National Certificate of Educational Achievement
TAUMATA MĀTAURANGA Ā-MOTU KUA TAEA

Exemplar for Internal Achievement Standard

Mathematics and Statistics Level 1

This exemplar supports assessment against:

Achievement Standard 91033

Apply knowledge of geometric representations in solving problems

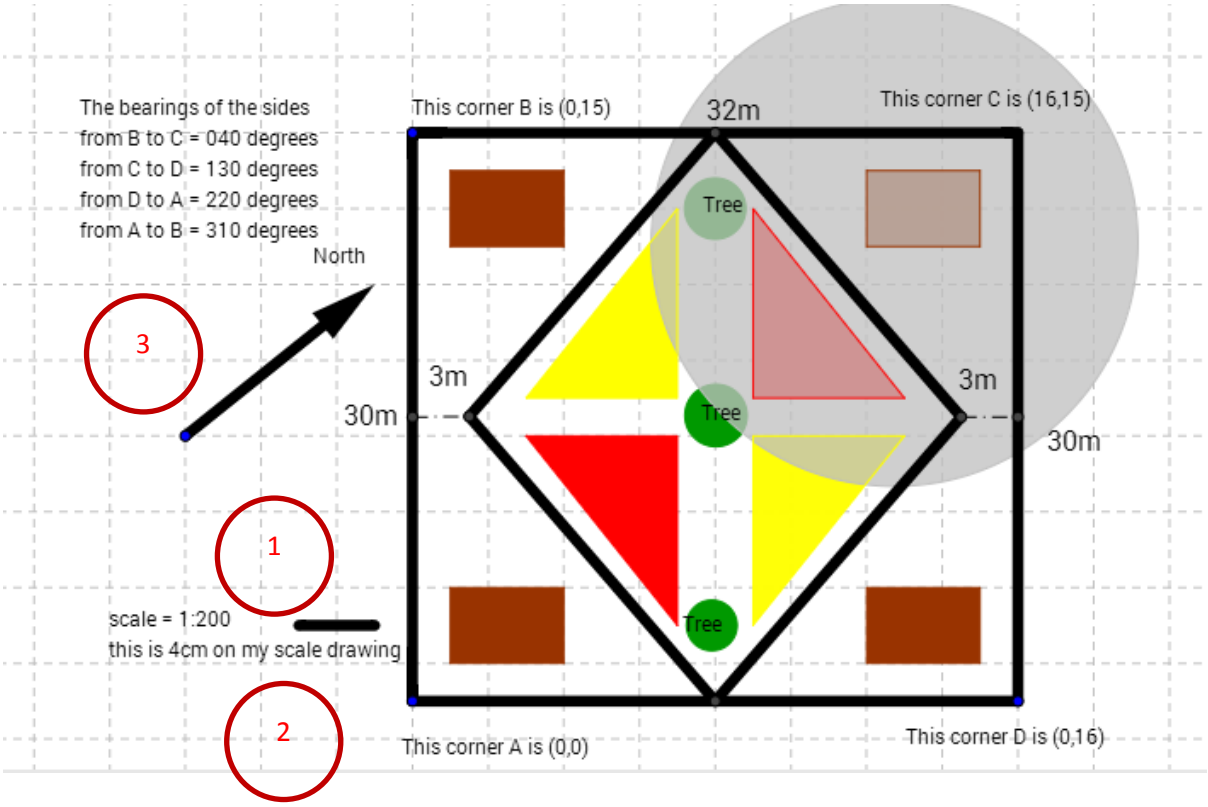
An annotated exemplar is an extract of student evidence, with a commentary, to explain key aspects of the standard. These will assist teachers to make assessment judgements at the grade boundaries.

