**Extended Mathematics**
**Topic : Geometry**
**Year :May 2013 -May 2024**
**Paper -2**
**Answers**

Question 1

| | | |
|---|---|---|
| 6 | **3** | **M2** for $3\times\sqrt[3]{\frac{288\pi}{36\pi}}$<br>or **M1** for $3\times\sqrt[3]{\frac{288\pi}{36\pi}}$ or $3\times\sqrt[3]{\frac{36\pi}{288\pi}}$ |

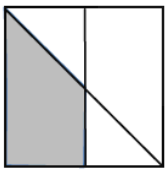
Question 2

| | | | |
|---|---|---|---|
| **(a)** | 95 | **1** | |
| **(b)** | 77 | **2** | **B1** for [angle] $ACD = 58°$ or [angle] $BAC = 19°$ or [angle] $ANB = 103°$ or [angle] $CAE = 66°$ |

Question 3

| | | |
|---|---|---|
| **40.3** or 40.31 to 40.32 | **3** | **M2** for $4.4\times\sqrt[3]{\frac{0.05}{65}}$ soi<br>**or M1** for $\sqrt[3]{\frac{0.05}{65}}$ soi or $\sqrt[3]{\frac{65}{0.05}}$ soi |

Question 4

| | | | |
|---|---|---|---|
| **(a)** | Equidistant from $A$ and $B$ (or $C$ and $D$ or $AD$ and $BC$) | **1** | |
| **(b)** |  | **1** | |

Question 5

| | | |
|---|---|---|
| 105 | **2** | **M1** for 180 – 55 – 50<br>or **B1** for 55 or 75 seen in the correct angle inside the triangle |

Question 6

| | | |
|---|---|---|
| **(a)** 24 | **2** | **M1** for $MOC = 48$ |
| **(b)** 24 | **2** | **M1** for $ACM = 66$<br>or<br>**B1** for 48 – *their* **(a)** |

Question 7

| | | |
|---|---|---|
| 52 | **3** | **B2** for $AOB = 104$<br>or **B1** for $OAB$ or $OBA = 38$ |

Question 8

| | | |
|---|---|---|
| decagon | **3** | **M1** for 360 ÷ 36 oe<br>**A1** for 10 |

Question 9

| | | |
|---|---|---|
| **(a)** 110 | **1** | |
| **(b)** 79 | **2** | **B1** for $DAC = 42$ or $ACB = 79$ or $ACD = 28$ |

Question 10

| | | |
|---|---|---|
| 125 | **2** | **B1** for 55 or 125 in any other correct position on diagram or **M1** for 180–55 |

Question 11

| | | |
|---|---|---|
| 48 | **2** | **M1** for $15^2$ or $\left(\frac{1}{15}\right)^2$ or $\frac{1}{15^2}$ or $\sqrt{10800}$ or $\frac{1}{\sqrt{10800}}$ |

Question 12

| | | | |
|---|---|---|---|
| **(a)** | 74 | **1** | |
| **(b)** | 8.69 | **1** | |

Question 13

| | | |
|---|---|---|
| 576 | **4** | **M1** for $\frac{1458}{3456}$ or $\frac{3456}{1458}$<br>**M1 dep** for $\sqrt[3]{\textit{their fraction}}$<br>**M1** for (*their* cube root )$^2$ |

Question 14

| | | | |
|---|---|---|---|
| **(a)** | correct working | **2** | **B2** for $\sqrt[3]{\frac{1}{8}} = \frac{1}{2}$ or $\sqrt[3]{8} = 2$ AND $\frac{10}{2} = 5$ oe and $\frac{4}{2} = 2$ oe<br>or<br>**B1** for $\sqrt[3]{\frac{1}{8}}$ or $\sqrt[3]{8}$ or $8 = 2^3$ or $\frac{1}{8} = (\frac{1}{2})^3$ |
| **(b)** | 147 or 146.5 to 146.6… | **4** | **M3** for $\frac{7}{8} \times \frac{1}{3} \times \pi \times 4^2 \times 10$<br>or<br>**M1** for $\frac{1}{3} \times \pi \times 4^2 \times 10$<br>and<br>**M1** for $\frac{1}{3} \times \pi \times 2^2 \times 5$<br>and<br>**M1** for subtracting *their* volumes |

Question 15

| | | | |
|---|---|---|---|
| **(a)** | 32 | **2** | **B1** for $AOC = 116$ |
| **(b)** | 35 | **2** | **B1** for $CDA = 122$ |

Questio 16

| | | |
|---|---|---|
| 160 | **3** | **M2** for $180 - \frac{360}{18}$ or $\frac{180 \times (18-2)}{18}$ oe<br>or **M1** for $180 \times (18-2)$ or $\frac{360}{18}$ |

Question 17

| | |
|---|---|
| 108 | **1** |
| Angle at **centre** is **twice** angle at **circumference** oe | **1** |

Question 18

| | | |
|---|---|---|
| 9.13 or 9.127 to 9.1271 | **3** | **M2** for $\sqrt[3]{\frac{1000}{440}}$ [1.31] oe<br>or $\sqrt[3]{\frac{440}{1000}}$ [0.761] oe<br>Or **M1** for $\frac{1000}{440}$ [2.27] oe<br>or $\frac{440}{1000}$ [0.44] oe<br>or $\sqrt[3]{\frac{figs440}{figs1000}}$ or $\sqrt[3]{\frac{figs1000}{figs440}}$ |

