

Solution	Marks	Remarks	
1. (a) The simple interest = \$1.5	1A	Any figure roundable to 64.3	
(b) $h = 64.3$	1A		
(c) $x = \frac{21}{5} (= 4.2)$	1A		
(d) (i) $x + 2y$ is greatest at (1, 4)	1A		
(ii) $x + 2y$ is least at (0, -3)	1A		
The greatest value is 9.	1A		
The least value is -6.	1A		
2. (a) $f(3) = 5$	1A	Accept answers showing in reasonable order (e.g. 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000)	
(b) $y = \frac{6x-3}{2x} (= 3 - \frac{3}{2x})$	1A		
(c) $\frac{1}{x-1} - \frac{1}{x+1} = \frac{2}{x^2-1} (= \frac{2}{(x-1)(x+1)})$	1A		
(d) The remainder is 2.	1A		
(e) H.C.F. = $2xy^2$ L.C.M. = $12x^2y^3z$ (or $2^2 \cdot 3x^2y^3z$)	1A+1A		
(f) $r = 1, s = -2$	1A+1A		
(g) $\frac{1}{\sqrt{3}-1} = \frac{\sqrt{3}+1}{2}$	1A		
3. $\frac{\sin\theta + \cos\theta}{\sin\theta - \cos\theta} = \frac{3}{2}$	1A		roundable to 78.7°, 259° deduct 1A for each excess answer
$2\sin\theta + 2\cos\theta = 3\sin\theta - 3\cos\theta$	1A		
$\sin\theta = 5\cos\theta$	1M		
$\therefore \tan\theta = 5$	1A+1A		
$\theta = 78.7^\circ$ or 259° (各答一个角扣一分) 用 radian 表示亦可	4		
Remark $\sin\theta = 5\cos\theta$ (same as above) $\sin^2\theta = 25\cos^2\theta$ $\sin^2\theta = 25(1 - \sin^2\theta)$ $\sin^2\theta = \frac{25}{26}$ (i) If $\sin\theta = \sqrt{\frac{25}{26}}$, $\theta = 78.7^\circ$ or 101° (rej.) (ii) If $\sin\theta = -\sqrt{\frac{25}{26}}$, $\theta = 259^\circ$ or 281° (rej.)	1A 1M 1A 1A		

