

# College ABCD

## Topic Test

<b>Assessment Period:</b>	<b>2022 S2</b>
<b>Course:</b>	<b>MATHEMATICAL APPLICATIONS</b>
<b>Unit:</b>	<b>Unit 2: Mathematical Applications (1.0)</b>
<b>Accreditation:</b>	<b>T</b>
<b>Weight:</b>	<b>30%</b>
<b>Maximum Mark:</b>	<b>36</b>
<b>Due Date:</b>	<b>20 Oct</b>

### Assessment Conditions

- Test completed in-class – no collaboration
- One A4, single sided, handwritten page of notes allowed
- Scientific Calculators permitted

### Additional Information

Time allowed: 50 minutes

## Other Applicable Policies

### Academic Integrity

The BSSS and College ABCD is committed to a system of school-based assessment and views seriously any breach of the rules or instructions governing assessment. Any cheating, plagiarism, dishonesty, alteration of results or improper practice in relation to school-based assessment in any subject shall constitute a breach of discipline. This includes any tampering with the assessment data on computer files by a student.

Any work that is found to be in breach of discipline in relation to school-based assessment will incur a penalty ranging from a reprimand and warning, in writing, through to the cancellation of all assessment results for Years 11 and 12. Students who unintentionally breach the rules of school-based assessment will be given appropriate counselling and guidance so they do not repeat the offence. The impact on unit scores of the penalties imposed for serious and repeated instances will be managed in accordance with the BSSS Policy and Procedures . Any offence will be reported to the Faculty Leader who will then inform the Teaching and Learning Coordinator for escalation to the Assistant Principal where necessary.

Students are to refer to and be familiar with the BSSS Academic Integrity: Student Guide to ensure student obligations and academic integrity are met. A College Referencing and Curriculum Guide is accessible via the student handbook.

The College uses Turnitin to assist students to prevent plagiarism and enhance academic skills for original thinking, authentic writing, proper attribution and academic integrity practices. Students are to use this tool to check text similarity, find missing citations and ensure proper citation using the Harvard Referencing Style for all assessment from first draft to final submission. The use of Turnitin does not apply to exams and in-class tests.

When submitting the task, students are to sign off on the below prompt made visible via the LMS:

I certify that:

- (a) The work that I have submitted is my own work and has not been submitted for assessment before.
- (b) I have kept a copy of this assignment and all relevant notes and references materials that I used in the production of the assignment.
- (c) I have given references for all sources of information that are not my own, including the words, ideas and images of others.

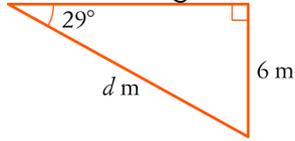
### For academic integrity

Review [BSSS Policy and Procedure Manual 4.3.12](#) for more details.

## Part A: Multiple-choice Section

Each question is worth 1 mark.

- 1 The length of  $d$  in the triangle below is closest to:

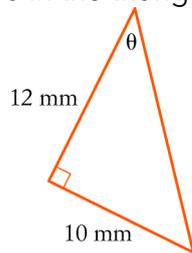


D level question CT 2

applies simple mathematical techniques to solve routine problems in limited contexts

6.86 m	10.82 m	12.38 m	2.90 m	6.00 m
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- 2 The magnitude of  $\theta$  in the triangle below is closest to:

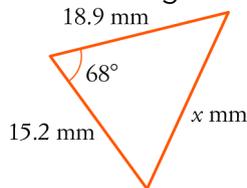


D level question CT 2

applies simple mathematical techniques to solve routine problems in limited contexts

40°	56°	34°	39°	16°
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- 3 The perimeter of the triangle below is:

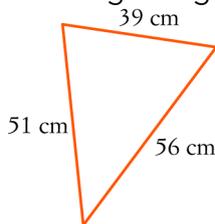


C level question CT 2

applies mathematical techniques to solve routine and non-routine problems in some contexts

19.3 mm	38.1 mm	53.4 mm	410 mm	58.4 mm
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- 4 The area of the following triangle is closest to:

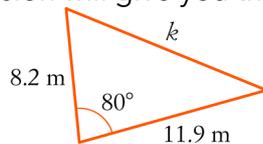


C level question CT 2

applies mathematical techniques to solve routine and non-routine problems in some contexts

994.5 cm <sup>2</sup>	1092 cm <sup>2</sup>	963.5 cm <sup>2</sup>	112.8 cm <sup>2</sup>	11557.2 cm <sup>2</sup>
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- 5 Which expression will give you the length of  $k$  (in metres) in the following triangle?