Question 19

| | | | |
|---|---|---|---|
| **(a)** | 35 | **2** | **M1** for [$Z$ =] 180 – 88 – 57 or $VWX = 57$ or $YZX = 35$ |
| **(b)** | 10.8 | **2** | **M1** for $\frac{AC}{7.2} = \frac{12.6}{8.4}$ oe |

Question 20

| | | | |
|---|---|---|---|
| **(a)** | 68 | **1** | |
| **(b)** | 15 | **2** | **M1** for $\frac{360}{n} = 24$ or $(n-2)180 = 156n$ |

Question 21

| | | |
|---|---|---|
| 37 | **2** | **M1** for 180 – 90 – 53 oe<br>or **B1** for 53 or the right angle, either marked in correct place on diagram |

Question 22

| | | |
|---|---|---|
| Parallel | **1** | |
| Same length | **1** | |

Question 23

| | | | |
|---|---|---|---|
| **(a)** | 7.5 | **2** | **M1** for [10] $\times \frac{6}{8}$ oe |
| **(b)** | 12 cao | **2** | **M1** for $9 \times \frac{8}{6}$ oe or $9 \times \frac{10}{\textit{their}\ \textbf{(a)}}$ |

Question 24

| | | |
|---|---|---|
| 6 | **3** | **M2** for $4.5\times\sqrt[3]{\frac{128}{54}}$ oe or better<br>**M1** for $\sqrt[3]{\frac{128}{54}}$ or $\sqrt[3]{\frac{54}{128}}$ oe or $\frac{54}{128}=\left(\frac{4.5}{x}\right)^3$ oe |

Question 25

| | | |
|---|---|---|
| 4140 | **2** | **M1** for $(25-2)\times180$ or $25\times\left(180-\frac{360}{25}\right)$ |

Question 26

| | | | |
|---|---|---|---|
| **(a)** | 12 | **2** | **M1** for $\frac{7.2}{x}=\frac{15}{25}$ oe or better eg $7.2\times\frac{25}{15}$ |
| **(b)** | 12.8 | **3** | **M2** for $16\times\sqrt[3]{\frac{192}{375}}$ oe<br>or<br>**M1** for $\sqrt[3]{\frac{192}{375}}$ or $\sqrt[3]{\frac{375}{192}}$ oe or $\left(\frac{16}{y}\right)^3=\frac{375}{192}$ oe |

Question 27

| | | |
|---|---|---|
| 6.24 or 6.244 to 6.245 | **3** | **M2** for $\sqrt{8^2-5^2}$<br>or **M1** for $8^2=5^2+x^2$ or better |

Question 28

| | | |
|---|---|---|
| 0.3 | **2** | **M1** for $\frac{k\times50000\times50000}{100000\times100000}$ oe<br>If zero scored **SC1** for figs 3 |

Question 29

| | | |
|---|---|---|
| Parallelogram | **1** | |

Question 30

| | | | |
|---|---|---|---|
| **(a)** | 47 | **1** | |
| **(b)** | 117 | **2** | **M1** for 360 – (115 + 85 + 97) |
| **(c)** | 244 | **2** | **B1** for 116 seen at centre or 122 seen at circumference |

Question 31

| | | |
|---|---|---|
| 64000 | **3** | **M2** for $\frac{1.6\times 20000^2}{100^2}$ oe<br>or<br>**M1** for figs 64 in answer or $1\,cm^2 = 40\,000\,m^2$ |

Question 32

| | | |
|---|---|---|
| 9.1 oe | **2** | **M1** for $\frac{5.2}{PQ}=\frac{12.4}{21.7}$ oe |

Question 33

| | | | |
|---|---|---|---|
| **(a)** | 5 | **2** | **M1** for $\frac{9}{k}=\frac{6+4.8}{6}$ oe |
| **(b)** | 24 | **3** | **M2** for $\sqrt[3]{\frac{2592}{1500}}\times 20$ oe<br>or **M1** for $\sqrt[3]{\frac{2592}{1500}}$ or $\sqrt[3]{\frac{1500}{2592}}$ |

Question 34

| | | | |
|---|---|---|---|
| **(a)** | 72 | **1** | |
| **(b)** | 123 | **2FT** | FT dep. on answer being obtuse<br>**M1** for (360 – *their*$(a)$ – 42) [÷2] |

Question 35

| | | |
|---|---|---|
| 110 | **3** | **B2** for $ADC = 25$<br>or **B1** for $AEC = 135$ or $CAE = 25$ |

Question 36

| | | |
|---|---|---|
| 62 on answer line or clearly identified as $<ACB$<br><br>**and**<br><br>two correct supporting reasons | **4** | **B1** for $<AOB = 124$ or for *their* $<AOB \div 2$<br>or<br>other appropriate correct angle one step from $<ACB$<br>**B1** for any correct reason<br>e.g. isosceles triangle **or** angles in triangle = 180<br>**B1** for a different correct reason leading directly to $<ACB$<br>e.g. angle at circumference is ½ angle at centre oe<br>**B1** for 62 |

Question 37

| | | |
|---|---|---|
| 45 | **3** | **M2** for 360 ÷ (180 – 172)<br>or **M1** for 180 – 172 or $\frac{180(n-2)}{n}=172$ oe |

Question 38

| | | |
|---|---|---|
| 460 | **2** | **B1** for 1 $cm^2$ : 100 $km^2$ oe<br>or **M1** for 4.6 × 1 000 000² ÷ 100 000² oe seen |

Question 39

| | | |
|---|---|---|
| 145 | **3** | **M2** for (6 – 2) × 180 – 5 × 115<br>or **M1** for (6 – 2) × 180<br>Alt method<br>**M2** for 180 – (360 – 5 × (180 – 115))<br>or **M1** for 360 – 5 × (180 – 115) |

