Camden High School
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Year 9 - 5.3 Mathematics
Assessment Task Term 3 2023

TOPICS: Pythagoras' Theorem and Trigonometry	
SUBMISSION REQUIREMENTS: Term 3 – Week 6 - 9MATL3 & 9MATR3 - **Period 4 – WEDNESDAY 23rd of AUGUST**	**MARKS:** **Section 1 -** /30 **Section 2 -** /10 **Section 3 -** /12 **TOTAL -** /52

OUTCOMES TO BE ASSESSED:

MA4 – 16MG – applies Pythagoras' theorem to **calculate** side lengths in right-angles triangles, and **solves** related problems

MA5.3 – 2WM – generalises mathematical ideas and techniques to **analyse** and **solve** problems efficiently

MA5.2-13MG – applies trigonometry to **solve** problems, including problems involving bearings

DIRECTIONAL VERBS:

Uses – applies, utilise, employ in a particular situation

Generalises – Explains, connects, relates cause and effect; make the relationships between things evident; provide why and/or how using appropriate terminology, diagram and/or symbols

Analyse - Relate cause and effect to compare how things are similar or different; make the relationships between things evident; provide explanation for why and/or how

Solve – Ascertain, **calculate**, evaluate, determine from given facts, figures

TASK DESCRIPTION:

In this task you will be applying Pythagoras' Theorem and Trigonometry to find missing sides and angles of right angled triangles.

There are **three** sections to this assessment task

- Section 1 – Creating five questions using Pythagoras' Theorem and trigonometry
- Section 2 – Using a clinometer to find the unknown lengths of two objects
- Section 3 – Using a compass to create a right-angle triangle

Sections 1, 2 and 3 are to be completed individually and at home. You will be given 1 period of class time to assist you in completing Section 2 where an example will be modelled for you. **If you are absent on the day this task is modelled, it is your responsibility to seek assistance from your teacher outside of class time.** Ensure that you have thoroughly checked all your work for any errors and compared your work against the **Assessment Marking Criteria** prior to the submission date.

This entire booklet needs to be submitted on **WEDNESDAY 23rd of AUGUST**.

Student Name: _____

ASSESSMENT MARKING CRITERIA:

Section 1

Question 1: Pythagoras' Theorem – finding the length of the hypotenuse	2	Question is complete and meets all criteria
	1	Slight errors in question – question does not ask to find the length of the hypotenuse
	0	Questions is incomplete or not attempted – question does not involve Pythagoras' Theorem – question is not clear
Image including Diagram	2	Image including diagram is neat, complete, correct and fully labelled with realistic measurements
	1	Image including diagram is mostly complete – may contain some minor errors - may have unrealistic measurements
	0	Diagram is incomplete or not attempted – image is not included
Solution	2	Full and correct solution provided
	1	Partial solution – may contain minor errors
	0	Little or no attempt at solutions

Question 2: Pythagoras' Theorem – finding the length of a side	2	Question is complete and meets all criteria
	1	Slight errors in question – question does not ask to find the length of a side
	0	Questions is incomplete or not attempted – question does not involve Pythagoras' Theorem – question is not clear
Image including diagram	2	Image including diagram is neat, complete, correct and fully labelled with realistic measurements
	1	Image including diagram is mostly complete – may contain some minor errors - may have unrealistic measurements
	0	Diagram is incomplete or not attempted – image is not included
Solution	2	Full and correct solution provided
	1	Partial solution – may contain minor errors
	0	Little or no attempt at solutions

