



UKMT Team Maths Challenge 2010



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.



UKMT Team Maths Challenge 2010

HEAD-TO-HEAD (MINI-RELAY)

School number:

School name: _____

MARKING REMINDERS:

Circle mark awarded (3 or 1) for each question:

1st attempt = 3,
any subsequent attempt = 1.

Cross out '3' if question answered incorrectly (only 1 mark now possible) - subsequent questions can still get 3 marks.

Award bonus of 3 marks to first team in pair to present a complete set of correct answers (whether on their first attempt or not).

Round A			Round B		
A1	3	1	B1	3	1
A2	3	1	B2	3	1
A3	3	1	B3	3	1
A4	3	1	B4	3	1
Bonus	3		Bonus	3	
Total	<input type="text"/>		Total	<input type="text"/>	

Round C			Round D		
C1	3	1	D1	3	1
C2	3	1	D2	3	1
C3	3	1	D3	3	1
C4	3	1	D4	3	1
Bonus	3		Bonus	3	
Total	<input type="text"/>		Total	<input type="text"/>	

Grand Total:



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HEAD-TO-HEAD (MINI RELAY) ANSWERS

A1	80
A2	8
A3	6
A4	5184

B1	2
B2	200
B3	342
B4	8892

C1	17
C2	8
C3	90
C4	174

D1	6
D2	24
D3	22
D4	96

Guidelines for Teachers

- For Round 1, give Q1 and Q3 (and a blank Record Sheet) to Pair A, and Q2 and Q4 to Pair B. Switch this for Round 2, i.e. give Q2 and Q4 to Pair A, and Q1 and Q3 to Pair B.
- Once Pair A has the answer to Q1, they write it on the Record Sheet and pass this (via you) to Pair B. This continues with Pair B passing the answer to Q2 to Pair A (via you) and so on.
- Pairs can work on either of their questions at any time and should be encouraged to do some preparatory work while waiting for the answer to the previous question.
- Once they have written down the answer to Q4, Pair B hands the Record Sheet to you.
- Mark the answers, starting from Q1 (see 'Marking Reminders' on score sheet on previous page).
 - **If all answers are correct**, your team has successfully completed the round. If they beat the opposing team in doing so, they are also eligible for the bonus points for that round.

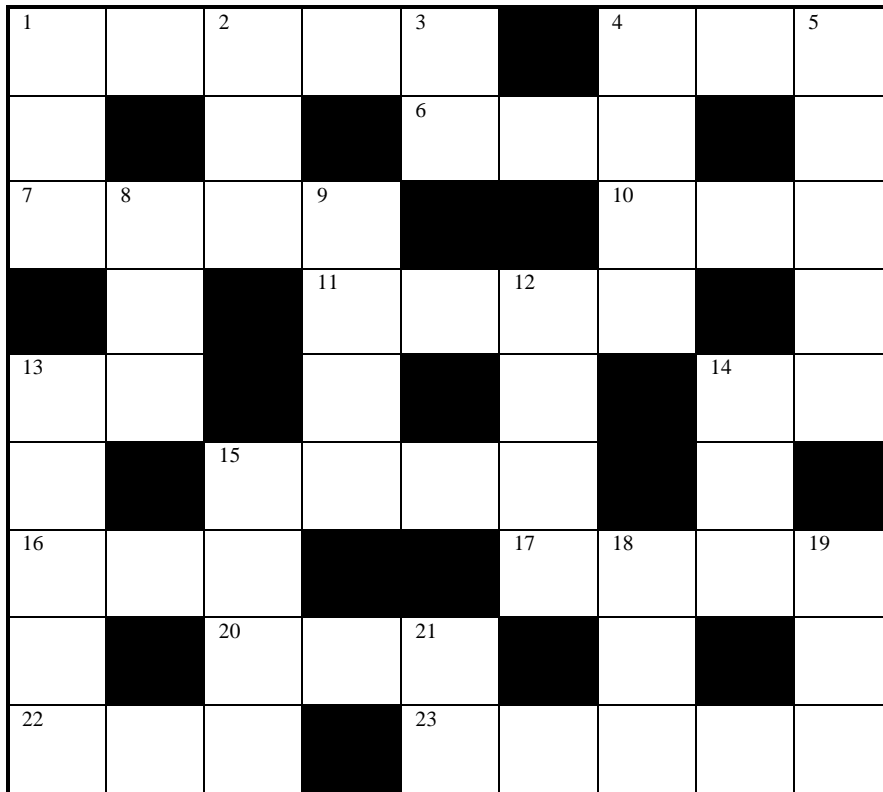
OR:

