CSSA

2021

TRIAL HIGHER SCHOOL CERTIFICATE EXAMINATION

MARKING GUIDELINES

Mathematics Standard 2

Section I

15 marks

Questions 1-15 (1 mark each)

Question	Answer	Content	Syllabus Assessed	Targeted Performance Bands
1	D	Commission	MS-F1.2	2-3
2	B	Minimum spanning tree	MS-N2.2	2-3
3	D	Non-linear relationships	MS-A4.2	2-3
4	A	Direct variation	MS-A2	3-4
5	B	Rates	MS-M7	3-4
6	A	Standard form	MS-M1.1	3-4
7	C	Mean and standard deviation	MS-S1.2	3-4
8	A	Trigonometry	MS-M6	3-4
9	D	Pareto chart	MS-S1.1	4-5
10	C	Scale	MS-M7	4-5
11	A	Algebra	MS-A1	4-5
12	B	Inflation	MS-F4.1	4-5
13	C	Theoretical and experimental probability	MS-S2	4-5
14	D	Trigonometry	MS-M6	5-6
15	C	Networks	MS-N3	5-6

Section II

85 marks
Questions 16 – 41

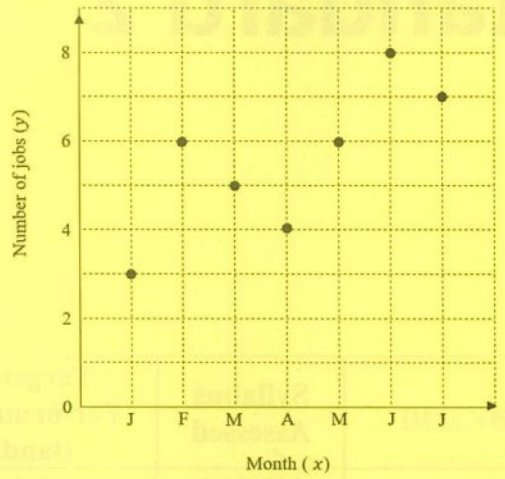
Question 16 (3 marks)

16(a) (2 marks)

Content: **MS-S4**

Outcomes assessed: **MS2-12-2**

Targeted Performance Bands: **2-3**

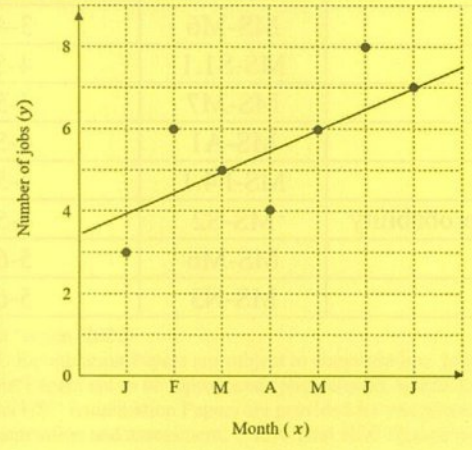
Solution	Criteria	Marks
	**1 mark** for some correct values shown on scatterplot **2 marks** for correct scatterplot	**2**

16(b) (1 mark)

Content: **MS-S4**

Outcomes assessed: **MS2-12-2**

Targeted Performance Bands: **2-3**

Sample Solution	Criteria	Mark
	**1 mark** for a correct line of best fit	**1**

Question 17 (2 marks)
Content: **MS-F1.2**
Outcomes assessed: **MS2-12-5**
Targeted Performance Bands: **2-3**

Solution	Criteria	Marks
Hours $= 15 + 6 \times 1\frac{1}{2} = 24$ $\$27.60 \times 24 = \$662.40$	**1 mark** for calculation of hours or similar progress **2 marks** for correct working and answer	**2**

Question 18 (2 marks)
Content: **MS-M7**
Outcomes assessed: **MS2-12-3**
Targeted Performance Bands: **2-3**

