



National Final

Supervisor's Booklet

Please ensure that students do not have access to this booklet, and take care to hold it so that answers cannot be seen.



Senior Team Maths Challenge 2010



Mini Relay Score Sheet

School number:

School name: _____

Round A			Round B			Round C		
A1	2	1	B1	2	1	C1	2	1
A2	2	1	B2	2	1	C2	2	1
A3	2	1	B3	2	1	C3	2	1
A4	2	1	B4	2	1	C4	2	1
Bonus	2		Bonus	2		Bonus	2	
Total	<input type="text"/>		Total	<input type="text"/>		Total	<input type="text"/>	

Round D			Round E			Round F		
D1	2	1	E1	2	1	F1	2	1
D2	2	1	E2	2	1	F2	2	1
D3	2	1	E3	2	1	F3	2	1
D4	2	1	E4	2	1	F4	2	1
Bonus	2		Bonus	2		Bonus	2	
Total	<input type="text"/>		Total	<input type="text"/>		Total	<input type="text"/>	

Grand Total:



Mini Relay : Marking Instructions – a reminder

Teams can hand in the Answer Sheet only when they have an answer to all four questions. The teacher starts marking at Q.1 and stops marking at the first incorrect answer, ignoring any subsequent answers. The teacher circles 2 marks on the Score Sheet by each correct answer and crosses out the 2 for the first incorrect answer. The Answer Sheet is then returned to the pair who gave that incorrect answer.

When the Answer Sheet is handed in again only 1 mark is available for any question previously answered incorrectly. Teams may have as many attempts as they wish at such a question. Correct answers to later questions will still earn 2 marks each.

There will be a whistle after 4 minutes. Handing in an Answer Sheet with four correct answers before this whistle will earn a bonus of 2 marks in addition to the maximum of 8 marks available for the individual answers. This bonus is circled on the Score Sheet.

A final whistle is blown after 6 minutes. Teams must stop working and hand in their Answer Sheet for marking.

MINI RELAY ANSWERS

A1	4
A2	12
A3	8
A4	20

D1	7
D2	5
D3	2
D4	$\frac{2}{3}$

B1	4
B2	9
B3	9
B4	6464

E1	6
E2	3
E3	12
E4	4

C1	12
C2	6
C3	18
C4	21

F1	6
F2	12
F3	14
F4	9



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1			2			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			

Across

- 1 Fifty-three less than a perfect cube
- 3 A square number
- 5 The product of a prime number and 26 Down
- 7 The cube of a prime number
- 8 Difference between 34 Down and 33 Down
- 9 100 more than the difference between 15 Across and 34 Down
- 11 A number that is between 1200 and 1300 and is also two less than the product of a triangle number and a Fibonacci number
- 13 The cube of a prime number
- 15 A rearrangement of the digits of 34 Down
- 17 Value of y in the solution of $3x + 16y = 50801$ and $5y = 4x + 21$
- 19 A fourth power
- 21 A multiple of 3 Down
- 22 Four times a Fibonacci number
- 23 Five more than a triangle number
- 25 p^p where p is a prime number
- 27 A palindromic number
- 29 Value of x in the equations in 17 Across
- 31 Forty-five more than a triangle number, twenty-seven less than the following triangle number
- 33 33 more than the difference between 34 Down and 25 Across
- 35 One less than three times a Fibonacci number
- 36 The minimum value of $n^2 + 6n + 2009$
- 37 The mean of 33 Across and 34 Down
- 38 10 times the highest common factor of 7 Across and 27 Across
- 39 A fourth power

Down

- 1 The product of a prime number and 3 Down
- 2 Coefficient of x in expansion of $(x^2 + 350x + 13)^2$
- 3 A palindromic number
- 4 Sum of 26 Down and 39 Across
- 5 Mean of 26 Down, 32 Down and 34 Down
- 6 Value of y in the solution of $12x - 6y = 690$ and $11x - 5y = 2084$
- 10 Difference between 21 Across and 1 Down
- 12 One more than a Fibonacci number
- 14 A square number
- 15 Sum of 25 Across and 19 Across
- 16 32 Down added to the reverse of 18 Down
- 17 Three less than a square number
- 18 A cube number
- 19 The cube of a prime number
- 20 Value of x in the equations in 6 Down
- 24 Two less than twice a Fibonacci number
- 26 A fourth power
- 28 $\frac{4 \times 10^7 \times 5 \times 10^9}{2 \times 10^{19} \times 2 \times 10^{-6}}$
- 29 Seven less than nineteen times a triangle number
- 30 Thirty less than the sum of the interior angles in a dodecagon
- 31 Three hundred less than a fourth power
- 32 Twice a Fibonacci number
- 33 Larger solution of $x^2 - 1010x + 6024 = 0$
- 34 A sixth power



