

Trigonometry 2 - Marking Scheme

Q1.

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|---|--|----|-----|
| 4 | Use trig formulae to express equation in terms of $\cos \theta$ and $\sin \theta$ | M1 | |
| | Use Pythagoras to obtain an equation in $\sin \theta$ | M1 | |
| | Obtain 3-term quadratic $2 \sin^2 \theta - 2 \sin \theta - 1 = 0$, or equivalent | A1 | |
| | Solve a 3-term quadratic and obtain a value of θ | M1 | |
| | Obtain answer, e.g. 201.5° | A1 | |
| | Obtain second answer, e.g. 338.5° , and no others in the given interval | A1 | [6] |
| | [Ignore answers outside the given interval. Treat answers in radians (3.52, 5.91) as a misread and deduct A1 from the marks for the angles.] | | |

Q2.

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|---|---|----|-----|
| 6 | (i) Use $\tan(A + B)$ and $\tan 2A$ formulae to obtain an equation in $\tan x$ | M1 | |
| | Obtain a correct equation in $\tan x$ in any form | A1 | |
| | Obtain an expression of the form $a \tan^2 x = b$ | M1 | |
| | Obtain the given answer | A1 | [4] |
| | (ii) Substitute $k = 4$ in the given expression and solve for x | M1 | |
| | Obtain answer, e.g. $x = 16.8^\circ$ | A1 | |
| | Obtain second answer, e.g. $x = 163.2^\circ$, and no others in the given interval | A1 | [3] |
| | [Ignore answers outside the given interval. Treat answers in radians as a misread and deduct A1 from the marks for the angles.] | | |

Q3.

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|---|--|----|-----|
| 3 | Attempt use of $\sin(A + B)$ and $\cos(A - B)$ formulae to obtain an equation in $\cos \theta$ and $\sin \theta$ | M1 | |
| | Obtain a correct equation in any form | A1 | |
| | Use trig. formula to obtain an equation in $\tan \theta$ (or $\cos \theta$, $\sin \theta$ or $\cot \theta$) | M1 | |
| | Obtain $\tan \theta = \frac{\sqrt{6}-1}{1-\sqrt{2}}$, or equivalent (or find $\cos \theta$, $\sin \theta$ or $\cot \theta$) | A1 | |
| | Obtain answer $\theta = 105.9^\circ$, and no others in the given interval | A1 | [5] |
| | [Ignore answers outside the given material] | | |

Q4.

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|---|--|----|-----|
| 2 | (i) State or imply $R = 25$ | B1 | |
| | Use correct trigonometric formula to find α | M1 | |
| | Obtain 16.26° with no errors seen | A1 | [3] |
| | (ii) Evaluate of $\sin^{-1} \frac{17}{R}$ ($= 42.84\dots^\circ$) | M1 | |
| | Obtain answer 59.1° | A1 | [2] |

Trigonometry 2 - Marking Scheme

Q5.

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|----------|-----------------|--|--------------------------|
| 9 | (i) | State or imply $R = 5$
Use relevant trigonometry to find α
Obtain $\alpha = 0.6435$ | B1
M1
A1 [3] |
| | (ii) (a) | Carry out appropriate method to find one value in given range
Obtain 1.80
Carry out appropriate method to find second value in given range
Obtain 5.77 and no other value | M1
A1
M1
A1 [4] |
| | (b) | Express integrand as $k \sec^2(\theta - \text{their } \alpha)$ for any constant k
Integrate to obtain result $k \tan(\theta - \text{their } \alpha)$
Obtain correct answer $2 \tan(\theta - 0.6435)$ | M1
A1
A1 [3] |

Q6.

