Old Past Papers - Straight Line
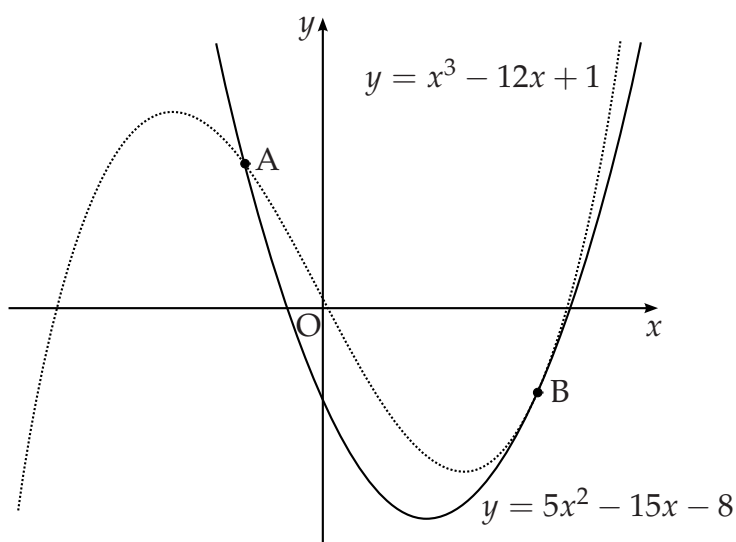
[SQA] 1. The diagram shows a sketch of the graphs of $y = 5x^2 - 15x - 8$ and $y = x^3 - 12x + 1$.

The two curves intersect at A and touch at B, i.e. at B the curves have a common tangent.

(*a*) (i) Find the x-coordinates of the point of the curves where the gradients are equal. **4**

(ii) By considering the corresponding y-coordinates, or otherwise, distinguish geometrically between the two cases found in part (i). **1**

(*b*) The point A is $(-1, 12)$ and B is $(3, -8)$.

Find the area enclosed between the two curves. **5**

[SQA] 2. Triangle ABC has vertices $A(2, 2)$, $B(12, 2)$ and $C(8, 6)$.

(*a*) Write down the equation of l_1, the perpendicular bisector of AB. **1**

(*b*) Find the equation of l_2, the perpendicular bisector of AC. **4**

(*c*) Find the point of intersection of lines l_1 and l_2. **1**

(*d*) Hence find the equation of the circle passing through A, B and C. **2**
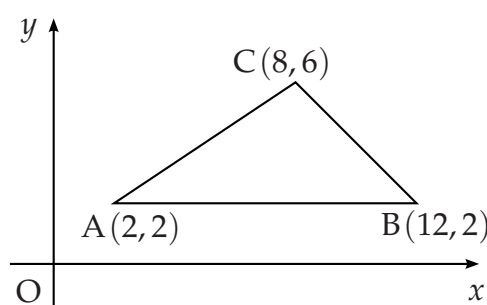
[SQA] 3. (a) Find the equation of AB, the perpendicular bisector of the line joing the points $P(-3, 1)$ and $Q(1, 9)$.

4

(b) C is the centre of a circle passing through P and Q. Given that QC is parallel to the y-axis, determine the equation of the circle.

3

(c) The tangents at P and Q intersect at T.

Write down

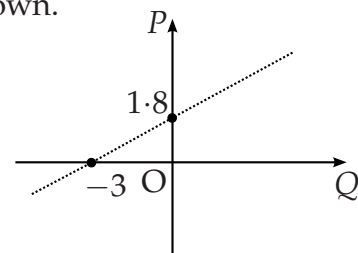(i) the equation of the tangent at Q

(ii) the coordinates of T.
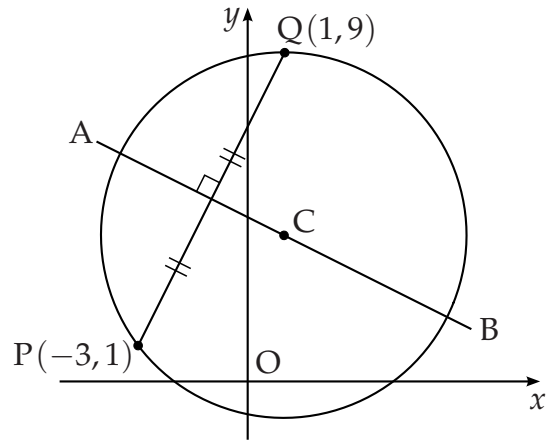
2

[SQA] 4. The results of an experiment give rise to the graph shown.