New Zealand Qualification Authority

To support internal assessment from 2014

	Grade Boundary: Low Excellence
1.	For Excellence, the student needs to apply knowledge of geometric representations, using extended abstract thinking, in solving problems. This involves one or more of: devising a strategy to investigate or solve a problem, identifying relevant concepts in context, developing a chain of logical reasoning, or proof, forming a generalisation and also using correct mathematical statements, or communicating mathematical insight. This student's evidence is a response to the Vocational Pathways assessment resource 'Dig a little deeper'. This student has identified relevant concepts in context in designing the garden using a scale diagram (1), two-dimensional co-ordinate systems (2), bearings (3) and a net (4). Correct mathematical statements have been used to describe these concepts. Insight has been shown in the report on the design of the garden by the consideration of the locus of the shadow over the garden and the impact of colour on the design brief (5). For a more secure Excellence, the student could consider the positioning of the shadow at different times of the day and year and describe more fully the dimensions of the raised flower beds.

This is the scale drawing of my garden design



The scale used for the drawing was 1:200

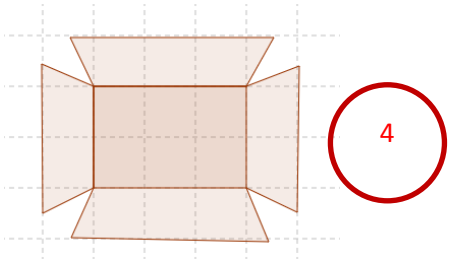
To help the gardener plant the trees I have used a coordinate system with the origin at the bottom left hand corner of the garden, and the x-axis along the bottom. The corner coordinates are given on the diagram. The trees would be at (8,2), (8,7.5) and (8,13).

The brown boxes are the bottom of raised flower beds which are trapezoidal prisms. They will be planted with a mix of red and yellow flowers

The colours of the plants are indicated on the diagram, these reflect the colours in the school sports teams clothes and link the garden to the school. The grey circle shows the shadow that will be cast over the garden late in the afternoon by other school buildings. The gardener needs to take this into account which plants to choose as the ones outside the grey circle will be in full sun all day, whilst inside the grey circle they will be in part sun and part shade. The area inside the diamond not covered by the flower beds will be crushed shells for a path. The area outside the diamond and inside the rectangle will be grassed apart from the raised flower beds.

5

Here is a scale drawing of the net to make the raised flower beds. The same scale is used, so 1 square in the grid is 2cm by 2cm. They are quite tall so that they can be a real feature of the garden.

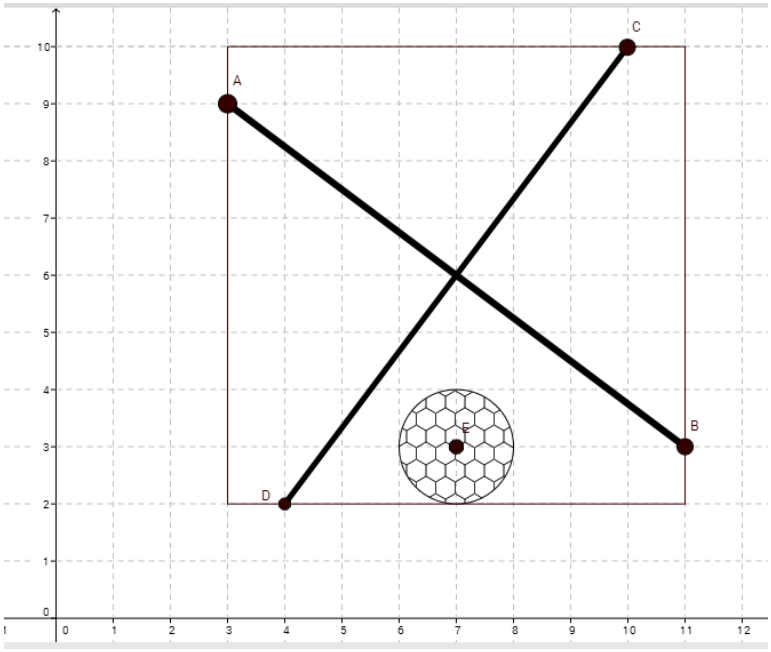

4

	Grade Boundary: High Merit
2.	For Merit, the student needs to apply knowledge of geometric representations, using relational thinking, in solving problems. This involves one or more of: selecting and carrying out a logical sequence of steps, connecting different concepts and representations, demonstrating understanding of concepts, forming and using a model and also relating findings to a context, or communicating thinking using appropriate mathematical statements. This student's evidence is a response to the TKI assessment resource 'Logo Design'. This student has demonstrated an understanding of concepts in designing the logo by using a scale drawing (1), a two-dimensional co-ordinate system (2), a construction (3) and a locus (4). Appropriate mathematical statements have been used throughout the instructions for creating the logo and for the sewing machine. To reach Excellence, the student would need to provide more detailed instructions for sewing the logo from the inside of the garment.

