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SENIOR PHASE

GRADE 9

NOVEMBER 2017

**MATHEMATICS
MARKING GUIDELINE**

MARKS: 140

This marking guideline consists of 11 pages.

INSTRUCTIONS AND INFORMATION

1. Give full marks for answers only, unless stated otherwise.
2. Accept any alternate correct solutions that are not included in the memorandum.
3. Underline errors committed by learners and apply Consistent Accuracy (CA).
4. THE FINAL MARK MUST BE CONVERTED TO 100.

KEYS	
M	Method
CA	Consistent Accuracy
A	Accuracy
S	Statement
SF	Substitution in Formula
R	Reason
S/R	Statement and Reason

Ques.	Mark allocation		Total
1.1	A	✓	(1)
1.2	D	✓	(1)
1.3	C	✓	(1)
1.4	A	✓	(1)
1.5	B	✓	(1)
1.6	B	✓	(1)
1.7	C	✓	(1)
1.8	D	✓	(1)
1.9	B	✓	(1)
1.10	A	✓	(1)
			[10]

QUESTION 2 [30 marks]			
Ques.	Solution	Mark allocation	Total
2.1	$0,000\ 014\ 6 = 1,46 \times 10^{-5} \checkmark \mathbf{A}$	Answer : 1	(1)
2.2.1	$\sqrt{0,06y^4 + 0,1y^4} \quad \sqrt{0,06y^4 + 0,1y^4}$ $= \sqrt{0,16y^4} \checkmark \mathbf{A}$ $= 0,4y^2 \checkmark \mathbf{A}$ OR $= \sqrt{\frac{16}{100}y^4} \checkmark \mathbf{A}$ $= \frac{2}{5}y^2 \checkmark \mathbf{A}$	$\sqrt{0,16y^4} / \sqrt{\frac{16}{100}y^4} : 1\text{Mark}$ Answer: 1 Mark	(2)
2.2.2	$\frac{\sqrt[3]{x^6}}{(4x^2)^0} = \frac{x^2}{1} = x^2 \checkmark \mathbf{A}$	$x^2 : 1\text{Mark}$ Answer : 1 Mark	(2)
2.2.3	$\frac{(3x^4y^{-1})^2}{x^{-2} \times x^{-1}y^{-2}}$ $= \frac{9x^8y^{-2}}{x^{-3}y^{-2}} \checkmark \mathbf{M}$ $= 9x^{11} \checkmark \mathbf{CA}$	$9x^8y^{-2} : 1\text{Mark}$ $x^{-3}y^{-2} : 1\text{Mark}$ Answer: 1 Mark	(3)
2.2.4	$3(x-3)(x+3) - (x-1)^2$ $= 3(x^2 - 9) - (x^2 - 2x + 1)$ $= 3x^2 - 27 - x^2 + 2x - 1 \checkmark \mathbf{A}$ $= 2x^2 + 2x - 28 \checkmark \mathbf{CA}$	$x^2 - 9 : 1\text{Mark}$ $x^2 - 2x + 1 : 1\text{Mark}$ $3x^2 - 27 - x^2 + 2x - 1 : 1\text{Mark}$ $2x^2 + 2x - 28 : 1\text{Mark}$	(4)
2.2.5	$3\frac{1}{4}x - 2\frac{2}{3} \times 2\frac{1}{6}x + 4\frac{1}{2}x$ $= \frac{13x}{4} - \frac{52x}{9} + \frac{9x}{2} \checkmark \mathbf{M}$ $= \frac{117x - 208x + 162x}{36} \checkmark \mathbf{M}$ $= \frac{71x}{36} \checkmark \mathbf{CA}$	$\frac{13x}{4} - \frac{52x}{9} + \frac{9x}{2} : 1\text{Mark}$ $117x - 208x + 162x : 1\text{Mark}$ $36 : 1\text{Mark}$ $\frac{71x}{36} : 1\text{Mark}$	(4)
2.3.1	$2x^2 + 6x - 36$ $= 2(x^2 + 3x - 18) \checkmark \mathbf{A}$ $= 2(x+6)(x-3) \checkmark \mathbf{A} \quad \checkmark \mathbf{A}$	$2(x^2 + 3x - 18) : 1\text{Mark}$ $(x+6) : 1\text{Mark}$ $(x-3) : 1\text{Mark}$	(3)
2.3.2	$9x(5a-b) + 2(b-5a)$ $= 9x(5a-b) - 2(5a-b) \checkmark \mathbf{M}$ $= (5a-b)(9x-2) \checkmark \mathbf{A} \quad \checkmark \mathbf{A}$	$9x(5a-b) - 2(5a-b) : 1\text{Mark}$ $(5a-b) : 1\text{Mark}$ $(9x-2) : 1\text{Mark}$	(3)

