Neap

Final Examination 2022

NSW Year 11 Mathematics Standard
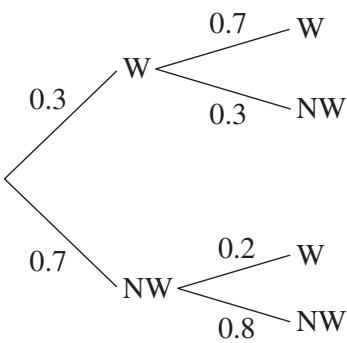
Solutions and Marking Guidelines

SECTION I

Answer and explanation	Syllabus content, outcomes and targeted performance bands
Question 1 **B** **B** is correct. If a vertical line is drawn from \$60 to the graph line, it intersects the graph line when €40 is reached on the *y*-axis. **A**, **C** and **D** are incorrect. These options are not supported by the graph.	MS–A2 Linear Relationships MS11–6 Bands 1–2
Question 2 **A** **A** is correct. 0.002859 rounded to two significant figures is 0.0029. Expressing 0.0029 in standard form means the decimal place moves three places to the right. Hence, 2.9×10^{-3}. **B** is incorrect. This option may be reached by rounding incorrectly. **C** is incorrect. The power is incorrect. **D** is incorrect. This option may be reached by rounding incorrectly and using the wrong power.	MS–M1 Applications of Measurement MS11–3 Bands 1–2
Question 3 **C** $(9 \times 14.50) + (8 \times 1.5 \times 14.50) = \$304.50$	MS–F1 Money Matters MS11–5 Bands 1–2
Question 4 **B** $\dfrac{1}{3} \times 600 = 200$ times	MS–S2 Relative Frequency and Probability MS11–8 Bands 1–2
Question 5 **D** Los Angeles UTC –7 and Perth UTC +8 equates to a 15-hour time difference (7 + 8 = 15). Wednesday, 7:00 pm + 15 hours = Thursday, 10:00 am	MS–M2 Working with Time MS11–3 Bands 2–3
Question 6 **C** Let the total price = *P* and the number of songs = *n*. $P = kn$ $24 = k \times 15$ $k = 1.6$ $P = 1.6n$ $51.20 = 1.6n$ $n = \dfrac{51.20}{1.6}$ $ = 32$ songs	MS–A2 Linear Relationships MS11–6 Bands 2–3

Answer and explanation	Syllabus content, outcomes and targeted performance bands	
Question 7 **C** **C** is correct. Comprehensive insurance covers damage to the car of the person at fault in an accident. **A** is incorrect. Compulsory third-party insurance covers injury to the people involved in the accident other than the person at fault. **B** is incorrect. Non-compulsory third-party insurance covers damage to the property of others, but not the person at fault. **D** is incorrect. Fire and theft insurance does not cover the damage of a car of the person at fault in an accident.	MS–F1 Money Matters MS11–5	Bands 2–3
Question 8 **C** **C** is correct. The shading of the letter S on the keyboard is similar to the shading of the letter T. As the letter T has a frequency of 41, the letter S must be similar in frequency to the letter T. Hence, the closest option is **C** with a frequency of 38. **A** is incorrect. For the letter S to have a frequency of 18, its shading on the keyboard would need to be lighter than the letter I. **B** is incorrect. The frequency of the letter S is significantly higher than the letter I as seen in the darker shading. **D** is incorrect. The frequency of the letter S is not greater than the frequency of the letter E.	MS–S1 Data Analysis MS11–7	Bands 3–4
Question 9 **A** **A** is correct. The graph is a straight line and increasing in value, as would be seen for a savings account that earns simple interest. **B** is incorrect. A graph showing compound interest would not show the behaviour of a linear function. **C** and **D** are incorrect. The value of the products in these options are depreciating, whereas the graph is increasing.	MS–F1 Money Matters MS11–6	Bands 3–4
Question 10 **A** $\text{gradient} = \dfrac{-6-3}{-3-6}$ $= \dfrac{-9}{-9}$ $= 1$ The equation is $y = x + c$. Substituting (6, 3) gives: $3 = 6 + c$ $c = -3$ Therefore, the equation is $y = x - 3$.	MS–A2 Linear Relationships MS11–2	Bands 3–4