I have been asked to draw a logo for a sports apparel company who specialises in making clothes for baseball players.

I have decided the logo will include two baseball bats and a baseball.

My completed design is shown below.



1

The design logo on the shirt is inside a square that is 40cm by 40cm.

This is a scale drawing of the logo using a scale of 1:5. The squares on the graph paper are 1cm so 1cm on the scale drawing represents 5cm on the real design.

To construct the design;

1. Mark the point A at (3,9) and the point B at (11,3)
2. Join A and B: this is of length 10cm
3. Construct the perpendicular bisector of AB.
4. Mark the point C on this line which is 5cm from where the lines cross
5. Mark the point D on this line which is 5cm from where the lines cross.
6. Mark the point E at (7,3)
7. Draw the locus of points which are no more than 1cm from E. This is all the points inside a circle which I have shaded in like a baseball.

2

3

4

When the machine sews this design it will sew from the back of the material.

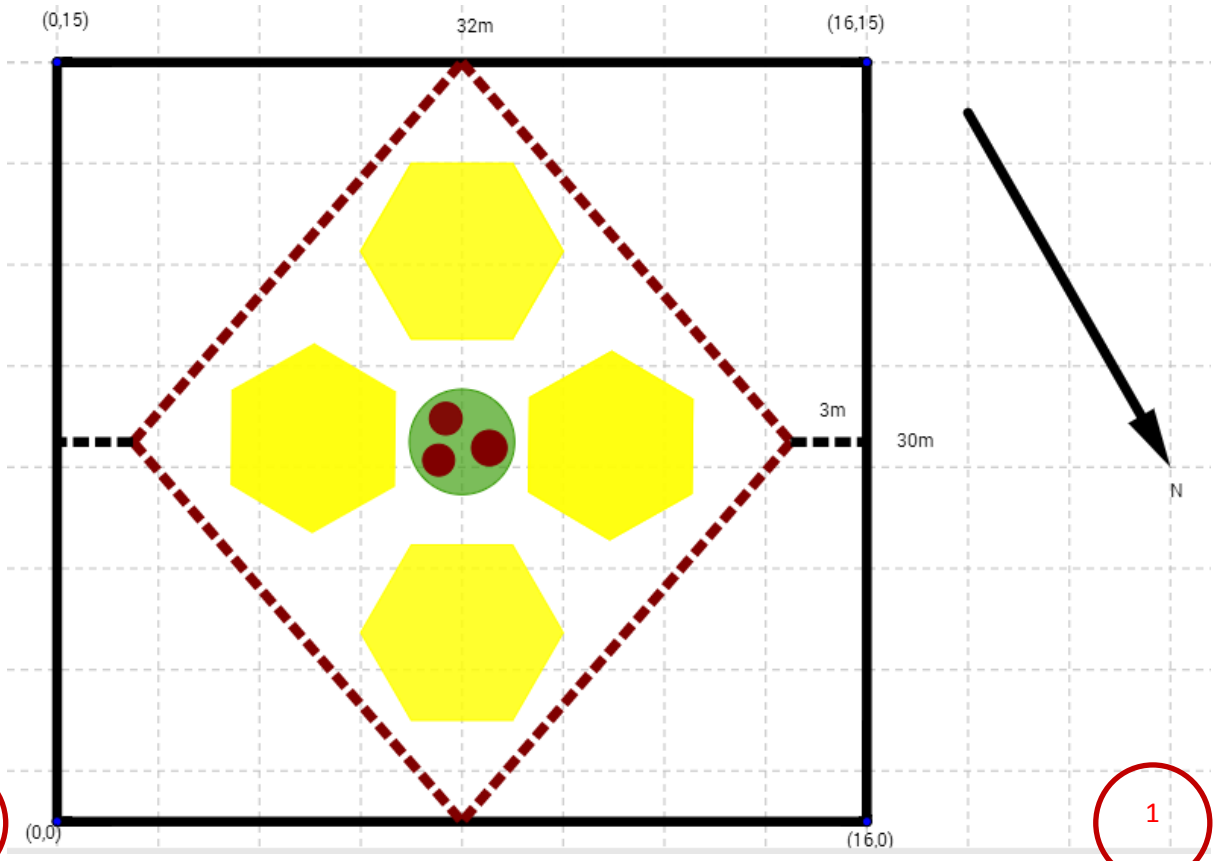
To sew the design from the back the instructions are going to be pretty much the same except that the x values will all change but not the y values. If the sewing machine starts at the point (12,0) on the diagram then the new x coordinates will be 12-x. So (3,9) becomes (9,9) and the same with all the rest. I don't think any other instructions need to change.