C level question CT 2

applies mathematical techniques to solve routine and non-routine problems in some contexts

$\sqrt{8.2 \times 11.9 - 2 \times 8.2 \times 11.9 \cos(80^\circ)}$	$\frac{11.9 \sin(80^\circ)}{8.2}$
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$8.2^2 + 11.9^2 - 2 \times 8.2 \times 11.9 \cos(80^\circ)$	$\sqrt{8.2^2 + 11.9^2 - 2 \times 8.2 \times 11.9 \cos(80^\circ)}$
$\frac{8.2 \sin(80^\circ)}{11.9}$	

6 An equilateral triangle has side lengths of 10 cm. Which of the following is not equal to the height of the triangle?

C level question RC1  
represents mathematical concepts in numerical, graphical and symbolic form to some routine and some non-routine problems in some contexts.

$\frac{5}{\tan(30^\circ)}$	$5 \cos(30^\circ)$	$\sqrt{10^2 - 5^2}$	$10 \sin(60^\circ)$	$10 \cos(30^\circ)$
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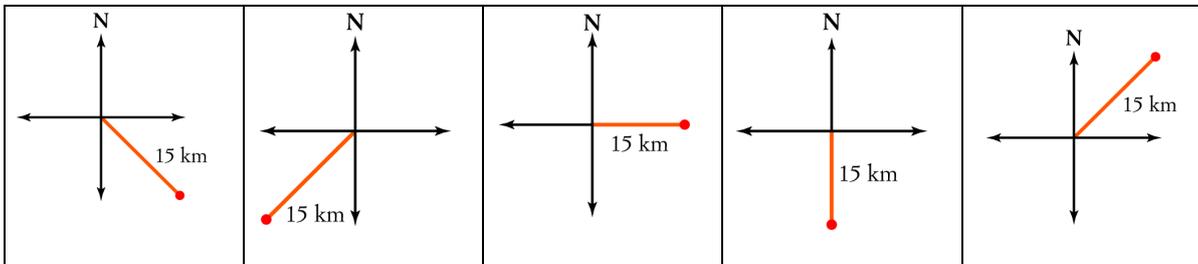
7 The true bearing  $280^\circ$  is equal to:

D level question CT2  
applies simple mathematical techniques to solve routine problems in limited contexts

N $280^\circ$ W	N $10^\circ$ W	W $10^\circ$ N	W $80^\circ$ N	N $80^\circ$ W
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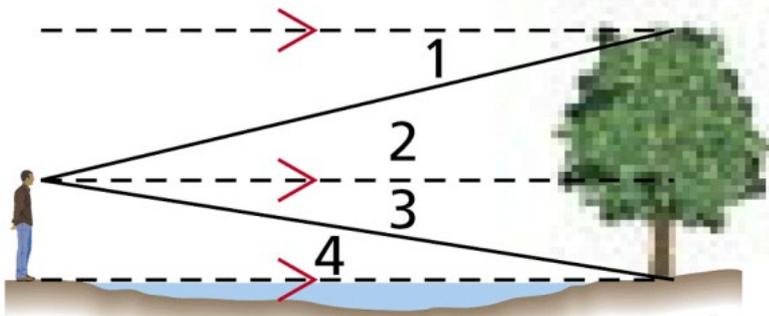
8 Michelle sailed 15 km in a south-easterly direction. Which of the following diagrams illustrates her journey?

D level question CT2  
applies simple mathematical techniques to solve routine problems in limited contexts



9 In the diagram below, decide which angle would represent the angle of depression for a butterfly sitting in the tree looking at the man.

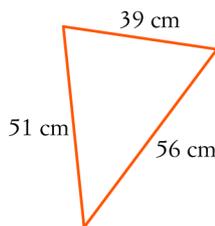
D level question RC1  
Represents simple mathematical concepts in numerical, graphical or symbolic form in routine problems in limited contexts.



