



# JOHN EDMONDSON HIGH SCHOOL

## Assessment Notification

Faculty: Mathematics

Course: Mathematics Standard

Year: 11

Assessment Task: 1

Assessment Weighting: 20% Due: Term 1 Week 8 Date: Monday 13<sup>th</sup> March 2023

Task Type: Hand in Task  In Class Task  Practical Task

### Outcomes assessed (NESA)

MS11-1, MS11-6, MS11-9, MS11-10

Please Note: Further information related to these codes can be found on the NESA website

### Task Description/Overview

This assignment involves the use and application of algebra to solve practical problems associated with metabolic rates and medication dosages. It comprises two parts:

- **Part A** requires students to calculate basal metabolic rates and create and analyse a spreadsheet.
- **Part B** requires students to research, calculate medication dosages for children and create and analyse spreadsheets.

All parts of the task are to be completed individually. Only one period will be allocated to assist students with Google Sheets.

### Detailed Assessment Task Description

**Part A** – Students have to calculate their own Basal Metabolic Rates (BMR) using a formula and create a spreadsheet showing the results of inputting a range of values into the formulae. Students also have to calculate the age of a person given a BMR and using their current height and weight.

**Part B** – Students have to calculate the required dosages of infants and children. Students also have to create and analyse spreadsheets showing the results of inputting a range of values into the formulae.

### Submission instructions:

- Students have to submit this assignment at the **beginning of the lesson** on Monday, 13<sup>th</sup> March.
- **Solutions must be completed on the lines provided** for each question.
- Spreadsheets must be created using **Google Sheets** and **shared via email** with the teacher marking your class' assignments. Your Google Sheet must be named in the format of:  
**Class\_LastName\_FirstName** (e.g. 11B\_Smith\_John)

Email of teacher marking your assignment: \_\_\_\_\_@education.nsw.gov.au

### Assessment Criteria

<b>Grade</b>	<b>Description</b>	<b>Mark Range</b>
<b>Outstanding (O)</b>	<ul style="list-style-type: none"> <li>▪ demonstrates a thorough understanding of the mathematics involved in solving the problem</li> <li>▪ uses appropriate mathematical processes in solving the problem without error</li> <li>▪ communicates in a concise and systematic manner and justifies conclusions using appropriate mathematical language, notation and symbols</li> </ul>	<b>30 - 35</b>
<b>High (H)</b>	<ul style="list-style-type: none"> <li>▪ demonstrates understanding of the mathematics involved with appropriate calculations with either a minor arithmetic or calculation error OR all mathematical calculations have been carried out without error but the final conclusion is incorrect</li> <li>▪ communicates in a concise and systematic manner and justifies conclusions using some mathematical language, notation and symbols</li> </ul>	<b>23 - 29</b>
<b>Sound (S)</b>	<ul style="list-style-type: none"> <li>▪ demonstrates progress towards a solution with some error</li> <li>▪ demonstrates a sound understanding and uses appropriate working mathematical processes</li> <li>▪ communicates in a concise and systematic manner and justifies conclusions using some mathematical language, notation and symbols</li> </ul>	<b>15 - 22</b>
<b>Basic (B)</b>	<ul style="list-style-type: none"> <li>▪ demonstrates a basic knowledge of content and understanding of the mathematics involved in solving the problem</li> <li>▪ demonstrates progress towards a solution with some error</li> <li>▪ demonstrates a basic understanding of what it means to work mathematically with some use of mathematical language, notation and/or symbols</li> </ul>	<b>6 - 14</b>
<b>Limited (L)</b>	<ul style="list-style-type: none"> <li>▪ demonstrates a limited understanding of the mathematics involved in solving the problem</li> <li>▪ limited use of mathematical language</li> </ul>	<b>0 - 5</b>

### **Satisfactory completion of courses**

A course has been satisfactorily completed, when the student has:

- Followed the course developed/endorsed by the NSW Educational Standards Authority (NESA)
- Applied himself/herself with diligence and sustained effort to the set tasks and experiences provided in the course.
- Achieved some or all of the course outcomes

#### **Student confirmation**

I certify the following assessment is all my own work and I have not copied materials from other sources.