Solution	Criteria	Marks
$\$200 \div \$1.79 = 111.7318436$ litres $111.73\ldots \div 6.2 \times 100 = 1802.13$ Ethel can travel 1802 km	**1 mark** for calculation of number of litres or similar progress **2 marks** for correct working and answer	**2**

Question 19 (3 marks)
19(a) (1 mark)
Content: **MS-M2**
Outcomes assessed: **MS2-12-3**
Targeted Performance Bands: **2-3**

Solution	Criteria	Marks
$63° - 18° = 45°$	**1 mark** for correct answer	**1**

19b (2 marks)
Content: **MS-M2**
Outcomes assessed: **MS2-12-3**
Targeted Performance Bands: **3-4**

Solution	Criteria	Mark
15° = 1 hour of time difference 45° ÷ 15° = 3 hours of time difference Prince Edward Island is further west so is 3 hours behind the time in La Palma. 10 am – 3 hours = 7 am on Prince Edward Island	**1 mark** for calculation of 3 hours of time difference **2 marks** for correct working and answer	**2**

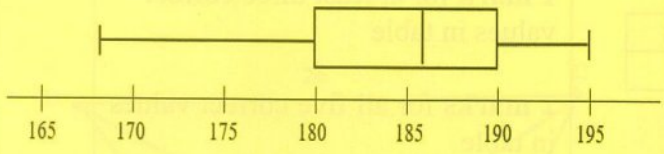
Question 20 (2 marks)
Content: **MS-A2**
Outcomes assessed: **MS2-12-1**
Targeted Performance Bands: **3-4**

Solution	Criteria	Marks
From graph: 40 Euros = $A66 Conversion rate: $A1 = $US0.75 ∴ 66 × 0.75 = $US49.50	**1 mark** for reading ≈ $A66 from graph **2 marks** for correct conversion into $US	**2**

Question 21 (4 marks)
21(a) (1 mark)
Content: **MS-S1.2**
Outcomes assessed: **MS2-12-2**
Targeted Performance Bands: **3-4**

Solution	Criteria	Marks
$\bar{x} = \frac{2214}{12} = 184.5$ cm	**1 mark** for correct answer	**1**

21(b) (3 mark)
Content: **MS-S1.2**
Outcomes assessed: **MS2-12-2**
Targeted Performance Bands: **3-4**

Solution	Criteria	Marks
	**1 mark** for one or two correct values displayed **2 marks** for three or four correct values displayed **3 marks** for all five correct values displayed	3

Question 22 (3 marks)
Content: **MS-M1.2**
Outcomes assessed: **MS2-12-4**
Targeted Performance Bands: **3-4**

Solution	Criteria	Marks
Length of unmarked side: $x^2 = 4.8^2 + 4.8^2$ $\therefore x = \sqrt{4.8^2 + 4.8^2}$ $x = 6.788$ m $P = (4.8 \times 4) + 6.788$ $= 25.988$ m Cost = \$52 $\times$ 25.988 = \$1351.39	**1 mark** for calculation of length of unmarked side **2 marks** for calculation of perimeter **3 marks** for complete correct working and answer	3

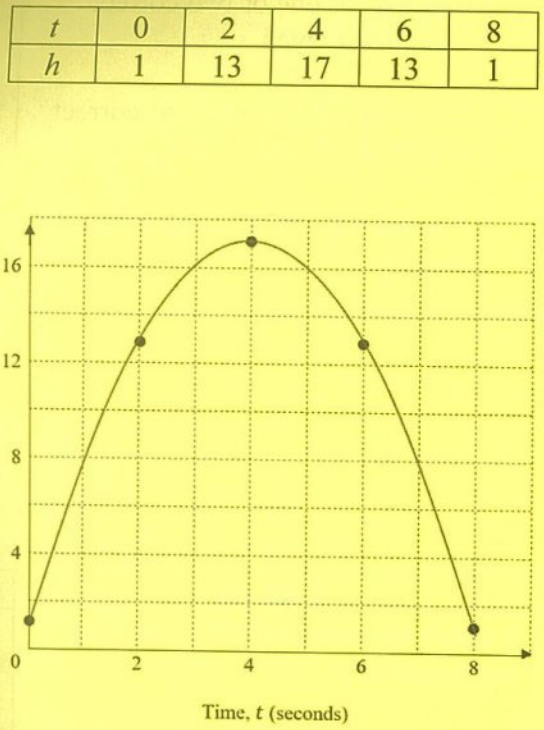
Question 23 (5 marks)

