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# **GCSE MARKING SCHEME**

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**AUTUMN 2016**

**MATHEMATICS - NUMERACY (NEW)  
UNIT 2 - INTERMEDIATE TIER**

**3310U40-1**

## **INTRODUCTION**

This marking scheme was used by WJEC for the 2016 examination. It was finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conference was held shortly after the paper was taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conference was to ensure that the marking scheme was interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conference, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about this marking scheme.

GCSE Mathematics – Numeracy Unit 2: Intermediate Tier Autumn 2016	Mark	Comment
1(a) 6 km	B1	
1(b) 19:30	B1	
1(c) 18:30	B1	
1(d) Explanation, e.g. 'still the same distance from home', 'keeping the same distance', 'he was 6 km away from home for the whole time', 'his distance stayed at 6 km from home', 'does not change distance during this time', 'didn't go any further from home', 'didn't get any closer to home'	E1	<p>Ignore additional incorrect statements except when it implies he was stopped</p> <p>Accept, e.g. 'he was jogging on the spot', 'he was climbing a tower block', 'walking on a circular path (centred on his home)', 'kept a constant distance', 'he was walking but keeping the distance from home'</p> <p>Allow, e.g. 'he was stuck in traffic he is still on his journey'</p> <p>Do not accept, e.g. 'turning round to head for the supermarket', 'he is going in the same direction for 30 minutes', 'could be stuck in traffic', 'he had a break as the distance didn't change showing he stayed in the same place', 'stayed in the same place for 30 minutes', 'he is at the supermarket', 'he was walking the same distance for 30 minutes'</p>

GCSE Mathematics – Numeracy Unit 2: Intermediate Tier Autumn 2016	Mark	Comment
2(a)(i) Angle $100^\circ (\pm 2^\circ)$  $36000 \times 100 (\pm 2) \div 360$ or $100 \times 100 (\pm 2)$  $9800$ to $10200$  (people)	B1  M1  A1	Sight of 100 ignoring any incorrect units is B1 only, until used in a relevant calculation  FT for M1 only if the angle is out of tolerance but within $\pm 4^\circ$
2(a)(ii) Sport $115^\circ \pm 2^\circ$ and News $55^\circ \pm 2^\circ$  $36000 \times 115 (\pm 2) \div 360$ - $36000 \times 55 (\pm 2) \div 360$ , or $36000 \times 60 (\pm 4) \div 360$ or $11500 (\pm 200) - 5500 (\pm 200)$  $5600$ to $6400$ (people)	B1  M1  A1	Both angles within tolerance OR sight of $60 (\pm 4)$  FT $60 (\pm 4) \times$ 'their number of people per degree' FT for M1 only if one angle is out of tolerance but this one angle is within $\pm 4^\circ$
2(a)(iii) (Talent show is) $\frac{1}{4}$ of 36000 and considering $\frac{2}{3}$ of this angle or number of people  $\frac{2}{3} \times 36000 \times 90 \div 360$ or $\frac{2}{3} \times 9000$ or equivalent  $6000$ (women)	B1  M1  A1	OR considering 36000 – 'their drama' – 'their sport' – 'their news' if clearly identifiable  Or $60 \times$ 'their number of people per degree' FT 'their $\frac{1}{4} \times 36000$ '  CAO
2(b) $360 \times 70/100$ or equivalent  $252^\circ$	M1  A1	OR sight of $700 \div 2.7(777\dots)$ or $700 \div 2.8$  CAO
3. Sight of (€) 7000 or (€) 24 000 or (€) 31 000  (Tax at 25%) $0.25 \times 7000$  $(€) 1750$  (Tax at 35%) $0.35 \times 24\ 000$ or $0.35 \times (34\ 500 - 10\ 500)$ or $0.35 \times (31\ 000 - 7000)$ or equivalent $(€) 8400$  Tax $(€) 10\ 150$	B1  M1  A1  M1  A1  B1	Ignore £ for €  FT use of 'their 10500 - 3500', or 10500, or for sight of (€)2625 CAO, not FT  FT use of $(31\ 000 - 10\ 500 =) 20\ 500$ as 'their 24 000', including for sight of (€)7175  CAO, not FT  FT 'their 1750' + 'their 8400' provided both M1 marks previously awarded (e.g. FT 2625 + 7175 = (€)9800)  <u>Alternative:</u> Sight of (€) 7000, (€) 24000 or (€)31000 B1 34500 - $(0.75 \times 7000 + 0.65 \times 24000 + 3500)$ M4 (or M1 for sight of $0.75 \times 7000 + 0.65 \times 24000 + 3500$ ) (€) 10 150 A1

