Question	Scheme	Marks
1(a)	Remainder is $f(2)=2\times2^3-7\times2^2+5\times2+4=..$	M1
	$=2$	A1
		(2)
(b)	$2x^2$ "$-3x-1$" $x-2\overline{)2x^3-7x^2+5x+4}$ $2x^3-4x^2$ "$-3x^2$"$+5x+4$ $-3x^2+6x$ $-x+4$ $-x+2$ 2	M1
	(Quotient is) $2x^2-3x-1$	A1
		(2)
		(4 marks)

(a) Note that part (a) demands that the remainder theorem must be used.

M1: Attempts f (2). Score for an attempt to substitute x= 2 into the expression and proceed to a value.

See the main mark scheme. Condone slips.

E.g. $f(2)=2\times2^3+7\times2^2+5\times2+4=..$ or $f(2)=64-28+10+4=..$

Allow as evidence $f(2)=2$ for both marks but $f(2)=6$ for example, without sight of any intermediate working would be M0. Attempting to get the remainder via division alone is M0

A1: Correct answer following M1.

It must be the answer to part (a), their first answer or identified as R =, f (2) = o.e.

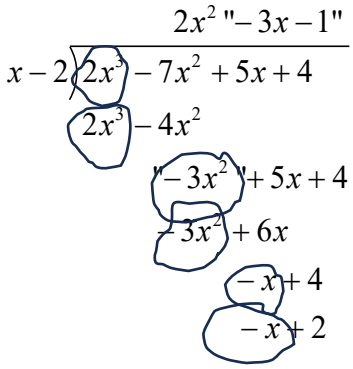
(b) Work done in part (a) can be scored in part (b).

M1: Attempts long division of f(x) by $x-2$

Look for a full attempt at division (including synthetic division) reaching at least a 3-term quadratic of the form $2x^2+ax+b$ and a constant remainder

The remainder may be 0 and may be implied.

For a full attempt at division look for the terms in x^3, x^2 and x to be fully 'cancelled out' as seen below and is acceptable even though the remainder has not been reached



A1: Correct quotient which **must** be seen separately to the long division sum.
It must be the answer to part (b) or identified as Q = o.e.

Alternatives in (b)

M1: Subtracts their r from f(x) and attempts to factor out $(x-2)$

$$\frac{f(x)}{x-2} = q(x) + \frac{r}{x-2} \Rightarrow q(x)(x-2) = f(x) - r = 2x^3 - 7x^2 + 5x + 2$$
$$= (x-2)(2x^2 + ... \pm 1)$$

Alternatively sets $2x^3 - 7x^2 + 5x + 4 = (x-2)(2x^2 + Px + Q) + '2'$ and attempts to find P and Q

A1: Correct quotient.
This **must** be separately stated, not as part of a factorised cubic unless clearly identified

Question	Scheme	Marks
2(i)	$1+\sin^2 x+\cos x=0 \Rightarrow 1+1-\cos^2 x+\cos x=0$	B1
	$\Rightarrow \cos^2 x-\cos x-2=0 \Rightarrow (\cos x-2)(\cos x+1)=0 \Rightarrow \cos x=...$	M1
	$\Rightarrow \cos x=-1 \Rightarrow x=\pi$	A1
		(3)
(ii)	$\sin(\theta+60^o)=4\cos(\theta+60^o) \Rightarrow \tan(\theta+60^o)=4$	B1
	$\Rightarrow \theta=\arctan('4')-60^\circ$	M1
	$=16.0^\circ$	A1
		(3)
		(6 marks)

(i) Condone omission of the variable *x* at any point in the solution

B1: Correct application of $\sin^2 x=1-\cos^2 x$ to the equation. E.g. sight of $1+1-\cos^2 x+\cos x=0$

M1: Forms and solves a 3-term quadratic in cos *x*

- allow this mark to be awarded if sign errors are made e.g. $\sin^2 x=\pm 1\pm\cos^2 x$
- allow a solution of a 3TQ in cos *x* via any means including via a calculator leading to $\cos x=...$ If a calculator is used the roots (values of cos*x*) must be correct for their quadratic
- do NOT allow a solution without the intermediate step. E.g. $\cos^2 x-\cos x-2=0 \Rightarrow \pi(\text{or } 180°)$

A1: Correct answer only. It must be exact and **must** follow B1, M1

If they correctly find $x=\pi$ and then follow this with 3.14 then allow. An answer of 180° is A0

Do not accept any other answers within the range $0<x\leqslant 2\pi$

(ii) Condone omission of degrees symbol at any point in the solution. Missing brackets can only be condoned if their subsequent work implies their intended presence.

B1: Correct application of ' $\tan(\theta+60^\circ)=\sin(\theta+60^\circ)/\cos(\theta+60^\circ)$' to reach $\tan(\theta+60^\circ)=4$

You may see $x=\theta+60°$ in which case it would be for $\tan x=4$

M1: Correct process from $\tan(\theta+60^\circ)=k,\quad k\neq 0$ to reach a value for θ, allow $\theta=\arctan(k)\pm 60^\circ$

So $\tan(\theta+60^\circ)=\frac{1}{4} \Rightarrow \theta+60^\circ=14° \Rightarrow \theta^\circ=-46°$ or indeed 74° would score M1

Note that $\tan(\theta+60^\circ)=4 \Rightarrow \theta+60^\circ=1.326 \Rightarrow \theta^\circ=...$ would score M0 due to mixed units