2021 VCE VET Engineering Studies external assessment report

General comments

It was pleasing to see that most students attempted most questions in the paper, with the majority answering safety-related questions well.

While some students demonstrated excellent understanding of engineering principles, a large number were unsuccessful in correctly answering questions fundamental to the engineering trade. In particular, incorrect terminology was used for commonly used tools and fasteners and basic machine set-ups.

Another area requiring improvement overall was drawing. Few students could demonstrate correct dimensioning of a basic engineering component or sketching in third-angle projection. Students need to understand that there are standard ways of dimensioning a component, including correct use of extension line, arrows and dimensions.

Calculations were answered well overall. Students could improve by showing their working out in a systematic way, which could also eliminate some basic errors.

Specific information

This report provides sample answers or an indication of what answers may have included. Unless otherwise stated, these are not intended to be exemplary or complete responses.

The statistics in this report may be subject to rounding resulting in a total more or less than 100 per cent.

Question 1

Mark	0	1	2	Average
%	24	49	28	1.1

Typical answers accepted were:

- no loose clothing/hair
- work held securely
- vice directed towards column of drill
- clamp vice
- guard in place
- don’t touch swarf with bare hands.

This question was answered well by most students.

Question 2

Mark	0	1	2	Average
%	36	12	52	1.2

Typical answers accepted were:

- Hazards:
  - sharp swarf
  - loose clothing
  - sharp tool bits
  - work sticking out from the back of the lathe
  - long work not supported
- Control:
  - use pliers for swarf
  - button-up clothing
  - point tools away from operator (remove unused tools)
  - support long work with tailstock.

This question was answered well by most students.

Question 3a.

Mark	0	1	Average
%	3	97	1.2

The correct answer was flammable material stored in area / fire danger or similar. This question was answered well by most students.

Question 3b.

Mark	0	1	2	Average
%	14	13	73	1.6

Typical answers accepted were:

- welding
- grinding / abrasive cutting
- heating using naked flame (e.g. oxyacetylene).

This question was answered well by most students.

Some students gave answers like 'no smoking', suggesting that they did not fully read the question regarding a 'work task'.

Question 4

Mark	0	1	Average
%	12	88	0.9

Typical answers accepted were:

- able to check/test part before mass production
- have a real part to look at and test
- time saving / efficient way of checking.

The majority of students answered this question correctly.

Question 5a.

Mark	0	1	2	Average
%	40	22	39	1.0

Blade: 32 TPI

Reason: More or finer teeth required for thin material / coarse teeth will jam on thin material (or similar)

Some students seemed unaware of the relationship between TPI and material thickness.

Question 5b.

Mark	0	1	Average
%	64	36	0.4

The correct answer was Blade A.

A large number of students answered incorrectly, seemingly unaware of the basics of fitting a hacksaw blade and principles of a cutting tool.

Question 5c.

Mark	0	1	Average
%	8	92	0.9

Acceptable answers included:

- blade will break
- blade will twist
- blade won't cut straight
- blade will come off.

Question 6

Mark	0	1	Average
%	41.1	58.9	0.6

The correct answer was 110 mm. This question was answered correctly by the majority of students.

Question 7

Mark	0	1	2	3	Average
%	26.2	34.5	34.5	4.8	1.15

Type of pliers	Name
	Combination pliers
	Long nose / needle nose / pointy nose
	Multi grips / slip joint / adjustable

Most students could not correctly name the three pliers, particularly the combination pliers. Some students replied with the use rather than the name.

Question 8a.

Mark	0	1	2	Average
%	12	41	47	1.4

Typical answers accepted were:

- cracks / damage to disc
- max RPM against grinder
- correct size hole / fits grinder
- disc suitable for material.

Generally, correct responses were given. A significant number of students described checks to the grinder rather than the grinding disc.

Question 8b.

Mark	0	1	Average
%	29	71	0.7

The correct answer was:

Ensure grinder is disconnected from power supply.

