2024 4NA Mathematics Prelim **Paper 2**

Marking Scheme

Qns	Workings	Mark Allocation
1	$1.673320053 = 1.67$	B1
2	$\frac{3mn}{14n^2} \div \frac{12m^2n}{7n}$ $= \frac{3mn}{14n^2} \times \frac{7n}{12m^2n}$ $= \frac{1}{8m}$	M1 A1
3a	$16x^2 - 49 = (4x-7)(4x+7)$	B1
3b	$12ab - 16bc + 3a - 4c$ $= 4b\,(3a - 4c) + 3a - 4c$ $= (3a - 4c)\,(4b + 1)$	M1 common factor A1
4a	$5-(-20) = 25$	B1
4b	$-25 \div 8848$ $= -0.002825497288$ $= -0.00283$	M1 A1
5a	$\frac{2(10)+11(25)+9(35)+6(45)+3(65)}{31}$ $= 34.67741935$ $= 34.7 \,/\, \frac{1075}{31}$ $\sqrt{\frac{2(10)^2+11(25)^2+9(35)^2+6(45)^2+3(65)^2}{31} - \left(\frac{1075}{31}\right)^2}$ $= 13.49644421$ $= 13.5$	B1 Mean M1 A1 S.D
5b	She is correct as the corporate order of 60 madeleines is greater than the estimated mean, hence including this value in the calculation will increase the estimated mean.	B1
6a	8, 4	B1
6b	$28 - 4(n-1)$ $= 28 - 4n + 4$ $= 32 - 4n$	B1

6c	$32-4n=-42$ $4n=32+42$ $4n=74$ $n=\frac{74}{4}$ $n=18\frac{1}{2}$ Donovan is incorrect. As n is not an integer, – 42 is not a term in the sequence.	M1 A1
7a	$\frac{12}{20}\times\frac{11}{19}=\frac{33}{95}$	B1
7b	$\left(\frac{12}{20}\times\frac{7}{19}\right)+\left(\frac{7}{20}\times\frac{12}{19}\right)+\left(\frac{7}{20}\times\frac{1}{19}\right)+\left(\frac{1}{20}\times\frac{7}{19}\right)$ $=\frac{91}{190}$	M1 A1
7c	$\left(\frac{12}{20}\times\frac{7}{19}\right)+\left(\frac{7}{20}\times\frac{12}{19}\right)+\left(\frac{12}{20}\times\frac{11}{19}\right)+\left(\frac{7}{20}\times\frac{6}{19}\right)$ $=\frac{9}{10}$	M1 A1
8a	Triangles *ABE* and *DCE*. Given *AB* parallel to *CD*, angle *ABE* = *DCE* (alternate angles), angle *BAE* = angle *CDE* (alternate angles), and angle *AEB* = angle *DEC*. Given that there are at least 2 pair of corresponding angles in both triangles with different corresponding length, triangles *ABE* and *DCE* are similar.	B1 B1 for each pair of corresponding angles
8b	$\frac{CE}{BE}=\frac{DE}{AE}$ $\frac{2}{5}=\frac{3}{AE}$ $AE=7.5$ $AD=7.5+3=10.5$	M1 corresponding ratios M1 value of *EA* A1 value of *AD*
9a	Angle *ABD* = 180° – 123° = 57° Reason: angles in opposite segment	B1 value B1 reason
9b	Angle *CBD* = 90° – 57° = 33° Reason: right angled triangle in semi-circle	B1 value B1 reason
9c	Angle *CAD* = 33° Reason: angles in same segment	B1 value B1 reason

11a	$(2x+5-4)(x-1-4)=110$ $(2x+1)(x-5)=110$ $2x^2-10x+x-5=110$ $2x^2-9x-5=110$ $2x^2-9x-5-110=0$ $2x^2-9x-115=0$	M1 M1 expansion A1
11b	$2x^2-9x-115=0$ $x=\frac{-(-9)\pm\sqrt{(-9)^2-4(2)(-115)}}{2(2)}$ $x=\frac{9\pm\sqrt{81+920}}{4}$ $x=10.15964601$ *or* $-5.65964601(rej)$ $2x+1=2(10.15964601)+1=21.31929202=21.3$ $(x-5)=10.15964601-5=5.15964601=5.16$	M1 quadratic formula M1 x values B1 B1
12a	$\frac{r}{6}=\frac{3}{10}$ $r=\frac{3}{10}\times 6$ $r=1.8$	 M1 by similarity A1
12b	Slant height of water $=\sqrt{3^2+1.8^2}=3.498571137$ Curved surface area/surface area in contact with water $=\pi(1.8)3.498571137$ $=19.78395369$ $=19.8$	M1 slant height/ ecf M1 A1
12c	$\frac{1}{3}\pi(1.8)^2 3=10.1787602$ $\frac{1}{3}(6)^2 12-10.1787602$ $=133.821$ $=134$	M1 vol of water M1 A1
13a	$\frac{37}{100}\times 4000=1480$ $1480\times 12=17760$	M1 A1

