2024 WASSCE MOCK - ELECTIVE MATHEMATICS 2 SOLUTION

ELECTIVE MATHEMATICS

Question	Solution	MARKS
1	$x-\frac{1}{x}$ $\frac{x^2-1}{x}$ Since $x=2+\sqrt{5}$ $\frac{(2+\sqrt{5})^2-1}{2+\sqrt{5}}$ $\frac{4+4\sqrt{5}+5-1}{2+\sqrt{5}}$ $\frac{8+4\sqrt{5}}{2+\sqrt{5}}$ Rationalizing the denominator $\frac{8+4\sqrt{5}}{2+\sqrt{5}}\times\frac{2-\sqrt{5}}{2-\sqrt{5}}$ $\frac{16-8\sqrt{5}+8\sqrt{5}-20}{4-2\sqrt{5}+2\sqrt{5}-5}$ $=4$ Leaving the answer in the form $m+n\sqrt{5}$ $4+0\sqrt{5}$	**M 1 for correct substitution** **M 1 for simplification** **M 1 for rationalizing the denominator** **M1 for simplification** **A 1 (for obtaining the answer 4)** **A1 for leaving the answer in the for $m+n\sqrt{5}$** **Total=6 marks**
2.	$\int_1^t (2x+5)dx=18$ $[x^2+5x]_1^t=18$ $(t)^2+5(t)-[(1)^2+5(1)]=18$ $t^2+5t-6=18$ $t^2-5t-24=0$ $(t-3)(t+8)=0$ $t=3\ \ or\ t=-8$ $\therefore\quad t=3\text{ since t}>0$	**M1 for correct integration** **M1 for correct substitution** **A1 for quadratic equation** **M1 for any factor correct** **A1 (t=3 or t= -8)** **A1 for final answer ($t=3$)** **Total=6 marks**

3.	$B^2 + 3B + 2I = 3N \text{ given } B = \begin{bmatrix}2 & 3\\1 & 4\end{bmatrix}$ $\begin{bmatrix}2 & 3\\1 & 4\end{bmatrix}\begin{bmatrix}2 & 3\\1 & 4\end{bmatrix} + 3\begin{bmatrix}2 & 3\\1 & 4\end{bmatrix} + 2\begin{bmatrix}1 & 0\\0 & 1\end{bmatrix} = 3N$ $\begin{bmatrix}7 & 18\\6 & 19\end{bmatrix} + \begin{bmatrix}6 & 9\\3 & 12\end{bmatrix} + \begin{bmatrix}2 & 0\\0 & 2\end{bmatrix} = 3N$ $3N = \begin{bmatrix}15 & 27\\9 & 33\end{bmatrix}$ $N = \frac{1}{3}\begin{bmatrix}15 & 27\\9 & 33\end{bmatrix}$ $N = \begin{bmatrix}5 & 9\\3 & 11\end{bmatrix}$	**M1 for correct substitution** **M1 for simplification** **A1 for $\begin{bmatrix}15 & 27\\9 & 33\end{bmatrix}$** **M1 for dividing both sides by 3** **M1A1 for final answer** **Total=6 marks**
4	**a.** Comparing $x^2 + y^2 - 4x - 2y + c = 0$ with the general equation $x^2 + y^2 + 2gx + 2fy + c = 0$ $\frac{2g}{2} = \frac{-4}{2}, \quad 2f = -2$ $g = -2, \quad f = -1$ Also, the radius of a circle, $r = \sqrt{g^2 + f^2 - c}$ But $r = 3\sqrt{2}$ $3\sqrt{2} = \sqrt{(-2)^2 + (-1)^2 - c}$ $3\sqrt{2} = \sqrt{4 + 1 - c}$ $3\sqrt{2} = \sqrt{5 - c}$ Taking square root on both sides $9(2) = 5 - c$ $18 = 5 - c$ $18 - 5 = - c$ $c = - 13$ **b.** $\sin \propto \cos\beta - \sin\beta\cos\alpha$ $\sin 15^0 = (45^0 - 30^0)$ $= \sin 45 \cos 30 - \sin 30 \cos 45$ $= \frac{\sqrt{2}}{2} \times \frac{\sqrt{3}}{2} - \frac{1}{2} \times \frac{\sqrt{2}}{2}$ $= \frac{1}{4}(\sqrt{6} - \sqrt{2})$	**B1 for $f = -1$ and $g = -2$** **M1 for correct substitution** **A1 for C = -13** **B1 for expansion** **M1 for simplification** **A1 for answer** **Total=6 marks**
5	**a.** 7 oranges (ripe + unripe) and 5 bananas Select 1 out of 7 oranges & 1 out of 5 bananas $= {}^7C_1 \times {}^5C_1$ $= \frac{7!}{(7-1)!1!} \times \frac{5!}{(5-1)!1!}$ $= 7 \times 5$ = 35 ways	**M1 for correct combination** **A1 for answer**