Angle 1	Angle 2	Angle 3	Angle 4
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10 Find the size of the smallest angle in the triangle below.

C level question CT3  
applies mathematical techniques to solve routine and non-routine problems in some contexts.



$76^\circ$	$42^\circ$	$62^\circ$	$48^\circ$	$36^\circ$
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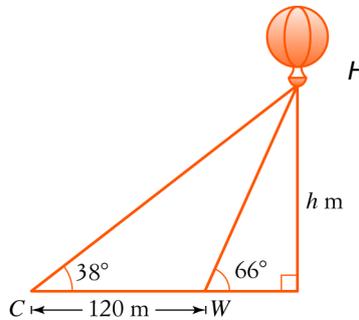
## Short Response Questions

- 1** Farmer Jo has a triangular dam on her property. The lengths of the sides are 168m, 208m and 236m. Calculate the area of the dam, to the nearest square metre. **[3 Marks]**

C level question CT1

represents mathematical concepts in numerical, graphical and symbolic form to some routine and some non-routine problems in some contexts

- 2** William (*W*) and Chris (*C*), standing 120 m apart, observe a hot air balloon (*H*) at angles of elevation of  $66^\circ$  and  $38^\circ$  respectively. **[2+1=3 Marks]**



- a** Find the distance between William and the hot air balloon correct to two decimal places.

B level question CT2

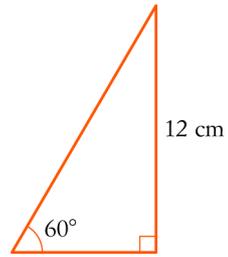
selects and applies mathematical techniques to solve routine and non-routine problems in a variety of contexts

- b** Calculate the height of the hot air balloon,  $h$  metres, correct to two decimal places.

B level question CT2

selects and applies mathematical techniques to solve routine and non-routine problems in a variety of contexts

**3** Calculate the area of this triangle using two different methods. Answer correct to two decimal places. **[3 Marks]**



C level question CT2

applies mathematical techniques to solve routine and non-routine problems in some contexts

## Part C: Analysis questions

- 1** A wall leans inwards and makes an angle of  $88^\circ$  with the floor. **[2+2+3=7 Marks]**  
**a** A 4 m long ladder leans against the wall with its base 2.3 m out from the wall. Find the angle that the top of the ladder makes with the wall, to the nearest degree.

C level question RC1

represents mathematical concepts in numerical, graphical and symbolic form to some routine and some non-routine problems in some contexts

- b** A longer ladder is placed the same distance out from the wall and its top makes an angle of  $31^\circ$  with the wall.

**i** How long is this ladder (correct to two decimal places)?

B level question RC1

represents mathematical concepts in numerical, graphical and symbolic form in routine and non-routine problems a variety of contexts

**ii** How much further does it reach up the wall than the first ladder (to the nearest centimetre)?

A level question CT3

constructs, selects and applies complex mathematical models to routine and non-routine problems in a variety of contexts

**2** A helicopter is delivering supplies to three islands off the coast. The helicopter leaves island A on a bearing of  $020^{\circ}$ T and flies for 45km to reach island B. It then heads due east to reach island C, which is 62km away. **[2+2=4 Marks]**

**a** Draw a diagram to represent islands A, B and C (not to scale), with noted dimensions.

A level question RC1  
represents complex mathematical concepts in numerical, graphical and symbolic form in routine and non-routine problems in a variety of contexts

**b** Calculate the distance between island C and island A, correct to two decimal places.

B level question CT2  
selects and applies mathematical techniques to solve routine and non-routine problems in a variety of contexts

**3** 31-year-old Larry stands on the ground and sees the Canberra fireworks that are launched from the top of a tower at 9:15pm on 31<sup>st</sup> December, 2020. Larry sees the top of the tower at an angle of elevation of  $38^\circ$ . Larry estimates there are 1500 people standing around the tower. When the fireworks are at their highest point, they are 800m above the tower and Larry sees them at an angle of elevation of  $80^\circ$ . After the fireworks are completed at 9:42pm, Larry walks 1.6km back to where his car is parked and then drives home, 11.8 km away. He returns home at 10:30pm.

