Province of the
EASTERN CAPE
EDUCATION

SENIOR PHASE

GRADE 9

NOVEMBER 2018

MATHEMATICS
MARKING GUIDELINE

MARKS: 140

This marking guideline consists of 13 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 marking guideline.
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

QUESTION 1 [10 marks]

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

QUESTION 2 [25]

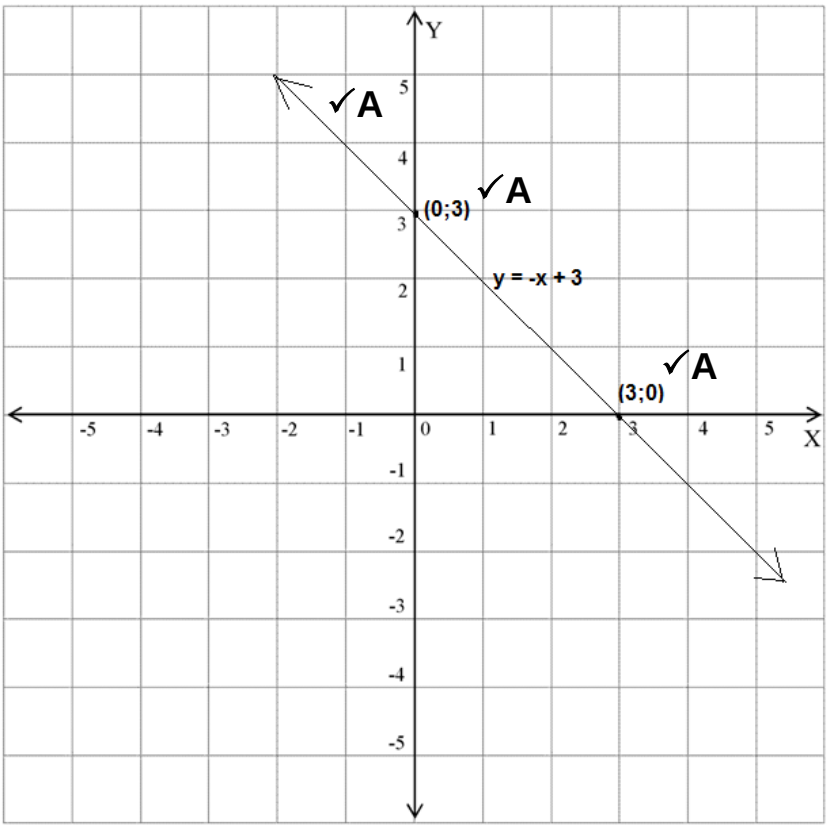
Ques.	Solution	Mark allocation	Total
2.1	1 042 000 000 = $1,042\times10^{9}$ ✓**A**	Answer: 1Mark	(1)
2.2.1	$3z^2-\left(4\frac{2}{3}z^3\div\frac{7z}{2}\right)$ $=3z^2-\left(4\frac{2}{3}z^3\div\frac{7z}{2}\right)$ ✓ **M** $=3z^2-\frac{4z^2}{3}$ ✓ **M** $=\frac{5z^2}{3}/\frac{5}{3}z^2$ ✓**CA**	$\left(\frac{14z^3}{3}\times\frac{2}{7z}\right)$: 1 Mark $\frac{4z^2}{3}$: 1 Mark Answer: 1 Mark	(3)
2.2.2	$2(x-3)^2-3(x+1)(2x-5)$ $=2(x^2-6x+9)-3(2x^2-3x-5)$ ✓**M** ✓**M** $=2x^2-12x+18-6x^2+9x+15$ $=-4x^2-3x+33$ ✓**CA**	(x^2-6x+9): 1 Mark $(2x^2-3x-5)$: 1 Mark Answer: 1 Mark	(3)
2.2.3	$\left(\frac{2x^{-1}y}{3y^2}\right)^{-2}$ $=\left(\frac{2y}{3xy^2}\right)^{-2}$ ✓**M** $=\left(\frac{3xy^2}{2y}\right)^{2}$ ✓**M** $=\frac{9x^2y^2}{4}$ ✓**CA** **OR** $\left(\frac{2x^{-1}y}{3y^2}\right)^{-2}$ $=\frac{2^{-2}x^2y^{-2}}{3^{-2}y^{-4}}$ ✓**M** $=\frac{\frac{1}{4}x^2y^2}{\frac{1}{9}}$ ✓**M** $=\frac{9}{4}x^2y^2$ ✓**CA** **OR**	$\left(\frac{2y}{3xy^2}\right)^{-2}$: 1 Mark $\left(\frac{3xy^2}{2y}\right)^{2}$: 1 Mark Answer: 1 Mark **OR** $\frac{2^{-2}x^2y^{-2}}{3^{-2}y^{-4}}$: 1 Mark $\frac{\frac{1}{4}x^2y^2}{\frac{1}{9}}$: 1 Mark Answer: 1 Mark **OR**	