Question 40

| | | | |
|---|---|---|---|
| **(a)** | 112 | **1** | |
| **(b)** | 56 | **1** | |

Question 41

| | | |
|---|---|---|
| [$a$ =] 70<br>[$b$ =] 40 | **2** | **B1** for each |

Question 42

| | | | |
|---|---|---|---|
| **(a)** | 68 | **1** | |
| **(b)** | 9 | **2** | **M1** for 360 ÷ 40 oe<br>or<br>$\frac{180(n-2)}{n}$ = 140 oe |

Question 43

| | | |
|---|---|---|
| *B* | **1** | |

Question 44

| | | |
|---|---|---|
| 46.3 or 46.29 to 46.30 | **3** | **M2** for $53\times\sqrt[3]{\frac{20}{30}}$ oe<br>or **M1** for $\sqrt[3]{\frac{20}{30}}$ or $\sqrt[3]{\frac{30}{20}}$ or $\left(\frac{53}{x}\right)^3=\frac{30}{20}$ or better |

Question 45

| | | |
|---|---|---|
| 25 | **2** | **B1** for 67 or 113 seen once in correct position<br>or **M1** for $a$ + 42 = 67<br>or $a$ + 42 + 113 = 180 or better |

Question 46

| | | |
|---|---|---|
| 6.35 or 6.349 to 6.350 | **3** | **M2** for $\frac{8}{h}=\sqrt[3]{\frac{0.5}{0.25}}$ oe<br>or **M1** for $\left(\frac{8}{h}\right)^3=\frac{0.5}{0.25}$ oe<br>or for $\sqrt[3]{\frac{0.5}{0.25}}$ or $\sqrt[3]{\frac{0.25}{0.5}}$ oe |

Question 47

| | | |
|---|---|---|
| [$x$ =] 55 | **1** | |
| [$y$ =] 125 | **1FT** | correct or **FT** (180 – their $x$) |

Question 48

| | | |
|---|---|---|
| 42 | **2** | **M1** for $Q = 90$ or $WPQ = 90 - 42$ or $WPQ = 48$ |

Question 49

| | | |
|---|---|---|
| 150 | **3** | **M2** for $\left(\frac{1}{0.512}\right)^{\frac{2}{3}}$ oe or $\left(\frac{0.512}{1}\right)^{\frac{2}{3}}$ oe<br>or **M1** for scale factor $\left(\frac{1}{0.512}\right)^{\frac{1}{3}}$ oe or $\left(\frac{0.512}{[1]}\right)^{\frac{1}{3}}$ oe |

Question 50

| | | | |
|---|---|---|---|
| (a) | 10 | **2** | **M1** for $5x+6x+7x=180$ oe or $\frac{180}{5+6+7}$<br>or **B1** for angles 50, 60 and 70 |
| (b) | 70 | **1FT** | **FT** 7 × *their* **(*a*)** provided 0 < *their answer* < 180 |

Question 51

| | | |
|---|---|---|
| [$w$ =] 40 | **1** | |
| [$x$ = ] 95 | **2** | **B1** for angle $ABC$ = 85<br>or *their* $w$ + *their* $CBD$ = 85 |
| [$y$ = ] 45 | **2** | **B1** for angle $CBD$ = 45 or angle $ACD$ = 40<br>or angle $ACD$ = *their* $w$ or $y$ = *their* $CBD$ |

Question 52

| | | | |
|---|---|---|---|
| (a) | Similar | **1** | |
| (b) | 5.6 | **2** | **M1** for $\frac{4}{8}=\frac{2.8}{AX}$ oe |
| (c) | $\frac{y}{4}$ oe | **1** | |

Question 53

| | | |
|---|---|---|
| 110 | **1** | |
| 70 | **1** | |

Question 54

| | | | |
|---|---|---|---|
| (a) | [$u$ =] 35 | **1** | |
| | [$v$ =] 110 | **2** | **B1** for $ACB$ or $ADB$ = 35 |
| (b) | 75 | **2** | **B1** for 150<br>or **M1** for $\frac{360-210}{2}$ |

Question 55

| | | |
|---|---|---|
| 165 | **3** | **M2** for $\frac{360}{8}+\frac{360}{3}$ oe<br>or **M1** for [exterior angle of octagon =] $\frac{360}{8}$ or<br>[exterior angle of triangle =] $\frac{360}{3}$ oe |

Question 56

| | | |
|---|---|---|
| 76.9 or 76.94 to 76.95 | **3** | **M2** for $90 \div \sqrt[3]{\frac{160}{100}}$ or $90 \times \sqrt[3]{\frac{100}{160}}$<br>or **M1** for $\sqrt[3]{\frac{160}{100}}$ soi or $\sqrt[3]{\frac{100}{160}}$ soi or<br>$\left(\frac{h}{90}\right)^3=\frac{100}{160}$ oe |

Question 57

| | | |
|---|---|---|
| [$w$ =] 54<br>[$x$ =] 126<br>[$y$ =] 60 | **3** | **B1** for [$w$ =] 54<br>**B1** for [$x$ =] 126<br><br>If **B0 B0** for first two B marks then **B1** for *their* $w$ + *their* $x$ = 180<br><br>**B1** for [$y$ =] 60 or for *their* $w$ + *their* $x$ + *their* $y$ = 240 |

Question 58

| | | |
|---|---|---|
| 60 | **3** | **B2** for $x = 6$<br>or<br>**M1** for $29x + x = 180$ oe<br>and **M1** for $360 \div 6$ or $360 \div$ *their* $x$<br>or $180(n - 2) =$ *their* $x \times 29n$ |