2.4.1	$(2x-3)(2x+3)=0$ $\therefore x = \frac{3}{2} \checkmark \mathbf{A}$ or $\therefore x = -\frac{3}{2} \checkmark \mathbf{A}$	Answer: 1 mark Answer: 1 mark	(2)
2.4.2	$\frac{3x-2}{7} = \frac{x-2}{3}$ $21\left(\frac{3x-2}{7}\right) = 21\left(\frac{x-2}{3}\right) \checkmark \mathbf{M}$ $\therefore 3(3x-2) = 7(x-2)$ $\therefore 9x-6 = 7x-14 \checkmark \mathbf{M}$ $\therefore 2x = -8$ $\therefore x = -4 \checkmark \mathbf{CA}$	$\times$ by LCM: 1Mark $9x-6 = 7x-14$: 1Mark Answer: 1 mark	(3)
2.4.3	$27 \cdot 3^x = 1$ $\therefore 3^x = \frac{1}{27} \checkmark \mathbf{M}$ $\therefore 3^x = 3^{-3} \checkmark \mathbf{M}$ $\therefore x = -3 \checkmark \mathbf{CA}$ OR $27 \cdot 3^x = 1$ $\therefore 3^3 \cdot 3^x = 1$ $\therefore 3^{3+x} = 3^0 \checkmark \mathbf{M}$ $\therefore 3+x = 0 \checkmark \mathbf{M}$ $\therefore x = -3 \checkmark \mathbf{CA}$	$\therefore 3^x = \frac{1}{27}$: 1Mark $3^x = 3^{-3}$: 1Mark Answer: 1 mark OR $3^{3+x} = 3^0$: 1Mark $3+x = 0$: 1Mark Answer: 1 mark	(3)
			[30]

QUESTION 3 [22 Marks]																	
Ques.	Solution					Mark allocation	Total										
3.1																	
3.1.1	<table border="1"><tr><td>Figure</td><td>1</td><td>2</td><td>3</td><td>4</td></tr><tr><td>Number of Triangles</td><td>4</td><td>8</td><td>12</td><td>16</td></tr></table> $p = 12$ and $q = 16$ ✓A					Figure	1	2	3	4	Number of Triangles	4	8	12	16	12 & 16: 1Mark	(1)
Figure	1	2	3	4													
Number of Triangles	4	8	12	16													
3.1.2	$T_n = 4n$ ✓A					$4n$: 1Mark	(1)										
3.1.3	$120 = 4n$ ✓M $n = 30$ ✓CA $\therefore 30^{\text{th}}$ figure ✓A					SF 120 : 1Mark $n = 30$: 1Mark Answer : 1Mark	(3)										
3.2.1	$y = 2x - 4$ $0 = 2x - 4$ ✓M $x = 2$ ✓CA					Let $y = 0$: 1 Mark Answer : 1Mark	(2)										
3.2.2	$y = -4$ ✓A					-4 : 1Mark	(1)										
3.2.3 & 3.3						3.2.3 $y = 2x - 4$ x -int ercept : 1Mark y -int ercept : 1Mark Straight Line : 1Mark 3.3 $x = 4$ x -int ercept : 1Mark vertical / shape : 1Mark	(3) (2)										
3.4	$y = 4$ ✓A					Answer: 1Mark	(1)										
3.5.1	$\frac{1}{3}A - 1 = -1$ ✓M $A = 0$ ✓CA					$\frac{1}{3}A - 1 = -1$: 1Mark Answer: 1Mark	(2)										

