This is a Class 1 exam

Lebanon Evangelical School
for Boys and Girls
Loueizeh - Baabda

Stage Exam 06

19, 20, 21JUN2023

Do NOT write in this box. Your MARK will be placed here.

Subject :	Maths	
Class :	9B and 9C	
Teacher :	Taline Hawatian	
Duration :	2 hours	
Your name :		*Time taken to complete exam*
Your Class :		
Exam Room :		
How many sheets, including cover sheet :		

- Do not open this paper until the teacher in charge instructs you to do so.
- The most important thing to remember in taking an exam is NEVER PANIC.
- If you are caught cheating in this exam, you will be awarded zero for ALL exams that are taken on this day.

I.- (3 points)

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

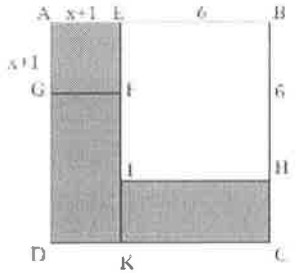
Number	Question	a	b	c
1	The scientific notation of $C=\frac{(10\sqrt{7})^4}{2.4\times10^{-4}\times2+10^{-4}\times4\times1.25}$ is	5×10^{-8}	5	5×10^{8}
2	After a discount of 10%, followed by another discount of 15%, the price of an article becomes \$153.The original price of the article was	\$200	\$250	\$193
3	$\sqrt{7}-2$ | $\frac{5}{3}$ x | $\sqrt{7}+2$ The above table is a proportionality table. $x=$	$\frac{9}{5}$	$\frac{1}{5}$	5
4	$(4+\sqrt{5})^2-\frac{8}{\sqrt{5}-2}=$	-7	5	$16\sqrt{5}$

II.- (5 points)

Part A

Given the two polynomials $P(x)=(7+x)^2-36$ and $Q(x)=3(x-3)(x+1)$

1) Factorize $P(x)$. 2) Verify that $Q(x)=3x^2-6x-9$



Part B

In the following figure, ABCD, AEFG, and EBHI are squares. AE= x+1 EB=6

1) Write in terms of x the area of ABCD.
2) **A** represents the area of the shaded region.
   Verify that **A**$=(x+1)(x+13)$.
3) Develop, reduce and order A.
4) Calculate x so that the area A is four times the area of AEFG.

III.- In class 9, each student practices one sport. 35% of the students practice football, $\frac{1}{4}$ of the students practice basketball, and 48 students practice volleyball.

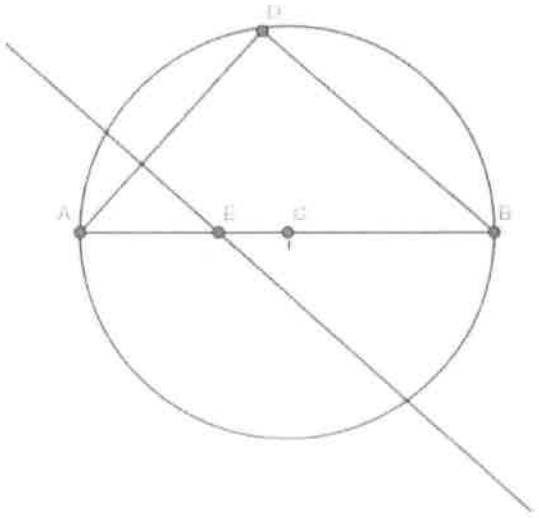
1) Calculate the percentage of students that practice basketball. Deduce the percentage of students that practice volleyball.
2) Calculate the total number of students in class 9. (2 points)

IV.- In an orthonormal system of axes $x'Ox, y'Oy$, consider the points $M(-3; -5)$, $N(6; -2)$, and $P(0; 4)$. Let (d) be the straight line of equation $y = x - 2$.

1) Plot the points M, N, and P.
2) Verify that M belongs to (d). Draw (d).
3) Write the equation of the straight line (NP) and show that (NP) and (d) are perpendicular.
4) H is the intersection point of (d) and (NP). Show that the coordinates of H are $(3; 1)$. Calculate MH.
5) Calculate the area of triangle MNP.Q is the symmetric of M with respect to H. Determine the coordinates of Q.
6) G is the orthogonal projection of P on (MN). Show that the four points P, H, G, M belong to the same circle (C) of center I. Determine the coordinates of I and the radius of the circle (C). Draw (C). (5.5 points)

IV.- In the figure below, (C) is a circle of center C, radius R=3cm and diameter [AB]. D is a point on (C) such that AD=4cm. E is a point on [AB] such that AE= 2cm. (4.5 points)

1) Reproduce the figure.
2) What is the nature of triangle ADB? Justify. Show that DB= $2\sqrt{5}$ cm.
3) F is the orthogonal projection of E on (AD).
   Prove that (FE) and (DB) are parallel.
4) Verify that EF= $\frac{2\sqrt{5}}{3}$ and calculate AF.
5) The perpendicular from E to (AB) cuts (DB) at K and (AD) at H. What does H represent for triangle AKB? Justify. Show that (BH) is perpendicular to (AK).