Question 9a.

Mark	0	1	Average
%	75	25	0.3

Very few students correctly named 'dividers'. A large number of students called it a compass.

Question 9b.

Mark	0	1	Average
%	37	63	0.7

Acceptable answers were:

- scribing circles or arcs
- dividing a line into equal spacing
- transferring a measurement.

This question was poorly answered overall, indicating students were not aware of basic marking-out tools

Question 9c.

Mark	0	1	Average
%	58	42	0.4

The correct answer was to sharpen (grind) points.

Few students correctly answered this question. This could possibly stem from students not knowing the correct use of dividers.

Question 10

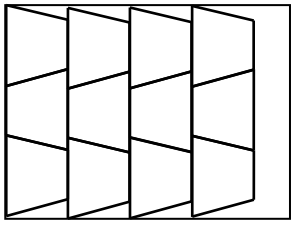
Marks	0	1	2	3	4	5	6	Average
%	4	7	20	24	19	17	9	3.3

Application	Material
surgical instrument	stainless steel
soft drink can	aluminium
car engine block	cast iron
water supply pipe	plastic / PVC / copper
twist drill for metal	HSS / tool steel / carbide / high carbon steel / hardened steel
frame for small shelving unit	mild steel / steel / RHS / angle iron / aluminium / galvanised steel

Most students attempted all answers, but few knew the correct materials against applications.

Question 11ai.

Mark	0	1	Average
%	88	12	0.1



Students often did not know how to lay out work correctly to minimise wastage.

Question 11aii.

Mark	0	1	Average
%	84	16	0.2

The correct answer was 12 pieces.

Most student responses appeared to be guesses, rather than logical calculations.

Question 11b.

Mark	0	1	Average
%	41	59	0.6

The correct answer was pop rivet.

Incorrect responses suggested students were not aware of correct terminology for common fasteners.

Question 11c.

Mark	0	1	Average
%	25	75	0.8

The correct answer was 'C'. Most students answered correctly.

Question 11d.

Mark	0	1	Average
%	51	49	0.5

The correct answer was spot welding.

Most students responded with TIG or MIG welding, possibly going with a common welding process, but failing to take into account the application/requirements.

Question 11e.

Mark	0	1	2	Average
%	29	52	19	0.9

Acceptable answers included:

- use safety edges (folded over)
- use rubber strip on sharp edges.

A large number of students responded with removing the sharp edges with a file or grinding/sanding them, seemingly unaware that the question states they have been previously de-burred.

Question 12a.

Mark	0	1	Average
%	64	36	0.4

Acceptable answers included:

- reduce friction between moving parts (or similar)
- allowing parts to move while held together (or similar).

While allowance was made to the accepted wording of student answers, most students could not adequately describe the function.

Question 12b.

Mark	0	1	Average
%	41	59	0.6

Acceptable answers included:

- parts will seize (or similar)
- parts will overheat (or similar)
- parts will wear quickly (or similar).

Some students could not give a suitable response.

Question 12c.

Mark	0	1	Average
%	76	24	0.3

Acceptable answers were:

- less friction when operating
- suitable for higher speeds
- less wear.

Some students answered ‘can take heavier loads’, which is incorrect.

Question 13a.

Mark	0	1	Average
%	75	25	0.3

The correct answer was the slot drill can be fed straight down into solid material (or similar).

Few students answered this correctly, despite references to slot drills and end mills in recent examinations. Most answers suggested that students did not understand the basic concept/uses of cutters.

Question 13b.

Mark	0	1	2	Average
%	80	10	10	0.3

Equipment: Dial indicator

Procedure: Run dial indicator along parallel strip and adjust vice until parallel (or similar)

Very few students correctly named ‘dial indicator’ and its use. Some suggested you need a spanner, with no explanation of how to align; others suggested using a square, with no logical explanation for this choice.

Question 13c.