	Grade Boundary: Low Merit
3.	For Merit, the student needs to apply knowledge of geometric representations, using relational thinking, in solving problems. This involves one or more of: selecting and carrying out a logical sequence of steps, connecting different concepts and representations, demonstrating understanding of concepts, forming and using a model and also relating findings to a context, or communicating thinking using appropriate mathematical statements. This student's evidence is a response to the Vocational Pathways assessment resource 'Dig a little deeper'. This student has demonstrated an understanding of concepts in designing the garden by using a scale drawing (1), a two-dimensional co-ordinate system (2), and bearings (3). Appropriate mathematical statements have been used throughout the design of the garden. For a more secure Merit, the student would need to describe the location of the flower beds and identify more clearly how the plan can be used to construct the garden.

Student 3: Low Merit

Am designing a garden to go in front of the school offices

Here is my plan



3

2

1

The scale of the plan is 1:200 so 1 cm on the plan is 2m on the ground. Each square on my graph paper is 2cm.
The bearing of the side from (16,15) to (16,0) is 032 degrees. As you work round the rectangle clockwise keep adding 90 to get the bearings of all the sides, which will help the maker put it in the right direction.
The garden needs to be exactly the right way round so I have given the bearings of the four sides to help marking them out correctly.
Once you have it the right way round the coordinates will ensure that the corners are correct.

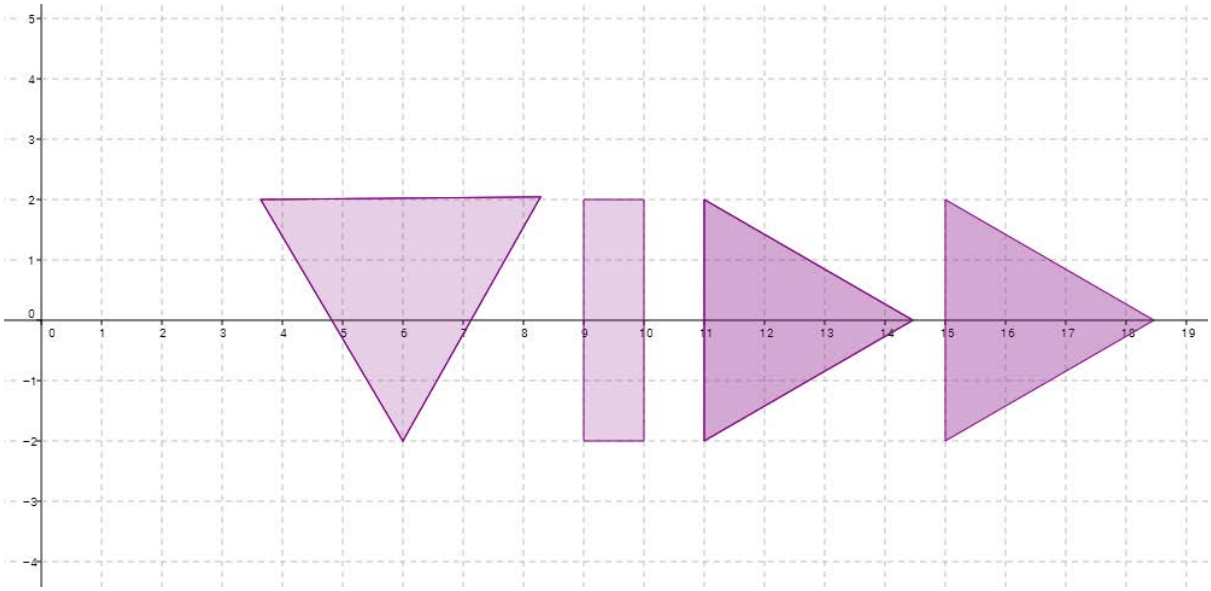
The green circle will be grass with three small trees planted. I think mandarin trees would be nice, then we can pick them for lunch.
The yellow hexagons are going to be flower beds.
The brown dotted lines are low walls. Inside them there will be small pebbles on the paths.
Everything else is grass.

