ORTHOGRAPHIC PROJECTIONS OF LINES AND PLANES

I Main Topic: Key view directions

A General comments

1 A line viewed at right angles appears in true length

2 A plane figure viewed at right angles appears in true size and shape

3 In an end-on view parallel to a line, the line appears as a point

4 A plane viewed parallel to the plane (i.e., edge-on) appears as a line

5 Projections lines (thin) are perpendicular to fold lines (dashed). Fold lines are edge views of projection planes.

6 Use related views to determine the distances from points to fold lines; (e.g., the left and right views are related, because each is adjacent to the front view; and show distances of points from the front plane).

B Trend and plunge of a line

1 The trend of a line is an azimuth measured relative to north (i.e., a compass bearing). Project a line into a horizontal plane (i.e., a top view) to measure its trend.

2 The plunge of a line is an inclination below the horizontal and is measured in a vertical plane. The plunge is seen in a vertical cross section taken along the line. To solve for the plunge of a line graphically, one must first determine the trend (B1) and then take an auxiliary cross-section view looking perpendicular to the trend direction; the cross section parallels the line.

C Strike and dip of a plane

1 The strike of a plane is an azimuth. It is the direction of a horizontal line in a plane. It is obtained by looking down on a horizontal line contained in the dipping plane.

2 The dip of a plane is an inclination. From A3 & A4, to see the dip of a plane it must be viewed parallel to the line of strike, so take a vertical cross section that is perpendicular to the line of strike (i.e., look in a horizontal direction parallel to strike). To solve for the dip of a plane graphically, one must first determine the strike (C1) and then take an auxiliary view looking parallel to the strike direction.

In the exercises below, consider north to be towards the top of the page for the top views. Label the points, show the projection lines, and label the right angles. Measure distances to the nearest 0.1 mm and angles to the nearest degree. **The scoring is 1 pt for each correctly projected point, with half-credit for a point projected in the correct direction but with an incorrect projection distance, and 1 pt for each correct numerical answer. (59 pts total)**

1 Exercise 1: Complete the adjacent views of the lines (**3x2 pts**)
2 Exercise 2: Complete the adjacent views of the lines (**2 pts, 4 pts**)
3 Exercise 3: Complete the four views of the triangle (**12 pts**)
4 Exercise 4: Find the trend, plunge, and length of the lines (**2x5 pts**)
(1 pt for each for two points to project, trend, plunge, and length)
5 Exercise 5: Find the strike and dip of the planes (**5 pts, 5 pts, 7 pts**)
6 (1 pt for each for points to project, strike, and dip)
7 For a plane with a strike of 30° and a dip of 70°, find the trend and plunge of the pole, and the direction cosines of the pole, using an x=north, y=east, and z=down convention. Solve using long-hand (show your work below or on an attached sheet) and check using Matlab sph2cart. Include a printout of your Matlab work. Scoring is 1 pt/box. (**8 pts**)

Longhand (5 pts)

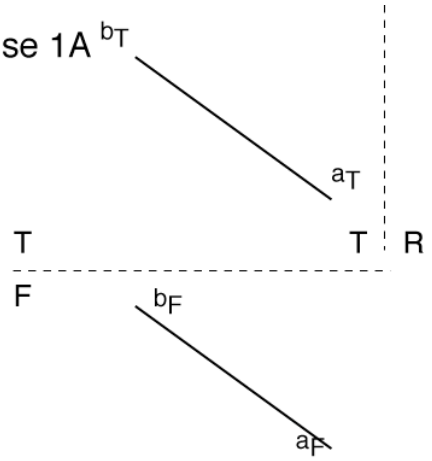
Plane strike	Plane dip	Pole trend	Pole plunge	α	β	γ
30°	70°					

Show calculations here or an attached page.

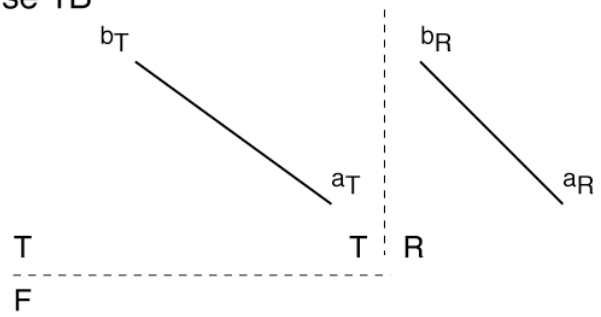
Matlab (3 pts)

