



UKMT Team Maths Challenge 2011

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 2011

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:



UKMT Team Maths Challenge 2011

HEAD-TO-HEAD (MINI RELAY) ANSWERS

A1	6
A2	4
A3	20
A4	425

B1	8
B2	70
B3	7
B4	490

C1	36
C2	144
C3	6
C4	99

D1	200
D2	40
D3	2
D4	8

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.

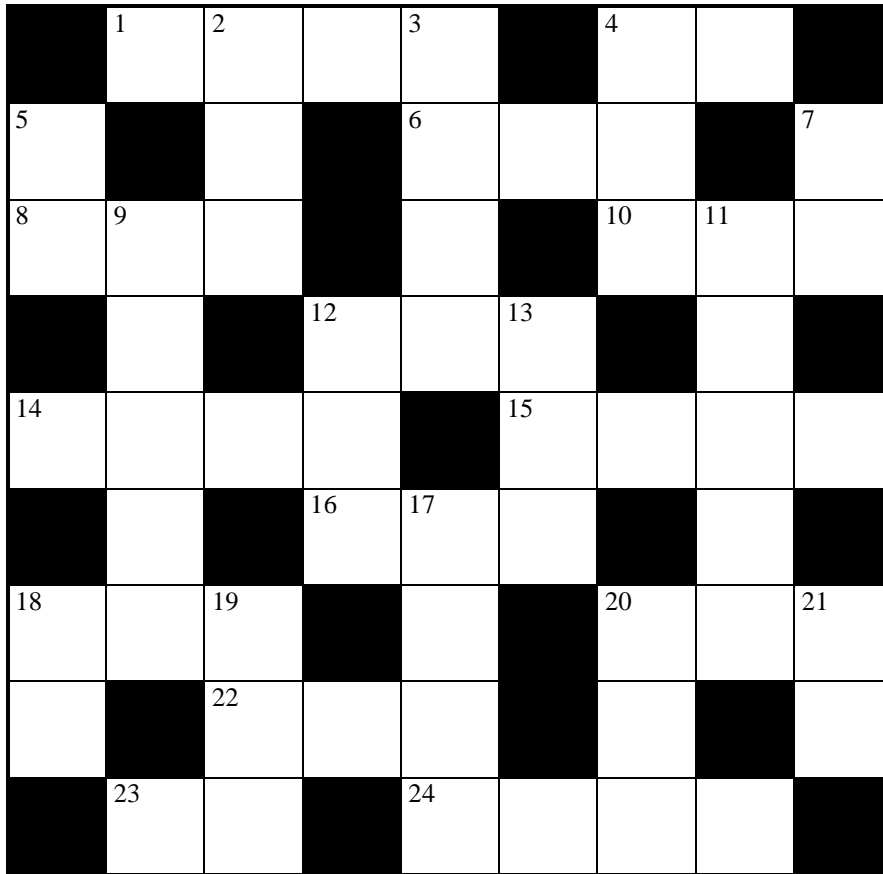
OR:

- **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.



UKMT Team Maths Challenge 2011

CROSSNUMBER



Across

- 1 The largest prime factor of 87878 (4)
 4 The square root of 3 Down (2)
 6 (7 Down) percent of 20 Down (3)
 8 The square of 7 Down (3)
 10 A prime number (3)
 12 A palindromic number which is the sum of five consecutive Fibonacci numbers (3)
 14 The product of 6 Across and the square root of 2 Down (4)
 15 The number of line segments in the thirtieth pattern in the sequence shown here (4)
-
- 11 33 66
- 16 The perimeter of a rhombus whose area is 6000 and the lengths of whose diagonals are in the ratio 8 : 15 (3)
 18 The sum of a square number and 18 Down (3)
 20 A number with four factors (3)
 22 16 Across reduced by (5 Down) percent; a multiple of three (3)
 23 Four less than a square number (2)
 24 The lowest common multiple of 18 Down and 23 Across (4)