Question 59

| | | |
|---|---|---|
| [$x$ = ] 60<br>[$y$ =] 40 | **2** | **B1** for each or for two numbers that add to 100 |

Question 60

| | | | |
|---|---|---|---|
| (a) | 1480 | **1** | |
| (b) | 30 | **3** | **M2** for $10 \times \sqrt{\frac{3960}{440}}$ or $10 \div \sqrt{\frac{440}{3960}}$<br>or **M1** for $\sqrt{\frac{3960}{440}}$ or $\sqrt{\frac{440}{3960}}$ or $\left(\frac{h}{10}\right)^2 = \frac{3960}{440}$ oe |

Question 61

| | | |
|---|---|---|
| 54 | **3** | **M2** for $\frac{180 \times (5-2)}{5}$ or $180 - \frac{360}{5}$<br>or **M1** for $180 \times (5 - 2)$ or $\frac{360}{5}$ |

Question 62

| | | |
|---|---|---|
| 101 | **1** | |

Question 63

| | | |
|---|---|---|
| 63<br>corresponding [angles]<br>59<br>angles [in a] triangle [add up to] 180 oe | **4** | **B1** for [$a$ =] 63<br>**B1** for corresponding angles<br>**B1FT** for [$b$ =] 59 or *their a* + *their b* = 122<br>**B1** for angles [in a] triangle [add up to] 180 oe |

Question 64

| | | | |
|---|---|---|---|
| (a) | similar | **1** | |
| (b) | 11.61 | **3** | **M2** for $8.6 \times \sqrt{\frac{65.61}{36}}$<br>or **M1** for $\sqrt{\frac{65.61}{36}}$ or $\sqrt{\frac{36}{65.61}}$<br>or $\left(\frac{8.6}{BX}\right)^2 = \frac{36}{65.61}$ oe |

Question 65

| | | | |
|---|---|---|---|
| (a) | 5 | **1** | |
| (b) | 1 | **1** | |

Question 66

| | | | |
|---|---|---|---|
| (a) | 1.8 | **2** | **M1** for $\frac{10}{8} = \frac{9}{AP}$ oe |
| (b) | 10.3 or 10.31 to 10.32 | **3** | **M2** for $13 \times \sqrt[3]{\frac{0.25}{0.5}}$ oe<br>or **M1** for $\sqrt[3]{\frac{0.5}{0.25}}$ oe or $\sqrt[3]{\frac{0.25}{0.5}}$ oe or $\frac{0.5}{0.25} = \left(\frac{13}{h}\right)^3$ oe |

Question 67

| | | |
|---|---|---|
| [$w$ = ] 95<br>[$x$ = ] 85<br>[$y$ = ] 48 | **3** | **B1** for each<br>If **B0** scored for $x$ and for $y$,<br>**SC1** for *their x* + *their y* = 133 |

Question 68

| | | |
|---|---|---|
| 7.5 nfww | **3** | **M2** for $[OB^2 =] \left(\frac{12}{2}\right)^2 + 4.5^2$ oe<br>or **B1** for recognition of right angle |

Question 69

| | | |
|---|---|---|
| 80 | **2** | **M1** for $\left(\frac{12}{3}\right)^2$ or $\left(\frac{3}{12}\right)^2$ oe or $\frac{3^2}{5}=\frac{12^2}{A}$ oe |

Question 70

| | | |
|---|---|---|
| 94 | **2** | **B1** for *ACB* or *PAB* or *ABC* = 43<br>or **M1** for $180-2\times43$ or $\frac{1}{2}x=90-43$ |

Question 71

| | | |
|---|---|---|
| 5 | **1** | |

Question 72

| | | |
|---|---|---|
| [*x* =] 62 | **2** | **B1** for 56 identified as angle *A*<br>or **M1** for $\frac{(180-56)}{2}$ |
| [*y* =] 118 | **2** | **FT** for 2 marks *their* acute *x* + *their y* =180<br>or 56 + *their* acute *x* = *their y*<br>or **B1** for any of<br>*ACB*, *BCM* or *LCN* = 62 or *their* acute *x*<br>or **M1** for 180 – 62 or 180 – *their* acute *x*<br>or 56 + 62 or 56 + *their* acute *x* |

Question 73

| | | |
|---|---|---|
| Congruent | **1** | |

Question 74

| | | |
|---|---|---|
| 73 | **3** | **B1** for angle *PBC* = 52<br>**B1** for *APO* or *BPC* = 55 or *APC* or *OPB* = 125 |

Question 75

| | | | |
|---|---|---|---|
| (a) | 126 | **4** | **M3** for $\frac{360-\left[180-\left(360\div 5\right)\right]}{2}$ or $\frac{360-180\times\left(5-2\right)\div 5}{2}$<br>or **M2** for $\frac{180\times\left(5-2\right)}{5}$ or $180-\frac{360}{5}$<br>or **M1** for $180\times(5-2)$ or $\frac{360}{5}$ |
| (b) | 7 : 2 | **2** | **M1** for $\sqrt{\frac{73.5}{6}}$ or $\sqrt{\frac{6}{73.5}}$ |

Question 76

| | | |
|---|---|---|
| 36 | **4** | **B1** for angle *KNL* or *MNJ* = 76<br>**B2** for angle *LJM* or *LKM* = 68<br>or **B1** for angle *LMJ* = 90 or *LKJ* = 90 or *LCM* = 136<br>(*C* = centre) |