Plane strike	Plane dip	Pole trend	Pole plunge	α	β	γ
30°	70°	As above	As above			

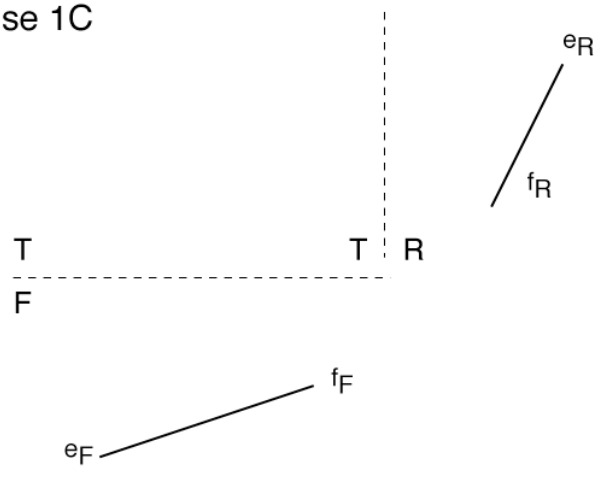
Exercise 1A



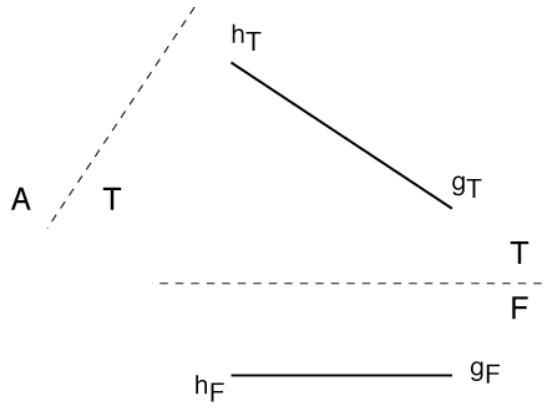
Exercise 1B



