Numeracy In Practice

Building Workplace Numeracy Proficiency and Training Skills of VET Practitioners

This Snapshot relates to Question 2a from the Numeracy Proficiency Assessment Tool – Process Manufacturing Industry. It is designed to be read in conjunction with explanatory information provided in the Guide.

Using Ratios and Metric Conversions

Many jobs require workers to use ratios and perform metric conversions, for example:

- Cleaners preparing cleaning solutions
- Plasterers mixing plaster
- Childcare workers maintaining staffing ratios
- Hairdressers mixing hair colouring

This example is a ratio by volume in metric units of measurement. Examples of ratios in the workplace include financial ratios, weight ratios, staff ratios and gear ratios.

Workers responsible for using ratios and performing metric conversions require complementary skills, for example skills to:

- Work safely
- Follow workplace instructions
- Meet quality requirements
- Work cooperatively
- Meet deadlines
- Identify and report problems
- Explain ratios to other workers, supervisors or customers

THE QUESTION

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

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?

ACSF NUMERACY LEVEL

This question requires skills associated with using ratios, calculating metric conversions and basic calculations.

Using ratios is the highest level numeracy skill. The content area of ratios is described as part of indicator .10 at level 4 in the focus area *Mathematic knowledge and skills: number and algebra.*

This question requires level 4 indicator .09 skills to read and interpret the question.

The question also requires level 4 indicator .11 skills to communicate the answer.

This question maps to ACSF numeracy level 4.

WHAT THE QUESTION IS ASKING

The mathematical information embedded in the question must be identified and interpreted before the problem can be solved.

The first sentence and the photograph give context. They do not contain mathematical information. They are not needed to solve the problem.

The second sentence contains mathematical information about ratios. It describes the ratio of Part A and Part B by volume. Knowledge of ratios and volume is needed to interpret this information.

The third sentence contains mathematical information about the problem to be solved. It describes the size of the batch in litres and specifies that the answer must be represented in millilitres. Knowledge of metric units of measurement is needed to interpret this instruction.

HOW TO SOLVE THE PROBLEM

There is more than one way to answer this question. Two possible options are shown.

Option 1: Metric conversion then ratio calculation

- Metric conversion

    Conversion rate is

    1 L = 1000 ml

Therefore

20 L = 20 L x 1000 = 20 000 ml

- Use the ratio 4:1 to find the volume of 1 part

  Total parts = 4 parts + 1 part = 5 parts

  5 parts = 20 000 ml

  1 part = ?

  To work out how many ml in 1 part, divide both sides by 5

  5/5 parts = 20 000 ml/5
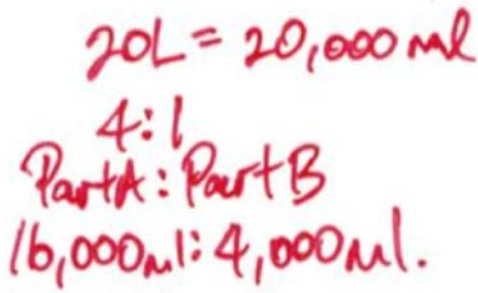
  1 part = 4000 ml

- Use the ratio to find the volume of Part A and Part B

  Part A = 4 parts = 4 x 4000 ml = 16 000 ml

  Part B = 1 part = 4000 ml

An example of a
correct answer using
Option 1

20L = 20,000 ml
4:1
PartA : Part B
16,000ml : 4,000ml.

Option 2: Ratio calculation then metric conversion

- Use the ratio 4:1 to find the volume of 1 part

  Total parts = 4 parts + 1 part = 5 parts

  5 parts = 20 L

Numeracy In Practice: Using ratios and metric conversions

Divide both sides by 5 to work out the ml in 1 part

5/5 parts = 20 L/5

1 part = 4 L

- Use the ratio to find the volume of Part A and Part B

  Part A = 4 parts = 4 x 4 L = 16 L

  Part B = 1 part = 4 L

- Metric conversion

  The conversion rate is
  1 L = 1000 ml

  Part A = 16 L x 1000 = 16 000 ml

  Part B = 4 L x 1000 = 4000 ml

> **Working through this PD resource places <u>you</u> in the role of the learner.**

HOW TO CHECK THE ANSWER

Check Part A + Part B = 20 000 ml = 20 L

HOW TO COMMUNICATE THE ANSWER

Record the answer with the result and the unit of measurement. The most technically correct answer is Part A 16 000 ml and Part B 4000 ml.

ACSF ASSESSMENT DECISIONS

A Credit is applied to the following responses:

1. Part A 16 000 ml and Part B 4000 ml

2. Part A 16 L and Part B 4 L (benefit of the doubt given for higher level skill achieved in correct ratio calculation over lower level skill of metric conversion)

3. 16:4 (benefit of the doubt given for higher level skill achieved in correct ratio calculation over incorrect representation of the result and lower level skill of metric conversion)

MEETING WORKPLACE EXPECTATIONS

In most workplaces the worker is expected to record the correct answer in accordance with workplace requirements. This is consistent with the first response above.

In response 2 the answer is mathematically correct but the metric conversion has not been completed. This is a problem if the answer is used by another worker not skilled in metric conversions. This is unacceptable in the workplace.

