MATHS

SSEP EXAMPLE // CHEMICAL MANUFACTURER
DEVELOPED BY // FAIRFIELD COLLEGE AND ECOLAB

ACTIVITY EXAMPLE

KEY WORDS

Numeracy | percentages | decimals | ratios | numbers | volume | measurement | graphs | statistics | trends | profit and loss | sales | analysis | budgets

ALSO USEFUL FOR

Business studies | Economics | Agriculture | Agribusiness | Science | Chemistry

PROGRAMME OUTLINE

3 POINTS OF CONTACT

- Company staff come into classroom (x2)
- Workplace visit (x1)

EXAMPLE

1. Plant staff come into classroom, introduce themselves, background to the company, their careers and how maths is used in the industry. Student activity: graphs
2. Workplace visit includes health & safety overview, tour of plant, meeting staff and hearing about different careers. Seeing chemical manufacturing 'behind the scenes'.
3. Company staff come into classroom.
   Student activity: volume and ratios.

For more on SSEP see:
www.smartnz.nz

MATHS

SSEP EXAMPLE // CHEMICAL MANUFACTURER
DEVELOPED BY // FAIRFIELD COLLEGE AND ECOLAB

ACTIVITY EXAMPLE

Andrew Langman
Supply Manager - New Zealand Supply Chain

ECOLAB

Graphs

Graphs - Definition

- noun. 1A diagram showing the relation between variable quantities, typically of two variables, each measured along one of a pair of axes at right angles. ... 'The data may be visual, ie., images, charts, **graphs**, or diagrams or a written description.'
  Oxford Dictionary

- A picture that represents some data or data interaction

ACTIVITY EXAMPLE

For more on SSEP see:
www.smartnz.nz

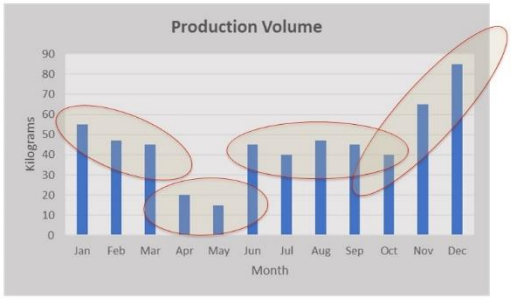
MATHS

SSEP EXAMPLE // CHEMICAL MANUFACTURER
DEVELOPED BY // FAIRFIELD COLLEGE AND ECOLAB

ACTIVITY EXAMPLE

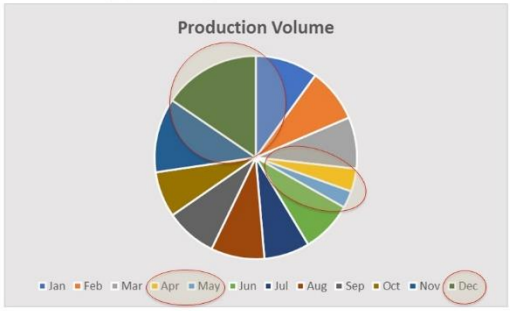
Graphs - Interpretation

- What is this graph showing?



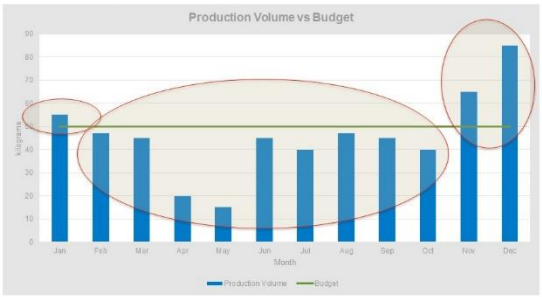
Graphs - Interpretation

- What is this graph showing?



Graphs - Interpretation

- What is this graph showing?



