**The Bridge to A level**

**Diagnosis**

**Mark Scheme**



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| **Section** | **Question** | **Answer** | **Marks** | **Notes** |
| 1 | 1 | -2, -4 | M1A1 | (x ± 2)(x ± 4) |
|  | 2 | y = 3 or y = 4 caox = ±$\sqrt{3}$ or x = ± 2 cao | M1 A1B2 | For (y-3)(y+4) oe eg use of quad formy = 3 or y = 4 caoB1 for two roots correct or ft ‘their’ yB2 for cao |
|  | 3(i) | (x – 3)2 - 7 | B1M1A1 | (x – 3)2-7 |
|  | 3(ii) | (3,-7) | B1 | ft from part (i) |
|  |  |  |  |  |
| 2 | 1 | v = $\sqrt{\frac{2E}{m}}$ cao www | B3 | Award M1 for a correct first constructivestep, M2 for v2 = $\frac{2E}{m}$ oe |
|  | 2 | r = $\sqrt[3]{\frac{3V}{4Π}}$  | B3 | Award M2 for r3 = $\frac{3V}{4Π}$ , M1 for cube rootof ‘their’ r3  |
|  | 3 | C = $\frac{4P}{1-P}$ oe | M1M1M1A1 | PC + 4P = C4P = C – PC4P = C(1 – P) |
|  |  |  |  |  |
| 3 | 1 | (0.3,1.9)  | M1A1A1 | for substitution or for rearrangementone mark each coordinate |
|  | 2 | ($\frac{10}{3},\frac{5}{3})$ | M1A1A1 | for substitution or for rearrangementone mark each coordinateNote: award B2 if roiunded to 1dp or worse |
|  | 3 | ($\frac{2}{5}, \frac{11}{5})$ or (-1,-2) or answer given as x=, y= | M1 M1A1A1 | substituting linear into non-linearforming quadratic in xone mark for each set of solutions |
|  |  |  |  |  |
| 4 | 1(i) | 7 | M1A1 | 9-2 |
|  | 1(ii) | $\frac{5}{7} $ + $\frac{4}{7}$ $\sqrt{2}$ | M1M1A1 | multiplying top and bottom by 3 + $\sqrt{2}$$\frac{3+2+3\sqrt{2}+ √2}{7} $if one (or none) error only |
|  | 2(i) | 30√2 | M1A1 | for √8 = 2√2 or √50 = 5√2 |
|  | 2(ii) | $\frac{1}{11} $ + $\frac{2}{11}$ $\sqrt{3}$ | M1M1A1 | multiplying top and bottom by 6 + $\sqrt{3}$denominator = 11 (or 33) |
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| 5 | 1(i) | 1 | B1 |  |
|  | 1(ii) | a8 | B1 |  |
|  | 1(iii) | $$\frac{1}{3a^{3}b}$$ | B1B1B1 | 3ba3inverse |
|  | 2(i) | ±5 | M1A1 | for $\sqrt{25}$ or $\frac{1}{5}$ seen |
|  | 2(ii) | 8x10y13z4  (or 23x10y13z4) | B3 | B2 for 3 elements correctB1 for 2 elements correct |
|  |  |  |  |  |
| 6 | 1(i) | Grad AB = 1Grad BC = -1product of gradients = -1 hence perp | M1M1C1 |  |
|  | 1(ii) | 10 | M1A1 | Use of pythagoras |
|  | 2 | y = -4x + 19 caoMidpoint (4,3)verifying on line x + 2y = 10 | M1 M1A1B1C1 | calculating musing (y -7) = m(x-3) |
|  |  |  |  |  |
| 7 | 1 | Cubic the correct way up-1, 2 and 5 indicated on x-axis10 indicated on y-axis | G1G1G1 |  |
|  | 2 | Negative quadratic curveIntercept (0,9)Through (3,0) and (-3,0) | G1G1G1 |  |
|  | 3 | Any correct y value calculated(0,5), (1,1), (2,-1), (3,-1), (4,1) and (5,5) calculatedAbove points plottedSmooth parabola through the points | B1B1G1G1 |  |
|  |  |  |  |  |
| 8 | 1 | y = (x – 2)2 - 4 | B2 | M1 if y omitted, or for y = (x + 2)2 - 4 |
|  | 2(i) | Translation of($\begin{matrix}2\\0\end{matrix}$) | B1B1 |  |
|  | 2(ii) | y = f(x – 2) | B2 | B1 for y = f(x + 2) |
|  | 3(i) | Translation of($\begin{matrix}-4\\0\end{matrix}$) | B1B1 |  |
|  | 3(ii) | sketch of parabola right way upmin at (0,-4) and graph through (-2,0) and (2,0) | B1B1 |  |
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| 9 | 1(i) | 15.5 | M1A1 | Use of Pythagoras |
|  | 1(ii) | x = 75.5°  | M1A1 | (cos x = $\frac{4}{16}$) correct ratio and substitution |
|  | 2 | √8 or 2√2 (but not ± √8) | M1 M1A1 | Use iof pythagorasuse of tan Ɵ = opp / adj |
|  | 3 | Smooth curve between y = 1 and y = -1(90,0) and (270,0)(0,1), (180,-1), (360,1) | G1G1G1 |  |
|  |  |  |  |  |
