

CATHOLIC SECONDARY SCHOOLS ASSOCIATION OF NSW 2020 TRIAL HIGHER SCHOOL CERTIFICATE EXAMINATION MATHEMATICS STANDARD 2

Section I

15 marks

Ouestions 1-15 (1 mark each)

Question	Answer	Content	Syllabus Assessed	Targeted Performance Bands	
1	С	Network terminology	MS-N2.1	2-3	
2	A	Loans	MS-F4.2	2-3	
3	D	Scatterplots	MS-S4	2-3	
4	В	Median	MS-S1.2	3-4	
5	С	Ratio	MS-M7	3-4	
6	D	Area of a triangle	MS-M6	3-4	
7	D	Linear relationships	MS-A2	3-4	
8	В	Units of energy	MS-M1.3	4-5	
9	В	Critical path	MS-N3	4-5	
10	A	Latitude and longtitude	MS-M2	4-5	
11	A	Medicine dosage	MS-A1	4-5	
12	C	Probability	MS-S2	4-5	
13	A	Normal distribution	MS-S5	5-6	
14	В	Shortest path	MS-N2.2	5-6	
15	D	Compass bearings	MS-M6	5-6	

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Section II

85 marks

Questions 16 - 44

Question 16 (2 marks)

Content: MS-A1

Outcomes assessed: MS2-12-1

Targeted Performance Bands: 3-4

Solution	Criteria	Marks
$BAC_{female} = \frac{10N - 7.5H}{5.5M}$	1 mark for correct substitution into formula	
$=\frac{(10\times5)-(7.5\times3)}{5.5\times75}$	2 marks for correct working and answer	2
= 0.067		

Question 17 (2 marks)

Content: MS-M1.3

Outcomes assessed: MS2-12-3

Targeted Performance Bands: 2-3

Solution	Criteria	Marks
$5 \times 365 \times 300 \div 1000 \times 0.30$ = \$164.25	1 mark for progress towards answer with one error in working	
	2 marks for correct working and answer	2

Question 18 18a (2 marks)

Content: MS-A4.1

Outcomes assessed: MS2-12-6

oluti	<i>ed Perfo</i> ion							Criteria	Marks
-								1 mark for one correct line marked on the graph	
	F	T	I I	 1		,	I = 100x		
5	800							2 marks for two correct lines marked on the graph	
	600			/		£	C = 50x + 200	and another the graph	
						*****			2
	400		1						
	200			 <u>.</u>		a), i, a 4 of			
	/								
	0 "	2	4	6	8	x			

18b (1 mark)

Content: MS-A4.1

Outcomes assessed: MS2-12-6 Targeted Performance Rands:2-3

Criteria	Mark
1 mark for correct answer	1

Question 19 (2 marks)

Content: MS-S2

Outcomes assessed: MS2-12-2

Targeted Performance Bands:2-3

Solution	Criteria	Marks
31% + 7% = 38%	1 mark for correct addition	
	of two percentages	
$38\% \times 1200 = 456 \text{ people}$		2
Solve in Early	2 marks for correct working	
	and answer	

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Question 20 (4 marks) Content: MS-F4.1

Outcomes assessed: MS2-12-5

Targeted Performance Bands: 3-4

Solution	Criteria	Marks
Option A = 5 × \$3600 = \$18 000	1 mark for correct calculation of one option	
Option B = \$92 000 × 3% × 5 = \$13 800	2 marks for correct calculation of two options	
Option C = \$92 000 (1 + 3%) ⁵ - \$92 000 = \$14 653.21	3 marks for correct calculation of three options	4
Therefore, Option A gives Molly the biggest pay increase	4 marks for correct calculation of all three options and a correct statement	

Question 21 (2 marks)

Content: MS-A2

Outcomes assessed: MS2-12-6
Targeted Performance Bands: 3-4

Solution	Criteria	Marks
$m = \frac{rise}{run}$	1 mark for correct calculation of the gradient	
$m = \frac{-2500}{30}$ $m \approx -83\frac{1}{3}$	2 marks for correct gradient and explanation of meaning	2
This represents a loss of value of the laptop of approximately \$83.33 per month		