3.5.2	$\frac{1}{3}(1) - 1 = B \quad \checkmark A$ $B = -\frac{2}{3} \quad \checkmark CA$	$\frac{1}{3}(1) - 1 = B : 1Mark$ Answer : 1Mark	(2)
3.6.1	Common difference = $-3 - (-5) = 2$ y -intercept = -3 Since $x = 0 \quad \checkmark A$ $y = 2x - 3 \quad \checkmark A$	Explanation : 1 Mark Answer : 1 Mark If ANSWER ONLY Full Marks	(2)
3.6.2	$21 = 2m - 3 \quad \checkmark M$ $m = 12 \quad \checkmark CA$	Substitution : 1Mark Answer : 1Mark	(2)
			[22]
QUESTION 4 [12 marks]			
Ques.	Solution	Mark allocation	Total
4.1	$A = P \left(1 + \frac{r}{100} \right)^n \quad \checkmark M$ $A = 15000 \left(1 + \frac{16}{100} \right)^3 \quad \checkmark SF$ $A = R23413,44 \quad \checkmark CA$ Compound Interest = R 8413,44 $\checkmark CA$	Formula : 1 Mark Substitution : 1Mark R23413,44 : 1Mark Answer : 1Mark	(4)
4.2	Let the age of the son = x $\therefore$ Age of the father = $36 - x \quad \checkmark M$ $\therefore$ Son in 7 years time = $x + 7$ $\therefore$ Father in 7 years time = $43 - x \quad \checkmark M$ $\therefore 4(x + 7) = 43 - x$ $\therefore 4x + 28 = 43 - x$ $\therefore 5x = 15$ $\therefore x = 3 \quad \checkmark CA$ Son is 3 years old and the Father is 33 years old $\checkmark CA$	x and $36 - x$: 1Mark $x + 7$ and $43 - x$: 1Mark $4(x + 7) = 43 - x$: 1Mark CA Answer: 1Mark Both ages: 1Mark	(4)
4.3	$d = s \times t \quad \checkmark M$ $d = 120km / h \times 3h$ $d = 360km \quad \checkmark A$ $t = \frac{d}{s}$ $t = \frac{360km}{90km / h} \quad \checkmark M$ $t = 4h \quad \checkmark CA$	Formula/M : 1Mark $360km$: 1Mark $\frac{360km}{90km / h}$: 1Mark Answer : 1Mark	(4)
			[12]

QUESTION 5 [14]			
Ques.	Solution	Mark allocation	
5.1			
5.1.1	$\angle ADC = 65^\circ$ ($\checkmark A$ corresponding $\angle s$, $CD \parallel AB$) ($\checkmark R$)	Answer: 1 Mark Reason : 1 Mark	(2)
5.1.2	$\angle EBC = 65^\circ$ (Given : $\angle ABE = \angle EBC$) $\angle BCD = 65^\circ$ ($\checkmark A$ Alternate $\angle$'s, $EB \parallel CD$) ($\checkmark R$)	Answer: 1 Mark Reason: 1 Mark	(2)
5.2			
5.2.1	$2x + 35^\circ + 3x - 10^\circ = 140^\circ$ ($\checkmark S$ Exterior $\angle$ of $\triangle RST$) ($\checkmark R$) $5x + 25^\circ = 140^\circ$ ($\checkmark A$) $x = 23^\circ$ ($\checkmark CA$) OR $\angle RTS = 40^\circ$ ($\angle$'s on a straight line = 180°) $2x + 35^\circ + 3x - 10^\circ + 40^\circ = 180^\circ$ ($\checkmark S$ Sum of 3 $\angle$'s of $\triangle RST = 180^\circ$) ($\checkmark R$) $5x + 10^\circ = 140^\circ$ ($\checkmark A$) $x = 23^\circ$ ($\checkmark CA$)	Statement: 1 Mark Reason: 1 Mark Simplifying: 1 Mark Answer: 1 Mark OR Statement: 1 Mark Reason: 1 Mark Simplifying: 1 Mark Answer: 1 Mark	(4)
5.2.2	$\angle QSR = 2x + 35^\circ$ $\angle QSR = 2(23^\circ) + 35^\circ$ ($\checkmark M$) $\angle QSR = 81^\circ$ ($\checkmark CA$)	Substitution/Method: 1 Mark Answer: 1 Mark	(2)
5.3			
5.3.1	$\angle QPR = 35^\circ$ ($\checkmark A$ Sum of 3 $\angle$'s of $\triangle PQR = 180^\circ$) ($\checkmark R$) OR $\angle QPR = 35^\circ$ ($\checkmark A$ Complementary $\angle$'s) ($\checkmark R$)	Answer : 1 Mark Reason : 1 Mark OR Answer : 1 Mark Reason : 1 Mark	(2)
5.3.2	$\angle PSO = 38^\circ$ ($\checkmark A$ $PO = OS$, radii) ($\checkmark R$) OR $\angle PSO = 38^\circ$ ($\checkmark A$ $PO = OS$, radii) ($\checkmark R$)	Answer : 1 Mark Reason : 1 Mark OR Answer : 1 Mark Reason : 1 Mark	(2)
			[14]

