

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

ارشادات عامة :- يسمح باستعمال آلة حاسبة غير قابلة للبرمجة او اختران المعلومات او رسم البيانات.
- يجب تنطيع المرشح الإجابة بالترتيب الذي يناسبه دون الالتزام بترتيب المسائل الواردة في المسابقة.

I - (2 points)

In the following table, only one of the proposed answers to each question is correct.
Write the number of the question and its corresponding answer. Justify your choice.

Number	Question	Proposed answers		
		a	b	c
1	Let $P(x) = 3x^2 - 2x + 2\sqrt{3}$, then $P(\sqrt{3}) =$	9	0	$9 + 4\sqrt{3}$
2	The original price of an article is 5 200 L.L. After a discount of 15% , the new price will be:	5 980 L.L	780 L.L	4 420 L.L
3	x is the measure of an acute angle so that $\sin x = \frac{2}{5}$, then $\cos x =$	$\frac{3}{5}$	$\frac{4}{5}$	$\frac{\sqrt{21}}{5}$
4	If $2x - 3 > 5$, then:	$x + 4 > 0$	$-3x + 12 < 0$	$x < -4$

II - (2.5 points)

Consider the three numbers **A**, **B** and **C** so that:

$$A = \frac{8}{3} + 5 \div (1 - \frac{2}{5}) ; B = \sqrt{2 - \frac{6}{5}} \times \sqrt{2 + \frac{6}{5}} \text{ and } C = \frac{2\sqrt{75} - \sqrt{48}}{5\sqrt{2} \times \sqrt{54} - 5\sqrt{27}}$$

In what follows, the steps of calculation must be shown.

- 1) Show that **A** is a natural number.
- 2) Write **B** in the form of a fraction in its simplest form.
- 3) Prove that **C** is decimal
- 4) Prove that $B + C = 2$.

III - (2 points)

- 1) Solve the following system:
$$\begin{cases} x + y = 35 \\ 2x - 3y = 0 \end{cases}$$
- 2) Find, with justification, two natural numbers such that their sum is 35 and the double of one of them is the triple of the other.

IV- (3.5 points)

Given the following algebraic expression:

$$E(x) = (3x - 4)^2 - (3x - 4)(x + 2).$$

1) a. Show that $E(x) = 6x^2 - 26x + 24$

b. Solve the equation $E(x) = 24$.

2) Factorize $E(x)$.

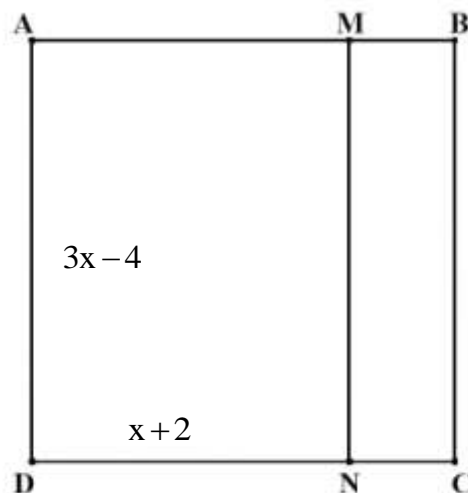
3) In the adjacent figure:

ABCD is a square with side $3x - 4$.

AMND is a rectangle such that $DN = x + 2$. ($x > 3$)

a. Express, in terms of x , the area S of the square **ABCD** and S' the area of the rectangle **MBCN**.

b. Determine x so that $S = 4S'$.



V- (5 points)

In an orthonormal system of axes $x'Ox$; $y'Oy$, consider the points $A(3;3)$, $B(0;-3)$ and $C(-6;0)$.

1) Plot the points A, B and C.

2) Verify that $y = 2x - 3$ is the equation of the line (AB) .

3) Calculate the slope of the line (BC).

Deduce that (AB) and (BC) are perpendicular.

4) Show that ABC is a right isosceles triangle.

5) Let **D** be the point defined by $\overline{AD} = \overline{BC}$.

a. Verify that the coordinates of **D** are $(-3;6)$.

b. Show that the quadrilateral ABCD is a square.

6) Let **E** be the symmetric of D with respect to A and (**G**) the circle circumscribed about triangle CDE.

a. Calculate the coordinates of E.

b. Calculate the coordinates of I the center of circle (G).

c. Determine the equation of the tangent at D to the circle (G).

VI- (5 points)

In the adjacent figure, consider a circle (C) with center O and diameter $AB = 6$ cm.

Let **D** be a point on (C) such that $BD = 3.6$ cm .

Denote by **M** the midpoint of [OB].

The parallel through M to (BD) intersects [AD] at J.

1) Copy the figure, it will be completed in the following parts.

2) Show that ABD is a right triangle, and then verify that $AD = 4.8$ cm.

3) Verify that $AJ = 3.6$ cm and calculate JM.

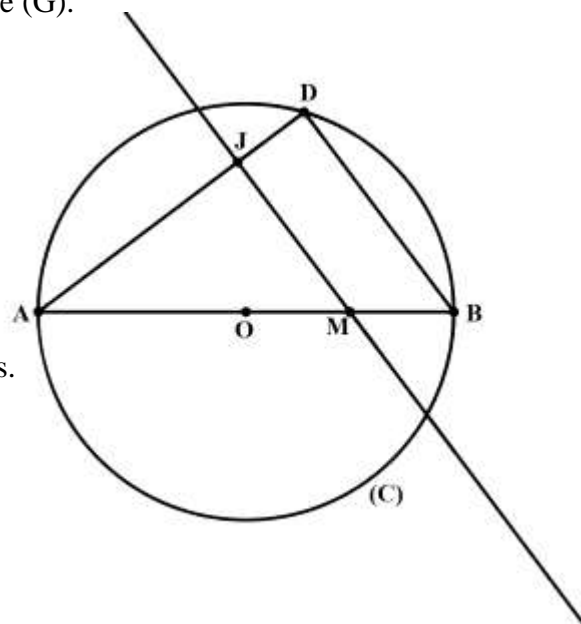
4) The tangents to (C) at A and D intersect at L.

