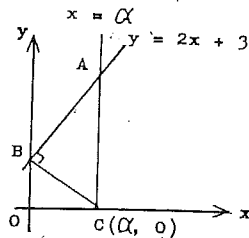


PAST EXAMINATION QUESTIONS

- Find the equation of the perpendicular bisector of the straight line joining the points $B(-1, 0)$ and $C(3, 4)$. Calculate (i) the co-ordinates of A , the point equidistant from B and C and lying on the straight line $2y - 3x = 16$, (ii) the area of the triangle ABC . (N54/P2/2)
- Show that the three points A, B, C whose co-ordinates are $(0, 6), (2, 1)$ and $(7, 3)$ respectively are three corners of a square. Find (i) the co-ordinates of the point at which the diagonals intersect; (ii) the gradient of the diagonal BD ; (iii) the co-ordinates of D , the fourth corner of the square. (N58/P2/1)
- Find the equations of the lines through the point $(-2, -4)$ which are respectively parallel to and perpendicular to the line $5x + 4y = 15$. Find the co-ordinates of the point at which the perpendicular line meets $5x + 4y = 15$ and hence find the distance between the parallel lines. (N58/P2/2)
- AB, AD are two sides of a parallelogram $ABCD$. Given that the co-ordinates of A, B, D are $(1, 2), (3, 5), (5, 7)$ respectively, find the co-ordinates of the point C .
Find also the equations of the two diagonals AC and BD and the equation of the line through A perpendicular to BD . (N59/P2/1)
- Prove that the points $A(-1, 2), B(5, 0), C(7, 4)$ and $D(1, 6)$ are the corners of a parallelogram. Find the equations of the diagonals AC, BD and the co-ordinates of their point of intersection. (N60/P2/1)
- A is the point $(-1, 0)$ and B is the point $(1, 1)$. If P is the point (h, k) . Write down expressions for the lengths of PA and PB . Find the equations connecting h and k , (i) when $PA = PB$; (ii) when $PA = 2PB$. Find also the point on the line $4x + 5y = 4$ which is equidistant from A to B . (N60/P2/2)
- Prove that the four points $A(2, 2), B(5, -2), C(-3, 4), D(-6, 8)$ are the vertices of a parallelogram and find the equations of its diagonals. Calculate the lengths of AB and BC .
If $ABEF$ is a rhombus with E on BC (not CB produced) and F on AD , find the co-ordinates of E and F . (J61/P1/7)
- The points A, B and C are $(4, 0), (2, 2)$ and $(0, 6)$ respectively. AB produced cuts the y -axis at P and CB produced cuts the x -axis at Q . Find the co-ordinates of the points P and Q . Find also the equation of the straight line joining the midpoints of AC and OB (where O is the origin), and verify that this line passes through the midpoint of PQ . (J61/P2/7)
- Write down the equation of the line through $(0, 2)$ perpendicular to the line $y = m(x - 2)$. Find, in terms of m , the co-ordinates of P , their point of intersection. (N61/P1/8ii)
- [Squared paper may NOT be used in this question.]
The sides of a triangle are OA, OB, AB , and have equations $2x - y = 0, 3x + y = 0, x - 3y + 10 = 0$ respectively. Find the equations of the three medians of the triangle and verify that they are concurrent. Verify that the line joining the midpoints of OA and OB has the same gradients as AB . (J62/P1/7)
- The vertices of a triangle P, Q, R are $(1, 7), (-2, 5), (2, 3)$ respectively. S is the midpoint of QR . Verify that $PQ^2 + PR^2 = 2PS^2 + 2SR^2$. Calculate the area of the quadrilateral $OQPR$, where O is the origin. (N62/P1/7)
- The co-ordinates of A, B and C are $(-2, 7), (6, -1)$ and $(9, 4)$ respectively and M is the midpoint of AB . Find (a) the co-ordinates of M ; (b) the numerical value of $AB : CM$; (c) the equation of the line BC . (N62/P2/1)
- Write down the equation of the line which makes an intercept of $2a$ on the x -axis and $3a$ on the y -axis. Given that the line passes through the point $(14, -9)$, find the numerical value of a . (N62/P2/2i)
- The co-ordinates of A, B and C are $(3, 1), (1, 5)$ and $(4, 2)$ respectively. P is the midpoint of BC ; Q lies on AC and is such that $CQ : QA = 3 : 1$; R lies on AB and is such that $AR : RB = 1 : 3$. Find the equations of the lines AP, BQ and CR and prove that the lines are concurrent. (J63/P1/7) [Graph paper may not be used in this question.]
- (i) Two diagonally opposite vertices of a square are $(0, 8)$ and $(6, 4)$. Prove that $(1, 3)$ is also a vertex of the square and find the co-ordinates of the fourth vertex. Calculate the length of the side of the square.
(ii) A is the point $(2, 0)$ and B the point $(6, 0)$. P is the point where the line joining A to $(h, 4)$ meets the line joining B to $(-h, 4)$. Find the co-ordinates of P in terms of h . Verify that P lies on the line $x + y = 4$. (N63/P1/7)

16. Prove that the distance from the point $(1, 1)$ to the point $\left(\frac{2t^2}{1+t^2}, \frac{(1-t)^2}{1+t^2}\right)$ is the same for all values of t . (ii) Find the area of the triangle whose vertices are $(a, 0)$, $(0, b)$ and (x, y) . (N63/P2/7i)
17. The line through $A(4, 7)$ with gradient m meets the x -axis at P and the y -axis at R . The line through $B(8, 3)$ with gradient $-\frac{1}{m}$ meets the x -axis at Q and the y -axis at S . Find, in terms of m , the co-ordinates of P, Q, R and S . Obtain expressions for $OP \cdot OQ$ and $OR \cdot OS$, where O is the point $(0, 0)$. (N64/P1/6i)
18. The points A and B have co-ordinates $(1, 1)$ and $(3, 2)$ respectively. Determine the co-ordinates of the two points, distant $2\sqrt{13}$ from A , which lie on the line through A perpendicular to AB . (N68/P1/8)
19. The sum and product of two numbers, x and y , are 10 and 12 respectively. Form appropriate equations, plot the corresponding graphs and hence obtain approximate values for x and y . (J70/P1/1)
20. The point P is the foot of the perpendicular from $A(0, t)$ to the line whose equation is $y = kx$. Determine (a) the equation of the line AP , (b) the co-ordinates of P , (c) the area of the triangle OAP , where O is the origin. (N72/P1/8)
21. P is the point of intersection of the lines $y + x = 1$ and $3y + 2x = 1$. Find the co-ordinates of the point midway between P and the line $y = 2x + 8$. (J73/P1/8)
22. The points A, B, C and D have co-ordinates $(3, -2), (p, 3), (6, 2)$ and (q, r) respectively. The figure $ABCD$ is a rhombus. Determine (a) the values of p, q, r , (b) the area of the rhombus. (N73/P1/8)
23. A and B are the points $(0, 3)$ and $(4, 0)$ respectively. Find the equation of the line through $(5, 6)$ perpendicular to AB and find the distance between the points where the line meets the axes. (sp1/1)
24. A, B, C and D are the points $(1, 6), (3, 2), (11, 8)$ and $(-1, 2)$ respectively. Find the equation of the line through the mid-point of AB and parallel to CD . (sp1/2)
25. The equations of two sides, PQ, PR , of the triangle PQR are $y - 3x + 6 = 0$ and $3y - 4x - 2 = 0$ respectively. The co-ordinates of D , the foot of the perpendicular from P to QR are $(0, 4)$. Find the equation of QR . (sp2/2)
26. The line whose equation is $y = -x + 5$ is the perpendicular bisector of the line joining the points $P(3, 10)$ and $Q(\alpha, \beta)$. (i) Write down, in terms of α and β , the co-ordinates of the midpoint of PQ . (ii) Show that $\beta = \alpha + 3$ and $\alpha + \beta = 13$. (J74/P1/2)
27. The co-ordinates of three points P, Q, R are $(2, -1), (6, 7)$ and $(-2, 7)$ respectively.
 (i) Calculate the length of the line joining R to the midpoint of PQ .
 (ii) Find the equation of the line through R parallel to PQ . (J74/P2/1)
28. Three of the vertices of a parallelogram $ABCD$ are $A(9, 3), B(-2, 1)$ and $C(8, 6)$.
 (i) Write down the co-ordinates of the midpoint of AC and hence, or otherwise, find the co-ordinates of the fourth vertex D .
 (ii) Prove that $ABCD$ is a rhombus. (N74/P1/1)
29. The equations of the sides AB, BC, CA of the triangle ABC are $y = 2x, y = 3x, x + y = 8$ respectively. Find the equation of the line through C perpendicular to AB . The line meets the x -axis in P and the y -axis in Q . Calculate the ratio $\frac{PC}{CQ}$. (N74/P2/2)
30. The co-ordinates of three points A, B and C are $(0, 4), (2, 3)$ and $(-4, 9)$ respectively. The midpoint of BC is M . Find the equation of the straight line through M perpendicular to AM . (J75/P1/1)
31. (a) Given that the points $(-1, -1), (0, 2)$ and $(2, k)$ lie on a straight line, find k .
 (b) Given that the points $(2t, t), (2t + 1, t - 3)$ are equidistant from the origin, find t . (J75/P2/3)
32. A straight line of gradient 5 is drawn through the point $(1, -4)$ on the curve $y = 3x^2 - 7x$. Calculate the co-ordinates of the point at which the line meets the curve again. (N75/P1/1)
33. The co-ordinates of P and Q are $(-3, 2)$ and $(5, 12)$. Find the equations of (i) the line PQ , (ii) the perpendicular bisector of PQ . (N75/P2/2)
34. A certain operation maps the point $P(x, y)$ onto the point $P'(x + 2y, y - x)$.
 (i) Find the images Q', R' of the points $Q(3, 2), R(7, -4)$.
 (ii) Show that the midpoint of $Q'R'$ is the image of the midpoint of QR . (N75/P2/9)
35. The line joining the points $A(-1, 3)$ and $B(5, 15)$ meets the axes at P and Q . Find the equation of AB and calculate the length of PQ . (J76/P1/1)

