Question Number	Scheme	Marks
8(a)	$3a = \frac{a}{1-r} \Rightarrow r = ...$	M1
	$r = \frac{2}{3}$ *	A1*
		(2)
(b)	$ar - ar^3 = 16$	B1
	$\frac{10}{27}a = 16 \Rightarrow a = ...$	M1
	$a = 43.2$	A1
	$S_{10} = \frac{43.2(1-\left(\frac{2}{3}\right)^{10})}{1-\frac{2}{3}} = 127.4$	dM1A1
		(5)
		(7 marks)

(a)

M1: Sets $3a = \frac{a}{1-r}$, cancels all the *a*'s and attempts to rearrange to find a numerical value for *r*

A1*: $r = \frac{2}{3}$ with no errors and at least one intermediate step after $3a = \frac{a}{1-r}$

Alternative by verification:

$$r = \frac{2}{3}, \Rightarrow \frac{a}{1-r} = \frac{a}{1-\frac{2}{3}} = 3a \qquad \text{Hence } r = \frac{2}{3}$$

Score **M1** for substituting $r = \frac{2}{3}$ into a correct sum to infinity formula and obtaining $3a$

Score **A1** for correct work followed by a (minimal) conclusion e.g. QED, proven, etc.

(b)

B1: $ar - ar^3 = 16$ seen or implied.

M1: Proceeds to a value for *a* from a linear equation in *a* using $r = \frac{2}{3}$ and $ar - ar^3 = 16$

But condone use of $r = \frac{2}{3}$ and $ar^2 - ar^4 = 16$

A1: $a = 43.2$ or any equivalent correct numerical expression e.g. $\frac{16 \times 27}{10}, \frac{216}{5}$

dM1: Substitutes their *a*, $r = \frac{2}{3}$ and *n* = 10 into the correct sum formula.

(Also allow a correct and full attempt to calculate the sum of all 10 terms separately)

It is dependent on the previous method mark.

A1: awrt 127.4 For reference the exact answer is $\frac{92840}{729}$

If candidates use $ar + ar^3 = 16$ rather than $ar - ar^3 = 16$ we will treat this as a copying slip and allow B0M1A0dM1A0 if the subsequent work merits it.

Question Number	Scheme	Marks
9(a)	$y = x^3 - 5x^2 + 3x + 14 \Rightarrow \dfrac{\mathrm{d}y}{\mathrm{d}x} = 3x^2 - 10x + 3 = 0$	M1
	Roots are $3, \dfrac{1}{3} \Rightarrow$ when $x = 3,\ y = "3"^3 - 5\times"3"^2 + 3\times"3" + 14 = ...$	dM1
	Centre is $(3, 5)$	A1
		(3)
(b)	At A $y = 8$	B1
	$r^2 = (2-"3")^2 + ("8"-"5")^2$ (=10)	M1
	$(x-3)^2 + (y-5)^2 = 10$	A1
		(3)
(c)	$\dfrac{"8"-"5"}{2-"3"} = ...(-3)$	M1
	$y - "8" = "\dfrac{1}{3}"(x-2)$	M1
	$y = \dfrac{1}{3}x + \dfrac{22}{3}$ *	A1*
		(3)
(d)	$\int_0^2 x^3 - 5x^2 + 3x + 14\ \mathrm{d}x = ...\left(\dfrac{1}{4}x^4 - \dfrac{5}{3}x^3 + \dfrac{3}{2}x^2 + 14x\right)$	M1
	Area $= \left[\dfrac{1}{4}x^4 - \dfrac{5}{3}x^3 + \dfrac{3}{2}x^2 + 14x\right]_0^2 - \left(\dfrac{1}{2}\times\left(\dfrac{22}{3} + "8"\right)\times 2\right) = ...$ $\dfrac{1}{4}\times 16 - \dfrac{5}{3}\times 8 + \dfrac{3}{2}\times 4 + 14\times 2 - \dfrac{46}{3}$	dM1
	$\dfrac{74}{3} - \dfrac{46}{3} = \dfrac{28}{3}$	A1
		(3)
		(12 marks)

(a)

M1: Differentiates the equation of the curve and sets equal to 0 which may be implied by their attempt to solve below. Do not credit this differentiation in any other parts of the question. For the differentiation, look for at least 2 of $x^3 \to ...x^2,\ -5x^2 \to ...x,\ 3x \to 3$

dM1: Solves a 3 term quadratic equation by any valid means (including a calculator) and substitutes one of their roots in the original equation to find the *y* coordinate. **Depends on the first mark.**

A1: Correct coordinates $(3, 5)$ or e.g. $x = 3$, $y = 5$ (Ignore any work with e.g. $x = \dfrac{1}{3}$ and ignore any work attempting to prove maximum/minimum points – just look for correct coordinates identified)

(b)

B1: *y* coordinate at *A* is 8 (Allow this to score anywhere)

M1: Attempts to find the radius of the circle (or radius^2) using $(2,"8")$ and their minimum point.

Score for $(2-"3")^2 + ("8"-"5")^2$ or equivalent correct work for their coordinates of *T* and *A*.

You can ignore what they call it e.g. condone radius $= (2-"3")^2 + ("8"-"5")^2$

A1: $(x-3)^2 + (y-5)^2 = 10$ oe e.g. $(x-3)^2 + (y-5)^2 = \left(\sqrt{10}\right)^2$, $\sqrt{(x-3)^2 + (y-5)^2} = \sqrt{10}$