

Write your name here	
Surname	Other names
Edexcel	Centre Number
International GCSE	Candidate Number
<h1 style="margin: 0;">Further Pure Mathematics</h1> <h2 style="margin: 0;">Paper 2</h2>	
Monday 21 May 2012 – Afternoon Time: 2 hours	Paper Reference 4PM0/02
Calculators may be used.	Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Without sufficient working, correct answers may be awarded no marks.
- Answer the questions in the spaces provided
– *there may be more space than you need.*

Information

- The total mark for this paper is 100.
- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Check your answers if you have time at the end.

Turn over ►

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PEARSON

Answer all ELEVEN questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

1 Solve the equation

$$5^{x+1} = 120$$

giving your answer to 3 significant figures.

(4)

(Total for Question 1 is 4 marks)



(2)

P 4 1 7 7 5 A 0 3 3 2

3 Solve the equations

$$2x^2 + xy - y^2 = 36$$

$$x + 2y = 1$$

(6)

[illegible]

(Total for Question 3 is 6 marks)



4 Differentiate with respect to x

$$(a) \quad \frac{1}{x^2}$$

$$(b) \frac{1}{(2x+1)^2} \quad (2)$$

$$(c) \frac{1}{1 - \cos^2 x} \quad (3)$$

(FOIA b 7 - DEXTER : 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



5 The curve R has equation $y = x^2 - 7x + 10$

The curve S has equation $y = -x^2 + 7x - 2$

- (a) Find the coordinates of each of the two points where the curves R and S intersect. (4)

- (b) Find the area of the finite region bounded by the curve R and the curve S . (4)

Question 5 continued



(Total for Question 3 is 6 marks)



- (3)

This image shows a full page of a handwriting practice worksheet. It consists of multiple sets of three horizontal lines each. Each set includes a solid top line, a dashed middle line, and a solid bottom line, providing a guide for letter height and placement. The lines are evenly spaced across the entire page, leaving ample room for practicing various letters and words.

(Total for Question 6 is 6 marks)



7 The curve G has equation $y = 3 - \frac{1}{x-1}$, $x \neq 1$

- (a) Find an equation of the asymptote to G which is parallel to

- (i) the x -axis,

- (ii) the y -axis.

(2)

- (b) Find the coordinates of the point where G crosses

- (i) the x -axis,

- (ii) the y -axis.

(2)

- (c) Sketch G , showing clearly the asymptotes and the coordinates of the points where the curve crosses the coordinate axes.

(3)

A straight line l intersects G at the points P and Q . The x -coordinate of P and the

x-coordinate of Q are roots of the equation $2x - 3 = \frac{1}{x - 1}$

- (d) Find an equation of l .

(2)

[illegible]

(continued from page 10)



8 The curve C has equation $y = 4x + 8 + \frac{25}{x-2}, x \neq 2$

(6)

(3)



(Total for Question 6 is 9 marks)



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- This image shows a full page of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page, providing a template for handwriting practice. There are no margins, text, or other markings on the page.

Question 9 continued

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

(Total for Question 9 is 13 marks)



10 The points A , B , C and D are the vertices of a quadrilateral and

$$\overrightarrow{AB} = 3\mathbf{i} + 5\mathbf{j}, \quad \overrightarrow{AC} = 6\mathbf{i} + 6\mathbf{j} \quad \text{and} \quad \overrightarrow{AD} = 9\mathbf{i} + 3\mathbf{j}$$

(a) (i) Find \overrightarrow{BC}

(ii) Hence show that $ABCD$ is a trapezium.

(3)

(b) (i) Find the exact value of $|\overrightarrow{BD}|$

(ii) Find a unit vector parallel to \overrightarrow{BD}

(4)

The point F is on the line BD and $BF : FD = 1 : 2$

(c) Find \overrightarrow{AF}

(2)

The point E is on the line AD such that $ABCE$ is a parallelogram.

(d) (i) Show that F lies on the line CE

(ii) Find the ratio $EF : FC$

(6)



[illegible]

(Total for Question 10 is 15 marks)



11

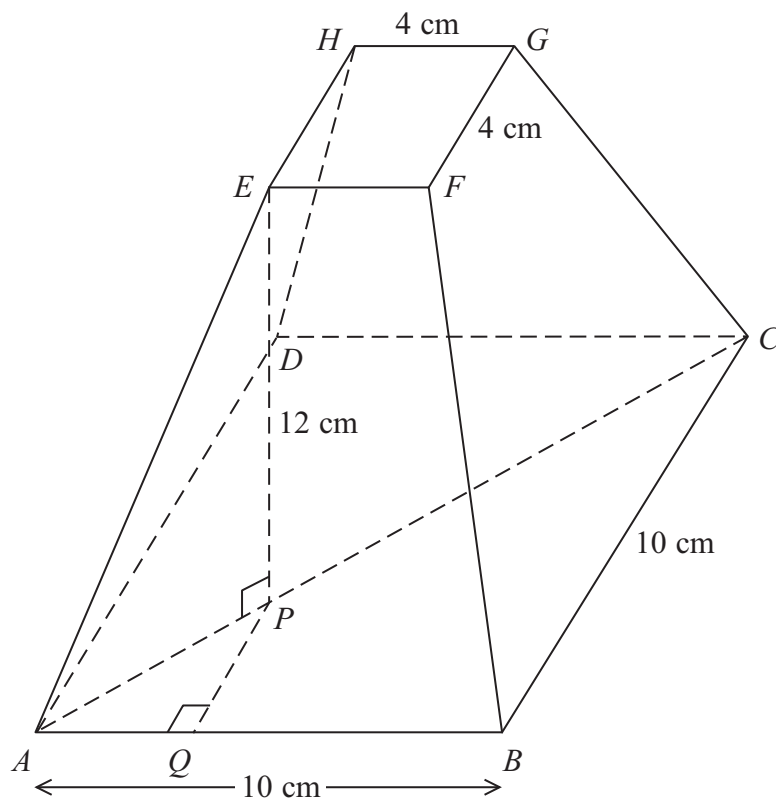
Diagram **NOT** accurately drawn

Figure 1

Figure 1 shows a truncated right pyramid. The base $ABCD$ is a square with sides of length 10 cm. The top $EFGH$ is a square with sides of length 4 cm. The base is parallel to the top and $AE = BF = CG = DH$.

The point P is on the line AC such that angle APE is a right-angle and $EP = 12$ cm.

(a) Find, in centimetres, the exact length of

(i) AC (ii) EG (iii) AP

(6)

(b) Find, in centimetres to 3 significant figures, the length of AE .

(2)

(c) Find, in degrees to 1 decimal place, the angle between the line AE and the plane $ABCD$.

(2)

The point Q is on the line AB . Angle AQP is a right-angle.

(d) (i) Show that $PQ = 3$ cm.

(ii) Write down, in centimetres, the length of AQ .

(2)

(e) Find, in degrees to 1 decimal place, the angle between the line AE and the line AB .

(2)

(f) Find, in degrees to 1 decimal place, the angle between the plane $ABFE$ and the plane $ABCD$.

(3)







TOTAL FOR PAPER IS 100 MARKS