Student signature: \_\_\_\_\_

## Part A: CALCULATING METABOLIC RATES

The **Basal Metabolic Rate** or **BMR** is the amount of energy utilised while your body is at rest. It is the number of calories your organs need to function without any physical activity. One way of measuring your BMR is by using the Harris-Benedict equation:

$$\mathbf{BMR}_{\text{male}} = 66.47 + (13.75 \times \text{weight in kg}) + (5.003 \times \text{height in cm}) - (6.755 \times \text{age in years})$$

$$\mathbf{BMR}_{\text{female}} = 655.1 + (9.563 \times \text{weight in kg}) + (1.85 \times \text{height in cm}) - (4.676 \times \text{age in years})$$

Fill out the blanks for questions 1 to 3:

1. Write down your current weight in kilograms: \_\_\_\_\_ kg
2. Write down your current height in centimetres: \_\_\_\_\_ cm
3. How old are you? \_\_\_\_\_ years old
4. Assuming your weight and height remains the same, use your answers from questions 1 & 2 and the relevant BMR formula above to find your BMR:

a) **in your current age** (show working out)

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b) **in 3 years' time** (show working out)

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c) **in 7 years' time** (show working out)

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5. Create a spreadsheet to show your BMR from your current age to 15 years from now, considering your weight and height do not change. *Your solutions may look similar to the image below.*

	A	B
1	<b>Age</b>	<b>BMR</b>
2	17	1493.203
3	18	1488.527
4	19	1483.851
5	20	1479.175
6	21	1474.499
7	22	1469.823
8	23	1465.147
9	24	1460.471
10	25	1455.795
11	26	1451.119
12	27	1446.443
13	28	1441.767
14	29	1437.091
15	30	1432.415
16	31	1427.739

6. Using your spreadsheet, or otherwise, find the difference between your BMR now and your BMR in 15 years' time if your weight and height stays the same. Why do you think it has gone up/down?

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7. If someone with your current height and weight has a BMR of 1620 (male) or 1430 (female), what is their age, to the nearest year? **Show your working out.**

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## Part B: MEDICATION

There are three formulae used to calculate the required dosages for children and infants.

**Fried's rule:**       $Dosage = \frac{Age\ of\ infant\ (months) \times Adult\ dosage}{150}$

**Young's rule:**       $Dosage = \frac{Age\ of\ child\ (years) \times Adult\ dosage}{Age\ of\ child\ (years) + 12}$

**Clark's rule:**       $Dosage = \frac{Weight\ (kg) \times Adult\ dosage}{70}$

Find a **liquid** medicine online as a subject of your research.

1. Write down the name of your chosen medicine: \_\_\_\_\_
2. Research and find the adult dosage of your chosen medicine? \_\_\_\_\_
3. For your chosen medicine, use Clark's rule and calculate the dosage for a child weighing:
  - a) **10 kg** (show working out)

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- b) **15 kg** (show working out)

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- c) **20kg** (show working out)

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4. Create a spreadsheet to calculate the dosage for children weighing from 5 to 20 kg using Clark's rule. *Your solutions may look similar to the image below.*

	A	B
1	<b>Weight (kg)</b>	<b>Dosage (Clark's Rule)</b>
2	5	1.428571429
3	6	1.714285714
4	7	2
5	8	2.285714286
6	9	2.571428571
7	10	2.857142857
8	11	3.142857143
9	12	3.428571429
10	13	3.714285714
11	14	4
12	15	4.285714286
13	16	4.571428571
14	17	4.857142857
15	18	5.142857143
16	19	5.428571429
17	20	5.714285714

5. For your chosen medicine, use Fried's rule and calculate the dosage for a child aged:
- a) **6 months** (show working out)

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- b) **18 months** (show working out)

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- c) **2 years** (show working out)

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6. Create a spreadsheet to calculate the dosage for children ages 6 to 24 months using Fried's rule. *Your solutions may look similar to the image below.*

	A	B
1	<b>Age (months)</b>	<b>Dosage (Fried's Rule)</b>
2	6	0.8
3	7	0.9333333333
4	8	1.066666667
5	9	1.2
6	10	1.333333333
7	11	1.466666667
8	12	1.6
9	13	1.733333333
10	14	1.866666667
11	15	2
12	16	2.133333333
13	17	2.266666667
14	18	2.4
15	19	2.533333333
16	20	2.666666667
17	21	2.8
18	22	2.933333333
19	23	3.066666667
20	24	3.2

7. Using your spreadsheets, or otherwise, what do you think is more important, a child's age or weight? Justify your answer.

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## Marking Rubric for Part A

