

Numeracy By Measure

Building the Workplace Measurement Skills
of VET Practitioners



Tyre Wall Markings

VEHICLE MEASURES

Many jobs require workers to work with measurements. Measurement underpins the success and welfare of a modern workplace and touches almost every part of working life. To develop and sell products and services, to manage quality and safety, and to enhance productivity workplaces need to measure processes, products and performance.

The example used in this Snapshot is a job task performed by automotive workers in service centres and retail stores. The job task involves interpreting automotive tyre wall markings. It includes understanding and working with a range of measures, including linear dimensions, weight and speed.

This is an example of where numeracy skills often focus more on the ability to read, interpret, understand and communicate mathematical information than the ability to do calculations and take measurements.

The numeracy skills required include the ability to read, interpret and understand the mathematical information in written specifications – the application of ACSF numeracy indicator .09, *identifying mathematical information and meaning in activities and texts*.

The numeracy skills also include the ability to use and apply a range of mathematical skills to undertake the task, including understanding and comparing measurement specifications, the application of ACSF numeracy indicator .10, *using and applying mathematical and problem solving processes*.

The numeracy skills also include the ability to record measurements and communicate orally to customers and other workers – the application of ACSF numeracy indicator .11, *communicating and representing mathematics*.

Workers responsible for undertaking such measurement tasks must also have a range

of other complementary skills, such as the skills to work safely (follow safety procedures and identify and report hazards) and the skills to follow workplace procedures (identify what must be measured and what tools to use, how often and when, where and how it needs to be

recorded, identify the need to take action and take appropriate action). Other skills may include those needed to explain measurement information to other workers, supervisors or customers.

THE CONTEXT

Automotive workers such as tyre technicians, vehicle examiners and tyre sales staff need to be able to interpret tyre wall markings to ensure a correct and safe tyre is installed on a vehicle. A tyre wall marking illustrating the types of measurement information involved is shown below.

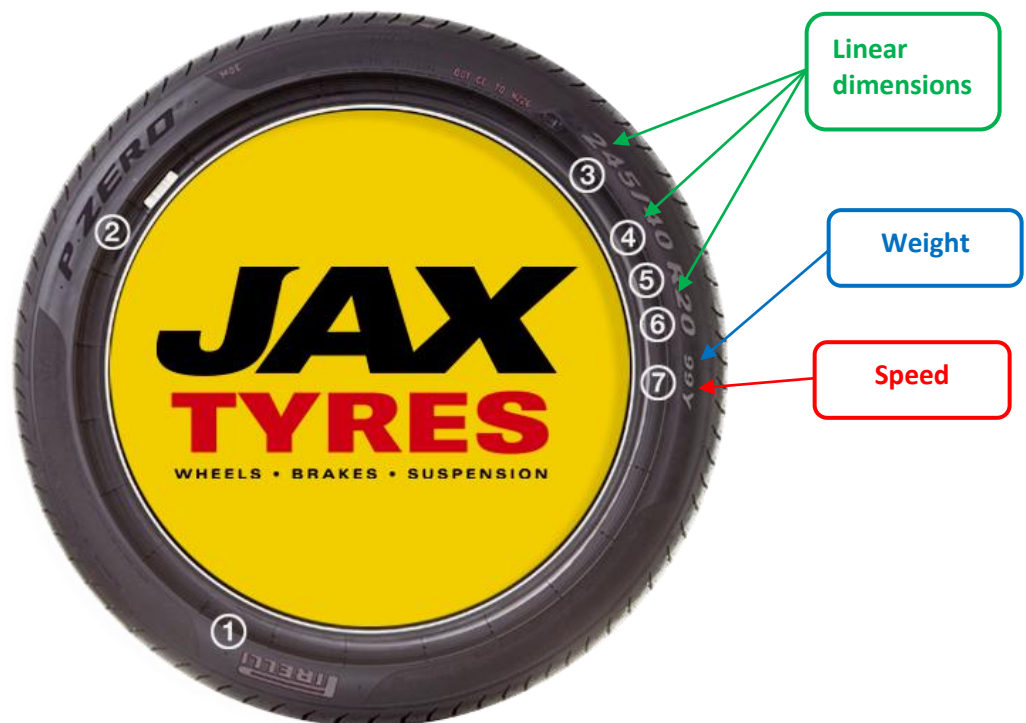


Image reproduced with permission from JAXQuickfit Tyres.

