Numeracy In Practice

BUILDING WORKPLACE NUMERACY PROFICIENCY AND TRAINING SKILLS OF VET PRACTITIONERS

A Professional Development Resource

NUMERACY PROFICIENCY ASSESSMENT TOOL – PROCESS MANUFACTURING INDUSTRY

Funded under the Workplace English Language and Literacy (WELL) Program by the Australian Government Department of Industry, Innovation, Climate Change, Science, Research and Tertiary Education.

ISBN 978-0-9874157-3-8

DEVELOPERS

This resource was developed by Oggi Consulting Pty Ltd.

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ACKNOWLEDGEMENTS

Oggi Consulting would like to thank David Tout for his expert opinion and guidance in the development of the resource.

Oggi Consulting would like to acknowledge the members of the Project Reference Group who contributed to the development of this resource: Claire Wright (TAFE NSW), Peter Canavan (Australian Industry Group), Anna Ridgway (Australian Council for Private Education and Training) and Robert Bluer (Innovation and Business Skills Australia).

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INTRODUCTION

The *Numeracy in Practice* Numeracy Proficiency Assessment Tool – Process Manufacturing Industry is designed to be used by VET practitioners who deliver training in the workplace to assess their own numeracy skills.

The assessment questions align with the Australian Core Skills Framework (ACSF) numeracy core skill with a focus on levels 3 and 4.

Working through this PD resource will give you insight into your own numeracy skills and confidence, and your capacity to support your learners.

The alignment has been validated by a recognised numeracy assessment expert.

The tool is contextualised to the process manufacturing industry where workers are required to collect and analyse numerical data to make decisions to meet business related goals, for example, maintaining operations and achieving productivity improvements.

The content has been verified by industry representatives as an accurate reflection of numeracy skills demands in the process manufacturing industry for semi-skilled workers.

Contextualising this tool to other industries is possible but not straightforward. It requires an in-depth understanding of the workplace context and the numeracy skills demands. Any changes to any of the questions should be re-aligned with the ACSF and validated by industry representatives and ACSF numeracy assessment experts.

Please note that no tool can assess for every contingency and, therefore, the results of this assessment are an indicator only.

The ***Numeracy in Practice*** Guide contains the ACSF mapping and the answers, and provides general advice relevant to comprehending the question, doing the mathematics, representing the result, and understanding the context.

The ***Numeracy in Practice*** Snapshots contain detailed information specific to six selected questions.

Numeracy in Practice and its companion resource, ***Numeracy in Focus,*** are available for download from the WELL practitioners' website at www.wellpractitioners.com.au.

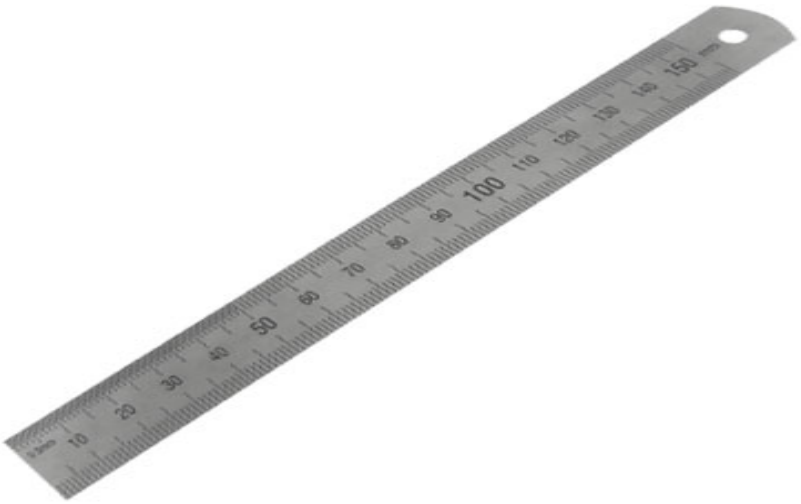
INSTRUCTIONS

The Numeracy Proficiency Assessment Tool – Process Manufacturing Industry is designed to identify your current numeracy skills relevant to the process manufacturing industries.

Allow up to 40 minutes to complete the assessment. During this time you should work independently and answer each question to the best of your ability. It's OK to leave a question if you do not think that you can answer it. Do as much as you can.

You will need the following resources to complete the assessment:

- A basic calculator
- A 150 mm or 300 mm steel trade ruler annotated in millimetres, not centimetres, as per the diagram
- Three pieces of tubing or hose between 30 mm and 70 mm in length, labelled 1, 2 and 3



It is your choice whether you self-administer the tool or seek out an experienced colleague to administer the tool.

It is recommended that you seek the assistance of an experienced numeracy specialist to mark the assessment. Guidance for making assessment decisions is provided in the *Numeracy in Practice* Guide.