13b	2nd year/ age 26: $\frac{110}{100}\times 4000 = 4400$ $12\left(\frac{37}{100}\times 4400\right) = 19536$ 3rd year/ age 27: $\frac{110}{100}\times 4400 = 4840$ $12\left(\frac{37}{100}\times 4840\right) = 21489.60$ Total contribution for 3 years $= 17760 + 19536 + 21489.60$ = 58, 785.60	M1 Calculate 10% annual increment M1 A1
13c	$\frac{5}{100}\times 350000 = 17500 < 58785.60$ $\frac{5}{100}\times 1500000 = 75000 > 58785.60$ $58785.60 - 17500 = 41285.60$ Since $17500 < 58785.60$, Alex has sufficient CPF savings to cover the down payment for a 3-room resale flat only. Hence, 3 room resale flat is a better choice.	M1 downpayment (ecf) A1
14a	$180° - 55° = 125°$ $360° - 125° = 235°$	M1 A1
14b	$AB^2 = 60^2 + 80^2 - 2(60)(80)\cos 40°$ $AB^2 = 2645.973346$ $AB = 51.43902552$ $AB = 51.4$	M1 A1
14c	$\frac{1}{2}(60)(80)\sin 40° + \frac{1}{2}(55)(80)$ $= 3742.690263$ $= 3740$	M1 Area of triangle A1
14d	$\tan\theta = \frac{15}{55}$ $\theta = \tan^{-1}\frac{15}{55}$ $\theta = 15.2551187$ $\theta = 15.3°$	M1 A1
15a	Household *A*: 350 – 90 = 260 Household *B*: 400 – 50 = 350 Household *B* has a higher range.	B1 calculate range B1

15b	210	B1
15c	325 – 150 = 175	M1 A1
15d	Household *A* is more consistent in the daily usage of water as the interquartile range is smaller than that of household *B*.	B1
15e	$\frac{65}{200} \times 100\%$ $= 32.5\%$	M1 A1

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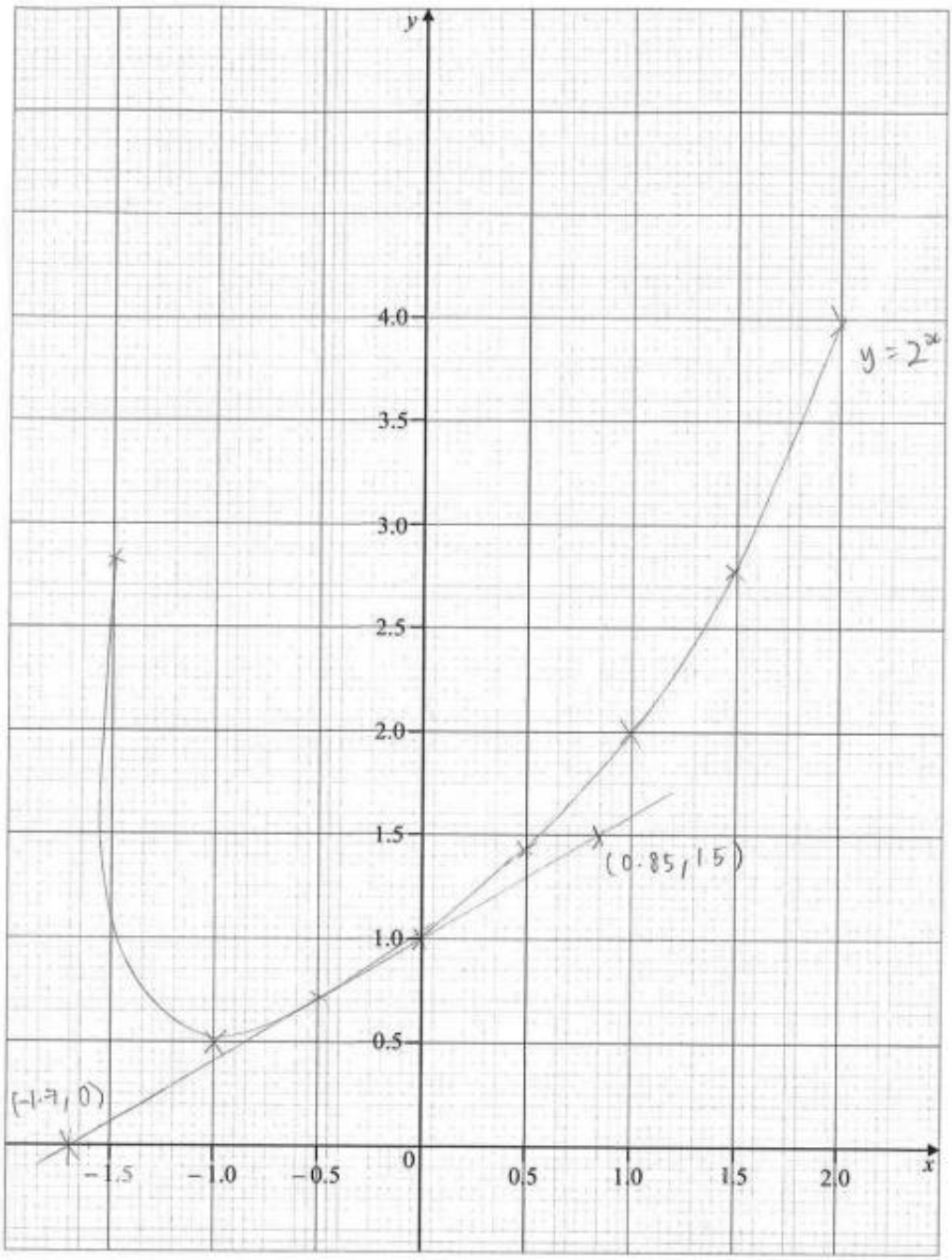

(a) $\frac{1}{2}$ / 0.5 B1

(b) points plotted correctly B1
smooth curve B1

(c) No real value of x when $y = 0$
2^x is always positive

(d) 1.8

(e) Draw tangent B1
0.588 B1