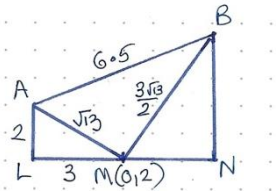
| | | | | | |
|---|---|---|---|---|---|
| **22** | (gradient $AM$ =) $\frac{4-2}{-3-0}$ oe $(=-\frac{2}{3})$ | | 7 | M1 | A correct method to find gradient of $AM$ |
| | $y=\frac{3}{2}x+2$ or<br>eg $\frac{y-2}{x}=\frac{3}{2}$ oe | | | M1 | For the correct equation of the line passing through $BD$ or for a correct expression involving the $x$ and $y$ coordinates of point $B$ or point $D$ |
| | $(x--3)^2+(y-4)^2=6.5^2$ or<br>$(x-0)^2+(y-2)^2=6.5^2-[(-3-0)^2+(4-2)^2]$<br>oe eg $x^2+(y-2)^2=29.25$ | | | M1 | A correct equation in $x$ and $y$ to find the coordinates of $B$ and $D$ |
| | eg $x^2+6x+9+y^2-8y+16-42.25=0$ oe or<br>$x^2+y^2-4y+4-29.25=0$ oe | | | M1 | Brackets expanded |
| | eg $x^2+6x+9+\left(\frac{3}{2}x+2\right)^2-8\left(\frac{3}{2}x+2\right)+16-42.25=0$<br>$\left(\frac{2y-4}{3}\right)^2+y^2-4y+4-29.25=0$ oe | | | M1 | For a correct substitution into a correct equation to get an equation in either $x$ only or $y$ only |
| | eg $\frac{13}{4}x^2=\frac{117}{4}$ or<br>$13y^2-52y-211.25=0$ oe | | | M1 | A fully correct simplified equation in $x$ or in $y$ – all brackets expanded and like terms grouped. |
| | | (3, 6.5) (−3, −2.5) | | A1 | correct coordinates<br>SCB3 for one pair of correct coordinates or both $x$ values correct or both $y$ values correct |
| | | | | | **Total 7 marks** |

***See next page for alternative scheme***

| | | | | | |
|---|---|---|---|---|---|
| **22** Alt 1 | $(AM=)\sqrt{3^2+2^2}\ (=\sqrt{13}=3.605...)$ or $(AM^2=)3^2+2^2(=13)$ | | 7 | M1 | Use of Pythagoras for point *A* to point *M* |
| | $(BM=)\sqrt{6.5^2-"\sqrt{13}"^2}\ (=\sqrt{29.25}=\frac{3\sqrt{13}}{2}5.4083...)$ | | | M1 | A correct method to find the length of *BM* or *DM* |
| | $(\text{SF}=)\frac{\sqrt{29.25}}{\sqrt{13}}=\frac{3}{2}$ oe **or** *MN* = *x*, *BN* = 1.5*x* (*see diag*) or<br>$(LAM=)\sin^{-1}\frac{3}{\sqrt{13}}(=56.3...)$ oe **or**<br>$(LMA=)\cos^{-1}\frac{3}{\sqrt{13}}(=33.6...)$ **or** | | | M1 | A correct method to find the SF of the enlargement of the sides *AM* to *BM* or angle *LAM* OR *LMA*<br> |
| | eg $\overrightarrow{MB}_x=\frac{3}{2}\times2$ or $\overrightarrow{MB}_y=\frac{3}{2}\times3$ or $\overrightarrow{MD}_x=-\frac{3}{2}\times2$ or $\overrightarrow{MD}_y=-\frac{3}{2}\times3$ oe<br>or<br>$x^2+\left(1.5x\right)^2=\sqrt{29.25}^2$ **or** $MN=\sqrt{29.25}\cos56.3...(=3)$ oe<br>**or** $BN=\sqrt{29.25}\sin56.3...(=4.5)$ oe<br>*turn over* | | | M1 | A correct method to find the translation of at least one component of *MB* or *MD* (need not be written in vector form) OR correct Pythagoras statement using the SF to find *x* coordinates OR 1 correct trig statement to find translations from *M* |
| | $\overrightarrow{MB}_x=\frac{3}{2}\times2$ **and** $\overrightarrow{MB}_y=\frac{3}{2}\times3$ **or** $\overrightarrow{MD}_x=-\frac{3}{2}\times2$ **and** $\overrightarrow{MD}_y=-\frac{3}{2}\times3$ oe<br>**or**<br>$x^2+2.25x^2=29.25$<br>**or**<br>$MN=\frac{3\sqrt{13}}{2}\cos56.309...(=3)$ **and** $BN=\frac{3\sqrt{13}}{2}\sin56.309...(=4.5)$ oe | | | M1 | A correct method to find the translation of both components of *MB* or *MD* (need not be written in vector form)<br>OR<br>correct Pythagoras statement with no brackets using the SF to find *x* coordinates<br>OR<br>2 correct trig statements to find translations from *M* |

| | | | | |
|---|---|---|---|---|
| | eg (0, 2) is translated $\begin{pmatrix} 3 \\ 4.5 \end{pmatrix}$ or $(0+3,\ 2+4.5)$ (= (3, 6.5))<br>or (0, 2) is translated $\begin{pmatrix} -3 \\ -4.5 \end{pmatrix}$ or $(0-3,\ 2-4.5)$ (= (−3, −2.5)) oe<br>**or**<br>$3.25x^2 = 29.25$ | | | M1 correct method to find the coordinates of *B* or *D* or one pair of correct coordinates<br>or<br>a correct method to find both *x* coordinates or both *y* coordinates OR<br>a fully correct simplified equation in *x* all brackets expanded and like terms grouped. |
| | | (3, 6.5)<br>(−3, −2.5) | | A1 correct coordinates<br>SCB3 for one correct coordinate or both *x* values correct or both *y* values correct |
| | | | | **Total 7 marks** |

| | | | | | |
|---|---|---|---|---|---|
| **23** | (i) | | (180, 0) | 1 | B1 |
| | (ii) | | (360, −1) | 1 | B1 |
| | | | | | **Total 2 marks** |