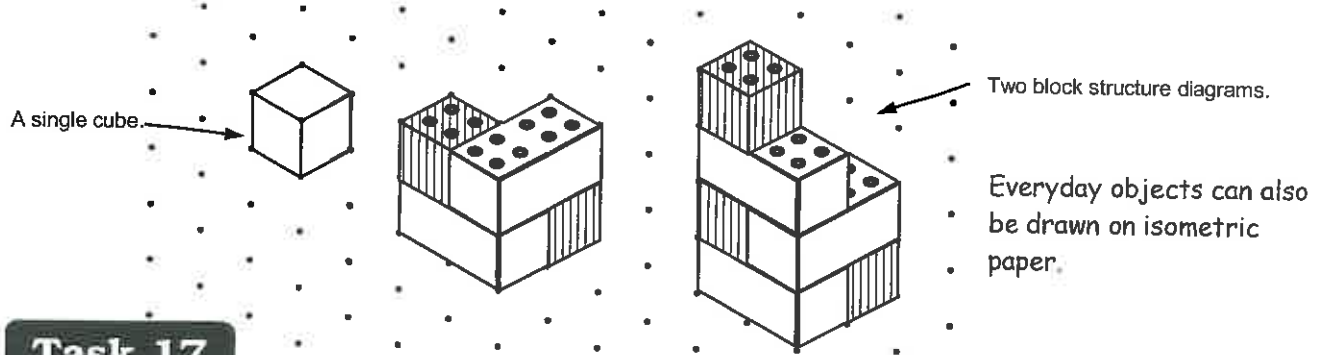
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Drawing on isometric paper:

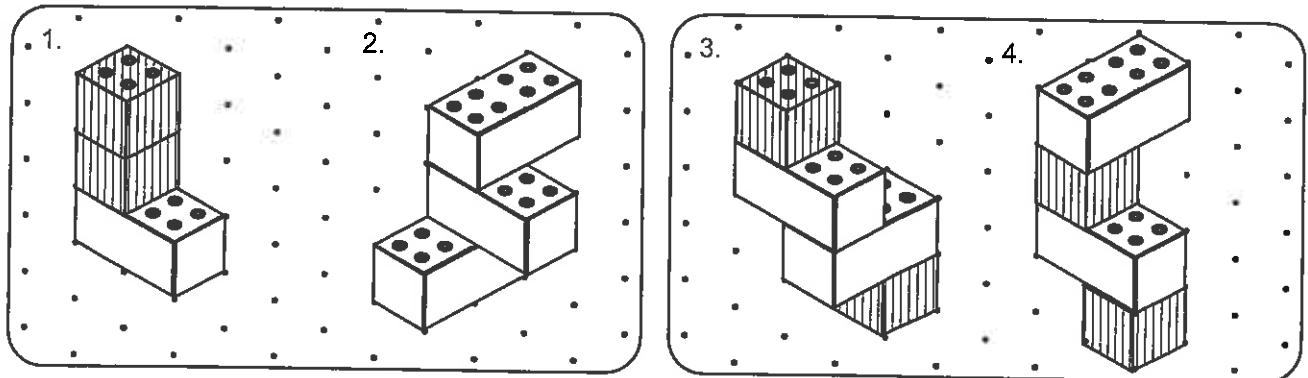
Isometric paper is special paper with dots on which 3D objects can be drawn and they look almost realistic.

Example:

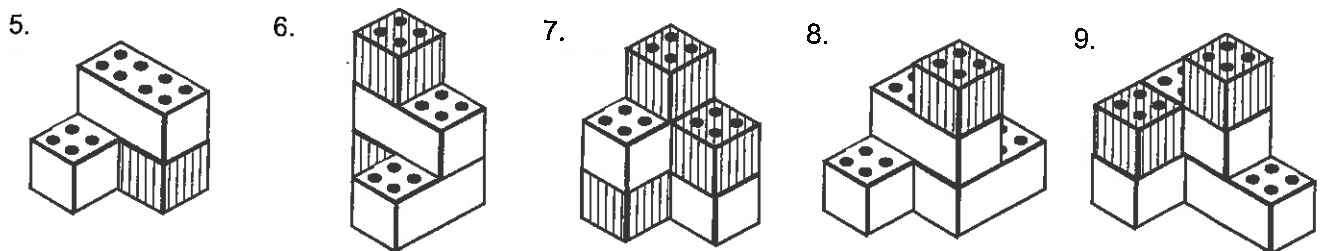


Task 17

Copy these block structures below on some 'Isometric paper'.



Redraw these block structures below on some 'Isometric paper'.



- Using some Lego type blocks, build each of the block structures 5 to 9.
- Draw the top, front, left side, right side and back view diagrams for each block structure 5 to 9.
- Everyday objects can also be drawn on isometric paper. Look around your classroom for objects that you could draw on some isometric paper.



Task 18

Using the resource ...

'Geometry Level 4: 3-Dimensional Block Structures & Isometric / View Diagrams'
created by **AWS Teacher Resources**,

draw more block structures on isometric paper and view diagrams on specially prepared squared paper.



Geometry

L4MG

Worksheet

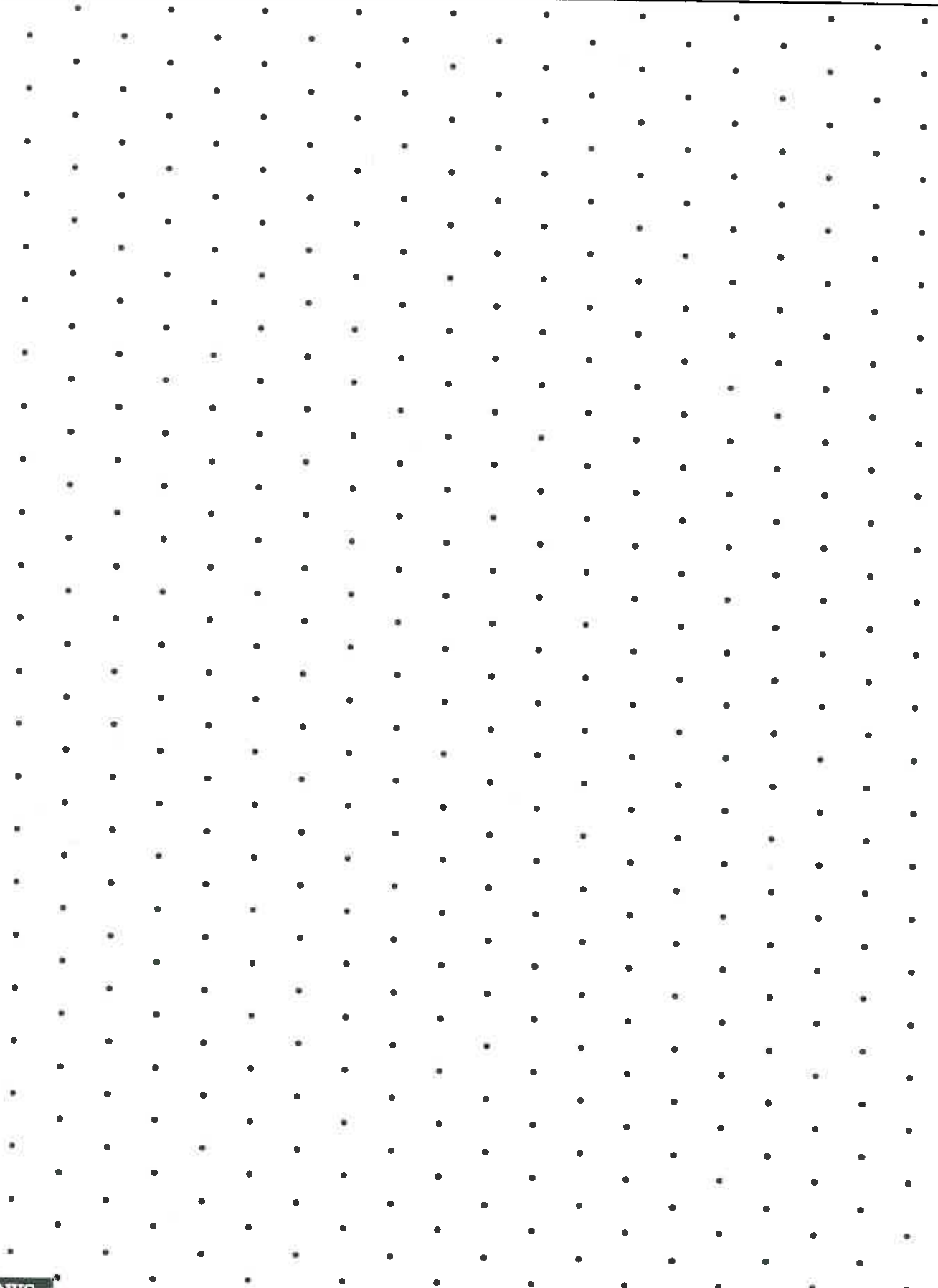
12

G4

Isometric paper Master Sheet

Name:

Class:



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Describing location using grid references:

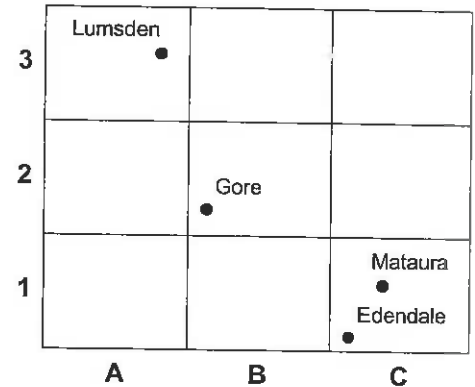
To describe where something is, such as a town or a park on a map or plan, a **map or grid reference** is used. A grid reference identifies an area on a map or plan, rather than a specific point.

Example: Which town is in the area given by the grid reference A3?

What is the grid reference for Gore?

If you were asked to go to the town in the grid reference of C1, what problem could occur?

Answers: In A3 is Lumsden, Gore is in B2 and which town would you go to in C1, as there are two towns?



Task 19

For Task 19, use the map from the *AA New Zealand Road Atlas* book (Map or grid references) to answer the following questions.



- Samuel used the index to find out where Turangi is. After Turangi was written 5F2. What does 5F2 mean?

Write down the grid or map references in which these towns occur.

- Waipukurau
- Marton
- Ohakune
- Owhanga

Locate these grid references and state the main feature within each grid reference.

- G1
- F3
- H3
- F1
- G5

Jason and his family are going to a drive from their home in Taupo to an uncle's place in Bulls.

- If they drive from Taupo to Turangi and then on to Whakapapa Village, write down the map or grid references for the places they pass through for this part of the journey.

From Whakapapa Village they travelled through National Park, turned left at Tohunga Junction and on to the Waiouru Army Museum.

- List in order the grid references for the towns they passed through and for the army museum.
- What large town did they pass through in grid reference E3?

From Waiouru Army Museum they travelled along the shortest route to Bulls.

- List in order the grid references they pass through as they travel to Bulls.
- What large town was on the border of F4 and F5?



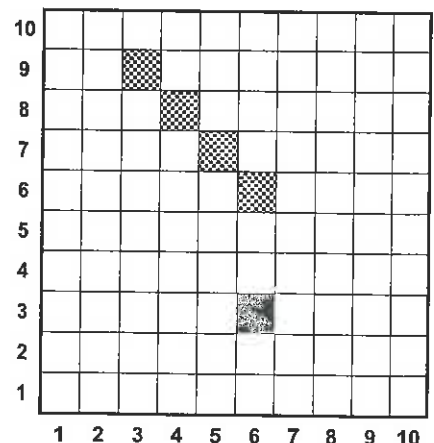
- Create your own questions using the map and have a classmate answer your questions.

Task 20

A very popular game called 'Battleships' uses a grid reference system to locate ships placed within the grid.

- The black square in this grid has the grid reference of (6,3). What does (6,3) mean?
- A battleship is 4 squares long. Write the grid references for the battleship marked on this grid.
- Make a copy of this grid. Create your own sized ships and play a game of Battleships with a classmate.

Remember the order the numbers are written is important.





Geometry

LAMG

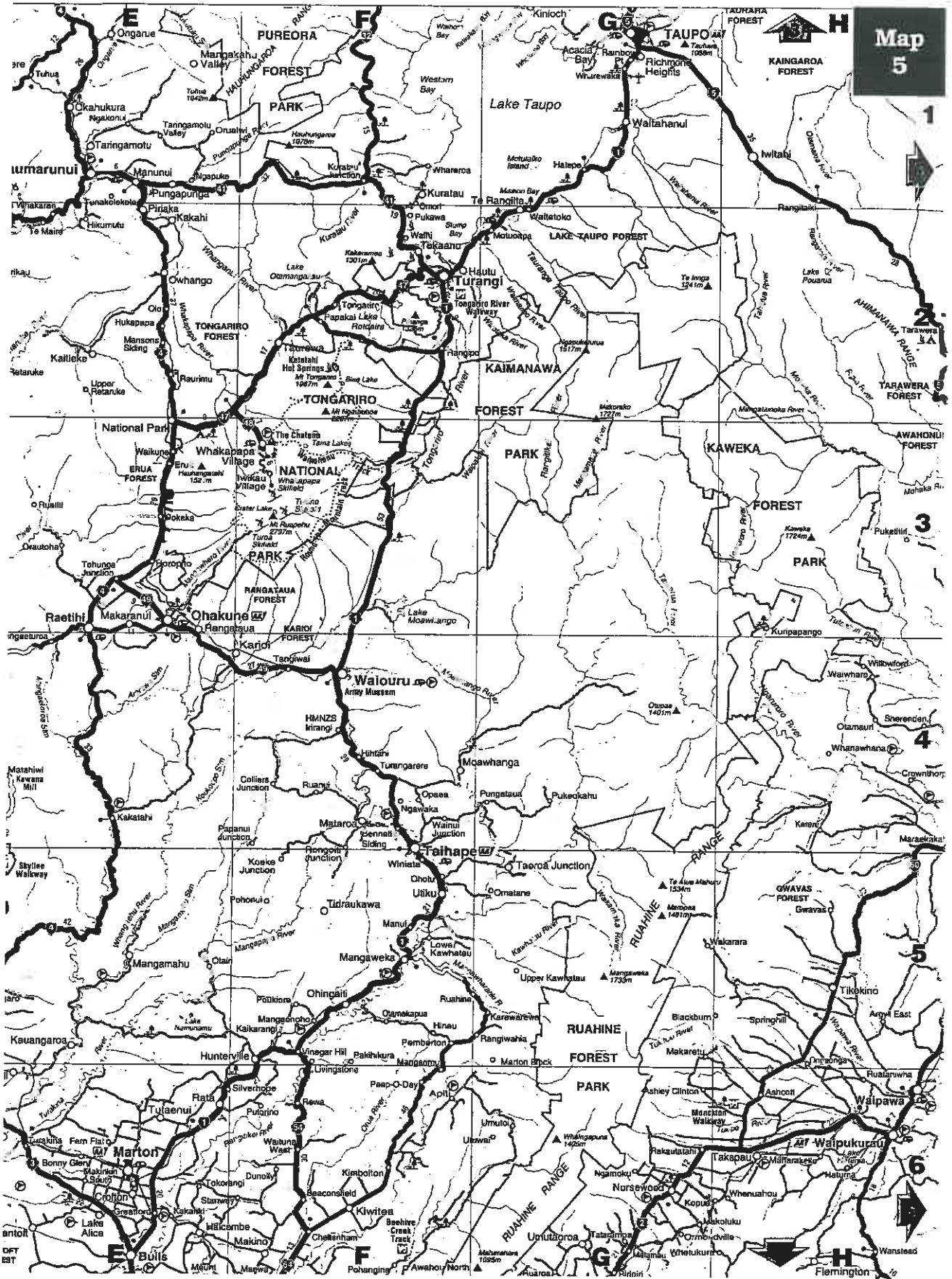
Worksheet

13

G5

Map or grid references

Use this *AA New Zealand Road Atlas* map for the questions in Task 19.



Map 5

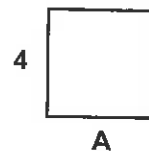


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Finding location using co-ordinates:

When using a map or grid reference, such as A4, it refers to anything within the area A4.



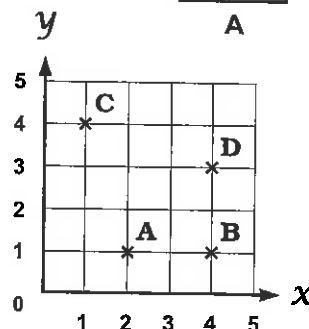
However, when a mathematical graph is drawn and co-ordinates are used, the co-ordinates refer to exactly where the lines cross.

Example: A = (2,1), B = (4,1) and C = (1,4).

Each pair of numbers in the brackets are called **order-pairs** or co-ordinates. The first number (x-axis) is across and the second number (y-axis) is up / down.

What are the co-ordinates for the point D?