23(a) (4 marks)

Content: **MS-A4.2**

Outcomes assessed: **MS2-12-1**

Targeted Performance Bands: **3-4**

Solution	Criteria	Marks
	**1 mark** for at least three correct values in table **2 marks** for all five correct values in table **3 marks** for correct values in table and correct values graphed **4 marks** for all five correct values in table, values graphed and parabola drawn	**4**

t	0	2	4	6	8
h	1	13	17	13	1

23(b) (1 marks)

Content: **MS-A4.2**

Outcomes assessed: **MS2-12-1**

Targeted Performance Bands: **3-4**

Solution	Criteria	Marks
$t = 4$ seconds	**1 mark** for correct answer	**1**

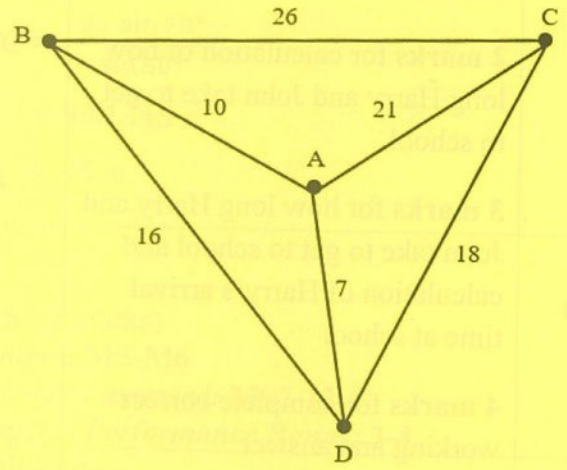
Question 24 (3 marks)

24(a) (2 marks)

Content: **MS-N2.1**

Outcomes assessed: **MS2-12-8**

Targeted Performance Bands: **3-4**

Sample Solution	Criteria	Marks
	**1 mark** for a partly correct network diagram or features missing **2 marks** for correct and labelled network diagram such as the one given	**2**

24(b) (1 mark)

Content: **MS-N2.1**

Outcomes assessed: **MS2-12-8**

Targeted Performance Bands: **2-3**

Solution	Criteria	Marks
$7 + 18 + 26 + 10 = 61$ km	**1 mark** for correct answer	**1**

Question 25 (4 marks)
Content: **MS-M7**
Outcomes assessed: **MS2-12-3**
Targeted Performance Bands: **3-4**

Solution	Criteria	Mark
Harry $= \frac{3}{5} \times 60$ $= 36$ mins John $= \frac{3}{12} \times 60$ $= 15$ mins Harry arrival $= 8{:}10$ am $+ 36$ mins $= 8{:}46$ am John needs to leave home 15 mins before 8:46 am 8:46 am -15 mins $= 8{:}31$ am	**1 mark** for calculation of how long Harry or John takes to get to school **2 marks** for calculation of how long Harry and John take to get to school **3 marks** for how long Harry and John take to get to school and calculation of Harry's arrival time at school **4 marks** for complete correct working and answer	**4**

Question 26 (3 marks)
Content: **MS-F4.1**
Outcomes assessed: **MS2-12-5**
Targeted Performance Bands: **3-4**

