Unit 4 Practice A - Solutions

Question	Points of expected responses	Illustrative scheme
1	$\bullet^1$ use Section formula $\bullet^2$ substitute $\bullet^3$ find coordinates of S	$\bullet^1$ $S = \frac{1}{7}(2t + 5r)$ $\bullet^2$ $S = \frac{1}{7}\left(2\begin{pmatrix}3\\-7\\2\end{pmatrix} + 5\begin{pmatrix}-4\\7\\5\end{pmatrix}\right)$ $\bullet^3$ S = (-2, 3, 3) NB If candidates uses stepping out technique: $\bullet^1$ evidence of process $\bullet^2\bullet^3$ find coordinates of S
2	$\bullet^1$ recognise a pathway for $\overrightarrow{PT}$ $\bullet^2$ identify $-\overrightarrow{SP}$ vector $\bullet^3$ complete calculation for $\overrightarrow{PT}$	$\bullet^1$ $\overrightarrow{PT} = -\overrightarrow{SP} + \overrightarrow{ST}$ $\bullet^2$ PS = - SP = - (6i – 10j – k) $\bullet^3$ PT = (-6i + 10j + k) + (-2i + 4j + 4k) = (-8i + 14j + 5k) or $\begin{pmatrix}-8\\14\\5\end{pmatrix}$ NB Do not award $\bullet^3$ for (-8, 14, 5).
3	$\bullet^1$ find vector components $\bullet^2$ use scalar product $\bullet^3$ process scalar product $\bullet^4$ process $\lvert\overrightarrow{PQ}\rvert$ and $\lvert\overrightarrow{PR}\rvert$ ie calculate magnitudes $\bullet^5$ find angle	$\bullet^1$ PQ = $\begin{matrix}0\\4\\6\end{matrix}$ and PR = $\begin{matrix}-1\\6\\-2\end{matrix}$ $\bullet^2$ $= \frac{\overrightarrow{PQ}.\overrightarrow{PR}}{\lvert\overrightarrow{PQ}\rvert.\lvert\overrightarrow{PR}\rvert}$ $\bullet^3$ PQ.PR = (0 + 24 -12) = 12 $\bullet^4$ |PQ| = $\sqrt{52}$ and |PR| = $\sqrt{41}$ $\bullet^5$ angle = 74.94° radians or 1.31

4	#2.1 select appropriate strategy to show collinearity •1 interpret vector •2 interpret multiple of vector •3 complete proof •4 interpret ratio #2.2 Explain a solution in context	#2.1 show they are collinear •1 eg AB = $\begin{pmatrix} 12 \\ -8 \\ 4 \end{pmatrix}$ •2 eg BC = $\begin{pmatrix} 3 \\ -2 \\ 1 \end{pmatrix}$, AB = 4BC •3 AB = 4BC hence vectors are parallel, but B is a common point so A, B and C are collinear. •4 interpret ratio AB : BC , 4 : 1 #2.2 Yes, the football coach has placed the cones correctly (with statement related to previous working).
5	•1 differentiates correctly	•1 $\frac{d}{dx}$ (4sinx) = 4cosx
6	•1 integrates correctly	•1 3sinθ + c
7	•1 integrates correctly	•1 h(x) = $\frac{3}{4}(8 + x)^{\frac{4}{3}}$ + c
8	•1 starts integration •2 completes integration •3 substitutes limits •4 evaluate definite integral	•1 $(x - 1)^4$ •2 ... x $\frac{1}{4}$ •3 $(\frac{1}{4}(2 - 1)^4) - (\frac{1}{4}(1 - 1)^4)$ •4 $\frac{1}{4}$ units^2
9 (a)	•1 use $\log_a x + \log_a y = \log_a xy$	•1 $\log_2(5p \times 7q) = \log_2 35pq$
(b)	•2 $\log_a x^m = m\log_a x$ OR $\log_a x^m - \log_a x^n = \log_a \frac{x^m}{x^n}$ •3 simplify to $k\log_a x$	•2 $8\log_a x - 5\log_a x$ OR $\log_a x^2$ •3 $3\log_a x$

10	•[1] starts to solve •[2] solves correctly	•[1] $(x - 3) = 2^3$ •[2] $x = 11$ NB if a candidate simply obtains the solution by inspection, award both points
11	•[1] expand kcos(x – a) •[2] compare coefficients •[3] process *k* •[4] process *a*	•[1] *k*cosxcosa + *k*sinxsina stated explicitly •[2] *k*cosa = 4 **and** *k*sina = 3 stated explicitly •[3] $k = \sqrt{25} = 5$ •[4] a = 36.89°
12	#2.1 recognisesthat this has same shape as 10cos(x + 36.9) •[1] sets up cos (…..) correctly •[2] obtains compound angle •[3] obtains double angle •[4] obtains final angle	#2.1 evidence ofthe candidate using 10cos(2x + 36.9) •[1] $\cos(2x + 36.9) = \frac{5}{10}$ •[2] 2x + 36.9 = 60°, 300° •[3] 2x = 23.1°, 263.1° •[4] *x* = 11.55°, 131.55° reject 131.55° NB award •[4]only if 131.55° rejected
		Total of 35marks plus 2 x #2.1 and 1 x #2.2