SEO6/20222023/Maths/9BC

I- 1) c 0.25

$$\frac{(10\sqrt{7})^4}{2.4\times10^{-4}\times2+10^{-4}\times4\times1.25}$$

$$=\frac{10^4\times7^2}{2\times10^{-4}(2.4+2.5)}=\frac{10^4\times49}{2\times10^{-4}\times4.9}$$ 0.5

$$=\frac{10^5\times10^4}{2}=5\times10^8$$

2) a 0.25

$$y=\left(1-\frac{10}{100}\right)\left(1-\frac{15}{100}\right)x$$ 0.5

$$y=0.765x \qquad x=\frac{153}{0.765}=\$200$$

3) a 0.25

$$\frac{\sqrt{7}-2}{x}=\frac{\frac{5}{3}}{\sqrt{7}+2}$$

$$\frac{5}{3}x=(\sqrt{7}-2)(\sqrt{7}+2)$$ 0.5

$$\frac{5}{3}x=7-4 \qquad x=\frac{3}{\frac{5}{3}}=\frac{9}{5}$$

4) b 0.25

$$(4+\sqrt{5})^2-\frac{8}{\sqrt{5}-2}$$

$$=16+8\sqrt{5}+5-\frac{8}{\sqrt{5}-2}\cdot\frac{\sqrt{5}+2}{\sqrt{5}+2}$$

$$=16+8\sqrt{5}+5-\frac{8\sqrt{5}+16}{5-4}$$ 0.5

$$=16+8\sqrt{5}+5-8\sqrt{5}-16=5$$

II- A/1) $P(x)=(7+x)^2-36=(7+x+6)(7+x-6)$

$=(x+13)(x+1)$ 1

2) $Q(x)=3(x-3)(x+1)$

$=3(x^2+x-3x-3)$

$=3x^2-6x-9$ 1

B/

1) $AB = AE + EB = x + 1 + 6 = x + 7$ 0.5

$\mathcal{A}_{ABCD} = AB^2 = (x+7)^2$

2) $A = \mathcal{A}_{ABCD} - \mathcal{A}_{EBHI}$ 1

$= (x+7)^2 - 36 = (x+1)(x+13)$ (proved)

3) $A = (x+1)(x+13) = x^2 + 13x + x + 13 = x^2 + 14x + 13$

4) 0.5

$\mathcal{A}_{AEFG} = (x+1)^2$

$A = 4(x+1)^2$

$(x+1)(x+13) - 4(x+1)^2 = 0$

$(x+1)[x+13 - 4(x+1)] = 0$

$(x+1)(x+13-4x-4) = 0$ 1

$(x+1)(-3x+9) = 0$

$-3(x+1)(x-3) = 0$

$x+1 > 0$

$x > -1$

$x = -1$ rejected

$x - 3 = 0$

$x = 3$ accepted

III.- 1) $\frac{1}{4} = 0.25$. 25% of students practice basketball 0.5

$100 - (35 + 25) = 100 - 60 = 40$ 0.5

40% of students practice volleyball.

2) 1

$100 \longrightarrow 40$

total $\longrightarrow 48$

total $= \frac{4800}{40} = 120$

The total number of students is 120.

IV.- 1) Figure 0.5

2) $y_m \stackrel{?}{=} x_m - 2$

$-5 \stackrel{?}{=} -3 - 2$ $-5 = -5$ verified 0.25

2)

x	-1	0	1
y	-3	-2	-1

(d) 0.25

3) (NP): $y = ax + b$

$a = \frac{y_P - y_N}{x_P - x_N} = \frac{4+2}{0-6} = \frac{6}{-6} = -1$ 0.5

$y - y_P = -1(x - x_P)$

$y - 4 = -x$ $\quad (NP): y = -x + 4$ 0.5

slope (NP) x slope (d) $= (-1)(1) = -1$ 0.25

This implies that (NP) and (d) are perpendicular.