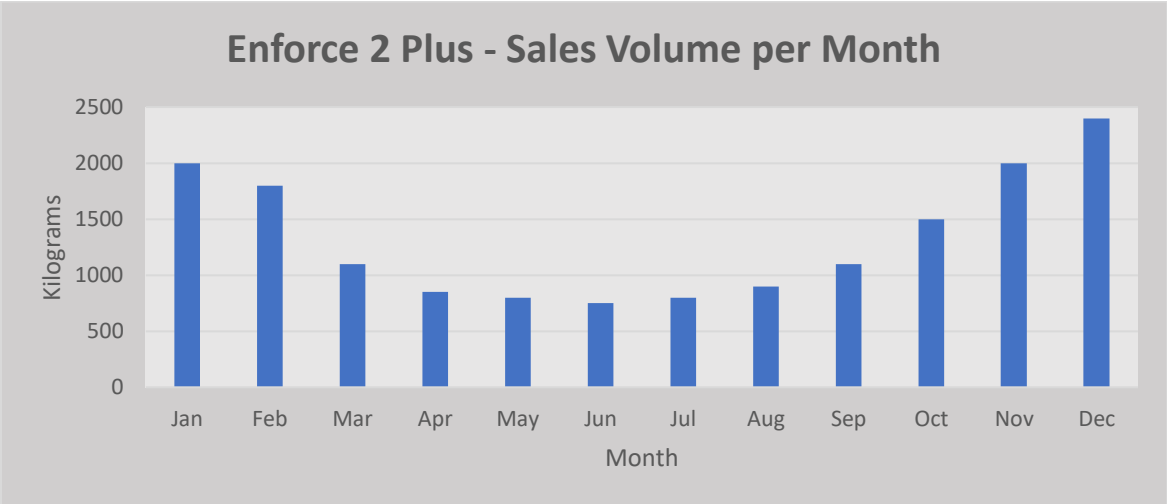
Video

- West Texas Chemical plant explosion
https://www.youtube.com/watch?v=pdDuHxwD5R4

ACTIVITY EXAMPLE

For more on SSEP see:
www.smartnz.nz

Below is a sales volume per month graph for **Enforce 2 Plus**



Question 1:

Approximately how much is sold in January? _____ Kilograms

Approximately how much is sold in June? _____ Kilograms

Approximately how much is sold in October? _____ Kilograms

Approximately how much is sold in December? _____ Kilograms

What is the difference in Sales between June and December?

_____ Kilograms (December) – _____ Kilograms (June) = _____ Kilograms

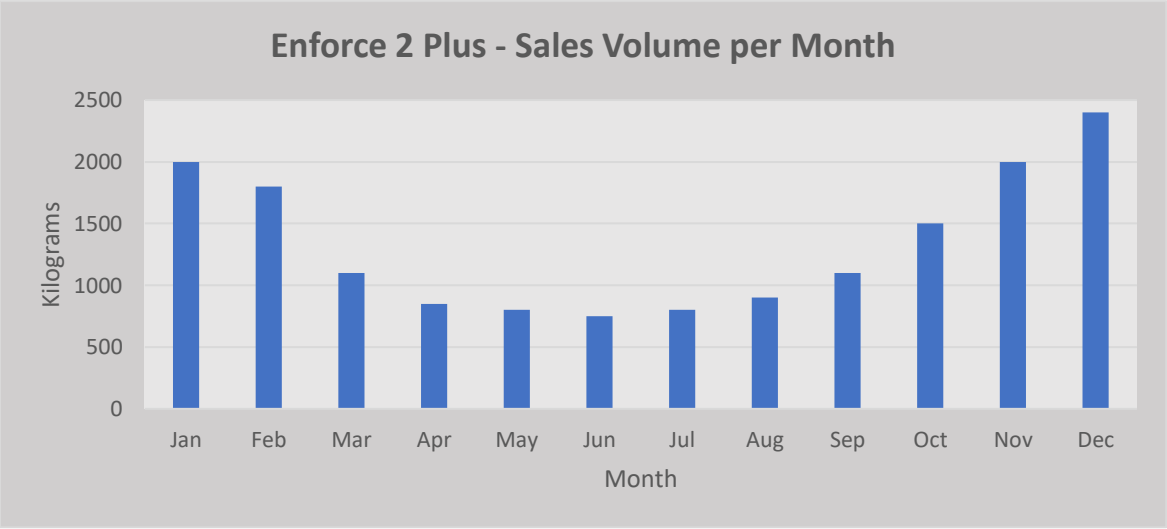
What could be the reason for this difference in Sales (Name three possible reasons)?