Mark	0	1	Average
%	88	12	0.1

The correct answer was that the slot will not be parallel to sides.

Some students realised it would not be to specifications, but could not explain how or why. Another common answer was ‘slot will not be in the middle’, which does not adequately describe the issue.

Question 13d.

Mark	0	1	2	Average
%	22	47	31	1.1

Acceptable answers were:

- workpiece is secured / vice is tight
- cutter is tightened
- cutter clear of vice/work
- cutter rotation correct
- correct RPM is set
- clear table of loose items
- ensure guards are in place.

Most students could identify at least one safety check.

Question 14

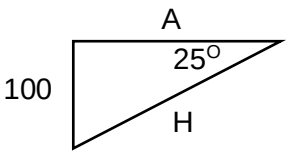
Mark	0	1	2	3	4	Average
%	4	16	37	37	6	2.3

Feature	Letter	Measuring tool or gauge
major diameter	D	micrometer or vernier caliper
pitch	C	screw pitch gauge or thread gauge
length	F	ruler
spanner size	B	ruler or vernier caliper

Common errors were selecting ‘G’ as the length and selecting ‘B’ as the major diameter. Most students correctly identified the pitch, but very few named the correct tool used to measure.

Question 15

Marks	0	1	2	3	4	5	Average
%	65	2	6	2	3	22	1.4



$H = \frac{100}{\text{Sin } 25^{O}}$ $H = \frac{100}{0.4226}$ **H = 236.63**

$A = \frac{100}{\text{Tan } 25^{O}}$ $A = \frac{100}{0.466}$ **A = 214.59**

Perimeter =

800 + (2 × 220) + (2 × 236.6) + 370.8

Students did not break this down and often left out one section. Some students also assumed that the hypotenuse of the triangle was the same as the adjacent length in their working out.

Question 16a.

Mark	0	1	2	Average
%	57	9	34	0.8

½ πD = ½ (3.142 x 600) = 942.6

942.6 + 300 = 1242.6 mm

A common error was to add the 600 mm length instead of calculating half the perimeter. Some students also used the formula for a circles area, instead of the formula for perimeter.

Question 16b.

Mark	0	1	2	Average
%	81	10	9	0.3

Top cover: (.9426 × .25) + (.3 × .25)

= .23565 + 0.75

= 0.31065 m^2

Side covers: π x $.3^2$ = .28778 m^2

Total surface area = .31065 + .28778 = .59343

Weight: .59343 × 11.2 = 6.65 kg

Some students used the incorrect formula to calculate the surface area. Most students would benefit from a structured, logical approach to their working out to reduce the risk of confusion and error.

Question 16c.

Mark	0	1	2	Average
%	36	36	29	0.9

Acceptable answers were:

- TIG
- MIG
- oxyacetylene.

Some students put down arc welding or stick welding. It appears students are unaware of the differences in welding processes and suitability for material thickness.

Question 17a.

Mark	0	1	Average
%	58	42	0.4

The correct answer was 400 RPM. This question was answered correctly overall.

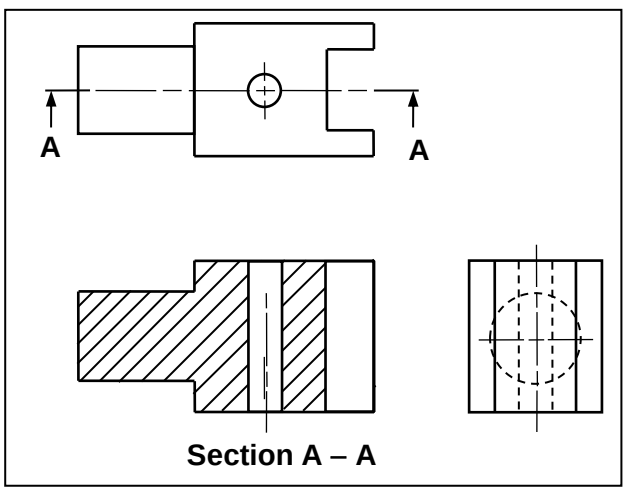
Question 17b.