QUESTION 6 [11 marks]			
Ques.	Solution	Mark allocation	Total
6.1	$AD + DC = AB + BE$ $\therefore AC = AE \dots \dots \dots (1)$ In $\triangle ABC$ and $\triangle ADE$ $\checkmark$S/R 1 $AC = AE$ [Proved at (1)] 2 $\angle A = \angle A$ [Given] $\checkmark$ S/R 3 $AB = AD$ [Common] $\checkmark$ S/R $\therefore \triangle ABC \equiv \triangle ADE$ SAS $\checkmark$ S/R	Statement and reason: 1 mark Statement and reason: 1 mark Statement and reason: 1 mark Statement and reason: 1 mark	(4)
6.2.1	$\frac{MN}{MK} = \frac{2}{4} = \frac{1}{2}$ $\checkmark$ S $\frac{MK}{ML} = \frac{4}{8} = \frac{1}{2}$ $\checkmark$ S $\frac{NK}{KL} = \frac{5}{10} = \frac{1}{2}$ $\checkmark$ S $\therefore \triangle MNK \parallel \triangle MKL$ [Corresponding sides are in proportion] $\checkmark$ S/R	Statement : 1 mark Statement : 1 mark Statement : 1 mark Statement/Reason : 1 mark	(4)
6.2.2	$\angle KNM = 65^\circ$ ($\angle$'s on a straight line = 180°) $\checkmark$ S/R $\checkmark$ A $\checkmark$ R $\therefore \angle MKL = 65^\circ$ [$\triangle MNK \parallel \triangle MKL$]	Statement/Reason: 1 mark Answer : 1 mark Reason: 1 mark	(3)
			[11]
QUESTION 7 [18 marks]			
Ques.	Solution	Mark allocation	Total
7.1			
7.1.1	$A = \text{Area of } 2\Delta\text{'s} + \text{Area of } 3\text{rectangles}$ $A = 2\left(\frac{1}{2} \times 8\text{cm} \times 6\text{cm}\right) + 15\text{cm} \times 10\text{cm} + 15\text{cm} \times 8\text{cm} + 15\text{cm} \times 6\text{cm}$ $\checkmark$SF $A = 48\text{cm}^2 + 150\text{cm}^2 + 120\text{cm}^2 + 90\text{cm}^2$ $A = 408\text{cm}^2$ $\checkmark$ A	Substitution : 1Mark Answer : 1Mark	(2)
7.1.2	$V = \text{Area of base} \times \text{height}$ $\checkmark$ M $V = \frac{1}{2} \times 8\text{cm} \times 6\text{cm} \times 15\text{cm}$ $\checkmark$ SF $V = 360\text{cm}^3$ $\checkmark$ CA	Formula : 1Mark Substitution : 1Mark Answer : 1Mark	(3)

