

Mathematics A

General Certificate of Secondary Education J512

Mark Scheme for the Components

June 2009

512/MS/R/09

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OCR Publications
PO Box 5050
Annesley
NOTTINGHAM
NG15 0DL

Telephone: 0870 770 6622
Facsimile: 01223 552610
E-mail: publications@ocr.org.uk

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General Certificate of Secondary Education

Mathematics A (J512)

MARK SCHEMES FOR THE COMPONENTS

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J512/01 Paper 1 (Foundation Tier)

| | | | | |
|---|-----|------------------------------|---|---|
| 1 | (a) | 8.5 | 1 | $\pm 0.2\text{cm}$ |
| | (b) | 5.4 | 1 | $\pm 0.2\text{cm}$ or SC1 if (a) and (b) both in mm |
| | (c) | R on radius | 1 | |
| | (d) | C on circumference | 1 | |
| | (e) | M on midpoint | 1 | |
| | (f) | Line parallel to AB drawn | 1 | By eye |
| 2 | (a) | (i) 1/12 | 1 | |
| | | (ii) 5/12 | 1 | |
| | (b) | 3/4 | 2 | Allow 1 for 6/8 oe seen or answer $\frac{1}{4}$ |
| | (c) | Any vulgar fraction $< 1/10$ | 1 | |
| 3 | (a) | 1½ circles drawn | 1 | |
| | (b) | Cheese and tomato | 1 | |
| | (c) | 12 | 1 | |
| | (d) | 2 | 1 | |
| | (e) | 56 | 2 | M1 for $20 + 12 + 10 + 6 + 8$ or $5 + 3 + 2\frac{1}{2} + 1\frac{1}{2} + 2$ or 14 seen |
| 4 | (a) | (i) 9 | 1 | |
| | | (ii) 20 | 1 | |
| | | (iii) 21 | 2 | Allow 1 for 7 seen |
| | | (iv) 11 | 2 | Allow 1 for 10 seen |
| | (b) | It could also be $\div 2$ oe | 1 | Single operation only |
| 5 | (a) | (i) 3200 | 1 | |
| | | (ii) 1600 | 1 | |
| | | (iii) 2700 | 1 | |
| | | (iv) 2.4(0) | 1 | |
| | (b) | (i) 4800 | 1 | |
| | | (ii) 2980 | 1 | |
| 6 | (a) | 15 | 1 | |
| | (b) | 5.5 oe | 2 | M1 for 5 and/or 6 identified and not used incorrectly |

| | | | | |
|----|-----|--|--------|---|
| 7 | (a) | (i) Obtuse angle marked O | 1 | |
| | | (ii) Reflex angle marked R | 1 | |
| | (b) | 60° | 1 | ± 2° |
| | (c) | (i) 40° "line" with ("angles" or "180") | 1 1 | '180' can be implied by correct answer/working Where totals are given with reasons they must be correct |
| | | (ii) 110° ("point" or "circle") with ("angles" or "360") | 1 1 | '360' can be implied by correct answer/working |
| 8 | (a) | 2.50(p) | 3 | M1 for 35×50 or 35×0.5 or 1750 or 17.5(0) or $50 + 50 + \dots$ And M1dep for 20 – (<i>their</i> 17.5 which must be less than 20) |
| | (b) | 15 isw | 2 | M1 for $3/10 \times 50$ oe If 2 not scored, SC1 for 65 |
| 9 | (a) | (i) 7y final answer | 1 | |
| | | (ii) $2w + 4z$ final answer | 2 | B1 for either $2w$ or $4z$ seen |
| | (b) | 29 final answer | 2 | M1 for either 14 or 15 |
| 10 | (a) | 7 <u>more</u> full shapes shown tessellating on grid. No extra shapes misplaced. | 2 | 1 if at least 2 <u>more</u> shapes drawn ( or  must be seen) |
| | (b) | (i) 120 cm ³ | 2 1 | M1 for $3 \times 4 \times 10$ |
| | | (ii) Any 3 numbers that \times to 120 | 1 | not 3, 4 and 10 |
| 11 | (a) | 49 | 1 | |
| | (b) | 26 | 2 | B1 for either 16 or 10 seen as part answers |
| | (c) | 3.28 | 1 | |
| | (d) | 65 | 2 | M1 for 13 or $78 \div 6$ |
| 12 | | -- 23 -- -- 19 -- 16 43 -- 31 29 -- | 3 | B2 for 4 correct Or B1 for 2 correct |

