Geometreg Cyfesurynnau Cartesaidd

Cartesian Co-ordinate Geometry

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Ganwyd René Descartes ar y 15fed o Fawrth, 1596, yn Ffrainc. Defnyddiodd graffiau er mwyn cysylltu algebra efo geometreg. Mae graffiau'n defnyddio echelinau-x ag y yn cael eu galw'n graffiau **Cartes**aidd, ar ei ôl.

*René Descartes was born on the 15th of March, 1596, in France. He used graphs in order to connect algebra to geometry. Graphs that use x and y axes are named **Cartes**ian graphs.*

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- Ystyriwch unrhyw ddau bwynt $A = (x_1, y_1)$, $B = (x_2, y_2)$ mewn plân.
  Consider any two points $A = (x_1, y_1)$, $B = (x_2, y_2)$ in a plane.

- Y pellter rhwng A a B yw $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$.
  The distance between A and B is $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$.

- Graddiant y llinell AB yw $\frac{y_2 - y_1}{x_2 - x_1}$.
  The gradient of the line AB is $\frac{y_2 - y_1}{x_2 - x_1}$.

- Canolbwynt y llinell AB yw $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$.
  The mid-point of the line AB is $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$.

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Ymarfer 1 / *Exercise 1*

Ar gyfer y parau o bwyntiau canlynol, darganfyddwch (i) y pellter rhwng y ddau bwynt;
(ii) graddiant y llinell sy'n cysylltu'r ddau bwynt; (iii) canolbwynt y ddau bwynt.
For the following pairs of points, find (i) the distance between the two points; (ii) the gradient of the line connecting the two points; (iii) the mid-point of the two points.

(a) $A(2, 1), B(6, 4)$.

(b) $A(3, 1), B(4, 6)$.

(c) $A(-3, 2), B(9, 4)$.

(ch) $A(2, 5), B(-5, -3)$.

(d) $A(-10, -1), B(-2, -5)$.

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Atebion / *Answers*

(a) (i) 5 (ii) $\frac{3}{4}$ (iii) $(4, 2.5)$

(b) (i) $\sqrt{26}$ (ii) 5 (iii) $(3.5, 3.5)$

(c) (i) $2\sqrt{37}$ (ii) $\frac{1}{6}$ (iii) $(3, 3)$

(ch) (i) $\sqrt{113}$ (ii) $\frac{8}{7}$ (iii) $(-1.5, 1)$

(d) (i) $4\sqrt{5}$ (ii) $-\frac{1}{2}$ (iii) $(-6, -3)$

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Ymarfer 2 / *Exercise 2*

Cwblhewch y tabl canlynol.
Complete the following table.

A	B	Canolbwynt / Mid-point of *AB*
(2, 8)	(8, 14)	
(6, 10)		(10, 12)
	(20, 14)	(10, 5)
(–2, 5)		(5, 3)
	(7, –8)	(14, –16)
(–8, –5)		(–3, 4)
	(–5, 1)	(13, –2)

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Atebion / *Answers*

Cwblhewch y tabl canlynol.
Complete the following table.

A	B	Canolbwynt / Mid-point of *AB*
(2, 8)	(8, 14)	(5, 11)
(6, 10)	(14, 14)	(10, 12)
(0, –4)	(20, 14)	(10, 5)
(–2, 5)	(12, 1)	(5, 3)
(21, –24)	(7, –8)	(14, –16)
(–8, –5)	(2, 13)	(–3, 4)
(31, –5)	(–5, 1)	(13, –2)

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- Ystyriwch unrhyw ddau bwynt $A = (x_1, y_1), B = (x_2, y_2)$ mewn plân.
  Mae'r ddau bwynt yma, os yn wahanol, yn diffinio llinell syth yn y plân.
  Consider any two points $A = (x_1, y_1), B = (x_2, y_2)$ in a plane.
  These two points, if different, define a line on the plane.

  https://ggbm.at/qjpfmrra

- Mae'n bosib ysgrifennu hafaliad y llinell syth mewn tair ffordd wahanol.
  It is possible to write the equation of the straight line in three different ways.

$$y = mx + c$$

$$ax + by + c = 0$$

$$y - y_1 = m(x - x_1)$$

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Ymarfer 3 / *Exercise 3*

Ym mhob un o'r canlynol, diffinir llinell trwy roi un pwynt ar y llinell a graddiant y llinell.
Ysgrifennwch hafaliad y llinell ym mhob un o'r tair ffordd ar y sleid blaenorol.
In each of the following, a line is defined by a point on the line and its gradient. Write the equation of the line in each of the three forms shown on the previous slide.

