2014 Higher Prelim 1

Objective Test – Answers

Questions 1 – 16 are level C

Questions 17 – 20 are levels A/B

1	**B**
2	**D**
3	**B**
4	**B**
5	**D**
6	**B**
7	**A**
8	**B**
9	**A**
10	**B**
11	**C**
12	**C**
13	**D**
14	**C**
15	**A**
16	**A**
17	**D**
18	**A**
19	**C**
20	**D**

Paper 1 Section B Marking Scheme

21.

- 1 Rearrange equation making y the subject. $y = -2/3\,x + 5/3$
- 2 Parallel lines implies equal gradients $m = -2/3$
- 3 State equation of line $y + 1 = -2/3(x - 2)$

Notes

1. Mark 2 is available if it is consistent with mark 1
2. Mark 3 is available if it is consistent with mark 2

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22. (a)

Method 1 Synthetic division

1	2	-1	-4	3

- 1 Know to use $x = 1$

- 2 Complete evaluation

1	2	-1	-4	3
		2	1	-3
	2	1	-3	0

- 3 State conclusion $(x - 1)$ is a factor see note 2
- 4 Find quadratic factor $2x^2 + x - 3$ stated /implied by 5
- 5 Factorise completely $(x-1)(x-1)(2x + 3)$ stated explicitly

Method 2 Substitution and inspection

Know to use $x = 1$
$2 - 1 - 4 + 3 = 0$
$(x-1)$ is a factor see note 2
$(x-1)(2x^2 + x - 3)$
$(x-1)(x-1)(2x + 3)$ stated explicitly

Notes

1. Communication at mark 3 must be consistent with working at mark 1. Candidates working must arrive legitimately at zero before mark 3 is awarded. If the remainder is not zero then an appropriate statement would be '$(x - 1)$ is not a factor'.
2. For mark 3, minimum acceptable statement is 'factor'. Unacceptable statements: $x=1$ is a factor, $(x+1)$ is a factor, $x=1$ is a root, $(x-1)$ is a root etc.
3. At mark 5 the expression may be written as $(x-1)^2(2x + 3)$

22. (b)

- 6 State solutions $x = 1$ and $x = -3/2$ or -1.5 or equivalent (These may appear in the working at (a))

Notes

4. From (a) $(x-1)(x-1)(2x+3)$ leading to $x=1$ and $x=-3/2$ then $(1,0)$ and $(-3/2, 0)$ gains mark 6. However $(x-1)(x-1)(2x+3)$ leading to $(1,0)$ and $(-3/2, 0)$ does not gain mark 6.

5. From (a) $(x-1)(2x+3)$ leading to $x=1$ and $x=-3/2$ does not gain mark 6, as equation solved is not a cubic. However $(x-1)(x+1)(2x+3)$ leading to $x=1$, $x = -1$ and $x=-3/2$ gains mark 6, as follow through from a cubic equation.

22. (c)

Method 1

- 7 Set $y_{curve} = y_{line}$ $2x^3 - x^2 - 2x + 2 = 2x - 1$
- 8 Express in standard form $2x^3 - x^2 - 4x + 3 = 0$ See note 6
- 9 Compare with (a) or factorise $(x-1)(x-1)(2x + 3) = 0$
- 10 Identify x_G $x = 1$
- 11 Evaluate y_G $y = 1$

Method 2

- 7 Know to differentiate curve $6x^2 - 2x - 2$
- 8 Set derivative to gradient of line $6x^2 - 2x - 2 = 2$
- 9 Solve quadratic $x = -2/3$ and 1
- 10 Process to identify x_G at $x = 1$ evaluate y_{curve} and y_{line}
- 11 Complete to $y_{curve} = y_{line}$ $y = 1$ from both curve and line

Notes

In Method 1

6. Mark 8 is only available if '= 0' appears at either mark 8 or 9 stage.
7. Marks 9, 10 and 11 are only available via the working from marks 7 and 8.
8. If $(x-1)(x-1)(2x + 3)$ does not appear at mark 9 stage, it can be implied by marks 5 and 10.
9. At mark 9 a quadratic used from (a) may gain marks 9, 11 and 12 but a quadratic from mark 8 may gain marks 11 and 12 only.
10. If G and H are interchanged then mark 10 is lost but marks 11 and 12 are available.
11. Candidates who obtain three distinct factors at mark 9 can gain mark 11 for evaluating all y values but lose marks 10 and 12

12. A repeated factor at mark 5 or 9 stages is required for mark 10 to be awarded without justification and mark 12.

In both methods

13. All marks in © are available as a result of differentiating $2x^3 – x^2 – 2x + 2$ and solving this equal to 2 (from method 2)
    Only marks 7 and 8 (from method 1) are available to those candidates who choose to differentiate $2x^3 – x^2 – 4x + 3$ and set this equal to 0.
14. Candidates may choose a combination of making equations equal and differentiation.

22. (d)

- 12 State solution (-3/2, -4)

Notes

15. Method 2 from c would not yield a value for J and so mark 12 is not available.

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23. (a)

- 1 a = 2
- 2 b = 2
- 3 c = -11

Note

1. The values of a, b and c can be arrived at by completing the square or by expanding $a(x+b)^2+c$ and equating the coefficients. Any carry through errors make subsequent marks available.

23. (b)

- 4 Shape of graph (minimum)
- 5 Minimum TP (-2, -11)

Note

2. Mark 5 is available if the TP is consistent with the values of b and c in part (a).

23. (c)

- 6 Shape and position
- 7 Graph passes through point (-2,2)

Notes

3. Mark 6 is available if the shape and position are consistent with part (b).
4. Mark 7 is available if the point is consistent with mark 5.

23. (d)

- 8 Solve quadratic inequality $-9 - 2x^2 - 8x + 3 > 0$
  Leading to $-3 < x < -1$

Note

5. Mark 8 is available if solution is consistent with part (a).

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24. (a)

- 1 $h(x) = f(2x - 1)$
- 2 $h(x) = 1/(2x-6)$

24. (b)

- 3 $x \neq 3$

Note

1. Mark 3 is available if it is consistent with mark 2.

25.

- 1 Finding/identifying both limits $^{p}/_{1-0.2}$ and $^{q}/_{1-0.6}$
- 2 Equating both limits $^{p}/_{1-0.2} = {}^{q}/_{1-0.6}$
- 3 Express p in terms of q $p = 2q$