b. Select 3 out of 7 oranges & 4 out of 5 bananas

$$= {}^{7}C_{3} \times {}^{5}C_{4}$$

$$= \frac{7!}{(7-3)!3!} \times \frac{5!}{(5-4)!4!}$$

$$= \frac{7\times6\times5}{6} \times 5$$

$$= 175\ ways$$

M1 for correct combination

A1 for answer

c. 2 out of 3 unripe oranges = ${}^{3}C_{2}$

1 out of 4 ripe oranges = ${}^{4}C_{1}$

3 out of 5 ripe bananas = ${}^{5}C_{3}$

$$= {}^{3}C_{2} \times {}^{4}C_{1} \times {}^{5}C_{3}$$

$$= \frac{3!}{(3-2)!2!} \times \frac{4!}{(4-1)!1!} \times \frac{5!}{(5-3)!3!}$$

$$= 3 \times 4 \times 10$$

= 120 ways

M1

A1 for answer

Total=6 marks

6

Age	Age boundary	No. of workers
20 – 24	19.5 – 24.5	22
25 – 29	24.5 – 29.5	24
30 – 34	29.5 – 34.5	30
35 – 39	34.5 – 39.5	38
40 – 44	39.5 – 44.5	36
45 – 49	44.5 – 49.5	30
50 – 54	49.5 – 54.5	18
55 – 59	54.5 – 59.5	12

Graph

B4 for graph $(-{}^{1}/_{2}\ ee)$

Evidence of reading mode from the graph

M1

From the histogram, the modal age is 38.5 years.

A1 for answer

Total=6 marks

7

$$\cos\theta = \frac{\overrightarrow{QP}\cdot\overrightarrow{QR}}{|\overrightarrow{QP}|\cdot|\overrightarrow{QR}|}$$

But $\overrightarrow{QP} = \overrightarrow{OP} - \overrightarrow{OQ}$

$$\overrightarrow{QP} = \binom{2}{2} - \binom{3}{-1}$$

$$\overrightarrow{QP} = \binom{-1}{3}$$

B1 for either $\overrightarrow{QP}$ *or* $\overrightarrow{QR}$ **correct**

$$\overrightarrow{QR} = \overrightarrow{OR} - \overrightarrow{OQ}$$

$$\overrightarrow{QP} = \binom{4}{0} - \binom{3}{-1}$$

$$\overrightarrow{QR} = \binom{1}{1}$$

	$\lvert\overrightarrow{QP}\rvert = \sqrt{(-1)^2 + (3)^2}$ $\lvert\overrightarrow{QP}\rvert = \sqrt{10}$ $\lvert\overrightarrow{QR}\rvert = \sqrt{(1)^2 + (1)^2}$ $= \sqrt{2}$ $\overrightarrow{QP} \cdot \overrightarrow{QR} = \binom{-1}{3} \cdot \binom{1}{1} = -1 + 3 = 2$ $\cos\theta = \frac{2}{\sqrt{10} \times \sqrt{2}}$ $\cos\theta = \frac{2}{\sqrt{20}} = \frac{2}{2\sqrt{5}} = \frac{1}{\sqrt{5}}$ $\theta = \cos^{-1}(\frac{1}{\sqrt{5}})$ $\theta = 63.43°$	B1 for either magnitude correct B1 for finding $(\overrightarrow{QP} \cdot \overrightarrow{QR})$ M1 for correct substitution M1 for finding θ A1 for answer Total=6 marks
8	a. h = 5 + 30t − 5t² $v = \frac{dh}{dt} = 30 - 10t$ At t = 2s $v = 30 - 10(2)$ $v = 10ms^{-1}$ b. At maximum height, velocity = 0 $30 - 10t = 0$ $-30 = -10t$ $t = 3s$ For maximum height, substitute t = 3 into the expression of h $h = 5 + 30(3) - 5(3)^2$ $h = 50m$	M1 for the expression for velocity M1 for substitution A1 for answer M1 for equation A1 for $t = 3s$ B1 for$h = 50m$ Total = 6 mark
9	a. $f(x) = Px^2 + qx + r$ $f(1) \to P(1)^2 + q(1) + r = 0$ $P + q + r = 0 \ldots\ldots\ldots\ldots\ldots\ldots (1)$ $f(-1) \to P(-1)^2 + q(-1) + r = 4$ $P - q + r = 4$…………………. (2) $f(2) \to P(2)^2 + q(2) + r = 7$ $4P + 2q + r = 7$……………….. (3) $P + q + r = 0 \ldots\ldots\ldots\ldots\ldots\ldots (1)$ $P - q + r = 4$…………………….. (2) $4P + 2q + r = 7$…………………. (3)	B1 for eqn 1 B1 for eqn 2 B1 for eqn 3