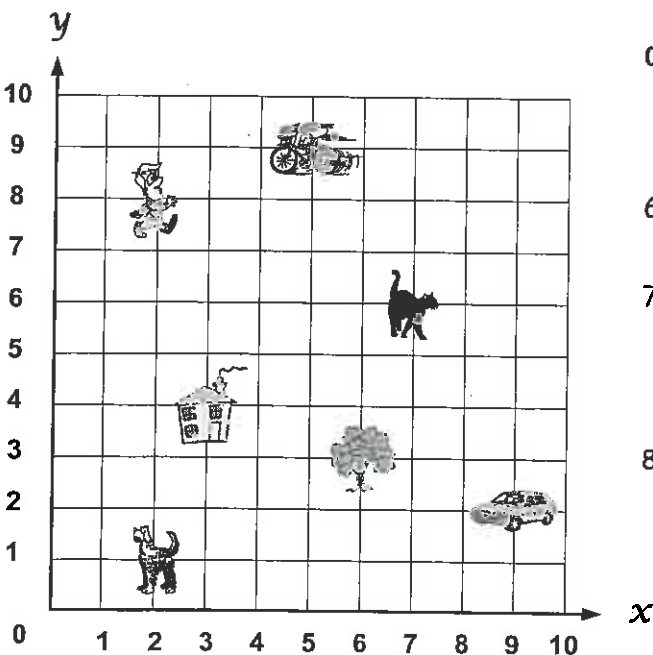
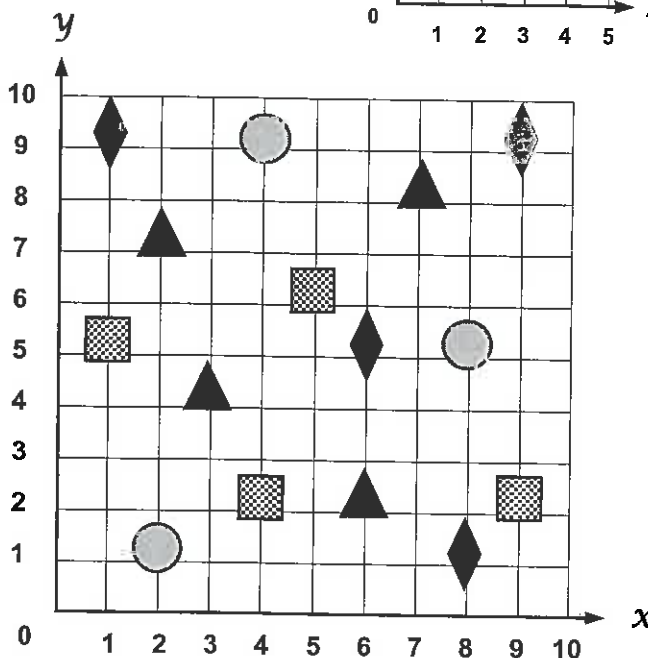
Answer: (4,3)



Task 21

On this graph there are various mathematical shapes drawn.

1. What shape is at the point (6,5)?
2. List the co-ordinates to locate all the triangles.
3. List the co-ordinates to locate all the squares.
4. List the co-ordinates to locate all the circles.
5. List the co-ordinates to locate all the diamonds.



6. Copy this graph, including the features marked on it.
7. On your graph draw the pathway that passes through these objects, in the order ... car, cat, dog, house, tree, man, cyclist and back to the car.
8. List the ordered pairs you went to as you located each object.

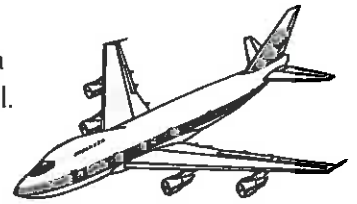
9. Draw a graph, similar to above, of your classroom (or some other space). Mark the key features on the graph.
Example: pupil's desk, teacher's desk, computers, reading corner, etc.
Have a classmate locate items in the classroom by using co-ordinates.



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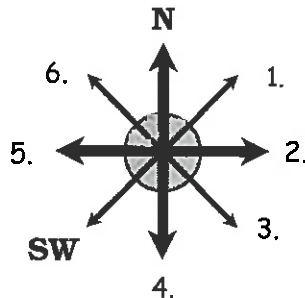
Finding location using compass points:

Imagine how difficult it would be to fly a plane from New Zealand to Australia without the use of a compass. Being able to use a compass is an important skill.



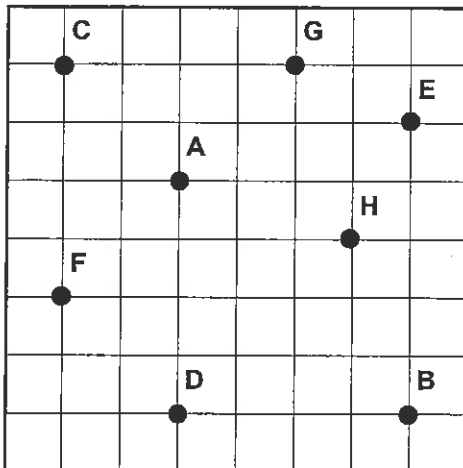
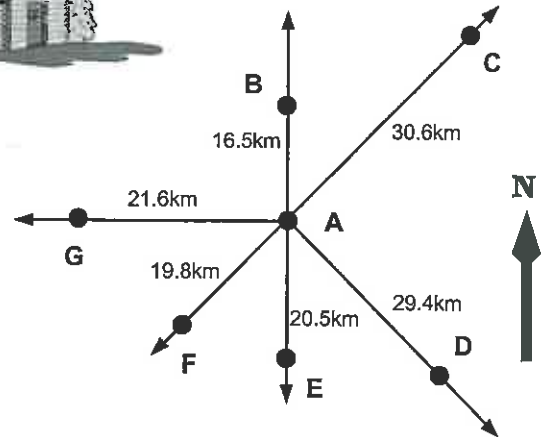
Task 22

Copy this diagram of a compass and fill in the missing directions numbered 1 to 6.



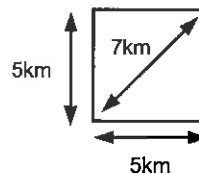
On this diagram each letter represents a town and the distances between Town A and all other towns are shown.

- Which town is 20.5km away from Town A?
- Which town is west of Town A?
- Give the compass directions and distances required to travel from Town A to all other towns, B to G.



This grid is a scale diagram showing the positions of various towns, represented by the letters A to H. The side of a square represents 5km and the diagonal is 7km.

Example:



The distance from A to B would be $4 \times 7\text{km} = 28\text{km}$, direction SE.

Calculate the distance and give the direction you would travel to go between the following towns.

- | | | |
|------------|------------|------------|
| 11. B to D | 12. A to D | 13. F to A |
| 14. H to D | 15. B to C | 16. E to B |
| 17. F to C | 18. C to A | 19. G to F |
20. Kelly is going to draw a scale diagram of a school playground area. Using the compass directions and a measuring tape, she collected the following information.

- The play ground area is 10 metres square.
- Right in the middle is a tower (T).
- 3 metres N of the tower is a slide (S).
- 4 metres east of the tower is a swing (W).
- In the NE corner there is a netball hoop (H).
- 7 metres south of the netball hoop there is a drinking tap (D1).
- In the SW corner there is a basketball hoop (B).
- 6 metres north of the basketball hoop there is another drinking tap (D2).



Use the information that Kelly collected to draw a plan of this playground in your maths book.

Use a scale of 1cm = 1m.

21. Create your own map with a scale. Write instructions to locate objects on your map (as above). Have a classmate recreate your map from your instructions, without seeing your map first.



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Finding locations using bearings measured from North:

A direction may be given as a **bearing**. Measured in a clockwise direction from North, the bearing is the angle between north and the direction.

Example: East has a bearing of 90° . South has a bearing of 180° and West has a bearing of 270° .

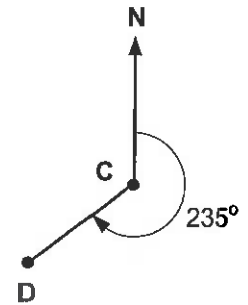
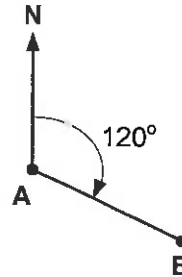
To find the bearing of point B from point A, follow these steps.

Step 1: Draw in a North line at point A.

Step 2: Imagine you are facing north and turn clockwise until you are facing B.

Step 3: Measure the angle, in a clockwise direction, between the North line and the line AB.

Answer: B is on a bearing of 120° from A.

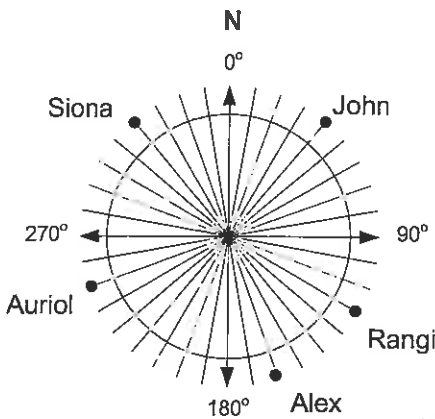
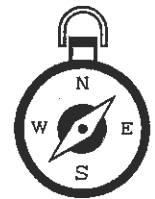


How could you work out a bearing that is over 180° , such as the bearing point D from point C?

Task 23

Calculate the bearings for these points on a compass.

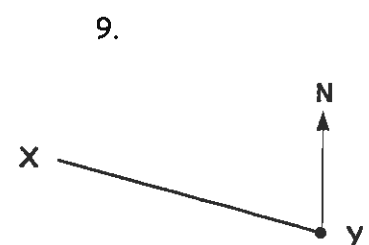
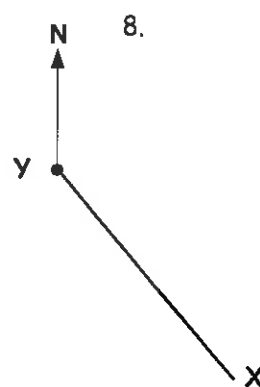
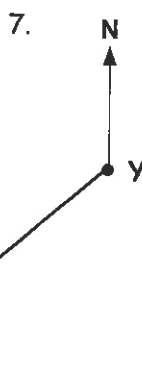
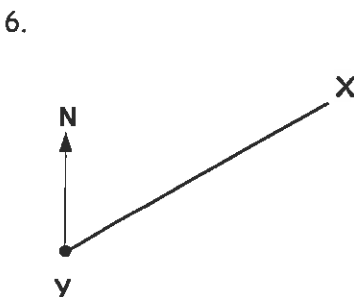
- SE
- NW
- NE
- SW



The Solomon family are having a family reunion. Members of the family are coming from different parts of the country.

- Use this diagram to work out the bearing that each family member will travel to get to the reunion.

Use a protractor to find the bearing of X from Y.



- Draw a map of your classroom, your school grounds or your own town. On your map, mark the direction of North and draw several main features.
- Have a classmate use a protractor to work out the bearings between main features on your map.



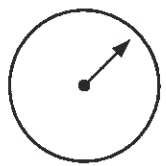
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Creating pathways (loci):

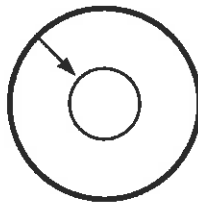
A locus is a path, or route followed by a moving object. Loci is the plural of locus.

Example: The flight of a bee creates a pathway or locus.

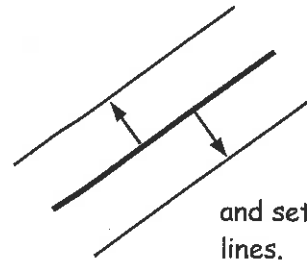
Other examples of some loci you could draw would include ...



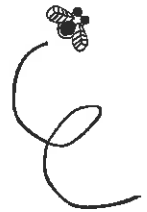
a circle drawn
around a point,



a circle drawn
around another
circle,



and sets of parallel
lines.



In the three examples, a point moving the same distance around a single point, around a given circle and parallel to a given line, has created these loci or pathways. Discuss how you would draw each locus.

Task 24

Draw a dot on a page in your maths book. Draw the locus of a point that moves so that it is always ...

1. 2cm from the dot
2. 15mm from the dot
3. 3.5cm from the dot.

Draw a circle with a radius of 35mm on a page in your maths book.

Draw the locus of a point that moves so that it is always ...

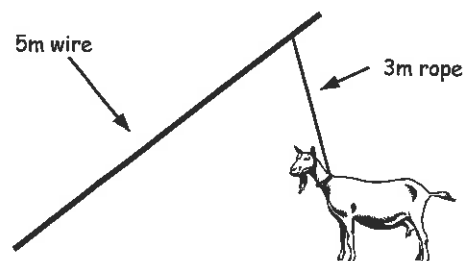
4. 2.0cm from the circle
5. 10mm from the circle
6. 1.5cm inside the circle

Draw a horizontal line on a page in your maths book.

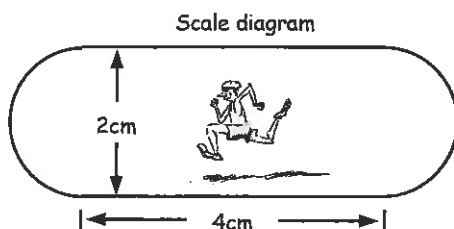
Draw the locus of a point that moves so that it is always ...

7. 15mm above the line
8. 2.5cm below the line
9. 10mm from the line

Sally has a pet goat tied to a 3 metre rope. The rope is attached to a 5 metre wire. The goat can move either side of the wire and the rope can slide up and down the wire.



10. Draw the locus the goat can make as it walks.
Use a scale of 1cm to represent 1m in your diagram.



This diagram represents the inside lane of a 400m running track. Richard is entered in the 400m race and is going to run in lane 2.

11. Copy this diagram of a 400m running track and draw 3 more lanes for this track. On your diagram, make each new lap 5mm apart.
12. Sketch the locus for the path that Richard will take as he runs in the 400m race in Lane 2.

Not all loci are like those in the questions above.

Example: A feather floating through the air would not create a smooth locus.

13. Draw some everyday loci for situations around your school.
Example: The locus for a soccer player while playing a game of soccer.
The locus for the flight of a tennis ball during a rally.

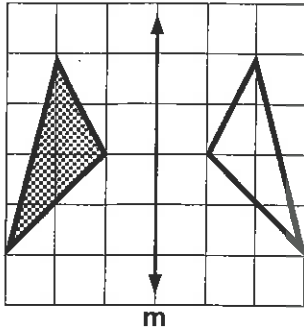


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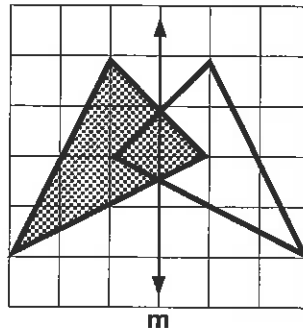
Reflecting shapes and locating mirror lines:

For a shape to be reflected there must be a mirror line. The mirror is often represented by an arrow.

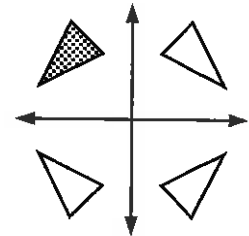
Example: The shaded shape has been reflected to its new position (clear shape).



Some shapes may cross the mirror line and have to be reflected both sides of the mirror line.



There may be more than one mirror line.



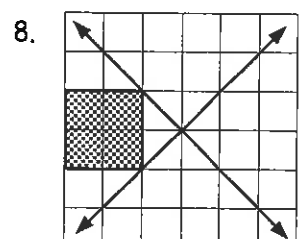
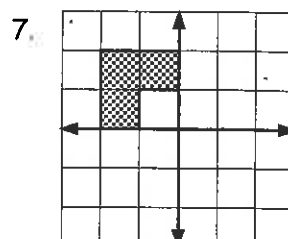
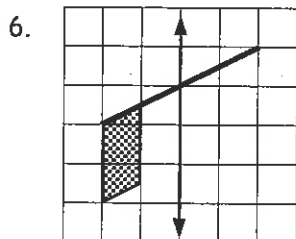
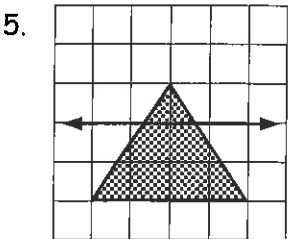
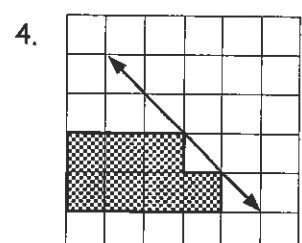
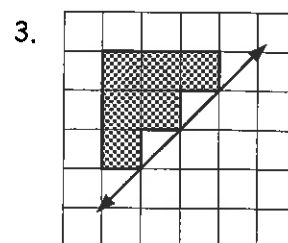
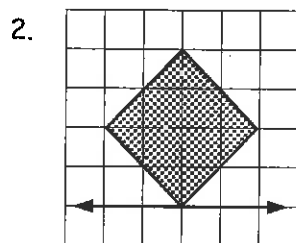
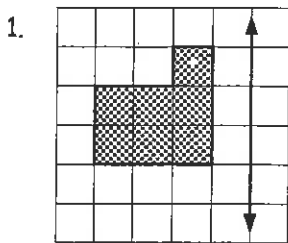
A **mirror line** is half way between corresponding points on a shape and its new reflected position.
A mirror line is also known as the **line of symmetry**.