1. Brand name
2. Model name
3. Tyre width
4. Tyre profile
5. Type of construction
6. Wheel size
7. Load and speed rating

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

Tyre sizes and what they mean

The specifications for a tyre are expressed as a code embossed on the tyre wall, for example:

245/40 R20 99Y

Here is an explanation of what the different symbols mean.

| | | |
|------------------------------|-----|--|
| Tyre width | 245 | The width (in millimetres) of the tyre from sidewall to sidewall. This measurement is also known as the section width. |
| Tyre profile | 40 | The ratio of the height of the tyre sidewall (also known as section height) expressed as a percentage of the width. The tyre profile is also known as the aspect ratio. In this case, 40% of 245 mm is 98 mm – the section height. |
| Type of construction | R | The type of tyre construction. Radial tyre construction is the most common sort of tyre made these days. |
| Wheel size | 20 | The diameter (in inches) of the rim of the wheel that the tyre has been designed to fit. It is an example of an everyday measurement that is used in Australia expressed in imperial units. |
| Load and speed rating | 99Y | <p>A symbol indicating the maximum load capacity and speed at which the tyre can be safely operated, subject to the tyre being in sound condition, correctly fitted, and with recommended inflation pressures.</p> <p>The number (99) is the load index. It indicates the maximum load per tyre – 99 has a rating of 775 kg.</p> <p>The letter (Y) is the speed rating. It indicates the maximum speed that the tyre can sustain for at least ten minutes without being damaged. 'Y' rated tyres are rated up to 300 kilometres per hour. A more common rating is 'H' which has a speed rating of 210 kilometres per hour.</p> <p>These two specifications require the understanding and interpretation of complex tables of values which are given in more detail on the next page.</p> |

Tyre load specification

The table below shows the range of values for the the maximum load capacity at which each type of tyre can be safely operated.

| Load Index | kg | Load Index | kg | Load Index | kg | Load Index | kg | Load Index | kg |
|------------|-----|------------|-----|------------|------|------------|------|------------|------|
| 60 | 250 | 84 | 500 | 108 | 1000 | 132 | 2000 | 156 | 4000 |
| 61 | 257 | 85 | 515 | 109 | 1030 | 133 | 2060 | 157 | 4125 |
| 62 | 265 | 86 | 530 | 110 | 1060 | 134 | 2120 | 158 | 4250 |
| 63 | 272 | 87 | 545 | 111 | 1090 | 135 | 2180 | 159 | 4375 |
| 64 | 280 | 88 | 560 | 112 | 1120 | 136 | 2240 | 160 | 4500 |
| 65 | 290 | 89 | 580 | 113 | 1150 | 137 | 2300 | 161 | 4625 |
| 66 | 300 | 90 | 600 | 114 | 1180 | 138 | 2360 | 162 | 4750 |
| 67 | 307 | 91 | 615 | 115 | 1215 | 139 | 2430 | 163 | 4875 |
| 68 | 315 | 92 | 630 | 116 | 1250 | 140 | 2500 | 164 | 5000 |
| 69 | 325 | 93 | 650 | 117 | 1285 | 141 | 2575 | 165 | 5150 |
| 70 | 335 | 94 | 670 | 118 | 1320 | 142 | 2650 | 166 | 5300 |
| 71 | 345 | 95 | 690 | 119 | 1360 | 143 | 2725 | 167 | 5450 |
| 72 | 355 | 96 | 710 | 120 | 1400 | 144 | 2800 | 168 | 5600 |
| 73 | 365 | 97 | 730 | 121 | 1450 | 145 | 2900 | 169 | 5800 |
| 74 | 375 | 98 | 750 | 122 | 1500 | 146 | 3000 | 170 | 6000 |
| 75 | 387 | 99 | 775 | 123 | 1550 | 147 | 3075 | 171 | 6150 |
| 76 | 400 | 100 | 800 | 124 | 1600 | 148 | 3150 | 172 | 6300 |
| 77 | 412 | 101 | 825 | 125 | 1650 | 149 | 3250 | 173 | 6500 |
| 78 | 425 | 102 | 850 | 126 | 1700 | 150 | 3350 | 174 | 6700 |
| 79 | 437 | 103 | 875 | 127 | 1750 | 151 | 3450 | 175 | 6900 |
| 80 | 450 | 104 | 900 | 128 | 1800 | 152 | 3550 | 176 | 7100 |
| 81 | 462 | 105 | 925 | 129 | 1850 | 153 | 3650 | 177 | 7300 |
| 82 | 475 | 106 | 950 | 130 | 1900 | 154 | 3750 | 178 | 7500 |
| 83 | 487 | 107 | 975 | 131 | 1950 | 155 | 3875 | 179 | 7750 |