**[2+2+2=6 marks]**

**a** Determine the relevant information and sketch a diagram that allows you to find the distance between Larry and the highest point of the fireworks. Label all measurements relevant to finding this distance.

A level question RC1

represents complex mathematical concepts in numerical, graphical and symbolic form in routine and non-routine problems in a variety of contexts

**b** Determine the distance between Larry and the highest point of the fireworks, to the nearest metre.

B level question CT2

selects and applies mathematical techniques to solve routine and non-routine problems in a variety of contexts

**c** Calculate the height of the fireworks above the ground, to the nearest metre.

B level question CT2

selects and applies mathematical techniques to solve routine and non-routine problems in a variety of contexts

**4** Murray is completing some yard work and has made the following sketch. He needs to work out the size of each angle to cut the lengths of timber required for the garden bed. He has worked out the angles below. However, he ends up with a triangle that totals to only 113.7 degrees and knows there is an error somewhere but is unsure where the error lies. **[1+2+2=5 marks]**

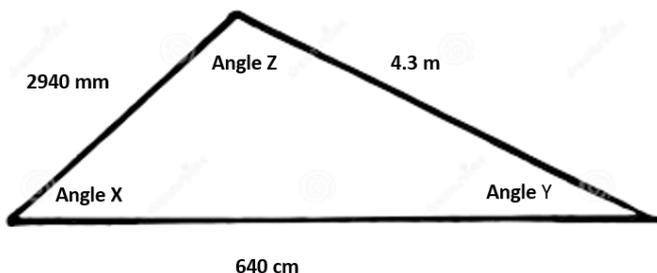


Image is not drawn to scale

To find Angle Z:

$$\cos(Z) = \left( \frac{2.94^2 + 6.4^2 - 4.3^2}{2 \times 2.94 \times 6.4} \right)$$

$$\text{Angle Z} = 34.23^\circ$$

To find Angle Y:

$$\frac{\sin Y}{2.94} = \frac{\sin(34.23)}{4.3}$$

$$\sin(Y) = \frac{2.94 \times \sin(34.23)}{4.3}$$

$$\text{Angle Y} = 22.62^\circ$$

To find Angle X:

$$\frac{\sin(X)}{6.4} = \frac{\sin(34.23)}{4.3}$$

$$\sin(X) = \frac{6.4 \times \sin(34.23)}{4.3}$$

$$\text{Angle X} = 56.85^\circ$$

- Identify where Murray has made his error. In his calculations for angle X, Y or Z?
- Determine what the correct angle should be.
- Explain where Murray went wrong in his calculations.

A level question CT1

critically applies mathematical concepts in a variety of complex contexts to routine and non-routine problems

A level question CT2

selects and applies advanced mathematical techniques to solve complex problems in a variety of contexts

A Level Q	12 marks	29%	AQ1bii, AQ2a, AQ3a, AQ4a, AQ4b, AQ4c
B level Q	11 marks	27%	SRQ2a, SRQ2b, AQ1b, AQ2b, AQ3b, AQ3c
C Level Q	12 marks	29%	MC3, MC4, MC5, MC6, SRQ1, SRQ3, AQ1a
D level Q	6 marks	15%	MC1, MC2, MC7, MC8, MC9, MC10
	41 marks	100%	

Highest Possible Response	A Level Q	B Level Q	C Level Q	D Level Q
MC 1 (1 mark)				
MC2 (1 mark)				
MC3 (1 mark)				
MC4 (1 mark)				
MC5 (1 mark)				
MC6 (1 mark)				
MC7 (1 mark)				
MC8 (1 mark)				
MC9 (1 mark)				
MC10 (1 mark)				
SR1 (3 marks)				
SR2 (3 marks)				
SR3 (3 marks)				
AQ1a (2 marks)				
AQ2i (2 marks)				
AQ2ii (3 marks)				
AQ2a (2 marks)				
AQ2b (2 marks)				
AQ3a (2 marks)				
AQ3b (2 marks)				
AQ3c (2 marks)				
AQ4a (1 mark)				
AQ4b (2 marks)				
AQ4c (2 marks)				
<b>Total marks for each grade area</b>	<b>/12 marks</b>	<b>/11 marks</b>	<b>/12 marks</b>	<b>/6 marks</b>
<b>Final Mark for assessment (/41)</b>	<b>Final Grade for Assessment:</b>			