1. _____
2. _____
3. _____

Question 2:

Only looking at the sales for **Enforce 2 Plus** from January to April:

What is this part of the graph telling us?



What is the trend this part of the graph showing (Circle correct answer)?

Increasing Flat Decreasing

What does this mean to the profit of the company?

_____

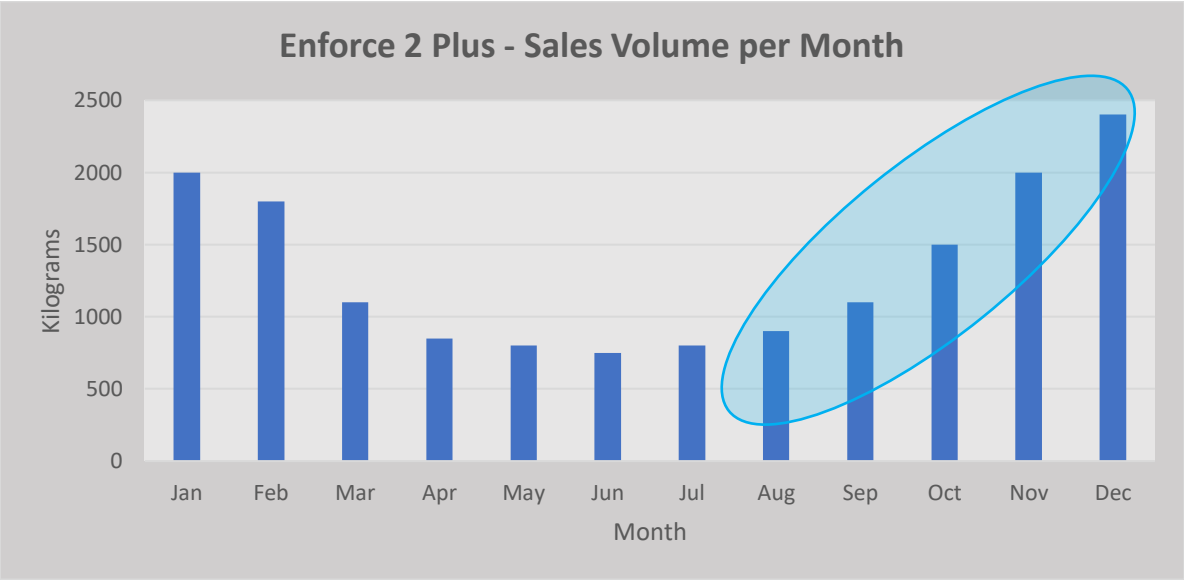
What could you do to change this trend?

_____

Question 3:

Only looking at the sales for **Enforce 2 Plus** from August to Dec:

What is this part of the graph telling us?



What is the trend this part of the graph showing (Circle correct answer)?

Increasing Flat Decreasing

What does this mean to the profit of the company?

