

# Numeracy In Practice

Building Workplace Numeracy Proficiency  
and Training Skills of VET Practitioners



This Snapshot relates to Question 1b from the Numeracy Proficiency Assessment Tool – Process Manufacturing Industry. It is designed to be read in conjunction with explanatory information provided in the Guide.

## Reading Instruments

Many jobs require workers to read and record measurements using a range of instruments, for example:

- Health workers taking blood pressure readings
- Drivers taking odometer readings
- Electricians taking voltage readings
- Production workers taking air pressure readings

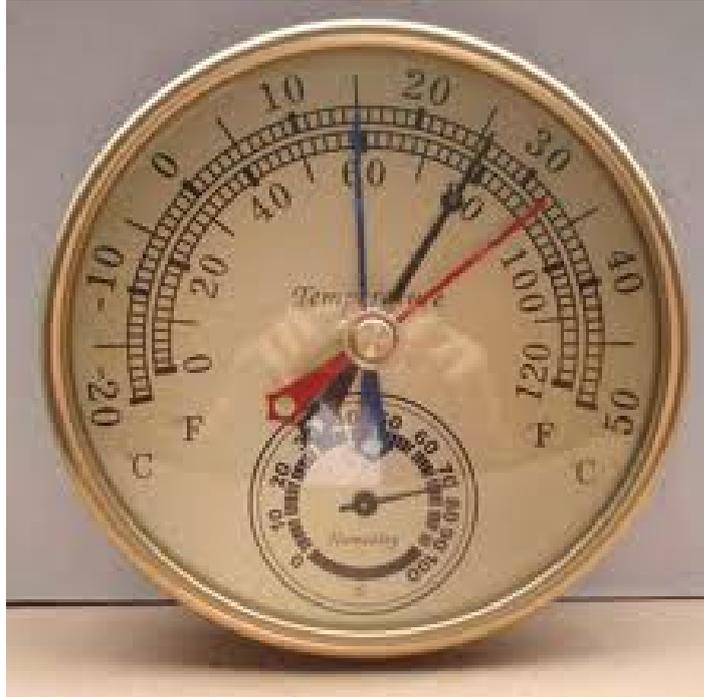
This example is a reading of temperature measurement using a thermometer that is a dial indicator. Examples of other instruments that must be read in the workplace include pressure gauges, dip sticks, weight scales, callipers, measuring cylinders and rulers.

Workers responsible for taking readings require complementary skills, for example skills to:

- Work safely
- Follow workplace instructions
- Meet quality requirements
- Work cooperatively
- Meet deadlines
- Identify and report problems
- Take readings at heights or in restricted spaces
- Check calibration
- Explain taking readings to other workers, supervisors or customers

## THE QUESTION

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



On the dial the minimum temperature is indicated by the blue pointer. The red pointer indicates the maximum temperature.

How many degrees Fahrenheit are there between the minimum and maximum temperatures?

Notes:

1. This question relies on the individual being able to identify the blue and red pointers. Colour blindness is a common condition that affects an individual's ability to see colour differences. Where colour blindness occurs, use this alternative instruction:

The minimum temperature is indicated by the pointer on the far left. The maximum temperature is indicated by the pointer on the far right.

2. The question uses an imperial unit of measurement. This is relevant in Australia where businesses buy from suppliers or sell to customers who use the imperial system.

In the workplace many instruments, like the dial used in this question, contain a dual scale showing metric and imperial units of measurement to cater to the global market.

## ACSF NUMERACY LEVEL

This question requires skills associated with reading an instrument that measures temperature.

The content area of reading instruments is introduced as part of indicator .10 at level 2 with a reference to 'simple instruments' in the focus area *Mathematical knowledge and skills: measurement and geometry*.

However, the dial used in this example is not a simple instrument because it shows two properties (temperature and humidity), a dual scale (metric and imperial) and negative values.

The question requires level 3 indicator .09 skills to read and interpret the question.

The question also requires level 3 indicator .11 skills to communicate the answer.

This question maps to ACSF numeracy level 3.