Ques.	Solution	Mark allocation	Total
	$\left(\frac{2x^{-1}y}{3y^2}\right)^{-2}$ $=\frac{1}{\left(\frac{2x^{-1}y}{3y^2}\right)^2}$ ✓M $=\frac{1}{\frac{2^2x^{-2}y^2}{3^2y^4}}$ ✓M $=\frac{9x^2y^2}{4}$ ✓CA	$\frac{1}{\left(\frac{2x^{-1}y}{3y^2}\right)^2}$: 1 Mark $\frac{1}{\frac{2^2x^{-2}y^2}{3^2y^4}}$: 1 Mark Answer: 1 Mark	(3)
2.2.4	$\frac{\sqrt{169x^6}\times\left(\frac{y}{p^{99}q}\right)^0}{\sqrt[3]{x^{12}}}$ ✓M $=\frac{13x^3\times1}{x^4}$ ✓M $=\frac{13}{x}$ ✓A	$13x^3$: 1 Mark x^4: 1 Mark Answer: 1 Mark	(3)
2.3.1	$ax^2-5ax+6a$ ✓M $=a(x^2-5x+6)$ ✓CA $=a(x-3)(x-2)$	$a(x^2-5x+6)$: 1 Mark $(x-3)$: 1 Mark $(x-2)$: 1 Mark	(3)
2.3.2	$(2x-3y)+(3y-2x)x^2$ $=(2x-3y)-(2x-3y)x^2$ ✓M $=(2x-3y)(1-x^2)$ ✓CA $=(2x-3y)(1+x)(1-x)$ ✓CA	$(2x-3y)-(2x-3y)x^2$: 1 Mark $(2x-3y)(1-x^2)$: 1 Mark $(2x-3y)(1+x)(1-x)$: 1 Mark	(3)
2.4.1	$\frac{x}{2}+\frac{2x+3}{3}=1$ $\therefore 6\left(\frac{x}{2}\right)+6\left(\frac{2x+3}{3}\right)=6(1)$ ✓M $\therefore 3x+4x+6=6$ $\therefore 7x=0$ $\therefore x=0$ ✓CA	× by LCM: 1 Mark Answer: 1 Mark	(2)

Ques.	Solution	Mark allocation	Total
2.4.2	$x^2 + x = 12$ $\therefore x^2 + x - 12 = 0$ $\therefore (x+4)(x-3) = 0$ ✓**M** ✓**CA** $\therefore x = -4$ or $x = 3$	$(x+4)(x-3)$: 1 Mark Both solutions: 1 Mark	(2)
2.4.3	$5^{x+2} = \frac{1}{25}$ $\therefore 5^{x+2} = 5^{-2}$ ✓**M** $\therefore x + 2 = -2$ $\therefore x = -4$ ✓**CA**	5^{-2}: 1 Mark Answer: 1 Mark	(2)
			[25]

QUESTION 3 [26]

