**Stage 2 GENERAL MathematicS**

**Assessment Type 1: Skills and Applications Tasks**

**TOPIC 1: MODELLING WITH LINEAR RELATIONSHIPS**

**Purpose**

To demonstrate your ability to:

* understand mathematical concepts and relationships from within Topic 1: Modelling with Linear Relationships
* select and apply mathematical techniques and algorithms to find solutions to problems
* interpret results, draw conclusions, and consider the reasonableness of solutions in context
* communicate mathematically and present mathematical information.

This assessment allows you to show your skills in understanding and appropriate use of the mathematical concepts, process and strategies in the following:

1. Subtopic 1.1: Simultaneous Linear Equations
2. Subtopic 1.2: Linear Programming

**Assessment Conditions**

This is a supervised assessment.

NO CALCULATOR, ELECTRONIC TECHNOLOGY or NOTES are to be used for Part A.

Provide complete working for all calculations.

This task is of 55 minutes working time, conducted in a 100 minute lesson.

* Part A: 30 minutes (non-calculator)
* Part B: 25 minutes (calculator)

Time will be set aside to collect Part A before access to calculators, for Part B, is provided.

**Assessment Design Criteria**

**Concepts and Techniques**

CT 1 Knowledge and understanding of concepts and relationships.

CT 2 Selection and application of mathematical techniques and algorithms to find solutions to problems in a variety of contexts.

CT 4 Use of electronic technology to find solutions to mathematical problems.

**Reasoning and Communication**

RC 1 Interpretation of mathematical results.

RC 2 Drawing conclusions from mathematical results with an understanding of their reasonableness and limitations.

RC 3 Use of appropriate notations representations and terminology.

RC 4 Communication of mathematical ideas and reasoning to develop logical arguments.

**Stage 2 GENERAL MathematicS**

**TOPIC 1: MODELLING WITH LINEAR RELATIONSHIPS**

**Skills and Applications Task**

**Answer all questions in the spaces provided, showing all calculations.**

**PART A: NO CALCULATOR, ELECTRONIC TECHNOLOGY or NOTES are to be used. TOTAL [ /27]**

**QUESTION 1:** Jed is a Primary school teacher and is stocking up on classroom stationery supplies. “Cheapy’s Warehouse” is selling stationery packs.

Pack A: 10 pencils with 12 pens for $9.28, and Pack B: 7 pencils with 3 pens for $3.58.

Jed wants to know if the cost of the pencils and pens in these ‘pack’ options are cheaper than the individual unit price of a pencil @ 30c each and pen @ 55c each.

1. Calculate the cost of each item in the packs and state if the packs are cheaper. [ /5]

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1. A “sales” notice advertises a package of 25 pencils with 30 pens for $23.20. Would Jed be better off buying in bulk? Provide calculations and justify. [ /3]

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**QUESTION 2:** Frieda’s class is running a “Juicy-Fruits’ Juice Bar” at their school’s fete. Customers buy freshly juiced fruit. They’ve plenty of donated fruit but have to buy their pineapples and bananas.

The local grocer has decided to support the school by charging a discounted price of $2 for each cored and peeled pineapple and a bag of bananas for $1.50 per bag. Frieda has $15 to spend and wants to spend it all.

a) If Frieda bought:

1. only bananas how many could she buy?
2. 3 pineapples, how many bags of bananas would she purchase? [ /3]

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1. Calculate the other option that uses all of Frieda’s $15 (by trial and error). [ /3]

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1. Frieda decides she wants to reserve some money for other purchases. The grocer insists that Frieda buys more than two bags of bananas and at least two pineapples to get the discounted prices. Graph the grocer’s constraints and the line made by your solutions in parts (a) and (b), on the axes below, and shade the feasible region. Provide an appropriate scale for each axis. [5 marks]

*bananas*

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*pineapples*

d) List the purchase combinations that meet the grocer’s constraints. [ /3]

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1. Show mathematically that if Frieda purchases 4 pineapples and 3 bags of bananas she will have enough cash to buy a 350ml drink of Coconut Milk costing $2. [ /2]

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1. Using the graph in part c), determine the combination which meets the grocer’s constraints and that leaves Frieda with the most change. Show using calculations how much change Frieda will have. [ /3]

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**Stage 2 GENERAL MathematicS**

**TOPIC 1: MODELLING WITH LINEAR RELATIONSHIPS**

**Skills and Applications Task**

**PART B: CALCULATOR/ELECTRONIC TECHNOLOGY and notes may be used. TOTAL [ /23]**

**QUESTION 1:** Barry’s Gourmet Butcher sells “Turducken”, a Christmas meat made of a mixture of Turkey, Duck and Chicken. He makes two Turducken blends, Deluxe and Light. Each week only 1800g of turkey, 2100g of duck and 1800g of chicken are available to make his Turduckens.