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CROSSNUMBER: Completed Grid

¹ 5	7	7	² 9			³ 1	2	2	⁴ 5		⁵ 2	5	9	⁶ 2
5			⁷ 1	3	3	1			⁸ 3	0	9	2		9
5			0			1			9			0		0
⁹ 5	¹⁰ 4	1	0			¹¹ 1	¹² 2	2	2		¹³ 4	¹⁴ 9	1	3
	4						5					0		
	4						8					2		
¹⁵ 9	4	0	¹⁶ 6			¹⁷ 2	5	7	¹⁸ 3		¹⁹ 6	5	6	²⁰ 1
6			²¹ 9	9	9	9			²² 3	9	4	8		5
8			5			1			7			5		0
²³ 6	²⁴ 3	3	3			²⁵ 3	²⁶ 1	2	5		²⁷ 9	²⁸ 5	5	9
	1						2					0		
	9						9					0		
²⁹ 3	2	1	³⁰ 1			³¹ 2	6	0	³² 1		³³ 1	0	0	³⁴ 4
2			³⁵ 7	7	5	1			³⁶ 2	0	0	0		0
4			7			0			2			0		9
³⁷ 2	5	5	0			³⁸ 1	2	1	0		³⁹ 4	0	9	6

Marking Instructions – a reminder

Pairs may only communicate through the teacher, and only to request that the other pair work on a particular clue.

When a pair enters an answer in the Answer Grid, the teacher checks each digit of the answer.

If it is correct, tick it and award one mark; if it is wrong, cross it out and enter the correct digit. The correct answer is then shown to both pairs so that they are up-to-date.

A pair may enter just one digit if they wish, rather than a complete answer.

A pair may sacrifice a square, by guessing, if they wish.

Help given to both pairs:

- (a) The first three triangle numbers over 1000 are 1035, 1081 and 1128.
The largest four digit triangle number is 9870.

- (b) Here is a list of all the cube numbers with at most four digits:
1, 8, 27, 64, 125, 216, 343, 512, 729, 1000, 1331, 1728, 2197, 2744, 3375, 4096,
4913, 5832, 6859, 8000 and 9261.



GROUP ROUND ANSWERS

1. Value of expression: 179.714625	2. Area of region: $\frac{\pi}{3}$ units ²
3. Value of x : 20	4. Sum of the first 100 terms: 2500
5. Number of collections of letters: 12	6. Number of unit cubes: $4m + 2n + 2p - 8$
7. Fraction of the circle that is shaded: $\frac{3}{5}$	8. Value of a : 441
9. $x = 2$ $y = 3$	10. Centre digit: 2

6 points for each correct answer.

TOTAL SCORE (/60)= _____



UKMT FMN Senior Team Mathematics Challenge Feedback Questionnaire

In questions 1, 2, 3 and 4, please rate the following aspects of the course using a scale of 1 to 4, where:

1 = Poor; 2 = Adequate; 3 = Good; 4 = Excellent.

Please circle the appropriate answer.

1: The suitability of the venue

1 2 3 4

Poor Adequate Good Excellent

Comments _____

2: Refreshments (if applicable)

1 2 3 4

Comments _____

3: The organisation of the event

1 2 3 4

Comments _____

4: Information (including maps/directions) received before the event

1 2 3 4

Comments

5: What are your comments on each of the four rounds?

Comments _____

6: Would you recommend this event to others?

Yes / No

7. Would you have preferred a different start time for the event? Yes / No

If yes what start time would you have preferred? _____

8. Please detail any suggestions for improvement to this event and give any other comments that you would like to make.

Thank you for completing this questionnaire. Please return it to UKMT or FMN coordinators at the end of the event, or post to: Jo Williams, UKMT Maths Challenges Office, School of Mathematics, University of Leeds, Leeds LS2 9JT, or fax to 0113 343 5500.



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