	Grade Boundary: High Achieved
4.	For Achieved, the student needs to apply knowledge of geometric representations in solving problems. This involves selecting and using a range of methods in solving problems, demonstrating knowledge of geometrical concepts and terms and communicating solutions using geometrical terms or representations. This student's evidence is a response to the TKI assessment resource 'Logo Design'. This student has, in designing the logo, selected and used a two-dimensional co-ordinate system (1), a construction (2) and a scale diagram (3). The instructions use correct geometrical concepts and terms. To reach Merit, the student would need to clearly identify the position of the equilateral triangles, and start to modify the instructions for sewing the design backwards.

Student 4: High Achieved

My Dad is starting a new company called Visually Inspiring Design Drawings and has asked me to design a logo for the company baseball hats. When they sew the design on the hat they do it from the back so I have to give instructions to sew it backwards.

My completed design is shown below. The final design is a bit small so I have drawn a bigger version to making it easier to see what to do.



This is a scale drawing of the logo using a scale of 5:1. The squares on the graph paper are 1cm so 5cm on the scale drawing represents 1 cm on the real design.

2

To construct the design;

1

3

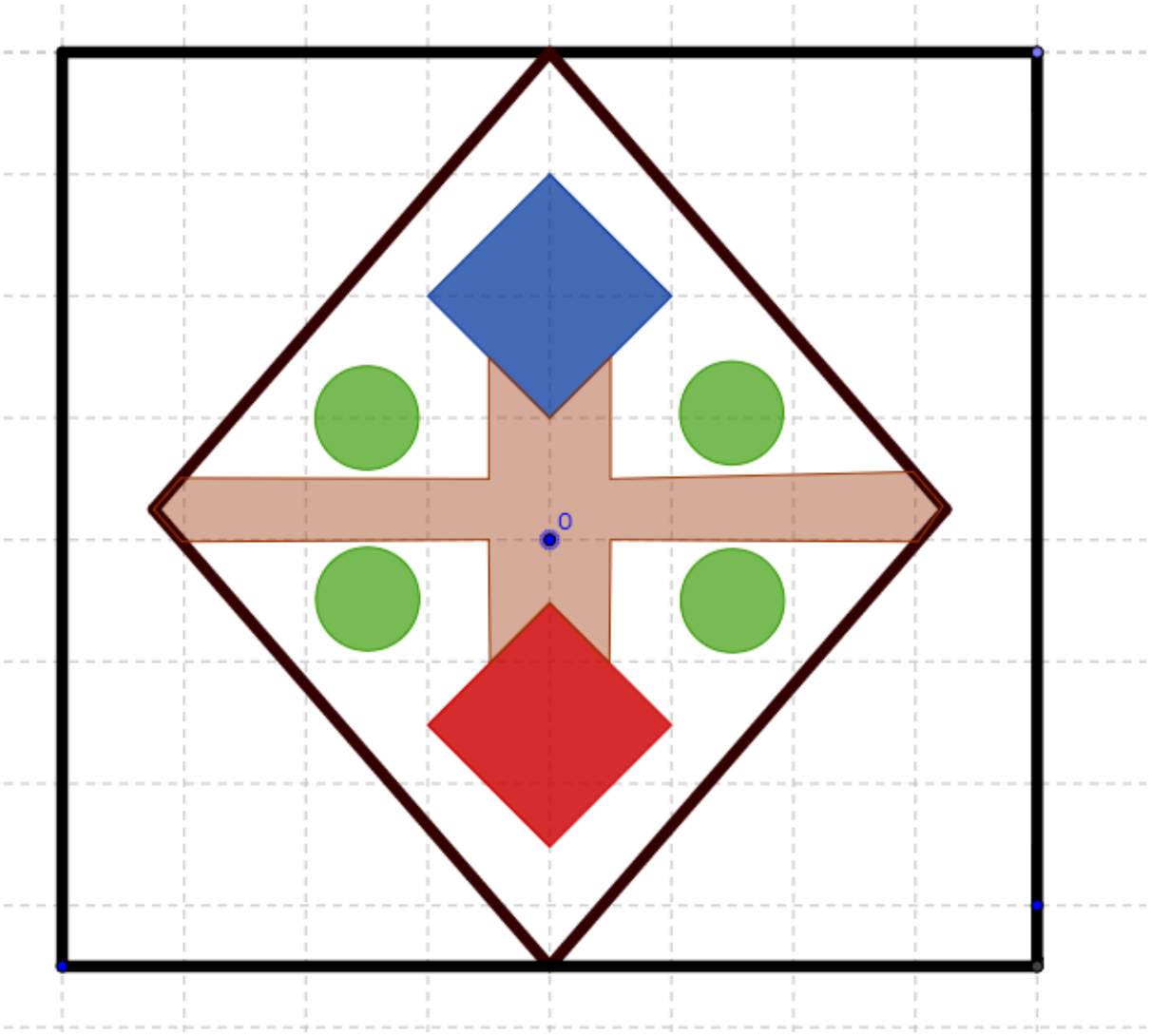
1. Mark the points (3.7,2) and (6,-2) on the diagram
2. Construct an equilateral triangle based on this side. This is the V.
3. Draw a rectangle with corners at (9,2), (9,-2), (10,-2) and (10,2). This is the I.