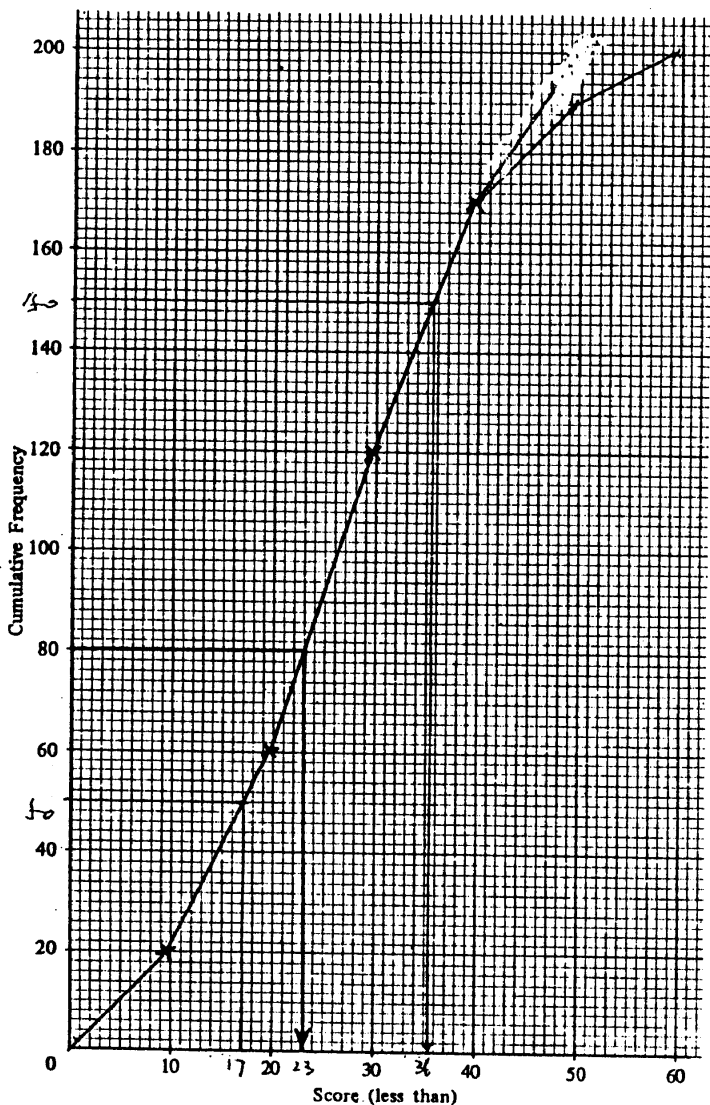
RESTRICTED 内部文件

Solution	Marks	Remarks
<p>4. $x^2 - x - 2 < 0$</p> <p>$(x + 1)(x - 2) < 0$</p> <p>$\therefore -1 < x < 2$</p> <p>Putting $x = y - 100$, we have</p> <p>$-1 < y - 100 < 2$</p> <p>$\therefore 99 < y < 102$</p>	<p>1A</p> <p>2A</p> <p>1M</p> <p>2A</p> <hr style="width: 50%; margin: 0 auto;"/> <p>6</p>	<p>for factorization or accept as $x = -1, 2$</p> <p>deduct 1A for any equal sign, accept graphical solution</p>
<p>5. (a) $9^x = \sqrt{3}$</p> <p>$9^x = 3^{\frac{1}{2}}$ (or $3^{2x} = \sqrt{3}$, $9^{2x} = 3$ etc.)</p> <p>$3^{2x} = 3^{\frac{1}{2}}$</p> <p>$2x = \frac{1}{2}$</p> <p>$\therefore x = \frac{1}{4}$</p>	<p>1A</p> <p>1M</p> <p>1A</p>	<p>equating index with the same base</p>
<p>OR Taking logarithms</p> <p>$x \log 9 = \log \sqrt{3}$</p> <p>$x = \frac{\log \sqrt{3}}{\log 9}$</p> <p>$= 0.25$</p>	<p>1M</p> <p>1A</p> <p>1A</p>	
<p>(b) $x \left(\frac{x^{-1}}{y^2} \right)^{-3} = x \left(\frac{1}{xy^2} \right)^{-3}$</p> <p>$= x(xy^2)^3$</p> <p>$= x(x^3y^6)$</p> <p>$= x^4y^6$</p>	<p>2M+1A</p>	<p>1M for correct use of the formula $a^{-n} = \frac{1}{a^n}$</p> <p>1M for correct use of the formula $(a^m)^n = a^{mn}$</p>

RESTRICTED 内部文件

Solution	Marks	Remarks
6. (a) $\alpha + \beta = \frac{m}{2}$ $\alpha\beta = \frac{500}{2} (= 250)$	1A	
The area of the picture = $\alpha\beta = 250$	1A	
(b) (i) The perimeter = $2(\alpha + \beta)$ $= 2\left(\frac{m}{2}\right) = m$	1A	
(ii) The area of the border $= (\alpha + 4)(\beta + 4) - \alpha\beta$ $= \alpha\beta + 4(\alpha + \beta) + 16 - \alpha\beta$ $= 4\left(\frac{m}{2}\right) + 16$ $= 2m + 16$	1A+ 1M	$(\alpha + 4)(\beta + 4)$ → subtracting answer in (a)
OR		
$= 2[2(\beta + 4) + 2\alpha]$ $= 4(\alpha + \beta) + 16$ $= 2m + 16$	1M+1A	1M for summation of areas
	1A	

7.