Question 77

| | |
|---|---|
| 4 | **1** |

Question 78

| | | |
|---|---|---|
| 2.1 | **2** | **M1** for $\frac{33.6\times 25000^2}{100000^2}$ oe<br>or answer figs 21 |

Question 79

| | | |
|---|---|---|
| (a) | Trapezium | **1** |
| (b) | Obtuse | **1** |

Question 80

| | | |
|---|---|---|
| 1500 | **3** | **M2** for $12 \div \left(\frac{20}{100}\right)^3$ oe<br>or **M1** for $\left(\frac{20}{100}\right)^3$ or $\left(\frac{100}{20}\right)^3$ oe<br>OR<br>**M1** for $\div 20^3$ oe<br>**M1** for $\times 100^3$ oe |

Question 81

| | | |
|---|---|---|
| 100 | **2** | **M1** for reflex angle = 2 × 130 or opposite angle of a cyclic quadrilateral shown = 50 |

Question 82

| | | | |
|---|---|---|---|
| (a) | $180 - 4x$ | **1** | |
| (b) | $90 - 2x$ | **1** | **FT** *their* **(a)** ÷ 2 in its simplest form dep on expression in $x$ in **(a)** |
| (c) | $90 + x$ | **2** | **FT** 180 – *their* **(b)** – $x$ oe dep on expression in $x$ in **(b)** then fully simplified<br>**M1** for $180 - (90 - 2x + x)$ oe<br>or 180 – *their* **(b)** – $x$ oe dep on expression in $x$ in **(b)** |

Question 83

| | | |
|---|---|---|
| 352 | **3** | **B2** for figs 352<br>or **M1** for $\left(\frac{75}{30}\right)^3$ oe or $\left(\frac{30}{75}\right)^3$ oe<br>OR<br>**M2** for $5.5 \times \left(\frac{30}{75}\right)^3 \times 1000$ |

Question 84

| | | |
|---|---|---|
| 90 | **3** | **M2** for $360 \div (180 - 176)$ oe<br>or **M1** for $180(n - 2) = 176n$ oe or $180 - 176$ |

Question 85

| | | |
|---|---|---|
| 49 000 | **3** | **M1** for $4.9 \times (10\,000\,000)^2$<br>**M1** for $\div (100\,000)^2$<br>OR<br>**M1** for 1 cm : 100 km<br>**M1** for $4.9 \times$ (*their* 100)$^2$<br>OR<br>**M2** for $(\sqrt{4.9} \times 10\,000\,000 \div 100\,000)^2$<br>or **M1** for $\sqrt{4.9} \times 10\,000\,000 \div 100\,000$ |

Question 86

| | | |
|---|---|---|
| 116° | **B1** | |
| alternate segment theorem | **B1** | |
| angles in opposite segments are supplementary or cyclic quadrilateral<br>or<br>angles at a point on a straight line | **B1** | |

Question 87

| | | |
|---|---|---|
| 165 | **2** | **M1** for $\frac{(24-2)\times 180}{24}$ or $180 - \frac{360}{24}$ |

Question 88

| | | |
|---|---|---|
| 5 | **3** | **M2** for $8 \times \sqrt{\frac{52.5}{134.4}}$ oe<br>or **M1** for $\sqrt{\frac{52.5}{134.4}}$ or $\sqrt{\frac{134.4}{52.5}}$ oe |

Question 89

| | | |
|---|---|---|
| 116 | **2** | **M1** for angle $ACB = 32$ soi |

Question 90

| | | | |
|---|---|---|---|
| (a) | 49 | **1** | |
| (b) | 98 | **1** | **FT** 2 × *their* **(a)** |
| (c) | 20 | **1** | |
| (d) | 70 | **1** | **FT** 90 – *their* **(c)** |

Question 91

| | | |
|---|---|---|
| 25 | 2 | **B1** for 130 seen<br>or **M1** for 50 ÷ 2 |

Question 92

| | | |
|---|---|---|
| 2 | 1 | |

Question 93

| | | |
|---|---|---|
| Complete explanation with geometrical reasons | 3 | **B1** for $RQP = x°$ $QR$ bisects angle $PQB$<br>**B1** for $RPQ = x°$ alternate segment theorem<br>**B1** for triangle $PQR$ has two equal angles both less than 60 (so can't be equilateral) so must be isosceles |

Question 94

| | | |
|---|---|---|
| 16.6 or 16.64… | 5 | **M2** for $21 \times \frac{18}{13.5} = [AC]$ oe<br>or **M1** for scale factor $\frac{13.5}{18}$ or $\frac{18}{13.5}$ oe soi<br>Then Pythagoras method:<br>and **M2** for $\sqrt{28^2 + 18^2}$ [÷ 2]<br>or $\sqrt{(theirAC)^2 + 18^2}$ [÷ 2]<br>or **M1** for $AD^2 = 28^2 + 18^2$<br>or $AD^2 = (theirAC)^2 + 18^2$ |

Question 95

| | | |
|---|---|---|
| [$x$ =] 55<br>[$y$ = ] 24 | 2 | **B1** for each |

Question 96

| | | |
|---|---|---|
| 7 | 3 | **M2** for $166 + 2x = 180$ or better<br>or **M1** for $97 - 3x + 69 + 5x = 180$ oe |

Question 97

| | | | |
|---|---|---|---|
| (a) | Kite | 1 | |
| (b) | 80 | 2 | **M1** for (180 – 82 – 58) or better |