Answer and explanation	Syllabus content, outcomes and targeted performance bands
Question 11 **D** Panama City is located (9°N, 80°W). To move 12° south, first moving 9° south to the equator and then another 3° south gives 3°S. Moving 30° west from 80°W gives $80 + 30 = 110$°W. Therefore, the coordinates are (3°S, 110°W).	MS–M2 Working with Time MS11–3 Bands 4–5
Question 12 **B** $$n = \frac{8-l}{m} + p$$ $$nm = 8 - l + pm$$ $$l = 8 + pm - mn$$	MS–A1 Formulae and Equations MS11–1 Bands 4–5

Question 13   **D**
 	
The probability that Sarina wins her first match is 0.3. Therefore, the probability that she does not win her first match is $1 - 0.3 = 0.7$.
 	
If Sarina wins her first match, the probability of her winning her second match is 0.7. Therefore, the probability of her not winning her second match is $1 - 0.7 = 0.3$.
 	
If Sarina does not win her first match, the probability of her winning her second match is 0.2. Therefore, the probability that she does not win her second match is $1 - 0.2 = 0.8$.
 	
This information is best represented in the probability tree diagram below.
 	
first match   second match
 	
0.3 — W — 0.7 — W
          — 0.3 — NW
0.7 — NW — 0.2 — W
           — 0.8 — NW
 	
The probability that Sarina will win at least one game is the complement to her not winning two games.
 	
$1 - 0.7 \times 0.8 = 0.44$
	MS–S2 Relative Frequency and Probability
	MS11–8 Bands 5–6

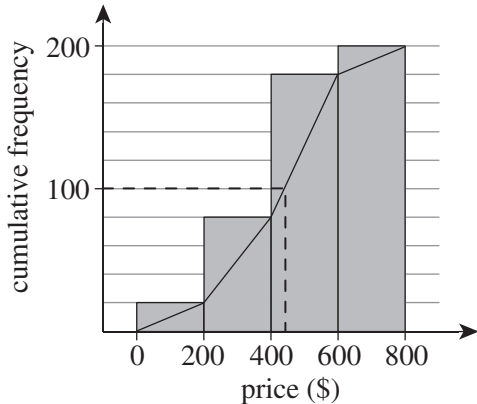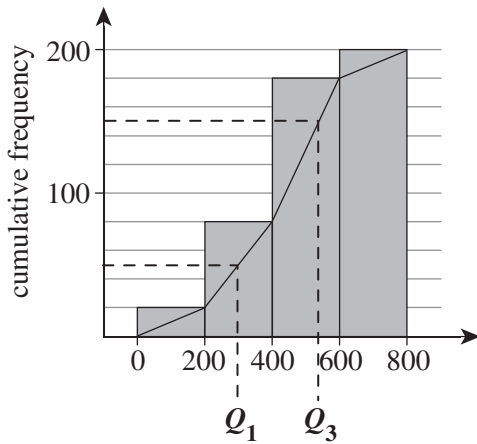| Answer and explanation	Syllabus content, outcomes and targeted performance bands
Question 14 **D** **D** is correct. The mean number of goals can be found using the following formula. $$\frac{3 \times 3 + 4 \times 7 + 5 \times 5 + 6 \times 1 + 7 \times x + 8 \times 4}{3 + 7 + 5 + 1 + x + 4} = 5.4$$ If Sarah scored seven goals in five games, the mean would be: $$\frac{3 \times 3 + 4 \times 7 + 5 \times 5 + 6 \times 1 + 7 \times 5 + 8 \times 4}{3 + 7 + 5 + 1 + 5 + 4} = 5.4$$ **A** is incorrect. If Sarah scored seven goals in two games, the mean would be: $$\frac{3 \times 3 + 4 \times 7 + 5 \times 5 + 6 \times 1 + 7 \times 2 + 8 \times 4}{3 + 7 + 5 + 1 + 2 + 4} = 5.1818$$ **B** is incorrect. If Sarah scored seven goals in three games, the mean would be: $$\frac{3 \times 3 + 4 \times 7 + 5 \times 5 + 6 \times 1 + 7 \times 3 + 8 \times 4}{3 + 7 + 5 + 1 + 3 + 4} = 5.2609$$ **C** is incorrect. If Sarah scored seven goals in four games, the mean would be: $$\frac{3 \times 3 + 4 \times 7 + 5 \times 5 + 6 \times 1 + 7 \times 4 + 8 \times 4}{3 + 7 + 5 + 1 + 4 + 4} = 5.3333$$	MS–S1 Data Analysis MS11–7 Bands 5–6
Question 15 **C** The area of larger circle is πR^2, and the area of the smaller circle is πr^2. $$\text{shaded area} = \pi R^2 - \pi r^2$$ $$= \pi\left(R^2 - r^2\right)$$ Using the right-angled triangle gives: $$R^2 = r^2 + 8^2$$ $$R^2 - r^2 = 8^2$$ Substituting $R^2 - r^2 = 8^2$ into the formula for the shaded area gives: $$\text{shaded area} = \pi \times 8^2$$ $$= 201.0619 \text{ cm}^2$$ $$\approx 201 \text{ cm}^2$$	MS–M1 Applications of Measurement MS11–4 Bands 5–6