| | | | | |
|----|-----|---|---------------------|---|
| 13 | (a) | Consistent frequency scale or key Heights – 8, 19, 11, 6, 3 C.Fs. – 8, 27, 38, 44, 47 Freq densities – 4, 9.5, 5.5, 3, 1.5 Fully correct bar chart with no errors Or Fully correct freq polygon or CF diagram or correct histogram with no errors | 1 1 1 | In correct interval Follow through using <i>their</i> 'scale' Condone one error 0-2 etc labels <u>or</u> correct horizontal scale With correct horizontal scale |
| | (b) | 2 up to 4 oe | 1 | |
| | (c) | 9/47 final answer | 2 | B1 for $9/x$ or $x/47$ seen Or SC1 for 9:47, 9 in 47, $9 \div 47$ etc |
| | | | | |
| 14 | (a) | 0.53 (The probabilities) add to 1 | 1 1 | Allow 53% or 53/100 Condone "add to 100%", "add to a whole" |
| | (b) | They might draw | 1 | |
| 15 | (a) | 0, 6, 8 | 1 | |
| | (b) | Correct ruled line within overlay from $x = -2$ to $x = 3$ | 2 | B1 for any three of <i>their</i> points correctly plotted |
| | (c) | Line $y = 5$ drawn | 1 | Any length |
| 16 | (a) | 5 | 2 | M1 for 30 seen |
| | (b) | $9 \times 2 - 1 = 17$ or $18 - 1 = 17$ $4 \times 2 + 9 = 17$ or $8 + 9 = 17$ isw | 1 1 | Or M1 for $9x - 4x$ or $9 + 1$ or better And A1 for $9x - 4x = 9 + 1$ or better isw |
| | (c) | 16 | 2 | M1 for $x/2 = 5 + 3$ or better or $x - 6 = 10$ |
| 17 | (a) | 18 | 2 | M1 for $60 \div (3 + 7)$ soi Or SC1 for answer of 42 or 18:42 |
| | (b) | 149.5 | 1 | |
| 18 | (a) | 7.5 or $7\frac{1}{2}$ or $15/2$ | 2 | M1 for $(5 \times 3) \div 2$ Or SC1 for 9 |
| | (b) | Correct reflection | 2 | B1 for 2 corners correct Or for a correct reflection in any vertical line Or a correct reflection in $y = 3$ |
| | (c) | Correct rotation | 3 | B2 for correct anti-clockwise rotation Or B1 for correct orientation, wrong position or 2 correct corners Or SC2 for correct 90 clockwise rotation about (0,0) of <i>their</i> P |
| | | | | |

| | | | | |
|-----------|------------|--|----------------------|---|
| 19 | (a) | $2 \times 2 \times 2 \times 5$ or $2^3 (\times) 5$ | 2 | M1 for attempt at factor tree/ladder or correct factor pair or better seen Or SC1 for 2, 2, 2, 5 identified |
| | (b) | (i) 8 cao (ii) 120 cao | 2 2 | B1 for $2 \times 2 \times 2$ oe or answer of 2 or 4 B1 for $2 \times 2 \times 2 \times 3 \times 5$ oe or a multiple of 120 Or M1 for listing multiples of 24 AND 40 <u>After 0.0 in (b)</u> Award SC2 in (b)(ii) for reversed answers |

J512/02 Paper 2 (Foundation Tier)

| | | | | |
|---|-----|---|---|--|
| 1 | (a) | 6 | 1 | |
| | (b) | 41 | 1 | |
| | (c) | 11 and 20 | 1 | |
| | (d) | 41 and 11 | 1 | |
| | (e) | 20 or 30 | 1 | |
| | (f) | 16 | 1 | |
| | (g) | 5 or 11 or 41 | 1 | |
| | (h) | 27 | 1 | |
| 2 | (a) | (i) 12 | 1 | |
| | | (ii) 9 | 1 | |
| | (b) | 2 | 2 | M1 for 33 – (sum of <i>their</i> 4 values) soi Or SC1 for 31 seen |
| 3 | | 53/100 9/100 0.09 | 4 | B1 for each entry 75% |
| 4 | (a) | Kilometres or km | 1 | Condone poor spelling |
| | (b) | Grams or g or gm | 1 | |
| | (c) | Millilitres or ml or cm ³ or cc | 1 | |
| | (d) | Kilo(grams) or kg | 1 | |
| 5 | (a) | Parallelogram Trapezium Kite | 3 | B1 for each correct |
| | (b) | Cuboid Cylinder Pyramid | 3 | B1 for each correct |
| 6 | (a) | (-3, -2) | 1 | |
| | (b) | B at (2, 4) C at (0, 3) D at (1.5, 2) | 3 | ± 2mm in any direction when plotting B1 for each correct plot -1 once for no label(s) or incorrect label(s) |
| 7 | (a) | 4.4521 | 1 | |
| | (b) | 1.7 or 17/10 or $1\frac{7}{10}$ | 1 | |
| | (c) | 132 | 2 | M1 for $3 \times 220 \div 5$ soi |

