Mathematics Grade 9 June Paper (0001) Memo

Time: 2H **Total :100 marks**

Section A (Algebra): [75]

Question 1: [8]

1.1 Complete the following table: **(6)**

	Set builder notation:	Interval notation:	Graphic representation:
(a)	$\{m / m \geq -10 ; m \in \mathbb{R}\}$	$m \in [-10 ; \infty)$ ✓ ✓	✓ ✓ -10
(b)	$\{x / -2 < x \leq 2 ; x \in \mathbb{Z}\}$ ✓	None ✓	-3 -2 -1 0 1 2 3 4 5
(c)	$\{y / 0 \leq y \leq 30 ; y \in \mathbb{R}\}$ ✓	$y \in [0 ; 30]$	✓ 0 30

1.2 Given: $-3,\dot{7}$; 125 ; $\sqrt[3]{-1}$; $\frac{14}{2}$; 4,125 ; $\sqrt{125}$ and π

(a) Write down the integer(s). **(1)**

$\sqrt[3]{-1} = -1$ $\frac{14}{2} = 7$

$\therefore 125 ; \sqrt[3]{-1} ; \frac{14}{2}$ ✓

(b) Write down the irrational number(s). **(1)**

$\sqrt{125}$ and π ✓

Question 2: [13]

2.1 Simplify, without using a calculator.
Write the answers as positive exponents.

(a) $\sqrt{\frac{75m^{1}n^{19}}{12m^{5}n^{3}}}$ **(3)**

$= \sqrt[2]{\frac{25\ m^{-4}n^{16}}{4}}$

$= \frac{5\ m^{-\frac{4}{2}}\ n^{\frac{16}{2}}}{2}$

$= \frac{5\ m^{-2}n^{8}}{2}$ ✓

$= \frac{5n^{8}}{2m^{2}}$ ✓

(b) $(2^{1}x^{1}y^{0}k^{-2})^{2}$ **(3)**

$= 2^{2}x^{2}y^{0}k^{-4}$ ✓

$= 4x^{2}(1)k^{-4}$

$= \frac{4x^{2}}{k^{4}}$ ✓

2.2 Simplify, without using a calculator and write the answer in scientific notation. **(3)**

$(1,5 \times 10^{3}) \div (5 \times 10^{5})$

$= (1,5 \div 5) \times (10^{3} \div 10^{5})$ ✓

$= 0,3 \times 10^{-2}$ ✓

$= 3,0 \times 10^{-1} \times 10^{-2}$

$= 3,0 \times 10^{-3}$ ✓

2.3 Solve for x:

(a) $2x^{\frac{2}{3}} = 32$ **(2)**

$x^{\frac{2}{3}} = \frac{32}{2}$

$\left(x^{\frac{2}{3}}\right)^{\frac{3}{2}} = 16$ ✓

$x^1 = \left(2^4\right)^{\frac{3}{4}}$

$x = 2^6 = 64$ ✓

(b) $8^x = 0,5^{x+1}$ **(2)**

$(2^3)^x = \left(\frac{1}{2}\right)^{x+1}$

$2^{3x} = (2^{-1})^{x+1}$ ✓

$2^{3x} = 2^{-x-1}$

$\therefore 3x = -x - 1$

$3x + x = -1$

$4x = -1$ ✓

$x = -\frac{1}{4}$ ✓

Question 3: [10]

3.1 Complete the following table and answer the questions below: **(2)**

Position in sequence:	1	3	4	5	8
Term:	3	-5	-9	-13 ✓	-25 ✓

(a) Determine the general term and write it as T_n = ... **(2)**

$T_n = a + (n-1)d$

$T_n = 3 + (n-1)(-4)$ ✓

$T_n = 3 - 4n + 4 = 7 - 4n$ ✓

(b) Determine the 20th term. **(2)**

$T_n = 7 - 4n$

$T_{20} = 7 - 4(20)$ ✓

$T_{20} = -73$ ✓

(c) **Which term will be equal to -301?** **(2)**

$T_n = 7 - 4n$

$-301 = 7 - 4n$

$4n = 7 + 301 = 308$

$n = \frac{308}{4} = 77$ ✓

3.2 Complete the next three terms in the sequence and write the pattern in words:

-128 ; 64 ; -32 ; 16 ; …….. **(2)**

(2)

-8 ; 4 ; -2 ✓

Divide by (-2) or multiply with a $(-\frac{1}{2})$ ✓

Question 4: [21]

