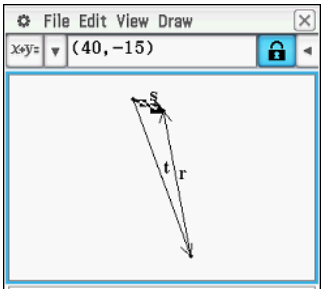
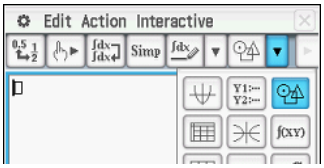
Activity 9 Applied component vectors

Aim: Use Geometry and Main to solve problems involving component vectors.

1. A light aircraft has a still-air speed of 220 km/h. A pilot wishes to fly the plane directly to an airport located at (–30**i** + 160**j**) km. There is a wind blowing with constant velocity of (40**i** –15**j**) km/h. Determine the velocity vector that the pilot should set to travel directly to the airport and the minimum time taken to complete the journey.

   Construct a scale diagram

Draw scale diagram • Open a new Geometry page. • Insert a vector **r** to represent the resultant plane velocity. Constrain the gradient of this vector to $\frac{160}{-30}$ • Insert a vector **s** to represent the wind velocity. Constrain the components of this vector to (40,–15) • Insert a vector **t** to represent the still-air velocity of the plane. Constrain this vector's magnitude to 220	
Open Main with a Geometry half window • Open a Geometry window • Select [View | Zoom to Fit]	

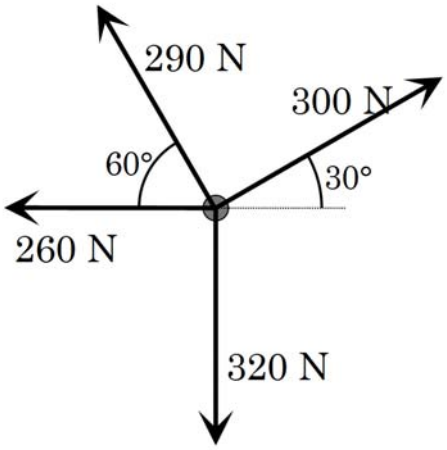
a) Tap to select the still-air velocity vector, **t**, then select the component vector form from the Measure pull down menu.
Write down the approximate component form.

Tap to select the resultant vector, **r***, then tap and drag this to the main screen to insert its component vector in matrix form.*

b) Use the norm command and an appropriate calculation to determine the time taken to complete the journey.

c) Determine the velocity vector the pilot should set and the associated time taken for the return journey. Your solution should include a neat labelled diagram.

2. Determine the resultant force in the system shown.



Learning notes

The Geometry application allows vectors to be constrained using magnitude/direction or components. This flexibility allows complex problems to be solved using scale diagrams.

Q2

The resultant of the system of forces shown can be found in a number of ways. You may wish to construct a scale head-to-tail diagram in the Geometry application, although this may be time consuming.

A more efficient method is to enter the forces in Main and add them up.

- Remember to use the angle symbol ∠ when entering vectors in magnitude and direction form, and that the angle is measured anticlockwise from the positive x–axis. Vectors entered in this way are automatically converted to component form, so your resultant will also be given in this way.
- You may then convert your answer using the toPol command.