Question 98

| | | |
|---|---|---|
| Accurate triangle with correct construction arcs | **2** | **B1** for accurate triangle with no/incorrect arcs<br>or **SC1** for accurate triangle with arcs with sides interchanged |

Question 99

| | | |
|---|---|---|
| 171 | **2** | **M1** for $180 - (360 \div 40)$ oe or $\frac{(40-2)\times 180}{40}$ oe |

Question 100

| | | |
|---|---|---|
| 107 | **4** | **B2** for $x = 40$<br>or **M1** for $2x + x + 60 = 180$ oe<br><br>**M1** for correctly substituting *their* $x$ into $4x - 87 + y = 180$ oe<br>or $4x - 87 + x + 60 + y + 2x = 360$ oe |

Question 101

| | | |
|---|---|---|
| 15 | **2** | **M1** for $\frac{360}{180-156}$ or $\frac{180(n-2)}{n} = 156$ oe |

Question 102

| | | |
|---|---|---|
| 107 | **4** | **B2** for $x = 40$<br>or **M1** for $2x + x + 60 = 180$ oe<br><br>**M1** for correctly substituting *their* $x$ into $4x - 87 + y = 180$ oe<br>or $4x - 87 + x + 60 + y + 2x = 360$ oe |

Question 103

| | | |
|---|---|---|
| Correct triangle constructed with $AC = 5$ cm and $BC = 6.5$ cm and intersecting arcs | **3** | **B2** for correct triangle with no/incorrect arcs<br>or **SC2** for accurate triangle with arcs but sides interchanged<br><br>or **B1** for 6.5 [cm] or 5 [cm] soi |

Question 104

| | | | |
|---|---|---|---|
| (a) | 1.84 | **2** | **M1** for $\frac{1.61}{x}=\frac{2.8}{3.2}$ oe |
| (b) | 9.20 or 9.204 to 9.205 | **3** | **M2** for $11.5\times\sqrt[3]{\frac{4}{7.8}}$ oe<br>or **M1** for $\sqrt[3]{\frac{4}{7.8}}$ or $\sqrt[3]{\frac{7.8}{4}}$ oe seen<br>or for $\frac{11.5^3}{x^3}=\frac{7.8}{4}$ oe |

Question 105

| | | |
|---|---|---|
| 36 | **2** | **M1** for angle $EHG = 72$<br>or for angle $EHF = 47$ **and** $GHF = 25$ |

Question 106

| | | | |
|---|---|---|---|
| (a) | 80 | **2** | **B1** for angle $PQT = 50$ |
| (b) | $[w =]$ 68<br>$[x =]$ 36 | **3** | **B1** for 68<br>**B2** for 36<br>or **M1** for $3x + 2x + 68 + 112 = 360$ or better |

Question 107

| | | | |
|---|---|---|---|
| (a) | Similar | **1** | |
| (b) | 4 | **2** | **M1** for $\frac{12}{6}=\frac{8}{BX}$ oe or better<br>If **0** scored **SC1** for answer 3.5 |
| (c)(i) | 6.7265 or 6.73 or 6.726 to 6.727 | **2** | **M1** for scale factor $2^2$ or $\left(\frac{1}{2}\right)^2$ oe soi |
| (c)(ii) | 13.453 or 13.5 or 13.45 to 13.46 | **1** | **FT** *their* **(c)(i)** × 2 |

Question 108

| | | |
|---|---|---|
| 130 | **2** | **M1** for 360 – 100 or better |

Question 109

| | | |
|---|---|---|
| Corresponding | **1** | |

Question 110

| | | | |
|---|---|---|---|
| (a) | 77.3 or 77.32 to 77.33… | **3** | **M2** for $\frac{360-60}{360}\times\pi\times12.4\times2$ oe<br>$[\pm n\times12.4]$<br>or **M1** for angle 60° or 300° soi<br>or for $\frac{k}{360}\times\pi\times12.4\times2$ oe $[\pm n\times12.4]$ |
| (b) | 5.17 or 5.172 to 5.173… | **3** | **M2** for $\frac{74.5}{\pi}\times\frac{360}{360-41}=r^2$ oe or better<br>or **M1** for $74.5=\frac{360-41}{360}\times\pi r^2$ oe<br>or for $\sqrt{\frac{74.5}{\pi}\times\frac{360}{k}}$ oe |

Question 111

| | | | |
|---|---|---|---|
| Congruent<br>Congruent<br>Not congruent | SAS<br>SSS<br>None | **3** | **B1** for each correct row |

Question 112

| | | |
|---|---|---|
| 456 or 456.4… | **4** | **M2** for $\frac{18.2}{\tan62}$ oe<br>or **M1** for $\tan62=\frac{18.2}{x}$ oe<br>**M1** for<br>$\frac{1}{2}\left(\left(\textit{their trapezium base}\right)+15.4\right)\times18.2$ oe |

Question 113

| | | |
|---|---|---|
| 68 | **3** | **M1** for correctly identifying 90° angle soi<br>or *DAC* / *DCA* = 68<br>**M1** for [obtuse angle] *AOC* identified as $2x$ soi<br>or $x$ = *their DAC* / *DCA* |

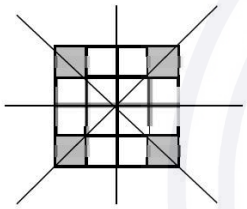
Question 114

| | | |
|---|---|---|
| Accurate construction of rhombus with sides 6.5 cm and correct construction arcs. | **2** | **B1** for accurate diagram with no/wrong arcs<br>or for one triangle (6.5 cm, 6.5 cm, 8 cm) correctly constructed with correct arcs or for four correct arcs |

