

College ABCD

Topic Test

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

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.

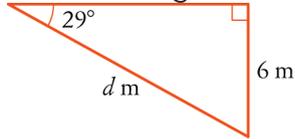
For academic integrity

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:

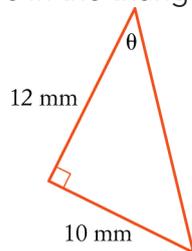


D level question CT 2

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 θ in the triangle below is closest to:

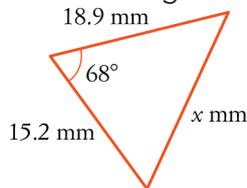


D level question CT 2

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:

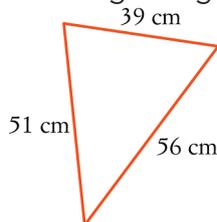


C level question CT 2

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 ²	1092 cm ²	963.5 cm ²	112.8 cm ²	11557.2 cm ²
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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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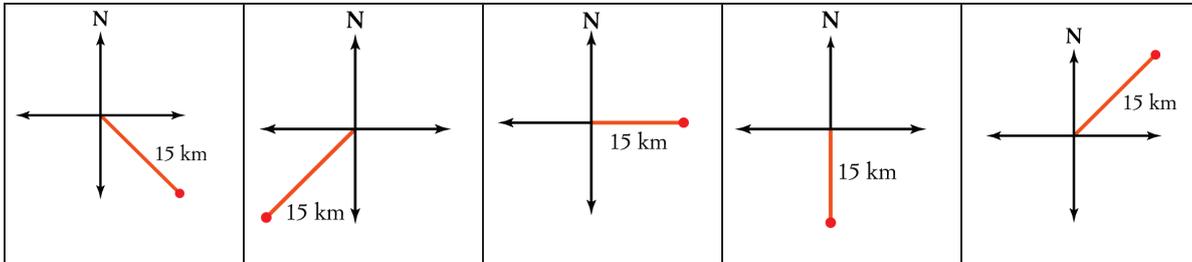
7 The true bearing 280° is equal to:

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

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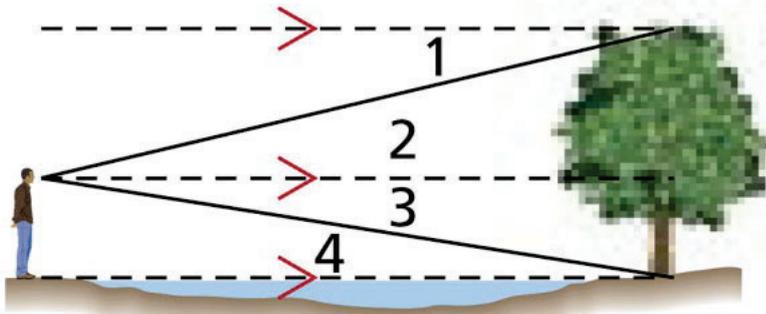
8 Michelle sailed 15 km in a south-easterly direction. Which of the following diagrams illustrates her journey?

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.

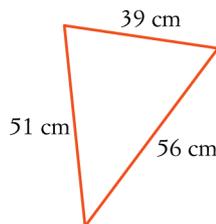
D level question RC1
Represents simple mathematical concepts in numerical, graphical or symbolic form in routine problems in limited contexts.



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°	42°	62°	48°	36°
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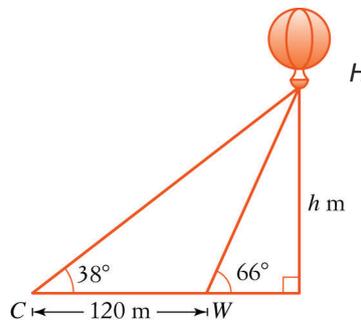
Short Response Questions

- 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° and 38° 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

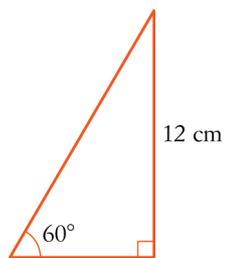
- b** Calculate the height of the hot air balloon, h metres, correct to two decimal places.

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° 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° 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° 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 31st December, 2020. Larry sees the top of the tower at an angle of elevation of 38° . 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° . 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]**

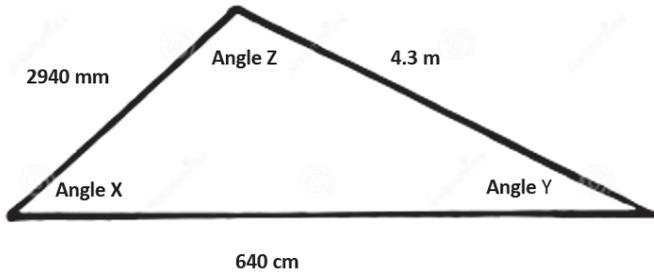


Image is not drawn to scale

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)				
Total marks for each grade area	/12 marks	/11 marks	/12 marks	/6 marks
Final Mark for assessment (/41)	Final Grade for Assessment:			

11 MATHS APPLICATIONS TEST: ANALYSIS OF THE TASK USING THE BSSS QUALITY ASSESSMENT GUIDELINE

Outstanding	Coverage of BSSS Accredited Courses	Outstanding	Reliability
High	Bias Awareness	Outstanding	Levels of Thinking
Outstanding	Student Engagement	Outstanding	Academic Integrity

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

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. This represents all of the content descriptions for the trigonometry topic in Unit 2.

2. RELIABILITY

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

COMMENTS

Marking scheme was detailed and clear making it easy to follow where marks were awarded allowing for consistent results. Specific teachers marked specific pages allowing for further consistency of marking processes and greater reliability in student results.

3. BIAS AWARENESS

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.

COMMENTS

Bias is determined across the suite of tasks in a portfolio; hence no individual task will be rated outstanding. However, this task is disciplinary appropriate and calls upon skill studied for and rehearsed in class. It allows access to a wide range of students through the escalating difficulty of the questions. The mix of multiple choice, short and extended answers allow access to different learning styles. All 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.

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, right angle trig, sine Rule, cosine Rule to solve problems.

5. STUDENT ENGAGEMENT

Satisfactory Student Engagement – Assessment tasks are appropriately 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.

COMMENTS

Students were engaged in a wide variety of tasks available to them in the test.

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.

COMMENTS

This is an exam under test conditions. The summative nature of the test allows for preparation. However, with non-routine problems in the short response and analysis questions, both requires students to provide answer that have not been pre-learned. Clear expectations for students to work independently and also prepare their own handwritten notes summary sheet.