Mark	0	1	Average
%	37.1	62.9	0.65

The correct answer was 100 m/min. This question was answered correctly overall.

Question 18

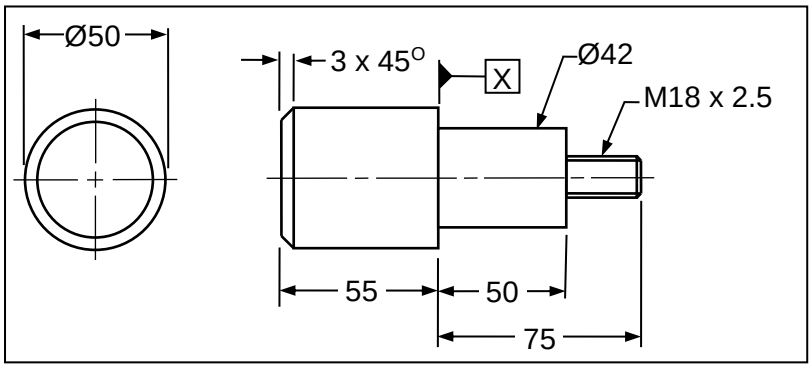
Mark	0	1	2	3	4	Average
%	28	29	24	15	3	1.4



A majority of students appeared to have little idea of what a sectioned view is. It also appears that a large number of students did not understand basic third-angle projection.

Question 19

Mark	0	1	2	3	4	Average
%	32	30	23	12	3	1.2



The vast majority of students did not dimension using standard drawing convention, such as extension lines and arrow heads. Most students were also seemingly unaware of dimensioning from a datum.

Question 20a.

Mark	0	1	2	3	Average
%	74	7	5	14	0.6

Circle: πr^2

$= 3.142 \times (.250^2)$

$= 0.196$

Rectangle: $0.7 \times 0.5 = 0.35$

Volume: $0.546 \times .4 = 0.218\ m^3$

A large number of students used length × width × height without taking the radiused ends into consideration to calculate volume. Most students would benefit from a structured, logical approach to their working out to reduce the risk of confusion and error.

Question 20b.

Mark	0	1	2	Average
%	86	2	11	0.3

Perimeter of circle: $\pi d = 3.142 \times .5 = 1.571$

Total Perimeter: $1.571 + 1.4 = 2.971$

Area: $2.971 \times 0.4 = 1.188\ m^2$

Most students would benefit from a structured, logical approach to their working out to reduce the risk of confusion and error.

Question 21a.

Mark	0	1	2	3	4	Average
%	25	21	9	21	25	2.0

Material size	Number of pieces	Length
50 × 75	2	1600
50 × 50	2	1800
50 × 50	4	1100
50 × 50	3	533 (534)

Students often failed to break up the inside pieces into shorter lengths (533). Another common error was to write down the total length of a particular size material, instead of the length of individual pieces (i.e. 50 × 75 = 3200 length, instead of 1600 length).

Question 21b.

Mark	0	1	2	Average
%	27	56	17	0.9

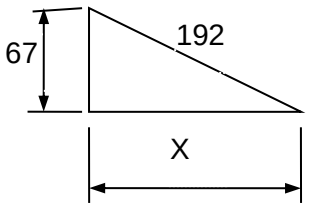
The correct answer was:

- measure across diagonal corners
- use large square.

Students often mistook the use of levels as a tool to check squareness. Some students used the 3, 4, 5 triangle method, which is not suitable for an application like this. Some students suggested checking it on a flat surface, confusing ‘flat surface’ with something that is ‘square’.

Question 21c.

Mark	0	1	2	Average
%	48	15	37	0.9



$X = \sqrt{192^2 - 67^2}$

$X = \sqrt{36864 - 4489}$

$X = \sqrt{32375}$

$X = \mathbf{180}$

Some students failed to identify when they had the answer (180) in their calculations. Some assumed the length was 192 (same as the angled line). Students would benefit from using the drawing to find the triangle required.

