Exemplar Fun with Rotation

Objectives： (1) To investigate the effect of rotation on simple shapes
(2) To discover the centre of rotation

Dimension： Measures, Shape and Space

Learning Unit： Transformation and Symmetry, Introduction to Coordinates

Key Stage： 3

Material Required： *Internet*

Prerequisite Knowledge： (1) Common terms and notations in geometry such as points, line segments, etc

(2) Rectangular coordinate system

Description of the Activity：

1. The teacher distributes Worksheet 12.1 to students.
2. The web site “MathsNet” is introduced to students.
3. The teacher explains how to choose a question in the Colour Grid.
4. Students are asked to do some of the problems in the class and some at home, for example, questions (a) to (n) in the class and questions (o) to (q) at home.
5. The teacher checks and discusses the answers with students.
6. Other web sites are introduced for students’ self-learning.

Worksheet 12.1: Fun with Rotation

You will use the dynamic geometry programme in the web site of "MathsNet" to complete this worksheet. Use the mouse to change or move the diagrams so as to see the changes on the points, lines and shapes.

1. Connect to the Internet and enter the web site http://www.mathsnet.net/.

2. Choose "Rotations" from the pull-down menu (See Figure 12.1).

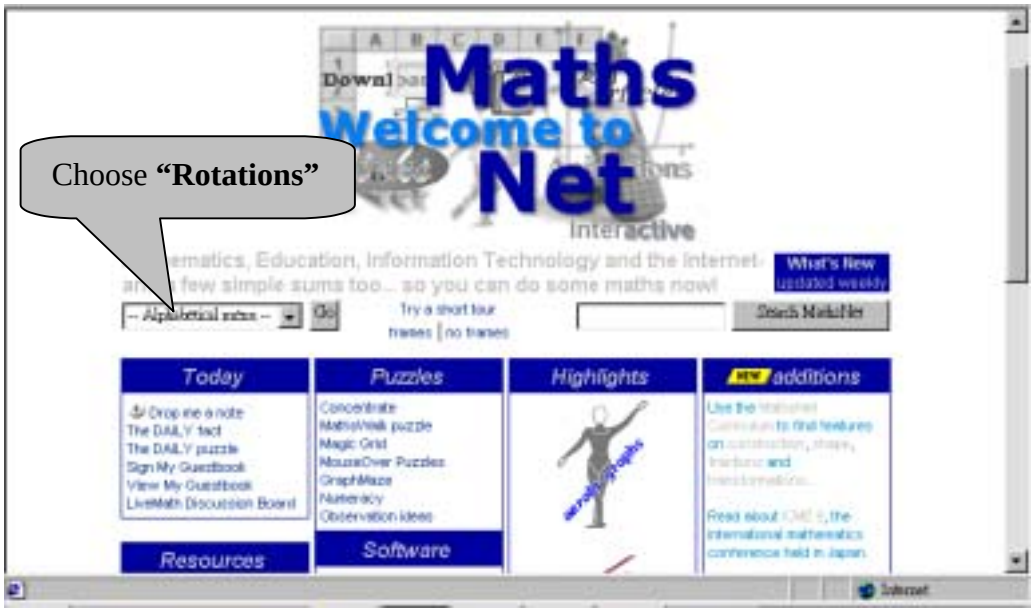

Figure 12.1

3. A new window will open and you can see a brief introduction of the program (see Figure 12.2).

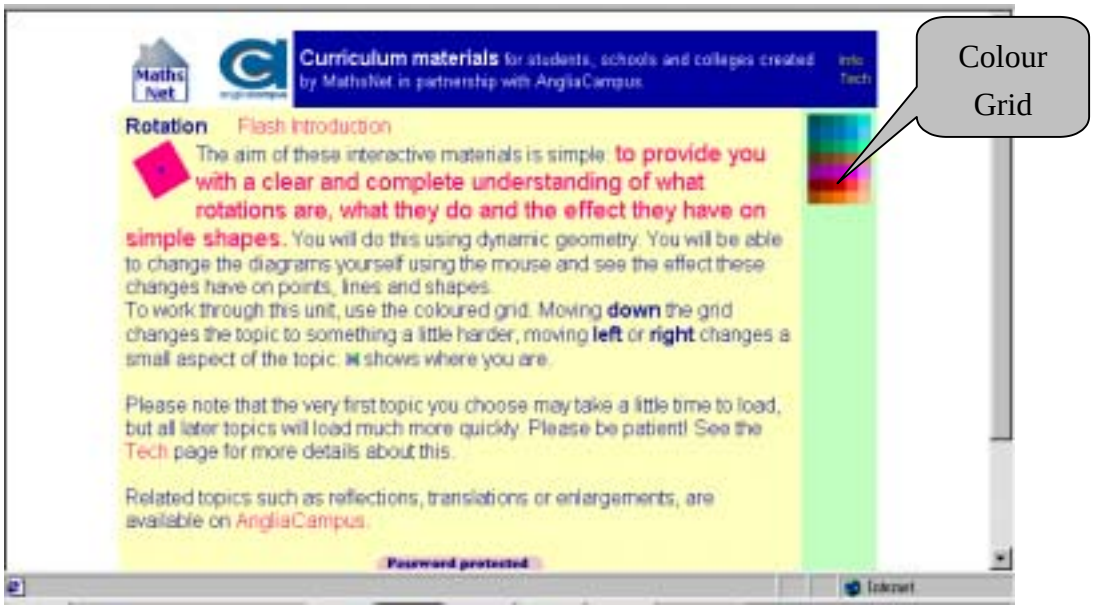

Figure 12.2

4. On the right-hand-side of the screen, you can see a colour grid. Moving left or right changes a question, moving down the grid changes the question to a harder level. shows where you are.

5. Move the pointer to any box inside the colour grid, the Question Number will appear beside the pointer.

6. Try the following problems and write your answers in the spaces provided.

   (a) Question **a3**：Which of these is true?

   _____

   _____

   (b) Question **b1**：In how many different positions does it cover itself exactly?

   Hexagon：_____

   Triangle：_____

   Rectangle：_____

(c) Question **b3**：Which of these is true?

_____

_____

(d) Question **b4**：What do the four lines through the centre of rotation show?

_____

(e) Question **c1**：Use your mouse to move the points and find the 4 sets.

1st set：_____ 2nd set：_____

3rd set：_____ 4th set：_____

(f) Question **c3**：What property do these lines always have?

_____

(g) Question **c4**：Which shapes show a quarter turn of the yellow shape?

_____

Which shapes show a half turn?