The original shape is called the **object**. Redrawn in its new position, the shape is called the **image**.

Task 25

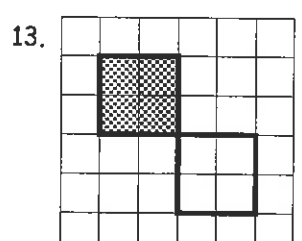
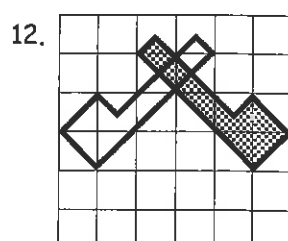
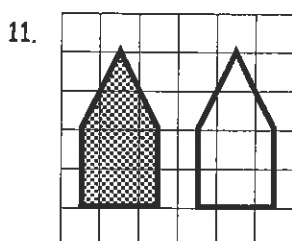
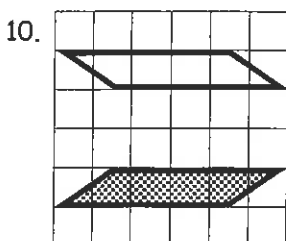
Copy each diagram below onto the squares of your maths book.

Reflect each shape (object) to its new position (image) using the arrowed line(s) as the mirror line(s).



9. Draw your own shapes (objects) and mirror lines. Ask a classmate to reflect each shape and draw the new position of the shape (image).

Copy these diagrams below and draw in the mirror lines (lines of symmetry).



14. Create your own diagram with a shape and its new position drawn, but no mirror line(s) marked. Have a classmate locate and draw in the mirror line(s).



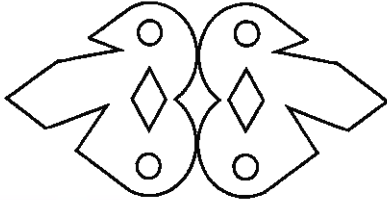
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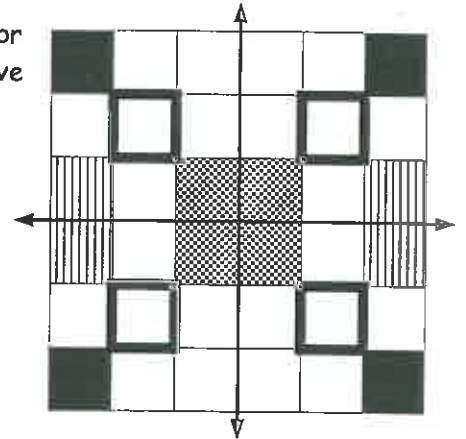
Creating designs involving reflection:

The use of reflection in designs is common, such as in wallpaper, floor or tile patterns. Some buildings have lines of symmetry. Making reflective designs can be fun.

Example: Folding paper, then cutting out pieces will produce designs.



Other designs can be created by using lines of symmetry and copying patterns.



Task 26

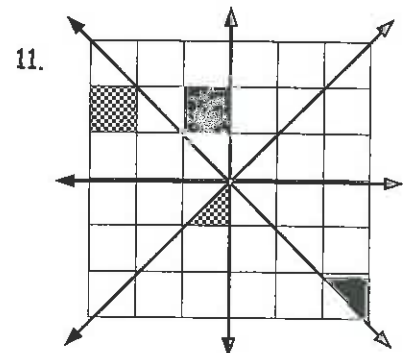
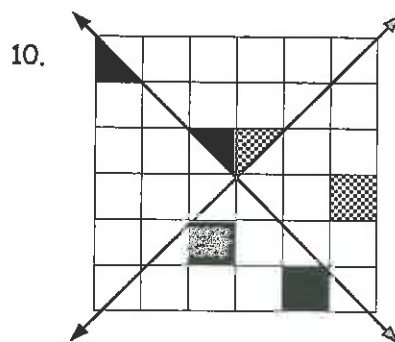
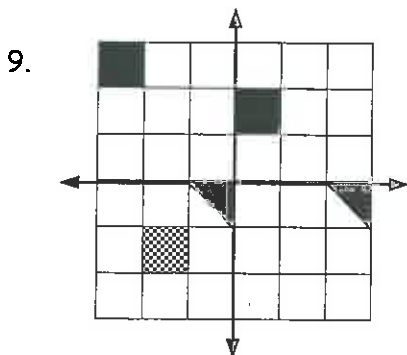
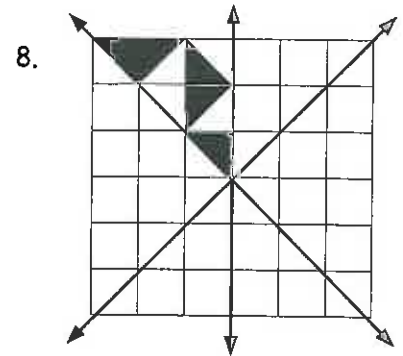
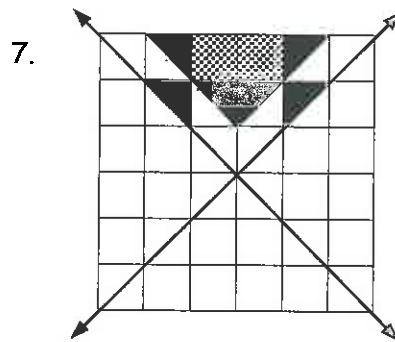
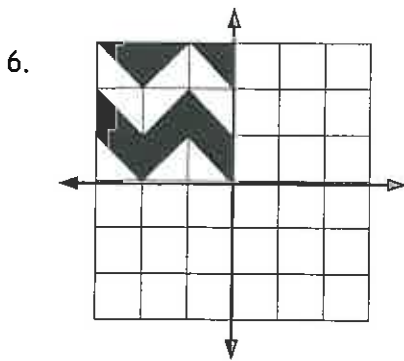
By folding paper and using scissors, create paper designs that have the following number of lines of symmetry. The pieces of paper you use to create your designs can be any shape.

1. 0 lines of symmetry
2. 1 line of symmetry
3. 2 lines of symmetry
4. 4 lines of symmetry
5. On your paper designs, mark all lines of symmetry.



Copy each diagram below using the squares in your maths book.

Complete each design by reflecting the shaded squares using the lines of symmetry marked as arrows.



12. Create your own designs in one corner as above and have a classmate complete the reflective patterns.





G7

Geometry

LAMG

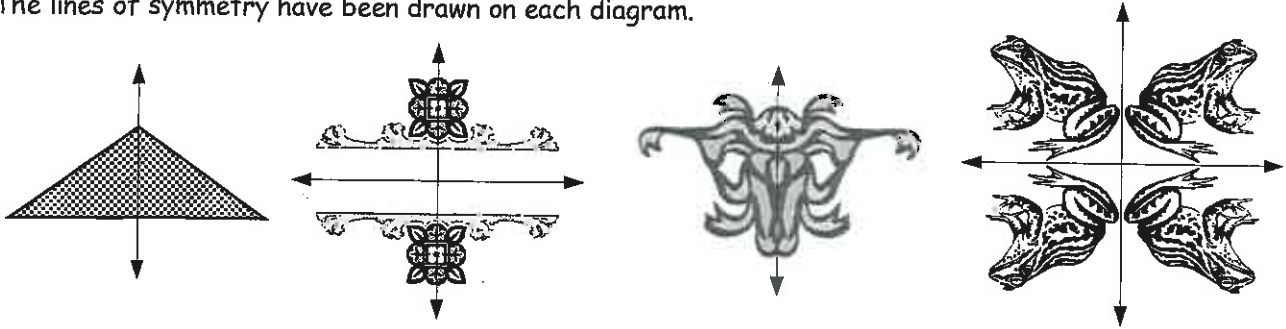
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Reflective symmetry:

Below are examples of shapes, patterns and pictures that all have lines of symmetry. The lines of symmetry have been drawn on each diagram.



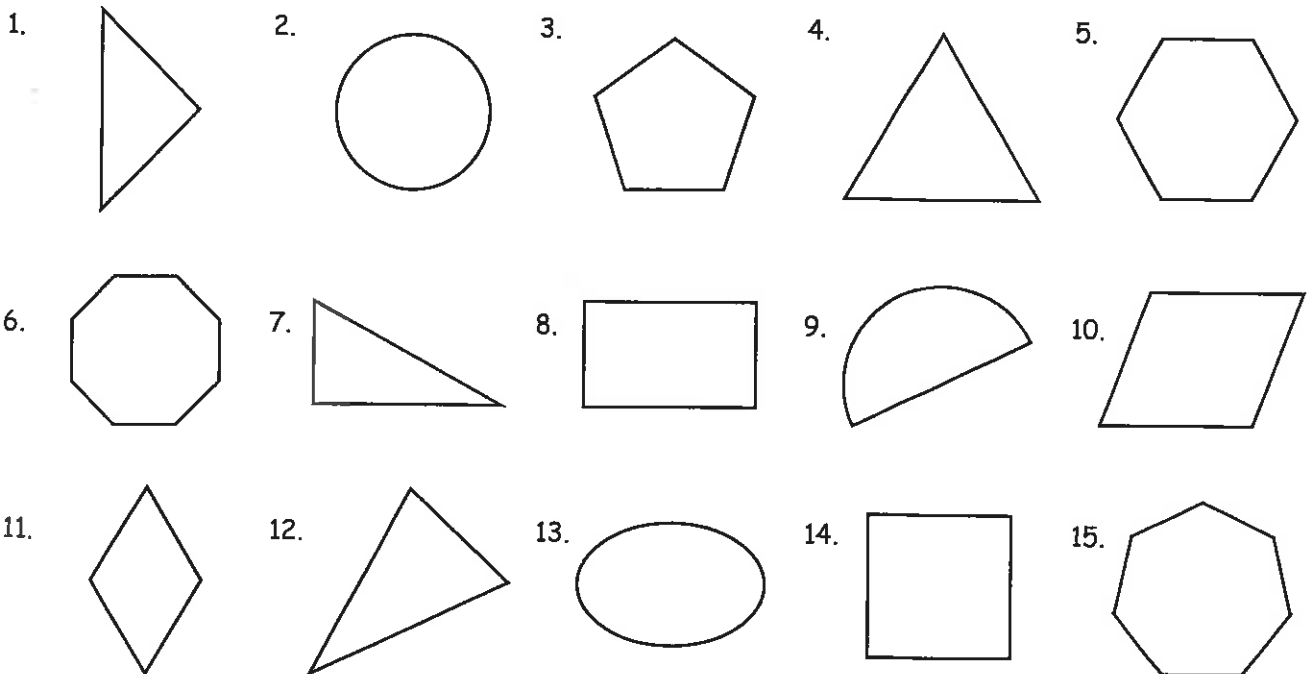
The Order of Reflective Symmetry of a shape is the number of lines of symmetry a shape has. Lines of symmetry are also called axes of symmetry.

What is the order of reflective symmetry for each shape above?

Answers: 1, 2, 1 & 2

Task 27

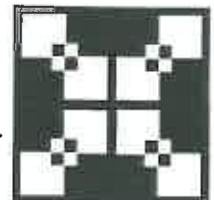
Copy and name each shape below, using the words listed below the shapes.



equilateral triangle, square, ellipse, semi-circle, hexagon, rectangle, pentagon, right-angled triangle, parallelogram, scalene triangle, octagon, isosceles triangle, circle, diamond (rhombus), heptagon

16. Draw in the lines of symmetry (if any) on the shape diagrams you copied from above and state the order of reflective symmetry for each shape.

17. Look around your classroom and make a list of objects that have lines of symmetry. State the order of reflective symmetry for each object on your list.



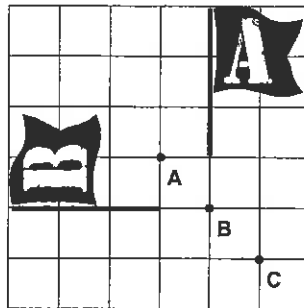
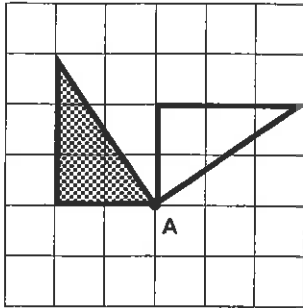
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Rotating shapes and finding the centre of rotation:

To rotate a shape or an object, you need an **angle of rotation** and a **centre of rotation**.

Example: Rotate the shaded triangle (object) $\frac{1}{4}$ turn (90°) clockwise about point A.

The new position of the triangle is the clear shape, called the image.



Example:

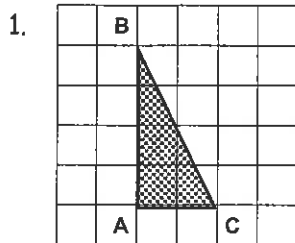
Flag A (object) has been rotated to its new position shown by Flag B (image).

Describe this rotation. Is the centre of rotation point A, B or C?

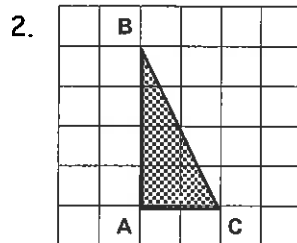
Answer: $\frac{1}{4}$ turn or 90° anti-clockwise rotation.
 ($\frac{3}{4}$ turn or 270° clockwise rotation)
 Centre of rotation was point B.

Task 28

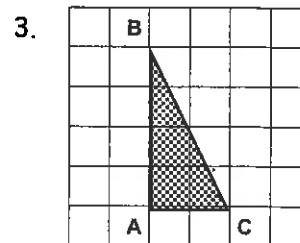
Copy each diagram below. Rotate the shaded shape (object) to its new position (image) as directed below each diagram



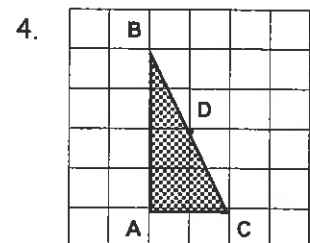
Rotate triangle ABC 90° clockwise, about point C.



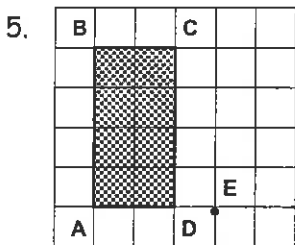
Rotate triangle ABC 180° anti-clockwise, about point A.



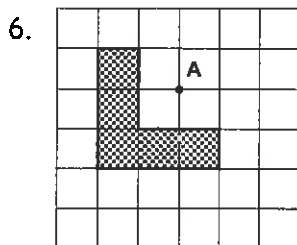
Rotate triangle ABC 90° anti-clockwise, about point B.



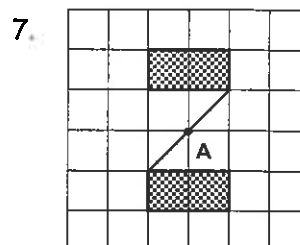
Rotate triangle ABC 90° clockwise, about point D.



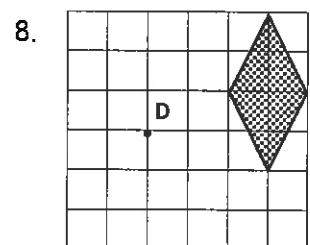
Rotate this rectangle ABCD 90° clockwise, about point E.



Rotate this shape 180° anti-clockwise, about point A.



Rotate this shape 90° clockwise, about point A.

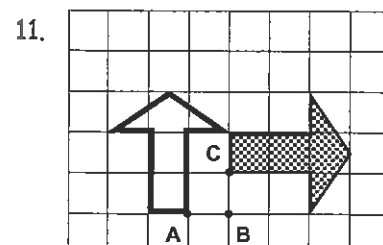
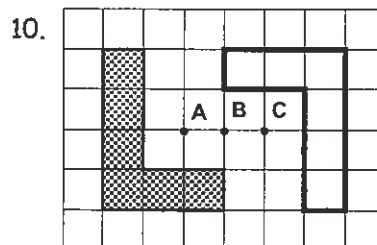


Rotate this shape 180° clockwise, about point D.

9. Draw your own shapes and mark centres of rotation. Have a classmate redraw your shapes after they have been rotated either 90° or 180° in a clockwise or anticlockwise direction.

In each diagram the shaded shape (object) has been rotated to a new position (image).

Describe each rotation and name the centre of rotation.





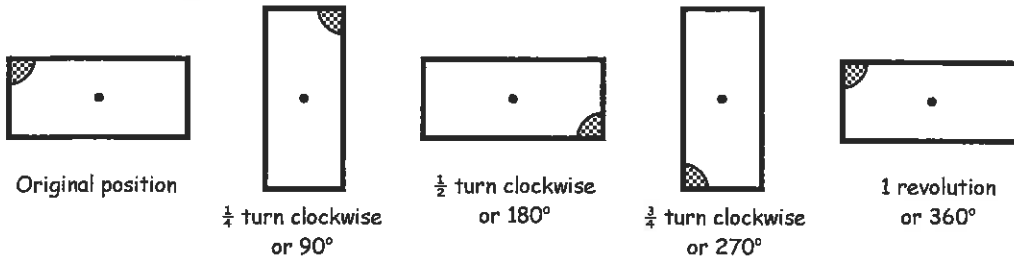
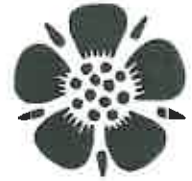
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Rotational symmetry:

A shape has rotational symmetry if it fits onto itself as the shape is rotated through one complete revolution about a fixed point called the **centre of rotation**.

