MATHEMATICS HG PAPER 2

ANALYTICAL GEOMETRY

QUESTION 1

1.1.1 Various methods can be used in Analytical Geometry and it is important that candidates indicate exactly what they are doing by using the letters, sides, etc. on the diagram e.g. $m_{AD} = m_{DC}$.

1.1.2 Candidates did not know the meaning of the term " inclination angle ".
It is important to remember that a negative gradient implies that $\tan\theta < 0$ and gives an obtuse angle. It is important that candidates keep in mind that their answers must be relative to the problem. Triangles cannot have negative or reflex angles, but equations can.

1.2.2 It appeared that the candidates were not aware of what they were doing when substituting one equation into another. Candidates must think graphically as if determining the points of intersection of two graphs.

QUESTION 2

2.1.3 The geometric meaning of a perpendicular bisector must always be kept in mind.
$CP^2 = CE^2$ renders the perpendicular bisector of CE.

2.2 The locus concept implies that a geometric fact must be interpreted algebraically.
It is therefore important to make a sketch. Too many candidates thought that any locus problem implies that the lengths of two lines are equal, e.g. $MP^2 = PN^2$, instead of using Pythagoras, $MP^2 + NP^2 = MN^2$.

TRIGONOMETRY

QUESTION 3

3.1 Many candidates did not know that $\cos 30^0 . \sec 30^0 = 1$ without using ratios.

3.2.1 Common error: $\operatorname{cosec}^2(180^0 + B) = -\operatorname{cosec}^2 B$
Hint: Write $\operatorname{cosec}^2(180^0 + B)$ as $[\operatorname{cosec}(180^0 + B)]^2 = [-\operatorname{cosec} B]^2$

The use of sketches to determine trigonometric ratios needs to be emphasized.
Candidates lost marks in the absence of a sketch.

3.3 When proving an identity candidates must work on one side of the identity only, that means LHS or RHS. They must not start off with the whole identity as such. They must end off with LHS = RHS.

The candidates must show intermediate steps in a proof. They must not skip steps and jump to the last conclusion. They must carefully explain how they got there.

The use of the coordinates *x* , *y* and *r* is not permissible in any proof of a trigonometric identity.

3.4 Given: $\tan 3x = 0{,}45$. Many candidates divided only the reference angle by 3 to obtain values for *x* and not the whole general solution for 3*x*.

Teachers should emphasize that for $\tan q$ only $180^0 k$ is necessary in the general solution. If however $360^0 k$ is used, both applicable quadrants must be indicated.

A mark is always allocated for $n \in Z$.

QUESTION 4

Interpretation of graphs needs to be emphasized.

The concepts: $f(x) . g(x) \geq 0$ and $f(x) - g(x) = 2$ need attention and were not well understood.

QUESTION 5

5.1.2 " HENCE " in a question implies that the results of the previous question will be applied in solving the next question.

Brackets must be used for compound angles e.g. $(90^0 – B)$ for $\cos(90^0 – B)$.

5.2.1 Brackets must be used where products are expanded:
$\sin(45^0 + x) . \sin(45^0 – x)$
$= (\sin 45^0 \cos x + \cos 45^0 \sin x)\ (\sin 45^0 .\cos x – \cos 45^0 . \sin x)$

QUESTION 6

6.1 The obtuse angle was badly handled in the proof of the sin rule. Candidates should rather use the area formula to prove the sin formula.

6.2.2 When proving an identity, all the intermediate steps must be shown. Candidates omitted $\sin[180^0 – (x + y)] = \sin(x + y)$.

6.3 When proving WITHOUT A CALCULATOR, candidates should rather use fractions and show the deduction $\cos 120^0 = -\cos 60^0 = -\frac{1}{2}$

GEOMETRY

QUESTION 7

7.1 When proving a theorem the given sketch may not be simplified.

7.2.1 Reasons must be written in brackets AFTER the statements to which they apply.

When, for instance, proving a quadrilateral a cyclic quadrilateral, the final reason must not include the "cyclic " concept, e.g.
∴ PJON a cyclic quadrilateral (opposite angles are supplementary)
and NOT
∴ PJON a cyclic quadrilateral (opposite angles OF A CYCLIC QUADRILATERAL are supplementary)

QUESTION 8

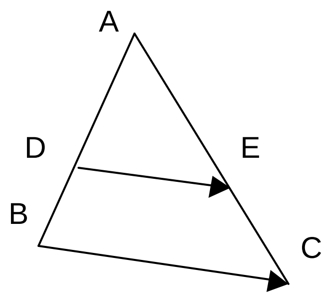
8.1 Care must be taken not to use impossible constructions in proofs of theorems.

The converse proof of similarity was clearly not well taught.

8.2 Questions following the proof of a theorem often involve the application of the theorem.

QUESTION 9

When working with **line segments** in a proportion, candidates must apply the parallel line proportional theorem.



$$\frac{AD}{DB} = \frac{AE}{EC}$$ (DE // BC ; Δ ABC)

This cannot be found directly from similarity.

9.2.3 After proving similarity, candidates can expect questions involving the use of equal angles and/or the proportion of the sides as in 9.2.2 and 9.2.3.

GENERAL REMARKS

1. All reasons must be given in geometry, even $\angle\angle\angle$ after similarity.

2. Special care must be taken when proving a tangent to a circle.
   The reason must be given as (CONVERSE tan/chord theorem).

3. Bookwork was poorly answered.