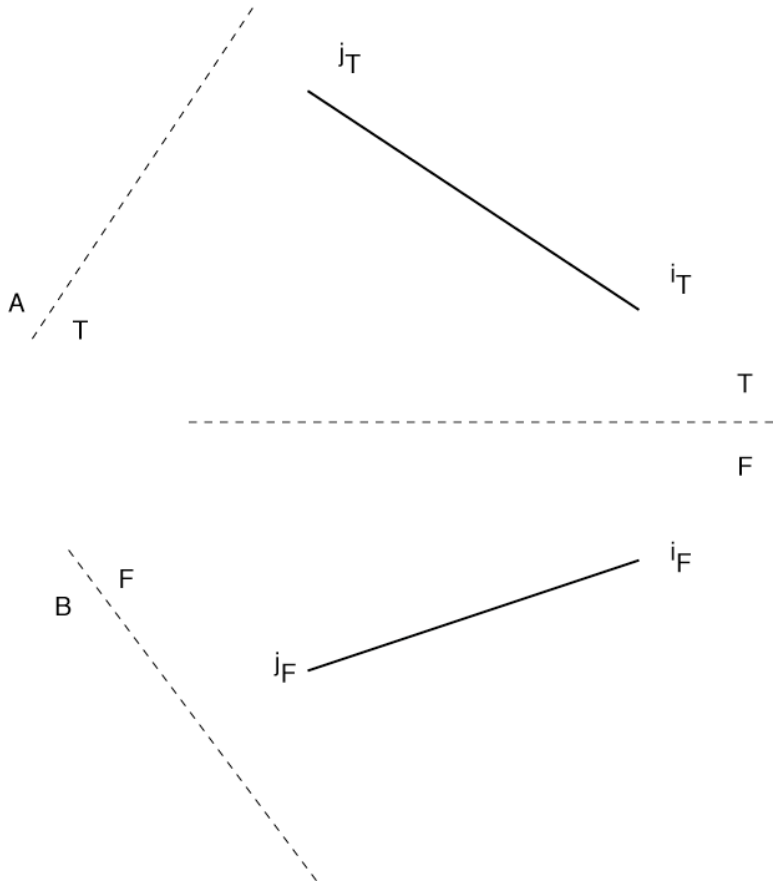
Exercise 1C



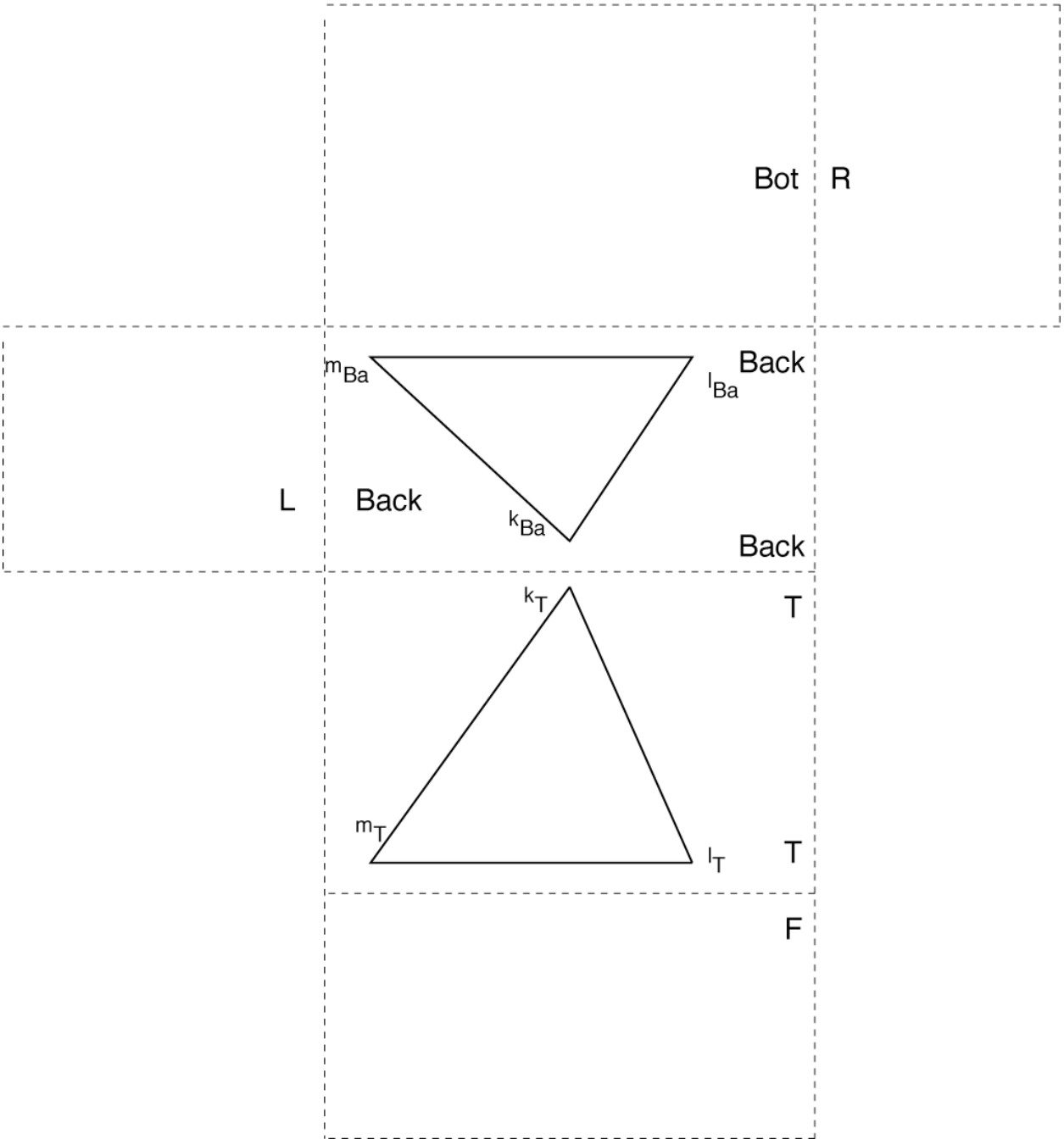
Exercise 2A



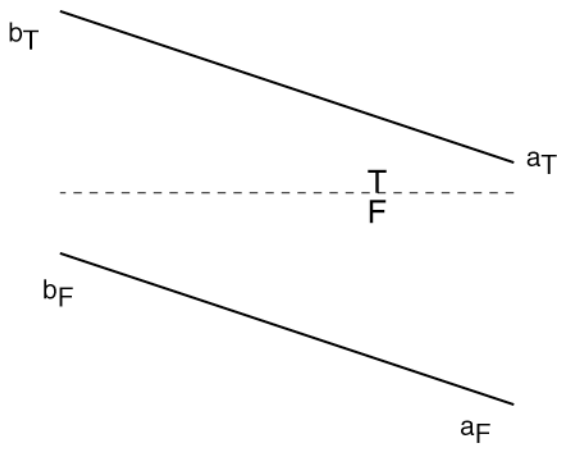
Exercise 2B