Example: This rectangle has been rotated in a clockwise direction.



Where is the centre of rotation for this shape?

Answer: The point in the middle.

The **Order of Rotational Symmetry** is the number of times a shape fits onto itself during one complete revolution. All shapes have an order of rotational symmetry of at least one, as they will fit onto themselves after 1 complete revolution through 360° .

What is the order of rotational symmetry for this rectangle?

Answer: 2 (180° & 360°)

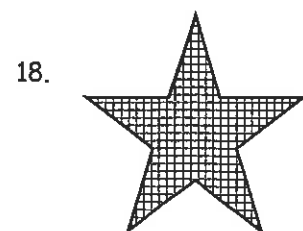
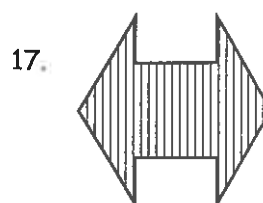
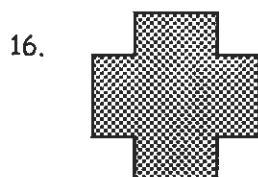
Task 29

Name each shape below. Copy these shapes onto cardboard and cut them out.

By rotating your shapes, work out the order of rotational symmetry for each shape.

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.
- 11.
- 12.
- 13.
- 14.
- 15.

Work out the order of rotational symmetry for these shapes.



19. Look around your classroom and make a list of objects that have rotational symmetry. State the order of rotational symmetry for the objects of your list.



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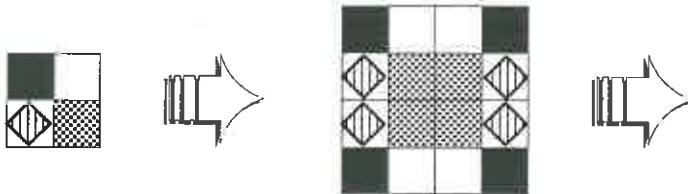
Describing symmetrical designs:

Many wallpapers, wrapping paper and indigenous art work from various countries have been created using patterns that have been reflected or rotated and then repeated many times.

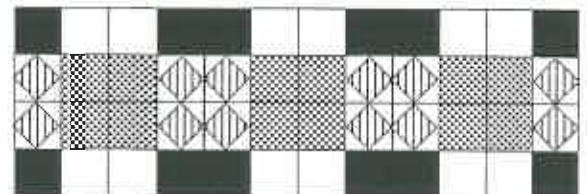
Example: Katie drew this simple pattern below ...



... she then **reflected** her pattern four times to create this pattern.



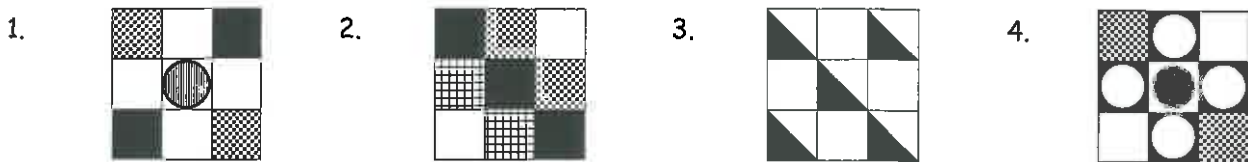
... she then **translated** this pattern three times to create a bigger pattern.



Remember, a shape or design is **translated** if it slides to a new position without being reflected (turned over) or rotated (turned around).

Task 30

Use each one of these simple designs to **create a larger pattern** by reflecting, rotating and / or translating each simple design. The different shadings represent different colours.



- Describe how you created each of your designs.
- Create and describe your own patterns.

Look around your classroom for examples of patterns, objects or designs that have been created by reflecting, rotating and / or translating a simple design.

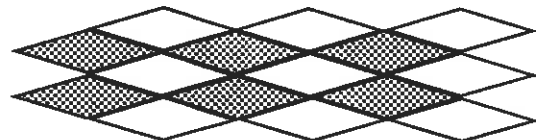
Example: Patterns such as wall paper, wrapping paper, frieze patterns, kowhaiwhai patterns etc.

- Describe how each pattern, object or design has been created.

Designs created by tessellating shapes:

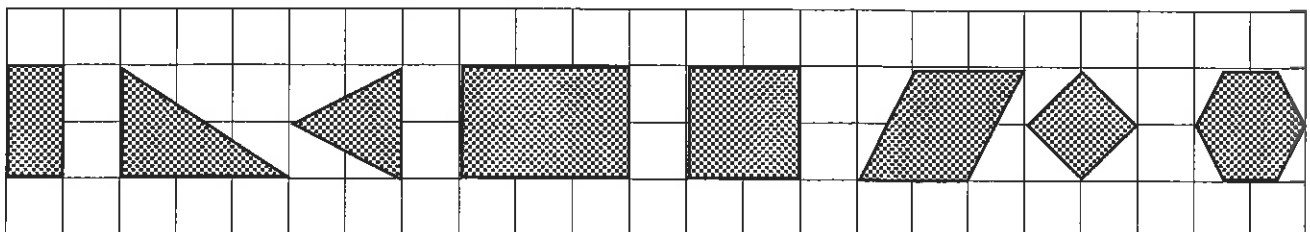
A design made up of repeating shapes, without gaps between the shapes, is called a **tessellation**. The shapes in the design have been reflected and / or rotated and / or translated.

Example:



Task 31

Create a design by tessellating any combination of these shapes.





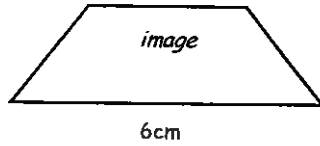
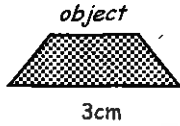
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Finding the scale factor for an enlargement:

When a shape is made bigger (or smaller) it is said to be **enlarged**.

Example: The shaded shape (object) has been enlarged, to create the clear shape (image).



By how much has the object been enlarged?

Answer: A 3cm long side on the object has become a 6cm long side on the image, therefore the shape is twice as big.

The size of the enlargement is called the **scale factor**. In this example, the scale factor is 2.

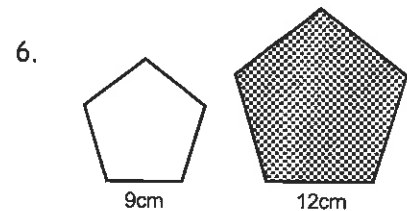
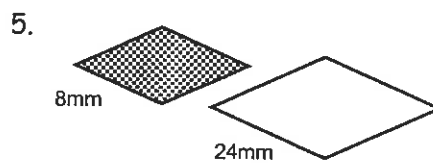
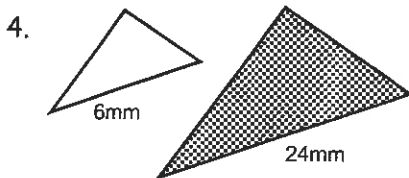
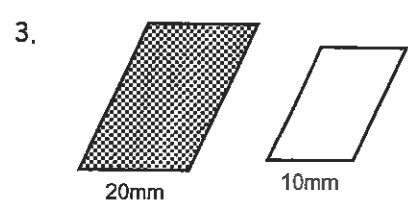
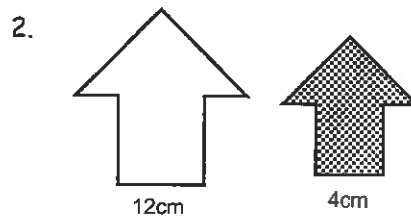
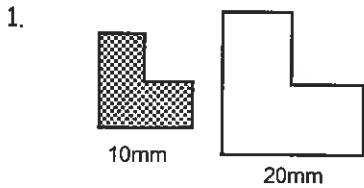
If a shape is made bigger when enlarged, the **scale factor** is a **whole number**.

If a shape is made smaller when enlarged, the **scale factor** is a **fraction**.

Task 32

Look at each pair of diagrams. The **shaded shape** is the **object** and the **clear shape** is the **image**.

Work out the scale factor for each enlargement. (These diagrams are not drawn to scale).

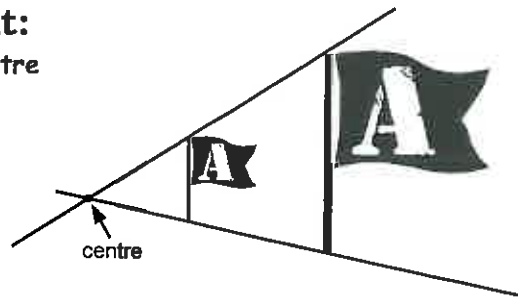


Finding the centre of an enlargement:

As well as a scale factor, an enlargement must have a **centre of enlargement**.

Example: To find the centre of an enlargement, join corresponding corners of the object and its image.

Where the lines cross is the centre of the enlargement.



Task 33

Copy each pair of diagrams. Object = shaded shape, Image = clear shape. Draw lines to find the **centre of enlargement** and label the centre **C**. State the **scale factor** for each enlargement.

1.		2.		3.	
		4.		5.	



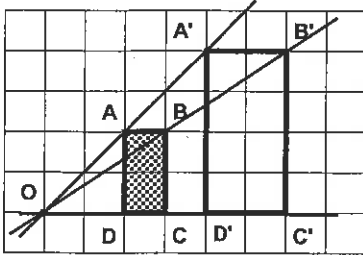
Please DO NOT write on the sheets

Please DO NOT write on the sheets

Drawing enlargements:

To enlarge a shape you need to know both the **scale factor** and the **centre of enlargement**.

Example: Using point O, enlarge ABCD by a scale factor of 2.



The **centre of enlargement** can be outside or inside the shape, or on one of its sides. The **scale factor** can be a whole number or a fraction.

If the object is labelled ABCD, then the image is labelled A'B'C'D'.

To enlarge a shape, follow these steps.

Step 1: Locate the centre of enlargement and one corner of the object.

Step 2: Count the squares across and / or up & down to get from the centre to this corner.

Example: From centre O to corner A is 2 squares right and 2 squares up.

Step 3: Multiply your answers in Step 2 by the scale factor.

Example: $2 \times 2 = 4$, therefore 4 to the right, $2 \times 2 = 4$, therefore up.

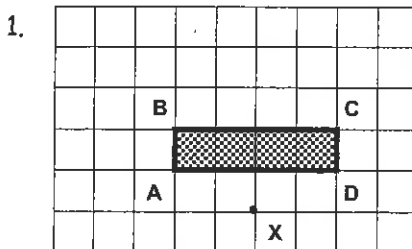
Step 4: Using your answers in Step 3, count from the centre to mark the new position of the corner, then label. *Example:* Point A moves to point A'.

Step 5: Repeat these steps for all corners of the shape, then draw lines to join corners, drawing the enlarged shape.

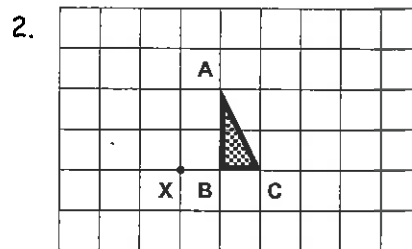
To check if your enlarged shape is in the right position, draw a line from the centre of enlargement through any point on the object and its corresponding point on the image. It should be a straight line.

Task 34

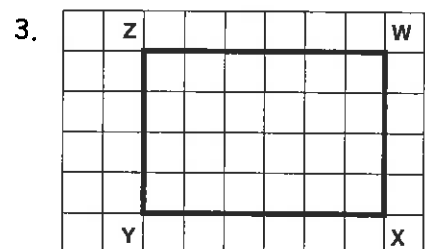
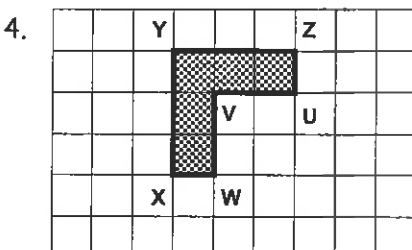
Copy each diagram. Using X as the centre of enlargement, enlarge each shape by the scale factor given. Remember to label the image and draw some lines on your completed enlargement diagram to show that the position of your diagram is correct.



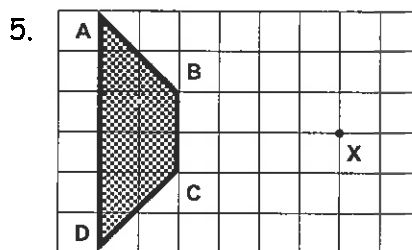
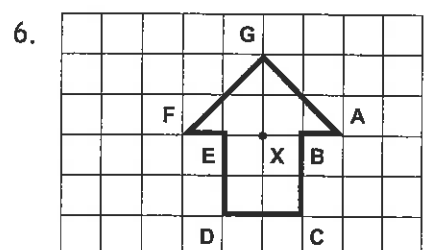
scale factor = 2



scale factor = 3

scale factor = $\frac{1}{2}$ 

scale factor = 3

scale factor = $\frac{1}{2}$ 

scale factor = 2

7. Draw a shape of your own and mark a centre of enlargement. Decide on a scale factor. Have a classmate draw the enlargement of your shape.

8. Look back at your enlargement diagrams.

Write two headings, 'Things that HAVE NOT changed' and 'Things that HAVE changed'.

Under each heading list the properties of enlargement that would go under each heading.

Example: length of sides, area, shape, angle size, orientation etc.

'In-class' Worksheet

Teaching Notes & Answers

How to use this section:

Teaching notes are enclosed in a box with a 'push-pin' at the top left corner. The teaching notes precede the answers for each worksheet / task. The teaching notes have been included to provide assistance and background information about each topic or unit of work.

Introduction:

The topic of Geometry is concerned with exploring shape and space. It involves the construction of various mathematical shapes using mathematical instruments correctly. Angle properties are explored and investigated further when looking at 'location' using a compass. Through the exploration of nets, the designs and construction of everyday packages are investigated. 3-dimensional models are created from various view diagrams and drawn on isometric paper. The symmetry of 2-dimensional shapes is explored and through understanding symmetry and transformation geometry, various symmetrical designs are to be created. Tessellations and enlargements are also investigated.



Geometry key facts:

Naming angles:

In **Task 1** pupils are to revisit many of the key geometrical words used at previous levels.

In **Task 2** pupils are to name angles using various methods.

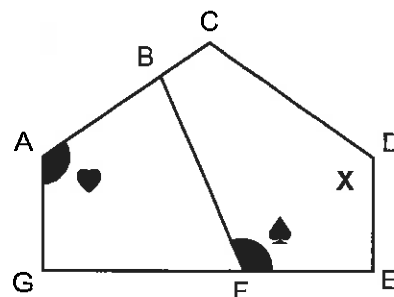
Worksheet 1

Task 1

1. clockwise
2. anti-clockwise
3. angle
4. degrees
5. protractor
6. compass
7. ruler
8. right
9. straight
10. acute
11. obtuse
12. reflex
13. perpendicular
14. parallel

Task 2

1. $\angle BFE$ or $\angle EFB$
2. $\angle A$
3. see diagram
4. line AG & line DE
5. line AG & line GE , line DE & line GE
6. $\angle ABF$ ($\angle FBA$), $\angle BFG$ ($\angle GFB$)
7. $\angle AGF$ ($\angle FGA$), $\angle FED$ ($\angle DEF$)
8. $\angle ACD$ ($\angle DCA$), $\angle FBC$ ($\angle CBF$), $\angle CDE$ ($\angle EDC$), $\angle BFE$ ($\angle EFB$), $\angle GAB$ ($\angle BAG$)
9. mark any angle greater than 180° with point A, B, C, D, E or G as a vertex
10. clockwise



Measuring and drawing angles:

In **Task 3** pupils are to use a protractor to measure angles already drawn. The measuring of these angles will require pupils to use either the inside or outside scale on a protractor.

In **Task 4** pupils are to draw various sized angles, including reflex angles. A reflex angle can be drawn by first drawing a straight line, and then measuring and drawing the remaining acute or obtuse angle required to complete the angle. No answers given for this task.

Worksheet 2

Task 3

1. 50°
2. 100°
3. 90°
4. 30°
5. 120°
6. 180°
7. 100°
8. 90°
9. 50°
10. 80°
11. 180° , straight line
12. 360° , one complete revolution
13. both the same size, 50° (vert. opp.)

Adjacent angles on a straight line:

Angles around a point:

Vertically opposite angles:

Angles in a triangle:

The worked examples at the top of each worksheet illustrate the various angle properties to be explored in Tasks 5 to 9. All angle diagrams are not drawn to scale, therefore pupils have to become confident using the angle rules.

In **Task 5** pupils are to calculate angles on a straight line.

In **Task 6** pupils are to calculate angles around a point.

In **Task 7** pupils are to calculate vertically opposite angles.

In **Task 8** pupils are to calculate angles in a triangle.

In **Task 9** pupils are to create their own angle diagrams. Classmates are to calculate the missing angles and state the rules used.