Tyre speed specification

The table below shows the range of values for the maximum speed at which each type of tyre can be safely operated.

| Speed rating | N | P | Q | R | S | T | U | H | V | Z | W | Y |
|----------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Maximum speed (km/h) | 140 | 150 | 160 | 170 | 180 | 190 | 200 | 210 | 240 | 240 | 270 | 300 |

ACSF NUMERACY MAPPING

The process of mapping the numeracy skills demands of a job task to the ACSF is imprecise. That is, there is no absolute right or wrong. Professional judgement is needed. Consult the ACSF as you reflect on the numeracy skills mapping presented in this Snapshot. Do you follow and agree with the logic? What is your reasoning?

This task maps to **ACSF numeracy level 3**, with the mathematical content mainly related to the focus area *Mathematical knowledge and skills: measurement and geometry*. A worker needs to be at **exit** numeracy level 3 to successfully and competently undertake a task such as this – that is, they need to be working at ACSF numeracy level 4.

To undertake the whole task of using tyre specifications requires the understanding and application of a range of measures and measurement activities including linear dimensions, weight and speed. Tyre technicians, vehicle examiners and tyre sales staff need the ability to read and interpret a range of data and related specifications as found in vehicle manuals, tyre catalogues and tyre markings. This not only requires the ability to read and extract the information (indicator .09) but also the knowledge to understand what it means (indicator .10) and the skills to communicate this (indicator .11) orally (for example, to a customer, supervisor or driver) and in writing (for example, on a form or sales docket).

Individually some of the measurement components of the task are at level 2, for example, reading a tyre width. However, as the job task demands the combination of a range of measurement skills, as well as knowledge of speed and ratios, it requires using higher level skills aligned to ACSF numeracy level 3.

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This applies to all three indicators. At level 2, the specification of skills is limited. For example, the first indicator describes the mathematical information as ‘familiar and simple length, mass, volume/capacity and temperature measures’ with no mention of speeds or imperial units, and the third indicator refers to ‘uses a combination of mainly informal and some formal’ language and symbolism. The type of information presented at level 2 should be ‘simple familiar texts with clear purpose’ and ‘familiar vocabulary’.

At level 3 there is the need to be able to deal with more sophisticated information and mathematics; such as 'may include some unfamiliar elements, embedded information and abstraction' and 'includes some specialised vocabulary'. The second indicator describes the mathematical application aspects as using 'a variety of developing mathematical and problem solving strategies' where in this case there is the need to understand both metric and imperial values and have some understanding of speed (a rate) and of ratios and proportions for the tyre profile specification. Similarly, the third indicator describes the use of 'a combination of both informal and formal oral and written mathematical language and representation'. The tyre specifications and their interpretation include formal mathematical language and representation which are at level 3 not at level 2.

The following pages illustrate and explain the unpacking and mapping of the measurement skills required in this task to the relevant ACSF numeracy indicators, focus areas and performance features.

LINEAR DIMENSIONS, WEIGHT AND SPEED

In this job task an understanding of linear dimensions, weight and speed is crucial to correctly reading and interpreting tyre markings and the associated tyre load and speed specifications. The information forms the basis for specifying not only a tyre's dimensions but ensures that tyre safety, performance and quality requirements are met. Misunderstanding of tyre markings and specifications could have significant ramifications in relation to road safety.