	Eqn 1 + Eqn 2 $2P + 2r = 4$ $P + r = 2$…………………… (4) Eqn (3) + 2 × Eqn (2) $4P + 2q + r = 7$ $2P - 2q + 2r = 8$ $6P + 3r = 15$ 2P + r = 15 …………………… (5) Eqn (5) – Eqn (4) (2p + r) – (p + r) = 5 – 2 2p + r – p – r = 3 p = 3 Put p = 3 into Eqn (4) 3 + r = 2 r = 2 – 3 r = - 1 From Eqn (1): p + q + r = 0 when p = 3, r = -1 3 + q – 1 = 0 q = 1 – 3 q = -2 $\therefore p = 3, r = -1 \text{ and } q = -2$ Factors of *f(x)* *f(x) = Px² + qx + r* but p = 3, r = -1 and q = -2 *f(x) = 3x² – 2x – 1* *f(x) =(3x + 1)(x – 1)* $\therefore \text{the factors of } f(x) \text{ are } (3x + 1) \text{ and } (x - 1)$	M1 for solving A1 for $p = 3$ A1 for $r = -1$ A1 for $q = -2$ A1 for finding the factors
	b. $\frac{2x^2 - x - 3}{(x+1)(x^2+2)} \equiv \frac{A}{x+1} + \frac{Bx+C}{x^2+2}$ $\frac{2x^2 - x - 3}{(x+1)(x^2+2)} \equiv \frac{A(x^2+2) + (Bx+C)(x+1)}{(x+1)(x^2+2)}$ $2x^2 - x - 3 = A(x^2+2) + (Bx+C)(x+1)$ $2x^2 - x - 3 = Ax^2 + 2A + Bx^2 + Bx + Cx + C$ $2x^2 - x - 3 = (A+B)x^2 + (B+C)x + (2A+C)$ Comparing the coefficients A + B = 2 …………… (1) B + C = -1 …………… (2) 2A + C = -3 ……………(3) $From\ Eqn\ (1); A = 2 - B$ $Put\ A = 2 - B\ \ into\ Eqn(3)$ $2(2 - B) + C = -3$ 4 – 2B + C = −3	B1 for equation M1 for solving

	$-2B + C = -7$ $2B - C = 7$ …………… (4) Add Eqn(4) and Eqn(2) $2B + B = 6$ $3B = 6$ $B = 2$ Put B = 2 into Eqn(1) $A + 2 = 2$ $A = 0$ Put A = 0 into Eqn(3) $2(0) + C = -3$ $0 + C = -3$ $C = -3$ $\therefore \frac{2x^2 - x - 3}{(x+1)(x^2+2)} \equiv \frac{2x-3}{x^2+2}$	A1 for $A = 0$ A1 for $B = 2$ A1 for $C = -3$ A1 for partial fraction Total=13 marks
10	a. $f(x) = 5x - \frac{6}{x^2}$ $f(x+h) = 5(x+h) - \frac{6}{(x+h)^2}$ From first principle $f'(x) = \lim_{h\to 0} \frac{f(x+h) - f(x)}{h}$ $f'(x) = \lim_{h\to 0} \frac{5(x+h) - \frac{6}{(x+h)^2} - (5x - \frac{6}{x^2})}{h}$ $f'(x) = \lim_{h\to 0} \frac{5h - \frac{6}{(x+h)^2} + \frac{6}{x^2}}{h}$ $f'(x) = \lim_{h\to 0} \frac{1}{h}\ [5h - \frac{6}{(x+h)^2} + \frac{6}{x^2}]$ $f'(x) = \lim_{h\to 0} \frac{1}{h}\ [5h + \frac{-6x^2 + 6(x+h)^2}{x^2(x+h)^2}]$ $f'(x) = \lim_{h\to 0} \frac{1}{h}\ [5h + \frac{-6x^2 + 6x^2 + 12xh + 6h^2}{x^2(x+h)^2}]$ $f'(x) = \lim_{h\to 0} \frac{1}{h}\ [5h + \frac{12xh + 6h^2}{x^2(x+h)^2}]$ $f'(x) = \lim_{h\to 0} \frac{1}{h}\ [5h + \frac{6h(2x+h)}{x^2(x+h)^2}]$	M1 for correct substitution M1 for simplification A1 for $\frac{1}{h}\left(5h + \frac{12xh + 6h^2}{x^2(x+h)^2}\right)$ M1 for factorizing num.