Task 5

1. $A = 63^\circ$, $B = 153^\circ$, $C = 77^\circ$, $D = 90^\circ$, $E = 126^\circ$, $F = 108^\circ$, $G = 67^\circ$, $H = 88^\circ$, $I = 83^\circ$, $J = 59^\circ$, $K = 126^\circ$, $L = 54^\circ$, $M = 137^\circ$, $N = 43^\circ$, $O = 137^\circ$, $P = 53^\circ$, $Q = 71^\circ$ 2. 97°

Task 6

1. $A = 115^\circ$, $B = 117^\circ$, $C = 57^\circ$, $D = 132^\circ$, $E = 108^\circ$, $F = 57^\circ$, $G = 63^\circ$, $H = 265^\circ$, $I = 83^\circ$, $J = 77^\circ$, $K = 83^\circ$, $L = 83^\circ$, $M = 56^\circ$, $N = 124^\circ$, $O = 56^\circ$, $P = 47^\circ$, $Q = 71^\circ$ 2. 120° 3. 60° 4. 105° 5. 45° 6. 12

Task 7

1. $A = 79^\circ$, $B = 121^\circ$, $C = 107^\circ$, $D = 90^\circ$, $E = 47^\circ$, $F = 113^\circ$, $G = 129^\circ$, $H = 69^\circ$, $I = 98^\circ$, $J = 78^\circ$, $K = 129^\circ$, $L = 51^\circ$, $M = 141^\circ$, $N = 39^\circ$, $O = 141^\circ$, $P = 37^\circ$, $Q = 65^\circ$ 2. 67°

Task 8

1. $A = 79^\circ$, $B = 117^\circ$, $C = 90^\circ$, $D = 34^\circ$, $E = 64^\circ$, $F = 59^\circ$, $G = 40^\circ$, $H = 65^\circ$, $I = 63^\circ$, $J = 52^\circ$, $K = 40^\circ$, $L = 140^\circ$, $M = 49^\circ$, $N = 49^\circ$, $O = 45^\circ$, $P = 76^\circ$, $Q = 37^\circ$ 2. 15°

Constructing triangles:

Creating designs involving circles:

The accurate construction of any shape using mathematical instructions, is a valuable skill. Triangles can be constructed using a ruler, compass and / or protractor.

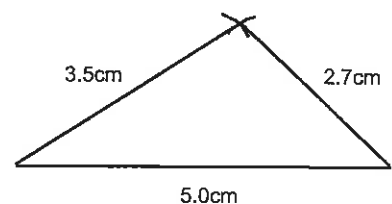
To construct a triangle with sides of 5.0cm, 3.5cm and 2.7cm follow these steps.

Step 1: Draw one of the sides, *Example:* 5.0cm

Step 2: Open the compass to 3.5cm, place the point of the compass on the left end of the line and draw an arc.

Step 3: Open the compass to 2.7cm, place the point of the compass on the right end of the line and draw an arc.

Step 4: Complete the triangle by joining the ends of the line to where the two arcs cross.



To construct a triangle when one or two angle sizes are given, the procedure is very similar except a protractor is used to draw accurate angles.

In **Task 10** pupils are to construct triangles given the length of all sides or given the lengths of some sides, plus 1 or 2 angle sizes. Pupils create their own diagrams and have a classmate reconstruct a copy of each diagram using mathematical instruments.

In **Task 11** pupils are to complete sentences associated with features of circles and use mathematical instruments to construct designs created from circles. Pupils create their own designs and have a classmate reconstruct a copy of each diagram using mathematical instruments.

Task 10

4. equilateral triangle 8. Side A = 6.5m, Side B = 4.5m

Task 11

- circumference
- centre
- arc
- radius, radii
- diameter
- semicircles
- segment
- sector
- The largest circle was drawn. The mid-point of its radius was found and a second circle was drawn, using the mid-point as the centre of this circle. Find the mid-point of the radius of the second circle and use this point to draw the smallest circle.

Understanding and drawing 'nets':
Creating and designing nets:

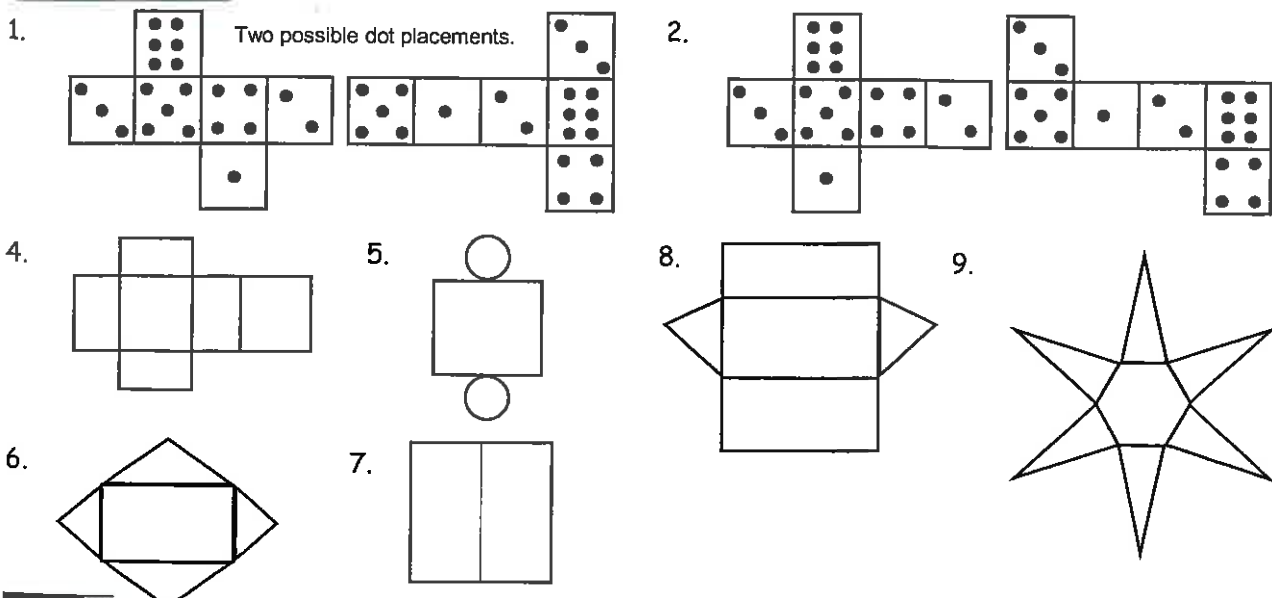
Worksheets 9 & 10

In **Task 12** pupils are to draw nets for everyday objects.

In **Task 13** pupils are to collect everyday packaging, carefully the packaging pulling apart to examine the nets used to form each package. Are these fancy packages necessary? Pupils are to discuss this issue.

In **Task 14** pupils are to accurately draw a net given the dimensions. Pupils are to design and create a net, that when folded will form a container to hold some pencils or crayons. Pupils are also to design and create a 'Get Well Soon' or 'Birthday' card. Encourage pupils to make an unusual shaped card, rather than a rectangular card. A further construction involves designing and creating a container with a lid.

Task 12



**View diagrams and making models:
Drawing on isometric paper:**

To draw a 3D object on plain paper can be difficult. Using isometric paper can make it easier.

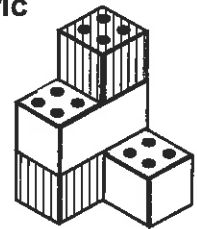
In **Task 15** pupils are to study the top, front, left side, right side and back view diagrams of structures made of Lego blocks and match them with '3D' looking diagrams of the same structure. Pupils are to use blocks to create these structures.

In **Task 16** pupils are to use a Level 4 Geometry resource specially created by **AWS Teacher Resources** to cover objectives 3 and 4 of the Geometry strand.

About this resource ...

3D Geometry Resource

- ◆ **A5 booklets with graded exercises covering Level 4 Geometry objectives, G3 & G4.**
- ◆ **Resource Code 4A5 includes 15 A5 sized booklets, plus isometric & squared paper PHOTOCOPY MASTERS, and teaching notes.**
- ◆ **Resource Code 4MB are sets of blocks required to build each block structure.**
- ◆ **Written for Years 7 / 8.**



Resource code: 4A5 Teacher's Resource plus 15 booklets
 Resource code: 4A5A Additional booklets
 Resource code: 4MB Block sets

Cost: \$30.00
 Cost: \$0.90 each
 Cost: \$0.80 each

This resource can be obtained on approval from

AWS Teacher Resources, P O Box 21304, CHRISTCHURCH 8030

In **Task 17** pupils are to practise drawing block structures on isometric paper and make structures out of Lego blocks. Having made the structures, pupils are to draw top, front, left side, right side and back views of these structures. Using isometric paper, everyday objects are to be drawn.

In **Task 18** pupils are to create more block structures and draw them on isometric and squared paper.

Task 15

1. C 2. E 3. D 4. A 5. B

Task 17

11. The following view diagrams have been drawn as if what can be seen on the page is the left side and the front of the block structure. There will be different correct orders.

	Top	Front	Left side	Right side	Back
5.					

	Top	Front	Left side	Right side	Back
6.					
7.					
8.					
9.					

Worksheets 13 to 17

Describing location using grid references:

Finding location using co-ordinates:

Finding location using compass points:

Finding locations using bearings measured from North:

Creating pathways:

There are several ways of locating places, objects or points on a map, using grid references or compass points. The next few tasks explore various methods.

In **Task 19** pupils are to locate places on a map using a grid reference. A grid reference defines an area, shaped like a square or rectangle, on a map, but does not locate an exact point. A map has been supplied for this task.

In **Task 20** pupils are to play games of battleships using a grid. Both pupils mark squares on their grids to represent battleships. Pupils take turns calling out grid references. The winner is the pupil who 'destroys' the opponent's battleships first, by calling out the squares the battleships are on. Remember to stress the order of the grid references is very important. The two numbers called out are in the order of across first, followed by up. This is consistent with graphs involving ordered pairs as used in the Algebra resource, and later in Task 21..

In **Task 21** pupils are to locate points or objects displayed on a graph using ordered pairs or co-ordinates. Pupils draw their own graphs and have a classmate describe the location of an object on the graph using co-ordinates.

In **Task 22** pupils are to first name the various directions on a compass and then use these directions to locate points radiating out from a central point. Distances are given, therefore pupils are to state the direction and distance various points are from the central point. A series of compass directions and distances are given and from this pupils are to create a scale diagram of a school playground area. Pupils are to create their own scale maps, write instructions as to where objects are located and have a classmate try to reconstruct the map.

In **Task 23** pupils are to work out bearings measured from north to locate different points. All bearings are measured in a clockwise direction and for this task, a protractor will be required.

In **Task 24** pupils are to draw pathways called a **loci**. Mathematical instructions are to be used. Examples of locii that are not smooth or constant pathways are also explored.

Task 19

- Map 5, grid square F2
- H6
- E6
- E3
- E2
- Lake Taupo
- Mount Tongariro
- Kaweka Forest Park
- Pureora Forest Park
- Ruahine Forest Park, Ruahine range
- G1, G2, F2
- E3, E3, F4
- Ohakune
- F4, F5, F6, E6
- Taihape

Task 20

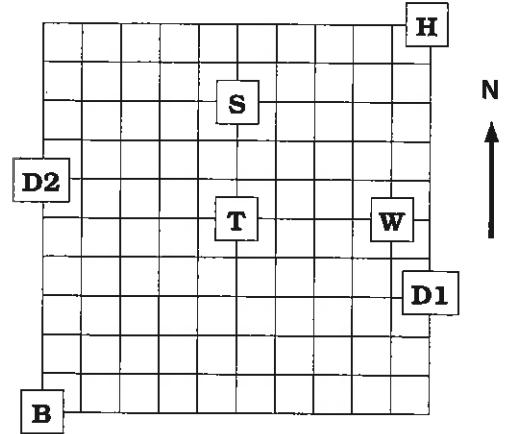
- (6,3) means 6 across to the right, then 3 up.
- (3,9), (4,8), (5,7), (6,6)

Task 21

- diamond
- (2,7), (3,4), (6,2), (7,8)
- (1,5), (4,2), (5,6), (9,2)
- (2,1), (4,9), (8,5)
- (1,9), (6,5), (8,1), (9,9)
- (9,2), (7,6), (2,1), (3,4), (6,3), (2,8), (5,9) & (9,2)

Task 22

- NE
- E
- SE
- S
- W
- NW
- Town E
- Town G
- Town B = 16.5km N, Town C = 30.6km NE, Town D = 29.4km SE, Town E = 20.5km S, Town F = 19.8km SW, Town G = 21.6km W
- 20km W
- 20km S
- 14km NE
- 21km SW
- 42km NW
- 25km S
- 20km N
- 14km SE
- 28km SW
- 20.



Task 23

- 135°
- 315°
- 45°
- 225°
- John 40°, Rangi 120°, Alex 160°, Auriol 250°, Siona 320°
- 60°
- 230°
- 140°
- 285°

Task 24

Diagrams below are not drawn to scale.

- Circle with radius = 2cm
- Circle with radius = 15mm
- Circle with radius = 3.5cm
- Two concentric circles. Labels: Circle radius = 35mm, inside circle radius = 15mm, outside circle radius = 55mm
- Two concentric circles. Labels: Circle radius = 35mm, inside circle radius = 25mm, outside circle radius = 45mm
- Two concentric circles. Label: inside circle radius = 20mm
- Two horizontal lines. An upward arrow between them is labeled "15mm above the line".
- Two horizontal lines. A downward arrow between them is labeled "2.5cm below the line".
- Two horizontal lines. An upward arrow between them is labeled "10mm above the line" and a downward arrow between them is labeled "10mm below the line".
- Two horizontal lines. An upward arrow between them is labeled "3cm" and a horizontal line between them is labeled "5cm line".
- Three concentric rounded rectangles. An arrow points to the middle one with the text: "Draw a line in this lane to show where Richard will run in this 400m race."

Reflecting shapes and locating mirror lines:

Creating designs involving reflections:

Reflective symmetry:

There are four transformations covered at this level; reflection, rotation, translation and enlargement. Over the next 7 worksheets these transformations will be investigated. In all cases, the original shape is called the **object** and its new position is called its **image**.

In **Task 25** pupils are to copy shapes onto the squares of their maths books, then reflect the shapes, given the position of the mirror lines. Some shapes cross the mirror line, therefore the reflection will involve reflecting parts of the shape in different directions. More than one mirror line is involved in some questions. Pupils are to locate mirror lines or lines of symmetry between two shapes and create their own diagrams that classmates can reflect.

In **Task 26** pupils are to create paper designs and complete patterns for designs involving reflection.

In **Task 27** pupils are to investigate the reflective symmetry of regular 2D shapes, stating the order of reflective symmetry for each shape.

Task 25

1.

2.

3.

4.

5.

6.

7.

8.

10.

11.

12.

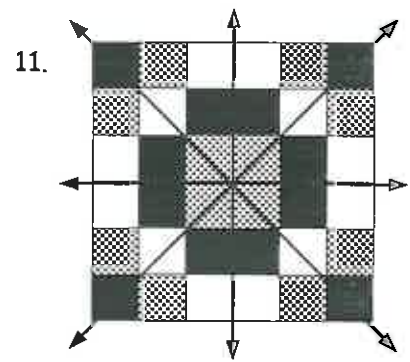
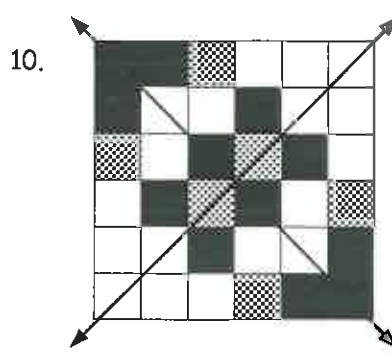
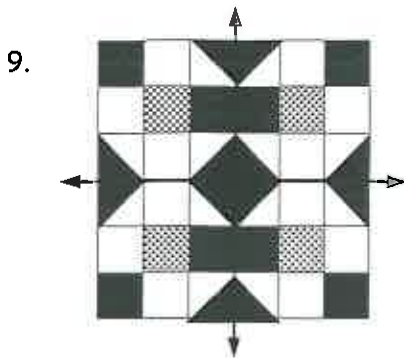
13.