Question 3: Trigonometry - finding the unknown denominator **Ratio:** $\text{Sin}\theta = \frac{O}{H}$ $\text{Cos}\theta = \frac{A}{H}$ $\text{Tan}\theta = \frac{O}{A}$	2	Question is complete and meets all criteria
	1	Slight errors in question – trigonometric ratio used more than once - question does not ask to find the unknown denominator
	0	Questions is incomplete or not attempted – question does not involve trigonometry – question is not clear
Image including Diagram	2	Image including diagram is neat, complete, correct and fully labelled with realistic measurements
	1	Image including diagram is mostly complete – may contain some minor errors - may have unrealistic measurements
	0	Diagram is incomplete or not attempted – image is not included
Solution	2	Full and correct solution provided
	1	Partial solution – may contain minor errors
	0	Little or no attempt at solutions

Question 4: Trigonometry - finding the unknown numerator **Ratio:** $\text{Sin}\theta = \frac{O}{H}$ $\text{Cos}\theta = \frac{A}{H}$ $\text{Tan}\theta = \frac{O}{A}$	2	Question is complete and meets all criteria
	1	Slight errors in question – trigonometric ratio used more than once question - does not ask to find the unknown numerator
	0	Questions is incomplete or not attempted – question does not involve trigonometry – question is not clear
Image including Diagram	2	Image including diagram is neat, complete, correct and fully labelled with realistic measurements
	1	Image including diagram is mostly complete – may contain some minor errors - may have unrealistic measurements
	0	Diagram is incomplete or not attempted – image is not included
Solution	2	Full and correct solution provided
	1	Partial solution – may contain minor errors
	0	Little or no attempt at solutions

Question 5: Trigonometry – finding the size of an angle **Ratio:** $\text{Sin}\theta = \frac{O}{H}$ $\text{Cos}\theta = \frac{A}{H}$ $\text{Tan}\theta = \frac{O}{A}$	2	Question is complete and meets all criteria
	1	Slight errors in question – trigonometric ratio used more than once question - does not ask to find the size of an angle
	0	Questions is incomplete or not attempted – question does not involve trigonometry – question is not clear
Image including Diagram	2	Image including diagram is neat, complete, correct and fully labelled with realistic measurements
	1	Image including diagram is mostly complete – may contain some minor errors - may have unrealistic measurements
	0	Diagram is incomplete or not attempted – image is not included
Solution	2	Full and correct solution provided
	1	Partial solution – may contain minor errors
	0	Little or no attempt at solutions

Total: /30

Section 2

Object 1:	1	Object named
	0	No object named
Image including Diagram	2	Image including diagram is neat, complete, correct and fully labelled with realistic measurements
	1	Image including diagram is mostly complete – may contain some minor errors - may have unrealistic measurements
	0	Diagram is incomplete or not attempted – image is not included
Solution	2	Full and correct solution provided
	1	Partial solution – may contain minor errors
	0	Little or no attempt at solutions

Object 1:	1	Object named
	0	No object named
Image including Diagram	2	Image including diagram is neat, complete, correct and fully labelled with realistic measurements
	1	Image including diagram is mostly complete – may contain some minor errors - may have unrealistic measurements
	0	Diagram is incomplete or not attempted – image is not included
Solution	2	Full and correct solution provided
	1	Partial solution – may contain minor errors
	0	Little or no attempt at solutions

Total: /10

Section 3

Image	1	Image of right angled triangle included
	0	Image is not included

Diagram	3	Diagram is neat, complete, correct and fully labelled with all measurements and bearings. Compass is included
	2	Diagram is mostly complete – may have missing information – may contain minor error
	1	Diagram is attempted – contains missing information – contains multiple errors
	0	Diagram is incomplete or not attempted

Question 1: What is the distance between point A and point C?	2	Full and correct solution provided
	1	Partial solution – contains missing information - contains minor errors
	0	Little or no attempt at solutions

Question 2: What is the bearing of C from A?	3	Full and correct solution provided
	2	Solution is mostly complete – may have missing information - contains minor errors
	1	Partial solution – contains missing information - contains multiple errors
	0	Little or no attempt at solutions