	$f'(x) = \lim_{h\to 0} \frac{1}{h}\ [5h\ +\ \frac{6h(2x+h)}{x^2(x^2+2xh+h^2)}\ ]$	M1 for dividing through by h
	$f'(x) = \lim_{h\to 0}\quad 5 + \frac{6(2x+h)}{x^4+2x^3h+x^2h^2}$	M1 for putting $h = 0$
	$f'(x) = 5 + \frac{6(2x+0)}{x^4+2x^3(0)+x^2(0)^2}$	
	$f'(x) = 5 + \frac{12x}{x^4}$	
	$f'(x) = 5 + \frac{12}{x^3}$	A1 for $f'(x) = 5 + \frac{12}{x^3}$
	b. $\int x\sqrt{1-x}\ dx$ Using substitution method Let u = 1 – x but x = 1 – u	
	$\frac{du}{dx} = -1$ $du = -dx, \qquad -du = dx$	B1 for $\frac{du}{dx} = -1$
	$\int x\sqrt{u} - du \qquad , \sqrt{u} = u^{\frac{1}{2}}$	
	$-1\int(1-u)\ u^{\frac{1}{2}}\ du$	M1 for substitution
	$-1\int u^{\frac{1}{2}}\ -\ u^{\frac{3}{2}}\ du$	M1 for integrating
	$-\left[\frac{u^{\frac{3}{2}}}{\frac{3}{2}} - \frac{u^{\frac{5}{2}}}{\frac{5}{2}}\right] + C$	
	$-\left[\frac{2}{3}u^{\frac{3}{2}} - \frac{2}{5}u^{\frac{5}{2}}\right] + C$	
	$-\frac{2}{3}u^{\frac{3}{2}} + \frac{2}{5}u^{\frac{5}{2}} + C$	A1 for $-\frac{2}{3}u^{\frac{3}{2}} + \frac{2}{5}u^{\frac{5}{2}} + C$
	$But\ u\ =\ 1 -\ x$	
	$-\frac{2}{3}(1-x)^{\frac{3}{2}} + \frac{2}{5}(1-x)^{\frac{5}{2}} + C$	M1 for substitution
	$\therefore \quad \int x\sqrt{1-x}\ dx = \ \frac{2}{5}(1-x)^{\frac{5}{2}} - \frac{2}{3}(1-x)^{\frac{3}{2}} + C$	A1 for answer
		Total=13 marks