_____

(h) Question **d0**：Which one of the labelled points is the centre of the rotation?

_____

(i) Question **d4**：What are the coordinates of this new position?

_____

Try other starting positions for the red point. What happens?

_____

What happens if you make the angle of rotation 180º?

_____

(j) Question **e0**：Is it possible to alter the yellow shape or rotate the blue shape so that the areas are different?

_____

(k) Question **e1**：Is it possible to alter the yellow shape or rotate the blue shape so that the angles do not match?

_____

(l) Question **e2**： Is it possible to alter the yellow shape or rotate the blue shape so that the lengths of sides do not match?

_____

(m) Question **f0**：What do you notice about those perpendicular bisectors?

_____

(n) Question **f1**：What do you notice about those perpendicular bisectors?

_____

Challenging problems：

Write down briefly the correct steps in sequence.

(o) Question **f2**：Steps _____

_____

_____

_____

(p) Question **f3**：Steps _____

_____

_____

_____

_____

(q) Question **f4**：Steps _____

_____

_____

_____

Notes for Teachers：

1. Before completing this worksheet, students should have some concepts of rotation on simple figures.
2. Only some of the questions from this web site are included in this worksheet. The teacher can modify the activity by adding some more questions from the Colour Grid.
3. If students are familiar with this topic and the equipment is sufficient, the teacher can let students complete this worksheet during the lesson. The teacher may adjust the number of questions as appropriate.
4. If the teacher would like to know the answers, they can send e-mail to the "MathsNet" to make request for it.
5. Some useful web sites for activities of transformation：
   (a) http://www.utc.edu/~cpmawata/transformations/translations/
   (To build up the concepts of transformations, with Java applets and guided questions)
   (b) http://www.schools.ash.org.au/stkierans-manly/Classes/Yr6/6B/Symmetry/index.htm
   (To explore the concepts of the line symmetry and rotational symmetry in the world around us, with many beautiful pictures)
   (c) http://www.shodor.org/interactivate/activities/transform/index.html
   (To explore the transformations of squares, parallelograms and triangles in the rectangular co-ordinate plane, with Java applets)
6. Some of the web sites mentioned in this exemplar may cease to exist or be relocated as time goes. The teacher should check and make sure that the web sites still exist before the activity.