SECTION II

Sample answer	Syllabus content, outcomes, targeted performance bands and marking guide
Question 16	
(a) $\text{mean} = \dfrac{3+5+7+9+11}{5}$ $= 7$	MS–S1 Data Analysis MS11–7 Bands 1–2 • Provides the correct solution 1
(b) highest score $= 11$ lower score $= 3$ range $= 11 - 3 = 8$	MS–S1 Data Analysis MS11–7 Bands 1–2 • Provides the correct solution 1
Question 17	
(a) Using the straight-line method of depreciation formula gives: $S = V_0 - Dn$ $= 7500 - 500 \times 4$ $= 5500$ Therefore, the value of the camera after four years is \$5500.	MS–F1 Money Matters MS11–6 Bands 1–2 • Provides the correct solution 1
(b) Determining the value of n when $S = 4500$ gives: $S = V_0 - Dn$ $4500 = 7500 - 500 \times n$ $500n = 7500 - 4500$ $n = \dfrac{3000}{500}$ $= 6$ Therefore, it will take six years for the camera to be worth \$4500.	MS–F1 Money Matters MS11–6 Bands 2–3 • Provides the correct solution 1
(c) value of the camera after eight years: $S = 7500 - 500 \times 8$ $= 3500$ value of n when the salvage value is \$0: $0 = 3500 - 350n$ $350n = 3500$ $n = \dfrac{3500}{350}$ $= 10$ $8 + 10 = 18$ Therefore, the camera will be worth \$0 after 18 years.	MS–F1 Money Matters MS11–6 Bands 4–5 • Provides the correct solution . . . . . .2 ___ • Makes significant progress 1