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|----------|-------------|--|--------------------------------|
| 7 | (i) | Use $\cos(A + B)$ formula to express the given expression in terms of $\cos x$ and $\sin x$
Collect terms and reach $\frac{\cos x}{\sqrt{2}} - \frac{3}{\sqrt{2}} \sin x$, or equivalent
Obtain $R = 2.236$
Use trig formula to find α
Obtain $\alpha = 71.57^\circ$ with no errors seen | M1
A1
A1
M1
A1 [5] |
| | (ii) | Evaluate $\cos^{-1}(2/2.236)$ to at least 1 d.p. (26.56° to 2 d.p., use of $R = \sqrt{5}$ gives 26.57°)
Carry out an appropriate method to find a value of x in the interval $0^\circ < x < 360^\circ$
Obtain answer, e.g. $x = 315^\circ$ (315.0°)
Obtain second answer, e.g. 261.9° and no others in the given interval
[Ignore answers outside the given range.]
[Treat answers in radians as a misread and deduct A1 from the answers for the angles.]
[SR: Conversion of the equation to a correct quadratic in $\sin x$, $\cos x$, or $\tan x$ earns B1, then M1 for solving a 3-term quadratic and obtaining a value of x in the given interval, and A1 + A1 for the two correct answers (candidates must reject spurious roots to earn the final A1).] | B1✓
M1
A1
A1 [4] |

Q7.

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|----------|--|--|---------------------------------|
| 3 | | Use correct $\tan 2A$ formula and $\cot x = 1/\tan x$ to form an equation in $\tan x$
Obtain a correct horizontal equation in any form
Solve an equation in $\tan^2 x$ for x
Obtain answer, e.g. 40.2°
Obtain second answer, e.g. 139.8° , and no other in the given interval
[Ignore answers outside the given interval.]
[Treat answers in radians as a misread and deduct A1 from the marks for the angles.]
[SR: For the answer $x = 90^\circ$ give B1 and A1 for one of the other angles.] | M1
A1
M1
A1
A1✓ [5] |
|----------|--|--|---------------------------------|

Trigonometry 2 - Marking Scheme

Q8.

- 4 (i)** State $R = 2$ B1
 Use trig formula to find α M1
 Obtain $\alpha = \frac{1}{6}\pi$ with no errors seen A1 [3]
- (ii)** Substitute denominator of integrand and state integral $k \tan(x - \alpha)$ M1*
 State correct indefinite integral $\frac{1}{4} \tan\left(x - \frac{1}{6}\pi\right)$ A1✓
 Substitute limits M1 (dep*)
 Obtain the given answer correctly A1 [4]

Q9.

- 5 (i)** Use Pythagoras M1
 Use the $\sin 2A$ formula M1
 Obtain the given result A1 [3]
- (ii)** Integrate and obtain a $k \ln \sin \theta$ or $m \ln \cos \theta$ term, or obtain integral of the form $p \ln \tan \theta$ M1*
 Obtain indefinite integral $\frac{1}{2} \ln \sin \theta - \frac{1}{2} \ln \cos \theta$, or equivalent, or $\frac{1}{2} \ln \tan \theta$ A1
 Substitute limits correctly M1(dep)*
 Obtain the given answer correctly having shown appropriate working A1 [4]

Q10.

- 7 (i)** Use $\sec \theta = \frac{1}{\cos \theta}$ and $\operatorname{cosec} \theta = \frac{1}{\sin \theta}$ B1
 Use $\sin 2\theta = 2 \sin \theta \cos \theta$ and to form a horizontal equation in $\sin \theta$ and $\cos \theta$ or fractions with common denominators M1
 Obtain given equation $2 \sin \theta + 4 \cos \theta = 3$ correctly A1 [3]
- (ii)** State or imply $R = \sqrt{20}$ or 4.47 or equivalent B1
 Use correct trigonometry to find α M1
 Obtain 63.43 or 63.44 with no errors seen A1 [3]
- (iii)** Carry out a correct method to find one value in given range M1
 Obtain 74.4° (or 338.7°) A1
 Carry out a correct method to find second value in given range M1
 Obtain 338.7° (or 74.4°) and no others between 0° and 360° A1 [4]