Question 22 (3 marks) Content: MS-A1

Outcomes assessed: MS2-12-1

Targeted Performance Rands: 3-4

Solution Solution	Criteria	Marks
$\frac{m}{3} = 2m - 1$	1 mark for correct answer without working or for a maximum of two errors	
m=3(2m-1)	in working	
m=6m-3	2 marks for a maximum of one error in working	3
-5m = -3		
$m=\frac{3}{5}$	3 marks for correct working and answer	

Question 23 (3 marks) Content: MS-F5

Outcomes assessed: MS2-12-5

Targeted Performance Bands: 3-4

Solution	Criteria	Marks
Value from table for 1.2% per period for 12 periods = 12.82455	1 mark for identitying correct value from table	
$FV = 12.82455 \times 250 = 3206.14	2 marks for calculation of FV	3
Interest = 3206.14 - (250 × 12) = \$206.14	3 marks for correct working and answer	

Question 24 (2 marks) Content: MS-F4.1

Outcomes assessed: MS2-12-5 Targeted Performance Bands:3-4

Solution	Criteria	Marks
$5000 \times \$8.20 = \$41\ 000$ $\frac{6000}{41000} \times 100 = 14.6\%$	1 mark for correct calculation of total market value or dividend payment per share	
or,	2 marks for correct working and answer	2
$$6000 \div 5000 = 1.20		_
$\frac{1.20}{8.20} \times 100 = 14.6\%$		

Question 25

25a (1 mark)

Content: MS-A1

Outcomes assessed: MS2-12-1

Targeted Performance Bands: 2-3

Solution	Criteria	Mark
P = 18n - 400	1 mark for correct answer	
$= 18 \times 200 - 400$ = \$3200		1

25b (1 mark)

Content: MS-A1

Outcomes assessed: MS2-12-1 Targeted Performance Bands: 3-4

Solution	Criteria	Mark
P = 18n - 400	1 mark for correct answer	
P+400=18n		
18n = P + 400		1
$n=\frac{P+400}{18}$		

25c (1 mark) Content: MS-A1

Outcomes assessed: MS2-12-1

Targeted	David	FORMATION.	Dande.	2.3
Targetea	Peri	ormance	Danas:	Z-3

Solution	Criteria	Mark
$n=\frac{P+400}{18}$	1 mark for correct answer	
$n = \frac{5000 + 400}{18}$		1
$n=\frac{5400}{18}$		•
n = 300 guests		

Question 26 (2 marks) Content: MS-M7

Outcomes assessed: MS2-12-3

Targeted Performance Bands: 3-4

Solution	Criteria	Marks
$s = \frac{d}{t}$	1 mark for correct conversion of units	
$= \frac{3200 \text{ m}}{3 \text{ mins } 16 \text{ secs}}$	2 marks for correct working and answer	2
$= \frac{3.2 \text{ km}}{0^{\circ} 3' 16''}$		2
= 58.8 km/h		

Question 27 (3 marks) Content: MS-S1.2

Outcomes assessed: MS2-12-7
Targeted Performance Bands: 4-5

Solution	Criteria	Marks
IQR = $7 - 4 = 3$ Upper limit = $Q_3 + 1.5 \times IQR$ = $7 + (1.5 \times 3)$ = 11.5	 1 mark for correct calculation of IQR 2 marks for correct calculation of upper limit 3 marks for correct concluding statement 	3
: The maximum score is 12 which is larger than the upper limit so it is an outlier for the data	with supporting calculations	