| | | | | |
|----|-----|---|---|---|
| 8 | (a) | 3^2 $1 + 3 + 5 + 7 + 9$ 7^2 $1 + 3 + 5 + 7 + 9 + 11 + 13$ | 4 | B1 for each correct box |
| | (b) | 6 -3 or (<i>their</i> 6) – 9 | 2 | B1 for each |
| 9 | (a) | 4 5 6 7 8 5 6 6 7 8 | 1 | Condone one error |
| | (b) | 5/36 or 0.14 or 0.139 or 0.1389 or 0.1388(...) | 2 | B1 for 5 and 36 seen Or 5/n or n/36 seen |
| | (c) | 3/36 or 1/12 or 0.08 or 0.083(...) | 1 | FT Allow 3/ <i>their</i> 36 |
| 10 | (a) | Germany | 1 | |
| | (b) | Russia | 1 | |
| | (c) | France | 1 | |
| | (d) | -2 | 1 | |
| 11 | (a) | 120 | 2 | M1 for 360 – sum of the 3 angles Or SC1 for 240 seen |
| | (b) | 3 www | 2 | M1 for 45/360 × 24 oe Or SC1 for 15 seen |
| 12 | | 250/600 oe isw (= 5/12) | 4 | <u>Method 1</u> B3 for 250 seen www Or M1 for 600 ÷ 4 or 600 ÷ 3 soi And M1dep for 600 – (<i>their</i> result for Anna + <i>their</i> result for Winston) <u>Method 2</u> B3 for 1 – 7/12 Or B2 for sight of 7/12 Or M2 for 1 – (1/4 + 1/3) or 1 – <i>their</i> (1/4 + 1/3) oe Or M1 for 1/4 + 1/3 oe |
| 13 | (a) | (i) 10 | 1 | |
| | | (ii) 4 | 1 | |
| | | (iii) 20 | 1 | |
| | | (iv) 2 | 2 | M1 for 12 – 2 = 5x oe or better |
| | (b) | (i) x + 3 or 3 + x | 1 | |
| | | (ii) 4x or 4 × x or x4 or x × 4 | 1 | |

| | | | | |
|----|-----|---|---------------------|--|
| 14 | (a) | 29 (Angles in) a <u>triangle or 3 sided/ angled shape</u> add(s) up to <u>180</u> | 2 1 | M1 for $180 - 90 - 61$ or $90 - 61$ |
| | (b) | 135 (Angles in) a <u>quadrilateral or 4 sided/ angled shape</u> add(s) up to <u>360</u> (Angles on) a <u>(straight) line</u> add up to <u>180</u> | 3 1 1 | M1 for $360 - (120 + 100 + 95)$ or $360 - 315$ or 45 seen www And M1 (dependent on first M1) for $180 - \text{their } 45$ |
| 15 | (a) | 225 | 2 | M1 for $150 \times 18/12$ or $150 + \frac{1}{2} (150)$ |
| | (b) | $14.28 - 14.3$ or $14 \frac{2}{7}$ | 2 | M1 for $25/175 \times 100$ If M0 then SC1 for $14.2(\dots)$ or 14 with no working |
| 16 | (a) | 3.5 or $3 \frac{1}{2}$ or $7/2$ | 1 | |
| | (b) | 7.5 or $7 \frac{1}{2}$ or $15/2$ | 2 | M1 for $\sqrt{(36 + 20.25)}$ or 56.25 seen |
| | (c) | 6.25 , $6 \frac{1}{4}$, $25/4$, $100/16$, $50/8$ | 1 | |
| 17 | (a) | Running bath <u>and</u> correct reason | 1 | |
| | (b) | 4 | 1 | |
| | (c) | 20 | 1 | |
| | (d) | 119.6 | 1 | |
| 18 | (a) | All 4 points plotted correctly $\pm \frac{1}{2}$ small square | 2 | B1 for 2 or 3 plotted correctly $\pm \frac{1}{2}$ small square |
| | (b) | Positive | 1 | |
| | (c) | Straight line ruled positive gradient | 1 | Line to pass between (3.6, 2.4) and (3.6, 3.2) and between (8, 7.6) and (8.8, 7.6) |
| | (d) | Strict ft <i>their</i> straight line reading $\pm \frac{1}{2}$ small square from 5 on y-axis | FT1 | |
| 19 | | $61.68 - 61.714$ cm | 3 1 | M2 for $2 \times \pi \times 6 + 24$ Or M1 for $2 \times \pi \times 6$ If M0 then SC1 for <i>their</i> circumference + 24 Correct units |