4.1 Consider the following algebraic expression:

$$3xy + 4x^2(2 - 3x) - 7 + 6x^{11}y^3 - (x^3 - 2)$$

(a) **How many terms are there in the expression?** **(1)**

5 terms ✓

(b) **Simplify the expression.** **(3)**

$3xy + 8x^2 - 12x^3 - 7 + 6x^{11}y^3 - x^3 + 2 = 3xy + 8x^2 - 13x^3 - 5 + 6x^{11}y^3$

(c) **Arrange the expression in (b) in ascending powers of *x*.** **(1)**

$-5 + 3xy + 8x^2 - 13x^2 + 6x^{11}y^3$ ✓

(d) **Write down the constant term in (b).** **(1)**

-5 ✓

4.2 If $m = \frac{3}{4}$; $n = -0{,}5$ and $t = 0$, calculate the numerical value of the following without using a calculator.
Show all calculations.

(a) $(6m - 3n)^2$ (3)

$= \left[6\left(\frac{3}{4}\right) - 3(-0{,}5)\right]^2$

$= \left[\frac{6}{1} \times \frac{3}{4} - \frac{3}{1} \times \frac{-1}{2}\right]^2$

$= \left[\frac{9}{2} + \frac{3}{2}\right]^2$

$= \left[\frac{12}{2}\right]^2 = [6]^2 = 36$

(b) $\frac{n}{m} + 5t - m^t$ (3)

$= \frac{-0{,}5}{\frac{3}{4}} + 5(0) - \left(\frac{3}{4}\right)^0$

$= -\frac{1}{2} \div \frac{3}{4} + 0 - 1$

$= -\frac{1}{2} \times \frac{4}{3}^2 - 1$

$= -\frac{2}{3} - 1 = -1\frac{2}{3}$

4.3 Simplify:

(a) $(3k - p)(2k + p)$ (2)

$= 6k^2 + 3kp - 2kp - p^2$

$= 6k^2 + 1kp - p^2$

(b) $2(x + 5)^2$ (3)

$= 2(x+5)(x+5)$

$= 2(x^2 + 5x + 5x + 25)$

$= 2(x^2 + 10x + 25)$

$= 2x^2 + 20x + 50$

(c) $2p^1q^3(p^2q^1 - 2) - (p^3q^4 + 3pq)$ (4)

$= 2p^3q^4 - 4pq^3 - 1p^3q^4 - 3pq$

$= 1p^3q^4 - 4pq^3 - 3pq$

Question 5: [18]

5.1 Solve for x:

(a) $4x - 3 = 6x - 2$ (1)

$4 - 6x = -2 + 3$

$-2x = 1$

$x = -\frac{1}{2}$

(b) $3(x + 1) - (x - 2)^2 = 2 - x^2$ (4)

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

$3x + 3 - x^2 + 4x - 4 = 2 - x^2$

$7x - x^2 + x^2 = -3 + 4 + 2$

$7x = 3 \rightarrow x = \frac{3}{7}$

(c) $(3x - 2)(4 - 3x) = 0$ (2)

$3x - 2 = 0$ or $4 - 3x = 0$

$3x = 2$ $4 = 3x$

$x = \frac{2}{3}$ $x = \frac{4}{3}$

(d) $\frac{x-4}{2} + \frac{1}{x} = \frac{x}{2}$ LCD = 2x (4)

$\frac{2x}{1} \times \frac{(x-4)}{2} + \frac{2x}{1} \times \frac{1}{x} = \frac{2x}{1} \times \frac{x}{2}$ ✓

$x(x-4) + 2 \times 1 = x \times x$

$x^2 - 4x + 2 = x^2$ ✓

$x^2 - 4x - x^2 = -2$

$-4x = -2$ ✓

$x = \frac{-2}{-4}$

$x = \frac{1}{2}$ ✓

5.2 Calculate x and y if $2x + 3 = x$ and $4y - x = 7$ (3)

$2x + 3 = x$ and $4y - x = 7$

$2x - x = -3$

$x = -3$ ✓

$4y - (-3) = 7$ ✓

$4y + 3 = 7$

$4y = 7 - 3$

$4y = 4$

$y = \frac{4}{4}$

$y = 1$ ✓

5.3 **Karen is a long jump athlete. Her friend Sandra, has a personal best for the season that is 0,3 m less than the personal best for Karen for the season. The personal best for the season for Carel, Karen's brother, is double Sandra's personal best for the season. The total (each athlete's personal best) for the three athletes is 15,5 meters. Calculate Karen's personal best for the season.** **(4)**