Sample answer	Syllabus content, outcomes, targeted performance bands and marking guide
Question 18	
(a) The coffee cup sizes are categorised as categorical ordinal as the data is expressed in words and an order can be given to the data.	MS–S1 Data Analysis MS11–10 Bands 1–2 • Provides the correct explanation . . .1
(b) total number of coffees sold in the one-hour period $$= 86 + 204 + 90$$ $$= 380$$ number of small coffee cups required $= \dfrac{86}{380} \times 1900$ $$= 430$$ Therefore, Viki should order 430 small coffee cups.	MS–S1 Data Analysis MS11–7 Bands 2–3 • Provides the correct solution 1
(c) $\dfrac{514}{4.184} = 122.8489$ $$\approx 123 \text{ kcal}$$	MS–M1 Applications of Measurement MS11–3 Bands 2–3 • Provides the correct solution 1
Question 19	
$\text{BAC} = \dfrac{10 \times 4 - 7.5 \times 2}{6.8 \times 82}$ $$= 0.04484$$ $$\approx 0.0448$$	MS–A1 Formulae and Equations MS11–1 Bands 2–3 • Provides the correct solution . . . . . .2 • Makes some progress. 1
Question 20	
(a) precision = 0.1 metres absolute error $= \dfrac{1}{2} \times 0.1$ $$= 0.05 \text{ metres}$$ lower bound $= 30.5 - 0.05$ $$= 30.45 \text{ metres}$$	MS–M1 Applications of Measurement MS11–3 Bands 2–3 • Provides the correct solution . . . . . .2 • Finds the absolute error 1
(b) percentage error $= \dfrac{\text{absolute error}}{\text{measurement}} \times 100$ $$= \dfrac{0.05}{30.5} \times 100$$ $$= 0.1639$$ $$\approx 0.16\%$$	MS–M1 Applications of Measurement MS11–3 Bands 2–3 • Provides the correct rounded solution with percentage sign . . . . .2 • Makes some progress. 1

Sample answer	Syllabus content, outcomes, targeted performance bands and marking guide
Question 21	
$\dfrac{2\ \text{hours}}{3\ \text{boats}} = 0.6667$ hours $\qquad\qquad = 40$ minutes $13{:}43 + 40$ minutes $= 14{:}23$	MS–M2 Working with Time MS11–3 Bands 2–3 • Provides the correct solution . . . . . .3 • Makes significant progress . . . . . . .2 • Completes ONE relevant calculation .1
Question 22	
(a) total amount paid $= \text{cost of car} + \text{on road costs} + \text{stamp duty}$ $= \$50\ 000 + \$450 + 3\% \times \$45\ 000 + 5\% \times \$5000$ $= \$52\ 050$	MS–F1 Money Matters MS11–6 Bands 2–3 • Provides the correct solution . . . . . .2 • Makes some progress. 1
(b) amount of fuel consumed in one week $= \dfrac{420}{100} \times 7.9$ $= 33.18$ L amount of fuel consumed in one year $= 33.18 \times 52$ $= 1725.36$ L amount spent on fuel each year $= 1725.36 \times \$1.659$ $= \$2862.37224$ $= \$2862.37$	MS–F1 Money Matters MS11–6 Bands 2–3 • Provides the correct solution . . . . . .3 • Makes significant progress . . . . . . .2 • Completes ONE relevant calculation .1
Question 23	
There are nine edges in the solid. total length of edges $= 5 + 5 + 4 + 4 + 3 + 3 + 5 + 5 + 5$ $= 39$ metres All edges represent poles that cost $2 per metre. cost of poles $= 39 \times 2$ $= \$78$ There are five faces in the solid. total area of faces $= \dfrac{1}{2} \times 3 \times 4 + \dfrac{1}{2} \times 3 \times 4 + 5 \times 4 + 5 \times 3 + 5 \times 5$ $= 72$ m^2 cost of synthetic material $= 72 \times 15$ $= \$1080$ total cost $= 1080 + 78$ $= \$1158$	MS–M1 Applications of Measurement MS11–4 Bands 3–4 • Provides the correct solution . . . . . .5 • Provides the correct solution with ONE error . . . . .4 • Finds the area OR cost of the poles. . . . . .3 • Makes some progress. . . . . .2 • Finds the cost of the poles OR the area of ONE face. 1