Deluxe uses at most 200g of turkey, 300g of duck and 300g of chicken.

Light uses at most 200g turkey, 200g of duck and 100g of chicken.

1. Complete the table below and write the constraints that represent this information.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Type | Turkey | Duck | Chicken |  |
| Deluxe |  |  |  | *x* |
| Light |  |  |  | *y* |
| At most |  |  |  |  |

[ /4]

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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1. One of the constraints and its label has been provided on the axis below. Graph all of the remaining constraints and label them (including x≥0 and y≥0). Shade the feasible region.

*y* Light (x100g) [ /5]

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*x* + *y* = 9 Deluxe (x100g) *x*

1. Barry’s profit is determined by the following equation: Profit = 4*x* + 2.5*y*

List the coordinates of the vertices for the feasible region. Showing calculations, determine how many of each blend of Turducken Barry should make to maximise his profit. [ /9]

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1. Is it reasonable to make decisions about the quantity of each blend of Turducken to make based only on the result of this linear programming investigation? [ /2]

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1. The “Light” blend is exceedingly popular, always quickly selling out. Should Barry consider one of the other options? Justify your answer. [ /3]

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Performance Standards for Stage 2 General Mathematics

|  | Concepts and Techniques | Reasoning and Communication |
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| A | Comprehensive knowledge and understanding of concepts and relationships.  Highly effective selection and application of mathematical techniques and algorithms to find efficient and accurate solutions to routine and complex problems in a variety of contexts.  Successful development and application of mathematical models to find concise and accurate solutions.  Appropriate and effective use of electronic technology to find accurate solutions to routine and complex problems. | Comprehensive interpretation of mathematical results in the context of the problem.  Drawing logical conclusions from mathematical results, with a comprehensive understanding of their reasonableness and limitations.  Proficient and accurate use of appropriate mathematical notation, representations, and terminology.  Highly effective communication of mathematical ideas and reasoning to develop logical and concise arguments.  Formation and testing of appropriate predictions, using sound mathematical evidence. |
| B | Some depth of knowledge and understanding of concepts and relationships.  Mostly effective selection and application of mathematical techniques and algorithms to find mostly accurate solutions to routine and some complex problems in a variety of contexts.  Attempted development and successful application of mathematical models to find mostly accurate solutions.  Mostly appropriate and effective use of electronic technology to find mostly accurate solutions to routine and some complex problems. | Mostly appropriate interpretation of mathematical results in the context of the problem.  Drawing mostly logical conclusions from mathematical results, with some depth of understanding of their reasonableness and limitations.  Mostly accurate use of appropriate mathematical notation, representations, and terminology.  Mostly effective communication of mathematical ideas and reasoning to develop mostly logical arguments.  Formation and testing of mostly appropriate predictions, using some mathematical evidence. |
| C | Generally competent knowledge and understanding of concepts and relationships.  Generally effective selection and application of mathematical techniques and algorithms to find mostly accurate solutions to routine problems in different contexts.  Application of mathematical models to find generally accurate solutions.  Generally appropriate and effective use of electronic technology to find mostly accurate solutions to routine problems. | Generally appropriate interpretation of mathematical results in the context of the problem.  Drawing some logical conclusions from mathematical results, with some understanding of their reasonableness and limitations.  Generally appropriate use of mathematical notation, representations, and terminology, with reasonable accuracy.  Generally effective communication of mathematical ideas and reasoning to develop some logical arguments.  Formation of an appropriate prediction and some attempt to test it using mathematical evidence. |
| D | Basic knowledge and some understanding of concepts and relationships.  Some selection and application of mathematical techniques and algorithms to find some accurate solutions to routine problems in context.  Some application of mathematical models to find some accurate or partially accurate solutions.  Some appropriate use of electronic technology to find some accurate solutions to routine problems. | Some interpretation of mathematical results.  Drawing some conclusions from mathematical results, with some awareness of their reasonableness.  Some appropriate use of mathematical notation, representations, and terminology, with some accuracy.  Some communication of mathematical ideas, with attempted reasoning and/or arguments.  Attempted formation of a prediction with limited attempt to test it using mathematical evidence. |
| E | Limited knowledge or understanding of concepts and relationships.  Attempted selection and limited application of mathematical techniques or algorithms, with limited accuracy in solving routine problems.  Attempted application of mathematical models, with limited accuracy.  Attempted use of electronic technology, with limited accuracy in solving routine problems. | Limited interpretation of mathematical results.  Limited understanding of the meaning of mathematical results, their reasonableness or limitations.  Limited use of appropriate mathematical notation, representations, or terminology, with limited accuracy.  Attempted communication of mathematical ideas, with limited reasoning.  Limited attempt to form or test a prediction. |