ANALYTICAL GEOMETRY; SUMMARY & EXERCISES*

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1 Analytical Geometry; Summary and Exercises

- Figures can be represented on the Cartesian plane
- The formula for finding the distance between two points is:

Distance =
$$\sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$$
 (1)

• The formula for finding the gradient of a line is:

Gradient =
$$\frac{y_2 - y_1}{x_2 - x_1}$$
 (2)

• The formula for finding the midpoint between two points is:

$$S\left(\frac{x_1 + x_2}{2}; \frac{y_1 + y_2}{2}\right) \tag{3}$$

• If two lines are parallel then they will have the same gradient, i.e. $m_{AB} = m_{CD}$. If two lines are perpendicular than we have: $-\frac{1}{m_{AB}} = m_{CD}$

2 End of Chapter exercises

- 1. Represent the following figures on the Cartesian plane:
 - a. Triangle DEF with D(1;2), E(3;2) and F(2;4)
 - b. Quadrilateral GHIJ with G(2;-1), H(0;2), I(-2;-2) and J(1;-3)
 - c. Quadrilateral MNOP with M(1;1), N(-1;3), O(-2;3) and P(-4;1)
 - d. Quadrilateral WXYZ with W(1;-2), X(-1;-3), Y(2;-4) and Z(3;-2)

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^{*}Version 1.1: Jul 30, 2011 6:35 am -0500

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¹ http://www.fhsst.org/lgv

2. In the diagram given the vertices of a quadrilateral are F(2;0), G(1;5), H(3;7) and I(7;2).

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Figure 1

- a. What are the lengths of the opposite sides of FGHI?
- b. Are the opposite sides of FGHI parallel?
- c. Do the diagonals of FGHI bisect each other?
- d. Can you state what type of quadrilateral FGHI is? Give reasons for your answer.

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- 3. A quadrialteral ABCD with vertices A(3;2), B(1;7), C(4;5) and D(1;3) is given.
 - a. Draw the quadrilateral.
 - b. Find the lengths of the sides of the quadrilateral.

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- 4. ABCD is a quadrilateral with verticies A(0;3), B(4;3), C(5;-1) and D(-1;-1).
 - a. Show that:
 - i. AD = BC
 - ii. ABODC
 - b. What name would you give to ABCD?
 - c. Show that the diagonals AC and BD do not bisect each other.

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- 5. P, Q, R and S are the points (-2;0), (2;3), (5;3), (-3;-3) respectively.
 - a. Show that:
 - i. SR = 2PQ
 - ii. SROPQ
 - b. Calculate:
 - i. PS
 - ii. QR
 - c. What kind of a quadrilateral is PQRS? Give reasons for your answers.

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6. EFGH is a parallelogram with verticies E(-1;2), F(-2;-1) and G(2;0). Find the co-ordinates of H by using the fact that the diagonals of a parallelogram bisect each other.

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- 7. PQRS is a quadrilateral with points P(0; \hat{a}^3); Q(\hat{a}^2 ;5); R(3;2) and S(3; \hat{a} C"2) in the Cartesian plane.
 - a. Find the length of QR.
 - b. Find the gradient of PS.
 - c. Find the midpoint of PR.

²http://www.fhsst.org/liZ

³http://www.fhsst.org/liB

⁴http://www.fhsst.org/lac

⁵http://www.fhsst.org/lax

 $^{^6 \, \}mathrm{http://www.fhsst.org/laa}$

d. Is PQRS a parallelogram? Give reasons for your answer.

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8. A(â€"2;3) and B(2;6) are points in the Cartesian plane. C(a;b) is the midpoint of AB. Find the values of a and b.

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- 9. Consider: Triangle ABC with vertices A (1; 3) B (4; 1) and C (6; 4):
 - a. Sketch triangle ABC on the Cartesian plane.
 - b. Show that ABC is an isoceles triangle.
 - c. Determine the co-ordinates of M, the midpoint of AC.
 - d. Determine the gradient of AB.
 - e. Show that the following points are collinear: A, B and D(7;-1)

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10. In the diagram, A is the point (-6;1) and B is the point (0;3)

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Figure 2

- a. Find the equation of line AB
- b. Calculate the length of AB
- c. $A\hat{a} \in \mathbb{T}^{\mathbb{N}}$ is the image of A and $B\hat{a} \in \mathbb{T}^{\mathbb{N}}$ is the image of B. Both these images are obtain by applying the transformation: $(x;y)\dagger'(x-4;y-1)$. Give the coordinates of both $A\hat{a} \in \mathbb{T}^{\mathbb{N}}$ and $B\hat{a} \in \mathbb{T}^{\mathbb{N}}$
- d. Find the equation of A'B'
- e. Calculate the length of A'B'
- f. Can you state with certainty that AA'B'B is a parallelogram? Justify your answer.

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⁷http://www.fhsst.org/laY

⁸ http://www.fhsst.org/lag

 $^{^{9} \}rm http://www.fhsst.org/la4 \\ ^{10} \rm http://www.fhsst.org/l4o$