COORDINATE GEOMETRY: LINES

AS Unit 1: Pure Mathematics A.

WJEC past paper questions: 2010 – 2017.

Total marks available 182 (approximately 3 hours 40 minutes)

1. The points A, B, C have coordinates (-11, 10), (-5, 12), (3, 8) respectively.
   The line L_1 passes through the point A and is **parallel** to BC.
   The line L_2 passes through the point C and is **perpendicular** to BC.
   a) Find the gradient of BC (2)
   b) i) Show that L_1 has equation
   $$x + 2y - 9 = 0$$
   ii) Find the equation of L_2. (6)
   c) The lines L_1 and L_2 intersect at the point D.
   i) Show that D has coordinates (1, 4).
   ii) Find the length of BD.
   iii) Find the coordinates of the mid-point of BD. (6)

(January 10)

2. The points A, B have co-ordinates (-1, 2), (8, 5) respectively.
   a) Find the gradient of AB. (2)
   b) Find the equation of AB and simplify your answer. (3)
   c) The line AB is extended to the point C so that B is the mid-point of AC. Find the coordinates of C. (2)

   The line L is parallel to AB. This line L intersects the y-axis at the point $(0, \frac{-1}{6})$ and the x-axis at the point D.

   d) i) Write down the equation of L.
   ii) Find the coordinates of D.
   iii) Find the length of AD. (6)

(January 11)

3. The points A, B, C, D have coordinates (-6, 4), (9, -1), (3, 16), (-7, 11) respectively.
   a) i) Find the gradient of AC.
   ii) Show that the equation of AC is
   $$4x - 3y + 36 = 0.$$
   iii) Show that BD is perpendicular to AC.
   iv) Find the equation of BD. (9)
   b) The lines AC and BD intersect at the point E.
   i) Show that E has coordinates (-3, 8)
   ii) Calculate the length of BE. (4)

(Summer 10)

4. The points A and B have coordinates (3, 11) and (9, -1) respectively.
The line L_1 passes through the point B and is **perpendicular** to AB.
   a) Find the gradient of AB. (2)
   b) Find the equation of L_1 and simplify your answer. (4)

   The line L_2 has equation $6x + 7y + 10 = 0$. The lines L_1 and L_2 intersect at the point C.

   c) i) Show that C has coordinates (3, -4).
      ii) Find the length of BC.
      iii) Find the coordinates of the mid-point of BC.
      iv) Write down the equation of the line AC. (7)

(Summer 11)

5. The points A, B, C, D have coordinates (-5, 14), (1, 2), (5, 4), (3, 8) respectively
   a) i) Show that AB and CD are parallel.
      ii) Find the equation of AB.
      iii) The line L passes through the point D and is perpendicular to AB. Show that L has equation
      $$x - 2y + 13 = 0$$ (8)
   b) The lines L and AB intersect at the point E.
      i) Find the coordinates of E.
      ii) Calculate the length of EF, where F denotes the mid-point of AB. (6)

(January 12)

6. The points A, B, C are such that A, B have coordinates (-4, 7), (2, -1) respectively and C is the mid-point of AB. The line L is the perpendicular bisector of AB.
   a) Find the gradient of AB. (2)
   b) Find the coordinates of C. (2)
   c) Show that the equation of L is $3x - 4y + 15 = 0$. (4)
   d) The point D lies on L and has coordinates (7, *k*).
      i) Show that *k* = 9.
      ii) Find the length of CA and the length of DA.
      iii) Hence show that the value of sin ADC may be expressed in the form $\frac{1}{\sqrt{a}}$, where a is an integer whose value is to be found. (7)

(Summer 12)

7. The points A and B have coordinates (2, -3) and (4, 1) respectively. The line L has equation $x + 2y - 11 = 0$.
   a) Find the equation of AB and simplify your answer. (5)
   b) Show that AB and L are perpendicular. (3)
   c) The lines AB and L intersect at the point C. Show that C has coordinates (5, 3). (2)
   d) Find the lengths of AB and AC. Hence find the value of the constant *k* such that AB = *k*AC, giving your answer in its simplest form. (4)

(January 13)

8. The points A, B, C have coordinates (8, 4), (6, -5), (3, 7), respectively. The line through A perpendicular to the line BC intersects BC at the point D.
   a) i) Find the gradient of BC.
      ii) Show that the equation of BC is $4x + y - 19 = 0$.
      iii) Find the equation of AD. (7)
   b) Show that the coordinates of D are (4, 3). (2)
   c) Find the length of BD. (2)
   d) The line AD is extended to E so that D is the mid-point of AE. Find the coordinates of E. (2)

(Summer 13)

9. The points A and B have coordinates (6, -2) and (4, 1) respectively. The line L_1 passes through the point B and is perpendicular to AB.
   a) i) Find the gradient of AB.
      ii) Find the equation of L_1. (5)
   b) The line L_2 passes through A and has equation $x - 8y - 22 = 0$.
      The lines L_1 and L_2 intersect at point C.
      i) Show that C has coordinates (-2, -3).
      ii) Find the co-ordinates of the midpoint of AC.
      iii) Find the area of the triangle ABC, simplifying your answer. (9)

(January 14)

10. The points A and B have coordinates (-2, 10) and (12, 3) respectively.
   a) i) Find the gradient of AB.
      ii) Find the equation of AB. (4)
   b) The line L is perpendicular to AB and intersects the y-axis at the point C (0, -1). The lines AB and L intersect at the point D.
      i) Write down the equation of L.
      ii) Show that D has coordinates (4, 7)
      iii) Find the length of AD and the length of BD. (7)
   c) The line CD is extended to the point E so that D is the mid-point of CE.
      i) Find the coordinates of E.
      ii) **Write down** the geometrical name for the quadrilateral ACBE. (3)

(Summer 14)

11. The points A, B, C have coordinates (-7, 3), (2, 0), (-3, 5) respectively. The line L passes through C and is perpendicular to AB.
   a) i) Find the gradient of AB.
      ii) Show that the equation of AB is $x + 3y - 2 = 0$.
      iii) Find the equation of L. (7)
   b) The line L intersects AB at the point D. Show that the coordinates of D are (-4, 2). (2)
   c) Show that L is not the perpendicular bisector of AB. (2)
   d) Find the value of tan $A\hat{B}C$ .Give your answer in its simplest form. (5)

(Summer 15)

12. The points A, B, C have coordinates (-6, -3), (4, 2), (-2, 5) respectively.
    a) i) Find the gradient of AB.
    ii) Find the equation of AB and simplify your answer. (5)
    b) Find the lengths of AB and AC. Hence find the value of the constant *k* such that AB = *k*AC, giving your answer in its simplest form. (4)
    c) The point D has coordinates (4, *m*), where *m* is a constant.
    i) Write down the equation of BD.
    ii) Given that CD is perpendicular to AB, find the value of *m*. (5)

(Summer 16)

13. The points A and B have coordinates (-2, 3) and (4, 5) respectively. The line L_1 passes through the point B and is **perpendicular** to AB.
    a) i) Find the gradient of AB.
    ii) Find the equation of L_1. (5)
    The line L_2 has equation $x + 2y + 1 = 0$. The lines L_1 and L_2 intersect at the point C.
    b) i) Show that C has coordinates (7, -4).
    ii) Show that the value of cos BĈA may be expressed in the form $\frac{3}{\sqrt{a}}$, where a is an integer whose value is to be found. (7)
    c) The line CB is extended to the point D so that B is the mid-point of CD.
    i) Find the coordinates of D.
    ii) **Write down** the geometrical name for the triangle ACD. (3)

(Summer 17)