Question 28 (5 marks)
Content: MS-F1.3

Outcomes assessed: MS2-12-5
Targeted Parformance Rands: 4-5

Solution	Criteria	Marks
Electric car:	1 mark for correct calculation of	
Purchase price = \$48 800	electricity cost for the electric car	
On-road costs = $$900 \times 5 = 4500		
Fuel cost = $25000 \div 100 \times 15 \times \0.25×5 = $\$4687.50$	2 marks for correct calculation of total cost of the electric car	
Servicing = $$450 \times 5 = 2250		
-	3 marks for correct calculation of	
TOTAL = \$60 237.50	total cost of the electric car and the	
	cost of petrol for the petrol car	
Petrol car:		
Purchase price = \$29 990	4 marks for correct calculation of	5
On-road costs = $$1600 \times 5 = 8000	total cost of the electric car and total	
Fuel cost = $25\ 000 \div 100 \times 7.6 \times \1.49×5 = $\$14\ 155$	cost of the petrol car	
Servicing = $$2000 \times 5 = 10000	5 marks for correct calculation of	
	total cost of the electric car, total cost	
TOTAL = \$62 145	of the petrol car and a correct concluding statement	
Rob should purchase the electric car as it will cost		
him less over the 5 year period. (Additionaly there is		
an added benefit of being better for the environment)		

Question 29 (2 marks) Content: MS-M1.2

Outcomes assessed: MS2-12-3
Targeted Performance Bands: 3-4

Solution	Criteria	Marks
$r=1.5~ extsf{m}$ $V=\pi r^2 h$	1 mark for correct calculation of volume of the water tank	
$V = \pi \times 1.5^2 \times 4$ $V = 28.27 \text{ m}^3$	2 marks for correct working and answer in litres	2
$1 \text{ m}^3 = 1 \text{kL}$		_
∴ capacity = 28.27kL = 28 274 L		

Question 30 30a (1 mark) Content: MS-S5

Outcomes assessed: MS2-12-7
Targeted Performance Bands: 3-4

Solution	Criteria	Mark
$z = \frac{x - \mu}{\sigma}$	1 mark for correct answer	
$z = \frac{2.9 - 2.4}{0.2}$ $z = 2.5$		1

30b (2 marks)

Content: MS-S5

Outcomes assessed: MS2-12-7

Solution	Criteria	Marks
z-score of between -2 and $2 \approx 95\%$ of scores	1 mark for correct calculation of 0.4 m either side of mean	
2 × standard deviation		
$= 2 \times 0.2 \text{ m}$	2 marks for correct working and answers	
= 0.4 m either side of the mean		2
Therefore 95% of scores are 2.4 m \pm 0.4 m		
95% of the trees are between 2 m and 2.8 m		

Question 31 (3 marks)

Content: MS-M7

Outcomes assessed: MS2-12-4

Targeted Performance Bands:4-5

Solution	Criteria	Marks
$A \approx \frac{h}{2} \left(d_f + d_t \right) + \frac{h}{2} \left(d_f + d_t \right)$	1 mark for use of the trapezoidal rule with an error such as incorrect value of h	
$\approx \frac{25}{2} (19.8 + 14.3) + \frac{25}{2} (14.3 + 0)$ $\approx 426.25 + 178.75$ $\approx 605 \text{ m}^2$ $V \approx 605 \times 0.12$ $\approx 72.6 \text{ m}^3$	2 marks for correct working and answer for area 3 marks for correct working and answer for volume	3

Question 32 (2 marks)

Content: MS-A4.2

Outcomes assessed: MS2-12-1

Targeted Performance Bands: 4-5

Solution	Criteria	Marks
$t = \frac{k}{s}$	1 mark for correct calculation of k	
$2\frac{15}{60} = \frac{k}{100}$	2 marks for correct working and answer	
$k = 2\frac{15}{60} \times 100$		
k = 225		
$\therefore t = \frac{225}{s}$		
When travelling at 60km/h:		2
$t = \frac{225}{s}$		
$t = \frac{225}{60}$		
t = 3.75 hours		
or,		
t = 3 hours, 45 minutes		

Question 33 (2 marks)
Content: MS-M1.1

Outcomes assessed: MS2-12-3
Targeted Performance Rands: 3-4

Solution	Criteria	Marks
% error = $\frac{0.05}{15.2} \times 100 = 0.329\%$	1 mark for using correct absolute error	2
	2 marks for correct working and answer	2