## Evaluating the task using the BSSS Quality Assessment Guidelines

### 1. Coverage of BSSS Accredited Courses

**Outstanding Coverage of BSSS Accredited Courses – Assessment tasks are strategically planned for alignment with Achievement Standards, unit goals and content descriptors. Assessments are not too big: assessing irrelevant content or criteria; nor too small: missing important content or criteria**

High Coverage of BSSS Accredited Courses - Assessment tasks are thoughtfully planned. Assessments are not too big: assessing irrelevant criteria; nor too small: missing important criteria.

Satisfactory Coverage of BSSS Accredited Courses - Assessment tasks are appropriately planned. Assessments are not too big: assessing irrelevant criteria; nor too small: missing important criteria.

Minimum Coverage of BSSS Accredited Courses – Assessment tasks require refinement. Assessments are uneven. Some tasks are either too big: assessing irrelevant criteria; or too small: missing important criteria.

No Coverage of BSSS Accredited Courses – Assessment tasks are unplanned. Assessments are uneven. Some tasks are either too big: assessing irrelevant criteria; or too small: missing important criteria.

### Comments

Test covered right angle trigonometry, angle of elevation and depression, bearings, sine rule, cosine rule, Heron's Rule and area of a triangle rule (using sine) well.

### 2. Reliability

Outstanding Reliability - Assessment tasks and marking are strategically designed to remove all sources of non-relevant variation in measurements.

**High Reliability - Assessment tasks and marking are thoughtfully designed to remove sources of large variation in measurements except for the key knowledge, skills and understandings of the student in the unit.**

Satisfactory Reliability - Assessment tasks and marking are designed with some consideration of reducing variation in measurements caused by factors other than the key knowledge, skills and understandings of the student in the unit.

Minimal Reliability - Assessment tasks and marking are designed with minimal consideration of reducing variation in measurements caused by factors other than the key knowledge, skills and understandings of the student in the unit.

No Reliability - Performance in the assessment tasks is largely determined by factors other than the key knowledge, skills and understandings of the student in the unit.

### Comments

Marking scheme was clear and easy to follow. Question: were there too many opportunities for students to lose marks for rounding and/or missing units? Would it be possible to make the assessment out of 38 marks and they only get penalised 1 mark for missing units and 1 mark for rounding errors?

### 3. Bias Awareness

**Outstanding Bias Awareness** – The suite of assessment tasks is strategically designed to be sensitive and empowering for all students, catering for the diverse needs of gender, socio-economic status, disabilities and/or cultures, and that do not marginalise or favour a student or group of students, or advantage or disadvantage certain background knowledge or ways of thinking.

**High Bias Awareness** - The suite of assessment tasks is designed that promote the diverse needs of gender, socio-economic status, disabilities and/or cultures, and that do not marginalise or favour a student or group of students, or advantage or disadvantage certain background knowledge or ways of thinking.

**Satisfactory Bias Awareness** - The suite of assessment tasks is designed to meet the needs of the dominant culture, socio-economic group or gender, with evidence of minor alterations for genders, socio-economic status and/or cultures, and doesn't overly advantage or disadvantage certain background knowledge or ways of thinking.

**Minimal Bias Awareness** - The suite of assessment tasks is designed to meet the needs of the dominant culture, socio-economic group or gender.

**No Bias Awareness** - Assessment tasks are openly skewed to favour or marginalise a student or group of students.

### Comments

No issues of bias, students allowed to bring in notes summary sheet and use scientific calculator.

### 4. Levels of Thinking

**Outstanding Levels of Thinking** – Comprehensive assessment tasks are designed that allow students to engage at progressively higher cognitive demands. The suite of assessments demonstrates that there are high expectations for all learners at all levels of learning and opportunities for extending all learners are strategically planned for. Assessment tasks are flexible and varied, promoting a range of assessment modes.