Down

- 2 A number with three factors (3)
 3 A number whose digits are all prime (4)
 4 An odd number (3)
 5 A multiple of five (2)
 7 The square root of 8 Across (2)
 9 The largest prime factor of 76767 (5)
 11 Twice a power of 9 (5)
 12 The mean of 4 Down and 10 Across (3)
 13 A multiple of 5 Down (3)
 17 The number of dots in the thirtieth pattern in the sequence shown here (4)
-
- 11 31 61
- 18 The sum of two positive cube numbers; also the difference between two positive cube numbers (2)
 19 One less than a power of two (3)
 20 The sum of the interior angles of a polygon, in degrees (3)
 21 The shortest side of a right-angled triangle whose longer sides are 4 Across and 23 Across (2)



UKMT Team Maths Challenge 2011

CROSSNUMBER

Completed Grid

	¹ 6	² 2	7	³ 7		⁴ 8	5	
⁵ 2		8		⁶ 2	0	7		⁷ 2
⁸ 5	⁹ 2	9		2		¹⁰ 3	¹¹ 1	3
	5		¹² 5	5	¹³ 5		3	
¹⁴ 3	5	1	9		¹⁵ 5	1	1	5
	8		¹⁶ 3	¹⁷ 4	0		2	
¹⁸ 9	9	¹⁹ 1		6		²⁰ 9	2	²¹ 3
1		²² 2	5	5		0		6
	²³ 7	7		²⁴ 1	0	0	1	

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 a digit is correct, put a tick in the shaded box underneath it; if it is incorrect, cross it out and enter the correct digit alongside it in the white box. 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.

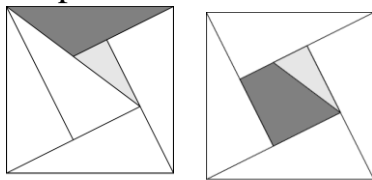

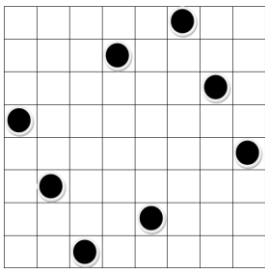
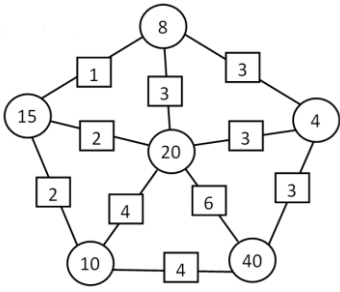
A pair may sacrifice a square, by guessing, if they wish.

When totting up the score award one mark for each tick.