Question 115

| | | |
|---|---|---|
| [$a$ =] 59<br>[$b$ =] 37<br>[$c$ =] 84 | **3** | **B1** for each<br><br>If 0 scored<br>**SC1** for *their* $(a + b + c) = 180$ if $a, b, c > 0$ |

Question 116

| | | | |
|---|---|---|---|
| (a) | 4 | **1** | |
| (b) |  | **2** | **B1** for 2 or 3 correct lines drawn<br>or for 4 correct lines and one wrong extra line |

Question 117

| | | |
|---|---|---|
| 40 000 | **3** | **B2** for 1 cm to 0.4 km or 2.5 cm to 1 km or 1 600 000 000<br><br>or **M2** for $\sqrt{\frac{3\times10^{k}}{18.75}}$ oe where $k > 5$<br><br>or **M1** for 1 $cm^2$ to 0.16 $km^2$ or 6.25 $cm^2$ to 1 $km^2$<br>or for $3 \times 10^{10}$ oe<br>or $1.875 \times 10^{-9}$ oe<br>or $3 \times 10^{6}$ oe **and** $1.875 \times 10^{-3}$ oe |

Question 118

| | | |
|---|---|---|
| 240 | **2** | **M1** for $360 \div (180 - 178.5)$ oe<br>or for $\frac{180(n-2)}{n} = 178.5$ oe |

Question 119

| | | |
|---|---|---|
| 48 | **2** | **B1** for 132 or 48 in the correct position on the diagram<br>or<br>**M1** for $180 - 132$ |

Question 120

| | | | |
|---|---|---|---|
| (a) | 55<br>Alternate segment theorem | **2** | **B1** for 55 |
| (b) | Tangents from an external point are equal in length | **1** | |

Question 121

| | | |
|---|---|---|
| 79 nfww | **3** | **M2** for $x + x + 58 + 58 + 86 = 360$ oe<br>or $86 - (180 - 2 \times 58)$ implied by $CAB = 22$<br>or **B1** for $DCA = 58$<br>or $BCA = x$<br>or $DAC = 64$ |

Question 122

| | | |
|---|---|---|
| correct triangle with arcs | **2** | **B1** for correct triangle with incorrect or no arcs<br>or for two correct arcs.<br>or a triangle with arcs but one side not in range |

Question 123

| | |
|---|---|
| 40° | **1** |

Question 124

| | | |
|---|---|---|
| *ADC* and *ADB* and 90<br>*AD*<br>RHS | **3** | **B1** for each correct line |

Question 125

| | |
|---|---|
| *DE* | **1** |

Question 126

| | | |
|---|---|---|
| 97 | 2 | **M1** for 360 – (73 + 129 + 75) |

Question 127

| | | |
|---|---|---|
| *PQX* and alternate<br>*PXQ* and [vertically] opposite oe<br><br>*ASA*<br>*XB* | 4 | **B2** for lines 1 and 2 correct<br>or **B1** for line 1 or 2 correct, or both angles correct<br><br>**B1** for line 3 correct<br>**B1** for line 4 correct |

Question 128

| | | |
|---|---|---|
| [$x$ = ] 38<br><br>[$y$ = ] 22 | 3 | **B1** for [$x$ = ] 38<br>and<br>**B2** for [$y$ = ] 22<br>or **M1** for angle $ACB$ = *their* $x$<br>or angle $BAD$ = 60<br>or angle $CBA$ = 120 |

Question 129

| | | |
|---|---|---|
| 162 | 3 | **M2** for $\left(\frac{(5-2)\times 180}{4+5+5+7+9}\right) \times k$ where $k$ = 1, 4, 5, 7, 9<br><br>or **M1** for $180n \div (4 + 5 + 5 + 7 + 9)$ where $n \geqslant 2$<br><br>or for (5 – 2) × 180 oe |

Question 130

| | | | |
|---|---|---|---|
| (a) | 4.5 oe | 2 | **M1** for $\frac{8}{6} = \frac{6}{QR}$ oe or better |
| (b) | 135 | 2 | **M1** for $\left(\frac{6}{8}\right)^3$ or $\left(\frac{8}{6}\right)^3$ or $\left(\frac{\textit{their}4.5}{6}\right)^3$ oe |

Question 131

| | | |
|---|---|---|
| 15 | 4 | **B2** for $x$ = 16 **soi**<br>or **M1** for $7x + 44 + x + 8 = 180$ or better<br><br>**M1** for $360 \div (\textit{their}\ x + 8)$ oe |

Question 132

| | | |
|---|---|---|
| Opposite angles add up to 180 oe | **1** | |

Question 133

| | | | |
|---|---|---|---|
| (a) | A and C | **1** | |
| (b) | ASA | **1** | |

Question 134

| | | |
|---|---|---|
| 112 | **2** | **M1** for $180 - 34 \times 2$ oe |

Question 135

| | | |
|---|---|---|
| [$u$ =] 20<br>[$v$ =] 52<br>[$w$ =] 108<br>[$x$ =] 36 | **4** | **B1** for each |

Question 136

| | | |
|---|---|---|
| 71.6 or 71.61 to 71.62 | **3** | **M2** for $\frac{\text{angle}}{360} = \frac{26-8-8}{2\pi \times 8}$ or better<br>or **M1** for $\frac{\text{angle}}{360} \times 2\pi \times 8$ oe |

Question 137

| | | | |
|---|---|---|---|
| (a) | 6 | **1** | |
| (b) | 8 | **2** | **M1** for $\left(\frac{2}{3}\right)^2$ or $\left(\frac{3}{2}\right)^2$ oe seen |