Solution	Criteria	Marks
Cost $= 500 \times \$2.35 = \$1175$ Brokerage on purchase $= 2\% \times \$1175 = \$23.50$ Total purchase cost $= \$1175 + \$23.50$ $= \$1198.50$ Selling price $= 500 \times \$3.50 = \$1750$ Brokerage on sale $= 3\% \times \$1750 = \$52.50$ Total sale payment $= \$1750 - \$52.50$ $= \$1697.50$ Profit $= \$1697.50 - \$1198.50$ $= \$499$	**1 mark** for correct calculation of purchase cost **2 marks** for correct sale payment **3 marks** for complete correct working and answer	**3**

Question 27 (4 marks)

27(a) (2 marks)

Content: **MS-M6**

Outcomes assessed: **MS2-12-4**

Targeted Performance Bands: **4-5**

Solution	Criteria	Marks
$\frac{BC}{\sin 70°} = \frac{80}{\sin 50°}$ $BC = \frac{80 \sin 70°}{\sin 50°}$ $= 98.1345 \ldots$ ≈ 98 m	**1 mark** for use of sine rule **2 marks** for correct working and answer	**2**

27(b) (2 marks)

Content: **MS-M6**

Outcomes assessed: **MS2-12-4**

Targeted Performance Bands: **3-4**

Solution	Criteria	Marks
$\cos 30° = \frac{w}{98.1345 \ldots}$ $w = \cos 30° \times 98.1345 \ldots$ $= 84.98699 \ldots$ ≈ 85 m	**1 mark** for progress towards answer **2 marks** for correct working and answer	**2**

Question 28 (3 marks)

28(a) (1 mark)

Content: **MS-S5**

Outcomes assessed: **MS2-12-7**

Targeted Performance Bands: **3-4**

Solution	Criteria	Marks
$z = \frac{x - \mu}{\sigma}$ $z = \frac{4.25 - 3.5}{1.0}$ $z = 0.75$	**1 mark** for correct answer	**1**

28(b) (2 marks)
Content: **MS-S5**
Outcomes assessed: **MS2-12-7**
Targeted Performance Bands: **4-5**

Solution	Criteria	Marks
$z = \frac{x - \mu}{\sigma}$ $z = \frac{1.5 - 3.5}{1.0}$ $z = -2$ Less than z-score of -2: $\frac{100\%-95\%}{2} = 2.5\%$ $2.5\% = 8$ $1\% = 3.2$ $100\% = 320$ babies	**1 mark** for calculation of 2.5% **2 marks** for correct working and answer	**2**

Question 29 (2 marks)
Content: **MS-A1**
Outcomes assessed: **MS2-12-1**
Targeted Performance Bands: **3-4**

Solution	Criteria	Marks
$c = \frac{x^2-a}{b}$ $cb = x^2 - a$ $cb + a = x^2$ $a = x^2 - cb$	**1 mark** for some correct algebra towards answer **2 marks** for correct working and answer	**2**

Question 30 (3 marks)

30(a) (2 marks)

Content: **MS-M1.2, MS-M7**

Outcomes assessed: **MS2-12-4**

Targeted Performance Bands: **4-5**

Solution	Criteria	Mark
$A \approx \frac{12.5}{2}(19+22) + \frac{12.5}{2}(22+18) + \frac{12.5}{2}(18+21) + \frac{12.5}{2}(21+32)$ $A \approx 256.25 + 250 + 243.75 + 331.25$ $A \approx 1081.25\ m^2$	**1 mark** for attempted use of four applications of trapezoidal rule **2 marks** for correct working and answer	**2**

30(b) (1 mark)

Content: **MS-M1.2**

Outcomes assessed: **MS2-12-4**

Targeted Performance Bands: **4-5**

Solution	Criteria	Marks
$\frac{1081.25}{50 \times 50} \times 100$ $= 43.25\%$	**1 mark** for correct answer	**1**

Question 31 (3 marks)