accept plotting the points with error ± 0.5

line segment from score 0 to score 9.5 is optional

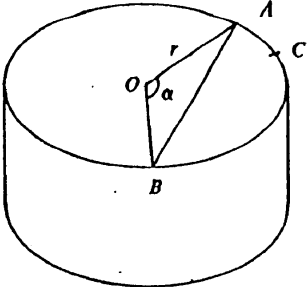
RESTRICTED 内部文件

Solution	Marks	Remarks														
<p>7. (a) Cumulative Frequency Table</p> <table border="1" style="margin-left: 20px; border-collapse: collapse;"> <thead> <tr> <th>Score (less than)</th> <th>Cummulative Frequency</th> </tr> </thead> <tbody> <tr><td>9.5</td><td>20</td></tr> <tr><td>19.5</td><td>60</td></tr> <tr><td>29.5</td><td>120</td></tr> <tr><td>39.5</td><td>170</td></tr> <tr><td>49.5</td><td>190</td></tr> <tr><td>59.5</td><td>200</td></tr> </tbody> </table>	Score (less than)	Cummulative Frequency	9.5	20	19.5	60	29.5	120	39.5	170	49.5	190	59.5	200	1A+1A	1A for any 3 correct
Score (less than)	Cummulative Frequency															
9.5	20															
19.5	60															
29.5	120															
39.5	170															
49.5	190															
59.5	200															
	2															
<p>(b) (i) Cumulative frequency polygon.</p> <p>The upper quartile = 36 (or 35)</p> <p>The lower quartile = 17</p> <p>∴ The interquartile range = 36 - 17 = 19</p>	1M+1A	<p><i>must be line segments</i></p> <p>1M for following the data in (a)</p> <p><i>上列 freq polygon 要對折</i></p>														
	1M+1A	<p>Accept 18 & 19</p> <p>1M for using the 25% or $(\frac{N+1}{4})$th value, etc.</p>														
<p>(ii) If the pass percentage is set at 60%, the number of students failed would be</p> <p>$200 \times (1 - 60\%) = 80$ <i>No. of students passed: 120</i></p> <p>The pass score should be 23</p>	1M	<p>80.</p> <p>or horizontal line through 80 on the graph</p>														
	1A															
	6															
<p>(c) Mean = 26.5 (<i>exact value</i>).</p> <p>Standard deviation = $\sqrt{166}$ (= 12.9)</p>	1A	Working steps are not required														
	1A	r.t. 12.9														
	2															
<p>(d) The new mean is <u>increased by 20</u>.</p> <p>i.e. Mean = 26.5 + 20 = 46.5</p> <p>The new standard deviation is <u>unchanged</u></p> <p>i.e. Standard deviation = $\sqrt{166}$ (= 12.9)</p>	1M	or exact answer														
	1M	or exact answer														
	2															

RESTRICTED 内部文件

Solution	Marks	Remarks
<p>8. (a) The slope of $L_1 = \frac{2-7}{10-0} (= -\frac{1}{2})$</p> <p>The equation of L_1 is $y - 7 = -\frac{1}{2}(x - 0)$</p> <p>i.e. $y = -\frac{1}{2}x + 7$</p> <p>(or $x + 2y - 14 = 0$, $5x + 10y - 70 = 0$, etc.)</p>	1A	
<p>(b) slope of $L_1 = -\frac{1}{2}$</p> <p>As $L_2 \perp L_1$, slope of $L_2 = 2$</p> <p>The equation of L_2 is</p> <p style="padding-left: 40px;">$y - 0 = 2(x - 4)$</p> <p>i.e. $y = 2x - 8$ (or $2x - y - 8 = 0$, etc.)</p> <p>Solving $\begin{cases} y = -\frac{1}{2}x + 7 \\ y = 2x - 8 \end{cases}$</p> <p style="padding-left: 40px;">$2x - 8 = -\frac{1}{2}x + 7$</p> <p>The coordinates of D are $x = 6$, $y = 4$ (or $D = (6, 4)$)</p>	1A <hr/> 2 <hr/> 1M <hr/> 1A <hr/> 1M <hr/> 1A	
<p>(c) As $AP : PB = k : 1$, the coordinates of P are given by</p> <p style="padding-left: 40px;">$x = \frac{10k}{1+k}$, $y = \frac{2k+7}{1+k}$</p> <p>Substituting in the equation of the circle,</p> <p style="padding-left: 40px;">$(\frac{10k}{1+k} - 4)^2 + (\frac{2k+7}{1+k})^2 = 30$</p> <p style="padding-left: 40px;">$(6k - 4)^2 + (2k + 7)^2 = 30(k + 1)^2$</p> <p>$\therefore 10k^2 - 80k + 35 = 0$</p> <p style="padding-left: 40px;">$2k^2 - 16k + 7 = 0 \dots\dots\dots (*) \quad 4 \pm \frac{5}{2}\sqrt{2}$</p> <p style="padding-left: 40px;">$k = \frac{16 \pm \sqrt{16^2 - 4 \times 2 \times 7}}{4} = \frac{8 \pm 5\sqrt{2}}{2}$ (7.54, or 0.464)</p> <p>As P lies on AD, $\frac{AP}{PB} = \frac{8 - 5\sqrt{2}}{2}$ (0.464)</p>	1A+1A <hr/> 1M <hr/> 1 <hr/> 1A <hr/> 1M <hr/> 6	<p>"x 消去"</p> <p>eliminate into 1 unknown</p> <p>accept $\frac{16 \pm \sqrt{200}}{4}$</p> <p>choosing the smaller one from 2 positive values</p>

