المركز التربوي للبحوث والإنماء	الهيئة الأكاديمية المشتركة قسم : الرياضيات	المادة:الرياضيات الشهادة: المتوسطة نموذج رقم ـ ٤ ـ المدة : ساعتان

نموذج مسابقة (يراعي تعليق الدروس والتوصيف المعدّل للعام الدراسي ٢٠١٦ـ٢٠١٧ وحتى صدور المناهج المطوّرة)

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

I-(2 points)

Answer by "true" or "false"each of the following statements. Justify your answer.

1) The number $\sqrt{3}-1$is a solution of the equation $x^2+2x-2=0$.
2) The price of an item is decreased by20%, andthen by20%. After the two reductions, the price of the item is decreased by 40%.
3) For any positivereal number x, the number $[(x+1)^2-(x-1)^2]$ is positive.
4) If a triangle ABC is right-angled at A, then $\cos^2\hat{B}+\cos^2\hat{C}=1$.

II- (5.5 points)

In an orthonormal system of axes (x'Ox) and (y'Oy), consider the threepoints A(–1 ,–3),B(–5, 1), and E(2 , 0).

1)
   a) Plot the three points A, B, and E.
   b) Let (D)be a line with equation $y=x+2$. Show that (D) is the perpendicular bisector of the segment [AB].
2) Let (C) bethe circle with diameter [BE].
   a) Calculate the coordinates of K, the center of (C), and show that A is a point on (C).
   b) Let M be the point with coordinates $(-\frac{3}{2}, m)$, where m is a real number. Calculate m so that M is on(C).
3) Let Fbe translate of E under the translation with vector$\overrightarrow{AB}$.
   a) Determine the coordinates of point F, and determine the nature of the quadrilateral ABEF.
   b) Write an equation of the line (D'), the translate of line (D) by the translation of vector $\overrightarrow{KA}$.

III-(2.5 points)

Before the World Cup, a company has 1500 TVs in its stores. For one week, the director of the company registered, each day, thepercentage of televisions sold in terms of the stock purchased. The table below shows the sales within this week.

Day of the week	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Payment percentage	8%	10%	15%	12%	20%	30%

1) Calculate the number of televisions sold every day.
2) What is the percentage of televisions that are sold?
3) Draw the bar graph that represents the distribution.

IV- (3 points)

1) Let $Q(x) = (x-2)^2 - 5(x-3)(x-2) + x^2 - 4$.
   a) Develop, reduce, and order Q(x).
   b) Solve the equation $Q(x) = -30$.
   c) Show that $Q(x) = (x-2)(-3x+15)$.
2) Let $D(x) = x^2 - 4x + 4 + (2x-4)(x+3)$ and $F(x) = \frac{Q(x)}{D(x)}$.
   a) Factorize D(x).
   b) Determine the values of x for which F(x) is defined.
   c) Simplify F(x), then solve the equation $F(x) = 2$.

V- (2 points)

My cousin toldher husband: "I bought 4 identical shirts and 3 identical pants for 100 000 LL. But if I bought six of the same shirts and 5 of the same pants, I would have paid 120 000 LL."
He replied: "your story is impossible."

1) Write a system of equations to modelthe speech of my cousin.
2) Who was right: My cousin or her husband? Justify your answer.

VI –(5 points)

Let (C) be a semicircle with center O and diameter [AB] such that AB = 6 cm. The perpendicular to [AB] at O intersects (C) at F. Let Mbe a point on the arc $\overset{\frown}{BF}$. The segment [AM] intersects the segment [OF] at D. The bisector of angle $\widehat{FOM}$intersects the segment [AM] at I and (C) at E.

1) Draw a figure.
2)
   a) Prove that the two triangles AMB and AOD are similar.
   b) Then calculate AD×AM.
3) Prove that the triangle FIM is right isosceles.
4) The line (FI) intersects (AB) at L.
   Prove that $\frac{LA}{LB} = \frac{IA}{IF}$.
5) H is the orthogonal projection of M on segment [AB]. Prove that $MH = \frac{3MB}{AD}$.