Ques.	Solution	Mark allocation	Total
3.1			
3.1.1	<table><tr><td>Shape</td><td>1</td><td>2</td><td>3</td><td>4</td><td>…</td><td>25</td></tr><tr><td>Number of rectangles</td><td>5</td><td>9</td><td>13</td><td>17</td><td>…</td><td>101</td></tr></table> $q = 17 \text{ and } r = 25$ ✓A	q = 17 and r = 25 : 1 Mark	(1)
3.1.2	$T_n = 4n+1$ ✓A ✓A	$4n$: 1 Mark $+1$: 1 Mark	(2)
3.1.3	$T_n = 4n+1$ $205 = 4n+1$ ✓SF $n = 51$ ∴ Shape number 51 has 205 rectangles. ✓CA	T_n =205 : 1 Mark Answer: 1 Mark	(2)
3.2.1	$T_n = n^2+1$ ✓A ✓A	n^2 : 1 Mark $+1$: 1 Mark	(2)
3.2.2	$T_n = n^2+1$ $T_{10} = (10)^2+1$ ✓SF $T_n = 101$ ✓CA	$SF(n=10)$: 1 Mark Answer: 1 Mark	(2)
3.3.1	$A = \frac{1}{2}x+2$ $A = \frac{1}{2}(-2)+2$ ✓SF $A = 1$ ✓CA	SF x = -2 : 1 Mark Answer: 1 Mark	(2)
3.3.2	$\frac{1}{2}(B)+2 = 4$ ✓SF $B = 4$ ✓CA	SF x = B : 1 Mark Answer: 1 Mark	(2)

Ques.	Solution	Mark allocation	Total
3.4.1	Common difference = $-7-(-10)=3$ $y-$intercept = -1 Since $x=0$ ✓A $y=3x-1$ ✓A OR $m=\frac{y_2-y_1}{x_2-x_1}$ $m=\frac{-7-(-10)}{-2-(-3)}$ $m=3$ ✓A $y=3x-1$ ✓A	Explanation: 1 Mark Answer: 1 Mark If ANSWER ONLY Full Marks OR m = 3: 1 Mark Answer: 1 Mark If ANSWER ONLY Full Marks	(2)
3.4.2	$y=3x-1$ $8=3q-1$ ✓SF $q=3$ ✓CA	SF both values: 1 Mark Answer: 1 Mark	(2)
3.5.1	$y=-x+3$ $0=-x+3$ $x=3$ ✓A	Answer: 1 Mark	(1)
3.5.2		$y=-x+3$ $x-$int*ercept*: 1 Mark $y-$int*ercept*: 1 Mark Straight Line : 1Mark	(3)

Ques.	Solution	Mark allocation	Total
3.6.1	Monday to Tuesday ✓A **OR** Saturday to Sunday ✓A	Answer: 1 Mark	(1)
3.6.2	15 packets of sweets sold ✓A **OR** 10 packets of sweets sold ✓A	Answer: 1 Mark	(1)
3.6.3	Thursday to Saturday ✓A	Answer: 1 Mark	(1)
3.6.4	The decrease varied.✓A	Answer: 1 Mark	(1)
3.6.5	The sales were constant.✓A **OR** No increase or decrease in the sales.✓A	Answer: 1 Mark	(1)
			[26]

QUESTION 4 [12]

Ques.	Solution	Mark allocation	Total
4.1	$SI = P.i.n$ ✓M $720 = 1800.i.5$ ✓SF $i = \frac{720}{1800 \times 5}$ $r = \frac{720}{1800 \times 5} \times 100$ $r = 8\%$ ✓CA	Formula: 1 Mark Substitution: 1 Mark Answer: 1 Mark	(3)
4.2	Let the breadth of the original playground $= x$ $\therefore$ The length of the original playground $= x+1$ $\therefore$ The perimeter of the original playground $= 2(x+1+x)$ ✓M $= 4x+2$ ✓M The length of the new playground $= x+4$ The breadth of the new playground $= x-1$ $\therefore$ The perimeter of the new playground $= 2(x+4+x-1)$ ✓M $= 4x+6$ ✓M $\therefore$ The difference in perimeter $= 4x+6-(4x+2)$ $= 4 meters$ ✓CA	$2(x+1+x)$: 1 Mark $4x+2$: 1 Mark $2(x+4+x-1)$: 1 Mark $4x+6$: 1 Mark Answer: 1 Mark	(5)
4.3	Total distance travelled $= 210 km$ Total time travelled $= 2,5 hours$ ✓M Average Speed $= \frac{Distance}{Time}$ ✓M $= \frac{210 km}{2,5 hours}$ ✓SF $= 84 km/h$ ✓CA	Distance & Time: 1 Mark *Formula*: 1 Mark *Substitution*: 1 Mark Answer: 1 Mark	(4)
			[12]