**High Levels of Thinking** – Clear assessment tasks are designed that allow students to engage at progressively higher cognitive demands. The suite of assessments demonstrates that there are expectations for all learners at all levels of learning and opportunities for extending all learners are planned for. Assessment tasks are flexible and varied, covering a range of assessment modes.

**Satisfactory Levels of Thinking** – Assessment tasks are designed around the thinking progression of the Achievement Standard. The suite of assessments demonstrates that there are some expectations for most learners to extend their thinking at all levels of learning. Assessment demonstrates some assessment modes.

**Minimal Levels of Thinking** - Assessment tasks are limited for the top students who are unable to show the extent of their thinking. The suite of assessments demonstrates that there are minimal expectations for learners to extend their thinking. Assessment is generally in one mode with some small changes to make each task different.

**No Levels of Thinking** – Assessment tasks are one dimensional and do not encourage a range of thinking levels. The suite of assessments demonstrates that there are no expectations for learners to extend their thinking. Assessment is in one mode only.

## Comments

Test demonstrated progressively more challenging questions, forcing students to create their own models from worded problems and demanding students choose from a wide range of techniques, Rt angle trig, Sine Rule, Cosine Rule to solve problems.

### 5. Student Engagement

Outstanding Student Engagement – Assessment tasks are strategically planned to engage students. Assessment tasks are explicitly and purposefully connected to contemporary issues or student lived experiences, interests, or prior knowledge. The suite of assessment tasks clearly supports student ownership.

High Student Engagement – Assessment tasks are thoughtfully planned to engage students. Assessment tasks are explicitly connected to contemporary issues or student lived experiences, interests, or prior knowledge. The suite of assessment tasks supports student ownership.

Satisfactory Student Engagement – Assessment tasks are appropriately planned to engage students. Assessment tasks are implicitly connected to contemporary issues or student lived experiences, interests, or prior knowledge. The suite of assessment tasks supports student ownership.

Minimal Student Engagement – Assessment tasks require refinement. Assessment tasks are connected minimally to contemporary issues or student lived experiences, interests, or prior knowledge. The suite of assessment tasks supports student ownership but are not aligned to unit goals, content descriptions and Achievement Standards.

No Student Engagement - Assessment tasks are unplanned. Assessment tasks lack connection to contemporary issues or student lived experiences, interests, or prior knowledge. The suite of assessment tasks does not support student ownership through choice, decision making opportunities and procedural choices and are not aligned to unit goals, content descriptions and Achievement Standards.

## Comments

### 6. Academic Integrity \*

**Outstanding Academic Integrity - Students are required to engage in genuine deep learning at a level of challenge appropriate to the student and tasks make provision for sense making or knowledge construction. Assessment is designed to ensure authenticity from students and requires individualised responses.**

High Academic Integrity - Academic integrity is discussed with students with expectations with respect to academic integrity and the consequences of cheating or plagiarising made clear. Assessment is designed to encourage original thinking from students and require individualised responses that will be different.

Satisfactory Academic Integrity - Assessment is designed so that a majority of the assessment encourages original thinking from students or requires individualised responses. Expectations in regard to plagiarism, assistance by others and referencing are referred to in the assessment task description.

Minimal Academic Integrity – Minimal evidence of academic integrity processes are in place. Assessment allows for the possibility of identical responses from students. Expectations in regard to plagiarism and referencing are inconsistent or applied inconsistently.

No Academic Integrity - Academic integrity is not mentioned in any documentation. Assessment requires identical responses from students. Expectations in regard to plagiarism and referencing are not addressed.

### Comments

Clear expectations for students to work independently and also prepare their notes summary sheet.

## Appendix A – Common Curriculum Elements

Common curriculum elements assist in the development of high quality assessment tasks by encouraging breadth and depth and discrimination in levels of achievement.