36. Find, in terms of m , the equation of the line through the point $(m, 0)$ with gradient m . Find the values of m for which the line passes through the point $(5, 6)$. (J76/P2/1)
37. The co-ordinates of the points P, Q, R are $(-1, 11), (2, 5)$ and $(t, 3)$ respectively. Given that $\angle PQR = 90^\circ$ calculate the value of t . The line PQ is produced to S so that $QS = PQ$. Calculate the co-ordinates of S . (J76/P2/7)
38. The points A, B, C have co-ordinates $(3, 12), (-1, 5)$ and $(2, 4)$ respectively. Prove that $AB = AC$. If $P(h, k)$ is another point equidistant from B and C , prove that $k = 3h + 3$. (N76/P1/3)
39. Three points have co-ordinates $A(2, 7), B(1, 0), C(5, 8)$. The point D is the foot of the perpendicular from A to BC . Calculate the co-ordinates of D . (J77/P1/1)
40. Q is the reflection of the point $(2, 9)$ in the straight line $y = 2x$. Calculate the co-ordinates of Q . (J77/P2/3)
41. In the triangle ABC the equations of AB and AC are $y = 2x - 1$ and $y = -4x + 23$ respectively. The foot of the perpendicular from A to BC is $(3, 4)$. Find the equation of BC . (N77/P1/2)
42. The figure shows the straight line $y = 2x + 3$ intersecting the line $x = \alpha$ at A , and the y -axis at B . If C is the point $(\alpha, 0)$ and $\angle ABC = 90^\circ$, calculate α . (N77/P2/8)



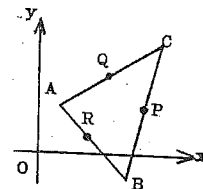
43. Given the point $A(a, 3), B(-2, 1)$ and $C(3, 2)$ find the possible values of a if the length of AB is twice the length of BC . (J78/P1/1)
44. Given that $f: x \rightarrow 4x - 3$, find the domain of x corresponding to a range of $-5 \leq f(x) \leq 5$. (J78/P1/9a)
45. Given the points $A(1, 3), B(3, 2)$ and $C(2, 4)$ find the co-ordinates of the point of intersection of the line through C parallel to AB and the line through B perpendicular to AB . (J78/P2/1)
46. A and B are the points $(8, 0)$ and $(0, 12)$ respectively. The perpendicular bisector of AB meets the axes at P and Q . Calculate the area of the triangle POQ where O is the origin. (N78/P1/1)
47. Given the points $A(3a, a), B(2, 3)$ and $C(4, 7)$ find the possible values of a if the area of the triangle ABC is 8 square units. (N78/P2/3)
48. In the triangle ABC the equations of two of the sides are $2y = x + 2$ and $y = 2x - 2$. Given that A is the point $(4, 3)$ and that $\angle ABC$ is 90° , find the equation of the third side. (J79/P1/5)
49. Three points have co-ordinates $A(1, 3), B(3, 5), C(1\frac{1}{2}, 4\frac{1}{2})$. The points D and C lie on the same side of AB , the angle DBA is 90° and the areas of $\triangle ACB$ and $\triangle ADB$ are equal. Find
(i) the equation of the line through C parallel to AB ,
(ii) the co-ordinates of D . (J79/P2/4)
50. A straight line through the point $(0, -3)$ intersects the curve $x^2 + y^2 - 27x + 41 = 0$ at $(2, 3)$. Calculate the co-ordinates of the point at which the line again meets the curve. (N79/P1/4)
51. P and Q are the points of intersection of the line $\frac{y}{2} + \frac{x}{3} = 1$ with the x and y axes respectively. The gradient of QR is $\frac{1}{2}$ and R is the point whose x co-ordinate is $2t$, where t is positive. Express the y co-ordinate of R in terms of t and evaluate t given that the area of $\triangle PQR$ is 21 square units. (N79/P1/5)
52. $A(t+2), B(t^2, 3t), C(2t, t-3), O(0, 0)$ are four distinct points. Calculate the value(s) of t if (i) AB is parallel to OC , (ii) OB is perpendicular to AC . (N79/P2/6)
53. Three points have co-ordinates $O(0, 0), A(5, 0)$ and $B(7, 6)$. If P is the point (x, y) calculate the values of x and y given that $AP = BP$, that the area of $\triangle AOP$ is 10 square units and that y is positive. (J80/P1/4)
54. Find (i) the equation of the line with gradient -2 which passes through the point $(2t, t)$, (ii) the values of t for which the area enclosed by this line and the co-ordinate axes is 4 square units. (J80/P2/1)
55. Given the points $A(2, 1)$ and $B(0, 5)$, find the equation of the line through B which is perpendicular to AB . Given that $C(h, k)$ lies on this line and that the gradient of AC is $\frac{4}{3}$, calculate the values of h and k . (N80/P1/5)
56. Three points have co-ordinates $A(1, -3), B(5, 5)$ and $C(5, 9)$. Find the equation of the perpendicular bisector of (i) AB , (ii) BC . Hence find the co-ordinates of the point equidistant from A, B and C . (N80/P2/4)
57. Three points have co-ordinates $A(-2, -1), B(6, 9)$ and $C(2, -3)$. The line through the midpoint of AB parallel to AC meets the x -axis at X and the y -axis at Y . Calculate the co-ordinates of X and Y . Hence deduce the area of $\triangle XOY$, where O is the origin. (J81/P1/1)