Note that the assessment is a test of your numeracy skills, not your literacy skills. Please seek assistance if you need English language or literacy support to complete the assessment. If required, the assessment can be completed orally.

QUESTIONS

QUESTION 1

An operator uses the dial indicator below to monitor environmental conditions in the factory.

QUESTION 1A

On the dial the minimum temperature is indicated by the blue pointer. What is the minimum temperature in degrees Celsius?

QUESTION 1B

The red pointer indicates the maximum temperature. How many degrees Fahrenheit are there between the minimum and maximum temperatures?

QUESTION 2

An operator prepares batches of polyurethane coating by blending a resin solution (Part A) with a curing agent (Part B).

QUESTION 2A

The mixing ratio of Part A to Part B is 4:1 by volume.

The operator must make a 20 L batch. How many millilitres (ml) of Part A and Part B are needed?

QUESTION 2B

Each batch has a maximum shelf life of 20 hours. If the operator makes a batch at 14:30, at what time does it reach its shelf life?

QUESTION 2C

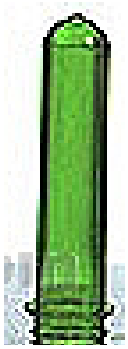
After 10 hours on a warm day, the batch thickens. The operator can thin the batch by adding 5% solvent. How many millilitres of solvent can the operator add to the 20 L batch?

QUESTION 2D

The operator only has 755 ml of Part B but plenty of Part A. What is the maximum amount of polyurethane coating the operator can mix?

QUESTION 3

Blow moulding is a manufacturing process used to make plastic bottles. Preforms are heated and inflated to fit the mould of a plastic bottle.



Preform

Plastic bottle

An operator monitors a blow moulding process that processes 32 preforms every 20 seconds.

QUESTION 3A

What is the production rate per hour?

QUESTION 3B

How many seconds does it take to produce 100 bottles?

QUESTION 3C

A production run started at 11:13 am and finished at 8:43 pm. The machine stopped between 12:17 pm and 12:32 pm for adjustment. How many plastic bottles were produced?

QUESTION 4

An operator checks the length of tubing made on the production line every hour.

QUESTION 4A

Select and measure the length of three pieces of tubing using the ruler.

In the table below, record the number of the piece and the length of each piece in millimetres.

Piece number	Length (mm)

QUESTION 4B

What is the average measurement?

QUESTION 4C

What is the range of the measurements?

QUESTION 4D

The product specification for export to the United States of America is 2.4″ +/– 0.5″ where 1″ = 24.5 mm.

Does the average measurement you calculated meet the specification?

QUESTION 5

An operator at a gel coating operation is preparing a mix of gel coat using a batch formulation. The batch is prepared by measuring the ingredients by weight and adding them to a drum ready for mixing.

The batch formulation includes both liquids and solids. The liquids are specified by volume (litres) and the solids are specified by weight (grams). To add the liquids the operator must use Specific Gravity* to convert the volumes to weights.

*Specific Gravity (SG) is the heaviness of a substance compared to that of water, and it is expressed without units. The SG of water is 1 where 1 litre of water is equal to 1 kilogram.

Batch Formulation		
Ingredient	**Amount**	**Specific Gravity**
Ingredient A	1500 grams	1.36
Ingredient B	850 grams	1.22
Ingredient C	15 litres	0.80
Ingredient D	2.5 litres	0.72
Ingredient E	2 litres	0.95

What is the total weight of the batch in grams?

QUESTION 6

An operator receives the following daily production report:

Daily Production Report

Total items produced: 528 units

Hours worked: 12 hours

Scrap: 32 units

Downtime: 38 minutes

QUESTION 6A

What was the production rate (items/hour)?

QUESTION 6B

The target scrap rate is <5%.

i. What was the actual scrap rate?

ii. Was the target met?

QUESTION 7

The following Certificate of Conformance was received with the shipment of a part.

ABC Metals P/L

Certificate of Conformance

Job number:	*672836*
Part number:	*BELT8973*
Date of manufacture:	*15/1/2011*

Test	Unit	Specification	Result
Tensile strength	MPa	15 minimum	*16.1*
Elongation at break	%	350 minimum	*502*
Abrasion	mm^3	250 maximum	*198*

QUESTION 7A

What is the specification for tensile strength?