4. Draw a line from (11,2) to (11,-2) and construct an equilateral triangle based on this side.
5. Draw a line from (15,2) to (15,-2) and construct an equilateral triangle based on this side. These two are the Ds.

To sew it backwards you have to do everything the opposite way round.

	Grade Boundary: Low Achieved
5.	For Achieved, the student needs to apply knowledge of geometric representations in solving problems. This involves selecting and using a range of methods in solving problems, demonstrating knowledge of geometrical concepts and terms and communicating solutions using geometrical terms or representations. This student's evidence is a response to the Vocational Pathways assessment resource 'Dig a little deeper'. This student has, in designing the garden, selected and used a two-dimensional co-ordinate system (1), bearings (2) and a scale diagram (3). The design uses correct geometrical concepts and terms. For a more secure Achieved, the student would need to strengthen the communication in the response, for example, by indicating measurements, the direction of North on the diagram and linking the bearings to directions from one point to another on the diagram.

Student 5: Low Achieved

Here is my garden design.



3

The scale of this design is 1: 100. Each square on the graph paper is 2cm.
The origin is at the point O, so the four shrubs (green circles) are centred at (3,2) (3,-1) (-3,2) and (-3,-1).

1

The cross in the middle will be a path with small stones in it,
The red and blue squares are flower beds, with the colour telling the gardener what colour to plant them.
The bearings of the four sides are 081, 171, 261 and 351 degrees. This will help the gardener get it in the right place when marking it out.

