وزارة التربية والتعليم العالي
المديرية العامة للتربية
دائرة الامتحانات

دورة العام ٢٠١٢ العادية | الشهادة المتوسطة

عدد المسائل :ستة	مسابقة في مادة الرياضيات المدة ساعتان	الاسم: الرقم:

ارشادات عامة :- يسمح باستعمال 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- (3 points)

In the table below, only one of the proposed answers to each question is correct. Write down the number of each question ,and give with justification, its corresponding answer .

N^0	Question	Proposed answers a	Proposed answers b	Proposed answers c
1	In an orthonormal system, the two lines with equations $y = 2x + 3$ and $2y + x = 1$ are…	intersecting at the point (1,5)	perpendicular	parallel
2	The original price of an article is 30 000 LL ,and its price after the discount is 27 600 LL . The percentage of discount is…	10 %	18 %	8 %
3	A triangle ABC is right at B. If AB=3 and $\widehat{ACB} = 40^\circ$, then AC = …	$\dfrac{3}{\sin 40^\circ}$	$3\sin 40^\circ$	$\dfrac{\sin 40^\circ}{3}$
4	The natural numbers, solutions of 3x-1<8 are…	1 ;2 ;3	0 ;1;2 ;3	0 ;1;2
5	A triangle ABC is right at A and M is the midpoint of [BC]. If AM = AB = 6 then AC =…	12	$6\sqrt{3}$	$9\sqrt{3}$
6	ABCD is a parallelogram and E is the translate of D under the translation with vector $\overrightarrow{BA}$. Therefore…	C is the midpoint of [DE]	$\overrightarrow{DB} + \overrightarrow{DE} = \overrightarrow{DA}$	$\overrightarrow{DE} + \overrightarrow{DA} = \overrightarrow{DB}$

II-(2 points)

Consider the three numbers A , B and C :

$$A = \left(\sqrt{5}+1\right)^2 + \left(\sqrt{5}-1\right)^2 ;\ B = \frac{3}{4} + \frac{5}{4} \times \frac{7}{15} \ \text{ and } \ C = \frac{\left(10\sqrt{3}\right)^4}{25\times10^3\times3+10^3\times6\times37.5}.$$

In the following questions , the steps of calculation must be shown

1) Prove that A is a natural number.
2) Write B as a fraction in its simplest form.
3) Prove that C is a decimal number.

III- (2 points)

In what follows, are the scores of a student in five tests: 10 ; 8 ; 13 ; x and y.

The difference between x and y is 7. The average (mean) of these five scores is 12.

1) Write a system of two equations with two unknowns modeling the given situation .
2) Solve the obtained system .

IV- (3 points)

Consider the expressions: $A(x) = 4x^2 - 9$ and $B(x) = (2x-3)^2 - (2x-3)(x-5)$.

1) Factorize A(x).

2) **a-** Verify that $B(x) = (2x-3)(x+2)$.

b- Solve the equation $B(x) = 0$.

3) Consider the expression $F(x) = \dfrac{A(x)}{B(x)}$.

a. For what values of x, F(x) is defined **?**

b. Simplify F(x) and solve $F(x) = 3$.

c. Calculate $F(\sqrt{5})$ and write the answer in the form $a - b\sqrt{5}$. (a and b are natural numbers)

V- (5 points)

In an orthonormal system of axes x'Ox, y'Oy, where the unit of length is the centimeter, consider the points A (1;-2), B(2;1), C(5;0) and the line (d) with equation $y = 3x - 5$.

1) **a.** Verify that (d) is passing through A and B.

b. Plot the points A, B, C and draw (d).

2) **a.** Determine the equation of the line (BC).

b. Calculate the lengths AB and BC.

c. Prove that ABC is a right isosceles triangle with vertex B.

3) Let (G) be the circle circumscribed about the triangle ABC and D is the point defined by $\overrightarrow{BD} = \overrightarrow{AC}$.

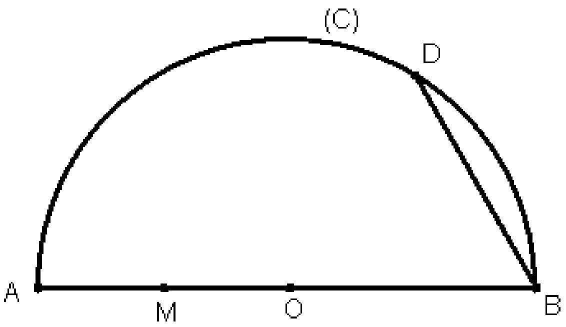
a. Calculate the coordinates of D.

b. Prove that (DB) is tangent to (G).

4) (d') is the translate of (d) under the translation with vector $\overrightarrow{AC}$. Find the equation of (d').

VI- (5 points)

Consider a semicircle (C) with centre O and radius R . [AB] is the diameter of (C) and D is a point on (C) so that BD = R.



Let M be the midpoint of [OA]. The perpendicular bisector of [OA] intersects [AD] at E, (BD) at F and (C) at K.

1) Reproduce and complete the figure.

2) Calculate the angles of the triangle ABD, then calculate AD in terms of R.

3) **a.** Prove that the two triangles ADB and FMB are similar.

b. Calculate BF in terms of R.

4) (BE) intersects (AF) at J. Show that J is on (C).

5) Prove that the points B, M, J and F are on the same circle whose center and radius should be determined.

6) **a.** Show that the triangle OKA is equilateral.

b. Prove that (OK) passes through the midpoint of [AF].