GCSE Mathematics – Numeracy Unit 2: Intermediate Tier Autumn 2016	Mark	Comment
4(a) $450 \times 99.4(0)$ $44\ 730$ (rupees)	M1 A1	If units are given they must be correct  <i>If no marks, award SC1 for sight of digits 4473(0) irrespective of place value</i>
4(b) $(450 \times 99.72 =) 44\ 874$ (rupees)  Means he can buy 44 500 (rupees) or 89 (500 rupee notes)  $44\ 500 \div 99.72$ or $450 - (44\ 874 - 44\ 500) \div 99.72$  $(\pounds) 446.25$	B1  B1  M1  A1	B1 for sight of $(500 \div 99.72 =) (\pounds)5.01(40\dots)$  OR B1 for sight of $44\ 874 \div 500 (=89.748\dots)$ <b>AND</b> $89 \times 500 = 44\ 500$ OR B1 for sight of $450 \div 5.01(40\dots)$ $(=89.748\dots)$ <b>AND</b> $89 \times 500 = 44\ 500$ or 89 notes  M1 FT rounding down to nearest 500 rupees provided $450 \times 99.72$ attempted  OR M1 for sight of $446.25 \times 99.72 = 44500$ from trial & improvement FT 'their 44 500' provided it is a multiple of 500 provided at least B1 previously awarded  A1 CAO  <u>Use of 99.40 rupees in (b)</u> $(450 \times 99.40 =) 44\ 730$ (rupees) <span style="float:right">B0</span> Means he can buy 44 500 (rupees) or <span style="float:right">B1</span> $89$ (500 rupee notes) $44\ 500 \div 99.40$ or $450 - (44\ 730 - 44\ 500) \div 99.40$ <span style="float:right">M1</span> $(\pounds) 447.69$ <span style="float:right">A0 as CAO</span>

GCSE Mathematics – Numeracy Unit 2: Intermediate Tier Autumn 2016	Mark	Comment
<p>5(a)</p> <p>(Eleri pays <math>6 \times \text{£}84.50 =</math>) (£)507</p> <p>(Nerys pays) <math>\frac{2}{3} \times 6 \times 84.5(0)</math></p> <p style="text-align: right;">+ 30</p> <p>Amount in the range (£) 367.98 to (£)368.04</p> <p>(Nerys pays £507 – (£367.98 to 368.04) less than Eleri)</p> <p>An answer in the range (£)138.96 to (£)139.02</p> <p>Organisation and communication</p> <p>Accuracy of writing</p>	<p>B1</p> <p>M1</p> <p>m1</p> <p>A1</p> <p>B1</p> <p>OC1</p> <p>W1</p>	<p>Treat use of 0.333, 0.666 or 0.67 as PA-1, do not accept 0.3 or 0.6 as <math>\frac{1}{3}</math> or <math>\frac{2}{3}</math> respectively (Note <math>\frac{1}{3} \times 84.50 = 28.1666\dots</math>) ( <math>\frac{2}{3} \times 84.50 = 56.333\dots</math> )</p> <p>Or <math>6 \times 84.5(0) - \frac{1}{3} \times 6 \times 84.5(0)</math> FT <math>\frac{2}{3} \times</math> 'their <math>6 \times 84.5(0)</math>'</p> <p><i>(Reminder: Depends on both the M and the m mark awarded)</i></p> <p>FT provided attempt <math>6 \times \text{£}84.50</math> for Eleri and M1&amp; m1 awarded for Nerys <i>(Omitting the cost of the Railcard gives £169, B0)</i></p> <p><i>Treat single journey considered as</i> MR-1 <i>(Eleri pays <math>3 \times 84.50 =</math>) £253.50</i> B1 <i>(Nerys pays) <math>\frac{2}{3} \times \text{£}253.50</math></i> M1 <i>+30</i> m1 <i>= (£)198.99 to (£)199.02</i> A1 <i>(difference of) (£)54.48 to (£)54.51</i> B1 <i>(depends on attempt <math>3 \times 84.50</math> and M1, m1)</i></p> <p><i>AND also similar to the alternative shown below</i></p> <p><u><i>Alternative looking directly at the saving:</i></u> <i>(Nerys saves=) <math>\frac{1}{3} \times 6 \times (\text{£})84.50</math></i> M2 <i>(£)168.96 to (£)169.02</i> A1 <i>- 30</i> m1 <i>(FT 'their 169' – 30)</i> <i>(=£) 138.96 to (£)139.02</i> A1</p> <p><i>Organisation and communication</i> For OC1, candidates will be expected to:</p> <ul style="list-style-type: none"> <li>• present their response in a structured way</li> <li>• explain to the reader what they are doing at each step of their response</li> <li>• lay out their explanations and working in a way that is clear and logical</li> <li>• write a conclusion that draws together their results and explains what their answer means</li> </ul> <p><i>Accuracy of writing</i> For W1, candidates will be expected to:</p> <ul style="list-style-type: none"> <li>• show all their working</li> <li>• make few, if any, errors in spelling, punctuation and grammar</li> <li>• use correct mathematical form in their working</li> <li>• use appropriate terminology, units, etc.</li> </ul>