11	a. $U_n = a + (n-1)d$ $U_{13} = a + (13-1)d = 27$ $a + 12d = 27$ ……………. (1) But $U_7 = 3U_2$ $a + 6d = 3(a + d)$ $a + 6d = 3a + 3d$ $-2a = -3d$ $a = \frac{3d}{2}$ ………………. (2) Putting Eqn(2) in Eqn(1) $\frac{3d}{2} + 12d = 27$ $27d = 54$ $d = 2$ putting $d = 2$ into Eqn(2) $a = \frac{3(2)}{2} = 3$ i. The first term, $a = 3$ ii. The common difference, $d = 2$ iii. Sum of the ten terms, $S_n = \frac{n}{2}[2a + (n-1)d]$ $S_{10} = \frac{10}{2}[2(3) + (10-1)(2)]$ $S_{10} = 120$	B1 for eqn …1 B1 for eqn…..2 M1 for solving A1 ($a = 3$) A1($d = 2$) M1 for substitution A1 for $S_{10} = 120$
	b. i. $(a+b)^n \sum_{r=0}^{n} \frac{n!}{(n-r)!\,r!} a^{n-r} b^r$ $(a+b)^n = (1-2x)^6$ by comparing $a = 1, b = -2x$ and $n = 6$ $\frac{6!}{(6-0)!0!}(1)^{6-0}(-2x)^0 + \frac{6!}{(6-1)!1!}(1)^{6-1}(-2x)^1 + \frac{6!}{(6-2)!2!}(1)^{6-2}(-2x)^2 + \frac{6!}{(6-3)!3!}(1)^{6-3}(-2x)^3 + \ldots$ $1 - 12x + 60x^2 - 160x^3 + \cdots$ **Alternatively** $(1+x)^n = 1 + nx + \frac{n(n-1)x^2}{2!} + \frac{n(n-1)x^3}{3!} + \cdots$	M1 M1A1 M1

$$(1-2x)^6 = 1 + 6(-2x) + \frac{6(5)(-2x)^2}{2!} + \frac{6(5)(4)(-2x)^3}{3!} + \cdots$$

M1A1

$$1 - 12x + 60x^2 - 160x^3 + \cdots$$

ii. $(0.98)^6 = (1-0.02)^6$

by comparing $(1-0.02)^6$ with $(1-2x)^6$

B1 for $x = 0.01$

$$-2x = -0.02$$
$$x = 0.01$$

M1 for correct substitution of x

$$(0.98)^6 = 1 - 12(0.01) + 60(0.01)^2 - 160(0.01)^3 + \cdots$$

= 0.88584

= 0.8858 (to 4 decimal place)

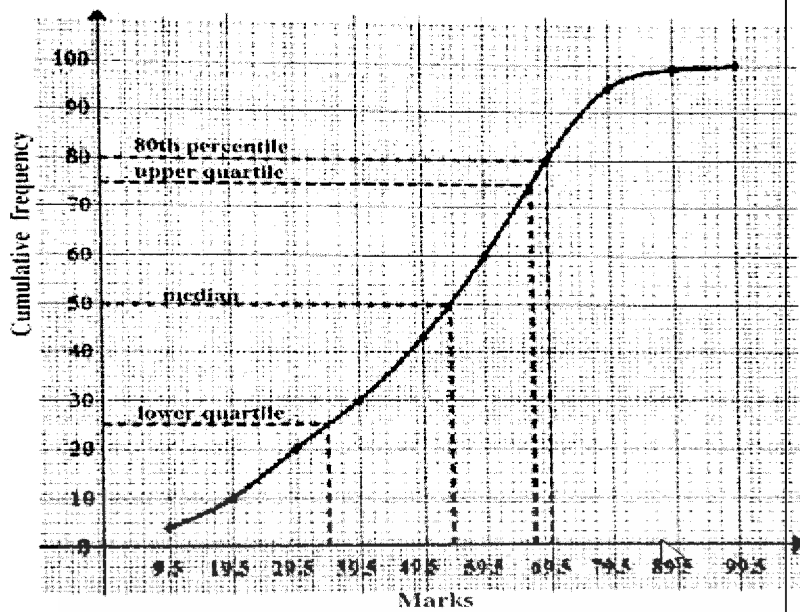
A1 for 0.8858

Total=13 marks

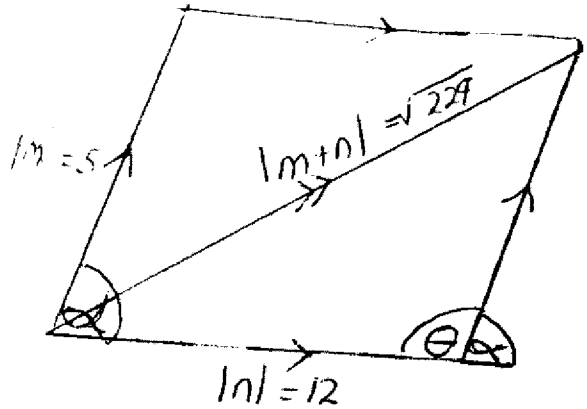
12 (a)