_____

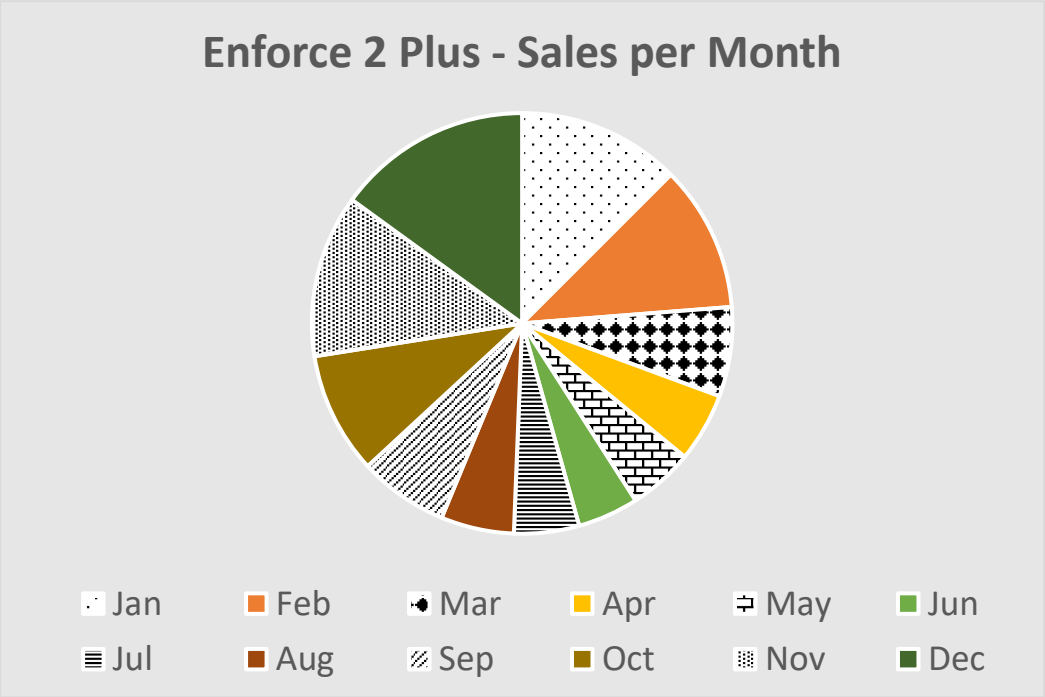
What could you do if this trend continues?

_____

Question 4:

Looking at the sales for **Enforce 2 Plus** in a Pie Chart format:

What is this graph telling us?



Are you able to see any trends in this graph (Circle answer)? Yes / No

Why can you see or not see any trends with this type of graph?

_____

Can you use this graph to show people which month has the biggest Sales? Yes / No

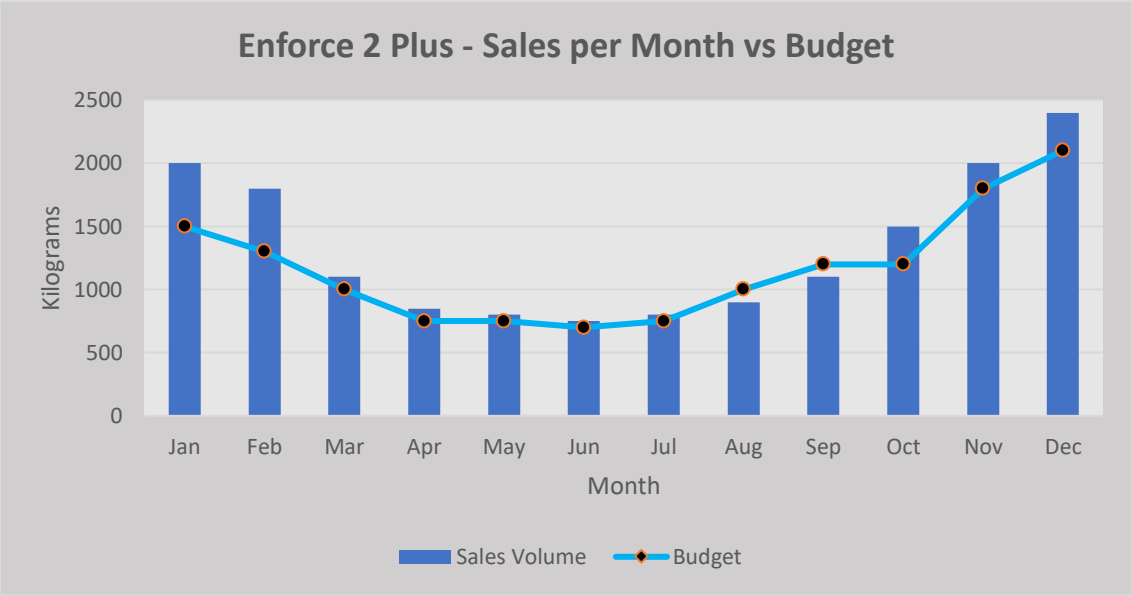
What is it about this type of graph that allows you to show the biggest sales month?