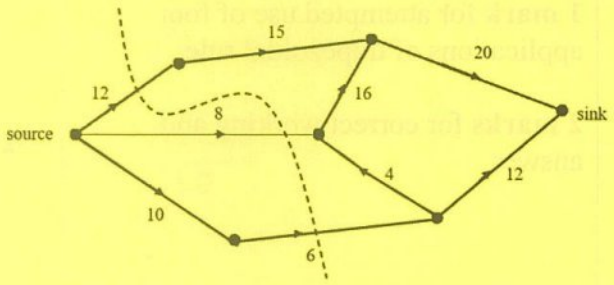
Content: **MS-F5**

Outcomes assessed: **MS2-12-5**

Targeted Performance Bands: **4-5**

Solution	Criteria	Marks
$FV = 4.1836 \times \$2200$ $= \$9203.92$ Investment $= \$2200 \times 4$ $= \$8800$ Interest $= \$9203.92 - \$8800$ $= \$403.92$	**1 mark** for value from table **2 marks** for calculation of future value **3 marks** for correct working and answer	**3**

Question 32 (2 marks)
Content: **MS-N3**
Outcomes assessed: **MS2-12-8**
Targeted Performance Bands: **4-5**

Solution	Criteria	Marks
 Maximum flow = 26	**1 mark** for correct minimum cut or maximum flow **2 marks** for both correct	**2**

Question 33 (3 marks)
Content: **MS-F5**
Outcomes assessed: **MS2-12-5**
Targeted Performance Bands: **4-5**

Solution	Criteria	Marks
$A_1 = 50\,000(1.0025) - 750$ $= \$49\,375$ $A_2 = 49375(1.0025) - 750$ $= \$48\,748.44$ $A_3 = 48\,748.44(1.0025) - 750$ $= \$48\,120.31$ Amount paid off $= \$50\,000 - \$48\,120.31$ $= \$1879.69$	**1 mark** for some use of formula **2 marks** for correct calculation of balance after three repayments **3 marks** for correct working and answer	**3**

Question 34 (4 marks)

34(a) (2 marks)

Content: **MS-S4**

Outcomes assessed: **MS2-12-2**

Targeted Performance Bands: **4-5**

Solution	Criteria	Marks
$v = 0.03w + 18.75$	**1 mark** for one correct value or values in incorrect place **2 marks** for correct answer	**2**

34(b) (2 marks)

Content: **MS-S4**

Outcomes assessed: **MS2-12-2**

Targeted Performance Bands: **4-5**

Solution	Criteria	Marks
$r = 0.199$ The data does not confirm the predicted negative association. Rather there is a weak, positive association.	**1 mark** for one correct value of r **2 marks** for correct value of r and correct interpretation of value	**2**

Question 35 (3 marks)

35(a) (2 mark)

Content: **MS-M7**

Outcomes assessed: **MS2-12-3**

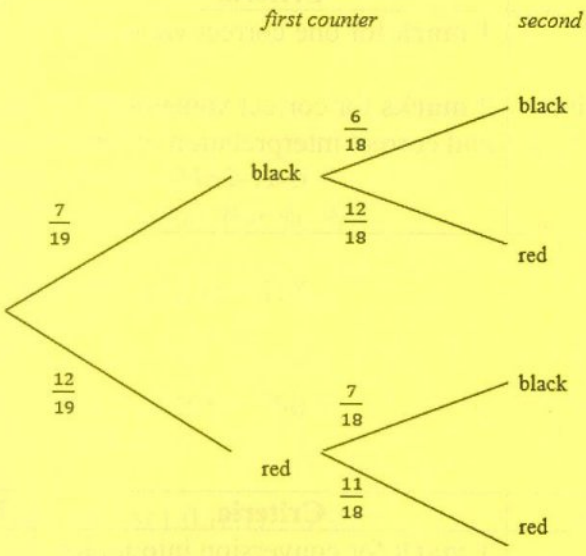
Targeted Performance Bands: **5-6**

Solution	Criteria	Mark
$2025\ \text{kJ} = 2\ 025\ 000\ \text{J}$ $2\ 025\ 000\ \text{J} \div 90 \div 60 = 375\ \text{W}$	**1 mark** for conversion into joules or other progress **2 marks** for correct working and answer	**2**

