

UNIT 2: CALCULATOR-ALLOWED, HIGHER TIER

GENERAL INSTRUCTIONS for MARKING GCSE Mathematics - Numeracy

1. The mark scheme should be applied precisely and no departure made from it. Marks should be awarded directly as indicated and no further subdivision made.
2. Marking Abbreviations
 The following may be used in marking schemes or in the marking of scripts to indicate reasons for the marks awarded.
 cao = correct answer only
 MR = misread
 PA = premature approximation
 bod = benefit of doubt
 oe = or equivalent
 si = seen or implied
 ISW = ignore subsequent working

 F.T. = follow through (✓ indicates correct working following an error and ✗ indicates a further error has been made)

 Anything given in brackets in the marking scheme is expected but, not required, to gain credit.
3. Premature Approximation
 A candidate who approximates prematurely and then proceeds correctly to a final answer loses 1 mark as directed by the Principal Examiner.
4. Misreads
 When the data of a question is misread in such a way as not to alter the aim or difficulty of a question, follow through the working and allot marks for the candidates' answers as on the scheme using the new data.
 This is only applicable if a wrong value, is used consistently throughout a solution; if the correct value appears anywhere, the solution is not classed as MR (but may, of course, still earn other marks).
5. Marking codes
 - 'M' marks are awarded for any correct method applied to appropriate working, even though a numerical error may be involved. Once earned they cannot be lost.
 - 'm' marks are dependant method marks. They are only given if the relevant previous 'M' mark has been earned.
 - 'A' marks are given for a numerically correct stage, for a correct result or for an answer lying within a specified range. They are only given if the relevant M/m mark has been earned either explicitly or by inference from the correct answer.
 - 'B' marks are independent of method and are usually awarded for an accurate result or statement.
 - 'S' marks are awarded for strategy
 - 'E' marks are awarded for explanation
 - 'U' marks are awarded for units
 - 'P' marks are awarded for plotting points
 - 'C' marks are awarded for drawing curves

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1. $380 \times 2.54/100 \times$ or 0.0254×380 $380 \times (1+0.0254)^6$ (£)441.72, (£) 441.71(635...), Conclusion, e.g. No as less than £460 Organisation and communication Accuracy of writing	B1 M1 A1 E1 OC1 W1 6	May be embedded in further calculation Method of adding on different amounts, 6 year period, following attempts to calculate 2.54% (e.g. $380+9.65(2)=389.65(2)$) Accept (£)441 or (£)442 from appropriate working FT from their compounded amount provided M1
2.(a) Mid points 0.5, 1.5, 2.5, 3.5 $0.5 \times 12 + 1.5 \times 44 + 2.5 \times 20 + 3.5 \times 4$ $6 + 66 + 50 + 14 (= 136) \div 80$ (£)1.7(0) (b) $60 \times 2.3(0) + 80 \times 1.7(0) (=138+136 = 274)$ $\div (60 + 80)$ (£)1.96	B1 M1 m1 A1 M1 m1 A1 7	Accept $\pm 1p$ FT their mid-points, within & including bounds Their $\Sigma fx \div 80$ FT 'their £1.70' or 'their Σfx evaluated' $\div 140$. FT their 80 provided from attempted sum of the correct numbers An answer of (£)1.95714... is M1, m1, A0
3.(a) Correct multiplier $\times 0.55 \times 0.8(0)$ $\times 0.44$ Conclusion, e.g. 'not the same as Jane thinks it is $\times 0.35$', '$0.35 \neq 0.44$' (b) $T = 0.55(\times)P$ $R = 0.44(\times)P$	B2 B1 E1 B2 B1 7	B1 for 0.55 and 0.8(0) or $(1-0.45) \times (1-0.2)$ Must show comparative multiplier, i.e. sight of $(\times)0.35$ B1 for $T = P - 0.45(\times)P$ FT their multiplier for (a)