QUESTION 5 [19]

Ques.	Solution	Mark allocation	Tot
5.1			
5.1.1	✓A ✓R $x = 85^\circ \left(\text{Alternate } \angle's;\ \text{AC//HF}\right)$	Answer: 1 Mark Reason: 1 Mark	(2)
5.1.2	✓A ✓R $y = 95^\circ \left(\text{Co-interior } \angle's = 180^\circ;\ \text{BF//CD}\right)$	Answer: 1 Mark Reason: 1 Mark	(2)
5.2			
5.2.1	$\angle Q_1 = 55^\circ \left(\text{Corresponding } \angle's;\ \text{MN//QP}\right)$ ✓S/ R $55^\circ + 2x - 5^\circ + 3x + 40^\circ = 180^\circ \left(3\ \angle's \text{ of } \Delta PQO = 180^\circ\right)$ ✓S ✓R $5x + 90^\circ = 180^\circ$ $x = 18^\circ$ ✓CA	Statement and reason: 1 Mark Statement: 1 Mark Reason: 1 Mark Answer: 1 Mark	(4)
5.2.2	$\angle MON = 2x - 5^\circ$ $= 2(18^\circ) - 5^\circ$ ✓M $= 31^\circ$ ✓CA	Substitution/Method:1 Mark Answer: 1 Mark	(2)
5.3.1	$\angle ADB + \angle ABD = 110^\circ [3\ \angle\text{'s of } \Delta ABD = 180^\circ]$ ✓S/R But $\angle ADB = \angle ABD [\Delta ADB \text{ is isosceles with AD} = \text{AB}]$ ✓S/R $\therefore\ \angle ADB = 55^\circ$ ✓A	Statement and reason:1 Mark Statement and reason:1 Mark Answer: 1 Mark	(3)
5.3.2	✓S ✓R $\angle BDC = 55^\circ [\text{Diagonal of rhombus ABCD bisect } \angle's]$ $\therefore \angle ADC = 110^\circ$ ✓A **OR** ✓S ✓R $\angle DAE + \angle ADC = 180^\circ [\text{Co-interior } \angle's = 180^\circ;\ \text{DC//AE}]$ $\therefore 70^\circ + \angle ADC = 180^\circ [\text{Co-interior } \angle's = 180^\circ;\ \text{DC//AE}]$ $\therefore \angle ADC = 110^\circ$ ✓A	Statement :1 Mark Reason:1 Mark Answer: 1 Mark **OR** Statement :1 Mark Reason:1 Mark Answer: 1 Mark	(3)
5.3.3	✓S ✓R $\angle DBE = 125^\circ [\text{Exterior } \angle \text{ of } \Delta ABD]$	Statement :1 Mark Reason:1 Mark	(2)
5.3.4	The opposite side of a rhombus are parallel. ✓R OR DC//AE ✓R	Reason:1 Mark	(1)
			[19]

QUESTION 6 [12]