RESTRICTED 内部文件

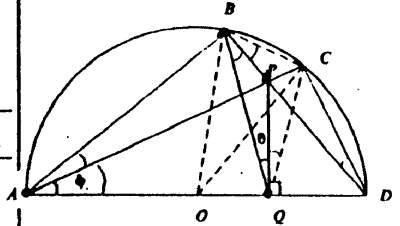
Solution	Marks	Remarks																											
9. (a) (i) Area of the sector $OACB = \frac{1}{2}r^2\alpha$ (ii) Area of $\triangle OAB = \frac{1}{2}r^2\sin\alpha$ (or $r^2\sin\frac{\alpha}{2}\cos\frac{\alpha}{2}$) \therefore area of the segment ACB $= \frac{1}{2}r^2\alpha - \frac{1}{2}r^2\sin\alpha$ (or $\frac{1}{2}r^2\alpha - r^2\sin\frac{\alpha}{2}\cos\frac{\alpha}{2}$) (iii) As AB divides the circle in the ratio 4:1 $\frac{1}{2}r^2\alpha - \frac{1}{2}r^2\sin\alpha = \frac{1}{5}\pi r^2$ $\therefore \sin\alpha = \alpha - \frac{2\pi}{5}$	1A 1M+1A 1M 1	 correct use of the ratio 4:1																											
Remark $\frac{\frac{1}{2}r^2(2\pi - \alpha) + \frac{1}{2}r^2\sin\alpha}{\frac{1}{2}r^2\alpha - \frac{1}{2}r^2\sin\alpha} = 4$ $\pi r^2 - \frac{1}{2}r^2\alpha + \frac{1}{2}r^2\sin\alpha = 2r^2\alpha - 2r^2\sin\alpha$ $\therefore \sin\alpha = \alpha - \frac{2\pi}{5}$	1M 1M																												
(iv) Let $f(\alpha) = \sin\alpha - \alpha + \frac{2\pi}{5}$ $f(2.1) (\approx 0.0198) > 0$ $f(2.2) (\approx -0.1349) < 0$ $\therefore f(\alpha) = 0$ has a root between 2.1 and 2.2 .	1	OR $f(\alpha) = \alpha - \sin\alpha - \frac{2\pi}{5}$ $f(2.1) < 0$ $f(2.2) > 0$ for showing opposite signs																											
(v) <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th style="width: 30%;">Interval</th> <th style="width: 20%;">Mid-value α_1</th> <th style="width: 50%;">f(α_1)</th> </tr> </thead> <tbody> <tr> <td>$2.1 < \alpha < 2.2$</td> <td>2.15</td> <td>-ve (-0.056)</td> </tr> <tr> <td>$2.1 < \alpha < 2.15$</td> <td>2.125</td> <td>-ve (-0.018)</td> </tr> <tr> <td>$2.1 < \alpha < 2.125$</td> <td>2.1125</td> <td>+ve (0.00097)</td> </tr> <tr> <td>$2.1125 < \alpha < 2.125$</td> <td>2.11875</td> <td>-ve (-0.0085)</td> </tr> <tr> <td>$2.1125 < \alpha < 2.11875$</td> <td>2.115625</td> <td>-ve (-0.0038)</td> </tr> <tr> <td>$2.1125 < \alpha < 2.115625$</td> <td>2.1140625</td> <td>-ve (-0.0014)</td> </tr> <tr> <td colspan="3" style="text-align: center;"><i>(b.p. 11.5)</i></td> </tr> <tr> <td>$2.1125 < \alpha < 2.1140625$</td> <td></td> <td></td> </tr> </tbody> </table>	Interval	Mid-value α_1	f(α_1)	$2.1 < \alpha < 2.2$	2.15	-ve (-0.056)	$2.1 < \alpha < 2.15$	2.125	-ve (-0.018)	$2.1 < \alpha < 2.125$	2.1125	+ve (0.00097)	$2.1125 < \alpha < 2.125$	2.11875	-ve (-0.0085)	$2.1125 < \alpha < 2.11875$	2.115625	-ve (-0.0038)	$2.1125 < \alpha < 2.115625$	2.1140625	-ve (-0.0014)	<i>(b.p. 11.5)</i>			$2.1125 < \alpha < 2.1140625$			1M+1A 1M-	for correct sign Testing sign at mid-value Correct choice of next interval Accept using smaller or larger starting intervals
Interval	Mid-value α_1	f(α_1)																											
$2.1 < \alpha < 2.2$	2.15	-ve (-0.056)																											
$2.1 < \alpha < 2.15$	2.125	-ve (-0.018)																											
$2.1 < \alpha < 2.125$	2.1125	+ve (0.00097)																											
$2.1125 < \alpha < 2.125$	2.11875	-ve (-0.0085)																											
$2.1125 < \alpha < 2.11875$	2.115625	-ve (-0.0038)																											
$2.1125 < \alpha < 2.115625$	2.1140625	-ve (-0.0014)																											
<i>(b.p. 11.5)</i>																													
$2.1125 < \alpha < 2.1140625$																													
$\therefore \alpha \approx 2.11$ (corr. to 2 d.p.)	1A 10	Check whether it is bounded by the last interval																											
(b) As the curved surface has uniform height, ratio of the curved surface areas of the two parts = ratio of the corresponding arc lengths. $= r(2\pi - \alpha) : r\alpha$ OR $(2\pi - \alpha) : \alpha$ $= 2\pi - 2.11 : 2.11$ $= 1.98 : 1$	1M 1A 2	OR $r\alpha : (2\pi - r)$ OR $\alpha : 2\pi - \alpha$ 1.98 及 1 之位置于解答时 r.t. 1.98																											
OR Let the height be h . \therefore ratio required = $r(2\pi - \alpha)h : r\alpha h$ $= 1.98 : 1$	1M 1A																												