Question 34 (2 marks)
Content: MS-M6

Outcomes assessed: MS2-12-3
Targeted Performance Bands:4-5

Solution	Criteria	Marks
$\frac{x}{\sin 72} = \frac{6.8}{\sin 56}$	1 mark for correct use of sine rule	
$x = \frac{6.8}{\sin 56} \times \sin 72$	2 marks for correct working and correctly rounded answer	2
x = 7.8 km		

Question 35 (2 marks)
Content: MS-M2

Outcomes assessed: MS2-12-3
Targeted Performance Bands: 4-5

Solution

Criteria

Marks

Difference between UTC +9 and UTC -5 is
14 hours. Washington DC is 14 hours behind
Tokyo.

14 hours before 8pm on Sunday

= 6am on Sunday

Criteria

Marks

1 mark for calculation of 14 hours of time difference or partly correct answer

2 marks for correct day and time

2

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Question 36 36a (2 marks)

Content: MS-N3

Outcomes assessed: MS2-12-8 Targeted Performance Bands:5-6

Solution	Criteria	Marks
C3 9 F3 D7 12 12 12 12	1 mark for some correct values that indicate understanding of network concepts 2 marks for all correct values	2

36b (1 mark) Content: MS-N3

Outcomes assessed: MS2-12-8 Targeted Performance Bands:4-5

Solution	Criteria	Mark
10 - 4 = 6 hours	1 mark for correct	
	answer	1

Question 37 37a (1 mark) Content: MS-S4

Outcomes assessed: MS2-12-7
Targeted Performance Bands:4-5

Criteria	Mark
1 mark for correct answer	1

37b (2 marks)
Content: MS-S4

Outcomes assessed: MS2-12-7
Targeted Performance Bands: 4-5

Solution	Criteria	Marks
m = 0.51 $c = 40.16$	1 mark for correct gradient and/or y-intercept	
y = 0.51x + 40.16	2 marks for correct values and correct equation	2

37c (1 mark)
Content: MS-S4

Outcomes assessed: MS2-12-7
Targeted Performance Bands: 4-5

Solution	Criteria	Mark
The correlation co-efficient will be lower/weaker when the additional student is included in the data (The value is now $r = 0.009$)	1 mark for correct answer	1

37d (1 mark)

Content: MS-S4

Outcomes assessed: MS2-12-7

Targeted Performance Bands: 4-5

Solution	Criteria	Mark
Disagree. The original data indicated that there may be a correlation. However, when the additional student is included, there is almost no correlation between driving hours and marks in Visual Arts.	1 mark for correct answer	1

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Question 38 (2 marks)

Content: MS-S5

Outcomes assessed: MS2-12-7

Targeted Performance Bands:4-5

Solution	Criteria	Marks
-2 to $1 = 3$ standard deviations	1 mark for correct calculation of the standard deviation or other progress	
3 standard deviations = $21 - 12 = 9$ \therefore each standard deviation is $9 \div 3 = 3$	towards answer	
$\sigma = 3$	2 marks for correct working and answer	
Mean:		2
$-2 = \frac{12 - \mu}{3}$		
$-6 = 12 - \mu$		
$\mu = 12 + 6$ $\mu = 18$		

Question 39

39a (1 mark)

Content: MS-A4.2

Outcomes assessed: MS2-12-6

Targeted Performance Bands: 5-6

Criteria	Mark
1 mark for correct answer	
	1

39b (1 mark)

Content: MS-A4.2

Outcomes assessed: MS2-12-6

Targeted Performance Rands: 3-4

Solution	Criteria	Mark
$C = 21 + (74 \times 3^{-0.2 \times 10})$	1 mark for correct answer	
$C = 21 + (74 \times 3^{-2})$		
C = 29.222 ° C		1
C = 29° C		

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Outcomes assessed: MS2-12-8
Targeted Performance Bands: 3-4

Solution	Criteria	Marks
A 400 200 150 250 100 200	1 mark for some correct features and values on a network diagram 2 marks for a correct network diagram such as the one given	2

40b (2 marks)