Marks	Freq	Marks less than	Cumulative frequency
0 - 9	4	9.5	4
10 - 19	6	19.5	10
20 - 39	10	29.5	20
30 - 39	10	39.5	30
40 - 49	13	49.5	43
50 - 59	17	59.5	60
60 - 69	20	69.5	80
70 - 79	15	79.5	95
80 - 89	4	89.5	99
90 - 99	1	99.5	100

B2 $(-{}^{1}/_{2}ee)$ for cumulative frequency

	 (b) (i) 80^{th} percentile $= \frac{80}{100} \times \sum f = \frac{80}{100} \times 100$ $= 80$ on the cumulative frequency axis. From the graph, the 80^{th} percentile is 69.5 (ii) Median $= \frac{1}{2} \times \sum f = \frac{1}{2} \times 100 = 50$ on the cumulative frequency axis. From the graph, the median is 53.5 (iii) Upper quartile, $Q_3 = \frac{3}{4} \times \sum f = \frac{3}{4} \times 100$ $= 75$ on the cumulative frequency axis. From the graph, $Q_3 = 66.5$ Lower quartile, $Q_1 = \frac{1}{4} \times \sum f = \frac{1}{4} \times 100$ $= 25$ on the cumulative frequency axis. From the graph, $Q_1 = 34.5$ $\therefore$ Inter-quartile range $= Q_3 - Q_1 = 66.5 - 34.5 = 32$	**B4($-\,{}^{1}/_{2}$ee)** **M1for evidence of reading from the graph** **A1 for 69.5** **M1 for evidence of reading the graph** **A1 for 53.5** **M1 for evidence of reading the graph** **M1 for difference** **A1 for 32** **Total=13 marks**
13	**$^{n}C_{r}\,(P)^{r}\,(1 - P)^{n-r}$** **Probability of selecting defective bolt, P(d) = $\frac{1}{3}$**	

	Probability of selecting non - defective bolt, P(d) = $1 - \frac{1}{3} = \frac{2}{3}$	M1A1 for non-defective
	a. Probability that exactly 2 of 4 are defective $= {}^4C_2[P(d)]^2\,[P(n)]^{4-2}$	M1 for combination
	$\frac{4!}{(4-2)!2!} \times \left(\frac{1}{3}\right)^2 \times \left(\frac{2}{3}\right)^2$ $6 \times \frac{1}{9} \times \frac{4}{9}$	M1 for simplification
	$= \frac{8}{27}$	A1 for $\frac{8}{27}$
	b. Probability that at least 1 of 4 is defective 1 – Probability that none is defective out of 4 $1 - {}^4C_0\,[P(d)]^0\,[P(n)]^4$ $1 - \frac{4!}{(4-0)!0!}\left(\frac{1}{3}\right)^0 \left(\frac{2}{3}\right)^4$	M1A1 for combination
	$1 - \frac{16}{81}$	M1 for simplification
	$= \frac{65}{81}$	A1 for $\frac{65}{81}$
	c. Probability that at most 2 out of 4 are defective P(none is defective) + P(one is defective) + P(2 are defective) ${}^4C_0\,[P(d)]^0\,[P(n)]^4 + {}^4C_1\,[P(d)]^1\,[P(n)]^3 + {}^4C_2\,[P(d)]^2\,[P(n)]^2$ $\left[1 \times \left(\frac{1}{3}\right)^0 \times \left(\frac{2}{3}\right)^4\right] + \left[1 \times \left(\frac{1}{3}\right)^1 \times \left(\frac{2}{3}\right)^3\right] + \left[1 \times \left(\frac{1}{3}\right)^2 \times \left(\frac{2}{3}\right)^2\right]$	M1A1 for combination
	$\left[1 \times 1 \times \frac{16}{81}\right] + \left[1 \times \frac{1}{3} \times \frac{8}{27}\right] + \left[1 \times \frac{1}{9} \times \frac{4}{9}\right]$ $\frac{16}{81} + \frac{32}{81} + \frac{24}{81}$	M1 for simplification
	$= \frac{8}{9}$	A1 for $\frac{8}{9}$ Total=13 marks

