

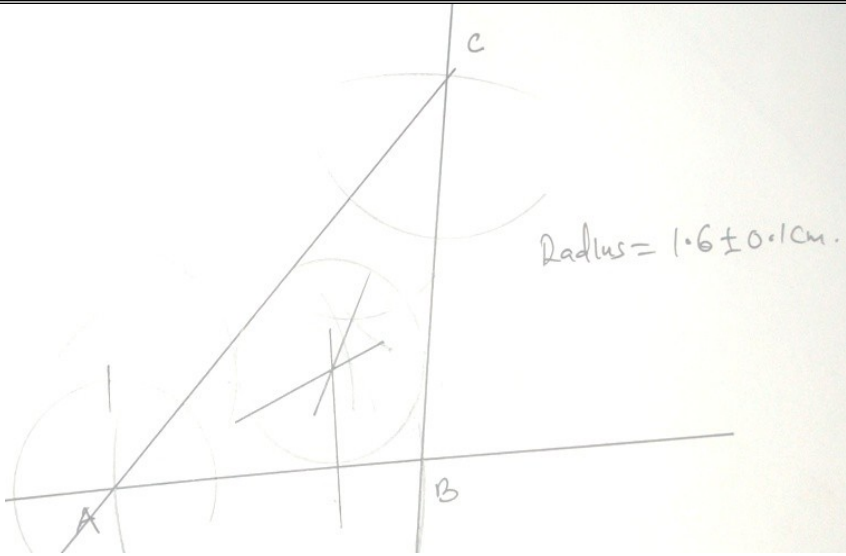
ST.CECILIA, NANGINA GIRLS' HIGH SCHOOL
FORM THREE END YEAR, 2019
MATHEMATICS
MARKING SCHEME

Paper 2

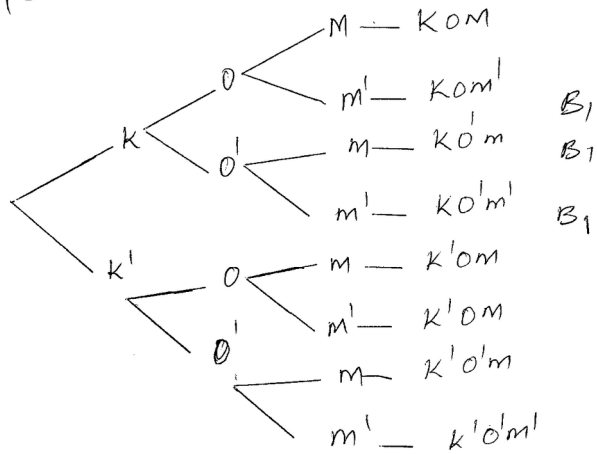
SECTION I

	WORKING	MARKS	GUIDELINES
1.	$\frac{133 \times 0.51 \times 1000000}{0.19 \times 0.0017 \times 1000000}$ $\frac{133 \times 51 \times 100}{19 \times 17}$ $617 \frac{11}{17}$	M1 M1 A1	Removal of fractions Correct Attempt to simplify CAO
		3	
2.	Error = $\frac{1}{2} \times 0.1 = \pm 0.05\text{cm}$ Actual length = $12.5 + 24.5 + 12.9 + 10.1 = 60.0$ Max length = $12.55 + 24.55 + 12.95 + 10.15 = 60.20$ Min length = $12.45 + 24.45 + 12.85 + 10.05 = 59.80$ A.E. = $\frac{60.20 - 59.80}{2}$ P.E. = $\frac{0.2}{60} \times 100 = 0.3\%$	M1 M1 A1	
		3	
3.	a) boys = $900 - 600 = 300$ ratio 3000:600 1:2 b) $300/900 \times 100$ $33 \frac{1}{3}\%$	M1 A1 B1	Getting the number of boys. Should be simplified.
4.	X R = $\frac{4.8 \times 5}{6} = 4$ $QT^2 = PT \times RT$ $QT^2 = 18 \times 8$ $QT = \sqrt{144} = QT = 12\text{cm}$	M1 M1 A1	
		3	