| | | | |
|----|--|----------------------------------|---|
| 20 | 8/0.22 or 8×123.9 or $123.9/0.22$ $8/0.22 \times 123.9$ 4500 – 4514 45(.00) – 45.10 www | M1 M1 A1 A1 | Accept if given in £ equivalent Final answer must be given in correct currency form |
| | | | |
| 21 | Trial between 2 and 3 Improved trial Two correct trials between 2.25 and 2.35 inclusive that give answers below 10 & above 10 2.3 | M1 M1 A1 A1 | Improved trial means a further trial which would give an answer closer to 10 Dependent on both M marks only |

J512/03 Paper 3 (Higher Tier)

| | | | | |
|---|-----|---|---------------------------------------|---|
| 1 | | -- 23 -- -- 19 -- 16 43 -- 31 29 -- | 3 | B2 for 4 correct Or B1 for 2 correct |
| 2 | | 'Online price' £2.50 www | 5 | B2 for 60 Or M1 for $75 \div 5$ soi And B2 for 57.5(0) Or M1 for 50×0.15 oe soi by 7.5(0) |
| 3 | (a) | (i) Consistent frequency scale or key Heights – 8,19,11,6,3 C.Fs. – 8,27,38,44,47 Freq densities – 4,9.5,5.5,3,1.5 Fully correct bar chart with no errors Or fully correct freq polygon or CF diagram or histogram with no errors (ii) 2 up to 4 oe (iii) 9/47 final answer | 1 1 1 1 2 | In correct interval Follow through using <i>their</i> 'scale' Condone one error 0-2 etc labels <u>or</u> correct horiz. scale With correct horizontal scale B1 for 9/x or x/47 seen Or SC1 for 9:47, 9 in 47, $9 \div 47$ etc |
| | (b) | One mark each, for anything sensible from 2 <u>different</u> categories - types of sweets - time period - no. of sweets | 1,1 | For example: - sweets other than chocolate - no mention of time period - how many is a few/lot? |
| 4 | (a) | $9 \times 2 - 1 = 17$ or $18 - 1 = 17$ $4 \times 2 + 9 = 17$ or $8 + 9 = 17$ isw | 1 1 | Or M1 for $9x - 4x$ or $9 + 1$ or better And A1 for $9x - 4x = 9 + 1$ or better isw |
| | (b) | 16 | 2 | M1 for $x/2 = 5 + 3$ or better or $x - 6 = 10$ |
| 5 | (a) | 18 | 2 | M1 for $60 \div (3 + 7)$ soi Or SC1 for answer of 42 or 18:42 |
| | (b) | 149.5 | 1 | |