RESTRICTED 内部文件

Solution	Marks	Remarks
<p>10. (a) The annual food production in</p> <p>(i) the 3rd year = $8 + 1 \times 2$ $= 10$ (or 10 million tonnes)</p> <p>(ii) the nth year = $8 + (n - 1) \times 2$ (or $n + 6$) $= 7 + n$ (million tonnes)</p>	<p>1A</p> <p>1A</p> <hr style="width: 50%; margin: 0 auto;"/> <p>2</p>	<p>u-1 for 10×10^6 or 10×10^6 million tonnes</p>
<p>(b) The total food production in the first 25 years</p> <p>= $\frac{25}{2} [2 \times 8 + (25 - 1) \times 2]$ or $\frac{25}{2} [8 + 8 + (25-1) \times 2]$ $= 500$</p>	<p>1A</p> <p>1A</p> <hr style="width: 50%; margin: 0 auto;"/> <p>2</p>	
<p>(c) The population of the country at the end of</p> <p>(i) the 3rd year = $2 \times (1 + 6\%)^2$ $= 2.25$ million</p> <p>(ii) the nth year = $2 \times (1 + 6\%)^{n-1}$ million (or $2 \times 1.06^{n-1}$ million)</p>	<p>1A</p> <p>1A</p> <hr style="width: 50%; margin: 0 auto;"/> <p>2</p>	<p>r.t. 2.25</p>
<p>(d) For the population to be doubled,</p> <p>$2 \times (1 + 6\%)^n = 4$ (\geq 12)</p> <p>Taking logarithm $n \log 1.06 = \log 2$</p> <p>$n = \frac{\log 2}{\log 1.06} = 11.9$</p> <p>The minimum number of years for the population to be doubled is 12 years.</p>	<p>1M</p> <p>1M</p> <p>1A</p> <hr style="width: 50%; margin: 0 auto;"/> <p>3</p>	<p>accept "answer of c(ii) = 4"</p> <p>for taking lograithm</p> <p>accept values r.t. 11.9</p>
<p>(e) The annual food production per capita of the 100th year</p> <p>= $\frac{7 + 100}{2 \times 1.06^{99}}$ $= 0.167$ < 0.2</p> <p>\therefore the country will face a food shortage problem.</p>	<p>1M+1A</p> <p>1M</p> <hr style="width: 50%; margin: 0 auto;"/> <p>3</p>	<p>1M for substituting $n=100$ to $\frac{\text{ans. of (a)(ii)}}{\text{ans. of (c)(ii)}}$</p> <p>corresponding logical conclusion</p>