4) $x_H - 2 = -x_H + 4$ 0.5

$2x_H = 6 \quad x_H = 3 \quad y_H = 3 - 2 = 1 \quad H(3;1)$

$MH = \sqrt{(x_H - x_M)^2 + (y_H - y_M)^2}$ 0.5

$= \sqrt{(3+3)^2 + (1+5)^2} = \sqrt{36+36} = \sqrt{72} = 6\sqrt{2}\,u$

5) $A_{MNP} = \frac{MH \times NP}{2}$ 0.5

$NP = \sqrt{(-2-4)^2 + (6-0)^2} = \sqrt{36+36} = \sqrt{72} = 6\sqrt{2}\,u$

$A = \frac{6\sqrt{2} \times 6\sqrt{2}}{2} = 36\,u^2$ 0.25

6) H is the midpoint of [MQ]

$x_H = \frac{x_M + x_Q}{2} \qquad y_H = \frac{y_M + y_Q}{2}$ 0.5

$3 = \frac{-3 + x_Q}{2} \qquad 1 = \frac{-5 + y_Q}{2}$

$x_Q = 6 + 3 = 9 \qquad y_Q = 2 + 5 = 7$

$Q(9;7)$

6) $\widehat{PGM} = 90°$ (G is the orth. projection of P on (MN))
$\Rightarrow$ P, G, M belong to the circle of diameter [MP].
$\widehat{MHP} = 90°$ (proved)
$\Rightarrow$ M, H, P belong to the circle of diameter [MP].
[MP] is a common hypotenuse.
Therefore P, G, M, H belong to the same circle of diameter [MP]. 0.25

I is the midpoint of [MP]

$x_I = \frac{x_M + x_P}{2} = \frac{-3+0}{2} = -\frac{3}{2}$ $\quad y_I = \frac{-5+4}{2} = -\frac{1}{2}$ 0.5

$I\left(-\frac{3}{2}; -\frac{1}{2}\right)$

$\text{Radius} = \frac{MP}{2} = \frac{\sqrt{(4+5)^2 + (-3)^2}}{2} = \frac{\sqrt{81+9}}{2} = \frac{\sqrt{90}}{2} = \frac{3\sqrt{10}}{2}$ 0.25

V.- 1) Figure 0.75

2) $\widehat{ADB} = 90°$ (inscribed angular sector facing the diameter is right). 0.25
$\Rightarrow$ Δ ADB is a right triangle, right angled at D.

$DB^2 = AB^2 - AD^2$ (Pythagoras theorem) 0.75
$= 36 - 16 = 20$ $\quad DB = \sqrt{20} = 2\sqrt{5}$ cm

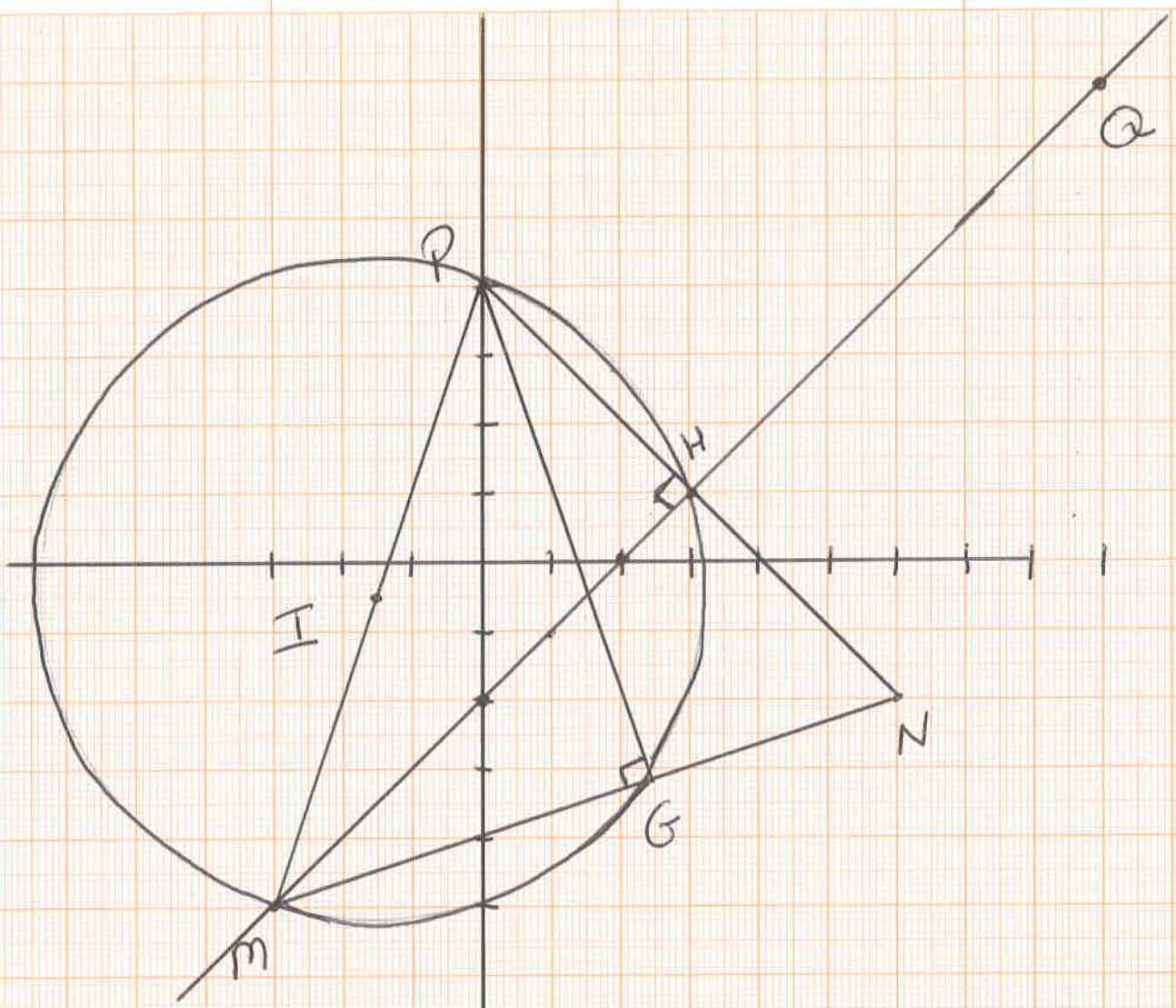
3) (EF) is perpendicular to (AD) (orth. projection)
(DB) is perpendicular to (AD) (proved) 0.5
$\Rightarrow$ (EF) is parallel to (DB)
(Two lines perpendicular to the same line are parallel)