- **At the first incorrect answer stop marking**, circle the incorrect answer and pass the Record Sheet back to the relevant pair to reattempt. There is no limit on the number of reattempts.
- If your team fails to complete the round in the time given, collect in their Record Sheet and mark those answers written on it. If the second pair has written the answer to Q4 on the sheet but failed to hand it to you in time, Q4 **should** still be marked; however, **bonus points are not available in that situation**.
- **No communication is allowed between the two pairs.** Final answers (and nothing else) are written on the Record Sheet which is passed between the pairs **via you**.
- *If a pair knows that the answer they have received must be wrong, they can circle it on the Record Sheet and pass this back to the other pair (via you) to reattempt.*
- *If a pair realises they have passed on an incorrect answer, they can ask you to retrieve the Record Sheet from the other pair, but only before Q4 is submitted to you for marking.*
- The bonus points can be awarded to both teams in the case of a tie. In this rare situation, the decision of the two teachers is final.



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CROSS NUMBER



Across

- 1 A power of eleven (5)
- 4 A square number which is the sum of a three-digit cube number and a three-digit fourth power (3)
- 6 The sum of five consecutive Fibonacci numbers (3)
- 7 The lowest common multiple of 1 Down and 21 Down (4)
- 10 A prime factor of 32123 (3)
- 11 The number of dots in the sixtieth pattern in this sequence: (4)
- 5

14

27
- 13 Twenty-five more than a multiple of seven and twenty-five less than a multiple of seventeen (2)
- 14 The difference between two cube numbers (2)
- 15 One more than a multiple of four; its digits are the same as those of 4 Down but not in the same order (4)
- 16 An odd number with ten factors; its digits are consecutive (3)
- 17 (13 Across) percent of 12 Down; the product of its digits is ten (4)
- 20 The square of 21 Down (3)
- 22 The area of a rhombus whose perimeter is 120 and the lengths of whose diagonals are in the ratio 3 : 4 (3)
- 23 A multiple of eleven with two distinct digits, each occurring more than once (5)

Down

- 1 A prime factor of 23432 (3)
- 2 A prime factor, the product of whose digits is (13 Across) percent of (13 Across) (3)
- 3 The sum of two Fibonacci numbers (2)
- 4 A number, the product of whose digits is zero (4)
- 5 A power of 111 (5)
- 8 The total of the interior angles (in $^{\circ}$) of a polygon (3)
- 9 The number of line segments in the fortieth pattern in this sequence: (4)
- 9

30

63
- 12 A number more than 15 Across but less than 15 Down (4)
- 13 A multiple of four whose five digits are distinct and have a range of four (5)
- 14 An even multiple of the sixth and twelfth prime numbers (3)
- 15 A multiple of eleven (4)
- 18 The longest side of a right-angled triangle whose shorter sides are 13 Across and 14 Across (3)
- 19 Half the mean of 2 Down, 3 Down, 10 Across and 16 Across (3)
- 21 The square root of 20 Across (2)



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CROSS NUMBER

Completed Grid

¹ 1	4	² 6	4	³ 1		⁴ 8	4	⁵ 1
0		6		⁶ 1	3	1		2
⁷ 1	⁸ 9	1	⁹ 9			¹⁰ 3	5	3
	0		¹¹ 7	3	¹² 8	0		2
¹³ 6	0		2		5		¹⁴ 9	1
7		¹⁵ 8	0	1	3		6	
¹⁶ 5	6	7			¹⁷ 5	¹⁸ 1	2	¹⁹ 1
4		²⁰ 3	6	²¹ 1		0		9
²² 8	6	4		²³ 9	8	9	8	9

Marking Instructions – a reminder

Pairs may only communicate through the teacher, for instance 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.