58. Three points have co-ordinates $A(1, 7)$, $B(7, 5)$, and $C(0, -2)$. Find
- the equation of the perpendicular bisector of AB .
 - the point of intersection of this perpendicular bisector and BC . (J81/P2/1)
59. The point (h, k) lies on the line $y = x + 1$ and is a distance of 5 units from the point $(0, 2)$. Write down two equations connecting h and k and hence find the possible values of h and k . (N81/P1/6)
60. Three points have co-ordinates $O(0, 0)$, $A(3, 5)$ and $B(9, 1)$. A fourth point C lies on the perpendicular bisector of AB so that OC is parallel to AB . Calculate the co-ordinates of C . (N81/P2/5)
61. P and Q are the points of intersection of the line $\frac{x}{a} + \frac{y}{b} = 1$, ($a > 0$, $b > 0$), with the x and y axes respectively. The distance PQ is 10 and the gradient of PQ is -2 . Find the value of a and of b . (J82/P1/1)
62. Three points have co-ordinates $P(-2, -3)$, $Q(2, 0)$, $R(8, -8)$.
- Prove that $\angle PQR = 90^\circ$.
 - Calculate the area of $\triangle PQR$.
 - Calculate the length of PR and hence, or otherwise, find the perpendicular distance of Q from PR . (J82/P1/2)

63. Three points have co-ordinates $A(2, 9)$, $B(4, 3)$ and $C(2, -5)$. The line through C with gradient $\frac{1}{2}$ meets the line AB produced at D . Calculate (i) the co-ordinates of D , (ii) the equation of the line through D perpendicular to the line $5y - 4x = 17$. (J82/P2/2)

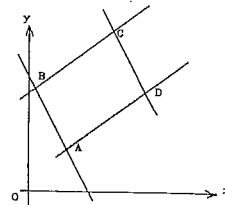
64. The line $x - y - 6 = 0$ meets the curve $y^2 = 8x$ at A and B . Calculate the length of AB . (N82/P1/1)

65. In the diagram, $P(6, 3)$, $Q(4, 7)$ and $R(3, 1)$ are the mid-points of the sides of the triangle ABC . Find



- the gradient of the line PQ ,
 - the equation of the line AB ,
 - the equation of the perpendicular bisector of the line AC . (N82/P1/4)
66. Three points have co-ordinates $A(0, 5)$, $B(8, 7)$ and $C(4, 1)$. Calculate the co-ordinates of the point of intersection of the perpendicular bisectors of the lines AB and BC . (N82/P2/4)
67. Given that the four points $A(1, 2)$, $B(2, -5)$, $C(7, 0)$ and $D(\alpha, \beta)$ are the vertices of the rhombus $ABCD$, calculate (i) the value of α and of β , (ii) the area of the rhombus. (J83/P2/1)
68. Three points have co-ordinates $A(4, 6)$, $B(-3, 5)$ and $C(9, -4)$. The point P is the foot of the perpendicular from A to BC . Calculate (i) the co-ordinates of P , (ii) the ratio $BP : PC$. (N83/P1/1)
69. Three points have co-ordinates $A(x, y)$, $B(-3, 1)$ and $C(5, 6)$. Given that AB has gradient 2 and that $AC = 5$, calculate the possible values of x and of y . (N83/P2/5)

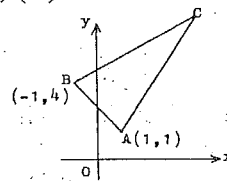
70. The figure shows a parallelogram $ABCD$. The equations of AB and AD are $y + 3x = 10$ and $y = x + 2$ respectively. Given that the diagonals of the parallelogram intersect at $(3\frac{1}{2}, 7\frac{1}{2})$, find (i) the co-ordinates of C , (ii) the equation of BC . (N83/P2/6)



71. Three points have co-ordinates $A(2, 1)$, $B(5, 6)$ and $C(1, 4)$. Find the equation of AC . The line through B parallel to OC , where O is the origin, meets CA produced at P . Calculate the co-ordinates of P . (J84/P1/1)
72. $ABCD$ is a parallelogram whose diagonals meet at E . Given that A is $(-3, 8)$, B is $(2, 3)$ and C is $(9, 2)$, calculate the co-ordinates of E . Show that the diagonals meet at right angles, and hence or otherwise calculate the area of $ABCD$. (J84/P2/1)
73. A line of gradient 3 passing through $A(-1, 6)$ meets the x -axis at B . Another line through A meets the x -axis at $C(2, 0)$. (i) Find the equation of AB and of AC . (ii) Calculate the area of $\triangle ABC$. (N84/P1/1)
74. Two points have co-ordinates $A(1, -2)$ and $B(-3, 6)$. Find the equation of the perpendicular bisector of AB . This perpendicular bisector meets the line $y = x - 1$ at the point P . Calculate the length of AP . (N84/P2/1)
75. The line $x - y - 6 = 0$ meets the curve $y^2 = 8x$ at the points A and B . Calculate the length of AB . (Sp1/1)

76. Three points A , B and C have co-ordinates $(0, 5)$, $(4, 7)$ and $(1, 3)$ respectively. Find (i) the equation of the line through C parallel to AB , (ii) the equation of the line through the mid-point of AB perpendicular to AB , (iii) the co-ordinates of the point of intersection of these two lines. (Sp1/6)

77. The line $y = 2x + 3$ intersects the y -axis at A . The points B and C on this line are such that $AB = BC$. The line through B perpendicular to AC passes through the point $D(-1, 6)$. Calculate (i) the equation of BD , (ii) the co-ordinates of B , (iii) the co-ordinates of C . (J85/P1/1)

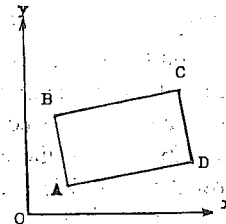


78. The figure shows a triangle ABC with $A(1, 1)$ and $B(-1, 4)$. The gradients of AB , AC and BC are $-3m$, $3m$ and m respectively. (i) Find the value of m . (ii) Find the co-ordinates of C . (iii) Show that $AC = 2AB$. (N85/P1/1)

79. $A(2t, t+1)$, $B(4t, t+5)$, $C(10+t, 0)$ and $O(0, 0)$ are 4 points. Given that t only takes positive values calculate the value of t for which (i) the area of triangle AOC is 26 square units, (ii) the mid-point of AB is equidistant from O and C . (N85/P2/1)

80. The line $y - 2x - 8 = 0$ meets the curve $y^2 + 8x = 0$ at A and B . Find the co-ordinates of the midpoint of AB . (J86/P1/3)

81. Solutions to this question by accurate drawing will not be accepted. In the rectangle $ABCD$, A and B are the points $(4, 2)$ and $(2, 8)$ respectively. Given that the equation of AC is $y = x - 2$, find (i) the equation of BC , (ii) the co-ordinates of C , (iii) the co-ordinates of D , (iv) the area of the rectangle $ABCD$. (J86/P1/10)



82. Solutions to this question by accurate drawing will not be accepted. Two points have co-ordinates $A(1, 3)$ and $C(7, 7)$. Find the equation of the perpendicular bisector of AC . B is the point on the y -axis equidistant from A and C and $ABCD$ is a rhombus. Find the co-ordinates of B and of D . Show that the area of the rhombus is 52 square units and hence, or otherwise, calculate the perpendicular distance of A from BC . (N86/P1/15)

83. Write down the equation of the straight line having a gradient of $-t$ and passing through the point $(0, t)$. This line meets the line $x + t(y + 1) = 0$ in the point (X, Y) . Obtain expressions for X and Y in terms of t and hence evaluate $X + Y$. (N86/P2/8b)