GCSE Mathematics – Numeracy Unit 2: Intermediate Tier Autumn 2016	Mark	Comment																					
<p>5(b) <math>\frac{1}{3} \times 7(.80)</math> <math>30 \div 2.60</math></p> <p>He would need to make 12 (single) journeys (or more) or 6 return journeys (or more)</p>	<p>M1 M1  A1</p>	<p>FT 'their <math>\frac{1}{3} \times 7(.80)</math>' incorrectly evaluated Note: Break-even is 11.538.. single journeys.</p> <p>CAO Allow 'if he goes (at least) once a month'</p> <p><i>Alternative:</i> M1 for any one correct discounted return or single cost M1 for method for the equivalent of 12 single or 6 returns, full and discounted costs, with sight of considering also the £30 A1 For either 6 return journeys or 12 singles, with no incorrect working seen</p> <table border="1" data-bbox="903 775 1442 1061"> <thead> <tr> <th>Return, £</th> <th>Discounted return, £</th> <th>Discounted + cost of rail card, £</th> </tr> </thead> <tbody> <tr><td>15.60</td><td>10.40</td><td>40.40</td></tr> <tr><td>31.20</td><td>20.80</td><td>50.80</td></tr> <tr><td>46.80</td><td>31.20</td><td>61.20</td></tr> <tr><td>62.40</td><td>41.60</td><td>71.60</td></tr> <tr><td>78.00</td><td>52.00</td><td>82.00</td></tr> <tr><td>93.60</td><td>62.40</td><td>92.40</td></tr> </tbody> </table>	Return, £	Discounted return, £	Discounted + cost of rail card, £	15.60	10.40	40.40	31.20	20.80	50.80	46.80	31.20	61.20	62.40	41.60	71.60	78.00	52.00	82.00	93.60	62.40	92.40
Return, £	Discounted return, £	Discounted + cost of rail card, £																					
15.60	10.40	40.40																					
31.20	20.80	50.80																					
46.80	31.20	61.20																					
62.40	41.60	71.60																					
78.00	52.00	82.00																					
93.60	62.40	92.40																					
<p>6(a) <math>0.24 \times 303\,000</math> or <math>303\,000 - 0.76 \times 303\,000</math> or equivalent</p> <p>72 720 (hectares)</p>	<p>M2  A1</p>	<p>Ignore any further calculations M1 for sight of <math>0.76 \times 303\,000</math> (= 230 280), then M1 for sight of <math>303\,000 - 230\,280</math></p> <p>Mark final answer</p>																					
<p>6(b) <math>34 \times 0.98^2 \times 1.06^5</math></p> <p>Answer in the range (£)43.67 to (£)43.7(0)</p>	<p>M2  A1</p>	<p>OR equivalent method to decrease by 2% and to increase by 6% on different amounts (<math>34 \times 0.98^2 = 32.6536</math>) (<math>34 \times 1.06^5 = 45.4996\dots</math>) M1 for sight of either <math>\times 0.98^2</math> or <math>\times 1.06^5</math> or equivalent calculations</p> <p>CAO, from correct working</p>																					
<p>7(a)(i) <math>2x + 2y</math> metres</p>	<p>B1</p>																						
<p>7(a)(ii) 48 <math>y = 5b/6x</math></p>	<p>B1 B1</p>																						
<p>7(b) <math>2.6 \times 33.6/2.1</math> or <math>2.6 \times 16</math> 41.6 (cm)</p>	<p>M1 A1</p>	<p>CAO</p> <p>Award M1, A0 for an answer of 40.32 from PA (<math>33.6 \times 1.2 = 40.32</math>)</p>																					