Question 138

| | | |
|---|---|---|
| 54 | **2** | **M1** for $180 - 71 - 55$ oe<br>or **B1** for 55 or 125 in a relevant correct position on the diagram |

Question 139

| | | | |
|---|---|---|---|
| (a) | 42 | **1** | |
| (b) | 55 | **1** | |
| (c) | 85 | **1** | |
| (d) | 108 | **2** | **M1** for [angle $ACD$ = ] 53<br>or [angle $BAC$ = ] 30 |
| (e) | 53 | **1** | |

Question 140

| | | |
|---|---|---|
| 24 | **3** | **M2** for $180(n-2)=11\times360$ oe<br>OR<br>**M1** for $\frac{180}{11+1}$ [× 11] oe<br>**M1** for $\frac{360}{their\ 15}$<br>or for $\frac{(n-2)\times180}{n}=(180-their\ 15)$ |

Question 141

| | | |
|---|---|---|
| 116 | **2** | **B1** for *ABD* = 32, *CAB* = 32, *BDC* = 32<br>or *CED* = 116<br>or **M1** for 180 – 32 – 32 |

Question 142

| | | | |
|---|---|---|---|
| (a) | SSS | **1** | |
| (b)(i) | 42 | **1** | |
| (b)(ii) | 42 | **1** | **FT** their part **(i)** |
| (b)(iii) | 84 | **1** | **FT** 2 × their part **(ii)** |

Question 143

| | | |
|---|---|---|
| 6.3 | **2** | **M1** for $\frac{5.6}{h}=\frac{7.2}{8.1}$ oe or better |

Question 144

| | | |
|---|---|---|
| 58, vertically opposite | **2** | **B1** for each |
| 122, interior | **2** | **B1** for each |

Question 145

| | | |
|---|---|---|
| 51 | **2** | **M1** for 360 – (56 + 104 + 71) |

Question 146

| | | | |
|---|---|---|---|
| (a) | Parallelogram | **1** | |
| (b) | 68 | **2** | **M1** for 180 – 112 oe<br>or for 180 – 112 – 44 |

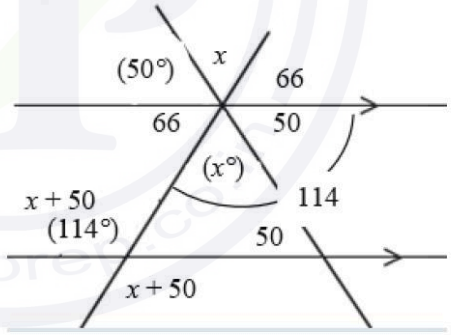
Question 147

| | | | |
|---|---|---|---|
| (a) | 62 | **2** | **B1** for angle $AOB = 124$<br><br>or **M1** for $\frac{180-28-28}{2}$ oe |
| (b) | 81 | **2** | **B1** for angle $RQP = 47$ or $QPU = 52$<br>or **M1** for $180 - 52 - 47$ |

Question 148

| | | | |
|---|---|---|---|
| (a) | 3.5 | **2** | **M1** for $\frac{9}{5} = \frac{6.3}{h}$ oe |
| (b) | 51.84 | **2** | **M1** for $\left(\frac{9}{5}\right)^2$ or $\left(\frac{5}{9}\right)^2$ oe<br><br>or $\left(\frac{6.3}{their(a)}\right)^2$ or $\left(\frac{their(a)}{6.3}\right)^2$ oe |

Question 149

| | | |
|---|---|---|
| 64 | **2** | **B1** for any of these angles labelled on the diagram<br>  <br><br>or **M1** for $x + 50 = 114$ or better |

Question 150

| | | |
|---|---|---|
| 33 | **3** | **B2** for $254 + 20 + x + 53 = 360$ oe or better<br>or $53 + 20 + x + 37 + 37 = 180$ oe or better<br>or $OAB = 33$<br>or $AOB = 114$<br>or 70 and 37 correctly identified<br>or 53 and 20 correctly identified<br><br>or **B1** for any correct relevant angle identified |

Question 151

| | | |
|---|---|---|
| 98 | 2 | **M1** for $x + 41 + 41 = 180$ oe or better |

Question 152

| | | |
|---|---|---|
| 25 | 3 | **B2** for [$y =$] 14.4 oe<br>or **M1** for $y + 11.5y = 180$<br>or for $360 \div$ *their* $y$ |

Question 153

| | | | |
|---|---|---|---|
| (a) | 50 | 1 | |
| (b) | 24 | 2 | **B1** for angle $PQR = 132$ soi<br>or **M1** for $\frac{180-(180-48)}{2}$ |

Question 154

| | | |
|---|---|---|
| 3.9 | 3 | **M2** for $5.2 \times \sqrt[3]{\frac{33.75}{80}}$ oe<br>or **M1** for $\frac{\sqrt[3]{33.75}}{\sqrt[3]{80}}$ oe or $\frac{\sqrt[3]{80}}{\sqrt[3]{33.75}}$ oe<br>or $\frac{h^3}{5.2^3} = \frac{33.75}{80}$ oe |

Question 155

| | | |
|---|---|---|
| 62 | 3 | **B2** for $m = 20$<br>or **M1** for $5m + 4m = 180$ soi<br>or $p + 4m + 38 = 180$ soi |

Question 156

| | | |
|---|---|---|
| 145 | 3 | **M1** for $180 \div 6$<br>or any angle congruent to $BCD = 30$<br>**M1** for (360 – 40 – *their* 30) ÷ 2 oe |