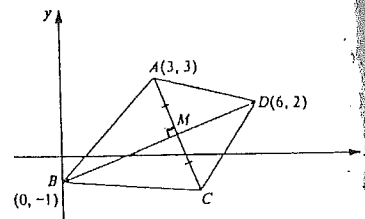
84. $ABCD$ is a parallelogram, lettered anticlockwise, such that A and C are the points $(-1, 5)$ and $(5, 1)$ respectively. Find the co-ordinates of the mid-point of AC . Given that BD is parallel to the line whose equation is $y + 5x = 2$, find the equation of BD . Given that BC is perpendicular to AC , find the equation of BC . Calculate (i) the co-ordinates of B , (ii) the co-ordinates of D , (iii) the area of $ABCD$. (J87/P1/15)

85. The line $y = 2x + 1$ meets the curve $y^2 - xy = 3$ at A and B . Calculate the co-ordinates of the mid-point of AB . (N87/P1/6)

86. Given the points $A(1, 8)$, $B(4, 7)$ and $O(0, 0)$ find (i) the equation of the line through A parallel to OB , (ii) the equation of the line through B perpendicular to AB , (iii) the co-ordinates of the point C in which these two lines intersect, (iv) the area of the triangle ABC . (N87/P1/16)

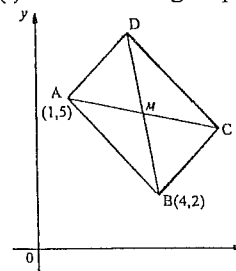
87. Three points have co-ordinates $A(3, 8)$, $B(-8, 4)$ and $C(-2, 0)$. Given that D is the mid-point of BC , calculate the length of AD . (J88/P1/1)

88. In the quadrilateral $ABCD$, the points A , B and D are at $(3, 3)$, $(0, -1)$ and $(6, 2)$ respectively. The line BD bisects the line AC at right angles at the point M . Find the equation of BD and of AC . Calculate (i) the co-ordinates of M , (ii) the co-ordinates of C , (iii) the area of the quadrilateral $ABCD$. (J88/P1/15)



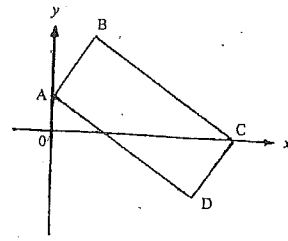
89. Given points $A(-2, 1)$, $B(2, -1)$ and $C(3, 3)$, find the equation of (i) the line through A parallel to BC , (ii) the perpendicular bisector of BC . (N88/P1/1)

90. $ABCD$ is a parallelogram whose diagonals meet at M . The co-ordinates of A and B are $(1, 5)$ and $(4, 2)$ respectively. Given that BD is parallel to $5x + y = 0$, and that AC is perpendicular to $5x - y = 0$, find the equation of BD and of AC . Calculate (i) the co-ordinates of M , (ii) the co-ordinates of C and of D . Prove that $ABCD$ is a rectangle. (N88/P1/14)



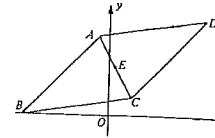
91. Find the equation of the line joining $A(-1, -9)$ to $B(6, 12)$. Another line passes through $C(7, -5)$ and meets AB at right angles at D . Find the equation of CD and calculate the co-ordinates of D . (J89/P1/1)

92. Solution to this question by accurate drawing will not be accepted. The diagram shows a parallelogram $ABCD$ with A and C on the co-ordinate axes. The equation of AB is $y = 2x + 1$ and the equation of BC is $2y + x = 12$. (i) Show that $ABCD$ is a rectangle. (ii) Find the co-ordinates of A , B , C and D . (iii) Find the area of $ABCD$. (J89/P1/15)



93. Three points have co-ordinates $A(-5, 6)$, $B(1, -4)$ and $C(3, 4)$. By calculation (i) show that the triangle ABC is isosceles, (ii) find the co-ordinates of the mid-point of the longest side. (N89/P1/3)

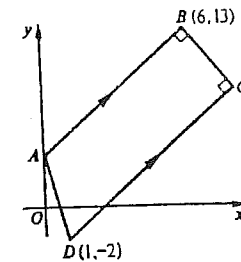
94. The points $A(-1, 10)$ and $C(3, 2)$ are opposite corners of a rhombus $ABCD$. The point B lies on the x -axis and E is the mid-point of AC . Calculate (i) the co-ordinates of the



points E , B and D . (ii) the area of the rhombus. (N89/P1/15)

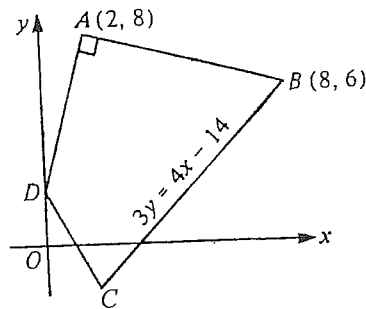
95. The line $3x + 4y = 15$ intersects the curve $2xy = 9$ at A and B . Find (i) the co-ordinates of A and of B , (ii) the distance AB . (J90/P1/1)

96. Solutions to this question by accurate drawing will not be accepted. The diagram shows a trapezium $ABCD$ in which AB is parallel to DC . The point A lies on the y -axis. Points B and D are $(6, 13)$ and $(1, -2)$ respectively. Angles ABC and BCD are 90° . Given that the equation of DC is $3y = 4x - 10$, find (i) the equation of AB , (ii) the equation of BC , (iii) the co-ordinates of A and of C , (iv) the area of the trapezium. (J90/P1/12)

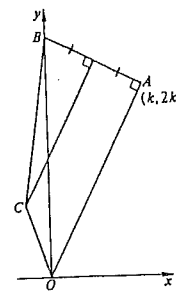


97. The line $y = 2x + 3$ intersects the curve $xy + 20 = 5y$ at A and B . Calculate the co-ordinates of A and of B . (N90/P1/1)

98. Solutions to this question by accurate drawing will not be accepted. The diagram shows a quadrilateral $ABCD$ in which A is $(2, 8)$ and B is $(8, 6)$. The point C lies on the perpendicular bisector of AB and the point D lies on the y -axis. The equation of BC is $3y = 4x - 14$ and angle $DAB = 90^\circ$. Find (i) the equation of AD , (ii) the co-ordinates of D , (iii) the equation of the perpendicular bisector of AB , (iv) the co-ordinates of C . Show that the area of triangle ADC is 10 unit^2 and find the area of the quadrilateral $ABCD$. (N90/P1/13)

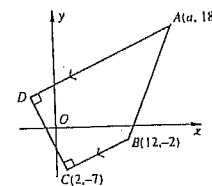


99. The diagram shows the quadrilateral $OABC$. The co-ordinates of A are $(k, 2k)$, where $k > 0$, and the length of OA is $\sqrt{80}$ units. (i) Calculate the value of k . AB is perpendicular to OA and B lies on the y -axis. (ii) Find the equation of AB and the co-ordinates of B . The point C lies on the line through O parallel to $y + 3x = 5$ and also on the perpendicular bisector of AB . (iii) Calculate the co-ordinates of C . Calculate the area of the quadrilateral $OABC$. (J91/P1/15)



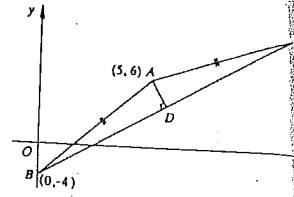
100. The line $y = 3x - 1$ intersects the curve $2x^2 + 2y^2 - x + y - 11 = 0$ at A and B . Calculate the co-ordinates of (i) A and B , (ii) the mid-point of AB . (N91/P1/1)

101. Solution to this question by accurate drawing will not be accepted. The diagram shows a trapezium in which AD is parallel to BC and angle $ADC = BCD = 90^\circ$. The points A , B and C are $(a, 18)$, $(12, -2)$ and $(2, -7)$ respectively. Given that $AB = 2BC$, find (i) the value of a , (ii) the equation of AD , (iii) the equation of CD , (iv) the co-ordinates of D , (v) the area of the trapezium. (N91/P1/15)