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GROUP CIRCUS ANSWERS

<p>1. Answer: two of</p> <table style="margin: 10px auto; border-collapse: collapse;"> <tr> <td style="border: 1px solid black; padding: 2px 5px;">2</td><td style="border: 1px solid black; padding: 2px 5px;">1</td><td style="border: 1px solid black; padding: 2px 5px;">9</td> <td style="border: 1px solid black; padding: 2px 5px;">2</td><td style="border: 1px solid black; padding: 2px 5px;">7</td><td style="border: 1px solid black; padding: 2px 5px;">3</td> <td style="border: 1px solid black; padding: 2px 5px;">3</td><td style="border: 1px solid black; padding: 2px 5px;">2</td><td style="border: 1px solid black; padding: 2px 5px;">7</td> </tr> <tr> <td style="border: 1px solid black; padding: 2px 5px;">4</td><td style="border: 1px solid black; padding: 2px 5px;">3</td><td style="border: 1px solid black; padding: 2px 5px;">8</td> <td style="border: 1px solid black; padding: 2px 5px;">5</td><td style="border: 1px solid black; padding: 2px 5px;">4</td><td style="border: 1px solid black; padding: 2px 5px;">6</td> <td style="border: 1px solid black; padding: 2px 5px;">6</td><td style="border: 1px solid black; padding: 2px 5px;">5</td><td style="border: 1px solid black; padding: 2px 5px;">4</td> </tr> <tr> <td style="border: 1px solid black; padding: 2px 5px;">6</td><td style="border: 1px solid black; padding: 2px 5px;">5</td><td style="border: 1px solid black; padding: 2px 5px;">7</td> <td style="border: 1px solid black; padding: 2px 5px;">8</td><td style="border: 1px solid black; padding: 2px 5px;">1</td><td style="border: 1px solid black; padding: 2px 5px;">9</td> <td style="border: 1px solid black; padding: 2px 5px;">9</td><td style="border: 1px solid black; padding: 2px 5px;">8</td><td style="border: 1px solid black; padding: 2px 5px;">1</td> </tr> </table> <p style="text-align: center; margin-top: 10px;">3 marks for one; 6 marks for two</p>	2	1	9	2	7	3	3	2	7	4	3	8	5	4	6	6	5	4	6	5	7	8	1	9	9	8	1	<p>2. Answer:</p> <p style="text-align: center; margin-top: 20px;">Equal totals along each edge, and no matching joins.</p> <p style="text-align: right; margin-top: 20px;">6 marks (cao)</p>
2	1	9	2	7	3	3	2	7																				
4	3	8	5	4	6	6	5	4																				
6	5	7	8	1	9	9	8	1																				
<p>3. Answer:</p> <p style="text-align: center; margin-top: 20px;">$A = 1; B = 0; C = 8; D = 9$</p> <p style="text-align: right; margin-top: 20px;">6 marks (cao)</p>	<p>4. Answer:</p> <p style="text-align: center; margin-top: 20px;">Side faces total 28</p> <p style="text-align: right; margin-top: 20px;">6 marks (cao)</p>																											
<p>5. Answer:</p> <p style="text-align: center; margin-top: 20px;">5(five) of Hearts</p> <p style="text-align: center; margin-top: 20px;">3 marks for suit; 3 for value</p>	<p>6. Answer:</p> <p style="text-align: center; margin-top: 20px;">11 counters</p> <p style="text-align: right; margin-top: 20px;">6 marks (cao)</p>																											
<p>7. Answer:</p> <p style="text-align: center; margin-top: 20px;">Four small congruent trapezia</p> <p style="text-align: right; margin-top: 20px;">6 marks (cao)</p>	<p>8. Answer:</p> <p style="text-align: center; margin-top: 20px;">22 distinct regions</p> <p style="text-align: right; margin-top: 20px;">6 marks (cao)</p>																											
<p>9. Answer:</p> <p style="margin-top: 20px;">Demonstrations of</p> <ul style="list-style-type: none"> (i) four congruent squares (ii) five congruent squares <p style="text-align: right; margin-top: 20px;">3 marks each</p>	<p>10. Answer:</p> <p style="text-align: center; margin-top: 20px;">Cube correctly coloured (all nine colours on each face)</p> <p style="text-align: center; margin-top: 20px;">4 faces correct: 3 marks all 6 faces correct: 6 marks</p>																											

6 points for each correct answer, except as above.



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RELAY score sheet

Team number

School name

A1	77	B8	12
B1	£4.14	A9	60
A2	134 (kg)	B9	$\frac{1}{24}$
B2	133 (months)	A10	144 (trees)
A3	54°	B10	2
B3	$\frac{18}{35}$	A11	KMTK
A4	70	B11	8 (cm ²)
B4	41 (°)	A12	63 (sweets)
A5	240 (ml)	B12	1.8 (%)
B5	TMMK	A13	2.5 (%)
A6	205 (°)	B13	220 (cm)
B6	20 (min)	A14	110 (°)
A7	10	B14	$\frac{7}{24}$
B7	1 (cm)	A15	134520
A8	12	B15	7

Correct answers score 2 points:

TOTAL SCORE = _____



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