9.	$4(t-1) - 3(4+t)=0$ $4t-3t - 4 - 12=0$ $t- 16 = 0$ $t= 16$	M1 A1	Attempting to remove fractions. Removing brackets correctly.
10.	i) $1^5 - 5(3x) + 1^3 \times 10 (3x)^2 - 1^2 \times 10 (3x)^3 +$ $1 - 15x + 90x^2 - 270x^3$ ii) $(0.97)^5 = (1 - 0.03)^5$ $3x = 0.03$ $x = 0.01$ $(0.97)^5 = 1 - 15(0.01) + 90(0.01)^2 - 270(0.01)^3$ $= 0.8587$	M1 A1 M1 A1	Simplified expression Substitution C.A.O
11.	$\cos 4x = -\frac{1}{2}$ $\cos^{-1} -\frac{1}{2} = 120^\circ, 240, 480$ $x = 30^\circ, 60^\circ, 120^\circ, 150$	M1 M1 A1	
		03	
12.	$\frac{2\sqrt{5}(\sqrt{5} - 2)}{(\sqrt{5} + 2)(\sqrt{5} - 2)}$ $\frac{10 - 4\sqrt{10}}{5 - 4}$ $10 - 4\sqrt{5}$	M1 M1 A1	For conjugate Numerator correctly expanded and denominator rationalized
		03	

13.		B1 B1 B1 B1	Construction of 45 Complete triangle Angle bisectors radius
14.	Tap A $\frac{1}{8} \times 2 = \frac{1}{4}$ Tap B $\frac{1}{10} \times 1 = \frac{1}{10}$ $\frac{1}{8} + \frac{1}{10} = \frac{9}{40}$ $\frac{9}{40} - \frac{1}{5} = \frac{1}{40}$ Remaining part $\frac{1}{10}$ $\frac{1}{10} \times \frac{40}{1} = 4 \text{ min}$ 4 minutes	M ₁ M ₁ A ₁	
15.	$3(2i-3j+k) + 2(3i-4j-3k)$ $6i-9j+3k+6i-8j-6k$ $12i-17j-3k$ ii) $(12)^2 + (-17)^2 + (-3)^2$ $442 = 21.02$		M1 A1 Accept the column vector. M1 for r of 442 seen. A1
		10	

24 (a)



b) i) $B^1 L^1 L^1 = \frac{1}{3} \times \frac{1}{4} \times \frac{1}{6} = \frac{1}{72}$

ii) $BLM + KOM^1 + KO^1M + K^1OM$

$$= \frac{2}{3} \times \frac{3}{4} \times \frac{5}{6} + \frac{2}{3} \times \frac{3}{4} \times \frac{1}{6} + \frac{2}{3} \times \frac{1}{4} \times \frac{5}{6} + \frac{1}{3} \times \frac{3}{4} \times \frac{5}{6} = \frac{5}{12}$$

$$+ \frac{1}{12} + \frac{5}{36} + \frac{5}{24} = \frac{61}{72}$$

iii) $KO^1M + K^1OM^1 + K^1O^1M = \frac{2}{3} \times \frac{1}{4} \times \frac{1}{6} + \frac{1}{3} \times \frac{3}{4} \times \frac{1}{6}$

$$+ \frac{1}{3} \times \frac{1}{4} \times \frac{5}{6} = \frac{1}{36} + \frac{1}{24} + \frac{5}{72} = \frac{5}{36}$$

B1

B1

M1

A1

M1

M1

A1

M1

A1

10

19.	$R \propto \frac{S}{T^2} \rightarrow R = \frac{kS}{T^2}$		B1	Accept alternative methods
	$R = 480 \text{ when } S = 150 \text{ and } T = 5$			
	$480 = \frac{k \times 150}{25}$	M1		
	$k = \frac{480 \times 25}{150} = 80$	M1		
	$R = \frac{80 S}{T^2}$		A1	
	$(i) R = \frac{80 \times 360}{2.25}$			
	$= 12\,800$		M1	
			A1	
	$(ii) S_2 = 1.05 S, T_2 = 0.8T$			
	$R_2 = \frac{80 \times 1.05 S}{0.64 T^2} = 131.25 \frac{S}{T^2}$	M1		
	$\% \text{ change} = \left(\frac{131.25 - 80}{80} \right) \times 100$	M1		
	118.75%	M1		
			A1	
		10		