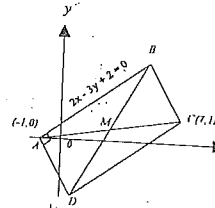
102. Calculate the gradient of the line joining the points $A(6, 7)$ and $B(-3, 1)$. Hence find the equation of the perpendicular bisector of AB . (J92/P1/1)

103. The solution of this question by accurate drawing will not be accepted. The diagram, which is not drawn to scale, shows an isosceles triangle ABC in which $AB = AC$. The co-ordinates of A and B are $(5, 6)$ and $(0, -4)$ respectively. Given that the gradient of BC is $\frac{3}{4}$ and that the perpendicular from A to BC meets BC at D , find (i) the equation of BC and of AD , (ii) the co-ordinates of D , (iii) the co-ordinates of C , (iv) the length of the perpendicular AD , (v) the area of triangle ABC . (J92/P1/14)



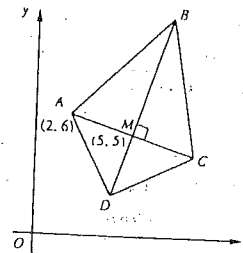
104. The straight line $2x + y = 2$ meets the curve $x^2 + xy + 3 = 0$ at the points A and B . Calculate the co-ordinates of the midpoint of AB . (N92/P1/1)
105. The perpendicular from $P(6, 0)$ to the straight line $4x + 3y + 1 = 0$ meets this line at Q . Find the equation of PQ and hence calculate the co-ordinates of Q . (N92/P1/2)

106. Solutions to this question by accurate drawing will not be accepted. The diagram shows a rectangle $ABCD$ whose diagonals meet at M . The co-ordinates of A and C are $(-1, 0)$ and $(7, 1)$ respectively, and the equation of AB is $2x - 3y + 2 = 0$. Find (i) the equation of AD and of CD , (ii) the co-ordinates of M , D and B , (iii) the area of the triangle BMC . (N92/P1/13)



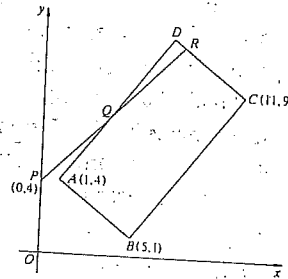
107. Two points A and B have co-ordinates $(-1, -2)$ and $(7, 4)$ respectively. Given that the perpendicular bisector of the line joining A and B meets the y -axis at C , calculate the co-ordinates of C . (J93/P1/9)

108. Solutions to this question by accurate drawing will not be accepted. In the quadrilateral $ABCD$ shown in the diagram, BD is the perpendicular bisector of AC . The mid-point of AC is M . The co-ordinates A and M are $(2, 6)$ and $(5, 5)$ respectively. AB is parallel to OM and ODC is a straight line. Find (i) the co-ordinates of C , (ii) the equation of AB , of BD and of CD , (iii) the co-ordinates of B and of D , (iv) the area of $ABCD$. (J93/P1/13)

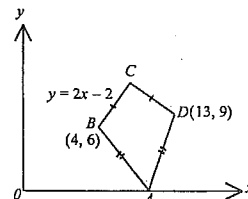


109. Find the equation of the perpendicular bisector of the line joining $A(-7, 2)$ and $B(-1, 10)$. This perpendicular bisector meets the x -axis at C . Calculate the length of CM , where M is the mid-point of AB . (N93/P1/2)

110. Solutions to this question by accurate drawing will not be accepted. $ABCD$ is a rectangle where A is $(1, 4)$, B is $(5, 1)$ and C is $(11, 9)$. The mid-point of AD is Q . The point P is $(0, 4)$ and (PQ) produced meets CD at R . Calculate (i) the coordinates of D and of Q , (ii) the equation of PR and of CD , (iii) the coordinates of R , (iv) the length of QD and of DR , (v) the area of triangle QDR . (N93/P1/13)

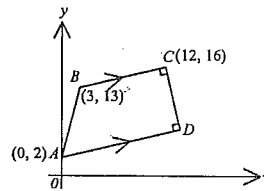


111. The solution to this question by accurate drawing will not be accepted. The diagram shows a kite $ABCD$ with $AB = AD$ and $CB = CD$. The point A lies on the x -axis, the point B is $(4, 6)$, the point D is $(13, 9)$ and the equation of BC is $y = 2x - 2$. Find (i) the gradient of BD and hence of AC , (ii) the equation of AC , (iii) the coordinates of A and of C , (iv) the length of BD and of AC , (v) the area of the kite $ABCD$. (J94/P1/10)



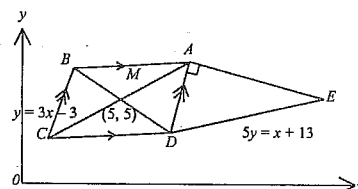
112. Three points have coordinates $A(1, 2)$, $B(9, 6)$ and $C(3, 8)$. Find the equation of the perpendicular bisector of AB and show that it passes through C . Hence, or otherwise, find the area of triangle ABC . (N94/P1/2)

113. Solutions of this question by accurate drawing will not be accepted. The diagram, which is not drawn to scale, shows a trapezium $ABCD$ in which BC is parallel to AD and CD is perpendicular to both BC and AD . The coordinates of A , B and C are $(0, 2)$, $(3, 13)$ and $(12, 16)$ respectively. Find (i) the equation of AD and of CD , (ii) the coordinates of D . The line AB produced meets the line DC produced at E . Find (iii) the coordinates of E , (iv) the ratio $AE : BE$, (v) the ratio of the area of the triangle BEC to the area of the trapezium $ABCD$. (N94/P1/13)



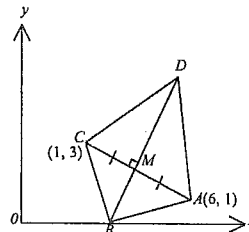
114. Calculate the distance of the point $A(5, 8)$ from M , the mid-point of the line joining the points $B(-1, 10)$ and $C(3, 2)$. Show that AM is perpendicular to BC . Calculate the area of triangle ABC . (J95/P1/4)

115. Solutions to this question by accurate drawing will not be accepted. The diagram shows a trapezium $ABCE$ consisting of a parallelogram $ABCD$ and a triangle ADE , where angle $DAE = 90^\circ$. The equation of the line CDE is $5y = x + 13$ and the equation of CB is $y = 3x - 3$. Calculate the coordinates of C . Given also that the diagonals of the parallelogram intersect at $M(5, 5)$, calculate the coordinates of A , B , D and E . (J95/P1/16)



116. Find the equation of the line which is parallel to $3y = 4x + 5$ and which passes through the mid-point of the line joining $(-2, 3)$ and $(5, 9)$. (N95/P1/1)

117. The diagram shows a quadrilateral $ABCD$ where A is $(6, 1)$, B is on the x -axis and C is $(1, 3)$. The diagonal BD bisects AC at right angles at M and $BD = \frac{7}{2}BM$. Find



- the equation of BD ,
- the x -coordinate of B ,
- the coordinates of D ,
- the area of the quadrilateral $ABCD$.

By considering the area of triangle ABD , or otherwise, find the perpendicular distance from D to BA extended. (N95/P1/15)

118. Three points are $O(0, 0)$, $A(4, 2)$ and $B(1, 2)$. Find the equation of the line through B which is parallel to OA . C is the point on this line whose x -coordinate is $-\frac{11}{5}$. Find the y -coordinate of C and show that $OB = OC$. (J96/P1/1)

119. A triangle has vertices $A(0, 2)$, $B(3, 7)$ and $C(0, 6)$. Given that $ABCD$ is a parallelogram, find
- the coordinates of D ,
 - the area of the parallelogram $ABCD$. (J96/P1/6)

120. The straight lines $y = ax + 9$, where a is a constant, and $y = \frac{1}{2}x - 1$ are perpendicular. State the value of a and hence find the coordinates of the point of intersection of the lines. (N96/P1/1)

121. The points A , B and C have coordinates $(-2, 1)$, $(3, 11)$ and $(-1, 8)$ respectively. The line from C which is perpendicular to AB meets AB at the point N .

