Further Pure Maths: Rectangular Cartesian Coordinates: 30-minute Pack

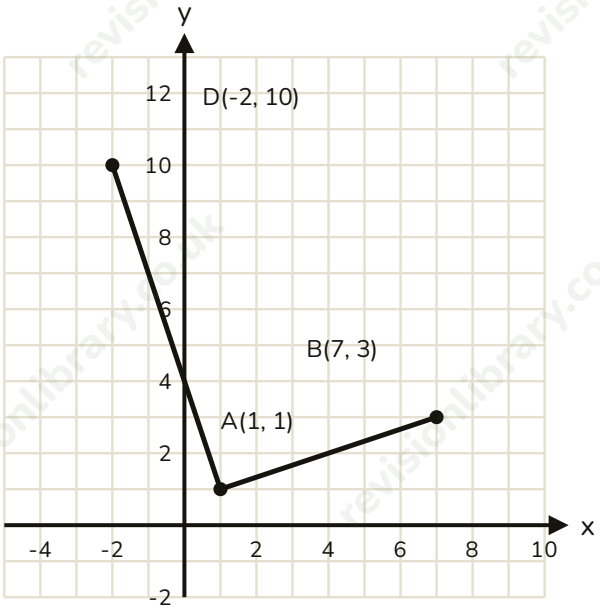
EDEXCEL 4PM1 · Calculator allowed · about 30 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Show your working. Give exact answers unless stated otherwise. Coordinates use the same unit on both axes.

1 A quadrilateral has consecutive vertices A(1, 1), B(7, 3), C and D(-2, 10). It is a parallelogram. Find C, show using gradients that the parallelogram is a rectangle, and calculate its area.



(Total for Question 1 is 6 marks)

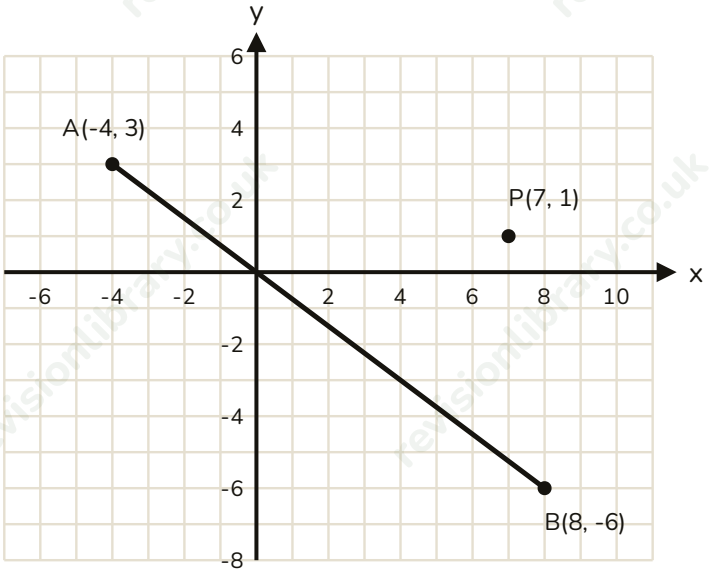
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2 A(-3, 4), B(5, -2) and P lie on a straight line in that order. AP:PB = 3:1. Find P. The line through P perpendicular to AB meets the x-axis at X. Find X.

(Total for Question 2 is 5 marks)

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3 A straight path is the segment joining A(-4, 3) to B(8, -6). A marker is at P(7, 1). Let H be the foot of the perpendicular from P to the infinite line through A and B. Find H, show that H lies on the path by finding AH:HB, and calculate the shortest distance from the marker to the path.



(Total for Question 3 is 6 marks)

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4 The line l passes through (2, -5) and (8, 4). Find an equation of the line through (-2, 3) parallel to l.

(Total for Question 4 is 3 marks)

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5 Find an equation of the line through (4, -1) perpendicular to 2*x + 5*y = 17.

(Total for Question 5 is 3 marks)

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Mark scheme · Further Pure Maths: Rectangular Cartesian Coordinates: 30-minute Pack

Question 1

Use C = B + (D - A), or equivalent parallel-side displacements.	**M1**
C = (4, 12).	**A1**
Calculate gradients AB = 1/3 and AD = -3.	**M1**
Their product is -1, so adjacent sides are perpendicular; a parallelogram with a right angle is a rectangle.	**A1**
Use area = $\sqrt{40}*\sqrt{90}$, or another valid coordinate area calculation.	**M1**
Area = 60 square units. Accept any valid method for the corresponding marks.	**A1**

Answer: C = (4, 12); rectangle; area = 60

Question 2

Use PB = AB/2, since AP = AB + BP and AP = 3*BP.	**M1**
P = (9, -5).	**A1**
Perpendicular gradient = 4/3.	**B1**
Use y + 5 = (4/3)*(x - 9) and set y = 0.	**M1**
X = (51/4, 0); accept equivalent exact forms and any valid method for the corresponding marks.	**A1**

Answer: P = (9, -5); X = (51/4, 0)

Question 3

Obtain an equation of AB, for example 3*x + 4*y = 0.	**M1**
Obtain the perpendicular through P, for example y - 1 = (4/3)*(x - 7).	**M1**
H = (4, -3) by solving the line equations.	**A1**
Compare AH = (8, -6) and HB = (4, -3), or the corresponding positive lengths.	**M1**
AH:HB = 2:1; H lies between A and B, so the perpendicular meets the path.	**A1**
Shortest distance = PH = $\sqrt{(7 - 4)^2 + (1 + 3)^2}$ = 5 units. Accept any valid method for the corresponding marks.	**A1**

Answer: H = (4, -3); AH:HB = 2:1; shortest distance = 5

Question 4

Calculate the gradient of l as (4 + 5)/(8 - 2).	**M1**
Use y - 3 = (3/2)*(x + 2), or substitute (-2, 3) into a line with their gradient.	**M1**
3*x - 2*y + 12 = 0 or any equivalent equation. Accept any valid method for the corresponding marks.	**A1**

Answer: 3*x - 2*y + 12 = 0

Question 5

Identify the perpendicular gradient as 5/2.	**B1**
Use y + 1 = (5/2)*(x - 4), or determine the intercept using the given point.	**M1**
5*x - 2*y = 22 or any equivalent equation. Accept any valid method for the corresponding marks.	**A1**

Answer: 5*x - 2*y = 22

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