In response 3 the answer is mathematically correct but incomplete. It lacks units of measurement and does not specify Part A and Part B. This is a problem if the answer is used by another worker not skilled in using ratios and metric conversions. This is unacceptable in the workplace.

Incorrect answers may cause problems that impact productivity, quality and safety. This is unacceptable in the workplace.

ANALYSING RESPONSES TO IDENTIFY SKILL GAPS

Skill gaps are often revealed in incorrect responses.

Incorrect Response	Analysis	Skill Gaps
Part A 20 Part B 5	Ratio given multiplied by 5	Level 4 indicator .10 in relation to ratios Support may also be needed for indicators .09 and .11 at this level
Part A 4000 Part B 1000	Ratio given multiplied by 1000	Level 4 indicator .10 in relation to ratios Support may also be needed for indicators .09 and .11 at this level

Incorrect Response	Analysis	Skill Gaps
Part A 4 Part B 1	No calculation performed	Level 4 indicator .10 in relation to ratios Support may also be needed for indicators .09 and .11 at this level
Part A 15 Part B 5	While this adds up to a total of 20, the ratio is incorrect	Level 4 indicator .10 in relation to ratios Support may also be needed for indicators .09 and .11 at this level
Part A 16 ml Part B 4 ml	Level 4 skills to reflect on the outcomes relative to implications have not been demonstrated because the answer is equivalent to the volume of a teaspoon rather than 20 L	Level 4 indicator .10 in relation to ratios Level 3 indicator .10 in relation to metric conversion Support may also be needed for indicators .09 and .11 at these levels
Part A 1600 ml Part B 4000 ml	The ratio is incorrect. This may be due to a calculation slip or metric conversion error Level 4 skills to reflect on outcomes relative to implications have not been demonstrated because the answer does not add up to 20 L	Level 4 indicator .10 in relation to ratios Level 3 indicator .10 in relation to calculations and metric conversion

IMPLICATIONS FOR TRAINING DELIVERY

Encourage the learner to talk about using ratios at home and at work.

Talk about:

- The ratios they use

- What the ratio is used for

- Why it is important

- How the ratio is used

- What calculations are needed

- How and where the outcome is reported

- How and where it is recorded

> **Working through this PD resource will support you to confirm and strengthen your own numeracy skills.**

Check learner performance against workplace requirements to identify learner needs. The learner may:

- Need support in one or more of the numeracy indicators

- Be suffering from maths anxiety

- Lack the complementary skills needed to perform the task, such as a correct understanding of the workplace requirements for using ratios

Use a range of teaching strategies, such as:

- Ask the learner to show their work and explain the working out

- Draw on what the learner already knows and challenge them

- Sequence the material according to the learners' individual needs. For example, they may be skilled in using ratios but unsure how to communicate the results

- Incorporate a range of ratios and workplace conditions. Include ratios by weight and by unit as well as by volume

- Ask questions to extend the learner, such as:

  o How would you explain to someone else what a ratio is?

  o What if you had to use a different mixing ratio?

  o How do you recognise a correct answer?

  o How do you recognise an incorrect answer?

- Mix up questions that do and do not require metric conversions for additional challenge

- Provide opportunities for practice without fear of failure and with time for reflection

- During training, work with mixing specifications gathered from the workplace and discuss the results

- Measure out the materials to check they add up to the required volume

- Outside training, encourage the learner to remove avoidance strategies, such as relying on another team member to undertake the calculations

- Assign a workplace buddy or mentor

- Ask learners to reflect on what they have learnt, the challenges encountered and how they were overcome

PROFESSIONAL DEVELOPMENT LEARNING STRATEGIES

Build your own skills:

- Identify examples of typical ratios found in the workplace

- Take a tour of the workplace and talk to people in the workplace about the ratios used, including:

  o What they are used for

  o Why they are important

  o Who uses ratios

  o How ratios are used

  o How and where they are reported

  o How and where they are recorded

> **Working through this PD resource will support you to confirm and strengthen your numeracy teaching skills.**

- Find examples of typical ratios at home, such as mixing cleaning products and garden sprays

- Practise using ratios found in the workplace, home or on the internet

- Check your answers with a trusted peer or mentor

- Ask a trusted peer or mentor to challenge you to extend your skills

ABOUT THIS RESOURCE

Numeracy in Practice is a professional development resource to support the development of VET practitioner numeracy proficiency skills and numeracy training skills.

It has been developed in response to a National Centre for Vocational Education and Research (NCVER) report titled *Seeking the N in LLN*. This report found that there may be a need to

increase the capacity of the VET workforce to meet the numeracy skills needs of existing workers. A copy of the full report is available for download at www.ncver.edu.au.

Numeracy in Practice: Building Workplace Numeracy Proficiency and Training Skills of VET Practitioners includes:

- A Guide with professional development activities
- A Numeracy Professional Assessment Tool – Process Manufacturing Industry
- Six Snapshots exploring different workplace numeracy skills

Topics covered in the Snapshots include:

- Reading instruments
- Using ratios and metric conversions
- Using rates and performing time calculations
- Measuring lengths
- Calculating quantities
- Reading specifications

VET practitioners interested in increasing their awareness of numeracy skills in the workplace may also like to access the companion resource *Numeracy in Focus: Building VET Practitioner Awareness of Numeracy in the Workplace*.

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

This resource was developed by Oggi Consulting Pty Ltd.
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