(a) $A(4, 6)$, $m = 3$.

(b) $A(9, 15)$, $m = -2$.

(c) $A(-2,4)$, $m = 5$.

(ch) $A(6, -2)$, $m = 0.5$.

(d) $A(-5, -10)$, $m = -0.2$.

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Atebion / *Answers*

	$y = mx + c$	$ax + by + c = 0$	$y - y_1 = m(x - x_1)$
(a)	$y = 3x - 6$	$y - 3x + 6 = 0$	$y - 6 = 3(x - 4)$
(b)	$y = -2x + 33$	$y + 2x - 33 = 0$	$y - 15 = -2(x - 9)$
(c)	$y = 5x + 14$	$y - 5x - 14 = 0$	$y - 4 = 5(x + 2)$
(ch)	$y = 0.5x - 5$	$y - 0.5x + 5 = 0$ neu/*or* $2y - x + 10 = 0$	$y + 2 = 0.5(x - 6)$
(d)	$y = -0.2x - 11$	$y + 0.2x + 11 = 0$ neu/*or* $5y + x + 55 = 0$	$y + 10 = -0.2(x + 5)$

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- Gadewch i'r llinellau L_1 ag L_2 gael graddiannau m_1 ag m_2, yn ôl eu trefn.
  Let the lines L_1 and L_2 have gradients m_1 and m_2, respectively.

- Os yw L_1 ag L_2 yn baralel, yna mae $m_1 = m_2$.
  If L_1 and L_2 are parallel, then $m_1 = m_2$.

- Os yw L_1 ag L_2 yn berpendicwlar, yna mae $m_1 m_2 = -1$.
  Neu, mae'n bosib dweud bod un graddiant yn negatif cilydd y llall:
  $$m_1 = -\frac{1}{m_2} \ \text{a} \ \ m_2 = -\frac{1}{m_1}.$$
  If L_1 and L_2 are perpendicular, then $m_1 m_2 = -1$.
  Or, it is possible to say that one gradient is the negative reciprocal of the other:
  $$m_1 = -\frac{1}{m_2} \ \text{and} \ \ m_2 = -\frac{1}{m_1}.$$

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Ymarfer 4 / *Exercise 4*

Mae'r llinell syth L_1 yn cysylltu'r pwyntiau (–5, 12) a (8, 6).
Mae'r llinell syth L_2 yn baralel i L_1.
Mae'r llinell syth L_3 yn berpendicwlar i L_1.
Beth yw graddiannau L_2 ag L_3?

The straight line L_1 connects the points (–5, 12) and (8, 6).
The straight line L_2 is parallel to L_1.
The straight line L_3 is perpendicular to L_1.
What are the gradients of L_2 and L_3?

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Ateb / *Answer*

Mae'r llinell syth L_1 yn cysylltu'r pwyntiau (–5, 12) a (8, 6).
Mae'r llinell syth L_2 yn baralel i L_1.
Mae'r llinell syth L_3 yn berpendicwlar i L_1.
Beth yw graddiannau L_2 ag L_3?

The straight line L_1 connects the points (–5, 12) and (8, 6).
The straight line L_2 is parallel to L_1.
The straight line L_3 is perpendicular to L_1.
What are the gradients of L_2 and L_3?

Graddiant L_2 yw $-\dfrac{6}{13}$. Graddiant L_3 yw $\dfrac{13}{6}$.
The gradient of L_2 is $-\dfrac{6}{13}$. The gradient of L_3 is $\dfrac{13}{6}$.