35(b) (1 mark)
***Content:*MS-M7**
***Outcomes assessed:*MS2-12-3**
***Targeted Performance Bands:* 4-5**

Solution	Criteria	Ma
$375 \div 1000 \times \$0.3159 = \$0.11846 \ldots$ $= \$0.12$	**1 mark** for correct answer	1

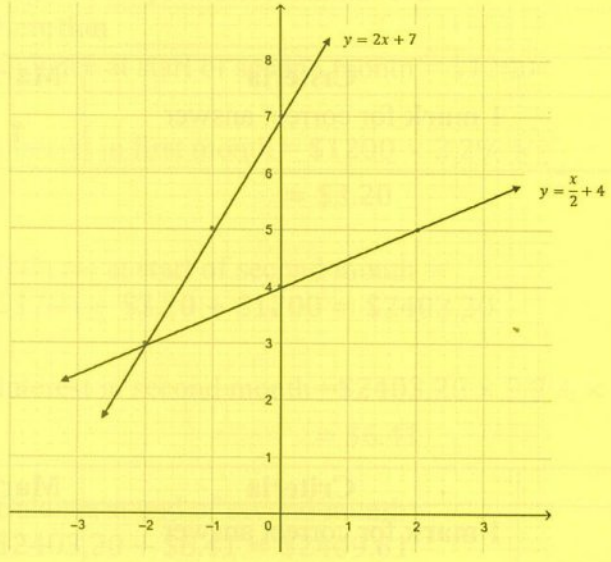
Question 36 (3 marks)
36(a) (1 mark)
***Content:* MS-S2**
***Outcomes assessed:* MS2-12-2**
***Targeted Performance Bands:* 4-5**

Solution	Criteria	Ma
	**1 mark** for correct values (simplified or unsimplified)	1

36(b) (2 marks)
Content: **MS-S2**
Outcomes assessed: **MS2-12-2**
Targeted Performance Bands: **4-5**

Solution	Criteria	Marks
$P_{same} = \left(\frac{7}{19} \times \frac{6}{18}\right) + \left(\frac{12}{19} \times \frac{11}{18}\right)$ $= \frac{29}{57}$ $P_{different} = 1 - \frac{29}{57}$ OR $P_{different} = \left(\frac{7}{19} \times \frac{12}{18}\right) + \left(\frac{12}{19} \times \frac{7}{18}\right)$ $= \frac{28}{57}$ ∴ Lucas is more likely to select two counters that are the same colour.	**1 mark** for correct calculation of at least one probability. **2 marks** for correct calculations and statement.	**2**

Question 37 (3 marks)
Content: **MS-A4.1**
Outcomes assessed: **MS2-12-1**
Targeted Performance Bands: **4-5**

Solution	Criteria	Marks
 Co-ordinates of the point of intersection $= (-2, 3)$	**1 mark** for one line graphed correctly **2 marks** for both lines graphed correctly **3 marks** for both lines graphed correctly and correct point of intersection	**3**

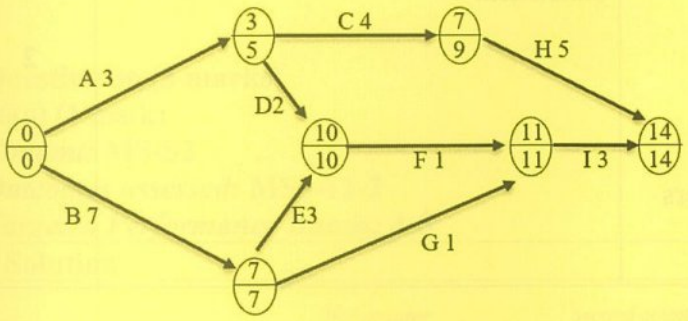
Question 38 (5 marks)

38(a) (4 mark)