The two lines (AD) and (LO) intersect at F.

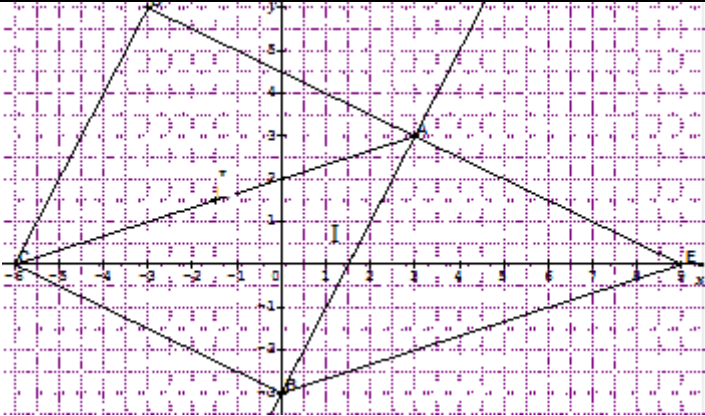
a. Calculate OF.

b. Prove that the two triangles OFA and OAL are similar then Calculate AL.

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



مشروع أسس التصحيح

Part of the ques.	Question I	Grade
1	$P(\sqrt{3}) = 9$.The answeris(a)	0.5
2	The price will be $5\ 200 \times 0.85=4420$. So the answeris (c)	0.5
3	$\cos^2 x = 1 - \frac{4}{25} = \frac{21}{25}$.So the answeris(c)	0.5
4	If $2x - 3 > 5$, then $x > 4$ so $-3x + 12 < 0$.So the answeris(b)	0.5
Question II		
1	$A = \frac{8}{3} + 5 \div \left(\frac{3}{5}\right) = \frac{8}{3} + \frac{25}{3} = 11$	0.5
2	$B = \sqrt{4 - \frac{36}{25}} = \sqrt{\frac{100 - 36}{25}} = \frac{8}{5}$	1
3	$C = \frac{10\sqrt{3} - 4\sqrt{3}}{5 \times 2 \times 3\sqrt{3} - 15\sqrt{3}} = \frac{6\sqrt{3}}{15\sqrt{3}} = \frac{2}{5}$ thus $B+C = 2$	1
Question III		
1	$x = 21$ and $y = 14$	1
2	x and y are two natural numbers, so the system is: $\begin{cases} x + y = 35 \\ 2x = 3y \end{cases}$ hence $x=21$ and $y = 14$	1
Question IV		
1.a	$E(x) = 6x^2 - 26x + 24$	0.5
1.b	$E(x) = 24$ then $x=0$ or $x = \frac{13}{3}$	0.5
2	$E(x) = (3x-4)(3x-4-x-2) = 2(3x-4)(x-3)$.	0.5
3.a	$S = (3x - 4)^2$ and $S' = (3x - 4)^2 - (3x - 4)(x + 2)$	1
3.b	$S = 4S'$ then $x = \frac{4}{3}$ rejected or $x = 4$ acceptable .	1
Question V		
1	 <p>Figure: A, B and C</p>	0.5
2	Equation of (AB) is $y = 2x - 3$	0.5
3	$a_{(BC)} = \frac{-1}{2}$ then (AB) and (BC) are perpendicular (product of their slopes = -1)	0.75

4.	(AB) perpendicular to (BC) , $AB = 3\sqrt{5}$; $BC = 3\sqrt{5}$ then ABC is right isosceles .	0.5
5.a	$\overline{AD} = \overline{BC}$ then $D(-3;6)$	0.5
5.b	$\overline{AD} = \overline{BC}$ then ABCD is a parm (BC) perpendicular to (AB) and $AB = BC$ then it is a square.	0.5
6. a	E(9, 0).	0.5
6. b	$I(\frac{3}{2}, 0)$	0.5
6.c	$a_{(ID)} = -\frac{4}{3}$ so, the slope of the tangent $= \frac{3}{4}$ and the equation of the tangent is $y = \frac{3}{4}x + \frac{33}{4}$.	0.75

Question VI

1		0.5
2	ABD is right at D since it is inscribed in a (C) of diameter [AB] $AD^2 = 36 - 12.96 = 23.04$ hence $AD = 4.8\text{cm}$.	0.75
3	Using Thales', $\frac{AJ}{AD} = \frac{AM}{AB} = \frac{JM}{BD}$ then $AJ = 3.6\text{cm}$ and $JM = 2.7\text{cm}$	1
4.a	F midpoint of [AD] and O midpoint of [AB] then $OF = \frac{1}{2}BD$ consequently $OF = 1.8$ or....	0.5
4.b	$\hat{\theta}$ common angle , $\hat{\theta}AL = \hat{\theta}FA = 90^\circ$ $\frac{OF}{OA} = \frac{AF}{LA} = \dots$ then $AL = 4$	1.25
5.a	$\tan \hat{\theta}LA = \frac{3}{4}$ then $\hat{\theta}LA = 37^\circ$, so $\hat{\theta}ALD = 74^\circ$	1