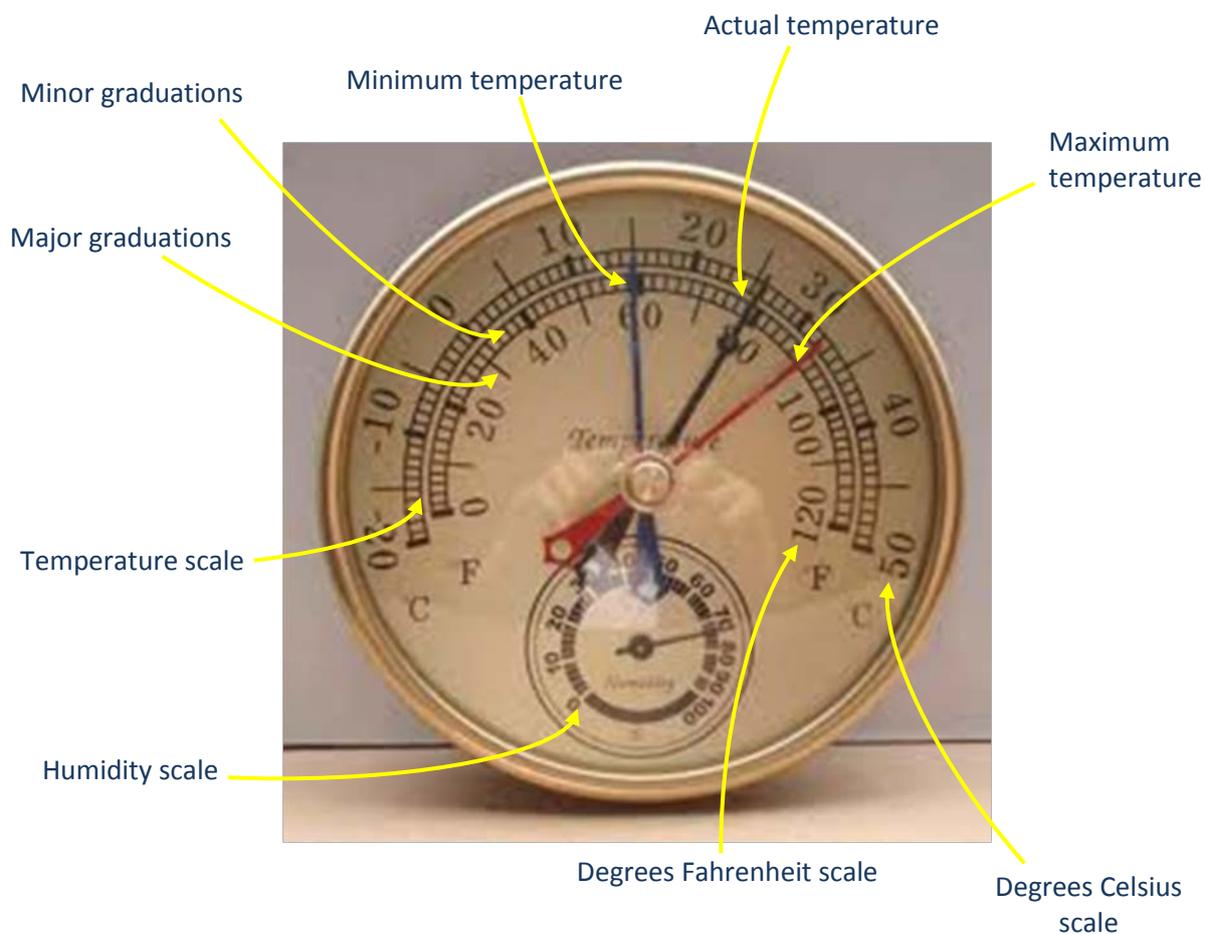
## WHAT THE QUESTION IS ASKING

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

The first paragraph contains mathematical information about measurement. It describes what is being measured and the instrument used.

The photograph contains mathematical information about measurement. It shows two properties, temperature on the top scale and humidity on the bottom scale. The temperature scale is a dual scale showing degrees Celsius and degrees Fahrenheit. Knowledge of temperature measurement and reading dial indicators is needed to interpret this information.

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



The second paragraph contains mathematical information about identifying the minimum and maximum temperatures. Knowledge of reading dial indicators and the terms minimum and maximum are needed to interpret this information.

The third paragraph contains mathematical information about the problem to be solved. It asks for the range between the minimum and maximum temperatures, represented in degrees Fahrenheit. Knowledge of reading dial indicators, units of measurement and the terms 'minimum', 'maximum' and 'between' are required to interpret this information.