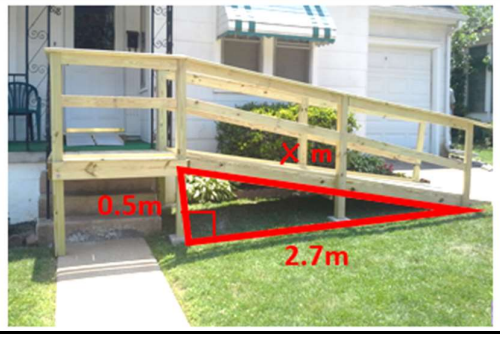
Question 3: What is the bearing of A from C?	3	Full and correct solution provided
	2	Solution is mostly complete – may have missing information - contains minor errors
	1	Partial solution – contains missing information - contains multiple errors
	0	Little or no attempt at solutions

Total: /12

SECTION 1 – Task Requirements

You will create **five questions** with images (including diagrams) and worked solutions. These questions need to be based on real-life situations which can be solved using Pythagoras' Theorem and trigonometry.

Use the following example as a guide to creating your questions –

<table>
<tr><th colspan="2">EXAMPLE – Section 1</th></tr>
<tr><td colspan="2">Question 1: Pythagoras' Theorem – finding the length of the hypotenuse (2 marks)</td></tr>
<tr><td colspan="2">Bob is building a wheelchair ramp. The wheelchair ramp needs to be 0.5m high. It will have a horizontal distance of 2.7m. What is the total length of the wheelchair ramp?</td></tr>
<tr><td>Image including Diagram (2 marks)</td><td>Solutions (2 marks)</td></tr>
<tr><td> 
</td><td>$a^2 + b^2 = c^2$
$0.5^2 + 2.7^2 = c^2$
$c^2 = 0.25 + 7.29$
$c^2 = 7.54$
$c = \sqrt{7.54}$
$c = 2.7459$ ….
$c = 2.75m$ 2.d.p</td></tr>
</table>

To complete this section successfully you will need to:

- Create **one** question using Pythagoras' Theorem to find the length of the hypotenuse
- Create **one** question using Pythagoras' Theorem to find the length of a side
- Create **three** questions using trigonometry
    - **all** trigonometric ratios must be used - $\text{Sin}\theta = \frac{O}{H}$, $\text{Cos}\theta = \frac{A}{H}$ and $\text{Tan}\theta = \frac{O}{A}$
    - **one** question must involve finding the unknown denominator
    - **one** question must involve finding the unknown numerator
    - **one** question must involve finding the size of an angle
- Ensure all questions are coherent. These can be clearly hand-written or typed
- Ensue all questions include a labelled diagram which is an **originally sourced image**; that is, you took the image yourself. You must label your diagram clearly; either hand-drawn or digitally created
- Ensure questions include **complete worked solutions**. Round all answers to **two decimal places**. These can be clearly hand-written or typed

Use Section 1 - Scaffold to help you complete this section.

SECTION 2 – Task Requirements

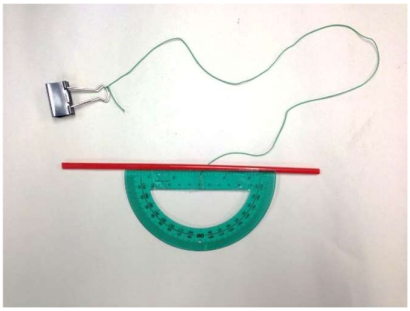
You will make and use a clinometer to find the unknown lengths of **two** objects, using trigonometry.

A clinometer is a tool used to measure the angle of elevation (angle from the ground) in a right-angled triangle. Instructions for making and using your clinometer are on the next page.
You are encouraged to use digital measurement apps to assist you when making measurements.