20.	(a) 40° $\angle ADB = \angle ACB$ - angles in same segment (b) Line AOC is a diameter $\angle ABC = 90^\circ$ ($\angle$ in semi circle) Hence $\angle BAC = 180 - (90 + 40)$ ($\angle$sum of DABC) $\angle BAC = 50^\circ$ (c) $DAB = (20 + 50) = 70^\circ$ $BCD = 180 - 70$ (opposite $\angle$S of cyclic quadrilateral) $BCD = 110^\circ$ $\angle ACD = 110 - 40 = 70^\circ$ (d) $\angle ADC = 90^\circ$ ($\angle$ in semi circle) $\angle BDC = \angle ADC - (\angle ADB = 90 - 40 = 50^\circ)$ $BCD = 110^\circ$ $\angle CBD = 180 - (110 + 50)$ ($\angle$sum of DBCD) $= 20^\circ$ (e) Point = 270° angle at a pont	B1 B1 B1 B1 B1 B1 B1 B1 B1 B1	
		10	

21.

22. a) The first term of an Arithmetic Progression (AP) is 2. The sum of the first 8 terms of the AP is 156.

i) Find the common difference of the AP (2mks)

$$\frac{n}{2} [2a + (n-1)d] = 156$$

$$4 [4 + 7d] = 156$$

M1

$$16 + 28d = 156$$

$$28d = 140$$

$$d = 5$$

A1

ii) Given that the sum of the first n terms of the AP is 416, find n .

$$\frac{n}{2} [4 + (n-1)5] = 416$$

(2mks)

$$4n + 5n^2 - 5n = 832$$

$$5n^2 - n - 832 = 0$$

$$5n^2 - 65n + 64n - 832 = 0$$

$$5n(n-13) + 64(n-13) = 0$$

$$n = 13$$

b) The 3rd, 5th and 8th terms of another AP from the first three terms of a Geometric progression (GP). If the common difference of the AP is 3, Find:

i) The first term of the GP (4mks)

$$a + 2d, a + 4d, a + 7d$$

B1

$$a + 6, a + 12, a + 21$$

M1

$$\frac{a+12}{a+6} = \frac{a+21}{a+12}$$

M1

$$18 = 2a$$

$$a = 9$$

A1

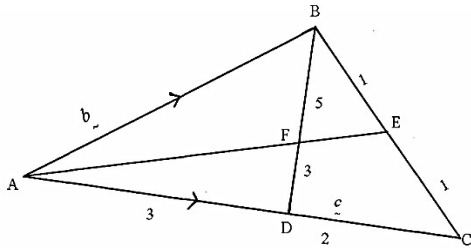
ii) The sum of the first 9 terms of the GP, to 4 s.f. (2mks)

$$r = \frac{a+12}{a+6} = \frac{21}{15} = \frac{7}{5}$$

$$S_n = \frac{a[(\frac{7}{5})^9 - 1]}{\frac{7}{5} - 1} = 442.4$$

10

22.



a) (i) $\vec{BD} = -\vec{b} + \frac{3}{5}\vec{c} = \frac{3}{5}\vec{c} - \vec{b}$

ii) $\vec{AE} = \vec{b} + \frac{1}{2}(\vec{b} + \vec{c}) = \vec{b} - \frac{1}{2}\vec{b} + \frac{1}{2}\vec{c} = \frac{1}{2}\vec{b} + \frac{1}{2}\vec{c}$ or $= \frac{1}{2}(\vec{b} + \vec{c})$

(b) $\vec{AF} = \vec{AB} + \vec{BF} = \vec{b} + t\left(\frac{3}{5}\vec{c} - \vec{b}\right) = \vec{b} - t\vec{b} + \frac{3}{5}t\vec{c} =$

$\vec{b}(1-t) + \frac{3}{5}t\vec{c}$

$\vec{AF} = n\vec{AE} = n\left(\frac{1}{2}\vec{b} + \frac{1}{2}\vec{c}\right)$

$\therefore \vec{b}(1-t) + \frac{3}{5}t\vec{c} = \frac{1}{2}n\vec{b} + \frac{1}{2}n\vec{c}$