14		
	(i)	
	Solving for $\propto$	
	which is the angle between $\|m\|$ and $\|n\|$ using cosine r	
	$\|m+n\|^2 = \|m\|^2 + \|n\|^2 - 2\|m\|\|n\| \cos\theta$	
	$\left\|\sqrt{229}\right\|^2 = \|5\|^2 + \|12\|^2 - 2\|5\|\|12\| \cos\theta$	**M1 for substitution**
	$229 = 25 + 144 - 120\cos\theta$	
	$229 - 169 = -120\cos\theta$	
	$60 = -120\cos\theta$	
	$\cos\theta = -0.5$	
	$\theta = cos^{-1}(-0.5)$	**M1 for finding θ**
	$\theta = 120^\circ$	**A1 for $\theta = 120^0$**
	θ and $\propto$ are supplementary	
	$\therefore \theta + \propto = 180^\circ$	
	But	
	$\theta = 120^\circ$	
	$\therefore 120^\circ + \propto = 180^\circ$	
	$\propto = 60^\circ$	
	$\therefore$ the angle between $\|m\|$ and $\|n\|$ which is $\propto = 60^\circ$	**A1 for $\alpha = 60^0$**
	(ii) Scalar (dot) product of $\mathbf{m}$ and $\mathbf{n}$	
	$= \|\mathbf{m}\|\|\mathbf{n}\|\cos\theta$	
	$= 5(12)\cos 60^\circ$	**M1 for substitution**
	$= 60\cos 60^\circ$	
	$= 60 \times 0.5$	
	$= 30$	**A1 for 30**
	b. $c = xa + yb$	
	$8i + 2j = x(6i - 5j) + y(2i + 7j)$	**M1 for substitution**
	$8i + 2j = 6xi - 5xj + 2yi + 7yj$	
	$8i + 2j = (6x + 2y)i + (-5x + 7y)j$	**A1 for $(6x + 2y)i + (-5x + 7y)j$**
	By comparing	
	$6x + 2y = 8$, $3x + y = 4 \ldots\ldots\ldots\ldots eqn\ 1$	**B1 for eqn (1)**

	$-5x+7y=2, \quad -5x+7y=2 \ldots\ldots\ldots.\, eqn\ 2$ $from\ eqn\ 1\ y=4-3x$………………eqn 3 $substituting\ eqn\ 3\ into\ eqn\ 2$ $-5x+7(4-3x)=2$ $-5x+28-21x=2$ $-26x=-26$ $x=1$ $putting\ x=1\ into\ eqn\ 2$ $-5(1)+7y=2$ $y=1$ $\therefore x=1\ and\ y=1$	B1 for eqn (2) M1 for solving A1 for $x=1$ A1 for $y=1$ Total = 13 marks
15	a. Velocity, $v=a+7t+bt^2$ Initial velocity = 30 ms $^{-1}$ when t = 0, v = 30 ms $^{-1}$ by substituting t = 0 and v = 30 ms $^{-1}$ into the expression of v $30 = a + 7(0) + b(0)^2$ $a = 30$ $v = 30 + 7t + bt^2$ after t = 1s of projection acceleration = 5 ms $^{-1}$ $a=\frac{dv}{dt}=7+2bt$	M1 for substitution A1 for $a=30$ M1 for differentiating

	But a = 5 ms $^{-1}$ t = 1s	
	5 = 7 + 2b(1)	M1 correct substitution
	2b = - 2	
	b = - 1	A1 for $b = -1$
	b. Substituting a = 30 and b = -1 into the expression of v	
	$v = 30 + 7t - t^2$	
	when the particle is momentarily at rest v = 0	
	$30 + 7t - t^2 = 0$	M1 for substitution
	$t^2 - 7t - 30 = 0$	A1 for $t^2 - 7t - 30 = 0$
	$(t - 10)(t + 3) = 0$	M1 for one factor correct
	$t = 10$ or -3	
	Hence the particle is at rest when t = 10 seconds	A1 for $t = 10$
	c. $S = \int v dt = \int (30 + 7t - t^2) dt$	
	$S = 30t + \frac{7}{2}t^2 - \frac{1}{3}t^3 + c$	M1 for integrating
	At point 0 ie the starting point t = 0 and s = 0	
	$0 = 30(0) + \frac{7}{2}(0)^2 - \frac{1}{3}(0)^3 + c$	M1 for finding c
	c = 0	
	Hence the expression of S becomes	
	Putting t = 10 into S	
	$S = 30(10) + \frac{7}{2}(10)^2 - \frac{1}{3}(10)^3$	M1 for substituting t
	S = 316.67m to 2 decimal places	A1 for $s = 316.67m$
		Total = 13 marks