UKMT Team Maths Challenge 2011

GROUP CIRCUS ANSWERS

<p>1. Answer:</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-bottom: 5px;"> <thead> <tr> <th style="text-align: left;">Meal</th> <th style="text-align: center;">Number</th> </tr> </thead> <tbody> <tr> <td>Soup & Salmon</td> <td style="text-align: center;">4</td> </tr> <tr> <td>Soup & Pizza</td> <td style="text-align: center;">6</td> </tr> <tr> <td>Prawn Cocktail & Salmon</td> <td style="text-align: center;">2</td> </tr> <tr> <td>Prawn Cocktail & Pizza</td> <td style="text-align: center;">8</td> </tr> </tbody> </table> <p style="text-align: right;">6 marks (cao)</p>	Meal	Number	Soup & Salmon	4	Soup & Pizza	6	Prawn Cocktail & Salmon	2	Prawn Cocktail & Pizza	8	<p>2. Answer: any correct solution, e.g.</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-bottom: 5px;"> <tbody> <tr> <td style="text-align: center;">-1</td> <td style="text-align: center;">0</td> <td style="text-align: center;">-5</td> </tr> <tr> <td style="text-align: center;">-6</td> <td style="text-align: center;">-2</td> <td style="text-align: center;">2</td> </tr> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">-4</td> <td style="text-align: center;">-3</td> </tr> </tbody> </table> <p style="text-align: right;">6 marks</p>	-1	0	-5	-6	-2	2	1	-4	-3
Meal	Number																			
Soup & Salmon	4																			
Soup & Pizza	6																			
Prawn Cocktail & Salmon	2																			
Prawn Cocktail & Pizza	8																			
-1	0	-5																		
-6	-2	2																		
1	-4	-3																		
<p>3. Answer: Two possibilities:</p> <div style="display: flex; align-items: center; justify-content: space-around;">  <p style="margin-left: 20px;">6 marks (cao)</p> </div> <div style="display: flex; align-items: center; justify-content: space-around; margin-top: 20px;">  </div>	<p>4. Answer:</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-bottom: 10px;"> <tbody> <tr> <td style="text-align: center;">a)</td> <td style="text-align: center;">31</td> <td style="text-align: center;">d)</td> <td style="text-align: center;">59 m²</td> </tr> <tr> <td style="text-align: center;">b)</td> <td style="text-align: center;">79.2</td> <td style="text-align: center;">e)</td> <td style="text-align: center;">1</td> </tr> <tr> <td style="text-align: center;">c)</td> <td style="text-align: center;">1234</td> <td style="text-align: center;">f)</td> <td style="text-align: center;">7.7</td> </tr> </tbody> </table> <p style="text-align: center;">1 mark for each correct answer</p>	a)	31	d)	59 m ²	b)	79.2	e)	1	c)	1234	f)	7.7							
a)	31	d)	59 m ²																	
b)	79.2	e)	1																	
c)	1234	f)	7.7																	
<p>5. Answer: Four possibilities</p> <p>$125 = 5^3$; $135 = 3^3 \cdot 5$; $225 = 3^2 \cdot 5^2$; $243 = 3^5$</p> <p>4 correct: 6 marks; 3 correct: 3 marks; 2 or less correct: 0 marks</p>	<p>6. Answer:</p>  <p style="text-align: right;">6 marks (cao)</p>																			
<p>7. Answer:</p>  <p style="text-align: right;">6 marks (cao)</p>	<p>8. Answer:</p> <p>Demonstrations of (a) eight squares; (b) three squares; (c) three squares.</p> <p style="text-align: center;">2 marks for each correct solution</p>																			

6 points for each correct answer, except as above.



UKMT Team Maths Challenge 2011

RELAY score sheet

Team number

School name

Correct answers score 2 points - circle 2 or 0 for each question.

A1	2 / 0	$x = 36^\circ, y = 54^\circ$	B8	2 / 0	2 : 1									
B1	2 / 0	21	A9	2 / 0	60									
A2	2 / 0	150	B9	2 / 0	12°									
B2	2 / 0	7	A10	2 / 0	20 mph									
A3	2 / 0	96°	B10	2 / 0	16 As									
B3	2 / 0	Tom and Kay (in either order)	A11	2 / 0	24°									
A4	2 / 0	20	B11	2 / 0	2011									
B4	2 / 0	18	A12	2 / 0	7 billion years									
A5	2 / 0	(0, 3)	B12	2 / 0	6									
B5	2 / 0	(-1, 5)	A13	2 / 0	84 kg									
A6	2 / 0	5	B13	2 / 0	36°									
B6	2 / 0	12	A14	2 / 0	<table border="1" style="display: inline-table; border-collapse: collapse;"> <tbody> <tr> <td style="padding: 2px;">A3</td> <td style="padding: 2px;">C2</td> <td style="padding: 2px;">B1</td> </tr> <tr> <td style="padding: 2px;">C1</td> <td style="padding: 2px;">B3</td> <td style="padding: 2px;">A2</td> </tr> <tr> <td style="padding: 2px;">B2</td> <td style="padding: 2px;">A1</td> <td style="padding: 2px;">C3</td> </tr> </tbody> </table>	A3	C2	B1	C1	B3	A2	B2	A1	C3
A3	C2	B1												
C1	B3	A2												
B2	A1	C3												
A7	2 / 0	30	B14	2 / 0	7									
B7	2 / 0	80	A15	2 / 0	9									
A8	2 / 0	39	B15	2 / 0	18 km/h									

TOTAL SCORE = _____



UKMT Team Maths Challenge 2011

BACK PAGE