Sample answer	Syllabus content, outcomes, targeted performance bands and marking guide
Question 24	
amount of income greater than $\$452 = 520 - 452$ $\qquad = \$68$ amount that payment is reduced by $= 0.50 \times \$68$ $\qquad = \$34.00$ Hamish's fornightly Austudy payment $= 530.40 - 34.00$ $\qquad = \$496.40$	MS–F1 Money Matters MS11–6 Bands 3–4 • Provides the correct solution . . . . . .2 • Makes significant progress 1
Question 25	
Using similar triangles gives: $\dfrac{x}{5} = \dfrac{16}{4}$ $x = \dfrac{16}{4} \times 5$ $\quad = 20 \text{ cm}$	MS–M1 Applications of Measurement MS11–4 Bands 3–4 • Provides the correct solution . . . . . .2 • Makes significant progress 1
Question 26	
taxable income $= 60\,970 - 3020$ $\qquad = \$57\,950$ income tax payable $= 5092 + 0.325 \times (57\,950 - 45\,000)$ $\qquad = \$9300.75$ Medicare levy $= 2\% \times 57\,950$ $\qquad = \$1159.00$ total tax payable $= 9300.75 + 1159$ $\qquad = \$10\,459.75$ Sandra paid \$12 550 in PAYG tax. Sandra will receive a tax refund. tax refund $= 12\,550 - 10\,459.75$ $\qquad = \$2090.75$	MS–F1 Money Matters MS11–6 Bands 3–4 • Provides the correct solution . . . . . .5 • Makes significant progress . . . . . . .4 • Makes significant progress with up to TWO errors. . . . . .3 • Finds the taxable income AND income tax payable . . . . .2 • Finds the taxable income 1

Sample answer	Syllabus content, outcomes, targeted performance bands and marking guide
Question 27	
(a) negative skew	MS–S1 Data Analysis MS11–7 Bands 3–4 • Provides the correct solution 1
(b) Using the cumulative frequency polygon, as there are 200 scores, the median would be approximately in the 100th position. Hence, the median price is approximately $460. *Note: A range of values are acceptable. Accept reasonable approximations.*	MS–S1 Data Analysis MS11–7 Bands 3–4 • Provides the correct solution 1

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Sample answer	Syllabus content, outcomes, targeted performance bands and marking guide
(c) The median price of a television from shop *A* is \$460. The median price of a television from shop *B* is \$350. The price of televisions from shop *A* is generally more expensive. The interquartile range of the price of televisions from shop *B* is \$300. The interquartile range of the price of televisions from shop *A* can be found using the cumulative frequency polygon. lower quartile (Q_1) = \$300 upper quartile (Q_3) = \$540 interquartile range (IQR) = 540 – 300 = \$240 Hence, the price of the middle 50% of televisions is more spread out in shop *B* than shop *A* as shop *B* has a large interquartile range. *Note: Consequential on answer to **Question 27(a)**. Accept responses that use the approximation given in **27(a)**.*	MS–S1 Data Analysis MS11–10 Bands 4–5 • Provides the correct solution . . . . . .3 • Interprets the median prices AND makes progress towards establishing the interquartile range for shop *A*. . . . . .2 • Interprets the median prices OR makes progress towards establishing the interquartile range for shop *A*. 1
Question 28	
(a) $\dfrac{5}{24}$	MS–S2 Relative Frequency and Probability MS11–8 Bands 1–2 • Provides the correct solution 1
(b) number of cans of lemonade = 5 number of cans that are not lemonade = 24 – 5 = 19 total number of cans = 24 Therefore, the relative frequency of not selecting a can of lemonade is $\dfrac{19}{24}$.	MS–S2 Relative Frequency and Probability MS11–8 Bands 3–4 • Provides the correct solution 1

Sample answer	**Syllabus content, outcomes, targeted performance bands and marking guide**

(c)   number of cans of ginger ale $= 0.125 \times 24$
               $= 3$ cans
     number of cans of tonic water $= 24 - 5 - 5 - 3$
               $= 11$ cans
	MS–S2 Relative Frequency and Probability
	 MS11–8 Bands 4–5
	 • Provides the correct solution 2
	 _____
	 • Makes some progress. 1