| | | | | |
|----|-----|---|-----|---|
| 6 | (a) | 7.5 or $7\frac{1}{2}$ or $15/2$ | 2 | M1 for $(5 \times 3) \div 2$ Or SC1 for 9 |
| | (b) | Correct reflection | 2 | B1 for 2 corners correct Or for a correct reflection in any vertical line Or a correct reflection in $y = 3$ |
| | (c) | Correct rotation | 3 | B2 for correct anti-clockwise rotation Or B1 for correct orientation, wrong position or 2 correct corners Or SC2 for correct 90 clockwise rotation about (0,0) of <i>their</i> P |
| | | | | |
| 7 | (a) | 4, 5, 6, 7 | 2 | B1 for answer of 3, 4, 5, 6, 7 |
| | (b) | (i) $x > 2$ | 2 | M1 for $3x > 4 + 2$ or better Or SC1 for answer of $x = 2$, $x \geq 2$ or >2 |
| | | (ii) $\frac{0 \text{-----}}{2 \quad 3 \quad 4 \quad 5} >$ | FT1 | Correct answer or follow through from <i>their</i> inequality in part (i) |
| | | | | |
| 8 | (a) | (<i>n</i> th term =) $-5n + 30$ oe final answer | 2 | B1 for $-5n$ or $5n$ seen |
| | (b) | $n^2 + 2$ oe final answer | 1 | |
| | | | | |
| 9 | (a) | $2 \times 2 \times 2 \times 5$ or $2^3 (\times) 5$ | 2 | M1 for attempt at factor tree/ladder or correct factor pair or better seen Or SC1 for 2,2,2,5 identified |
| | (b) | (i) 8 cao | 2 | B1 for $2 \times 2 \times 2$ oe or answer of 2 or 4 |
| | | (ii) 120 cao | 2 | B1 for $2 \times 2 \times 2 \times 3 \times 5$ oe or a multiple of 120 Or M1 for listing multiples of 24 AND 40 <u>After 0,0 in (b)</u> Award SC2 in (b)(ii) for reversed answers |
| | | | | |
| 10 | (a) | $129/500$ or 0.258 final answer | 2 | M1 for $129/$ <i>their</i> 500 seen Or SC1 for 129:500, 129 in 500, etc |
| | (b) | Yes, frequencies similar oe Or Yes, freq. values all near 125 oe Or Yes, difference/range of 17 in 500/large number of throws | 1 | |
| | | | | |
| 11 | | (1, 6) | 2 | M1 for any attempt to add and divide by 2 Or for answer of (1, <i>n</i>) or (<i>n</i> ,6) |
| | | | | |

| | | | | |
|----|-----|--|------------|---|
| 12 | (a) | $15x - 20$ final answer | 2 | B1 for $15x$ or -20 seen |
| | (b) | $2a(a + 4b)$ final answer | 2 | B1 for $2(a^2 + 4ab)$ or $a(2a + 8b)$ Or SC1 for $(2a + 0)(a + 4b)$ |
| | (c) | (i) 1 | 1 | |
| | | (ii) $4x^2y^4$ final answer | 3 | B1 for each correct term in a 3 term product Or SC1 for each of x^2 or y^4 seen in answer |
| | | (iii) 7^{15} final answer | 1 | |
| 13 | (a) | (i) Angle in a semi-circle (= 90) | 1 | Or angle subtended by diameter Or angle at centre is twice angle at circumference AND angles on straight line add to 180 Or alt segment AND tangent perp to radius/diameter |
| | | (ii) Tangent (perp. to) radius/diameter | 1 | Or angles in a triangle = 180 AND alternate segment Or alternate segment AND angles on a straight line add to 180 |
| | (b) | (i) 15 | 1 | |
| | | (ii) 18 | 1 | |
| | (c) | 10 final answer | 2 | M1 for 2.5 or $2\frac{1}{2}$ or $5 \div 2$ ($\times 4$) or for 5×2 or 10 seen |
| 14 | | $4\frac{1}{6}$ or equivalent mixed number | 3 | B2 for $\frac{25}{6}$ or equivalent top heavy Or M1 for $\frac{5}{2}$ or $\frac{5}{3}$ oe seen And M1 for multiplying tops and bottoms of <i>their two</i> top heavy fractions |
| 15 | (a) | Points correctly plotted | 2 | Ignore (5,0) B1 for 3 points correctly plotted Or SC1 for all correct y with <u>consistent</u> wrong x |
| | | <i>Their</i> points joined by lines or curve | FT1 | |
| | (b) | Age using 60 and <i>their</i> CF graph | FT1 | <i>Their</i> value $\pm \frac{1}{2}$ |
| | (c) | Only 5 above 40 | 1 | Allow 4 or 6 |