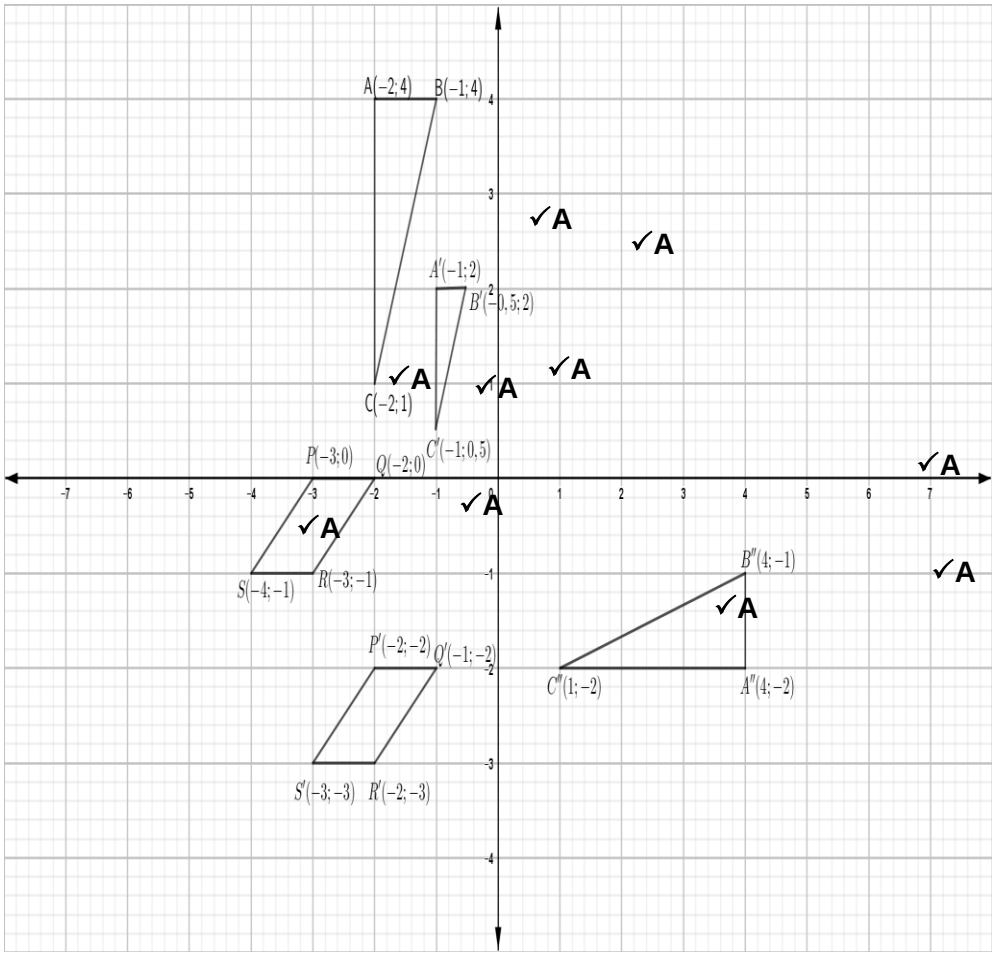
Ques.	Solution	Mark allocation	Total
6.1	In ΔPMN and ΔNOP: 1. $\angle MPN=\angle PNO$ [Alternate $\angle$'s; MP //NO] ✓**S/R** 2. $\angle MNP=\angle NPO$ [Alternate $\angle$'s; MN //PO] ✓**S/R** 3. PN=PN [Common] ✓**S/R** $\therefore$ $\Delta PMN \equiv \Delta NOP[\angle\angle S]$ ✓**S/R** $\therefore$ PM = NO ✓**S/R**	Statement and reason: 1 Mark Statement and reason: 1 Mark Statement and reason: 1 Mark Statement and reason: 1 Mark Statement and reason: 1 Mark	(5)
6.2.1	In ΔDBE and ΔFCE: 1. $\angle E_1=\angle E_3$ [Vertically Opposite $\angle$'s] ✓**S/R** 2. $\angle D_1=\angle F$ [Alternate $\angle$'s; AB//CF] ✓**S/R** 3. $\angle B=\angle C_2$ [Alternate $\angle$'s; AB//CF] ✓**S/R** $\therefore$ ΔDBE lll $\Delta FCE[\angle\angle\angle]$ ✓**S/R** **Note:** The learner can use any 2 pairs of equal angles in his/her proof and then simply state that the last pair of corresponding angles are equal because the sum of 3 angles of a triangle is equal to 180˚.	Statement and reason: 1 Mark Statement and reason: 1 Mark Statement and reason: 1 Mark Statement and reason: 1 Mark	(4)
6.2.2	$\frac{DB}{FC}=\frac{BE}{CE}$ [ΔDBE lll ΔFCE] ✓**S/R** $\frac{DB}{5}=\frac{8}{10}$ ✓**SF** $DB=4cm$ ✓**CA**	Statement and reason: 1 Mark Substitution: 1 Mark Answer: 1 Mark	(3)
			[12]

QUESTION 7 [13]