Content: **MS-N3**

Outcomes assessed: **MS2-12-8**

Targeted Performance Bands: **5-6**

Solution	Criteria	Mar
	**1 mark** for basic attempt to draw network diagram **2 marks** for correct network diagram with incorrect or missing ESTs and LSTs **3 marks** for correct network diagram with some correct ESTs and LSTs **4 marks** for correct network diagram with all correct ESTs and LSTs	4

38(b) (1 mark)

Content: **MS-N3**

Outcomes assessed: **MS2-12-8**

Targeted Performance Bands: **4-5**

Solution	Criteria	Mar
Critical path = B E F I	**1 mark** for correct answer	1

Question 39 (4 marks)

39(a) (1 mark)

Content: **MS-F4.2**

Outcomes assessed: **MS2-12-5**

Targeted Performance Bands: **4-5**

Solution	Criteria	Mar
$S = V_0(1-r)^n$ $= 54\,000(1-8.3\%)^{10}$ $= \$22\,703.20$	**1 mark** for correct answer	1

39(b) (3 marks)
***Content:*MS-F4.2**
***Outcomes assessed:*MS2-12-5**
***Targeted Performance Bands:*4-5**

Solution	Criteria	Marks
Total repayment = $\$723 \times 10 \times 12$ $= \$86\,760$ Interest paid = $\$86\,760 - \$54\,000$ $= \$32\,760$ $I = Prt$ $\$32\,760 = \$54\,000 \times r \times 10$ $r = \frac{32\,760}{54\,000 \times 10}$ $r = 6.07\%$	**1 mark** for calculation of total repayment **2 marks** for calculation of total repayment and amount of interest paid **3 marks** for correct working and answer	**3**

Question 40 (4 marks)
40(a) (2 marks)
***Content:* MS-F5**
***Outcomes assessed:* MS2-12-5**
***Targeted Performance Bands:* 5-6**

Solution	Criteria	Marks
Balance at start of second month = $\$1200$ Interest in first month = $\$1200 \times 3.2\% \times \frac{1}{12}$ $= \$3.20$ Balance at start of second month = $\$1200 + \$3.20 + \$1200 = \$2403.20$ Interest in second month = $\$2403.20 \times 3.2\% \times \frac{1}{12}$ $= \$6.41$ Balance at end of second month = $\$2403.20 + \$6.41 = \$2409.61$	**1 mark** for some correct working **2 marks** for complete correct working	**2**

40(b) (2 marks)
Content: **MS-F4.1**
Outcomes assessed: **MS2-12-5**
Targeted Performance Bands: **5-6**

Solution	Criteria	Marks
Beth $= 21\,600\,(1 + \frac{3.2\%}{12})^{18}$ $= \$22\,660.64$ $\$22\,660.84 - \$22\,155.56 = \$505.08$ Beth has \$505.08 more than Ella	**1 mark** for correct calculation of Bethany's FV **2 marks** for a correct working and answer	**2**

Question 41 (5 marks)
Content: **MS-M1.2, MS-M6**
Outcomes assessed: **MS2-12-4**
Targeted Performance Bands: **5-6**

Solution	Criteria	Marks
Arc XY $= \frac{\theta}{360} \times 2\pi r$ $= \frac{50}{360} \times 2 \times \pi \times 1200$ $= 1047.197\ldots$ $= 1047$ mm Interval XY: $XY^2 = 1200^2 + 1200^2 - 2 \times 1200 \times 1200 \times \cos 50°$ $= 1\,028\,771.68\ldots$ $XY = 1014.28\ldots$ $= 1014$ mm Difference $= 1047 - 1014 = 33$ mm Therefore the arc length, XY is 33 mm longer than the interval XY.	**1 mark** for progress towards calculation of arc length or interval length **2 marks** for correct calculation of arc length or interval length or some progress on both **3 marks** for correct calculation of arc length or interval length and progress on the other length **4 marks** for correct working and calculation of both arc length and interval length **5 marks** for correct working and calculation of both arc length and interval length and calculation of the difference between the two lengths	**5**