- Find the equation of AB and of CN .
- Calculate the coordinates of N . (J97/P1/2)

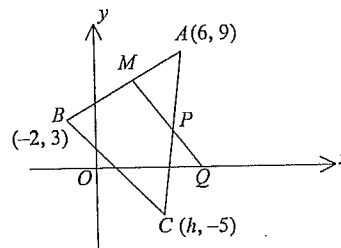
122. Solutions to this question by accurate drawing will not be accepted.

The diagram shows a triangle ABC , where A is $(6, 9)$, B is $(-2, 3)$ and C is $(h, -5)$. Given that $AB = BC$, and that h is positive,

- find the value of h ,
- show that angle $ABC = 90^\circ$.

The midpoint of AB is M . The line through M , parallel to BC , meets AC at the point P and the x -axis at the point Q . Find

- the coordinates of M , P and Q ,
- the ratio $MP : PQ$.



(J97/P1/14)

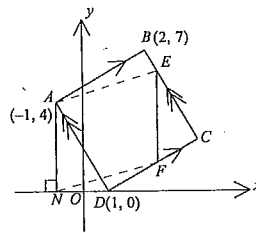
123. A line drawn through the point $A(4, 6)$, parallel to the line $2y = x - 2$, meets the y -axis at the point B .

(i) Calculate the coordinates of B .

A line drawn through A , perpendicular to AB , meets the line $2y = x - 2$ at the point C .

(ii) Calculate the coordinates of C . (N97/P1/2)

124. Solutions to this question by accurate drawing will not be accepted. The points $A(-1, 4)$, $B(2, 7)$, C and $D(1, 0)$ are the four vertices of a parallelogram. The point E lies on BC such that $BE = \frac{1}{3}BC$. Lines are drawn, parallel to the y -axis, from A to meet the x -axis at N and from E to meet CD at F .

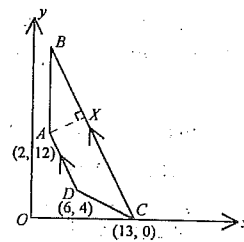


(i) Calculate the coordinates of C and of E .

(ii) Find the equation of DC and calculate the coordinates of F .

(iii) Explain why $AEFN$ is a parallelogram and calculate its area. (N97/P1/15)

125. The figure shows a trapezium $ABCD$ in which AD is parallel to BC and AB is parallel to the y -axis. The coordinates of A , D and C are $(2, 12)$, $(6, 4)$ and $(13, 0)$ respectively. The point X lies on BC such that angle $BXA = 90^\circ$.



(i) Find the equation of BC and of AX .

(ii) Deduce the coordinates of B and of X .

(iii) Determine the ratio $BC : AD$ in the form $n : 1$.

(iv) Find the length of AX and deduce the area of the trapezium $ABCD$. (J98/P1/11)

126. The line $2y + x = 5$ intersects the curve $y^2 + xy = 6$ at the points A and B . Find

(i) the coordinates of A and B ,

(ii) the distance AB . (N98/P1/1)

127. Solutions to this question by accurate drawing will not be accepted.

The diagram shows a parallelogram $ABCD$ in which A is $(8, 2)$ and B is $(2, 6)$. The equation of BC is $2y = x + 10$ and X is the point on BC such that AX is perpendicular to BC . Find

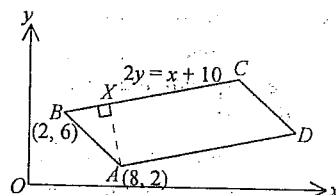
(i) the equation of AX ,

(ii) the coordinates of X .

Given also that $BC = 5BX$, find

(iii) the coordinates of C and of D ,

(iv) the area of the parallelogram $ABCD$. (N98/P1/11)



128. A is the point $(2, 5)$ and the line joining the points A and B has a gradient of $\frac{1}{3}$. The perpendicular bisector of AB passes through the point $(4, 9)$. Find

(a) the equation of AB ,

(b) the coordinates of B .

(J99/P1/2)

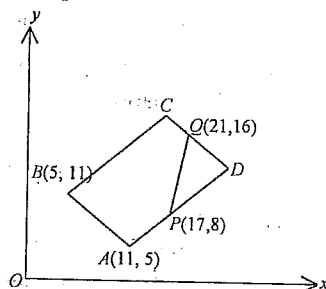
129. Solutions to this question by accurate drawing will not be accepted.

In the diagram the points $A(11, 5)$, $B(5, 11)$, C and D are the vertices of a parallelogram. The points $P(17, 8)$ and $Q(21, 16)$ lie on AD and CD respectively.

(a) Find the equation of AD and of CD .

(b) Find the ratio $DQ : QC$.

(c) Show that triangle PDQ is isosceles and determine its area.



(J99/P1/15)

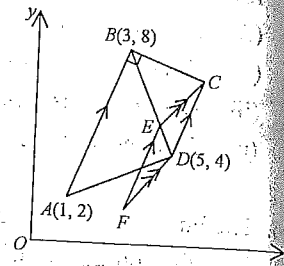
130. Find the equation of the perpendicular bisector of the line joining the point $(-5, 4)$ to the point $(9, -3)$.

(N99/P1/1)

131. The point $P(x, y)$ lies on the line $7y = x + 23$ and is 5 units from the point $(2, 0)$. Calculate the coordinates of the two possible positions of P . (N99/P1/9)

132. Solutions to this question by accurate drawing will not be accepted.

The diagram shows the trapezium $ABCD$ in which A is the point $(1, 2)$, B is $(3, 8)$, D is $(5, 4)$, angle $ABC = 90^\circ$ and AB is parallel to DC .



- (i) Find the coordinates of C .

The point E lies on BD and is such that the area of $\triangle CDE$ is $\frac{1}{4}$ of the area of $\triangle CDB$.

- (ii) Find the coordinates of E .

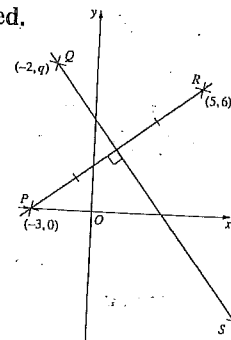
The point F is such that $CDFE$ is a parallelogram.

- (iii) Find the coordinates of F and the area of the parallelogram $CDFE$. (N99/P1/15)

133. Find the coordinates of the points of intersection of the line $2y = 3x - 3$ with the curve $xy = 3$. (J2000/P1/1)

134. Solutions to this question by accurate drawing will not be accepted.

The points $P(-3, 0)$, $Q(-2, q)$, $R(5, 6)$ and S are such that the perpendicular bisector of PR is QS , as shown in the diagram.



- (i) Find the value of q .

- (ii) Show that the area of triangle PQR is 25 units².

- (iii) Find the coordinates of S , given that the area of the quadrilateral $PQRS$ is 75 units².

- (iv) Find the length of the perimeter of $PQRS$. (J2000/P1/10)

135. The points A and B have coordinates $(2, 2)$ and $(10, 8)$ respectively. Find the equation of the perpendicular bisector of AB . (N2000/P1/2)

136. The lines $y - 3x = 1$ and $y + 2x = 6$ meet at the point A . Find

- (i) the equation of the line through A which passes through the point $B(3, 8)$,

- (ii) the equation of the line through A which is perpendicular to AB . (J01/P1/2)

137. Solutions to this question by accurate drawing will not be accepted.

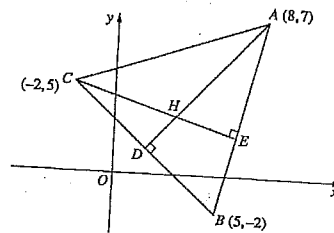
The vertices of the triangle ABC have coordinates $(8, 7)$, $(5, -2)$ and $(-2, 5)$, as shown in the diagram.