| 10 | 1(i) | 9.0 or 8.96 or 8.960 | M1M1A1 | for use of cosine rulefor square-rooting ‘their’ 80.2(8) |
|  | 1(ii) | 13.3 or better (13.2577..) | M1A1A1 | use of ‘their’ 0.5 x 4.1 x 6.6 x sin 108correct valuesans |
|  | 2 | BC = 384 (or better)Total length = 1034m (or better) | M1 M1A1A1 | recognisable attempt at cosine ruleBC2 = 3482 + 3022 – 2x348x302xcos72BC = 383.86….. Total length = BC + 650 ft |
|  |  |  |  |  |
| 11 | 1a) | $-6 \leq x \leq 6$  | A1 |  |
|  | 1b) | $x \leq - \frac{5}{3}$ , $x \geq \frac{5}{3}$  | A1 |  |
|  | 1c) | $-\frac{10}{3} <x <0$  | A1 |  |
|  | 2 | $$x<-\frac{1}{2}and x>\frac{3}{2}$$ | M1M1M1A1 | Multiplying out denominatorsForming a single quadratic2 critical values |
|  | 3 | $$x < -\frac{4}{3} , x >2$$ | M1M1A1 | Factorising quadraticCritical values |
|  |  |  |  |  |
|  |  |  |  |  |
| 12 | 1a) | ( n + 1 ) and ( n + 2 ) | A1 | Both correct |
|  | b) | = 3n + 3= 3 ( n + 1 )3 is a factor so the sum is a multiple of 3 | M1M1A1 | Adding expressions and simplifying resultFactorisingConclusion with reason |
|  | 2 | 2n + 1 is an odd number( 2n + 1 )2 = 4n2 + 4n + 14n2 + 4n = 4 ( n2 + 1) = evenso 4n2 + 4n + 1 is odd | M1M1A1 | Expression for odd numberSquare expressionExplanation |
|  | 3 | = $\frac{4x\left(x^{2}+5\right)}{2\left(x^{2}+5\right)}$$$= \frac{4x}{2}$$$=2x $which is always even as is a multiple of 2  | M1M1A1 | FactoriseSimplifyExplanation |
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| 13 | 1(a) | -3h+2f+g | B1 | OA - OB |
|  | 1(b) | -$\frac{1}{3}$ (6**h** + 2**f** + **g**) oe | M1A1 | PO = PA+AO |
|  | 2 | BA = 3DC so lines are parallel | M1M1A1 | Expression for BAExpression for DCConcluding statement  |
|   | 3 | QA and QM are both multiples of 2**j** – **k** so are parallel and have Q as a common point so are collinear | M1M1A1 | QA = 1/3 (2**j – k**) oeQM = ½ (2**j** – **k**) oeConcluding statement |
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| 14 | 1 | NP $\frac{3}{12}$ x $\frac{5}{11}$ = $\frac{5}{44}$ND $\frac{3}{12}$ x $\frac{4}{11}$ = $\frac{1}{11}$PN $ \frac{5}{12}$ x $\frac{3}{11}$ = $\frac{5}{44}$ PD $\frac{5}{12}$ x $\frac{4}{11}$ = $\frac{5}{33}$ DN $ \frac{4}{12}$ x $\frac{3}{11}$ = $\frac{1}{11}$ DP $\frac{4}{12}$ x $\frac{5}{11}$ = $\frac{5}{33}$ P(two different types) = $\frac{47}{66}$Or (alternative solution)NN $\frac{3}{12}$ x $\frac{2}{11}$ = $\frac{1}{22}$PP $\frac{5}{12}$ x $\frac{4}{11}$ = $\frac{5}{33}$ DD $\frac{4}{12}$ x $\frac{3}{11}$ = $\frac{1}{11}$  P(two the same type) = 1 – $\frac{19}{66}$ = $\frac{47}{66}$ | M1M1A1M1M1A1 | Multiplying each probability Adding their probabilities Correct solutionMultiplying probability of same typesSubtracting their answer from 1Correct solution |
|  | 2 | 0.75 x 0.7 = 0.525 or 0.25 x 0.9 = 0.225 0.525 + 0.225 =0.75  | M1M1A1 | Multiplying probabilities for both situationsAdding probabilities |
|  | 3a | $\frac{13664}{14345}$ or 0.95 | A1 |  |
|  | 3b | $\frac{520}{12102}$ = $\frac{260}{6051}$ or 0.04 | A1 |  |
|  | 3c |  $\frac{420}{13664}$ = $\frac{15}{488}$ or 0.03  | M1A1 | Allow M1 for $\frac{420}{14345}$ = $\frac{84}{2869}$ or 0.03 |
|  |  |  |  |  |
| 15 | 1a | FD= 2.5 and 1.2Plot on graph | M1A1 | FD = Frequency / class width |
|  | 1b | FD x class width15 and 36 | M1A1 | Both answers required |
|  | 2a | 1.0, 3.7, 4.0, 1.5Correct histogram drawn | A1A1M1A1 | Frequency density calculated1 mark for 3 correctMark awarded for 2 correct barsAll correct |
|  | 2b | 300 – 240 = 60 mins90  | M1A1 | Calculation to find the class width  |
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