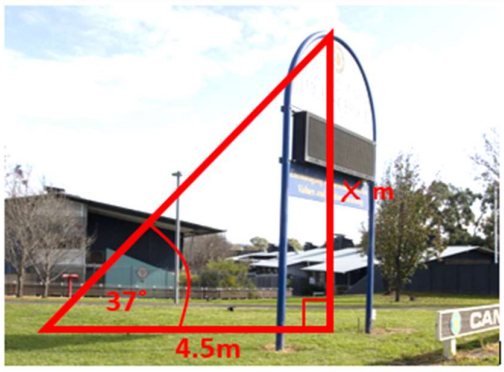
Use the following example as a guide to creating your questions –

EXAMPLE – Section 2

Clinometer Image 1



Object 1: *Camden High School Sign* (1 mark)

Image including Diagram (2 marks)	**Solution** (2 marks)
	$90^\circ - 53^\circ = 37^\circ$ $\tan\theta = \frac{Opposite}{Adjacent}$ $\tan 37^\circ = \frac{x}{4.5}$ $x = 4.5 \times \tan 37^\circ$ $x = 3.3909 \ldots$ $x = 3.39m$ 2.d.p

To complete this section successfully you will need to:

- Create your own clinometer using the instructions given
- Attach an image of your completed clinometer
- Select **two** objects to find the unknown lengths and use the clinometer to find the angle of elevation
- Ensue all questions include a labelled diagram which is an **originally sourced image**; that is, you took the image yourself. You must label your diagram clearly; either hand-drawn or digitally created
- Ensure questions include **complete worked solutions**. Round all answers to **two decimal places**. These can be clearly hand-written or typed

Use Section 2 - Scaffold to help you complete this section.

Instructions: How to Make and Use the Clinometer

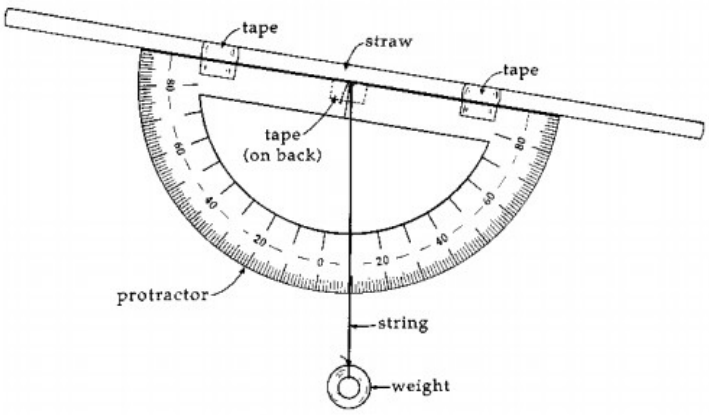
Materials

- Straw
- Protractor
- Tape
- String
- Small Weight

Steps

1. Attach the string to a protractor at the marked line in the centre of the protractor using tape. If you do not have a protractor, one has been included at the end of this document.
2. Attach the weight to the end of the string. The weight doesn't need to be too heavy. This could be a rubber, paper or binder clip. This weight will ensure the string taught and enable you to read the angle.
3. Attach the straw along the edge of the protractor using tape. You will look through this straw when aiming your clinometer at the top of the object you measuring.
4. Take a photo of your clinometer and attach the image to your assessment task.

Your clinometer is now ready to use and should resemble the image below:



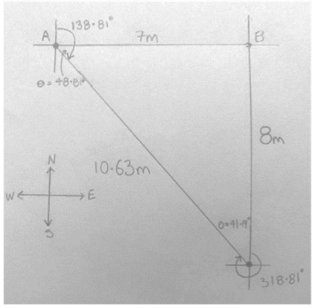
Instructions: How to Use the Clinometer

1. Select an object to find its unknown height. Remember to take a photo of the object you are measuring and attach it to your assessment.
2. Ensure that you are far enough away from the object to see the top from ground level.
3. Measure and record your distance from the base of the object.
4. Measure and record the angle of elevation using the clinometer **from ground level**. To do this look through the straw to the top of the object that you are measuring. Read the angle shown by the string hanging across the protractor. Subtract the angle shown from 90˚. This measurement is your angle of elevation.
5. Complete the diagram and use trigonometry to calculate the height of the unknown object.

