


<p>المادة: الرياضيات الشهادة: المتوسطة نموذج رقم - ١ - المدة : ساعتان</p>	<p>الهيئة الأكاديمية المشتركة قسم : الرياضيات</p>	 <p>المركز العلمي للبحوث والدراسات</p>
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نموذج مسابقة (يراعي تعليق الدروس والتوصيف المعطل للعام الدراسي ٢٠١٦-٢٠١٧ وحتى صدور المناهج المطورة)

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

I - (2 points)

Consider the three numbers A, B and C:

$$A = \frac{33 \times 10^{-4} \times 30 \times 10^2}{36 \times 10^{-2} \times 22 \times 10} ; B = \frac{7 - \frac{11}{3}}{1 - \frac{1}{6}} ; C = (\sqrt{2} - 1)^2 + (\sqrt{2} + 1)^2$$

All details of calculation must be shown.

- 1) Write A as a fraction in its simplest form.
- 2) Show that B is a natural number.
- 3) Verify that $C = B + 16A$.

II - (3 points)

The perimeter of a rectangle is 28cm. If the length is decreased by 10% and the width is increased by 20%, then the perimeter of this rectangle will be 28.8cm.

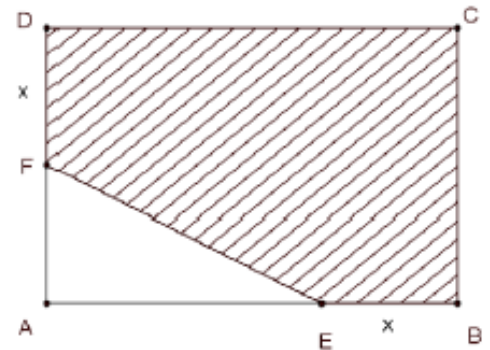
- a) Write a system of 2 equations of 2 unknowns to model the previous text.
- b) Verify that the original length is 8cm and calculate the original width.
- c) Determine the nature of quadrilateral resulting from modification of dimensions of the rectangle.

III - (4 points) in the figure at the right :

- x is a length expressed in cm such that $0 < x < 4$.
- ABCD is a rectangle such that $AB = 6\text{cm}$ and $AD = 4\text{cm}$.
- $BE = DF = x$

Denote by Y the area of the shaded part.

- 1) Prove that $Y = -\frac{1}{2}(x^2 - 10x - 24)$
- 2) a. Verify that $Y = -\frac{1}{2}((x - 5)^2 - 49)$.
b. Determine x so that $y = 20$.
- 3) Z is the area of a square with side $(x+2)$.
a. Express Z in terms of x .
b. Simplify $\frac{Y}{Z}$.
c. Can we calculate x if $Y = Z$?



IV - (5.5 points)

In an orthonormal system of axes $(x'Ox, y'Oy)$, consider the points $A(3; 0)$ and $B(-1; 2)$.

Let (d) be the line with equation $y = 2x + 4$.

- 1) a. Plot the points A and B.
b. The line (d) intersects $x'Ox$ at E and $y'Oy$ at F. Calculate the coordinates of points E and F, then draw (d).

- c. Verify that B is the midpoint of [EF].
- 2) a. Determine the equation of line (AB).
 b. Verify that (AB) is perpendicular bisector of [EF].
- 3) Consider the point $H(0 ; \frac{3}{2})$.
 a. Verify, that H is on the line (AB).
 b. Show that H is the orthocenter of the triangle AEF.
- 4) Let (C) be the circle with diameter [AF] and (Δ) the line passing through A and parallel to (EH).
 a. Verify that O and B are on the circle (C).
 b. Write an equation of the line (Δ).
 c. Show that (Δ) is the tangent to (C).

V- (5.5 points)

In the adjacent figure at the right:

- $AB = 5$ cm.
- (C) is the circle with diameter [AB] and center O.
- E a point on (C) such that $AE = 3$ cm.
- The tangent to (C) at B intersect (AE) at F.

1) Copy the figure.

2) a. Calculate BE

b. Prove that the two triangles AEB and ABF are similar.

c. Deduce BF and EF.

3) L is a point on (FB) such that $BL = \frac{15}{4}$, B is between L and F.

a. Compare $\frac{FE}{EA}$ and $\frac{FB}{BL}$.

b. Deduce that (BE) is parallel to (AL).

c. Show that $AL = \frac{25}{4}$

4) The line (EO) intersects the circle (C) at H. Let G the midpoint of [BL].

a. Prove that EAHB is a rectangle. Deduce that H is on (AL).

b. Prove that (GH) is tangent to (C).

c. Calculate, rounded to the nearest degree, the measure of \widehat{GHB} .