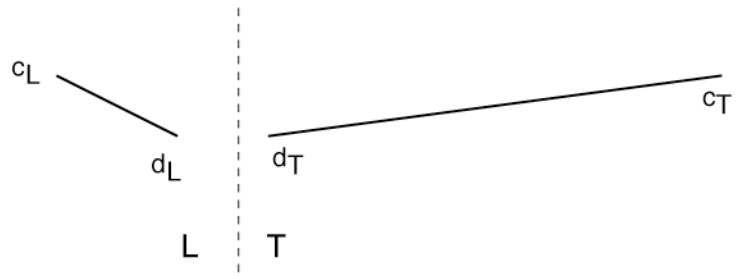
Exercise 3



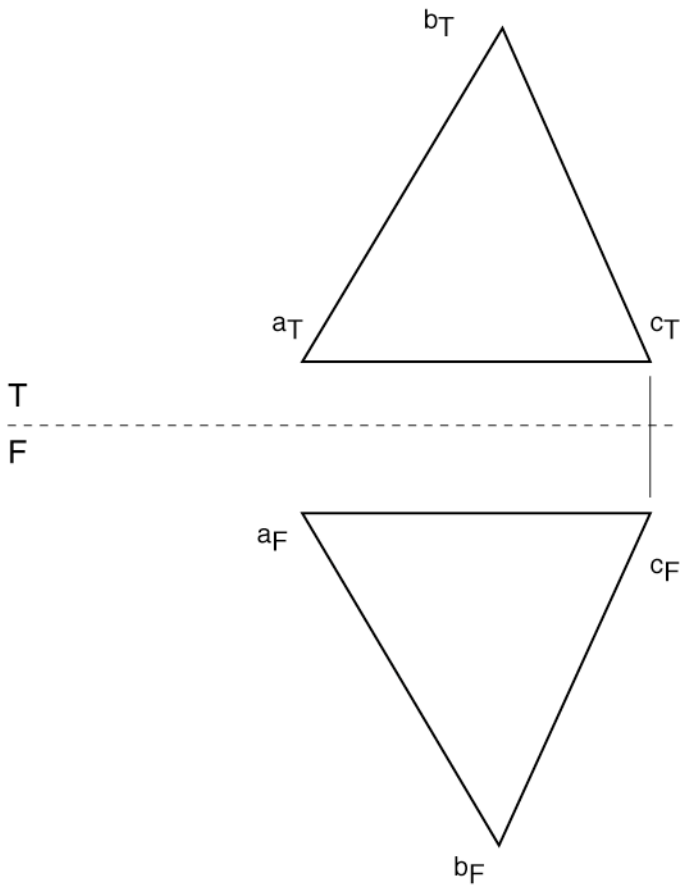
Exercise 4A



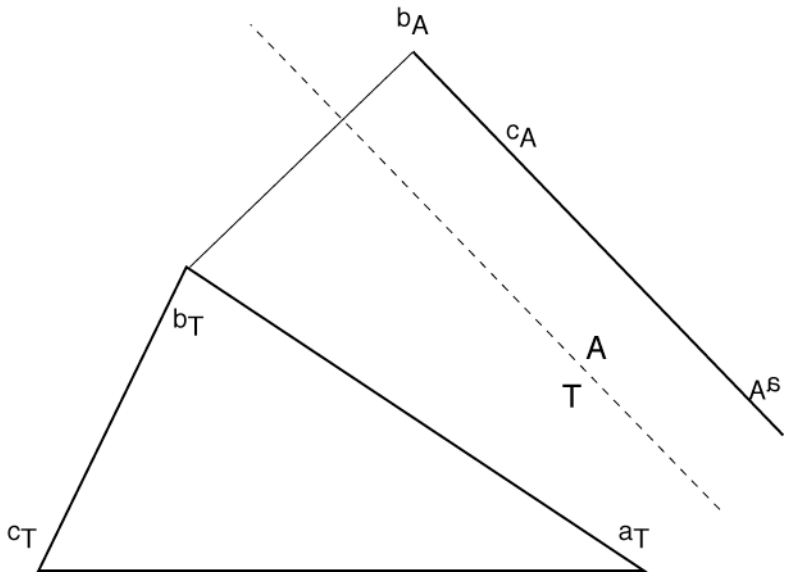
Exercise 4B



Exercise 5A



Exercise 5B



Exercise 5C