Question 29

area of the backyard $= \dfrac{5}{2}(10 + 6)$
                 $= 40$ m^2
 depth of dirt $= 10$ cm
             $= 0.1$ m
 volume of dirt to be removed $= 40 \times 0.1$
                          $= 4$ m^3
 number of skip bins $= \dfrac{4}{1.5}$
                 $= 2.6667$
                 ≈ 3
 Therefore, Jonathon will need three skip bins to hold all the dirt.
 Note: Do not accept unrounded or rounded-down values. The number of skip bins must be a whole number. Two skip bins will not hold all the dirt.
	MS–M1 Applications of Measurement
	 MS11–10 Bands 4–5
	 • Provides the correct solution 4
	 _____
	 • Makes significant progress
	      with ONE error 3
	 _____
	 • Calculates the volume of dirt
	      to be removed 2
	 _____
	 • Calculates the area of
	      the backyard. 1

Question 30

(a) The *y*-intercept represents the number of cupcakes made for which no muffins will be made (that is, 400 cupcakes).	MS–A2 Linear Relationships MS11–1 Bands 3–4 • Provides the correct explanation . . .1
(b) The gradient represents how many fewer cupcakes are made for every muffin made (that is, one cupcake).	MS–A2 Linear Relationships MS11–1 Bands 4–5 • Provides the correct explanation . . .1
(c) The graph would not applicable when *x* is less than 0 and when *x* is greater than 350. There cannot be fewer than 0 muffins made and at least 50 cupcakes must be made each day, which means that no more than 350 muffins can be made.	MS–A2 Linear Relationships MS11–1 Bands 4–5 • Provides the correct solution . . . . . .2 _____ • Gives ONE correct value of *x* 1

Sample answer	Syllabus content, outcomes, targeted performance bands and marking guide
Question 31	
Using the outlier formula gives: $\text{upper outlier limit} = Q_3 + 1.5 \times IQR$ $45 = 27 + 1.5(27 - x)$ $45 = 27 + 40.5 - 1.5x$ $45 = 67.5 - 1.5x$ $1.5x = 67.5 - 45$ $1.5x = 22.5$ $x = \dfrac{22.5}{1.5}$ $ = 15$	MS–S1 Data Analysis MS11–10 Bands 5–6 • Provides the correct solution . . . . . .3 • Makes significant progress . . . . . . .2 • Forms an expression for the IQR . . .1
Question 32	
(a) 80th percentile (or P_{80})	MS–S1 Data Analysis MS11–7 Bands 3–4 • Provides the correct solution 1
(b) Carmela will not be employed by the government. She is ranked $\dfrac{520}{700} = 0.7429$. Carmela is in the 75th percentile; this is not in the top 20% of people completing the exam.	MS–S1 Data Analysis MS11–7 Bands 5–6 • Provides the correct solution 1
(c) The skew of the dataset is negative. As there are 800 marks in the exam, the halfway point is 400. However, the median score is 570. As the majority of the scores are in the upper half, the skew of the dataset is negative.	MS–S1 Data Analysis MS11–7 Bands 5–6 • Provides the correct solution 1

Sample answer	Syllabus content, outcomes, targeted performance bands and marking guide
Question 33	
volume of each candle: $V = \pi r^2 h$ $\quad = \pi \times 4.5^2 \times 12$ $\quad = 763.4070 \text{ cm}^3$ mass of wax needed: $W = 763.4070 \times \left(\dfrac{100-10}{100}\right) \times 0.83$ $\quad = 570.2650 \text{ grams}$ GST-inclusive price $= 570.2650 \times 0.02$ $\qquad\qquad\qquad\quad = \$11.4053$ GST-exclusive price $= \dfrac{11.4053}{110} \times 100$ $\qquad\qquad\qquad\quad = 10.3685$ $\qquad\qquad\qquad\quad \approx \$10.37$	MS–A1 Formulae and Equations MS11–10 $\qquad\qquad\qquad$ Bands 5–6 • Provides the correct solution . . . . . .5 • Provides the correct solution with ONE error . . . . .4 • Calculates the volume AND mass . . . . .3 • Calculates the volume OR calculates the mass using incorrect values in the substitution. . . . . .2 • Completes ONE relevant calculation .1