**Year 11 to Year 12 Transition Paper**

**Trigonometric Ratios**

**Mark Scheme**

|  |  |  |
| --- | --- | --- |
| **Question** | **Scheme** | **Marks** |
| **1**  **(Way 1)** | cos 63 =  **or**  sin 27 = **or**  **or** oe | M1 |
| (*PQ* =) **or**  (*PQ* =) **or** | M1 |
| 53.5 | A1 |
| **(Way 2)** |  | M1 |
| oe | M1 |
| 53.5 | A1 |
| **(3 marks)** | | |
| **Notes**  **Way 1**  M1 for a correct trigonometric ratio  M1 for a correct rearrangement for *PQ*  **Both**  A1 Accept 53.5 - 53.53 | | |

|  |  |  |  |
| --- | --- | --- | --- |
| **Question** | **Scheme** | | **Marks** |
| **2(a)** | Finds third angle of triangle and uses or states | Finds third angle of triangle and uses or states Finds third angle of triangle and uses or states | M1 |
| So | So | A1 |
| Area =  or | | M1 |
| = 478 m2 | | A1 ft |
|  | | **(4)** |
| **(b)** | Plausible reason, e.g. Because the angles and the side length are not given to four significant figures  Or e.g. The lawn may not be flat | | B1 |
|  | | **(1)** |
| **(5 marks)** | | | |
| **Notes**  **(a)** M1: Uses sine rule with third angle to find one of the unknown side lengths  A1: finds expression for, or value of either side length  M1: Completes method to find area of triangle  A1 ft: Obtains a correct answer for their value of x or their value of y.  **(b)** B1: As information given in the equation may not be accurate to 4sf or the lawn may not  be flat so modelling by a plane figure may not be accurate. | | | |

|  |  |  |
| --- | --- | --- |
| **Question** | **Scheme** | **Marks** |
| **3(a)** | Uses | M1 |
| Sight of and proceeds to oe | M1 |
| \* | A1\* |
|  | **(3)** |
| **(b)** | Uses | M1 |
|  | A1 |
| (cm) | A1 |
|  | **(3)** |
| **(6 marks)** | | |
| **Notes** | | |
| **(a)**  **M1:** Attempts to use the formula .  If the candidate writes **without** sight of a previous correct line then this would be M0  **M1:** Sight of or awrt 0.866 and proceeds to oe such as  This may be awarded from the correct formula or  **A1\*:** Look for , or  This is a given answer and all aspects must be correct including one of the above intermediate lines. It cannot be scored by using decimal equivalents to  Alternative using the given answer of  **M1:** Attempts to use the formula oe  **M1:** Sight of and proceeds to  **A1\*:** Concludes that  **(b)**  **M1:** Attempts the cosine rule with the sides in the correct position.  This can be scored from as long as there is some attempt to substitute *x* in later. Condone slips on the squaring  **A1:** Accept , or  If they replace the surds with decimals they can score the A1 for  **A1:**  Condone other variables, say but it cannot be scored via decimals. | | |

|  |  |  |
| --- | --- | --- |
| **Question** | **Scheme** | **Marks** |
| **4** | 250 = 0.5 × 26 × *AC* × sin(39) oe | M1 |
| (*AC*=) 30.5(5579...) or 30.6 | A1 |
| oe  **or**  oe | M1 |
| (= 22.4(3407...)) **or**    (= 18.8(8524...)) | M1 |
| 250 + 0.5 × ‘30.56’ × ‘22.43’ × sin(180 – 95 – 47) (= 461.03....)  **or**  250 + 0.5 × ‘30.56’ × ‘18.88’ × sin(47) (= 461.03....) | M1 |
| 461 | A1 |
| **(6 marks)** | | |
| **Notes** | | |
| M1 for using the area formula correctly. If this mark is awarded then ft on the remaining M marks  M1 dep on M1 for correct substitution into sine rule  M1 (dep on previous M marks) for a correct method to find a missing length or sight of values in the ranges  22.39 – 22.47 for AB  18.8 – 18.92 for BC  M1 for a complete method to find total area  A1 accept 461 - 462 | | |

|  |  |  |
| --- | --- | --- |
| **Question** | **Scheme** | **Marks** |
| **5** | (*AC²* = ) | M1 |
| (*AC* = ) or  or 7.7(3073) **or** *AC* 2 = 59.7… | M1 |
| Eg **or** **or**  5.32 = 4.12 + “7.7”2 – 2×4.1×”7.7”×cos*x* oe | M1 |
| Eg (= 0.644(2…)) **or**  cos*x* =  (= 0.764(83…)  (= 22.4(3407...)) **or**    (= 18.8(8524...)) | M1 |
| 40.1 | A1 |
| **(6 marks)** | | |
| **Notes** | | |
| M1 for the correct use of Cosine rule to find AC  M1 NB: there must be evidence of correct order of operations for this mark to be awarded  M1dep on first M1  for correct use of sine rule or cosine rule ft for their value of AC or AC2  M1for isolating sinx or cosx  A1for 40.1 – 40.11 | | |

| **Question** | **Scheme** | **Marks** |
| --- | --- | --- |
| **6(a)** | Attempts | M1 |
|  | A1 |
|  | A1 |
|  | **(3)** |
| **(b)** | Eg | M1 |
|  | A1 |
| Total length of wood | A1 |
|  | **(3)** |
| **(6 marks)** | | |
| **Alt1(a)** | oe | M1 |