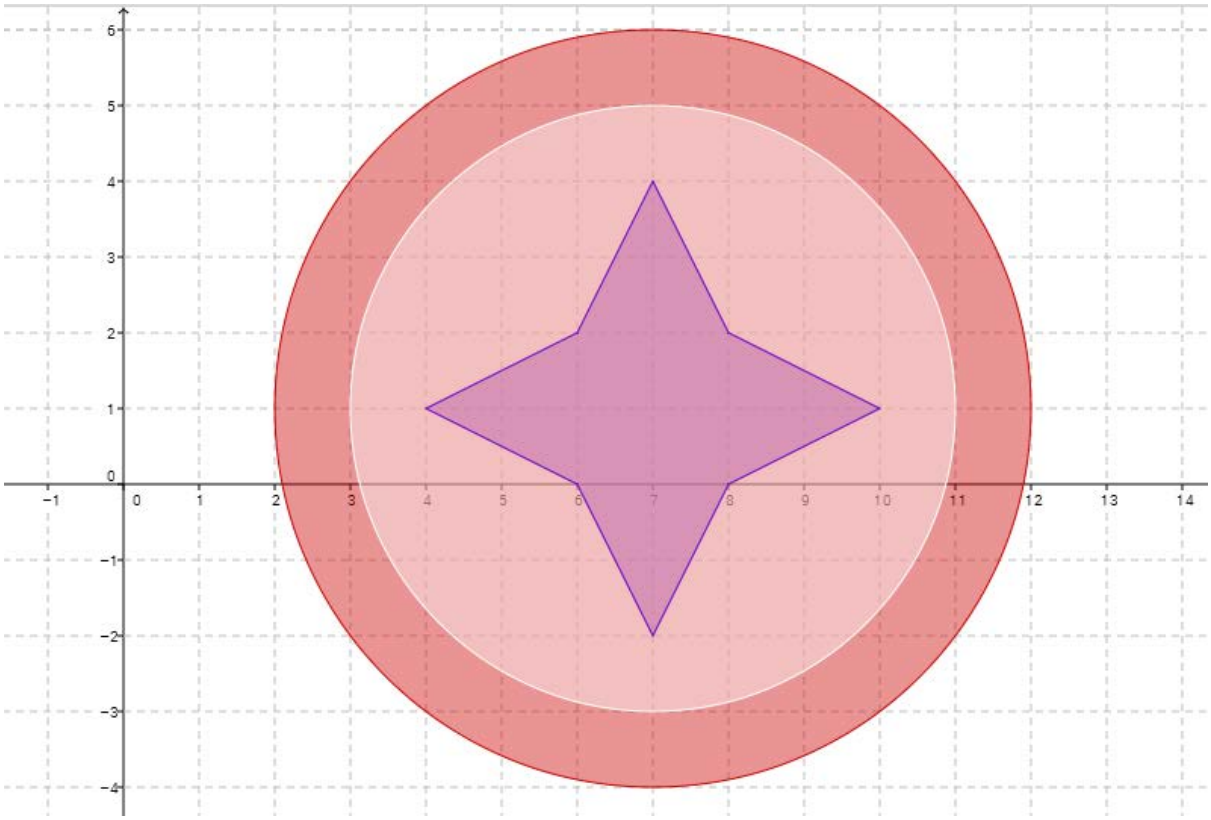
2

	Grade Boundary: High Not Achieved
6.	For Achieved, the student needs to apply knowledge of geometric representations in solving problems. This involves selecting and using a range of methods in solving problems, demonstrating knowledge of geometrical concepts and terms and communicating solutions using geometrical terms or representations. This student's evidence is a response to the TKI assessment resource 'Logo Design'. This student has, in designing the logo, selected and used a two-dimensional co-ordinate system (1) and a scale diagram (2). To reach Achieved, the student would need to select and use one further method. For example, they could do this by identifying the centre of the circles and using loci to describe their colouring.

Student 6: High Not Achieved

I am making a logo for my sports team, with sports stars, to go on their new t shirts.

Here is my design



The graph paper has 1cm squares and I have drawn the logo at a scale of 1:2, so 1cm on my design is 2cm on the t shirt.

2

Draw a circle radius 5cm and another with the same centre radius 4cm.

Draw a star inside the circles with the corners at (7,4), (8,2), (10,1), (8,0), (7,-2), (6,0), (4,1) and (6,2)

1

Colour the star purple.

Colour the circle outside the square pink and the circle outside the circle red.