GCSE Mathematics – Numeracy Unit 2: Intermediate Tier Autumn 2016	Mark	Comment
8(a) (diagonal <sup>2</sup> =) $3.3^2 + 3.3^2$ diagonal <sup>2</sup> = 21.78 or diagonal = $\sqrt{21.78}$ diagonal is 4.7 (cm)	M1 A1 A1	<i>Scale drawings are not accepted in Q8</i>  FT from M1 for the correctly evaluated square root of ‘their 21.78’ provided ‘their answer’ > 3.3 (cm) Must be to 1 d.p. Accept an unsupported 4.7(cm)
8(b) $11 \times 4.6(669\dots) \times 9.5 \times 4.6(669\dots)$ or $11 \times 4.7 \times 9.5 \times 4.7$ or $104.5 \times (4.7)^2$  (Area =) $2276(.01\text{cm}^2)$	M2           A1	FT for ‘their derived diagonal’, but not 3.3 cm M1 for sight of either $11 \times 4.6(669\dots)$ or $9.5 \times 4.6(669\dots)$ <i>(Height 44.3355... cm; width 51.3359...cm)</i>  Accept answers in the range 2211 (cm <sup>2</sup> ) to 2308.41 (cm <sup>2</sup> ) from appropriate working  <i>(Note: e.g. use of a diagonal such as 5.27(cm) allow appropriate calculation with 5.2 (cm) or 5.3 (cm) for M2, A1; however use of 5 throughout is a possible M2, A0)</i>



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<p>9(a) Sight of 31.2 and 3 or 180</p> <p style="text-align: center;"><math>\frac{31.2}{3}</math> OR</p> <p>(9.6 km/h =) 0.16 (km/min) with <math>\frac{31.2}{180}</math></p> <p style="text-align: center;">10.4 (km/h) OR 0.17(3.. km/min)</p> <p>% improvement <math>100 \times (10.4 - 9.6) \div 9.6</math> or  <math>100 \times 10.4 \div 9.6 - 100</math> or equivalent</p> <p style="text-align: center;">8(.333...%)</p>	<p>B1</p> <p>M2</p> <p>A1</p> <p>M1</p> <p>A1</p>	<p>Allow <math>31.2/7 \div 3/7</math>  FT 'their total distance'  'their total time in hours'  M1 for 'their total distance'  'their total time in minutes'  allow <math>31.2/7 \div 180/7</math></p> <p>FT from 1 arithmetic error in calculating either 31.2 or 3, i.e. one of these values needs to be correct  Do not FT from denominator in minutes unless 0.16 (km/min) seen  Allow a final answer from a correct method that rounds to 10.4, e.g. 10.3(54..km/h) from PA</p> <p><i>(Note: <math>31.2 \div 7 = 4.45714...</math>  <math>3 \div 7 = 0.42857...</math>  <math>180 \div 7 = 25.71428...</math>)</i></p> <p><i>If no marks so far, allow SC1 for evaluating 'a distance ÷ time in hours' correctly  (Sun to Sat : 10.615..., 10.45, 11, 10.6286, 10.8, 9.4286, 9.2727...)</i></p> <p>FT 'their 10.4' provided it is &gt;9.6 OR  FT 'their 0.17(3...)' provided it is &gt;0.16</p> <p><i>(Note: use of 10.354... leads to 7.85%)</i></p> <p><i>If previously M0, A0 for % improvement, allow SC1 for an answer of 108%, or similar from FT</i></p>
<p>9(b) <math>\tan</math> elevation = <math>\frac{200}{1600}</math> or equivalent</p> <p>Angle of elevation is <math>7(.125....^\circ)</math></p>	<p>M1</p> <p>A2</p>	<p>A1 for <math>\tan^{-1} 0.125</math> or <math>\tan^{-1} (200/1600)</math></p>