| **Question** | **Scheme** | **Marks** |
| --- | --- | --- |
| **7 (a)** | Area *ABCD* is 40 cm2  oe | M1 |
|  | M1 |
|  | A1 |
|  | **(3)** |
| **(b)** | Attempts | M1 |
| (cm) | A1 |
|  | **(2)** |
| **(5 marks)** | | |
| **Notes**  (a)  M1 Scored for a correct attempt at using the area of *ABCD* is 40 cm2  Score for  or  where *θ* is one of the corner angles.  M1 Score for    A1  (b)  M1 Attempts  - allow if the angle used is acute as long as it is clearly their attempt at angle *DAB*. So allow use of  unless they have correctly found angle *DAB* and chosen the wrong one here.  A1 (cm) Accept 15 in place of 15.0. Allow from attempts using awrt 138°  ……………………………………………………………………………………………………………  Alt for (a)  M1 Area *ABCD* is 40 cm2  OR oe  Essentially this mark is for using the area together with an appropriate trig identity to form an equation in the sine or cosine of one of the angles of the parallelogram. Attempts finding “*DX*” where *X* is where the perpendicular to *DC* through *A* meets *DC* are possible.  M1  or may see  This is for a complete correct method to find the angle *DAB*  A1 | | |

|  |  |  |
| --- | --- | --- |
| **Question** | **Scheme** | **Marks** |
| **8(a)** |  | B1 |
| and (60°, 0) and (240°, 0) and (-120°, 0) and (-300°, 0) | B1 B1 |
|  | **(3)** |
| **(b)** | **(**= .2588) | M1 |
| *x* – 60° = 15° (or 165° or – 195° or – 345°) or 0.262 or radians | A1 |
| So *x* = 75° or 225° or – 135° or –285° (allow awrt) | M1 A1 A1 |
|  | **(5)** |
| **8 marks** | | |
| **Notes** | | |
| 1. **B1** : Correct exact *y* intercept (not decimal) – allow on the diagram or in the text. Allow   **B1** for 2 correct *x* intercepts then **third** **B1** for all 4 correct *x* intercepts ( may or may not be given as coordinates – may be given on graph) Must be in degrees. (Extra answers in the range lose the **third B1**)   1. **M1**: Divides by 4 first giving correct statement but  **is M0 and is also M0 and is M0** if not preceded by correct statement   **A1**: Obtains 15° (or 165° or – 195° or – 345°)  **M1:** Adds 60° to their previous answer which should have been in degrees and obtained by using inverse sine  **A1**: Two correct answers second **A1:** All four correct answers Extra answers outside range are ignored. Lose final A mark for extra wrong answers in the range.  **If they approximate too early allow awrt answers given for full marks**. (e.g. 75.01 etc)  **Answers in mixture, degrees and radians**: Allow first M A1 only so M1A1M0A0A0 for 60.262 for example | | |

| **Question** | **Scheme** | | **Marks** |
| --- | --- | --- | --- |
| **9(a)** |  | Attempts the sine rule with the sides and angles in the correct places | M1 |
|  | Proceeds without errors to given answer with at least one intermediate line of working. | A1\* |
|  | | **(2)** |
| **(a)**  **Way 2** |  | Attempts the sine rule with the sides and angles in the correct places and replaces sin *ACB* by 2/3 and sin 30 by 1/2 | M1 |
|  |  | Correct working to achieve both sides equal **and** conclusion | A1 |
|  | **Notes:**  Score M1A1 for  Score M1A0 for  Score M0A0 for (no sin rule used) | |  |
|  |  | | **(2)** |
| **(b)** | (Obtuse *ACB* = )  Attempts to find obtuse *ACB* but ignore how it is referenced i.e. just look for an attempt at the calculation | | M1 |
| (Angle *ABC* =) awrt | Awrt **(Must be seen in (b))** | A1 |
|  | | **(2)** |
|  | **Note that in (c) and (d), the M marks are available for using *ABC* as 41.81… if the candidate clearly thinks that this is *ABC* – this may be seen labelled on the diagram at *B* or is clearly their answer to part (b)** | |  |
| **(c)** | 20 = | Attempts to use Area of triangle formula with *A* = 20, 4*x*, 3*x* and their 11.81° | M1 |
|  | Proceeds using correct arithmetic and fully correct processing to …  **Dependent on previous mark.** | **d**M1 |
|  | Awrt 4.04 | A1 |
|  | | **(3)** |

|  |  |  |
| --- | --- | --- |
| **(d)** | Attempts the cosine rule **to obtain a value for *AC***:  Condone poor bracketing e.g. rather than  Or uses area **to obtain a value for *AC***:  Uses  Or sine rule **to obtain a value for *AC***:  or | M1 |
| Awrt 4.96 (**allow also awrt 4.95**) This comes from | A1 |
|  | **(2)** |
| **(9 marks)** | | |

|  |  |  |
| --- | --- | --- |
| **Question** | **Scheme** | **Marks** |
| **10 (a)** | Uses | M1 |
|  | oe | A1 |
|  | Uses | M1 |
|  |  | A1 |
|  |  | **(4)** |
| **(b)** | Uses | M1 |
|  |  | A1 |
|  |  | **(2)** |
| **(6 marks)** | | |
| **Notes**  **(a)**  **M1:** Uses the formula  in an attempt to find the value of  or  **A1:**  oe This may be implied by or awrt 0.644 (radians)  **M1:** Uses their value of  to find two values of  This may be scored via the formula or by a triangle method. Also allow the use of a graphical calculator or candidates may just write down the **two values**. The values must be symmetrical  **A1:**  or  Condone these values appearing from  **(b)**  **M1:** Uses a suitable method of finding the longest side. For example chooses the negative value (or the obtuse angle) and proceeds to find *BC* using the cosine rule. Alternatively works out *BC* using both values and chooses the larger value. If stated the cosine rule should be correct (with a minus sign). Note if the sign is +ve and the acute angle is chosen the correct value will be seen. It is however M0 A0  **A1:** | | |