مشروع معيار التصحيح

مسابقة في مادة الرياضيات
المدة ساعتان

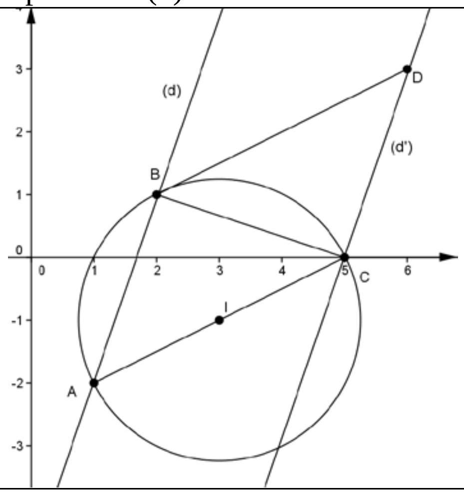
الاسم:
الرقم:

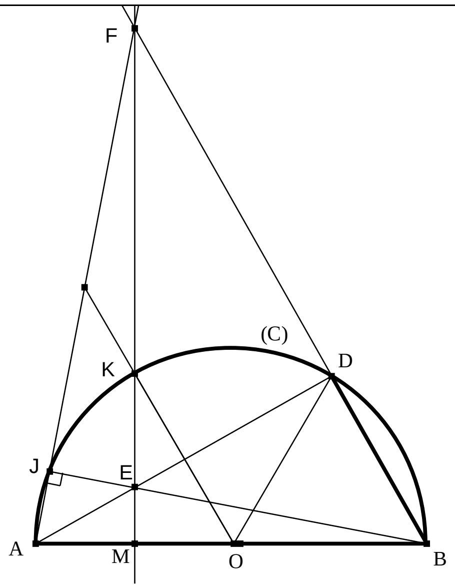
	Part of the Q	Answer	Mark
I (3pts)	1	(2)(- 0.5) = -1, therefore (b)	**0.5**
	2	30 000 -27 600 =2400 = $\frac{30000\times x}{100}$; x=8 (8 %), therefore (c)	**0.5**
	3	$\frac{3}{\sin 40^0}$ therefore (a)	**0.5**
	4	0;1;2 therefore (c)	**0.5**
	5	ABM is equilateral, then BC=12 and AC=$\frac{12\sqrt{3}}{2}=6\sqrt{3}$. therefore (c)	**0.5**
	6	DEAB is a parallelogram, $\overrightarrow{DB}+\overrightarrow{DE}=\overrightarrow{DA}$ therefore (c)	**0.5**

	Part of the Q	Answer	Mark
II (2pts)	1	A=12	**0.75**
	2	B=$\frac{4}{3}$	**0.5**
	3	C =0.3	**0.75**

	Part of the Q	Answer	Mark
III (2pts)	1	$\frac{x+10+8+13+y}{5}=$ 12 ; so, x + y + 31 = 60 Thus , x + y = 29 The system is $\begin{cases} y=x+7 \\ x+y=29 \end{cases}$	**1.25**
	2	x = 11, so y = 18.	**0.75**

	Part of the Q	Answer	Mark
IV (3pts)	**1**	A(x) = (2x – 3) (2x + 3)	**0. 5**
	2.a	B(x) = (2x – 3) (x + 2).	**0.5**
	2.b	B(x) = 0 x = – 2 or x = $\frac{3}{2}$	**0.5**
	3. a	F(x) is defined $x\neq -2$ and $x\neq \frac{3}{2}$	**0.25**
	3.b	F(x) = $\frac{2x+3}{x+2}$ F(x) = 3 ; x = – 3.	**0.75**
	3.c	F ($\sqrt{5}$) = $\frac{2\sqrt{5}+3}{2+\sqrt{5}}=4-\sqrt{5}$.	**0.5**

V (5pts)	1. a	A and B are two points of (d)	**0.5**
	1. b		**0.75**
	2. a	$(BC): y = -\frac{1}{3}x + \frac{5}{3}$	**0.75**
	2. b	$AB = \sqrt{10}$; $BC = \sqrt{10}$	**0.75**
	2. c	$AB = \sqrt{10}$; $BC = \sqrt{10}$ and (AB) is perpendicular to (BC) then ABC is a right isosceles triangle at B.	**0.5**
	3.a	$\overrightarrow{AC}(4;2); D(x;y); \overrightarrow{BD}(x-2;y-1) \text{then} D(6;3)$	**0. 5**
	3.b	(BD) is perpendicular to (IB)	**0.75**
	4	(d'): y = 3x - 15	**0.5**

VI (5pts)	1	 Figure	**0. 5**
	2	$\widehat{ADB} = 90^0$, $\widehat{ABD} = 60^0$,$\widehat{BAD} = 30^0$: $AD = R\sqrt{3}$.	**1**
	3.a	The two triangles are right, and angle $\widehat{B}$ is common	**0.5**
	3.b	BF=3R	**0.5**
	4	(BE) is the third altitude in the triangle AFB, then ABJ is a right triangle at J, then J belongs to the circle	**0.5**
	5	$\widehat{FJB} = \widehat{FMB} = 90^0$ B,M,J and F are on the same circle.with center rmidpoint of [BF], radius= $\frac{3R}{2}$	**0.75**
	6.a	AKO is an equilateral triangle since KA=KO=OA=R.	**0.5**
	6.b	(OK) parallel to (BF),O rmidpoint of [AB], (OK) passes through the midpoint of [AF].	**0.75**