UNIT 11 *Angles, Bearings and Maps*   Activities

Activities

ACTIVITY 11.1   *Independent Angles*

In the diagram opposite, which has two pairs of
parallel lines, giving just one angle, say *a,* means
that all other angles are specified.
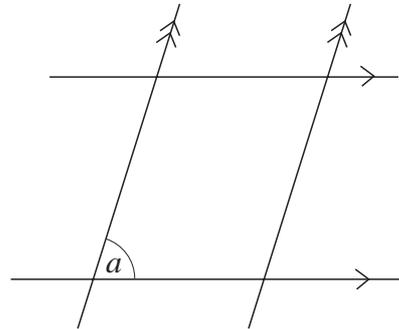
1.   Copy the diagram. Given that $a = 65°$, mark the size of each of the other angles on
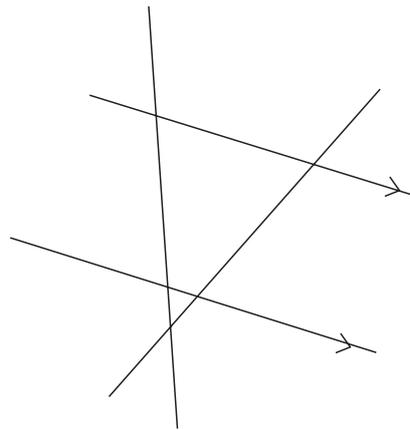   your diagram.

The number of 'independent' angles depends on the configuration, i.e. the number of lines
drawn, and which lines are parallel; this is illustrated in the following problem.

2.   In each of the following diagrams, decide how many independent angles there are.
      (If it is not clear, see how many values you need to give before all the other angles
      can be found.)
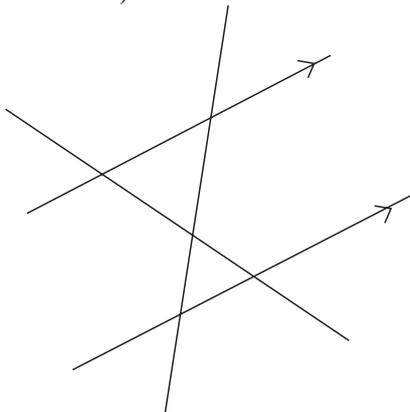
      (a)   (b)
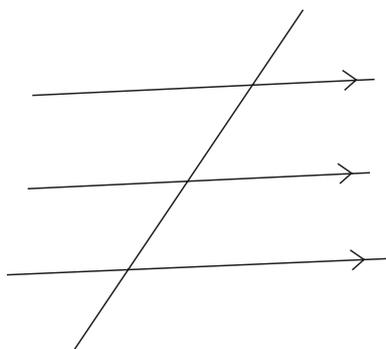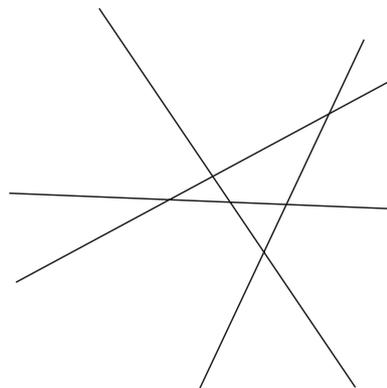
      (c)   (d)

Extension
Find the general formula for the number of independent angles when there are n lines, of
which m pairs are parallel.

ACTIVITY 11.2   *Flight Paths*

The map of Britain given on Sheet Activity 11.2a is drawn to a scale of 1 : 3 000 000.
Use the map to answer the following questions:

1.   What are the bearings of:

      (a)   Newcastle,   (b)   Edinburgh,   (c)   Glasgow,   (d)   Manchester

      from London? Also find the bearings *from* each of these cities *to* London.

2.   (i)   A plane leaves London at 1400 hours, travelling on a bearing of 322 ° at
             480 km per hour.

             (a)   On Sheet Activity 11.2a, draw the flight path of the plane.

             (b)   How many kilometres will the plane travel in 30 minutes?

             (c)   On the map, which city might it have reached in that time?

      (ii)   Another plane leaves Bristol at 1400 hours, travelling in the direction of
             Newcastle at a steady speed of 390 km per hour.

             (a)   Draw its flight path.

             (b)   Where will it be at 1425 hours?

             (c)   Design a new flight path which avoids the Manchester area by flying at
                    least 30 km to the west, and then changing direction towards Newcastle.
                    With the plane travelling at 390 km per hour, give the new flight path in
                    the form

	Bearing	*Duration of Flight*
1		
2		

Extension

You are the flight director of a new small airline based at Manchester. You have leased
4 identical planes which fly at an average speed of 450 km/h, and need refuelling after a
maximum distance of 600 km. You would like to provide at least one daily return flight
from Manchester to each of the other cities marked on the map.

Design: (a) *timetables* for the daily use of each plane (starting no earlier than 0700 hours,
            and finishing no later than 2200 hours; allow at least 40 minutes between
            arrival and departure at any airport).

        (b) *flight paths* for all flight movements, ensuring that they do not conflict with
            one another.
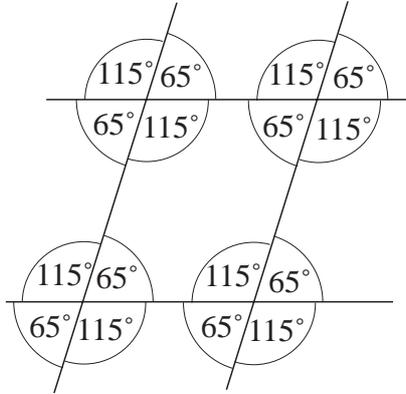
ACTIVITY 11.2a

Flight Paths - Map

Map of UK drawn to scale 1 : 3 000 000

N

Glasgow

Edinburgh

Newcastle

Manchester

Birmingham

London

Bristol

Southampton

Plymouth

ACTIVITIES 11.1 - 11.2   *Notes for Solutions*

11.1 1.

Note that, although 2 angles (65 ° and 115 °)
are needed, they are not independent as
65 ° + 115 ° = 180 ° .

2.   (a)   2   (b)   2   (c)   1   (d)   3

Extension
Formula: $n - m - 1$

11.2 1.   (a)   348 °   (b)   344 °   (c)   333 °   (d)   320 °

168 ° ;   164 ° ;   153 ° ;   140 °

2.   (i)   (b)   240 km   (c)   Manchester

(ii)   (b)   Very close to the London - Manchester flight (maybe at a different height!).

(c)   Possible answer:

	Bearing	Duration of Flight
1	357 °	30 mins
2	032 °	30 mins

Extension   Various alternatives