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4. Sight of 5 miles $\approx$ 8 km or 1 litre = 1.75 pints 7 km/l $\approx$ $7 \times 5/8$ miles/l $\approx 7 \times 5/8 \div 1.75$ (miles/pint) $\approx 7 \times 5/8 \div 1.75 \times 8$ (mpg) 20 (mpg)	B1 M1 M1 M1 A1 5	Or equivalent <i>Multipliers could appear in any order</i>
5. 52° or 38° indicated appropriately in the triangle Rig Bay to Jay Cliff = $\sin 52^\circ \times 3.2$ 2.5(216... km) ($3.2 + 2.5 \dots =$) 5.7 (km)	B1 M2 A1 B1 5	Sin $52^\circ = R \text{ to } J / 3.2$ FT ‘their RtoJ’ provided M1 awarded
6. Correct substitution into formula. Using 16553(p) $U = \frac{16553}{1.05 - .90} \times 31.48$ or equivalent 11.546 (Units used =) 1120	M1 m1 m1 A1 4	Do not penalise using (£)165.53 at this stage. The two ‘m’ marks may be awarded in either order. C.A.O. Accept answers of 1120 ± 1
7.(a) (i) $7.2^2 - 3.4^2 = h^2$ or other correct initial use of Pythagoras’ Theorem $h^2 = 40.28$ or ($h =$) $\sqrt{40.28}$ ($h =$) 6.3(46... cm) Volume = $\frac{1}{2} \times 3.4 \times 6.3(46..) \times 18.4$ 198.52(32...) 197(.064) or 197.1 ($200 - 198.52(32.. \text{cm}^3) = 1.48 =$) 1.5 (cm^3) (ii) Explanation, states or implies e.g. ‘too tight’, ‘could be different shape’ (b) 3.35, 3.45, 2.55, 2.65, 6.75, 6.85 Greatest $3.45 \times 2.65 \times 6.85 (=62.626125 \text{cm}^3)$ AND Least $3.35 \times 2.55 \times 6.75 (=57.661875 \text{cm}^3)$ Difference/Least ($\times 100$) (4.96425/57.661875) 8.6(%)	M1 A1 A1 M1 A1 B1 E1 B2 M1 m1 A1 12	Accept $7.2^2 - 3.4^2$, or $7.2^2 = 3.4^2 + \dots^2$ FT ‘their derived 6.3(46...) Accept answers from premature approximation CAO Sight of all 6 greatest and least values B1 for any 3 of the 6 Accept 9(%) from correct working
8(a) Correct or reasonable estimates for the population densities, identifying Singapore as greatest and Wales as the least.	B2	Singapore and Wales may not be identified explicitly but implied in later working. B1 at least 3 reasonable estimates for the population densities
7540.78 $\div$ 144.790713... 52(.0805.... times)	M1 A1 B1	
(b) Wales and Tonga	B2	B1 for 4 correct
(c) False True False False False		
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9(a) $\text{Diagonal}^2 = 8^2 + 8^2$ $\text{Diagonal} = 11.3(13..cm)$ $\text{Height} = \tan 32^\circ \times \frac{1}{2} \text{ Diagonal}$ $\text{Height} = 3.5(347.. cm)$ (b) Volume pyramid = $\frac{1}{3} \times (8 \times 8) \times 3.5(347...)$ $75.4(09...cm^3)$ (c) Hemisphere: $75.4(09...cm^3) = \frac{1}{2} \times \pi \times r^3 \times \frac{4}{3}$ $r^3 = \frac{3 \times 75.4(09...) \times 2}{4 \times \pi}$ $\text{Radius hemisphere } 3.3(0....cm)$	 M1 A1 M2 A1 M1 A1 M1 m1 A1 10	 FT their derived diagonal M1 for $\tan 32^\circ = \text{height} / \frac{1}{2} \text{ Diagonal}$ FT their derived height FT their derived volume of pyramid or total volume Isolating r^3 or r <i>Allow SC1 if worked with volume of sphere equated to derived cap volume with r evaluated accurately</i>
10.(a) D: Giving each pupil a raffle ticket and then randomly drawing raffle tickets for selection (b) $\frac{23456}{23456 + 43244 + 83124 + 11782 + 63789} \times 250$ $\frac{23456}{225395}$ 26 (people)	B1 M1 m1 A1 4	 Intention to find Central Party share of the votes OR sight of $0.104066(194) \times 250$ Must be given as a whole number

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11. <i>NATIONAL INSURANCE</i> [Weekly gross salary (£)47840 ÷ 52 =] (£)920 $0.12 \times [(\text{£})805 - (\text{£})153] + 0.02 \times [(\text{£})920 - (\text{£})805]$ (£)80.54 <i>TAX</i> $(0.2 \times 31865) = (\text{£})6373$ $0.4 \times (47840 - 41865)$ (£)2390.00 $(6373 + 2390.00) = (\text{£})8763$ <i>PENSION</i> $[(\text{£})920 \times 0.085 =] \text{ OR } [(\text{£})47840 \times 0.085 \div 52]$ (£)78.2(0) <i>TOTAL (Weekly)</i> $920 - [80.54 + 168.52 + 78.2(0)]$ = (£)592.74	B1 M2 A2 B1 M1 A1 B1 M1 A1 M1 A1 13	<i>Allow equivalent working (e.g. working in weeks, months or annually)</i> <i>Allow reasonable approximation at each stage</i> <i>Penalise once only for use of 48 weeks (12 × 4 weeks)</i> M1 for one FT 'their (£)920' A1 for (£)78.24 or (£)2.30 FT 'their (£)78.24' + 'their (£)2.30' (may be seen in later workings) Accept $0.4 \times (47840 - 41866)$ Accept (£)2389.6(0) Accept $(6373 + 2389.6(0) =)$ (£)8762.6(0) FT 'their (£)6373' + 'their (£)2389.6(0)' Award B1 for sight of (£)168.52 or (£)168.51 (may be seen in later workings) FT 'their (£)920' Accept $920 - [80.54 + 168.51 + 78.2(0)]$ FT all their values for 'weekly gross salary', 'tax', 'NI' and 'pension' Accept (£)592.75