_____

Question 5:

Looking at the sales versus Budget Graph for **Enforce 2 Plus**:

What is this graph telling us?



Looking at the above Graph. Does it look like we are making a profit (Circle answer)?

Yes / No

What is it about the graph that makes it look like we are making a Profit/Loss?

_____

Which month(s) show as a loss?

_____

Which month appears to show the greatest profit?

_____

MATHS

SSEP EXAMPLE // CHEMICAL MANUFACTURER
DEVELOPED BY // FAIRFIELD COLLEGE AND ECOLAB

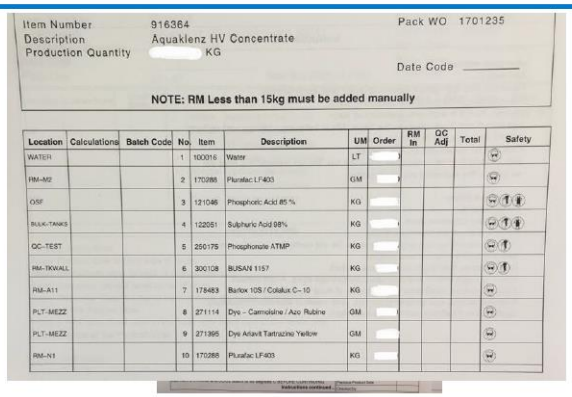
ACTIVITY EXAMPLE

Chemical Dangers




Personal Protection

Bill of Materials



Item Number 916364 Pack WO 1701235
Description Aquaklenz HV Concentrate
Production Quantity [redacted] KG
Date Code _____

NOTE: RM Less than 15kg must be added manually

Location	Calculations	Batch Code	No	Item	Description	UM	Order	RM In	QC Adj	Total	Safety
WATER			1	100016	Water	LT					
RM-M2			2	170288	Pluratac LF403	GM					
OSF			3	121046	Phosphoric Acid 85 %	KG					
BULK-TANKS			4	122051	Sulphuric Acid 98%	KG					
QC-TEST			5	250175	Phosphonate ATMP	KG					
RM-TKWALL			6	300108	BUSAN 1157	KG					
RM-A11			7	178483	Barlox 10S / Colalux C-10	KG					
PLT-MEZZ			8	271114	Dye - Carmoisine / Azo Rubine	GM					
PLT-MEZZ			9	271395	Dye Aravit Tartrazine Yellow	GM					
RM-N1			10	170288	Pluratac LF403	KG					

Enforce 2 Plus

- Chlorinated Alkali
- Cleaner and Sanitiser for the Dairy industry
- To be used on Vats and Pipes

Item Number	Chemical Description
1	A (Water)
2	B (Casutic)
3	C (Chlorine)
4	D (Surfactant)
5	E (Dye)

Hamilton Plant Statistics

- Manufacture 28,000,000kg / year
- Buy in 8,000,000kg / year
- Number of products Manufactured = 270 = 1080 SKU
- Finished pack sizes:
  - Bulk tank up to 33,000Lt
  - IBC 1,500Lt, 1000Lt
  - Drum 200Lt, 100Lt
  - Jerry Can 25Lt, 20Lt, 15Lt, 10Lt, 5Lt, 2Lt, 1Lt
  - Bladder 750ml

For more on SSEP see:
www.smartnz.nz

You have been asked to make the following mix

Product Name: **Enforce 2 Plus**

The Raw Materials that are required to manufacture this product has the following chemicals:

Item Number	Chemical Description
1	A (Water)
2	B (Caustic)
3	C (Chlorine)
4	D (Surfactant)
5	E (Dye)

Question 1:

Below is the "recipe" for 1kg of **Enforce 2 Plus**.