| | | | | |
|----|-----|---|--|--|
| 16 | (a) | $(x - 5)(x + 3)$ -3 or 5 | M2 FTB1 | M1 for $(x + a)(x + b)$ where $a + b = -2$ or $ab = -15$ FT only from 2 linear factors <u>After M0</u> SC1 for answers of -3 and 5 |
| | (b) | 2 and -2 www | 3 | B2 for 2 or -2 www or M1 for $(x - 2)(x + 2)$ or $(3x - 6)(x + 2)$ or $(x - 2)(3x + 6)$ or for $x^2 = 4$ soi |
| | (c) | $4x^2 - 2x - 2x + 1$ or better $10x^2 - 4x - 8 = 0$ or equivalent 3 term equation | M2 A1 | M1 for three of $4x^2$, $-2x$, $-2x$, $+1$ Dep on M2 scored |
| 17 | | $(\sqrt{4^2 + 5^2 + 10^2})$ $(\sqrt{141})$ $141 < 144$ or $\sqrt{141} < 12$, soi, so No | M2 A1 A1 | M1 for <u>any</u> attempt at Pythagoras in 2-D or 3-D |
| 18 | | $\pi \times 12^2 \times 10$ $= 1440\pi$ cao $\frac{4}{3} \times \pi \times 6^3$ $= 288\pi$ cao <i>their</i> $1440(\pi) \div$ <i>their</i> $288(\pi)$ soi $= 5$ | M1 A1 M1 A1 M1 A1 | If consistent value of pi used, <u>max</u> marks available are M1, A0, M1, A0, M1, A1 From attempt at finding volumes Dep. on M3 scored. Not from any rounding |
| 19 | (a) | $y = x - 1$ correctly drawn 3.6 to 3.8 0.2 to 0.4 | M1 A1 A1 | Zero for coordinates or $x = \dots y = \dots$ answers |
| | (b) | $2x - 2$ | 2 | M1 for attempt to rearrange into the form $x^2 - 3x = \dots$ Or SC1 for answer of $2 - 2x$ |
| 20 | | $\frac{11}{20} \times \frac{10}{19} + \frac{9}{20} \times \frac{8}{19}$ $= \frac{182}{380}$ oe isw | M2 A2 | M1 for $\frac{11}{20} \times \frac{10}{19}$ or $\frac{9}{20} \times \frac{8}{19}$ A1 for $\frac{110}{380}$ or $\frac{72}{380}$ oe isw Or SC2 for $\frac{182}{400}$ or $\frac{202}{400}$ or $\frac{202}{380}$ oe isw |

J512/04 Paper 4 (Higher Tier)

| | | | | |
|---|-----|--|-----|--|
| 1 | (a) | 225 | 2 | M1 for $150 \times 18/12$ or $150 + \frac{1}{2} (150)$ |
| | (b) | 14.28 – 14.3 or $14 \frac{2}{7}$ | 2 | M1 for $25/175 \times 100$ If M0 then SC1 for 14.2(...) or 14 with no working |
| 2 | (a) | 3.5 or $3 \frac{1}{2}$ or $7/2$ | 1 | |
| | (b) | 7.5 or $7 \frac{1}{2}$ or $15/2$ | 2 | M1 for $\sqrt{(36 + 20.25)}$ or 56.25 seen |
| | (c) | 6.25, $6 \frac{1}{4}$, $25/4$, $100/16$, $50/8$ | 1 | |
| 3 | (a) | Running bath <u>and</u> correct reason | 1 | |
| | (b) | 4 | 1 | |
| | (c) | 20 | 1 | |
| | (d) | 119.6 | 1 | |
| 4 | | 120 | 3 | M2 for $420 \div 3.5$ or $(420 \div 210) \times 60$ Or M1 for 3.5 (hours) or 210 (minutes) or $420 \div 3.3$ |
| 5 | | Fully correct | 3 | B2 for 2 points correct or triangle all sides $\times 2$ Or B1 for 1 point correct or 2 sides $\times 2$ |
| 6 | (a) | All 4 points plotted correctly $\pm \frac{1}{2}$ small square | 2 | B1 for 2 or 3 plotted correctly $\pm \frac{1}{2}$ small square |
| | (b) | Positive | 1 | |
| | (c) | Straight line ruled positive gradient | 1 | Line to pass between (3.6, 2.4) and (3.6, 3.2) and between (8, 7.6) and (8.8, 7.6) |
| | (d) | Strict ft <i>their</i> straight line reading $\pm \frac{1}{2}$ small square from 5 on y-axis | FT1 | |
| | (e) | Outside range of times | 1 | Allow correct comment with irrelevant comment Do not allow contradictory comments |
| 7 | (a) | 113 – 113.1 | 2 | M1 for $\pi \times 6^2$ |
| | (b) | 61.68 – 61.714 cm | 3 | M2 for $2 \times \pi \times 6 + 24$ Or M1 for $2 \times \pi \times 6$ If M0 then SC1 for <i>their</i> circumference + 24 |
| | | | 1 | Correct units |