Task 26

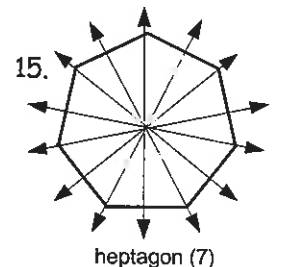
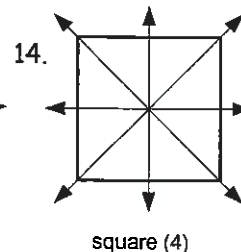
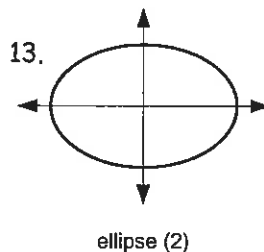
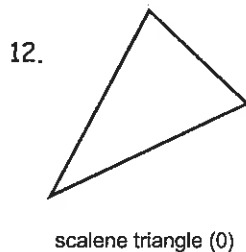
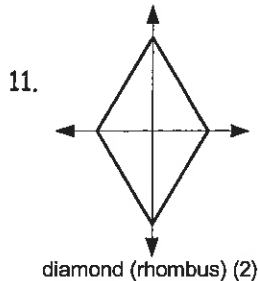
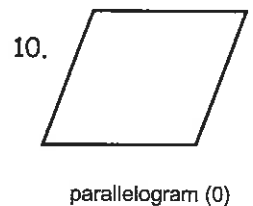
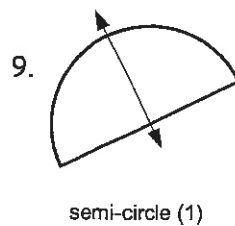
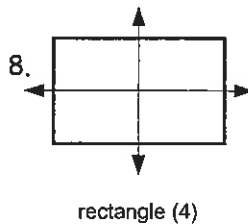
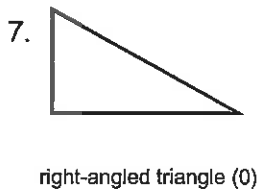
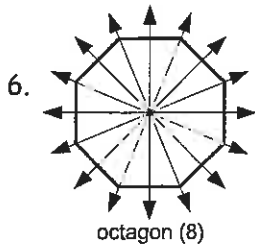
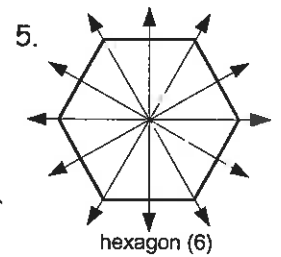
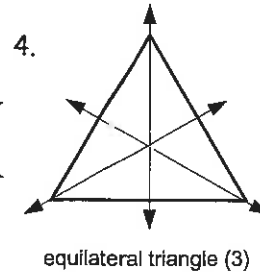
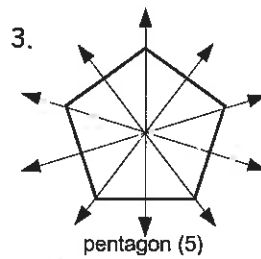
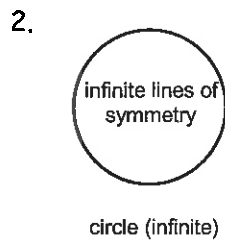
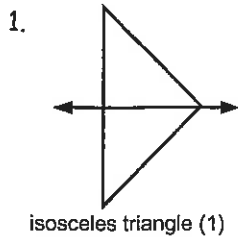
6.

7.

8.



Task 27



16. Symmetry lines are drawn on each shape above. Order of reflective symmetry is the number in the brackets after the name of the shapes.

Worksheets 21 & 22

Rotating a shape and finding the centre of rotation: Rotational symmetry:

In **Task 28** pupils are to investigate rotation. For rotation to occur there must be a **centre of rotation** and an **angle of rotation**. At this level the angles of rotation have been restricted to a $\frac{1}{4}$ turn or 90° , a $\frac{1}{2}$ turn or 180° and $\frac{3}{4}$ turn or 270° either in a clockwise or anti-clockwise direction. To find the centre of rotation, pupils can hold an object, simulate the rotation and by trial and error, the centre can be found.

In **Task 29** pupils are to investigate **rotational symmetry**. A shape has rotational symmetry if, as it is being rotated you can stop in a position whereby the shape looks the same as it did before it was rotated. The number of times this occurs will determine the number or order of rotational symmetry for that particular shape. All shapes have at least one order of rotational symmetry as any shape will look like itself once it has been rotated through 360° . The 2D shapes in this task can be drawn on cardboard, cut out and physically rotated to determine the order of rotation. Remember the centre of the shape will be the centre of the rotation.

In **Tasks 30 & 31** pupils are to create and describe either symmetrical designs or tessellations.

Task 28

- 1.
 - 2.
 - 3.
 - 4.
 - 5.
 - 6.
 - 7.
 - 8.
10. 180° clockwise or anti-clockwise about centre point B
 11. 90° anti-clockwise about centre point B

Worksheets 24, & 25

Finding the scale factor for an enlargement:

Finding the centre of an enlargement:

Drawing enlargements:

For an enlargement to occur, there must be a scale factor and a centre of enlargement. An enlargement can result in a shape becoming bigger or smaller, depending on the scale factor.

In **Task 32** pupils are to calculate the scale factors given an object and its image. By comparing the length of corresponding sides on the object and its image, the scale factor can be calculated.

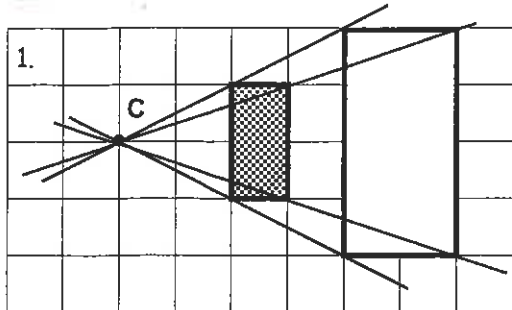
In **Task 33** pupils are to find the centres of enlargement for various shapes. This can be done by drawing lines through pairs of corresponding corners on the object and its image. Where the lines cross is the centre of enlargement. The scale factors can also be calculated from the diagrams.

In **Task 34** pupils are to enlarge a shape, given the scale factor and the centre of enlargement. The steps are outlined in Worksheet 25. Note the convention for labelling corresponding corners whereby if a corner on an object is labelled A, then the corresponding corner on its image would be labelled A'. Having drawn several enlargements, pupils are to comment on the properties of enlargement that are invariant. Invariant properties do not change.

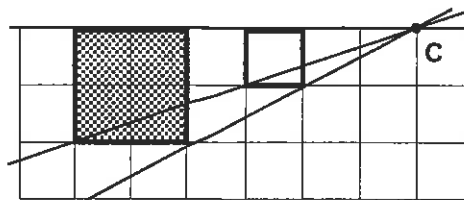
Task 32

1. 2
2. 3
3. $\frac{1}{2}$
4. $\frac{1}{4}$
5. 3
6. $\frac{3}{4}$

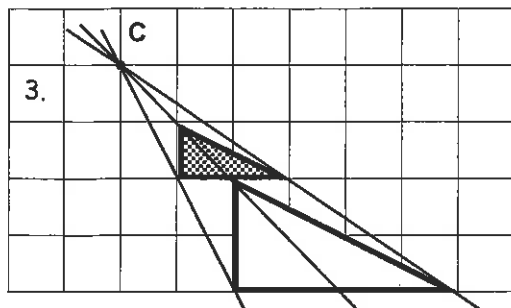
Task 33



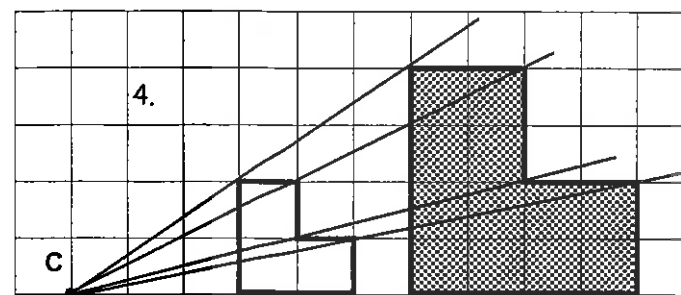
scale factor = 2



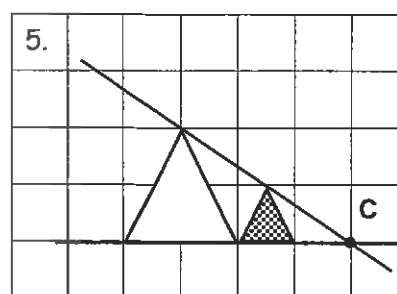
scale factor = $\frac{1}{2}$



scale factor = 2

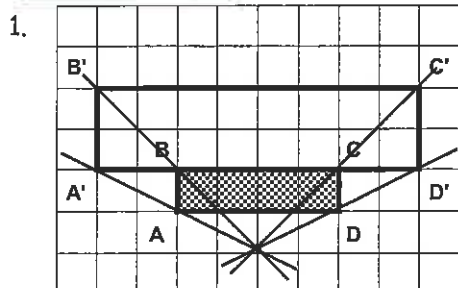


scale factor = 2

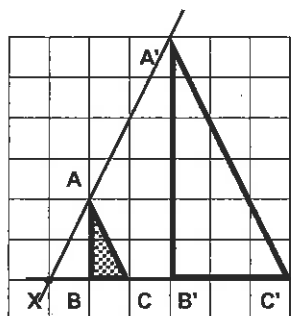


scale factor = 2

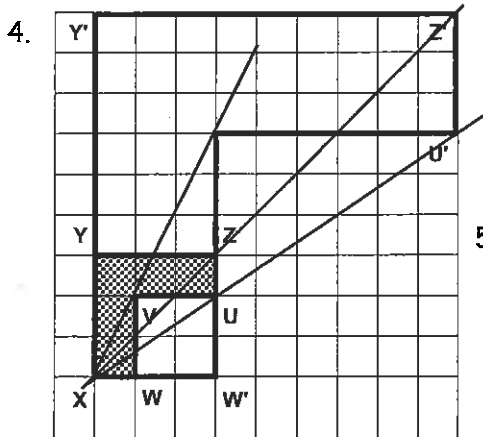
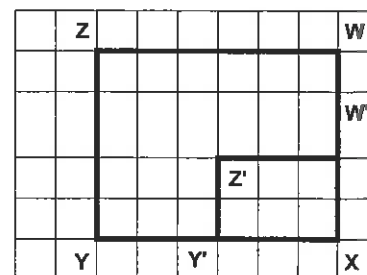
Task 34



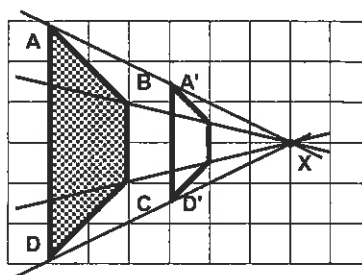
2.



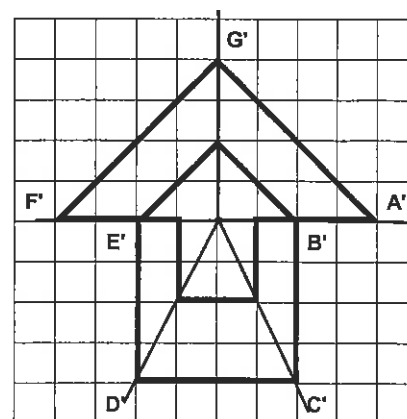
3.



5.



6.



8. 'Things that HAVE NOT changed' would include ...
 angle sizes, corresponding sides are always parallel, the
 centre of enlargement does not move, the labelling of letters is
 still in the same direction

'Things that HAVE changed' would include ...
 length of sides, area of the shape

Table of Contents for the Homework / Assessment Worksheet Masters for Geometry, Level 4

Worksheet Number	Topic	Geometry Objective(s)
1	Geometry key facts / Naming angles / Measuring angles / Drawing angles	G1
2	Angle properties / Using angle properties / Angle problems	G1
3	Constructing triangles / Circle parts	G1
4	Drawing nets / Net diagrams / Scale diagram of a net	G2
5	Drawing on isometric paper / Constructing 3D block structures / Drawing view diagrams	G3 / G4
6	Location using grid references / Location using co-ordinates / Location using compass points / Bearings from NORTH	G5
7	Reflective and rotational symmetry / Designs involving reflection / Rotating shapes / Tessellations	G6 / G7
8	Finding scale factors of enlargement / Finding a centre of an enlargement / Drawing an enlargement / Describing designs	G8
Answers		



Geometry

L4MG



G1

Homework / Assessment Worksheet

Name: _____

Class: _____

Complete by: _____

A: 10 'Quick Questions'

- $21 - 4 \times 5 + 11 = \dots\dots\dots$
- Convert 65cm to mm
.....
- Change 22:17 in 24hr time to a.m or p.m. time
.....
- Calculate 3^3
- Find the mean of the numbers 8, 15, 12, 3, 7
mean =
- Find $\frac{1}{2}$ of \$47.50
.....
- Estimate 102.9×4.89 by rounding first
..... \times =
- Measure this line to the nearest cm



9. $1.85 \times 0.8 = \dots\dots\dots$



perimeter =cm

B: Geometry key facts

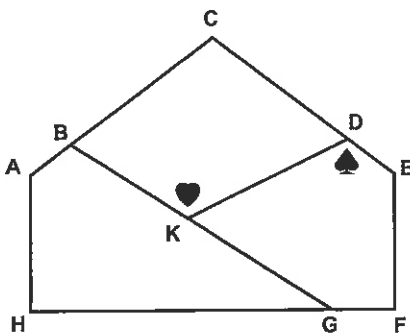
Complete each statement below using one of the words listed below.

- This arrow is pointing in a direction. 
- This arrow is pointing in an direction. 
- An is a measure of turn.
- Angle size is measured in
- A is used to measure angle size.
- A is used to draw circles.
- A is used to draw and measure straight lines.
- An angle that is 90° or a $\frac{1}{4}$ turn is called a angle.
- An angle that is 180° or a $\frac{1}{2}$ turn is called a angle.
- An angle is greater than 0° but less than 90° .
- An angle is greater than 90° but less than 180° .
- A angle is greater than 180° but less than 360° .
- Two lines that cross at right angles are
- Two lines that are the same distance apart are

- straight ruler
acute
parallel
clockwise
obtuse
protractor
compass
perpendicular
right degrees
angle
reflex
anti-clockwise



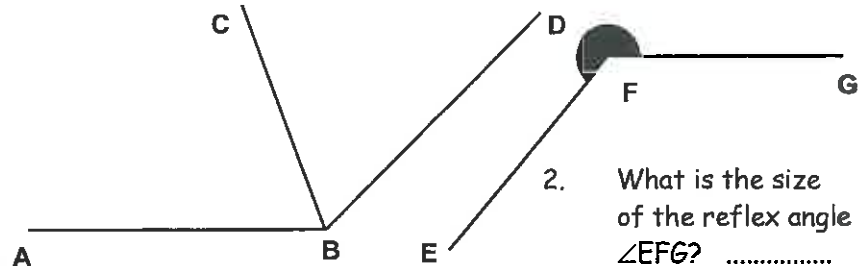
C: Naming angles



- Use three letters to name the angles marked with ♥ & ♠ shapes.
♥ = ♠ =
- Mark $\angle GBC$ with a X.
- Name two acute angles
.....
- Name two obtuse angles
.....

D: Measuring angles

- Use a protractor to measure $\angle ABC = \dots\dots\dots$ & $\angle DBA = \dots\dots\dots$



- What is the size of the reflex angle $\angle EFG$?

E: Drawing angles

Using the line AB as one arm of an angle and B as the vertex, draw the following angles .

- 105°
- 190°
- 40°



Comments:

Please sign:
Parent / Caregiver




Name: _____

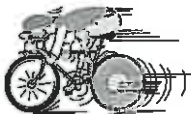
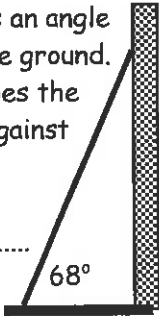
Class: _____

Complete by: _____

A: 10 'Quick Questions'

- $13 + 3 \times 9 - 24 =$
- Convert 134cm to m
.....
- Change 3:25 p.m. to 24 hour time
.....
- Calculate 9^2
- Find the median of the numbers 8, 15, 12, 3, 7
median =
- Find 50% of \$63.50
.....
- Estimate $89.56 \div 9.94$ by rounding first
..... \div =
- Measure this line to the nearest mm
- $2.45 \times 0.8 =$
- 
area =cm²

D: Angle problems

- A new bicycle wheel has been designed with 8 spokes.
What is the angle between each spoke?

.....
- A ladder leaning against a building makes an angle of 68° with the ground.
What angle does the ladder make against the building?

.....

B: Angle properties

Match the diagrams (A to D) with the angle rules (1 to 4).

