Question Number	Scheme	Marks
7 (a)	States either $kn=-24$ (1) or $\frac{n(n-1)}{2}k^2=270$ (2)	M1
	States both $kn=-24$ (1) and $\frac{n(n-1)}{2}k^2=270$ (2)	A1
	Substitutes $k=-\frac{24}{n}$ in equation (2) $\Rightarrow \frac{n(n-1)}{2}\left(-\frac{24}{n}\right)^2=270\Rightarrow n=...$	M1
	$n=16$	A1
	Uses their $n=16$ in $kn=-24\Rightarrow k=-\frac{24}{16}=-\frac{3}{2}$	dM1, A1
		(6)
(b)	$p=\frac{n(n-1)(n-2)}{3!}k^3=\frac{16\times15\times14}{6}\times\left(-\frac{3}{2}\right)^3=...$	M1
	$=-1890$	A1
		(2)
		(8 marks)

(a)

M1: States either $kn=-24$ (1) or $\frac{n(n-1)}{2}k^2=270$ (2) accepting equivalents but see note below

This mark cannot be awarded from $\binom{n}{1}k=-24$ or ${}^nC_2(kx)^2=270x^2$, with factorials

$\frac{n!}{(n-2)!}k^2=540$

or indeed versions including *x* terms such as $knx=-24x$ unless followed by a correct $kn=-24$

A1: States both $kn=-24$ (1) and $\frac{n(n-1)}{2}k^2=270$ (2) accepting equivalents

M1: Forms an equation in one variable leading to a value for *k* or *n*

It is dependent upon having achieved $kn=\pm24$ and $\frac{n(n-1)}{...}k^2=270$

The process of forming the equation must be credible so look for $k=\frac{\pm24}{n}$ being substituted and

NOT $k=\pm24-n$ FYI the equation in *k* is $\Rightarrow -\frac{24}{k}\left(-\frac{24}{k}-1\right)\times\frac{k^2}{2}=270\Rightarrow k=...$

A1: For either $n=16$ following a correctly solved equation in *n*.

or $k=-\frac{3}{2}$ if the equation in *k* was formed.

Look for correct working leading to the value for *n*. For example, forming a linear equation is sufficient. $\frac{n(n-1)}{2}\left(-\frac{24}{n}\right)^2=270\Rightarrow\frac{288(n-1)}{n}=270\Rightarrow288n-288=270n\Rightarrow n=16$

dM1: Uses $k=\pm\frac{24}{n}$ o.e. with their $n='16'$ to find *k* or their $k='-\frac{3}{2}'$ to find *n*

This mark may be implied. It is dependent upon the **previous** M

So, if they have scored the previous M, achieved $n=8$ and $k=\frac{24}{n}$ award for $k=3$

A1: $n=16$ and $k=-\frac{3}{2}$ following the award of all previous marks

…….

The demand of the question is that they show all stages of their working.

Example I

If a candidate states both equations $kn=-24$, $\frac{n(n-1)}{2}k^2=270$, shows **a correct intermediate line in a single variable** then follows this with correct $n=16$ and $k=-\frac{3}{2}$ **without the necessary working** they can be awarded SC: 1, 1, 1, 0, 1, 0

Example II

If a candidate states both equations $kn=-24$, $\frac{n(n-1)}{2}k^2=270$ and follows this with correct $n=16$ and $k=-\frac{3}{2}$ without any necessary intermediate equations and working they can be awarded SC: 1, 1, 0, 1, 0, 0

If the SC is seen in part (a), they can go on to score both marks in (b) for correct answers

…….

(b)

M1: Uses $p=\frac{n(n-1)(n-2)}{3!}k^3$ with their values for *n* and *k* found from part (a) to find a value for *p*.

This can be implied by a 'correct' answer for their values of *n* and *k*.

Allow fractional values for both *n* and *k*

Allow this to be scored by candidates who perhaps have only one equation, usually $kn=-24$ and go on to state for example that $n=4$ and $k=-6$ and then find $p=-864$

Values cannot be made up without an attempt in part (a) scoring at least one mark

A1: –1890 following correct values for *n* and *k*.

It must follow correct equations in part (a) but allow the values to be found from equations containing terms including factorial and/or combination notation.

Question Number	Scheme	Marks
8. (a)	$-5 < x < \frac{2}{3}$	M1, A1 **(2)**
(b)	$(2x-7)$	B1 **(1)**
(c)	$f'(x) = 2(3x-2)(x+5) = 6x^2+26x-20$	
	$f(x) = 2x^3+13x^2-20x+c$	M1, A1
	$x = \frac{7}{2}, \quad y / f(x) = 0 \Rightarrow c = (-175)$	dM1, A1
	$f(x) = 2x^3+13x^2-20x-175 = (2x-7)(x^2+10x+25)$	ddM1
	$= (2x-7)(x+5)^2$	A1 **(6)** **(9 marks)**

(a)

M1: Achieves the correct critical values. Condone for this mark -5 and awrt 0.67

They may be seen as part of an incorrect inequality

A1: $-5 < x < \frac{2}{3}$ or $-5 \text{,, } x \text{,, } \frac{2}{3}$. Either of these on their own (with consistent inequality use) scores both marks

Accept other valid alternatives such as $x \in \left(-5, \frac{2}{3}\right)$ and $\{x : x > -5\} \cap \left\{x : x < \frac{2}{3}\right\}$ but not $x < \frac{2}{3}$ or $x > -5$

(b)

B1: States $(2x-7)$ or $A = 2, B = -7$ which must be seen in (b).

Condone candidates who write $\left(x - \frac{7}{2}\right) = (2x-7)$ Note that stating $\left(x - \frac{7}{2}\right)$ on its own is B0

(c) Some candidates integrate in part (b). Allow these candidates to score the marks in (c) as long as they re-write $f(x)$ in (c) or do some extra work involving $f(x)$ in (c)

M1: Multiplies out $f'(x)$ to form a quadratic expression and attempts to integrate.

Look for $f'(x) = 2(3x-2)(x+5) = ax^2+bx+c \rightarrow f(x) = px^3+qx^2+rx....(+c)$ with or without the + c

A1: $f(x) = 2x^3+13x^2-20x+c$ with or without the + c

dM1: Substitutes $x = \frac{7}{2}, \quad y / f(x) = 0 \Rightarrow c = ...$

Alternatives exist via division using the fact that $(2x-7)$ is a factor of $2x^3+13x^2-20x+c$

A1: $f(x) = 2x^3+13x^2-20x-175$ but allow $f(x) = 2x^3+13x^2-20x+c$ followed by $c = -175$