| | | | | |
|----|-----|--|--|--|
| 8 | (a) | 67 Alternate (angles) | 1 1 | Award for fully correct alternative reasons |
| | (b) | 67 and 46 Isosceles | 2 1 | B1 for either 67 or 46 |
| 9 | | 17 provided correct equation seen | 3 | B2 for $x^2 = 289$ or $x = \sqrt{289}$ or $x = \sqrt{(2312/8)}$ Or B1 for $8x^2 = 2312$ If B0 then SC2 for $\sqrt{289}$ (= 17) and answer 17 or $2312/8$ (= 289) and answer 17 Or SC1 for 17 from trial and improvement or no method shown or embedded answer |
| 10 | | 8/0.22 or 8×123.9 or $123.9/0.22$ $8/0.22 \times 123.9$ 4500 – 4514 45(.00) – 45.10 www | M1 M1 A1 A1 | Accept if given in £ equivalent Final answer must be given in correct currency form |
| 11 | | Trial between 2 and 3 Improved trial Two correct trials between 2.25 and 2.35 inclusive that give answers below 10 & above 10 2.3 | M1 M1 A1 A1 | Improved trial means a further trial which would give an answer closer to 10 Dependent on both M marks only |
| 12 | | 0.4 oe | 3 | M2 for 10 correct possibilities and all 25 listed or $10 \times 1/5 \times 1/5$ or $1/5 \times 4/5$ and $1/5 \times 3/5$ and $1/5 \times 2/5$ and $1/5 \times 1/5$ Or M1 for all outcomes listed or 10 correct possibilities identified or (probability 2 spins =) $1/5 \times n/5$, $n = 1, 2, 3$ or 4 |
| 13 | (a) | 3.6 | 2 | M1 for 4×0.9 |
| | (b) | 5 | 2 | M1 for evidence of repeated $\times 0.9$ |
| 14 | (a) | (i) $2(f + g)$ | 1 | |
| | | (ii) $f^2(g + h)$ | 1 | |
| | (b) | Linear term + square term | 1 | |
| 15 | (a) | Fully correct $\pm \frac{1}{2}$ small square | 2 | M1 for box with correct median & one of UQ or LQ correct $\pm \frac{1}{2}$ small square |

| | | | | |
|----|-----|--|---|--|
| | (b) | Sim: Same range or both (positive) skew Diff: Men greater median/average or men have a greater IQR oe | 1 1 | |
| | (c) | 1/8 oe | 2 | B1 for $\frac{1}{4} \times \frac{1}{2}$ If B0 then SC1 for $\frac{1}{2} \times \frac{3}{4}$ or $\frac{1}{2} + \frac{1}{4}$ |
| 16 | (a) | Clear attempt to multiply equations to achieve same coeff in x or in y Clear addition or subtraction to eliminate x or y $x = 7, y = -18$ | M2 M1 A1 | Condone one multiplication error across both equations If M0 then M1 for one multiplication error in each equation Dep on M2 scored SC1 for both answers correct from non- algebraic method or if no working seen |
| | (b) | $V = \frac{1}{2} r^2 \omega \omega \omega$ | 3 | M2 for $2V = r^2$ or $V/r = r/2$ Or both lines of flow diagram correct Or M1 for $r = 2V/r$ Or first line of flow diagram correct |
| 17 | (a) | 43.9 – 43.912 | 3 | M2 for $\sin^{-1}(8.6/12.4)$ Or M1 for $\sin(\text{CAB}) = 8.6/12.4$ |
| | (b) | 7.3 – 7.31 | 3 | M2 for (DE =) $16.1 \times \cos 63$ or $16.1 \times \sin 27$ Or M1 for $\cos 63 = \text{DE}/16.1$ or $\sin 27 = \text{DE}/16.1$ |
| | (c) | 37.39 – 37.4 www | 2 | M1 for $\frac{1}{2} \times 16.1 \times 12.4 \times \sin 22$ |
| | (d) | 6.5 – 6.54 www | 3 | M2 for (CD ² =) 42.(...) Or M1 for $\text{CD}^2 = 16.1^2 + 12.4^2 - 2 \times 16.1 \times 12.4 \times \cos 22$ |
| 18 | (a) | $(x^2 =) (2n+1)^2 - (2n)^2$ or $x^2 + (2n)^2 = (2n+1)^2$ $(x^2 =) 4n^2 + 2n + 2n + 1 - 4n^2$ or $(2n+1+2n)(2n+1-2n)$ or $x^2 + 4n^2 = 4n^2 + 2n + 2n + 1$ $\sqrt{4n+1}$ | M1 M1 A1 | Dep 1 st M1 |
| | (b) | Odd and sensible attempt at reason $4n$ even so $4n + 1$ odd so $\sqrt{4n+1}$ odd | B1 B1 | |