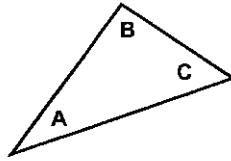


Diagram A

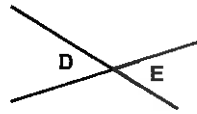


Diagram B

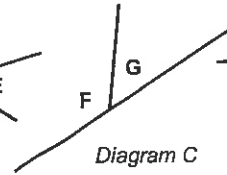


Diagram C

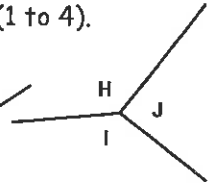
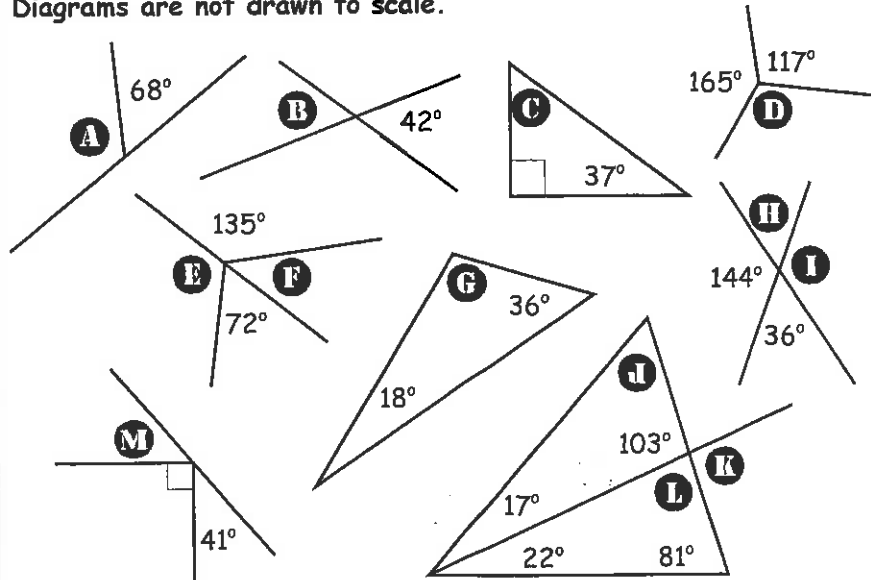


Diagram D

Diagram:

- Adjacent angles on a straight line add to 180°
- Angles around a point add to 360°
- Vertically opposite angles are equal.
- Angles in a triangle add to 180°

C: Using angle propertiesCalculate the missing angles and state which rule you used.
Diagrams are not drawn to scale.

- A =
 B =
 C =
 D =
 E =
 F =
 G =
 H =
 I =
 J =
 K =
 L =
 M =



Comments:

Please sign:
Parent / Caregiver



Name: _____

Class: _____

Complete by: _____

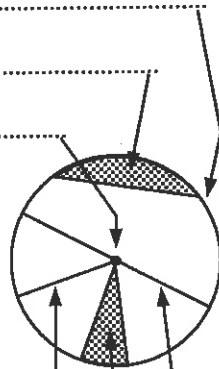
A: 10 'Quick Questions'

- $15 \div 3 \times 4 - 9 = \dots\dots\dots$
- Convert 1725mm to m
.....
- Change 07:55 in 24hr time to a.m or p.m. time
.....
- Calculate $\sqrt{81} = \dots\dots\dots$
- Find the mode of the numbers 8, 7, 9, 12, 7
mode =
- Find 20% of \$520.00
.....
- Estimate $895.9 \div 31.98$ by rounding first
..... \div =
- List the first 5 multiples of 12
- $6.95 \times 0.8 = \dots\dots\dots$
- Solve the equation
 $4y + 15 = 43$
 $y = \dots\dots\dots$

C: Circle parts

Name the parts of the circle, using the list of words below.

-
-
-
-
-
-



segment, centre, radius, sector, diameter, circumference

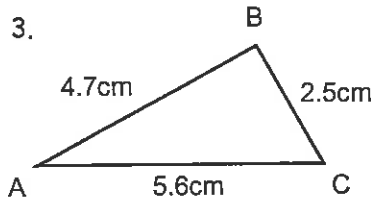
B: Constructing triangles

- Side AC of a triangle ABC has been drawn.
Complete the construction if side AB = 30mm and side CB = 40mm.
- Measure line AC and $\angle ABC$.
AC = $\angle ABC = \dots\dots\dots$

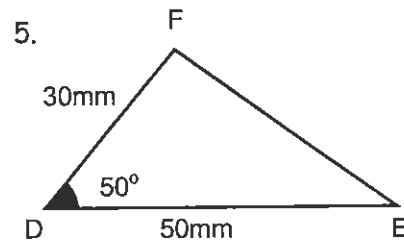
A

C

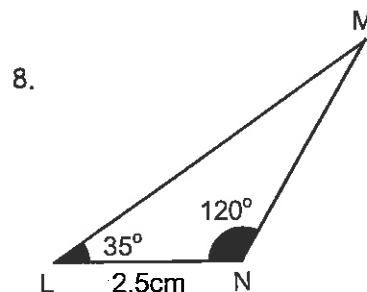
Construct these triangles. Show your construction marks. Diagrams below are not drawn to scale.



4. Measure $\angle A$



- Measure $\angle E$
- Measure the length of line EF mm



- Calculate $\angle M$
- Measure the length of line LM cm



Comments:

Please sign:
Parent / Caregiver



Geometry

L4MG

4

Homework / Assessment Worksheet

G2

Name: _____

Class: _____

Complete by: _____

A: 10 'Quick Questions'

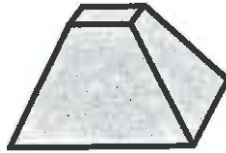
- $9 \times 4 \div 6 - 5 = \dots\dots\dots$
- Convert 2.525km to m
.....
- Change 8:15 a.m. to 24 hour time
.....
- $12.8 \div 0.4 = \dots\dots\dots$
- Find the range of the numbers 21, 3, 11, 1, 15
range =
- Find $\frac{3}{4}$ of \$48.80
.....
- If the area of a square is 49cm^2 , how long is each side?
.....
- List the factors of 28
.....
- $9.28 \times 0.9 = \dots\dots\dots$
- Solve the equation
 $5y - 15 = 45$
 $y = \dots\dots\dots$

B: Drawing nets

- Draw two different nets for a die (dice) and remember to draw in the dots.

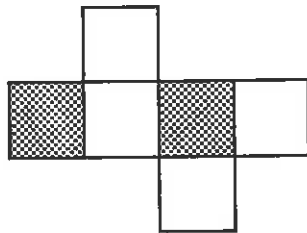
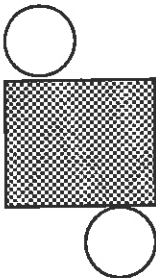


- Draw a net for this object below.



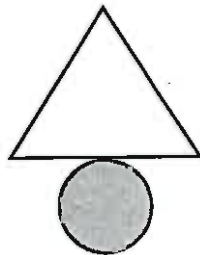
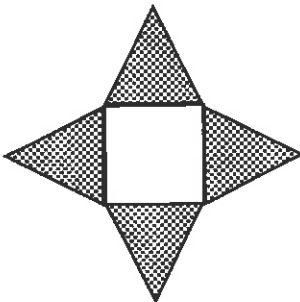
C: Net diagrams

Name the 3D objects created from these nets.



1.

2.

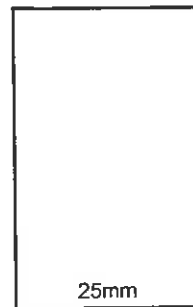
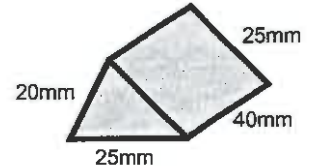


3.

4.

D: Scale diagram of a net

Complete this scale diagram of a net for this object. Label your diagram.



Please sign:
Parent / Caregiver

Comments:



AWS



Geometry

L4MG



G3 / G4

Homework / Assessment Worksheet

Name: _____

Class: _____

Complete by: _____

A: 10 'Quick Questions'

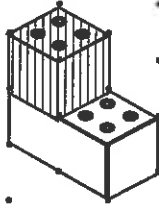
- $27 - 6 \times 4 + 11 = \dots\dots\dots$
- Convert 5625g to kg
.....
- Add $1.3\text{m} + 85\text{cm}$
(answer in cm)
- $0.62 \times 0.2 = \dots\dots\dots$
- Write 20 to 7 in digital time
- Find 20% of \$480.00
.....
- List the scores in this stem & leaf graph.

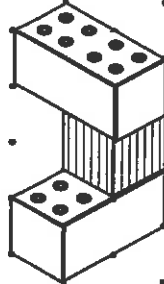
	21		5, 9, 0, 6
--	----	--	------------

.....
- Find the next 3 numbers in this sequence
4, 9, 14,
- $23.5 \times 0.6 = \dots\dots\dots$
- Solve the equation
 $2(y + 5) = 16$
 $y = \dots\dots\dots$

B: Drawing on isometric paper

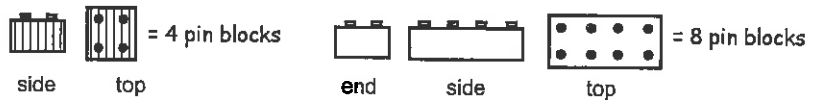
Copy each block diagram in the space provided.

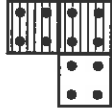




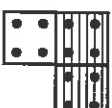




1. 

2. 

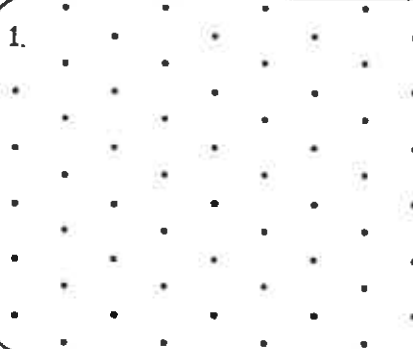
C: Constructing 3D block structures

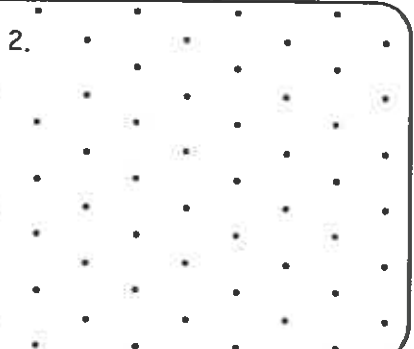
Study the view diagrams and build each block structure.



	Top	Front	Left side	Right side	Back
1.					
2.					

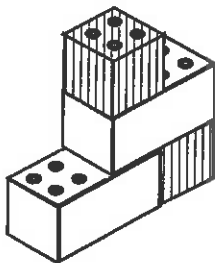
Draw each block structure above on isometric paper.

1. 

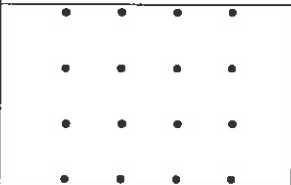
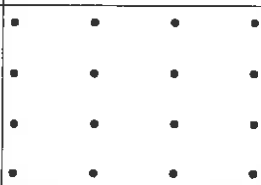
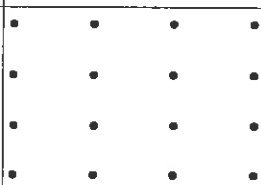
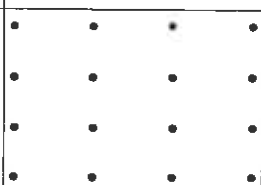

2. 

D: Drawing view diagrams

Study this diagram of a block structure made from 2 4-pin and 2 8-pin blocks.



Draw the view diagram for the block structure.

Top	Front	Left side	Right side	Back
				

Comments:

Please sign:
Parent / Caregiver





Geometry

L4MG



G5

Homework / Assessment Worksheet

Name: _____

Class: _____

Complete by: _____

A: 10 'Quick Questions'

- $27 \div 3 + 6 \times 5 =$
- Convert 3500mL to L
.....
- Write 25 to 11 in digital time
- $25.5 \div 0.5 =$
- Find the mean of the numbers 18, 3, 10, 7, 14
mean =
- Find 30% of \$50.00
.....
- If the perimeter of a square is 28cm, how long is each side?
- Find the next 3 numbers in this sequence
2, 9, 16,
- Add $1.7\text{m} + 85\text{cm}$
(answer in m)
- Solve the equation
 $4(y - 3) = 36$
 $y =$

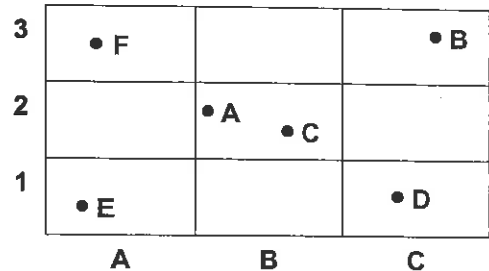
B: Location using grid references

The dots on this grid represent towns.

- Which town has a grid reference of A3?

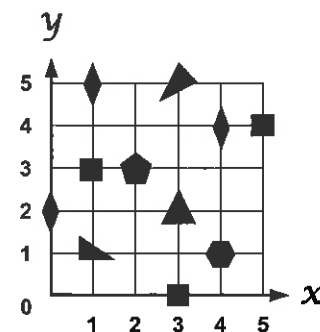
Describe the location of these towns.

- A
- B
- C
- D
- E



C: Location using co-ordinates

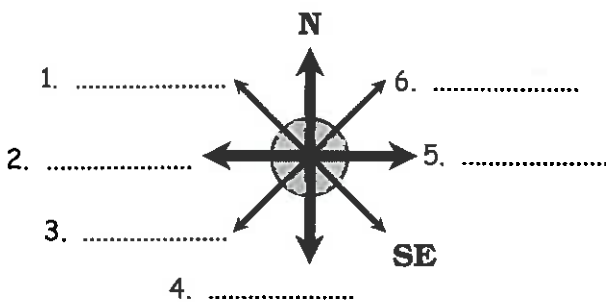
On this graph there are mathematical shapes.



- What shapes are at the points ...
(2,3) and
(4,1) ?
- List the co-ordinates to locate all the triangles.
- List the co-ordinates to locate all the squares.
- List the co-ordinates to locate all the diamonds.

D: Location using compass points

Fill in the missing compass points.



On this diagram each letter represents a town. State the distances and give the directions from Town A to the other towns, as follows ...

- A to B
 - A to D
 - A to F
-
- A to C
 - A to E

E: Bearings from NORTH

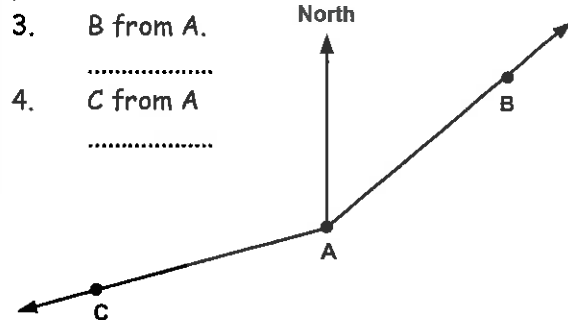
Bearings are measured from NORTH.

Example: East has a bearing of 90° .

Calculate the bearings for these compass directions.

- NE =
- SW =

Use a protractor to find the bearings of these points.



- B from A.
.....
 - C from A
.....
- If D is 2cm from A at a bearing of 150° , add point D to this diagram.



Comments:

Please sign:
Parent / Caregiver





Geometry

LAMG



G6 / G7

Homework / Assessment Worksheet

Name: _____

Class: _____

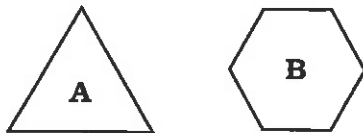
Complete by: _____

A: 10 'Quick Questions'

- $36 - 5 \times 7 + 9 = \dots\dots\dots$
- Convert 6.325L to mL
.....
- Add 4250g + 1.3kg
(answer in g)
- $0.98 \times 0.4 = \dots\dots\dots$
- Write $\frac{1}{4}$ to 11 in digital
time
- Find 10% of \$48.70
.....
- List the scores in this
stem & leaf graph.
| 30 | 1, 9, 8, 2, 3
.....
- Find the next 3 numbers
in this sequence
5, 11, 17,
- $17.4 \times 0.9 = \dots\dots\dots$
- Solve the equation
 $3(y - 6) = 15$
y =

B: Reflective and rotational symmetry

- Look at each 2D shape drawn below. Name each shape and draw in the lines of symmetry (if any) on each shape.



- State the order of reflective and order of rotational symmetry for each shape.

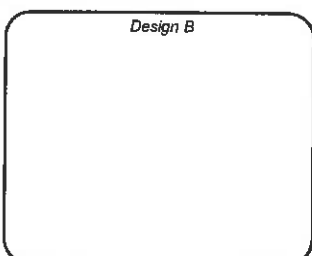
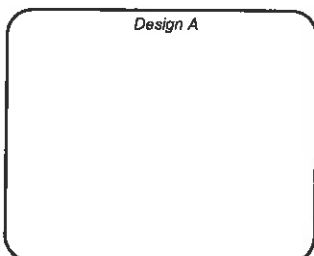
Complete the table below.

Shape	Reflective symmetry	Rotational symmetry
A		
B		
C		
D		
E		
F		
G		
H		

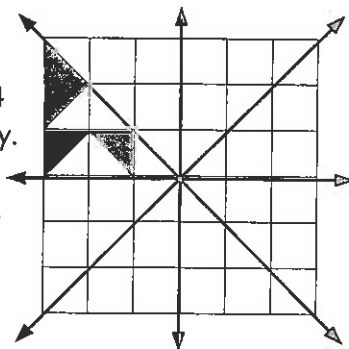


C: Designs involving reflection

- By folding paper and cutting with scissors, make two designs to fit in the gaps below. Make **Design A** with 1 line of symmetry and **Design B** with 2 lines of symmetry.

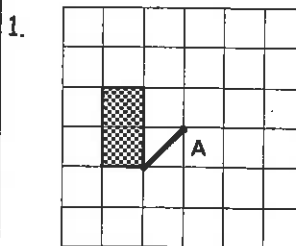


- This design has 4 lines of symmetry. Reflect the triangles pattern to complete the design.