Question	Mark	Description	Mark
1, 2, & 3	0	<ul style="list-style-type: none"> <li>Not stated</li> </ul>	
	1	<ul style="list-style-type: none"> <li>Weight, height and age <b>all</b> stated</li> </ul>	
4a	0	<ul style="list-style-type: none"> <li>Not attempted</li> </ul>	
	1	<ul style="list-style-type: none"> <li>Calculated BMR with partial error</li> </ul>	
	2	<ul style="list-style-type: none"> <li>Calculated BMR correctly with working out</li> </ul>	
4b	0	<ul style="list-style-type: none"> <li>Not attempted</li> </ul>	
	1	<ul style="list-style-type: none"> <li>Calculated BMR with partial error</li> </ul>	
	2	<ul style="list-style-type: none"> <li>Calculated BMR correctly with working out</li> </ul>	
4c	0	<ul style="list-style-type: none"> <li>Not attempted</li> </ul>	
	1	<ul style="list-style-type: none"> <li>Calculated BMR with partial error</li> </ul>	
	2	<ul style="list-style-type: none"> <li>Calculated BMR correctly with working out</li> </ul>	
5	0	<ul style="list-style-type: none"> <li>Not attempted</li> </ul>	
	1-2	<ul style="list-style-type: none"> <li>Partially completed spreadsheet</li> </ul>	
	3	<ul style="list-style-type: none"> <li>Correct cell formulae used and spreadsheet correctly completed</li> </ul>	
6	0	<ul style="list-style-type: none"> <li>Not attempted OR calculated the difference incorrectly and an unreasonable explanation given</li> </ul>	
	1	<ul style="list-style-type: none"> <li>Calculated the correct difference <b>OR</b> gave a reasonable explanation</li> </ul>	
	2	<ul style="list-style-type: none"> <li>Calculated the correct difference <b>AND</b> gave a reasonable explanation</li> </ul>	
7	0	<ul style="list-style-type: none"> <li>Not attempted</li> </ul>	
	1	<ul style="list-style-type: none"> <li>Calculated age with partial error</li> </ul>	
	2	<ul style="list-style-type: none"> <li>Calculated age correctly to the nearest year</li> </ul>	
<b>TOTAL</b>			<b>/14</b>



### Marking Rubric for Part B

Question	Mark	Description	Mark
1 & 2	0	<ul style="list-style-type: none"> <li>Not attempted</li> </ul>	
	1	<ul style="list-style-type: none"> <li>Medicine and adult dosage <b>both</b> stated</li> </ul>	
3a	0	<ul style="list-style-type: none"> <li>Not attempted</li> </ul>	
	1	<ul style="list-style-type: none"> <li>Calculated dosage using Clark's rule with partial error</li> </ul>	
	2	<ul style="list-style-type: none"> <li>Calculated dosage using Clark's rule correctly</li> </ul>	
3b	0	<ul style="list-style-type: none"> <li>Not attempted</li> </ul>	
	1	<ul style="list-style-type: none"> <li>Calculated dosage using Clark's rule with partial error</li> </ul>	
	2	<ul style="list-style-type: none"> <li>Calculated dosage using Clark's rule correctly</li> </ul>	
3c	0	<ul style="list-style-type: none"> <li>Not attempted</li> </ul>	
	1	<ul style="list-style-type: none"> <li>Calculated dosage using Clark's rule with partial error</li> </ul>	
	2	<ul style="list-style-type: none"> <li>Calculated dosage using Clark's rule correctly</li> </ul>	
4	0	<ul style="list-style-type: none"> <li>Not attempted</li> </ul>	
	1-2	<ul style="list-style-type: none"> <li>Partially completed spreadsheet</li> </ul>	
	3	<ul style="list-style-type: none"> <li>Correct cell formulae used, and spreadsheet correctly completed</li> </ul>	
5a	0	<ul style="list-style-type: none"> <li>Not attempted</li> </ul>	
	1	<ul style="list-style-type: none"> <li>Calculated dosage using Fried's rule with partial error</li> </ul>	
	2	<ul style="list-style-type: none"> <li>Calculated dosage using Fried's rule correctly</li> </ul>	
5b	0	<ul style="list-style-type: none"> <li>Not attempted</li> </ul>	
	1	<ul style="list-style-type: none"> <li>Calculated dosage using Fried's rule with partial error</li> </ul>	
	2	<ul style="list-style-type: none"> <li>Calculated dosage using Fried's rule correctly</li> </ul>	
5c	0	<ul style="list-style-type: none"> <li>Not attempted</li> </ul>	
	1	<ul style="list-style-type: none"> <li>Calculated dosage using Fried's rule with partial error</li> </ul>	
	2	<ul style="list-style-type: none"> <li>Calculated dosage using Fried's rule correctly</li> </ul>	
6	0	<ul style="list-style-type: none"> <li>Not attempted</li> </ul>	
	1-2	<ul style="list-style-type: none"> <li>Partially completed spreadsheet</li> </ul>	
	3	<ul style="list-style-type: none"> <li>Correct cell formulae used and spreadsheet correctly completed</li> </ul>	
7	0	<ul style="list-style-type: none"> <li>Not attempted/ incorrect response</li> </ul>	
	1	<ul style="list-style-type: none"> <li>Correct response with an unreasonable explanation</li> </ul>	
	2	<ul style="list-style-type: none"> <li>Correct response with a reasonable explanation</li> </ul>	
<b>TOTAL</b>			<b>/21</b>