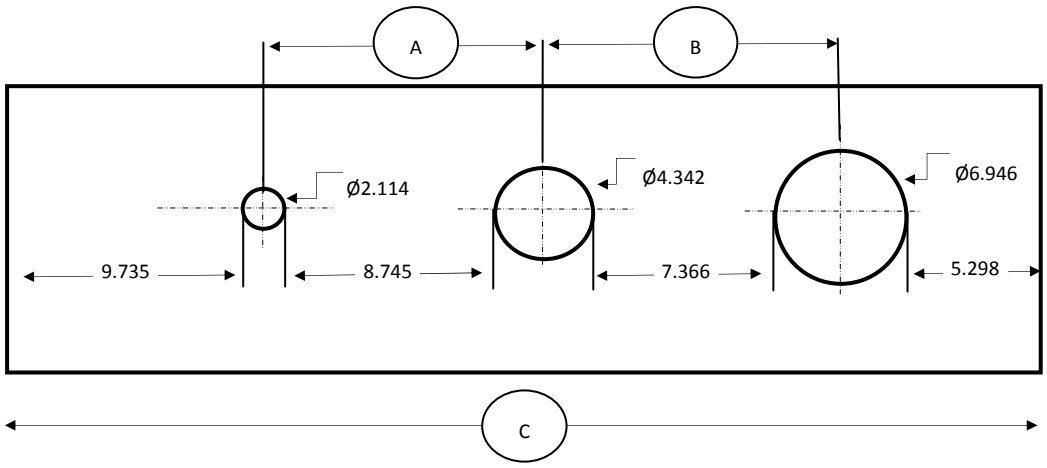
QUESTION 7B

Does the part conform to the specification for tensile strength?

QUESTION 8

An operator is cutting sheet materials to order using the drawing below.

The measurements are in millimetres and the Ø symbol is used to indicate that the measurement relates to a diameter.



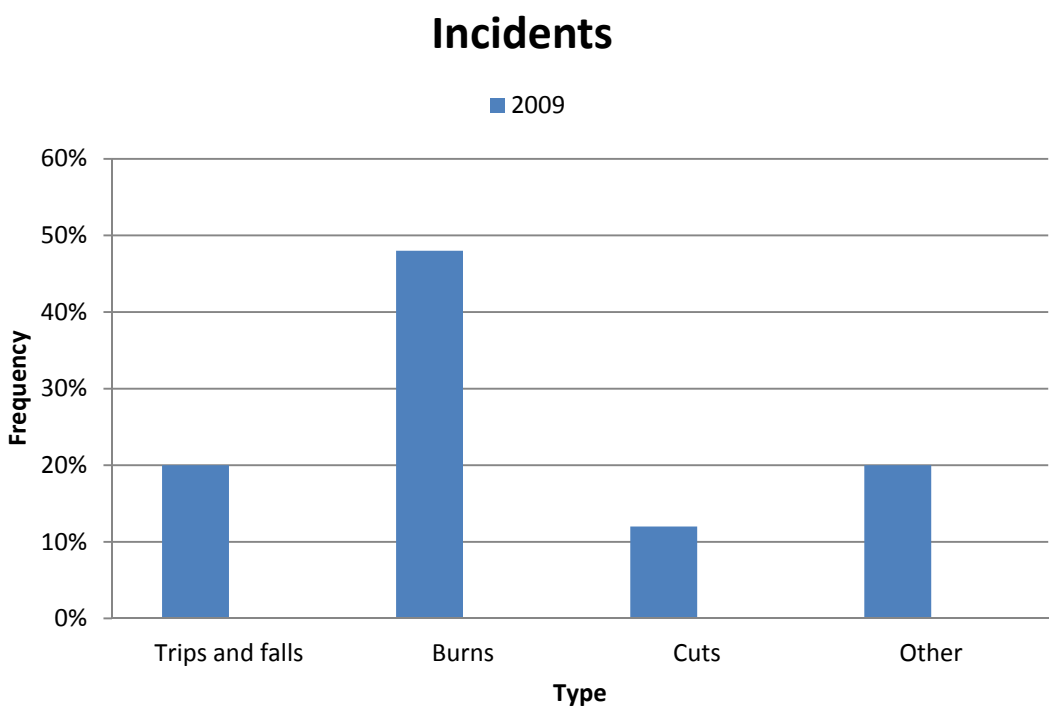
Not all the measurements that the operator needs are included in the drawing. Use the information provided in the drawing to calculate the missing measurements.

Measurement A	
Measurement B	
Measurement C	

QUESTION 9

Below is a table showing a summary of the number of incidents per year by incident type for 2009 and 2010, and a bar graph showing the percentage of incidents by incident type for 2009 only.

Type	Number of incidents	
	2009	2010
Trips and falls	5	3
Burns	12	16
Cuts	3	5
Other	5	2



QUESTION 9A

What percentage of incidents were trips and falls in 2009?

QUESTION 9B

Using the data provided for 2010 in the table, calculate the percentage of incidents for each incident type and plot the results on the bar chart.