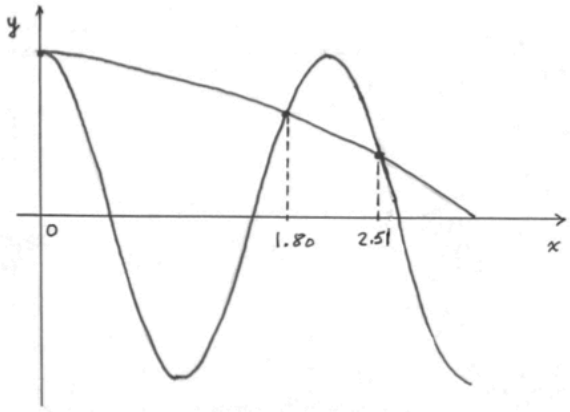
# Trig Identities and Unit Circle Answers

1)

**QUESTION 6**

**Method 1**




| | | |
|---|---|---|
| 0 | | *(C2)* |
| 1.80 [3 s.f.] | *(G2)* | *(C2)* |
| 2.51 [3 s.f.] | *(G2)* | *(C2)* |

**Method 2**

| | | |
|---|---|---|
| $3x = \pm 0.5x + 2\pi$ (*etc.*) | *(M1)* | |
| $\Rightarrow 3.5x = 0,\ 2\pi,\ 4\pi$ **or** $2.5x = 0,\ 2\pi,\ 4\pi$ | *(A1)* | |
| $7x = 0,\ 4\pi,\ (8\pi)$ **or** $5x = 0,\ 4\pi,\ (8\pi)$ | *(A1)* | |
| $x = 0,\ \frac{4\pi}{7}$ **or** $x = 0,\ \frac{4\pi}{5}$ | *(A1)(A1)(A1)* | |
| $x = 0,\ \frac{4\pi}{7},\ \frac{4\pi}{5}$ | | *(C2)(C2)(C2)* |

M03/520/S(1)

2)

**6.** (a) $x$ is an acute angle $\Rightarrow \cos x$ is positive. *(M1)*

$\cos^2 x + \sin^2 x = 1 \Rightarrow \cos x = \sqrt{1 - \sin^2 x}$ *(M1)*

$\Rightarrow \quad \cos x = \sqrt{1 - \left(\frac{1}{3}\right)^2}$ *(A1)*

$= \sqrt{\frac{8}{9}} \quad \left(= \frac{2\sqrt{2}}{3}\right)$ *(A1)* *(C4)*

(b) $\cos 2x = 1 - 2\sin^2 x = 1 - 2\left(\frac{1}{3}\right)^2$ *(M1)*

$= \frac{7}{9}$ *(A1)* *(C2)*

***[6 marks]***

N02/520/S(1)

3)

$\tan^2 x = \frac{1}{3}$ *(M1)*

$\Rightarrow \tan x = \pm \frac{1}{\sqrt{3}}$ *(M1)*

$\Rightarrow x = 30^\circ$ or $x = 150^\circ$ *(A1)(A1)*

**Answers:** $x = 30^\circ$ or $x = 150^\circ$ *(C2)(C2)*

N99/520/S(1)

4)

**QUESTION 13**

(a) $(3\sin x - 2)(\sin x - 3)$ — *A1 A1* — *C2*

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|---|
| **Note:** Award ***A1*** if $3x^2 - 11x + 6$ correctly factorized to give $(3x-2)(x-3)$ (or equivalent with another letter). |

(b) (i) $(3\sin x - 2)(\sin x - 3) = 0$

$\sin x = \frac{2}{3}$ $\quad$ $\sin x = 3$ — *A1 A1* — *C2*

(ii) $x = 41.8^\circ,\ 138^\circ$ — *A1 A1* — *C2*

| |
|---|
| **Notes:** Penalize ***[1 mark]*** for any extra answers and ***[1 mark]*** for answers in radians.<br>*i.e.* Award ***A1 A0*** for $41.8^\circ$, $138^\circ$ and any extra answers.<br>Award ***A1 A0*** for 0.730, 2.41.<br>Award ***A0 A0*** for 0.730, 2.41 and any extra answers. |

N03/520/S(1)

5)

**QUESTION 9**

**METHOD 1**

$2\cos^2 x = 2\sin x\cos x$ — *(M1)*

$2\cos^2 x - 2\sin x\cos x = 0$

$2\cos x(\cos x - \sin x) = 0$ — *(M1)*

$\cos x = 0, (\cos x - \sin x) = 0$ — *(A1)(A1)*

$x = \frac{\pi}{2}, x = \frac{\pi}{4}$ — *(A1)(A1)* — *(C6)*

**METHOD 2**

Graphical solutions

**EITHER**

for both graphs $y = 2\cos^2 x$, $y = \sin 2x$, — *(M2)*

**OR**

for the graph of $y = 2\cos^2 x - \sin 2x$. — *(M2)*

**THEN**

Points representing the solutions clearly indicated — *(A1)*

1.57, 0.785 — *(A1)*

$x = \frac{\pi}{2}, x = \frac{\pi}{4}$ — *(A1)(A1)* — *(C6)*

| |
|---|
| **Notes:** If no working shown, award ***(C4)*** for one correct answer.<br>Award ***(C2)(C2)*** for each correct decimal answer 1.57, 0.785.<br>Award ***(C2)(C2)*** for each correct degree answer $90^\circ$, $45^\circ$.<br>Penalize a total of ***[1 mark]*** for any additional answers. |

M04/521/S(1)

6) **QUESTION 14**

(a) when $y = 0$ (may be implied by a sketch) *(A1)*

$x = \frac{8\pi}{9}$ or 2.79 *(A1)* *(C2)*

(b) **METHOD 1**

Sketch of appropriate graph(s) *(M1)*
Indicating **correct** points *(A1)*
$x = 3.32$ or $x = 5.41$ *(A1)(A1)* *(C2)(C2)*

**METHOD 2**

$\sin\left(x + \frac{\pi}{9}\right) = -\frac{1}{2}$

$x + \frac{\pi}{9} = \frac{7\pi}{6}$, $x + \frac{\pi}{9} = \frac{11\pi}{6}$ *(A1)(A1)*

$x = \frac{7\pi}{6} - \frac{\pi}{9}$, $x = \frac{11\pi}{6} - \frac{\pi}{9}$

$x = \frac{19\pi}{18}$, $x = \frac{31\pi}{18}$ $(x = 3.32, x = 5.41)$ *(A1)(A1)* *(C2)(C2)*

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7) **QUESTION 14**

(a) $3(1 - 2\sin^2 x) + \sin x = 1$ *(A1)*

$6\sin^2 x - \sin x - 2 = 0$ $(p = 6, q = -1, r = -2)$ *(A1)* *(C2)*

(b) $(3\sin x - 2)(2\sin x + 1)$ *(A1)(A1)* *(C2)*

(c) 4 solutions *(A2)* *(C2)*

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