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

## HOW TO SOLVE THE PROBLEM

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

### Option 1: Calculating the difference

- Identify degrees Fahrenheit scale

*Look at either the far left or the far right of the temperature scale and identify the unit of measurement. Degrees Fahrenheit are represented on the inside scale*

- Read minimum temperature in degrees Fahrenheit

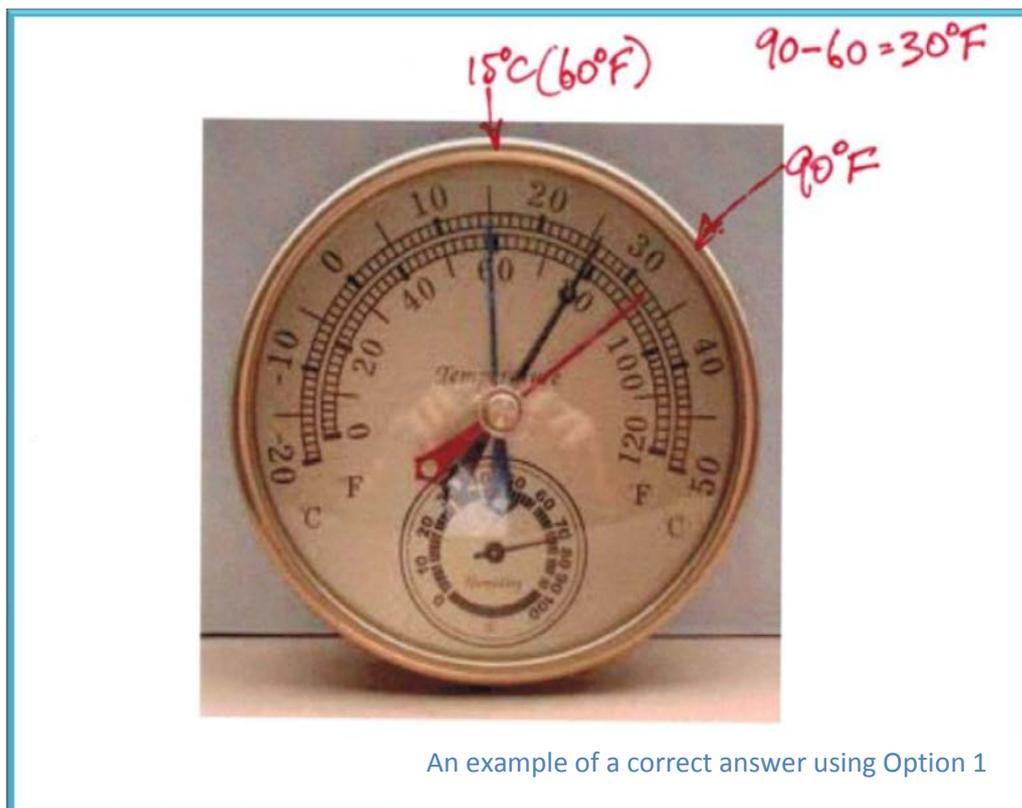
*Look at the blue pointer and take a reading in degrees Fahrenheit. The pointer falls directly on 60 and therefore no counting of graduations is needed*

*Minimum temperature = 60 °F*

- Read maximum temperature in degrees Fahrenheit

*Look at the red pointer and take a reading in degrees Fahrenheit. First read the major graduation (80 °F) and then the minor graduation (10 °F)*

*Maximum temperature = 90 °F*



An example of a correct answer using Option 1

- Calculate difference between the minimum and the maximum temperatures using the following formula

$$\begin{aligned} \text{Answer} &= \text{maximum temperature} - \text{minimum temperature} \\ &= 90\text{ }^{\circ}\text{F} - 60\text{ }^{\circ}\text{F} \\ &= 30\text{ }^{\circ}\text{F} \end{aligned}$$

### **Option 2: Counting the graduations**

- Identify degrees Fahrenheit scale

*Look at either the far left or the far right of the temperature scale and identify the unit of measurement. Fahrenheit is represented on the inside scale*

- Count graduations

*Start at the blue pointer and moving towards the right count the number of graduations on the Fahrenheit scale needed to reach the red pointer. There are 15 graduations*

- Identify size of the graduations

*Count the number of graduations between two known points. For example, between  $0\text{ }^{\circ}\text{F}$  and  $20\text{ }^{\circ}\text{F}$  there are 10 graduations. This means that every 1 graduation is equal to  $2\text{ }^{\circ}\text{F}$*

- Calculate the answer using the following formula

$$\begin{aligned} \text{Answer} &= \text{Number of graduations} \times 2 \\ &= 15 \times 2 \\ &= 30\text{ }^{\circ}\text{F} \end{aligned}$$

### **HOW TO CHECK THE ANSWER**

Check for reasonableness. The blue pointer reads  $60\text{ }^{\circ}\text{F}$ . The red pointer reads more than  $80\text{ }^{\circ}\text{F}$  and less than  $100\text{ }^{\circ}\text{F}$ . Therefore the correct answer will be somewhere between  $20\text{ }^{\circ}\text{F}$  ( $80\text{ }^{\circ}\text{F} - 60\text{ }^{\circ}\text{F}$ ) and  $40\text{ }^{\circ}\text{F}$  ( $100\text{ }^{\circ}\text{F} - 60\text{ }^{\circ}\text{F}$ ).