Assume Karen's personal best is x meters

$\therefore$ Sandra's " " is $(x - 0,3)$ m

and Carel's " " is $2(x - 0,3)$ m

Total = 15,5 meter

$\therefore x + (x - 0,3) + 2(x - 0,3) = 15,5$ ✓

$x + x - 0,3 + 2x - 0,6 = 15,5$

$4x - 0,9 = 15,5$

$4x = 16,4$

$x = \frac{16,4}{4}$

$x = 4,1$ ✓

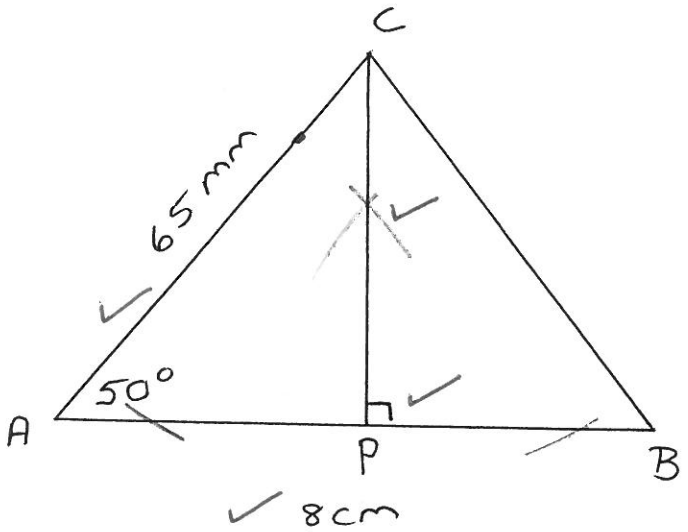
$\therefore$ Karen's personal best for the season is 4,1 m.

Section B (Geometry): [30]

Question 6: [4]

6.1 Use a sharp pencil, compass, protractor and a ruler and construct Δ ABC with $\hat{A} = 50°$, AB = 8 cm and AC = 65 mm. **(2)**

6.2 Use the construction in 6.1 and construct CP if CP $\perp$ AB. **(2)**



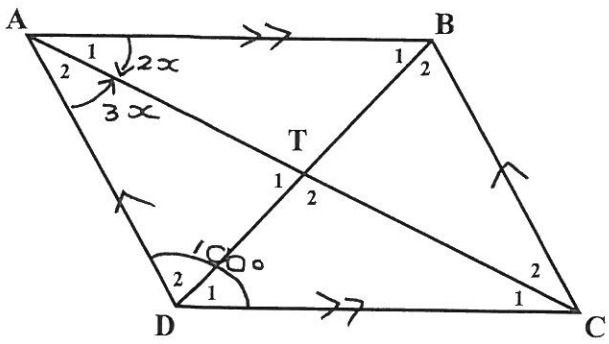
Question 7: [11]

7.1 Complete the following:

(a) A rhombus is a parallelogram of which the adjacent sides are equal in length. ∴ All 4 sides are equal. **(1)**

(b) The diagonals of a parallelogram bisect one another. **(1)**

7.2 ABCD is a parallelogram with $\hat{D} = 100°$.
$\hat{A}_1 = 2x$ and $\hat{A}_2 = 3x$



(a) Calculate, with reasons, for x. (2)

(b) If $\hat{B}_1 = 2x + 18°$, prove that ABCD is a rhombus. (3)

(c) AD = 100 mm and BD = 120 mm. Calculate the length of AT. (4)

(a) $\hat{A} + \hat{D} = 180°$ [co-interior $\angle$s; AB // CD] ✓

$\therefore 5x + 100° = 180°$

$5x = 80°$

$x = \frac{80°}{5} = 16°$ ✓

(b) $\hat{B}_1 = 2x + 18°$

$\hat{B}_1 = 2(16°) + 18°$

$\therefore \hat{B}_1 = 50°$

but $\hat{B}_1 = \hat{D}_1$ ✓ [alternate $\angle$s; AB // CD]

$\therefore \hat{D}_2 = 100° - 50°$ [$\hat{D} = 100°$ given]

$\hat{D}_2 = 50°$

$\therefore \hat{B}_1 = \hat{D}_2 = 50°$ ✓

$\therefore$ AB = AD [sides opposite equal $\angle$s]

$\therefore$ ABCD is a rhombus ✓, because the adjacent sides of parm ABCD are equal.