Then $1-t = \frac{1}{2}n$ and $\frac{1}{2}n = \frac{3}{5}t$

$2-2t=n$

$5n=6t$

$n = \frac{6}{5}t$

$\therefore 2-2t = \frac{6}{5}t$

$10-10t=6t$

$10=16t$

therefore, $t = \frac{10}{16} = \frac{5}{8}$

$n = \frac{6}{5}t = \frac{6}{5} \times \frac{5}{8} = \frac{3}{4}$

(c) $\vec{BF} = t\vec{BD}$

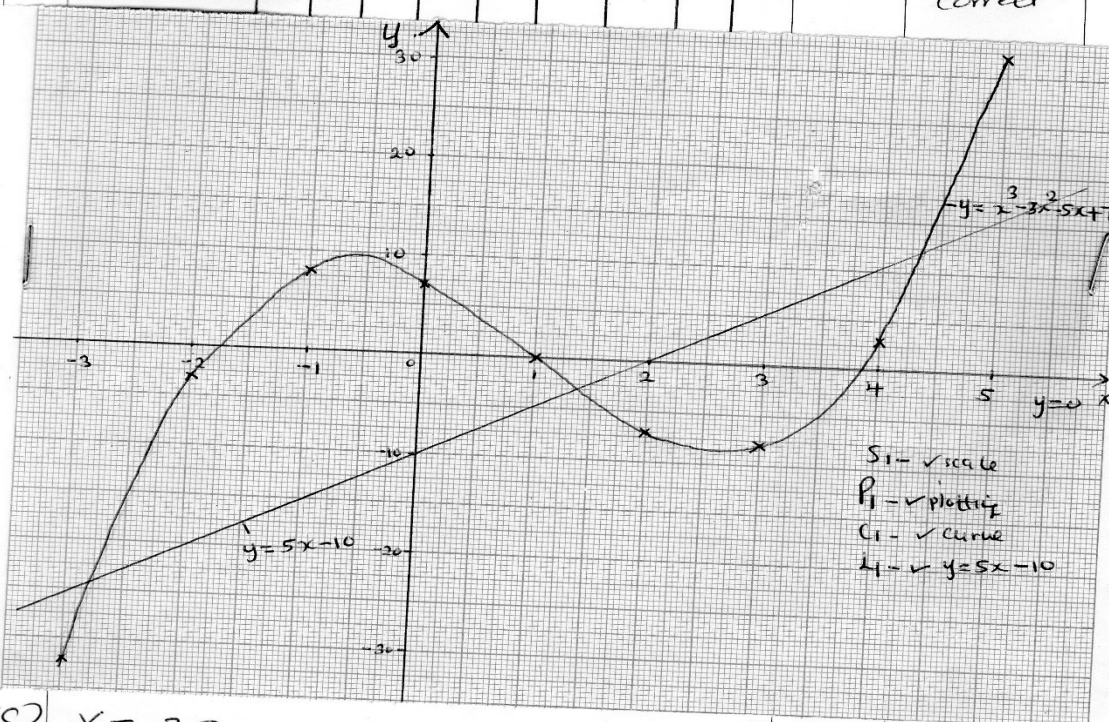
$\frac{BF}{BD} = \frac{5}{8}$

8:5

10

23.

CALCULATIONS											MARKS	REMARKS
24	x	-3	-2	-1	0	1	2	3	4	5		
(c)	$y = x^3 - 3x^2 - 5x + 7$	-32	-3	8	7	0	-7	-8	3	32	B ₂	All values correct.



(c) $x = 3.8$ & $x = -1.8$ & $x = 1$

d. $y = x^3 - 3x^2 - 5x + 7$
 $0 = x^3 - 3x^2 - 10x + 17$
 $y = \frac{5x - 7}{x^2 - 3x - 10}$

$x = 4.35$ & $x = 1.4$ & $x = -2.8$

B₂ For all values correct.

B₂ All values correct
 HB allow an error of 0.1

10.

24.

H.P = (24 X 1250) + 7200

10

M1

	$= 3000 + 7200$ 37200. b) cash price $= \frac{100}{124} \times 37200$ = 30,000	M1 A1 M1 A1	
	c) $A = 30\,000(1 + \frac{18}{100})^2$ $= 30,000(1.18)^2$ $= 41772.$ Total interest = $41772 - 30,000$ $= 11772.$	M1 M1 A1	
	d) $A = 800,000(1 - \frac{20}{100})^5$ $= 262,144.$	M1 A1	
		10	