7.2			
7.2.1	$AE^2 = AB^2 - BE^2$ [Pythagoras] $AE^2 = (5cm)^2 - (4cm)^2$ ✓S $AE^2 = 9cm^2$ $AE = 3cm$ ✓CA	Substitution : 1Mark Answer : 1Mark	(2)
7.2.2	$EC = 3cm$ [AE = EC = 3cm] ✓R OR $EC = 3cm$ [AE = EC = 3cm; Diagonal BD of Kite bisects AC] ✓R $AC = 6cm$ ✓A	Answer : 1 Mark Reason : 1 Mark	(2)
7.2.3	$BD = 4cm + 10cm = 14cm$ Area of Kite ABCD = $\frac{1}{2}(14cm \times 6cm)$ ✓M Area of Kite ABCD = $\frac{1}{2}(AC \times BD)$ Area of Kite ABCD = $42cm^2$ ✓CA Area of Quadrilateral PQRD = $\left(\frac{3}{2} \times 42\right)cm^2$ Area of Quadrilateral PQRD = $63cm^2$ ✓CA	Substitution : 1 Mark $42cm^2$: 1 Mark Answer : 1Mark	(3)
7.3			
7.3.1	$2\pi r = 44$ ✓M $r = \frac{44}{2\pi}$ ✓M $r = 7cm$ ✓CA	$2\pi r = 44$: 1Mark $r = \frac{44}{2\pi}$: 1Mark Answer : 1Mark	(3)
7.3.2	$V = \pi r^2 \times h$ ✓M $A = \pi(7cm)^2 \times 44cm$ ✓M $A = 6773,27cm^3$ ✓CA	$V = \pi r^2 \times h$: 1Mark $A = \pi(7cm)^2 \times 44cm$: 1Mark Answer : 1Mark	(3)
			[18]
QUESTION 8 [10 marks]			
Ques	Solution		
8.1			
8.1.1	$(x; y) \rightarrow (x-5; y+2)$ ✓A ✓A	$x-5$: 1Mark $y+2$: 1Mark	(2)
8.1.2	$A''(6;2)$ and $B''(0;-6)$ and $C''(8;-6)$ ✓A ✓A ✓A	$A''(6;2)$: 1 Mark $B''(0;-6)$: 1 Mark $C''(8;-6)$: 1Mark	(3)

8.2			
8.2.1 and 8.2.2		P(-2;2) ; Q(-3;-1) and R(0;2) 2 Marks ONE mark deducted for every incorrect plotting.	(2)
		P//(-2;-2) : 1 Mark Q//(-1;-3) : 1 Mark R//(2;0) : 1 Mark	(3)
			[10]

QUESTION 9[13 marks]

9.1			
9.1.1	Outcomes Outcomes Blue Pencil → Green Ruler [Blue Pencil;Green Ruler] ✓A Blue Pencil → Green Ruler [Blue Pencil;Green Ruler] ✓A Blue Pencil → White Ruler [Blue Pencil;White Ruler] Red Pencil → Green Ruler [Red Pencil;Green Ruler] ✓A Red Pencil → Green Ruler [Red Pencil;Green Ruler] ✓A Red Pencil → White Ruler [Red Pencil;White Ruler]	3 outcomes: 1Mark 3 outcomes: 1Mark	(2)
9.1.2	P(Red Pencil and Green Ruler) = $\frac{2}{6}$ or $\frac{1}{3}$ or 0,33 or 33% ✓A	Answer : 1 Mark	(1)
9.1.3	P(White Pencil and Red Ruler) = 0 or impossible ✓A	Answer : 1 Mark	(1)

9.2			
9.2.1	Test marks of learners Natural Science mark Maths mark	3 points plotted: 1 Mark 3 points plotted: 1 Mark 3 points plotted: 1 Mark	
			(3)
9.2.2	(15;90) OR (90;40)	(15;90) : 1 Mark OR (90;40) : 1 Mark	(1)
9.2.3	There is a strong positive correlation. ✓A OR Learners who perform well in Mathematics, generally perform well in Natural Science and learners who perform poorly in Mathematics generally perform poorly in Natural Science. ✓A	Answer : 1 Mark OR Answer : 1 Mark	(1)
9.3			
9.3.1	$27 = \frac{x+30}{2}$ ✓M $x = 24$ ✓A	$27 = \frac{x+30}{2}$: 1 Mark Answer : 1 Mark	(2)
9.3.2	$Mean = \frac{300}{10}$ $Mean = 30$ ✓CA	CA from 9.3.1 $\frac{300}{10}$: 1 Mark Answer : 1 Mark	(2)
			[13]
TOTAL:			140