(c) $\hat{T}_1 = 90°$ ✓ [diag. of rhombus bisect ⊥]

$DT = TB = 60\text{ mm}$ ✓ ["]

In $\triangle ATD$:

$AD^2 = AT^2 + DT^2$ [Pythagoras]

$(100)^2 = AT^2 + (60)^2$

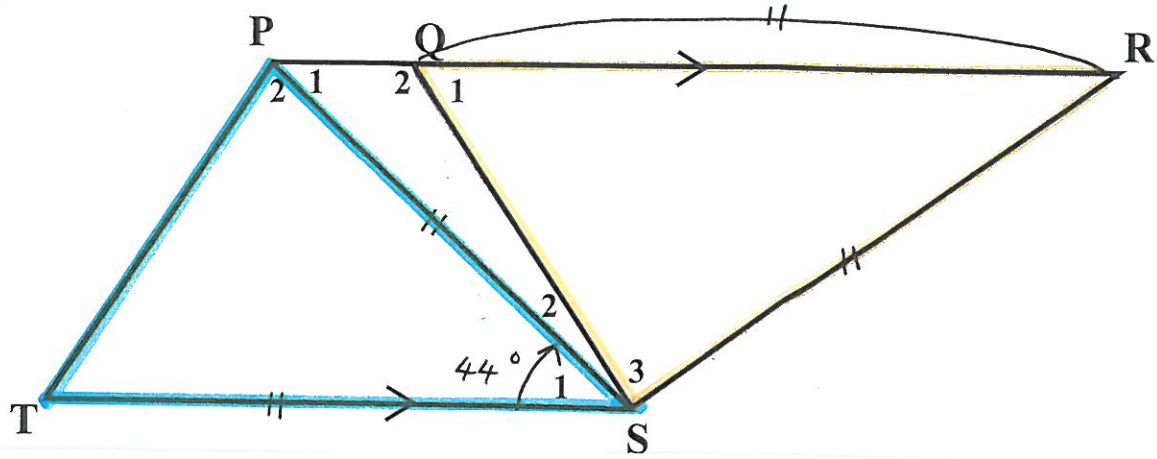
$10000 = AT^2 + 3600$

$\therefore AT^2 = 10000 - 3600$

$AT^2 = 6400$

$\therefore AT = 80\text{ mm}$ ✓

Vraag 8: [7]



PR // TS with TS = PS = RS = QR and $\hat{S}_1 = 44°$

8.1 Calculate $\hat{R}$ **(3)**

8.2 Prove that Δ QRS ≡ Δ PST **(4)**

8.1. $\hat{P}_1 = 44°$ ✓ [Alt ✓ $\angle$s; PR // TS]

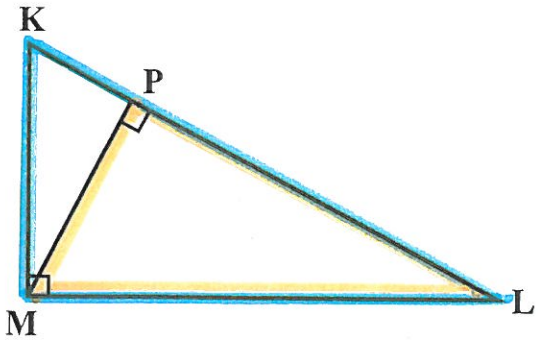
but $\hat{P}_1 = \hat{R} = 44°$ [$\angle$s opposite equal sides: PS = RS] ✓

8.2 In Δ QRS and Δ PST:

* QR = PS ✓ [given]
* $\hat{R} = \hat{S} = 44°$ ✓ [calculated]
* RS = TS ✓ [given]

∴ Δ QRS ≡ Δ PST [S$\angle$S] ✓

Vraag 9: [8]



9.1 Prove that: Δ KML /// Δ MPL **(4)**

9.2 Calculate the length of ML if KL = 9 cm and PL = 4 cm. **(4)**

9.1. In $\triangle KML$ and $\triangle MPL$:

* $\hat{L} = \hat{L}$ [common ∠]
* $\hat{M} = \hat{P}$ [both 90°]
* $\hat{K} = \hat{M}$ [int. ∠s of Δ]

$\therefore \triangle LMK /// \triangle LPM$ [∠∠∠]

9.2 $\frac{LM}{LP} = \frac{MK}{PM} = \frac{LK}{LM}$ [$\triangle KML /// \triangle LPM$]

$\frac{LM}{4} = \frac{9}{LM}$

$LM \times LM = 4 \times 9$

$LM^2 = 36$

$\therefore LM = \sqrt{36} = 6$ cm