SECTION 3 – Task Requirements

You will use a **compass** and follow a set of instructions to mark out a right-angled triangle. You will be given two measurements from your teacher to assist you in completing this section.

Use the following example as a guide to completing this section –

<table>
<tr><th colspan="2">EXAMPLE – Section 3</th></tr>
<tr><td colspan="2">Instructions:
1. Start facing due north at point A.
2. From A, walk due east for 7 m to point B.
3. From B, walk due south for 8 m to point C.
4. From C, return to point A.</td></tr>
<tr><td>Image including Diagram (1 mark)</td><td>Diagram (2 marks)</td></tr>
<tr><td>  </td><td> 
</td></tr>
<tr><td>Question 1: What is the distance between point A and point C?</td><td>Solution (2 marks)
$a^2 + b^2 = c^2$
$7^2 + 8^2 = c^2$
$c^2 = 49 + 64$
$c^2 = 113$
$c = \sqrt{113}$
$c = 10.6301$ ….
$c = 10.63m$ 2.d.p</td></tr>
<tr><td>Question 2: What is the bearing of C from A?</td><td>Solution (3 marks)
$\tan\theta = \frac{Opposite}{Adjacent}$
$\tan\theta = \frac{8}{7}$
$\theta = \tan^{-1}\left(\frac{8}{7}\right)$
$\theta = 48.8140$ ….
Bearing = 48.8140 …. + 90°
= 138.81°</td></tr>
<tr><td>Question 2: What is the bearing of A from C?</td><td>Solution (3 marks)
$\tan\theta = \frac{Opposite}{Adjacent}$
$\tan\theta = \frac{7}{8}$
$\theta = \tan^{-1}\left(\frac{7}{8}\right)$
$\theta = 41.1859$ ….
Bearing = 360° - 41.1859 ….
= 318.81°</td></tr>
</table>

To complete this section successfully you will need to:

- Follow the given instructions to mark out a right-angled triangle using a compass
- Attach an image of the right-angle triangle you have created
- Ensue all questions include a labelled diagram which is an **originally sourced image**; that is, you took the image yourself. You must label your diagram clearly; either hand-drawn or digitally created
- Ensure questions include **complete worked solutions**. Round all answers to **two decimal places**. These can be clearly hand-written or typed

Use Section 3 - Scaffold to help you complete this section.

Section 1 - Scaffold

Question 1: Pythagoras' Theorem – finding the length of the hypotenuse (2 marks)

_____

_____

_____

Image including Diagram (2 marks)	**Solution** (2 marks)

Question 2: Pythagoras' Theorem – finding the length of a side (2 marks)

_____

_____

_____

_____

Image including Diagram (2 marks)	**Solution** (2 marks)

Question 3: Trigonometry - finding the unknown denominator (2 marks) **Ratio:**

_____

_____

_____

Image including Diagram (2 marks)	**Solution** (2 marks)

Question 4: Trigonometry - finding the unknown numerator (2 marks) **Ratio:**

_____

_____

_____

_____

Image including Diagram (2 marks)	**Solution** (2 marks)

Question 5: Trigonometry – finding the size of an angle (2 marks)	**Ratio:**
_____ _____ _____	
Image including Diagram (2 marks)	**Solution** (2 marks)

Section 2 - Scaffold

Clinometer Image

Object 1: (1 mark)

Image including Diagram (2 marks)	**Solution** (2 marks)

Object 2: (1 mark)