How much of each chemical is required to make 10,000kg?

Item Number	Chemical Description	1kg	10,000kg
1	A (Water)	0.50	
2	B (Caustic)	0.25	
3	C (Chlorine)	0.14	
4	D (Surfactant)	0.10	
5	E (Dye)	0.01	

Question 2:

The Maximum Volume that can be mixed in Mix Vat 3 is 4,800kg. There needs to be a gap at the top of the Mix Vat for Safety of 200kg.

How much of each chemical is required to make 4,600kg? To the nearest 0.5kg

Item Number	Chemical Description	1kg	4,600kg
1	A (Water)	0.50	
2	B (Caustic)	0.25	
3	C (Chlorine)	0.14	
4	D (Surfactant)	0.10	
5	E (Dye)	0.01	

Question 3:

Only 1 drum of Chlorine was found on site.

1 Drum of Chlorine is 280kg.

How much **Enforce 2 Plus** can now be manufactured?

Item Number	Chemical Description	1kg	_____kg
1	A (Water)	0.50	
2	B (Caustic)	0.25	
3	C (Chlorine)	0.14	280
4	D (Surfactant)	0.10	
5	E (Dye)	0.01	

Question 4:

A customer order comes in for "**Lucky Cow Dairy Company**", which is for 22 Drums and 30 Jerries of **Enforce 2 Plus**.
1 Drum = 200kg
1 Jerry = 20kg

4a:
Work out how much **Enforce 2 Plus** is required:

22 Drums x _____kg = _____kg

30 Jerries x _____kg = _____kg

Total Volume of **Enforce 2 Plus** required:

Drums Volume Jerry Volume
_____kg + _____kg = _____kg

Enter the new Volume required in the table below

4b:
How much of each chemical is required to complete this order to "**Lucky Cow Dairy Company**"?

Item Number	Chemical Description	1kg	_____kg
1	A (Water)	0.50	
2	B (Caustic)	0.25	
3	C (Chlorine)	0.14	
4	D (Surfactant)	0.10	
5	E (Dye)	0.01	

Ratios answers

Question 1.

Item Number	Chemical Description	1kg	10,000kg	10,000kg
1	A (Water)	0.50		5000
2	B (Casutic)	0.25		2500
3	C (Chlorine)	0.14		1400
4	D (Surfactant)	0.10		1000
5	E (Dye)	0.01		100

Question 2.

Item Number	Chemical Description	1kg	4,600kg	4,600kg
1	A (Water)	0.50		2300
2	B (Casutic)	0.25		1150
3	C (Chlorine)	0.14		644
4	D (Surfactant)	0.10		460
5	E (Dye)	0.01		46

Question 3.

Item Number	Chemical Description	1kg	_____kg	2,000kg
1	A (Water)	0.50		1000
2	B (Casutic)	0.25		500
3	C (Chlorine)	0.14	280	280
4	D (Surfactant)	0.10		200
5	E (Dye)	0.01		20

Question 4a.

22 Drums x 200 kg = 4400 kg

30 Jerries x 20 kg = 600 kg

Total Volume of **Enforce 2 Plus** required:

Drums Volume + Jerry Volume

4400 kg + 600 kg = 5000 kg

Question 4b.