AD and CE are perpendicular to BC and AB respectively, and AD and CE meet at the point H . Find

- (i) the coordinates of D and of H ,

- (ii) the ratio $AD : HD$,

- (iii) the area of triangle ABC and of triangle HBC . (J01/P1/13)



138. Points A , B and C have coordinates $(1, 2)$, $(-2, 6)$ and $(9, 8)$ respectively.

- (i) Show that triangle ABC is right-angled.

- (ii) Calculate the area of triangle ABC . (N01/P1/2)

139. The line joining $A(5, 11)$ and $B(0, 1)$ meets the x -axis at C .

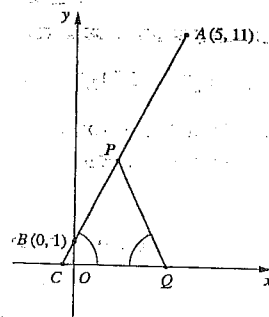
The point P lies on AC such that $AP : PB = 3 : 2$.

- (i) Find the coordinates of P .

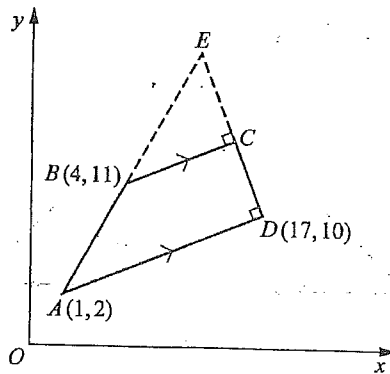
A line through P meets the x -axis at Q and angle $PCQ =$ angle PQC . Find

- (ii) the equation of PQ ,

- (ii) the coordinates of Q . (N01/P1/3)



140. Solutions to this question by accurate drawing will not be accepted.



The diagram, which is not drawn to scale, shows a trapezium $ABCD$ in which BC is parallel to AD . The side AD is perpendicular to DC . Point A is $(1, 2)$, B is $(4, 11)$ and D is $(17, 10)$. Find

(i) the coordinates of C ,

The lines AB and DC are extended to meet at E . Find

(ii) the coordinates of E ,

(iii) the ratio of the area of triangle EBC to the area of trapezium $ABCD$. (J2002/P1/12OR)

141. The line $2y = 3x - 6$ intersects the curve $xy = 12$ at the points P and Q . Find the equation of the perpendicular bisector of PQ . (N2002/P1/9)

TOPIC 8 LINEAR GRAPHS I

1. $x + y = 3$
 - (i) $(-2, 5)$
 - (ii) 12
2. (i) $(3\frac{1}{2}, 4\frac{1}{2})$
(ii) $\frac{7}{3}$
(iii) $(5, 8)$
3. $5x + 4y + 26 = 0; 4x - 5y - 12 = 0;$
 $(3, 0); \sqrt{41}$
4. $(7, 10); 4x - 3y + 2 = 0$
 $x - y + 2 = 0, x + y = 0$
5. $x - 4y + 9 = 0;$
 $3x + 2y - 15 = 0; (3, 3)$
6. $PA = \sqrt{h^2 + k^2 + 2h + 1};$
 $PB = \sqrt{h^2 + k^2 - 2h - 2k + 2};$
(i) $4h + 2k - 1 = 0$
(ii) $3h^2 + 2k^2 - 10h - 8k + 7 = 0;$
 $(-0.25, 1)$
7. $2x + 5y = 14, 10x + 11y = 28;$
 $5, 10; (1, 1), (-2, 5)$
8. $(0, 4), (3, 0); 2x + y = 1$
9. $x + m(y - 2) = 0; (\frac{2m(m+1)}{m^2+1}, \frac{2m(m-1)}{m^2+1})$
10. $7x - y = 0, x - y + 2 = 0,$
 $x + 2y - 5 = 0$
11. 15
12. (a) $(2, 3)$
(b) $8 : 5$
(c) $5x - 3y - 27 = 0$
13. $3x + 2y = 6a, 4$
14. AP is $5x + y = 16,$
 BQ is $5x + 3y = 20$
 - (ii) 15 sq. units
74. $x - 2y + 5 = 0; 10$
75. $16\sqrt{2}$ or 22.6
76. (i) $2y = x + 5$
(ii) $y + 2x = 10$
(iii) $(3, 4)$
77. (i) $2y + x = 11$
(ii) $(1, 5)$
(iii) $(2, 7)$
78. (i) $\frac{1}{2}$ (ii) $(5, 7)$
79. (i) 3 (ii) 2
80. $(-5, -2)$
81. (i) $3y - x = 22$
(ii) $(14, 12)$
(iii) $(16, 6)$
(iv) 80 units²
82. $2y + 3x - 22 = 0$
 $(0, 11), (8, -1), 6.45$
83. $y + tx = t; X = \frac{1}{t-1}, Y = \frac{t}{1-t}; 0$
84. $(2, 3), 5x + y = 13, 3x - 2y = 13$
(i) $(3, -2)$
(ii) $(1, 8)$
(iii) 26 units²
85. $(-\frac{3}{4}, -\frac{1}{2})$
86. (i) $7x - 4y = -25$
(ii) $3x - y = 5$
(iii) $(9, 22)$
(iv) 25 sq. units
87. 10 units
88. $x - 2y = 2, 2x + y = 9;$
(i) $(4, 1)$
(ii) $(5, -1)$
(iii) 15 units²

89. (i) $y - 4x = 9$
(ii) $8y + 2x = 13$
90. $5x + y = 22, x + 5y = 26;$
(i) $(3\frac{1}{2}, 4\frac{1}{2})$
(ii) $(6, 4)(3, 7)$
91. $3x - y = 6, x + 3y = -8, (1, -3)$
92. (i) $A(0, 1), B(2, 5), C(12, 0), D(10, -4);$
(ii) 50 sq. units
93. (i) $AC = BC$
(ii) $(-2, 1)$

94. (i) $E = (1, 6), B = (-11, 0),$
 $D = (13, 12);$
(ii) 120 units²
95. (i) $(2, 2\frac{1}{4}), (3, 1\frac{1}{2})$
(ii) $1\frac{1}{4}$
96. (i) $3y - 4x = 15$
(ii) $4y + 3x = 70$
(iii) $A = (0, 5), C = (10, 10)$
(iv) $62\frac{1}{2}$ units²
97. $(2\frac{1}{2}, 8), (1, 5)$
98. (i) $y = 3x + 2$
(ii) $(0, 2)$
(iii) $y = 3x - 8$
(iv) $(2, -2); 40$ units²
99. (i) 4
(ii) $2y = 20 - x, (0, 10)$
(iii) $(-1, 3); 25$ units²
100. (i) $(-\frac{1}{2}, -2\frac{1}{2}), (1, 2)$
(ii) $(\frac{1}{4}, -\frac{1}{4})$
101. (i) 22
(ii) $x - 2y = -14$
(iii) $2x + y = -3$
(iv) $(-4, 5)$
(v) 270 units²
102. $\frac{2}{3}, 6x + 4y = 25$
103. (i) $3x - 4y = 16, 4x + 3y = 38$
(ii) $(8, 2)$
(iii) $(16, 8)$
(iv) 5
(v) 50 units²
104. $(1, 0)$
105. $3x - 4y = 18, (2, -3)$
106. (i) $3x + 2y + 3 = 0, 2x - 3y - 11 = 0$
(ii) $(3, \frac{1}{2}), (1, -3), (5, 4)$
(iii) $6\frac{1}{2}$ units²
107. $(0, 5)$
108. (i) $(8, 4)$
(ii) $y = x + 4, y = 3x - 10, y = \frac{1}{2}x$
(iii) $(7, 11)(4, 2)$
(iv) 30 units²
109. $3x + 4y - 12 = 0; CM = 10$