Question 21d.

Mark	0	1	2	Average
%	40	25	36	1.0

Thickness: (accepted) 4–10 mm

Reason: Strong enough to hold bolts for coupling

Most students answered this question correctly. Some students had strength as the correct reason, but suggested using 1 mm or 2 mm thick material.

Question 21e.

Mark	0	1	2	3	Average
%	36	18	25	21	1.3

Hole position: 35–38 mm (ideal) (39–45 mm also accepted)

Thickness: 3–5 mm accepted

Some students tried to calculate the thickness using the angle, rather than thinking about a ‘suitable thickness’.

Question 21f.

Mark	0	1	Average
%	77	23	0.3

The correct answer was between 240 mm and 245 mm.

Some students failed to take into account the ‘facing’ process and calculated the length at 238 mm.

Question 21g.

Mark	0	1	2	Average
%	44	33	23	0.8

The correct answer was 4 jaw chuck and centre in tailstock OR between centres.

A large number of students did not use correct terminology to describe work holding (i.e. not specifying use of a 4 jaw chuck, supporting using a centre).

Question 21h.

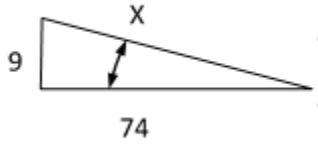
Mark	0	1	Average
%	87	13	0.2

The correct answer was compound rest or top slide.

Very few students correctly named the lathe part. A large number responded ‘swivel the tool’.

Question 21i.

Mark	0	1	2	Average
%	88	3	9	0.2



$\text{Tan X} = \frac{9}{74}$

$\text{Tan X} = 0.1216$

$\text{Tan X} = 0.1216$

$\mathbf{X = 6.93^{o}\ (7^{o})}$

Students would benefit from using the drawing to find the triangle required.

Question 21j.

Mark	0	1	Average
%	75	25	0.3

Acceptable responses were:

- can take axial load (or similar)
- the bearing can take pressure from different directions including the side (or similar).

Overall, students were on the right track, but some struggled with the description using correct terminology.

Question 21k.

Mark	0	1	Average
%	70	30	0.3

The correct answer was split pin.

A large number of students were not aware of basic fasteners used in engineering.

Question 21l.

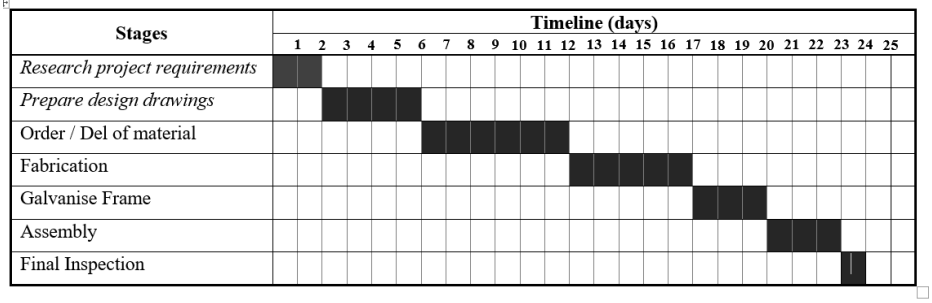
Mark	0	1	Average
%	68	32	0.3

The correct answer was that it will not come undone once adjusted (or similar).

Most students knew the reason; some struggled with an adequate description.

Question 21m.

Mark	0	1	2	3	Average
%	21	42	7	30	1.5



While most students shaded the days correctly, some students did not have the stages in a logical sequence (e.g. assembling before purchasing or assembling).

Question 21n.

Mark	0	1	Average
%	91	9	0.1

The correct answer was 7th November.

Most students simply subtracted the total days (24) from the 30th, and came up with 6th November, which is out by one day.