Item Number	Chemical Description	1kg	5000 kg	5,000kg
1	A (Water)	0.50		2500
2	B (Casutic)	0.25		1250
3	C (Chlorine)	0.14		700
4	D (Surfactant)	0.10		500
5	E (Dye)	0.01		50

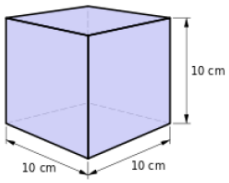
MATHS

SSEP EXAMPLE // CHEMICAL MANUFACTURER
DEVELOPED BY // FAIRFIELD COLLEGE AND ECOLAB

ACTIVITY EXAMPLE

Volume - Litre

- 1 Litre = 0.001m3



Volume - Litre

- Annual Production at Ecolab Hamilton is 28,000,000kg
- How many Swimming Pools is that
- 1 Swimming Pool is 25m x 50m x 2m
  - 2,500m3 / 0.001 = 2,500,000 Litre
- 28,000,000 x 2,500,000 = 11.2 swimming Pools per year

Volume - Mix Vat 2

- Mix Vat 2 is our largest Mix Vat at

  10,000 Litres

- 10,000 Litres x 0.001m3 = 10m3

Volume - Pallet

- Wooden structure to carry and store product on
- Designed to be carried by a forklift
- Some 200 Litre drums can weigh up to 300kg

ACTIVITY EXAMPLE

For more on SSEP see:
www.smartnz.nz

You have been asked to pack out the following Mix

Product Name: **Enforce 2 Plus**

Mix Vat 2 = **9,000 Litres**

Question 1:

Packing **Enforce 2 Plus** out of Mix Vat 2 (9,000 Litres)

How many 200 Litre drums will you get out? _____ Drums

Each pallet can hold 4 drums.

How many pallets will you need to have? _____ Pallets

ECOLAB

Question 2:

Packing **Enforce 2 Plus** out of Mix Vat 2 (9,000 Litres)

How many 20 Litre "Jerry cans" will you get out? _____ Jerry Cans

Each pallet can hold 38 Jerry cans.

How many pallets will you need to have?

_____ Jerry Cans / 38 = _____ Pallets

How many 20 Litre Jerry Cans will be on the last pallet?

_____ x 38 = _____ Jerry Cans

Question 3:

Packing **Enforce 2 Plus** out of Mix Vat 2 (9,000 Litres)

You only have room in the yard for 16 x 200 Litre Drums:

3a
How many Pallets is needed to pack these 16 Drums?

_____ Drums / _____ Drums per Pallet = _____ Pallets

3b
How many Litres is left over?

9,000 Litres – (16 x 200L) = _____ Litres

9,000 – (_____) = _____ Litres

3c
How many 20L Jerry Cans need to be packed out with the remining Liquid?

_____ Litres / 20 Litre Jerry Cans = _____ Jerry Cans

3d
How many Pallets are required to hold these Jerry Cans?

_____ Jerry Cans / 38 Jerry Cans per Pallet = _____ Pallets

Pallet Cost Increase

Question 4:

200 Litre Drums were used to pack out the 9,000 Litre **Enforce 2 Plus** mix.

In Question 1 you worked out that _____ Pallets is needed to pack out this mix

4a

The cost of each pallet is $10.

What is the total cost of the Pallets to pack out this mix? $_____

4b

The cost of each Pallet reduces to $5

How much do the pallets cost now to pack out the mix? $_____

How much money (profit) is made by this reduction in cost? $_____

4c

The cost of each of each Pallet increases to $15

How much do the pallets cost now to pack out the mix? $_____

How much money is now being lost by this increase in cost? $_____

Question 5:

20 Litre Jerry Cans were used to pack out the 9,000 Litre **Enforce 2 Plus** mix.

In **Question 2** you worked out that _____ Pallets is needed to pack out this mix

5a

The cost of each pallet is $10.

What is the total cost of the Pallets to pack out this mix? $_____

5b

The cost of each Pallet reduces to $5

How much do the pallets cost now to pack out the mix? $_____

How much money profit is made by this reduction in cost? $_____

5c

The cost of each of each Pallet increases to $15

How much do the pallets cost now to pack out the mix? $_____

How much money is now being lost by this increase in cost? $_____