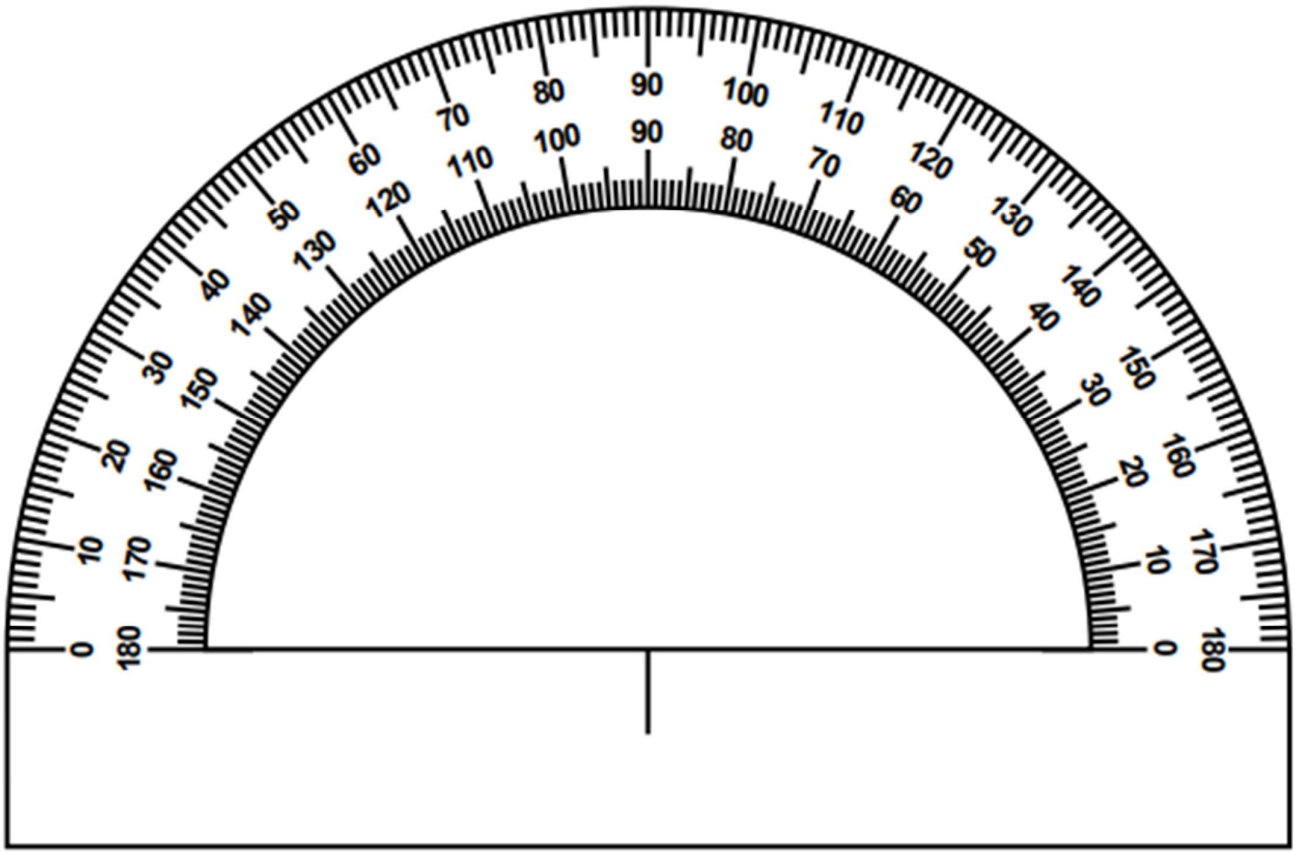
Image including Diagram (2 marks)	**Solution** (2 marks)

Section 3 - Scaffold

Instructions:

1. Start facing **due north** at point A.
2. From A, walk **due east** for_____m to point B.
3. From B, walk **due south** for_____m to point C.
4. From C, return to point A.

Image including Diagram (1 mark)	**Diagram** (2 marks)
Question 1: What is the distance between point A and point C?	**Solution** (2 marks)
Question 2: What is the bearing of A from C?	**Solution** (3 marks)
Question 2: What is the bearing of A from C?	**Solution** (3 marks)



If you do not have a protractor, use this one.