Ques.	Solution	Mark allocation	Total
7.1.1	Total Surface Area of pipe closed $=2\pi r^2+2\pi r\times h$ $=2\pi(18)^2+2\pi(18)\times 120$ ✓**SF** $=15607,4323cm^2$ ✓**CA** Total Surface Area of circular ends $=2\pi r^2$ $=2\pi(15)^2$ $=1413,716694cm^2$ ✓**A** Total Surface Area of pipe open both sides $=15607,4323cm^2-1413,716694cm^2$ $=14193,72cm^2$ ✓**CA**	Substitution: 1 Mark $25000,79434cm^2$:1 Mark $2513,274123cm^2$:1 Mark Answer: 1 Mark	(4)

Ques.	Solution	Mark allocation	Total
7.1.2	Total Volume of pipe closed $= \pi r^2 \times h$ $= \pi(18)^2 \times 120$ ✓**SF** $= 122145,1224 cm^3$ ✓**CA** Total Volume of hole $= \pi r^2 \times h$ $= \pi(15)^2 \times 120$ $= 84823,00165 cm^3$ ✓**A** Total Volume of pipe (open on both sides) $= 122145,1224 cm^3 - 84823,00165 cm^3$ $= 37322,12 cm^3$ ✓**CA**	Substitution: 1 Mark $122145,1224 cm^3$: 1 Mark $84823,00165 cm^3$: 1 Mark Answer: 1 Mark	(4)
7.2	FC $= \sqrt{5^2 - 4^2}$ [Theorem of Pythagoras] FC $= 3cm$ ✓**A** Area of ΔABC $= \frac{1}{2} \times 6cm \times 4cm$ $= 12 cm^2$ ✓**CA** Area of square ACDE $= 6cm \times 6cm$ $= 36\ cm^2$ ✓**CA** Area of Circle $= \pi \times (3cm)^2$ $= 28,27433388\ \text{cm}^2$ ✓**CA** Area of ALL the shaded sections $= 12\ \text{cm}^2 + (36 cm^2 - 28,27433388 cm^2)$ $= 19,73\ cm^2$ ✓**CA**	$FC = 3cm$: 1 Mark $12 cm^2$: 1 Mark $36\ cm^2$: 1 Mark $28,27433388\ \text{cm}^2$: 1 Mark Answer: 1 Mark	(5)
			[13]

QUESTION 8 [10]

Ques.	Solution	Mark allocation	Tot.
8.1 and 8.2 and 8.3		8.1 $A^{l}(-1;2)$: 1 Mark $B^{l}(-0,5;2)$: 1 Mark $C^{l}(-1;0,5)$: 1 Mark	(3)
		8.2 $A^{ll}(4;-2)$: 1 Mark $B^{ll}(4;-1)$: 1 Mark $C^{ll}(1;-2)$: 1 Mark	(3)
		8.3 $P(-3;0)$: 1 Mark $Q(-2;0)$: 1 Mark $R(-3;-1)$: 1 Mark $S(-4;-1)$: 1 Mark	(4)
			[10]

QUESTION 9 [13]			
Ques.	**Solution**	**Mark allocation**	**Total**
9.1.1	a = 19 ✓**A** b = 90 ✓**A** c = 61	Value of a: 1 Mark Value of b and c: 1 Mark	(2)
9.1.2 a)	$P(\text{Girl}) = \frac{150}{250} / \frac{3}{5}$ ✓**A** ✓**A**	Numerator: 1 Mark Denominator: 1 Mark	(2)
9.1.2 b)	$P(\text{A boy owning a cell phone}) = \frac{76}{250} / \frac{38}{125}$ ✓**A** ✓**A**	Numerator: 1 Mark Denominator: 1 Mark	(2)
9.1.2 c)	$P(\text{A learner with no cell phone}) = \frac{61}{250}$ ✓**A** ✓**A**	Answer: 1 Mark	(2)
9.2.1	The mean tends to be shifted upwards if there are extreme values. ✓**S** In this case, there are a few higher salaries, so the mean is shifted upwards, ✓**R** while the median shows that half of the salaries will be below R5 225. ✓**R**	Statement: 1 Mark Reason: 1 Mark Reason: 1 Mark **Accept any other logical explanation.**	(3)
9.2.2	✓**A** The median is generally a better indicator of the real situation when the data is not evenly spread out. ✓**R**	The median: 1 Mark Reason: 1 Mark **Accept any other logical explanation.**	(2)
			[13]
		TOTAL:	**140**