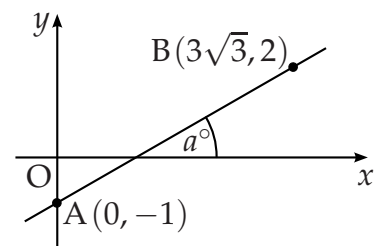(a) Write down the equation of the line in terms of P and Q.

2

It is given that $P = \log_e p$ and $Q = \log_e q$.

(b) Show that p and q satisfy a relationship of the form $p = aq^b$, stating the values of a and b.

4

[SQA] 5. Find the size of the angle a° that the line joining the points $A(0, -1)$ and $B(3\sqrt{3}, 2)$ makes with the positive direction of the x-axis.
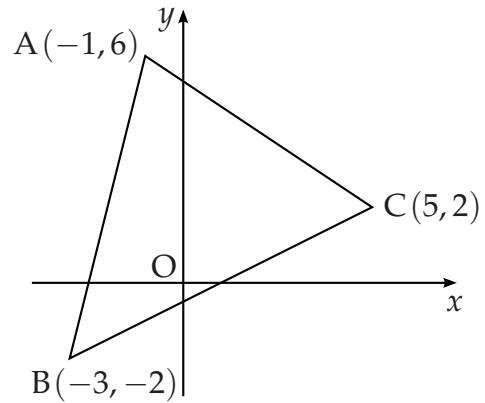
3

[SQA] 6. Find the equation of the straight line which is parallel to the line with equation $2x + 3y = 5$ and which passes through the point $(2, -1)$.

3

[SQA] 7. Triangle ABC has vertices $A(-1,6)$, $B(-3,-2)$ and $C(5,2)$.

Find

    (*a*) the equation of the line p, the median from C of triangle ABC. **3**

    (*b*) the equation of the line q, the perpendicular bisector of BC. **4**

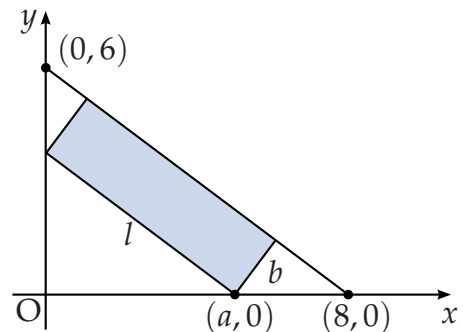   (*c*) the coordinates of the point of intersection of the lines p and q. **1**

[SQA] 8. The shaded rectangle on this map represents the planned extension to the village hall. It is hoped to provide the largest possible area for the extension.
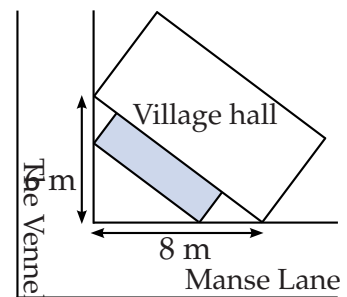
The coordinate diagram represents the right angled triangle of ground behind the hall. The extension has length l metres and breadth b metres, as shown. One corner of the extension is at the point $(a,0)$.

    (*a*) (i) Show that $l = \frac{5}{4}a$.

         (ii) Express b in terms of a and hence deduce that the area, A m^2, of the extension is given by $A = \frac{3}{4}a(8-a)$. **3**

    (*b*) Find the value of a which produces the largest area of the extension. **4**

[SQA] 9. Find the coordinates of the point on the curve $y = 2x^2 - 7x + 10$ where the tangent to the curve makes an angle of $45°$ with the positive direction of the x-axis. **4**

[SQA] 10. Show that the equation $(1 - 2k)x^2 - 5kx - 2k = 0$ has real roots for all integer values of k.

5

[END OF QUESTIONS]

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