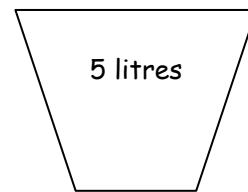


<i>Glenmore State High School</i>	
Mathematics Department	
Name:	Teacher:
Year Level: Year 8	1. Your report should be neatly hand-written or word-processed.
Unit: Natural Numbers	2. Staple this assignment sheet to the front of your report.
Due Date:	Rating:

Buckets of Maths

Budding Genius

- I have two buckets. One holds 3 litres and the other holds 5 litres. I have plenty of water. How can I get exactly 4 litres using these buckets?



Explain your answer clearly.

- What other amounts can I get with these two buckets? Justify each answer.
- Now I have a 2 litre bucket and a 4 litre bucket. Can I get exactly 3 litres using these buckets? Explain.

Genius

- Show how, with a 5 litre bucket and an 8 litre bucket, I can get all whole amounts from 1 litre to 13 litres.

Mega-Genius

- Investigate the Buckets problem for other size buckets. Describe your findings clearly, and justify your conclusions.

Buckets of Maths Solutions

1. Here is one way of setting out the steps:

Step	3 litre bucket	5 litre bucket	Total
Fill 3 litre bucket	3	0	3
Empty 3 litre bucket into 5 litre bucket	0	3	3
Fill 3 litre bucket	3	3	6
Fill 5 litre bucket from 3 litre bucket	1	5	6
Empty 5 litre bucket	1	0	1
Empty 3 litre bucket into 5 litre bucket	0	1	1
Fill 3 litre bucket	3	1	4
Empty 3 litre bucket into 5 litre bucket	0	4	4

Note that along the way, we have also found a way to get 1 litre and 6 litres as well.

- 2.
- | | |
|----------|-----------------------------------------------------------------------------------------------------------------------------------|
| 1 litre | See above |
| 2 litres | Fill the 5 litre bucket, and then fill the 3 litre bucket from the 5 litre bucket. There are 2 litres left in the 3 litre bucket. |
| 3 litres | Fill the 3 litre bucket |
| 4 litres | See above |
| 5 litres | Fill the 5 litre bucket |
| 6 litres | see above |
| 7 litres | Get 2 litres in the 3 litre bucket (as above) and then fill the 5 litre bucket. |
| 8 litres | Fill both buckets |

\therefore we can get all whole amounts from 1 litre to 8 litres.

3. With a 2 litre and 4 litre bucket we can only get an even number of litres. Hence it is not possible to get 3 litres.
4. A similar process to that followed in Q1 and Q2 is needed.
5. Some findings (letting A and B be the capacities):
- If A and B are both even then we cannot get an odd number of litres.
- If A is a factor of B, we can only get amounts that are multiples of A.
- We can get all whole amounts from 1 litre to (A+B) litres only if A and B are **relatively prime**.
- General rule: We can only get amounts that are multiples of highest common factor of A and B.