The information below shows how the different measurements apply to this task and align to ACSF numeracy level 3.

| ACSF numeracy indicator 3.09 | |
|---|---|
| Focus areas and performance features | Comment |
| <p>Explicitness of mathematical information</p> <ul style="list-style-type: none"> Interprets and comprehends a range of everyday mathematical information that is embedded in familiar and routine texts <p>Text complexity: 'may include some unfamiliar elements, embedded information and abstraction' and 'includes some specialised vocabulary'</p> | <p>The worker needs to be able to read and interpret the different tyre specifications as documented on a range of sources including the markings on the tyres themselves, in the tables of specifications, and in vehicle manuals, tyre manufacturer documents and vehicle labels.</p> <p>The tables are complex, use specialised vocabulary, and are not easily accessible.</p> <p>There are technical, specialised terms to interpret such as 'tyre profile', 'section width', 'section height' and 'load and speed rating' along with the need to comprehend the meaning of the range of different numbers and values in quite complex tables.</p> <p>There is also the need to have a sense of the imperial unit of inches in relation to the diameter of a wheel, no longer a common and familiar unit.</p> |

| ACSF numeracy indicator 3.10 | |
|--|--|
| Focus areas and performance features | Comment |
| <p>Mathematical knowledge and skills: number and algebra</p> <ul style="list-style-type: none"> • Uses and applies rates in familiar or routine situations, e.g. km/hr, <p>Mathematical knowledge and skills: measurement and geometry</p> <ul style="list-style-type: none"> • Measures, estimates and calculates length and mass | <p>The worker needs to be able to understand different tyre dimensions and specifications. This includes an understanding of different measurement systems (metric and imperial values) and some understanding of speed (a rate), and of ratios and proportions for the tyre profile specification.</p> <p>The worker needs to be able to compare measurements and make decisions based on a range of sources of information supplied not only on the tyres themselves, but also in the tables of specifications, and in vehicle manuals, tyre manufacturer documents and vehicle labels. This includes estimation skills to check and reflect on the tyres chosen or inspected.</p> |

| ACSF numeracy indicator 3.11 | |
|--|---|
| Focus areas and performance features | Comment |
| <p>Written mathematical language</p> <ul style="list-style-type: none"> • Uses a combination of both informal and formal written and oral mathematical language and symbols and general language to document and report on the mathematical and problem solving process and results <p>Oral mathematical language</p> <ul style="list-style-type: none"> • Uses a combination of both informal and formal oral mathematical and general language to present and discuss the mathematical and problem solving process and result <p>Complexity of mathematical symbolism, representation and conventions</p> <ul style="list-style-type: none"> • Uses a combination of both formal and informal symbolism and conventions relevant to the mathematical knowledge of the level, e.g. <ul style="list-style-type: none"> ○ km/hr ○ 1.25 m = 1250 mm | <p>The worker needs to be able to communicate the measurement information orally and in writing to supervisors, suppliers, customers and other workers.</p> <p>This involves using a range of informal and formal mathematical language in relation to linear dimensions, speed and weight.</p> |

ABOUT THIS RESOURCE

Numeracy by Measure: Building the Workplace Measurement Skills of VET Practitioners 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 vocational education and training (VET) workforce to meet the numeracy skills needs of existing workers in Australia. A copy of the full report is available for download at www.ncver.edu.au.

Numeracy by Measure: Building the Workplace Measurement Skills of VET Practitioners includes a [Guide](#) with professional development activities and six Snapshots exploring different workplace numeracy skills based on measurement. This is one of the Snapshots.

Measurement topics covered in the Snapshots include:

- [Bicycle Fitting](#)
- [Cabinet Fitting](#)
- [Health Monitoring](#)
- [Shoe Fitting](#)
- [Smallgoods Packing](#)
- [Tyre Wall Markings](#)

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

VET practitioners interested in increasing their awareness of numeracy skills in the workplace may also like to access the companion resources [Numeracy in Focus: Building VET Practitioner Awareness of Numeracy in the Workplace](#) and [Numeracy in Practice: Building Workplace Numeracy Proficiency and Training Skills of VET Practitioners](#).

[Numeracy by Measure](#), [Numeracy in Practice](#) and [Numeracy in Focus](#) are available for download from www.oggiconsulting.com/resources/.

Funded under the Workplace English Language and Literacy (WELL) Program by the Australian Government Department of Industry.

This resource was developed by Oggi Consulting Pty Ltd.

