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Cartesian Coordinate Geometry

(Gaeaf 2005)

1. The points A and B have coordinates (2, 3) and (5, 9) respectively. The line through B perpendicular to AB meets the x-axis at the point C.

(a) Show that the equation of the line BC is

$$x + 2y - 23 = 0.$$ [6]

(b) Find the coordinates of C. [1]

The point D has coordinates (24, 1). The line through A parallel to the line CD intersects the line BC in the point E.

(c) Show that the coordinates of E are (7, 8). [5]

(d) Find the length of CE. [2]

(Haf 2005)

1. The points A, B, C, D have coordinates (1, 7), (5, –1), (8, 3), (6, 7) respectively.

(a) Show that AB and CD are parallel. [3]

(b) Find the equation of AB. [2]

(c) The line L passes through the point D and is perpendicular to AB. Show that L has equation

$$x - 2y + 8 = 0.$$ [3]

(d) The lines L and AB intersect at the point E. Find the coordinates of E. [2]

(e) Calculate the length of EF, where F is the mid-point of AB. [4]

(Gaeaf 2006)

1. The points A, B, C have coordinates (–2, –3), (6, 1) and $(k, 3)$ respectively. The line AB is perpendicular to BC.

(a) Find the gradient of AB. [2]

(b) Show that $k = 5$. [3]

(c) The line L is parallel to BC and passes through A. Find the equation of L. [2]

(d) The line L intersects the y-axis at D. Calculate the length of CD. [3]

(Haf 2006)

1. The points A, B, C, D have coordinates $(3, 2)$, $(-4, 3)$, $(5, 6)$, $(4, -1)$, respectively.

(a) Show that the lines AC and BD are perpendicular. [5]

(b) Show that the line AC has equation

$$2x - y - 4 = 0$$

and find the equation of the line BD. [4]

(c) Find the coordinates of E, the point of intersection of AC and BD. [2]

(d) Find the length of AE. [2]

(Gaeaf 2007)

1. The points A, B, C, D have coordinates $(-5, 0)$, $(0, 5)$, $(3, 4)$ $(4, -3)$, respectively.

(a) Show that AC is perpendicular to BD. [4]

(b) Show that AD is parallel to BC. [3]

(c) Show that the equation of AC is

$$x - 2y + 5 = 0$$

and find the equation of BD. [3]

(d) The lines AC and BD intersect at E.

(i) Show that the coordinates of E are $(1, 3)$. [2]

(ii) Find the length of AE. [2]

(Haf 2007)

1. The points A, B, C, D have coordinates $(-1, 3)$, $(1, 7)$, $(2, -1)$, $(5, k)$, respectively. The line AB is parallel to the line CD.

(a) Find the gradient of AB. [2]

(b) Show that $k = 5$. [3]

(c) The line L is perpendicular to CD and passes through the point A. Show that the equation of L is $x + 2y - 5 = 0$. [3]

(d) The line L intersects the line CD at the point E. Find the coordinates of E. [4]

(Gaeaf 2008)

1. The points A, B, C have coordinates $(-2, 3)$, $(10, -1)$, $(3, 8)$ respectively. The line through C perpendicular to AB intersects AB at the point D.

(a) Find the gradient of AB. [2]

(b) Show that AB has equation

$$x + 3y - 7 = 0$$

and find the equation of CD. [5]

(c) Show that D has coordinates $(1, 2)$. [2]

(d) The mid-point of AB is denoted by E. Find the length of ED. [4]

(Haf 2008)

1. The points A, B, C, D have coordinates $(-7, 4)$, $(3, -1)$, $(6, 1)$, $(k, -15)$ respectively.

(a) Find the gradient of AB. [2]

(b) Find the equation of AB and simplify your answer. [3]

(c) Find the length of AB. [2]

(d) The point E is the mid-point of AB. Find the coordinates of E. [2]

(e) Given that CD is perpendicular to AB, find the value of the constant k. [4]

(Gaeaf 2009)

1. The points A, B, C have coordinates $(2, -1)$, $(-7, 1)$, $(5, 4)$, respectively. The line through A perpendicular to the line BC intersects BC at the point D.

(a) Show that the equation of BC is

$$x - 4y + 11 = 0,$$

and find the equation of AD. [7]

(b) Show that the coordinates of D are $(1, 3)$. [2]

(c) Find the length of CD. [2]

(d) The line AD is extended to E so that D is the mid-point of AE. Find the coordinates of E. [2]

(Haf 2009)

1. The points A, B, C are such that A, B have coordinates $(-1, 5)$, $(7, 11)$, 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

$$4x + 3y - 36 = 0.$$ [4]

(d) The line L intersects the x-axis at the point D.

(i) Find the coordinates of D.

(ii) Find the length of CD.

(iii) Find the value of $\tan \hat{CAD}$. [6]

(Gaeaf 2010)

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]

(Haf 2010)

1. 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]

(Gaeaf 2011)

1. The points A, B have coordinates $(-1, 2)$, $(8, 5)$ 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]

(Haf 2011)

1. 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]

(Gaeaf 2012)

1. 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]

(Haf 2012)

1. 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 $\sin A\hat{D}C$ may be expressed in the form $\frac{1}{\sqrt{a}}$, where a is an integer whose value is to be found. [7]

(Gaeaf 2013)

1. 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 $AB = kAC$, giving your answer in its simplest form. [4]

(Haf 2013)

1. 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]

(Gaeaf 2014)

1. 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 the point C.

(i) Show that C has coordinates $(-2, -3)$.

(ii) Find the coordinates of the mid-point of AC.

(iii) Find the area of triangle ABC, simplifying your answer. [9]

(Haf 2014)

1. 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]

(Haf 2015)

1. 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]

(Haf 2016)

1. 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 $AB = kAC$, 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]

(Haf 2017)

1. 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 $\cos B\hat{C}A$ 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]

(Haf 2018)

1. The points A, B, C and D have coordinates $(-2, 7)$, $(2, -1)$, $(5, 3)$ and $(3, 7)$ respectively.

(a) (i) Show that AB and DC are parallel.

(ii) Find the equation of AB. [5]

(b) The line L has equation $x - 2y + 11 = 0$ and intersects AB at the point E.

(i) Giving a reason, determine whether or not L is perpendicular to AB.

(ii) Show that E has coordinates $(-1, 5)$.

(iii) Calculate the length of EF, where F denotes the midpoint of AB. [8]

(c) **Write down** the geometrical name for the quadrilateral $ABCD$. [1]

(Haf 2019)

1. The points A and B have coordinates $(-2, 7)$ and $(6, 13)$, respectively. The point C is the midpoint of AB. The line L is the perpendicular bisector of AB.

(a) (i) Find the gradient of AB.

(ii) Find the equation of L. [7]

(b) The line L intersects the line $y = 2$ at the point D.

(i) Show that D has coordinates $(8, 2)$.

(ii) Find the value of $\tan B\hat{D}C$. [6]