Content: MS-N2.2

Outcomes assessed: MS2-12-8
Targeted Performance Rands: 3-4

Solution	Criteria	Marks
A 200 B C 200 100 200 150 + 200 + 100 + 200 = 650 m	1 mark for correct identification of a mimimum spanning tree such as the one given 2 marks for a correct spanning tree and calculation of least amount of cable	2

¹⁶

Question 41 (2 marks)

Content: MS-M1.2, MS-A1 Outcomes assessed: MS2-12-4 Targeted Performance Bands: 4-5

Solution	Criteria	Marks
$A \approx \frac{h}{2}(d_f + d_l)$	1 mark for correct substitution into Trapeziodal formula	
$24.15 \approx \frac{5.75}{2} (d_f + 4.42)$	2 marks for correct working and answer	
$48.3 \approx 5.75(d_f + 4.42)$		2
$8.4 \approx d_f + 4.42$		
$\therefore d_f = 3.98 \text{ km}$		

Question 42 (4 marks) Content: MS-M7

Outcomes assessed: MS2-12-3

Solution	Criteria	Marks
Power of old globes	1 mark for calculation of power of old or	
$= 60 \times 15 + 100 \times 5$	new globes only	
= 1400 watts		
	2 marks for calculation of amount of	
Power of new globes	energy saved	
$= 7 \times 15 + 12 \times 5$		
= 165 watts	3 marks for calculation of saving each	
	week or one other error in working	
Power saved = $1400 - 165 = 1235$ watts		
	4 marks for full correct working and	4
Cost of saving each week	answer	
$= 1235 \div 1000 \times 40 \times 0.25367$		
= \$12.53		
7-2 -3-2		
Cost of saving for year		
= \$12.53 × 52		
= \$651.63		
= \$\psi 031.03		

Question 43 (5 marks)

Content: MS-M6

Outcomes assessed: MS2-12-4

Targeted Performance Bands: 6

Solution		Criteria	Marks	
30°	20° b	3000m Aircraft	1 mark for one correct answer for length a, length b or obtuse angle, 130° 2 marks for two correct answers	
30°	12000m	9000m	for length a, length b or obtuse angle, 130°	
Airport $\sin 30^\circ = \frac{12000}{a}$			3 marks for three correct answers for length a, length b and obtuse angle, 130°	
$a = \frac{12\ 000}{\sin 30^{\circ}}$ $a = 24\ 000\ m$			4 marks for above correct plus correct substitution into cosine rule.	
$\sin 20^{\circ} = \frac{3000}{b}$ $b = \frac{3000}{\sin 20^{\circ}}$ $b = 8771.4 \text{ m}$			5 marks for complete correct working and answer	5
Airport $x^{2} = a^{2} + b^{2} - 2ab \cos x$ $x^{2} = 24000^{2} + 8771.4^{2}$	Aircraft 20° Aircraft 20° Aircraft 20° Aircraft 20°			

Question 44

44a (4 marks)

Content: MS-F4.1

Outcomes assessed: MS2-12-5

Solution Solution	Criteria	Marks
October: $$6500 (1 + \frac{4.5\%}{365})^{31}$	1 mark for correct calculation of value at end of October	
= \$6524.89 November: $$6524.89 + $6500 = 13024.89 $$13024.89 (1 + \frac{4.25\%}{365})^{30}$ = \$13070.46	 2 marks for correct calculation of value at start of November 3 marks for correct calculation of value at end of November 4 marks for correct calculation of value at end of December 	4
December: \$13 070.46 + \$6500 = \$19 570.46 \$19 570.46 $(1 + \frac{4\%}{365})^{31}$ = \$19 637.06		

44b (2 mark)

Content: MS-F4.1

Outcomes assessed: MS2-12-5 Targeted Performance Rands: 5-6

Solution Solution	Criteria	Marks
$$19637.06 = PV (1 + \frac{3.2\%}{12})^3$	1 mark for correct substitution into FV or PV formula	
$PV = \frac{\$19637.06}{(1 + \frac{3.2\%}{12})^3}$	2 marks for correct working and answer	2
PV = \$19 480.80		

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