RESTRICTED 内部文件

Solution	Marks	Remarks
11. (a) Join AB .		
$\angle ABD = 90^\circ$ (\angle in a semicircle)	1	accept "semicircle" or "diameter"
and $\angle AQP =$ 90° (Given) 缺 degree 4-1	1	
$\therefore \angle ABD + \angle AQP =$ 180° 或 \angle 的 补 角 180°	1	
\therefore AQPB is a cyclic quadrilateral. (Opp. \angle s supp.) i.e. A, Q, P, B are concyclic.	3	
(b) (i) Join CD .		
Using the same argument as in (a), it can be shown that PQDC is a cyclic quadrilateral.		
$\therefore \angle PQC =$ $\angle PDC$ (or $\angle BDC$) (\angle s in the same segment) 1	1	
Now consider the cyclic quadrilateral ADCB .		
$\angle BDC =$ $\angle BAC$ (or $\angle BAP$) (\angle s in the same segment) 1	1	
As AQPB is a cyclic quadrilateral,		
$\angle BAP =$ $\angle BQP$ (or θ) (\angle s in the same segment) 1	1	
$\therefore \angle BQC = \angle BQP + \angle PQC$		
In terms of θ ,		
$\angle BQC =$ 2θ	1	
(ii) Consider the given semi-circle.		
$\angle BOC = 2 \times \angle BAC$ \angle at centre = twice \angle at O^{ce}	1	accept " \angle at centre" or "O is the centre"
But $\angle BAC = \theta$ (Proved)		
$\therefore \angle BOC =$ 2θ (edge side 1/3)	1	
	6	
(c) Solution :		
Consider the quadrilateral AQPB .		
$\angle PBQ (= \angle PAQ) = \phi$	1	
But in the given semi-circle,		
$\angle CBD (= \angle CAD) = \phi$	1	
$\therefore \angle CBQ = \angle CBD + \angle PBQ$		
$= 2\phi$	1	
	3	
OR $\therefore \angle BQC = \angle BOC$ \therefore B, O, Q, C are concyclic Hence $\angle CBQ = \angle COQ$ $= 2\angle CAD$ $= 2\phi$	1	
	1	
	1	



RESTRICTED 内部文件

Solution	Marks	Remarks
<p>12. (a) (i) As PQ is perpendicular to the plane ABQ</p> $\tan 45^\circ = \frac{PQ}{AQ} \text{ and } \tan 60^\circ = \frac{PQ}{BQ}$ <p style="margin-left: 20px;">(或 PQ=AQ)</p> $\therefore AQ = \frac{h}{\tan 45^\circ} = h \text{ metres}$ $BQ = \frac{h}{\tan 60^\circ} = \frac{h}{\sqrt{3}} \text{ metres (or } 0.577h)$	<p>1A</p> <p>1A</p> <p>1A</p>	<p>for either</p> <p>r.t. 0.577</p>
<p>(ii) Consider $\triangle ABQ$.</p> <p>By the cosine rule,</p> $AB^2 = AQ^2 + BQ^2 - 2AQ \cdot BQ \cos \angle AQB$ $100^2 = h^2 + \left(\frac{h}{\sqrt{3}}\right)^2 - 2(h)\left(\frac{h}{\sqrt{3}}\right) \cos 80^\circ$ $= 1.13282h^2$ $\therefore h = 94.0 \text{ (93.9549)}$ <p>Consider $\triangle ABQ$ again.</p> <p>By the sine rule, $\frac{BQ}{\sin \angle QAB} = \frac{AB}{\sin \angle AQB}$</p> $\frac{93.9549}{\frac{\sqrt{3}}{\sin \angle QAB}} = \frac{100}{\sin 80^\circ}$ $\therefore \sin \angle QAB = \frac{93.9549 \times \frac{1}{\sqrt{3}} \sin 80^\circ}{100} = 0.5342$ $\angle QAB = 32.3^\circ \text{ (32.2902}^\circ)$	<p>1M+1A</p> <p>1A</p> <p>1A</p> <p>1M</p> <p>1A</p> <hr style="width: 50%; margin-left: auto; margin-right: 0;"/> <p style="text-align: center;">8</p>	<p>r.t. 94.0</p> <p>r.t. 32.3 accept 32°15'–32°21'</p>
<p>OR</p> <p>...</p> <p>By the cosine rule,</p> $QB^2 = AQ^2 + AB^2 - 2(AQ)(AB) \cos \angle QAB$ $\left(\frac{93.9549}{\sqrt{3}}\right)^2 = 93.9549^2 + 100^2 - 2 \times 93.9549 \times 100 \cos \angle QAB$ $\cos \angle QAB = 0.8454$ $\angle QAB = 32.3^\circ$	<p>1M</p> <p>1A</p>	