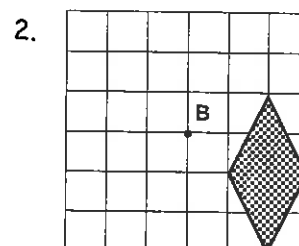


D: Rotating shapes

Rotate each shape as directed.



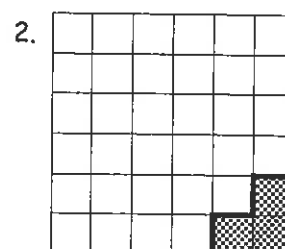
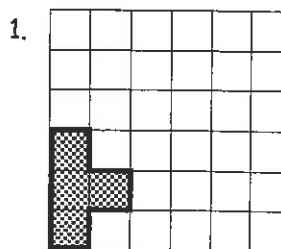
Rotate this shape
90° clockwise,
about point A.



Rotate this shape
180° clockwise,
about point B

E: Tessellations

Tessellate the shape in each box.



Comments:

Please sign:
Parent / Caregiver

AWS



Name: _____

Class: _____

Complete by: _____

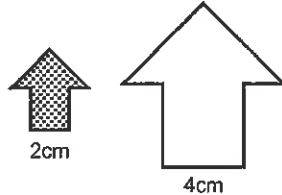
A: 10 'Quick Questions'

- $48 \div 8 + 7 \times 6 = \dots\dots\dots$
- Convert 4700mg to g
.....
- Write $\frac{1}{2}$ past 10 in digital time:.....
- $36.5 \div 0.5 = \dots\dots\dots$
- Find the median of the numbers 18, 3, 18, 12, 9
median =
- Find $\frac{2}{3}$ of \$48.00
.....
- If the area of a square is 64cm^2 , how long is each side?
- Find the next 3 numbers in this sequence
39, 35, 31,
- Add $5.6\text{km} + 1375\text{m}$
(answer in km)
- Solve the equation
 $3(y + 7) = 30$
 $y = \dots\dots\dots$

B: Finding scale factors of enlargement

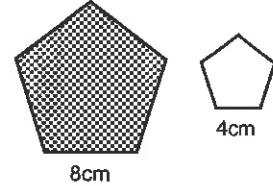
For an enlargement to occur, there must be a scale factor.
Work out the scale factors for these enlargements.
The object is the shaded shape, the clear shape is the image.

1.



scale factor =

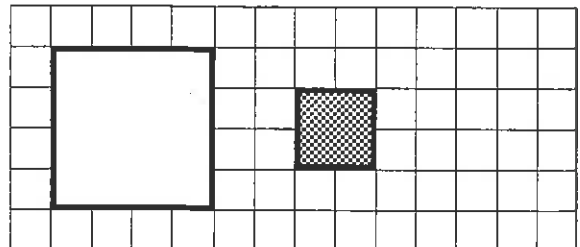
2.



scale factor =

C: Finding a centre of an enlargement

- Join corresponding corners of the object (shaded) and its image (clear) to locate the centre of this enlargement.



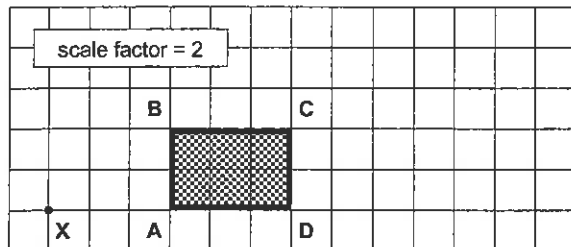
2.

State the scale factor of this enlargement.
.....

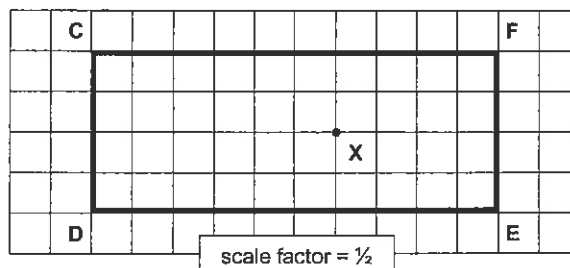
D: Drawing an enlargement

Using X as the centre of enlargement, enlarge each shape by the scale factor given. Remember to label the image and draw some lines on your completed enlargement diagram to show that the position of your diagram is correct.

1.



2.

**E: Describing designs**

Describe what has happened to each series of diagrams.
Use the words reflected, rotated, translated or enlarged.



1.



2.



3.



4.

Comments:

Please sign:
Parent / Caregiver

Homework / Assessment Worksheet

Answers

Worksheet 1

A:

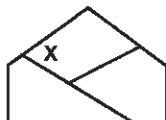
1. 12 2. 650mm 3. 10:17 p.m. 4. 27 5. mean = 9 6. \$23.75 7. $100 \times 5 = 500$ 8. 5cm
9. 1.48 10. 30cm

B:

1. clockwise 2. anti-clockwise 3. angle 4. degrees 5. protractor 6. compass 7. ruler
8. right 9. straight 10. acute 11. obtuse 12. reflex 13. perpendicular 14. parallel

C:

1. $\heartsuit = \angle BKD$ or $\angle DKB$, $\spadesuit = \angle KDE$ or $\angle EDK$ 2.
4. $\angle HAB$, $\angle BCD$, $\angle BKD$, $\angle KDE$, $\angle DEF$, $\angle FGK$



3. $\angle KBC$, $\angle CDK$, $\angle DKG$, $\angle KGH$

D:

1. $\angle ABC = 70^\circ$, $\angle ABD = 135^\circ$ 2. 230°

Worksheet 2

A:

1. 16 2. 1.34m 3. 15:25 4. 81 5. median = 8 6. \$31.75 7. $90 \div 10 = 9$ 8. 44mm
9. 1.96 10. 36cm^2

B:

1. Diagram C 2. Diagram D 3. Diagram B 4. Diagram A

C:

- $A = 112^\circ$, \angle 's on a st line = 180° , $B = 42^\circ$, vert. opp. \angle 's are equal $C = 53^\circ$, \angle 's in a $\Delta = 180^\circ$,
 $D = 78^\circ$, \angle 's around a pt. = 360° , $E = 108^\circ$, \angle 's on a st line = 180° , $F = 45^\circ$, \angle 's on a st line = 180° ,
 $G = 126^\circ$, \angle 's in a $\Delta = 180^\circ$, $H = 36^\circ$, vert. opp. \angle 's are equal $I = 144^\circ$, vert. opp. \angle 's are equal
 $J = 60^\circ$, \angle 's in a $\Delta = 180^\circ$, $K = 103^\circ$, vert. opp. \angle 's are equal $L = 77^\circ$, \angle 's in a $\Delta = 180^\circ$,
 $M = 49^\circ$, \angle 's on a st line = 180°

D:

1. 45° 2. 22°

Worksheet 3

A:

1. 11 2. 1.725m 3. 7:55 a.m. 4. 9 5. mode = 7 6. \$104 7. $900 \div 30 = 30$ 8. 12, 24, 36, 48, 60
9. 5.56 10. $y = 7$

B:

2. $AC = 50\text{mm}$, $\angle ABC = 90^\circ$ 4. $26^\circ \pm 1^\circ$ 6. $27^\circ \pm 1^\circ$ 7. $38\text{mm} \pm 1$ 9. 25° 10. $5.1\text{cm} \pm 0.1$

C:

1. circumference 2. segment 3. centre 4. radius 5. sector 6. diameter

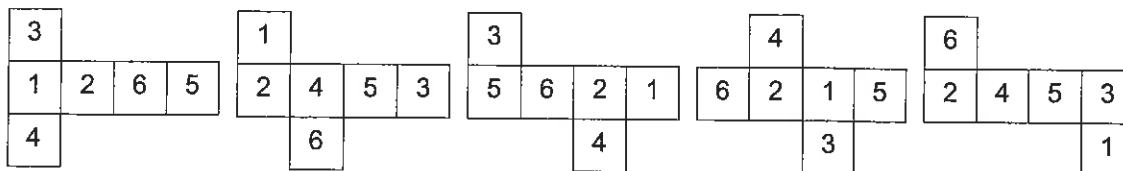
Worksheet 4

A:

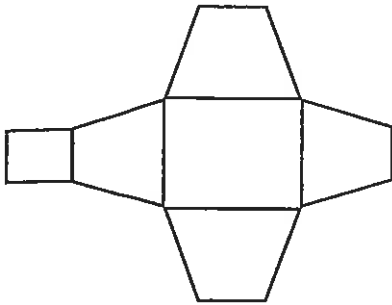
1. 1 2. 2525m 3. 08:15 4. 32 5. range = 20 6. \$36.60 7. 7cm 8. 1, 2, 4, 7, 14, 28
9. 8.352 10. $y = 12$

B:

1. Possible nets are drawn below, there may be more. NOTE: Dots have been replaced by numbers.



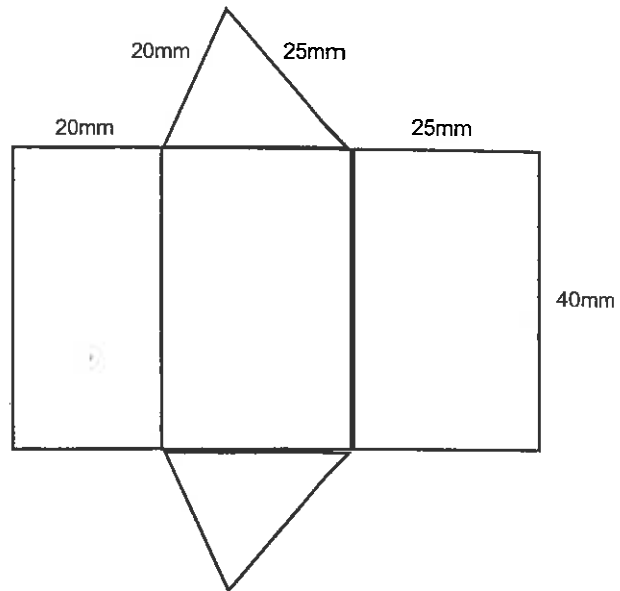
2.



C:

1. cylinder 2. cube 3. pyramid 4. cone

D:

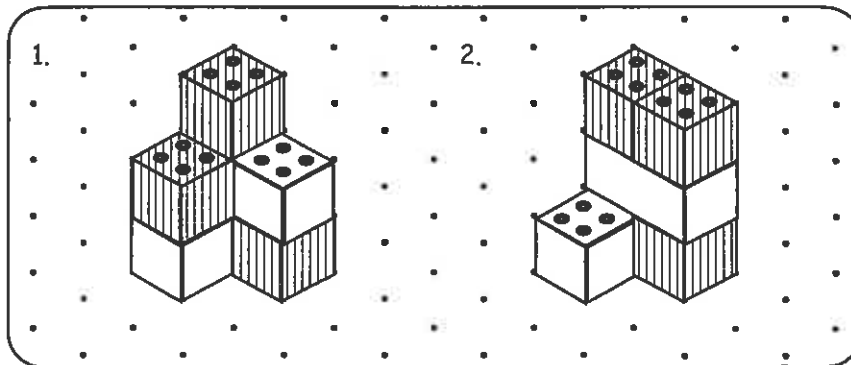


Worksheet 5

A:

1. 14 2. 5.625kg 3. 215cm 4. 0.124 5. 6:40 6. \$96 7. 215, 219, 210, 216 8. 19, 24, 29
9. 14.1 10. $y = 3$

C:



D:

Top	Front	Left side	Right side	Back

Worksheet 6

A:

1. 39 2. 3.5L 3. 10:35 4. 51 5. mean = 10.4 6. \$15 7. 7cm 8. 23, 30, 37 9. 2.55m
10. $y = 12$

B:

1. Town F 2. B2 3. C3 4. B2 5. C1 6. A1

C:

1. pentagon, hexagon 2. (1,1), (3,2), (3,5) 3. (3,0), (1,3), (5,4) 4. (0,2), (1,5), (4,4)

D:

1. NW 2. W 3. SW 4. S 5. E 6. NE 7. 12.3km, N 8. 9.7km, SE 9. 21.8km, W
10. 20.9km, E 11. 18.1km SW

E:

1. 45° 2. 225° 3. 50° 4. 255° 5. -

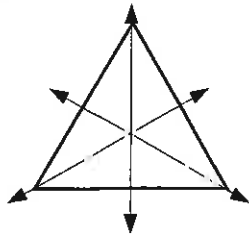
Worksheet 7

A:

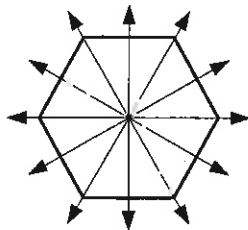
1. 10 2. 6325mL 3. 5550g 4. 0.392 5. 10:45 6. \$4.87 7. 301, 309, 308, 302, 303
 8. 23, 29, 35 9. 15.66 10. $y = 11$

B:

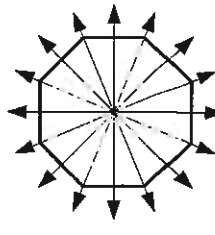
1.



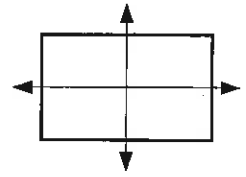
A = equilateral triangle



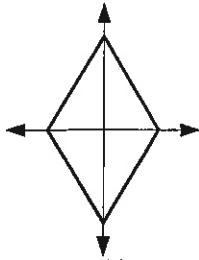
B = hexagon



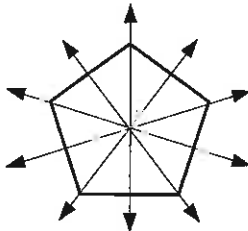
C = octagon



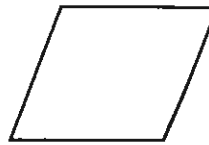
D = rectangle



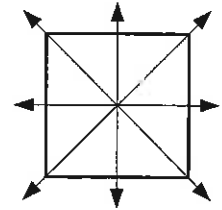
E = diamond (rhombus)



F = pentagon



G = parallelogram

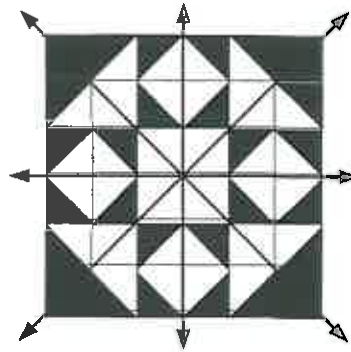


H = square

2.

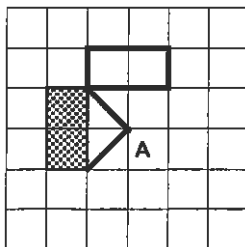
Shape	Reflective symmetry	Rotational symmetry
A	3	3
B	6	6
C	8	8
D	2	2
E	2	2
F	5	5
G	0	1
H	4	4

C:
2.

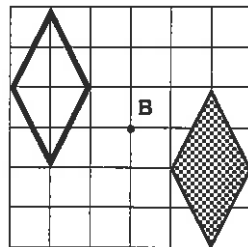


D:

1.



2.



Worksheet 8

A:

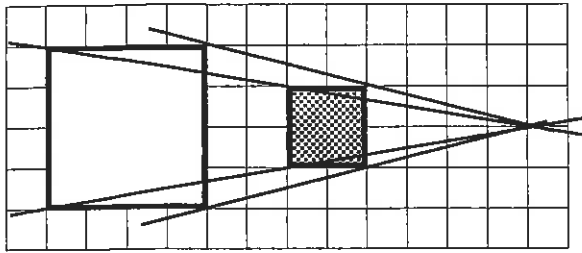
1. 48 2. 4.7g 3. 10:15 4. 73 5. median = 12 6. \$36 7. 8cm 8. 27, 23, 19 9. 6.975km
10. $y = 3$

B:

1. $sf = 2$ 2. $sf = \frac{1}{2}$

C:

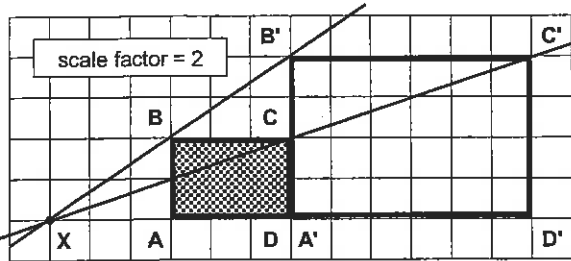
1.



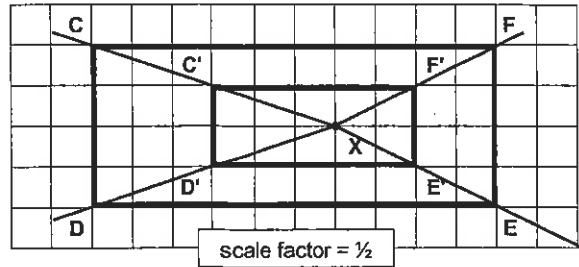
2. $sf = 2$

D:

1.



2.



E:

1. translated 2. rotated 3. enlarged 4. reflected