<p align="center"><b>GCSE Mathematics – Numeracy Unit 2: Intermediate Tier Autumn 2016</b></p>	<p align="center"><b>Mark</b></p>	<p align="center"><b>Comment</b></p>
<p>9(c)(i) run = <math>\frac{300}{\sin 10^\circ}</math> 1727(.631... m) or 1728(m)</p> <p>Assumption, e.g. 'road is straight', 'used a right-angled triangle', 'the road is smooth', 'Gwenda runs in a straight line'</p>	<p>M2</p> <p>A1</p> <p>E1</p>	<p>M1 for <math>\sin 10^\circ = 300/\text{run}</math></p> <p>ISW Accept reasonable estimates (rounding or truncation) following correct working, e.g. 1700, 1730, 1750</p> <p>Depends on a previous attempt to use right-angled triangle trigonometry or Pythagoras' theorem</p> <p>Accept 'Gwenda doesn't zigzag up the hill'</p>
<p>9(c)(ii) Impact, e.g. 'run could be longer', 'it is an under estimate', 'bumps could make it longer'</p>	<p>E1</p>	<p>Independent of (c)(i) Allow 'it is inaccurate'</p> <p>Do not accept 'shorter' alone However, accept 'shorter than the actual length'</p>
<p>10(a)(i) Mid points : 1.5 , 3 , 4.5, 7</p> <p><math>1.5 \times 2 + 3 \times 6 + 4.5 \times 8 + 7 \times 4</math> (= 3 + 18 + 36 + 28 = 85)</p> <p>4.25 (microns) <math>\div 20</math></p>	<p>B1</p> <p>M1</p> <p>m1</p> <p>A1</p>	<p>FT 'their mid points' provided each one lies within the appropriate group, including bounds</p> <p>Accept 4.3 from correct working, i.e. <math>85 \div 20</math> seen in working Do not accept 4.2 unless <math>4.25</math> or <math>85 \div 20</math> seen in working</p>

GCSE Mathematics – Numeracy Unit 2: Intermediate Tier Autumn 2016	Mark	Comment
10(a)(ii) 45 dust particles means $3 \times 7 : 3 \times 8$ $21 : 24$ or $21$ in total equivalent (A further) 13 (dust particles)	M1 m1 A1	Accept $7 \times 45 / (7+8) : 8 \times 45 / (7+8)$  Allow M1, m1, A0 for sight of $8 + 13 = 21$  <i>Alternative:</i> <i>Trial &amp; improvement, e.g.</i> $18 : 27$ (is $2 : 3$ incorrect) $19 : 26$ (incorrect) $20 : 25$ (is $4 : 5$ incorrect) $21 : 24$ (is $7 : 8$ correct!!)  <i>M1 for sight from the above list:</i> <i>a trial with correct simplification shown</i> <b>AND</b> <i>--- either for a second trial with correct simplification shown</i> <i>--- or the second trial has clearly been dismissed</i> <i>m1 Selection of <math>21 : 24</math></i> <i>A1 (a further) 13 (dust particles)</i>
10(b) (Circumference) $5 = 2 \times \pi \times r$ or $5 = \pi \times d$ Radius of the cylinder $\frac{5}{2\pi}$  Volume $\pi \times (5/2\pi)^2 \times 2$  4 (microns <sup>3</sup> )	M1 A1  m1 A2	$(5/2\pi = 0.79577\dots)$  FT 'their r' provided M1 awarded provided 'their r' $\neq 5/\pi$ A1 for $25/2\pi$ or $3.9(\dots)$ or $4.0$ (microns <sup>3</sup> )