| | | | | |
|----|-----|---|---|--|
| 19 | (a) | 9 | 1 | |
| | (b) | (i) $129 = 1 + 2^t$ | 1 | |
| | | (ii) 7 | 2 | M1 for trial $t \geq 5$ |
| 20 | (a) | $120 \times 0.1 (= 12)$ or $120 \times (1.75 - 1.65)$ or 5×2.4 or 0.2×60 | 1 | |
| | (b) | 21 18 9 (12) 3 | 3 | B2 for 2 or 3 correct Or B1 for 1 correct |
| 21 | | 5.42(2...) <u>and</u> -0.92(2...) | 7 | <p>B6 for $x = \frac{9 \pm \sqrt{(-9)^2 - 4 \times 2 \times -10}}{2 \times 2}$ or $(x - 9/4)^2 = 5 + (9/4)^2$ or $2x^2 - 9x - 10 = 0$ and one correct solution Or B5 for $2x^2 - 9x - 10 = 0$ Or B4 for $10x - 5 + 4x + 12 = 2x^2 - x + 6x - 3$ or $\frac{10x - 5 + 4x + 12}{2x^2 - x + 6x - 3} = 1$ Or B3 for $10x - 5 + 4x + 12$ and $2x^2 - x + 6x - 3$ Or B2 for $5(2x - 1) + 4(x + 3)$ and $(x + 3)(2x - 1)$ Or B1 for $5(2x - 1) + 4(x + 3)$ or $(x + 3)(2x - 1)$</p> <p>If B1 or B2 or B3 or B4 and quadratic, derived from rearrangement of fraction that also has 3 non-zero terms, award also SC1 for correctly completing the square or substitution in formula or factorising into brackets</p> |

Grade Thresholds

General Certificate of Secondary Education
 Mathematics A (J512)
 June 2009 Examination Series

Component Threshold Marks

| Component | Max Mark | A | B | C | D | E | F | G |
|-----------|----------|----|----|----|----|----|----|----|
| 1 | 100 | | | 73 | 61 | 49 | 37 | 25 |
| 2 | 100 | | | 71 | 59 | 48 | 37 | 26 |
| 3 | 100 | 72 | 56 | 41 | 25 | | | |
| 4 | 100 | 66 | 51 | 35 | 23 | | | |

Specification Options

Foundation Tier

| | Max Mark | A* | A | B | C | D | E | F | G |
|--------------------------------|----------|----|---|---|------|------|------|------|------|
| Overall Threshold Marks | 200 | | | | 144 | 120 | 97 | 74 | 51 |
| Percentage in Grade | | | | | 31.8 | 23.8 | 15.5 | 11.9 | 9.5 |
| Cumulative Percentage in Grade | | | | | 31.8 | 55.6 | 71.1 | 83.0 | 92.5 |

The total entry for the examination was 24985.

Higher Tier

| | Max Mark | A* | A | B | C | D | E | F | G |
|--------------------------------|----------|------|------|------|------|------|------|---|---|
| Overall Threshold Marks | 400 | 169 | 138 | 107 | 76 | 48 | 34 | | |
| Percentage in Grade | | 13.6 | 22.4 | 26.3 | 25.5 | 10.2 | 1.4 | | |
| Cumulative Percentage in Grade | | 13.6 | 36.0 | 62.3 | 87.8 | 98.0 | 99.4 | | |

The total entry for the examination was 16618.

Overall

| | A* | A | B | C | D | E | F | G |
|--------------------------------|-----|------|------|------|------|------|------|------|
| Percentage in Grade | 5.5 | 9.1 | 10.7 | 29.3 | 18.3 | 9.8 | 7.1 | 5.6 |
| Cumulative Percentage in Grade | 5.5 | 14.6 | 25.3 | 54.6 | 72.9 | 82.7 | 89.8 | 95.4 |

The total entry for the examination was 41603.

Statistics are correct at the time of publication.

OCR (Oxford Cambridge and RSA Examinations)
1 Hills Road
Cambridge
CB1 2EU

OCR Customer Contact Centre

14 – 19 Qualifications (General)

Telephone: 01223 553998

Facsimile: 01223 552627

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