- CR is $y = 2$
15. (i) $(5, 9); \sqrt{26}$
(ii) $(\frac{4h}{h+2}, \frac{8}{h+2})$
16. (i) distance = 1
(ii) $\frac{1}{2}(bx + ay - ab)$
17. (i) $P(\frac{4m-7}{m}, 0); Q(3m+8, 0);$
 $R(0, 7-4m); S(0, \frac{3m+8}{m});$
 $12m + 11 - \frac{56}{m}; \frac{56}{m} - 11, -12m$
18. $(7, 5), (-5, -3)$
19. 1.4, 8.6
20. (a) $yt + x = t^2$
(b) $(\frac{t^2}{1+t^2}, \frac{t^2}{1+t^2})$
(c) $\frac{t^2}{2(1+t^2)}$
21. $(-\frac{3}{5}, \frac{3}{10})$
22. (a) $\frac{1}{2}, 8\frac{1}{2}, -3$
(b) 25 sq. units
23. $3y = 4x - 2, \frac{5}{6}$
24. $2y = x + 6$
25. $y + 2x = 4$
26. $(\frac{3+\alpha}{2}, \frac{10+\beta}{2})$
27. (i) $\sqrt{52}$
(ii) $y = 2x + 11$
28. $(8.5, 4.5); (19, 8)$
29. $2y + x = 14; 6 : 1$
30. $2y = x + 13$
31. (a) 8 (b) 5
32. $(3, 6)$
33. (i) $5x - 4y + 23 = 0$
(ii) $4x + 5y - 39 = 0$
34. (i) $(7, -1), (-1, -11)$
(ii) $(5, -1) \rightarrow (3, -6)$
35. $y = 2x + 5; 5.59$
36. $y = m(x - m), m = 2$ or 3
37. $-2, (5, -1)$
39. $(4, 6)$
40. $(6, 7)$
41. $3y + x = 15$
42. 6
43. 8, -12
44. $-\frac{1}{2} \leq x \leq 2$

45. $(3.6, 3.2)$
46. $8\frac{1}{3}$ sq. units
47. 1.8 or -1.4
48. $x + 2y - 10 = 0$
49. (i) $x - y + 3 = 0$
(ii) $(2\frac{1}{2}, 5\frac{1}{2})$
50. $(2\frac{1}{2}, 4\frac{1}{2})$
51. $2 + t; 6$
52. (i) 7
(ii) $\pm\sqrt{15}$
53. 3, 4
54. (i) $2x + y = 5t$
(ii) $\pm\frac{4}{t}$

55. $2y = x + 10; 8, 9$
56. $2y + x = 5, y = 7, (-9, 7)$
57. $(10, 0), (0, 5); 25$ sq. units
58. (i) $y = 3x - 6$
(ii) $(2, 0)$
59. $k = h + 1, \sqrt{h^2 + (k - 2)^2} =$
 $h = 4, k = 5$ and $h = -3$
 $k = -2$
60. $(2\frac{10}{13}, -1\frac{11}{13})$
61. $2\sqrt{5}, 4\sqrt{5}$
62. (i) 25 sq. units
(ii) $5\sqrt{5}, 2\sqrt{5}$ units
63. (i) $(6, -3)$
(ii) $4y + 5x = 18$
64. 22.6 units
65. (i) -2
(ii) $y + 2x = 7$
(iii) $2y + 3x = 26$
66. $(4.2, 5.2)$
67. (i) $(6, 7)$
(ii) 40 units²
68. (i) $(1, 2)$
(ii) 1 : 2
69. $x = 1$ or $\frac{1}{5}, y = 9$ or $7\frac{2}{5}$
70. (i) $(5, 11)$
(ii) $y = x + 6$
71. $y + 3x = 7; (3, -2)$
72. $(3, 5); 30$
73. (i) $y = 3x + 9; y + 2x =$

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110. (i) $D = (7, 12), Q = (4, 8)$
(ii) $y - x = 4; 3x + 4y = 69$
(iii) $(7\frac{4}{7}, 11\frac{4}{7})$
(iv) $QD = 5, DR = \frac{5}{7}$
(v) $1\frac{11}{14}$ units²
111. (i) -3
(ii) $3x + y - 33 = 0$
(iii) $A = (11, 0), C = (7, 12)$
(iv) $BD = 3\sqrt{10}$ units
 $AC = 4\sqrt{10}$ units
(v) 60 units²
112. $2x + y - 14 = 0, 20$ units²
113. (i) $3y = x + 6, y = 52 - 3x$
(ii) $(15, 7)$
(iii) $(7\frac{1}{2}, 29\frac{1}{2})$
(iv) $5 : 3$
(v) $9 : 16$
114. 4.47 units, 20 units²
115. $C = (2, 3), A = (8, 7), B = (3, 6),$
 $D = (7, 4), E = (13\frac{1}{4}, 5\frac{1}{4})$
116. $3y = 4x + 12$
117. (i) $10x - 4y - 27 = 0$
(ii) $(2\frac{7}{10}, 0)$
(iii) $(5\frac{1}{2}, 7)$
(iv) 20.3 units
 5.89 units
118. $2y - x = 3, \frac{2}{5}$
119. (a) $(-3, 1)$ (b) 12 units²
120. $a = -2, (4, 1)$
121. (i) $y = 2x + 5; 2y = 15 - x$
(ii) $N = (1, 7)$
122. (i) $h = 4$
(ii) Gradient of $AB \times$ Gradient of $BC = -1$
 $\therefore AB$ is perpendicular to BC or $\angle ABC = 90^\circ$
(iii) $(2, 6); (5, 2)$
 $Q = (6.5, 0)$
(iv) $2 : 1$
123. (i) $B = (0, 4)$ (ii) $C = (6, 2)$
124. (i) $c = (4, 3); E(2\frac{2}{3}, 5\frac{2}{3})$
- (ii) $y = x - 1; F = (2\frac{2}{3}, 1\frac{2}{3})$
(iii) $14\frac{2}{3}$ units²
125. (i) $y = 26 - 2x; y = \frac{1}{2}x + 11$
(ii) $B = (2, 22); X = (6, 14)$
(iii) $2\frac{3}{4} : 1$
(iv) 4.47 units; 75 units²
126. (i) A and B are $(-1, 3)$ and $(1, 2)$
(ii) $AB = \sqrt{5}$
127. (i) $y + 2x = 18$
(ii) $X = (5\frac{1}{5}, 7\frac{3}{5})$
(iii) $C = (18, 14)$
 $D = (24, 10)$
(iv) 112 units²
128. (a) $3y = x + 13$
(b) $B = (8, 7)$
129. (a) $2y = x - 1; y = 37 - x$
(b) $DQ : QC = 2 : 1$
(c) 24 units²
130. $4x - 2y - 7 = 0$
131. $(-2, 3), (5, 4)$
132. (i) $(6, 7)$
(ii) $(4\frac{1}{2}, 5)$
(iii) $(3.5, 2), 2.5$ units²
133. $x = 2, y = 1\frac{1}{2}; x = -1, y = -3$
134. (i) $q = 7$
(ii) Area of $PQR = 25$ units²
(iii) $S = (7, -5)$
(iv) 36.5 units
135. $4x + 3y = 39$
136. (i) $y = 2x + 2$
(ii) $2y = 9 - x$
137. (i) $D = (2, 1)$
 $H = (4, 3)$
(ii) $AD : HD = 3 : 1$
(iii) Area of $\triangle ABC = 42$ units²
Area of $\triangle HBC = 14$ units²
138. (i) $AB^2 + AC^2 = BC^2$
 \therefore The triangle is right angled at A .
(ii) 25 units²
139. (i) $p = (2, 5)$
(ii) $y = 9 - 2x$

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- (iii) $Q = (4\frac{1}{2}, 0)$
140. (i) $C = (14, 16)$
(ii) $E = (9, 26)$
(iii) $25 : 39$
141. $4x + 6y + 5 = 0$