Check the calculation.

$$90 - 60 = 30$$

$$30 + 60 = 90$$

## HOW TO COMMUNICATE THE ANSWER

Record the answer providing the result and the unit of measure. The most technically correct result is 30 °F.

## ACSF ASSESSMENT DECISIONS

A Credit is applied to the following answers:

1. 30 °F
2. 30 degrees Fahrenheit
3. 30 F (benefit of the doubt given for lack of degrees symbol)
4. 30 or 30 ° (the question provided the unit of measurement and therefore the answer can stand alone without a unit of measurement)
5. 30 °C or 30 C (the unit of measurement is incorrect but benefit of the doubt is given for the answer being more right than wrong)
6. 31 °F or 32 °F (benefit of the doubt given for difficulties associated with reading a small scale)

## MEETING WORKPLACE EXPECTATIONS

In most workplaces the worker is expected to record the correct answer in accordance with workplace instructions. This is consistent with responses 1 and 2 above, although 30 °F would be the most commonly required representation.

Responses 3 and 4 may be acceptable depending on workplace requirements. For example, if a table used for recording workplace data included '°F' in the column heading, then the unit of measurement may not be required for the data entry.

Response 5 is unacceptable in the workplace. 30 °F is very different to 30 °C. Decisions based on this data could have serious consequences.

Response 6 may be acceptable depending on workplace requirements. For example, if a specification required a temperature range no greater than 30 °F, a reading of 32 °F may trigger unnecessary action.

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	Problem	Analysis	Skill gaps
90 °F	Maximum temperature	Instruction not understood or dial read incorrectly	Level 3 indicator .09 in relation to understanding the question Level 3 indicator .10 in relation to reading dials
19 °F	Difference between minimum temperature and actual temperature (black pointer)	Instruction not understood or dial read incorrectly	Level 3 indicator .09 in relation to understanding the question Level 3 indicator .10 in relation to reading dials
25 °F	Obtained when using 1 graduation = 1 °F instead of 2 °F	Dial read incorrectly	Level 3 indicator .10 in relation to reading dials
30 °C	Incorrect unit of measurement used	Instruction not understood or dial not read correctly or answer not communicated correctly	Level 3 indicator .09 in relation to understanding the question Level 3 indicator .10 in relation to reading dials Level 3 indicator .11 in relation to communicating the answer

## IMPLICATIONS FOR TRAINING DELIVERY

Encourage the learner to talk about reading and recording measurements at home and at work.

Talk about:

- Instruments they read
- What they measure
- Why the measurement is important
- How the instrument is read
- What calculations are needed
- How and where the measurement is reported
- What unit of measurement is used
- How and where it is recorded
- Different units of measurement
- Metric and imperial systems

Working through this PD resource places you in the role of the learner.

Check learner performance against workplace requirements and 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 reading and recording measuring devices

Use a range of teaching strategies, such as:

- Ask the learner to show their work and the working out
- Draw on what the learner already knows and challenge them
- Sequence the material according to the learners' individual needs. They may be skilled in using simple formulas but not familiar with reading a dial
- Incorporate a range of measuring devices and workplace conditions
- Ask questions to extend the learner, such as:
  - What if the minimum temperature was a negative number?
  - What if you had to use a different dial?

- Practise interpreting different questions, such as:
  - Difference between the minimum temperature and the actual temperature
  - Difference between the maximum temperature and the actual temperature
  - Mix up questions that do and do not require calculations for additional challenge
- Provide opportunities for practice without fear of failure and with time for reflection
- During training, walk around the workplace reading, calculating and recording measurements and discussing the results
- Outside training, encourage the learner to remove avoidance strategies, such as relying on another team member to take readings
- 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 measuring devices found in the workplace
- Take a tour of the workplace and talk to people about:
  - Instruments used
  - What is being measured
  - Why the measurement is important
  - Who takes the measurement
  - How the measurement is read and how and where it is reported
  - How and where it is recorded
- Find examples of typical measurements at home, such as preparing a meal or installing a bookshelf
- Practise reading instruments 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](http://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](http://www.wellpractitioners.com.au).

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