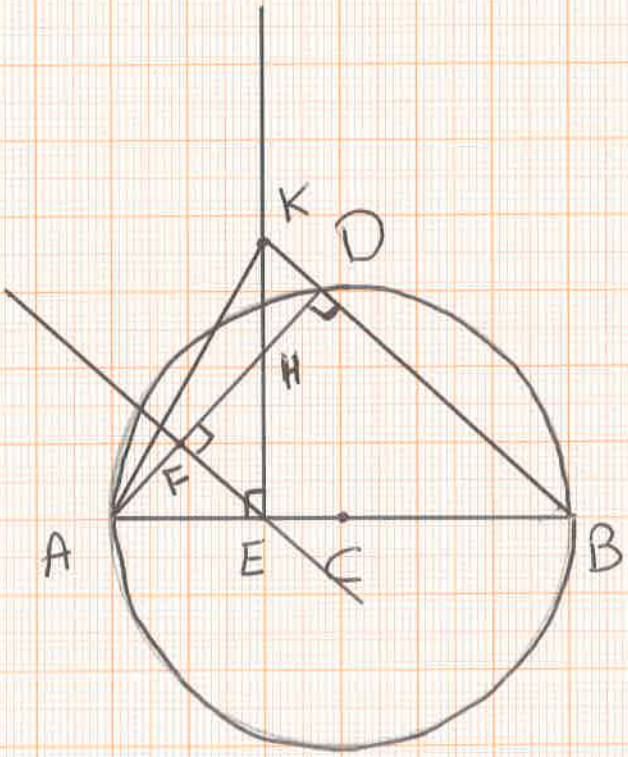
4) $\frac{AE}{AB} = \frac{AF}{AD} = \frac{EF}{BC}$ (Thales' property) 1

$\frac{2}{6} = \frac{EF}{2\sqrt{5}}$ $\quad EF = \frac{4\sqrt{5}}{6} = \frac{2\sqrt{5}}{3}$ cm

$\frac{2}{6} = \frac{AF}{4}$ $\quad AF = \frac{8}{6} = \frac{4}{3}$ cm 0.5

5) In ΔABK,
[KE] is the heiger relative to [AB] ((KE) is perpendicular to (AB))
[AD] is the heiglt relative to [KB] ($\widehat{ADB} = 90°$).
[KE] and [AD] intersect at H.
This implies that H is the orthocenter of ΔABK. 0.5
(BH) passes through the orthocenter H of ΔABK.
(BH) is the third heiglt. 0.25
So (BH) is perpendicular to (AK).


Q
P
H
I
N
G
M


K
D
H
F
A
E
C
B