Organisers	Elements	Examples
<b>create, compose and apply</b>	apply	ideas and procedures in unfamiliar situations, content and processes in non-routine settings
	compose	oral, written and multimodal texts, music, visual images, responses to complex topics, new outcomes
	represent	images, symbols or signs
	create	creative thinking to identify areas for change, growth and innovation, recognise opportunities, experiment to achieve innovative solutions, construct objects, imagine alternatives
	manipulate	images, text, data, points of view
<b>analyse, synthesise and evaluate</b>	justify	arguments, points of view, phenomena, choices
	hypothesise	statement/theory that can be tested by data
	extrapolate	trends, cause/effect, impact of a decision
	predict	data, trends, inferences
	evaluate	text, images, points of view, solutions, phenomenon, graphics
	test	validity of assumptions, ideas, procedures, strategies
	argue	trends, cause/effect, strengths and weaknesses
	reflect	on strengths and weaknesses
	synthesise	data and knowledge, points of view from several sources
	analyse	text, images, graphs, data, points of view
	examine	data, visual images, arguments, points of view
investigate	issues, problems	
<b>organise, sequence and explain</b>	sequence	text, data, relationships, arguments, patterns
	visualise	trends, futures, patterns, cause and effect
	compare/contrast	data, visual images, arguments, points of view
	discuss	issues, data, relationships, choices/options
	interpret	symbols, text, images, graphs
	explain	explicit/implicit assumptions, bias, themes/arguments, cause/effect, strengths/weaknesses
	translate	data, visual images, arguments, points of view
	assess	probabilities, choices/options
	select	main points, words, ideas in text
<b>identify, summarise and plan</b>	reproduce	information, data, words, images, graphics
	respond	data, visual images, arguments, points of view
	relate	events, processes, situations
	demonstrate	probabilities, choices/options
	describe	data, visual images, arguments, points of view
	plan	strategies, ideas in text, arguments
	classify	information, data, words, images
	identify	spatial relationships, patterns, interrelationships
	summarise	main points, words, ideas in text, review, draft and edit

## Appendix B – Glossary of Verbs

Verbs	Definition
<b>Analyse</b>	Consider in detail for the purpose of finding meaning or relationships, and identifying patterns, similarities and differences
<b>Apply</b>	Use, utilise or employ in a particular situation
<b>Argue</b>	Give reasons for or against something
<b>Assess</b>	Make a Judgement about the value of
<b>Classify</b>	Arrange into named categories in order to sort, group or identify
<b>Compare</b>	Estimate, measure or note how things are similar or dissimilar
<b>Compose</b>	The activity that occurs when students produce written, spoken, or visual texts
<b>Contrast</b>	Compare in such a way as to emphasise differences
<b>Create</b>	Bring into existence, to originate
<b>Demonstrate</b>	Give a practical exhibition an explanation
<b>Describe</b>	Give an account of characteristics or features
<b>Discuss</b>	Talk or write about a topic, taking into account different issues or ideas
<b>Evaluate</b>	Examine and judge the merit or significance of something
<b>Examine</b>	Determine the nature or condition of
<b>Explain</b>	Provide additional information that demonstrates understanding of reasoning and /or application
<b>Extrapolate</b>	Infer from what is known
<b>Hypothesise</b>	Put forward a supposition or conjecture to account for certain facts and used as a basis for further investigation by which it may be proved or disproved
<b>Identify</b>	Recognise and name
<b>Interpret</b>	Draw meaning from
<b>Investigate</b>	Plan, inquire into and draw conclusions about
<b>Justify</b>	Show how argument or conclusion is right or reasonable
<b>Manipulate</b>	Adapt or change
<b>Plan</b>	Strategies, develop a series of steps, processes
<b>Predict</b>	Suggest what might happen in the future or as a consequence of something
<b>Reflect</b>	The thought process by which students develop an understanding and appreciation of their own learning. This process draws on both cognitive and affective experience
<b>Relate</b>	Tell or report about happenings, events or circumstances
<b>Represent</b>	Use words, images, symbols or signs to convey meaning
<b>Reproduce</b>	Copy or make close imitation
<b>Respond</b>	React to a person or text
<b>Select</b>	Choose in preference to another or others
<b>Sequence</b>	Arrange in order
<b>Summarise</b>	Give a brief statement of the main points
<b>Synthesise</b>	Combine elements (information/ideas/components) into a coherent whole
<b>Test</b>	Examine qualities or abilities
<b>Translate</b>	Express in another language or form, or in simpler terms
<b>Visualise</b>	The ability to decode, interpret, create, question, challenge and evaluate texts that communicate with visual images as well as, or rather than, words