


المادة: الرياضيات الشهادة: المتوسطة نموذج رقم - ٥ - المدة : ساعتان	الهيئة الأكاديمية المشتركة قسم : الرياضيات	 المركز العلمي للبحوث والأبحاث
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نموذج مسابقة (براعي تعليق الدروس والتوصيف المعدل للعام الدراسي ٢٠١٦-٢٠١٧ وحتى صدور المناهج المطوّرة)

ارشادات عامة: - يسمح باستخدام آلة حاسبة غير قابلة للبرمجة او اختزان المعلومات او رسم البيانات.
 - يستطيع المرشح الإجابة بالترتيب الذي يناسبه دون الالتزام بترتيب المسائل الوارد في المسابقة.

I- (1.5points)

Given the number $a = \frac{1 + \sqrt{5}}{2}$.

- 1) Show that: $a^2 - a - 1 = 0$.
- 2) Prove that: $\frac{1}{a} = a - 1$.

II - (3points)

- 1)
 - a) Verify that $x^2 + 6x + 5 = (x + 3)^2 - 4$
 - b) Factorize $x^2 + 6x + 5$.
- 2) ABC is a triangle right at A, where $AC = 2x + 2$ and its area is $x^2 + 6x + 5$, (x is a positive real number).
 - a) Show that $AB = x + 5$.
 - b) Calculate, in terms of x, BC^2 .
- 3) Determine x if the area of triangle ABC equals 12 units of area.

III- (2.5points)

A survey about the content of a website was organized. Some visitors of the website were asked to rate the content using a 5-unit mark.

The table below shows the different opinions of the visitors.

Mark	1	2	3	4	5
Frequency	4	10	14	12	10

- 1) Calculate the average mark of the obtained marks.
- 2) The owners of the website will be satisfied if at least 65% of the visitors give a mark greater than or equal to 3. Will the owners of the website be satisfied? Explain your answer.
- 3) Construct the bar graph of this distribution.

IV-(2.5points)

To transport goods, Mr. Jadhav has the opportunity to address two transport companies: A and B. The offers presented by the two companies are given below.

Offer of Company A: 2 000 LL per kilometer.

Offer of Company B: 210 000 LL down payment and 1 500 LL per kilometer.

- 1) Calculate the amount to be paid for a distance of 100 km by the two offers.
- 2) Let x be the number of kilometers traveled. Denote by y_1 the price charged by Company A and by y_2 the price charged by Company B.
Express y_1 and y_2 in terms of x.

- 3) Calculate the number of kilometers traveled for which the prices charged in the two offers are the same. What is, then, the price to pay?
- 4) Jad chooses offer A and pay 500 000 LL. Does he choose the more advantageous offer?

V- (5.5 points)

ABE is an isosceles triangle of vertex B such that $BA = BE = 6$ cm and $\widehat{ABE} = 140^\circ$. The circle (C) with diameter [BE] and center O intersects the line (AB) at point F. Let I be the midpoint of [AE].

- 1) Draw a figure.
- 2) What is the nature of triangle BEF? Justify your answer.
- 3) Prove that I is on (C).
- 4) Calculate an approximate value of BF to the nearest millimeter.
- 5) a- Show that the triangles ABI and AEF are similar. Deduce that $AB \times AF = 2AI^2$.
b- Then calculate AE.
- 6) The two lines (BI) and (EF) intersect at H. Let (d) be the parallel through B to (AL). The line (d) intersects (AE) and (EF) at G and L respectively.
 - a) Prove that (LG) is tangent to (C).
 - b) Calculate the ratio $\frac{EL}{EH}$.

VI- (5 points)

In an orthonormal system of axes $x'Ox$ and $y'Oy$, Consider the points $A(4 ; 2)$ and $B(0 ; 4)$,
Let (d) the line through B and perpendicular to (OA).

- 1) Plot the points A, B and draw (d).
- 2) a) show that the triangle AOB is isosceles.
b) Prove that $y = -2x + 4$ is the equation of (d).
- 3) Let H be the orthocenter of the triangle OAB.
 - a) Verify that $y_H = 2$.
 - b) Calculate x_H .
- 4) Denote by E the meeting point of (OH) and (AB), and F that of (d) and $x'Ox$.
 - a) Calculate the coordinates of F.
 - b) Prove that the 2 triangles OBF and EOB are similar. Calculate the similarity ratio.
- 5) Let (C) be the circle circumscribed about the triangle BOF. Denote by (T) the tangent at B to (C). The line (T) intersects the x-axis at G.
 - a) Show that (T) is parallel to (OA)
 - b) Write an equation of (T).