UK Maths Trust

Mathematical Competition for Girls

Tuesday 22 September 2026

Organised by the United Kingdom Mathematics Trust

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Instructions

1. Do not turn over the page until told to do so.
2. Time allowed: 90 minutes.
3. Each question carries 10 marks.
4. The use of rough paper, rulers and compasses is allowed, but calculators and protractors are forbidden.
5. Use a pencil to fill in the Answer Sheet. Pay close attention to the instructions on the Answer Sheet that shows how to code your answers.
6. If you need to rub out an answer, do it as thoroughly as possible.
   Do not doodle on the Answer Sheet. Your answers will be marked by a machine, which may interpret any pencil markings in its own way, or reject the Answer Sheet.
7. All answers are three or four digit numbers, which may start with a zero. For example, if you think the answer is 25, you should enter 025 on the answer sheet.
8. Read the questions carefully, paying particular attention to what you are required to enter on the Answer Sheet for each part.
9. The space for each question part and sub-part is clearly labelled on the Answer Sheet. The number of marks for each part is indicated on this Question Paper.
10. There are no negative marks. Partial marks may be awarded for specific incorrect answers, so you should enter your answer even if you are not completely sure.
11. Earlier questions tend to be easier. Questions have multiple parts. Often earlier parts introduce results or ideas useful in solving later parts of the problem.
12. The questions on this paper are designed to challenge you to think, rather than guess. Although you are only required to enter numerical answers, you should still derive your results carefully.
13. To accommodate candidates sitting in other time zones, please do not discuss the paper on the internet until 08:00 BST on Thursday 24th September, when the solutions video will be released at ukmt.org.uk/video-solutions-list.

Enquiries about the Mathematical Competition for Girls should be sent to:

challenges@ukmt.org.uk

www.ukmt.org.uk

1. A rectangular apartment is divided into four rectangular rooms, by two straight interior walls which are parallel to the exterior walls. The rooms have areas A, B, C and D metres squared.

A	B
C	D

(a) Find the value of D when $A = 8$, $B = 4$ and $C = 12$. [2 marks]

(b) Find the value of C when $A = 7.5$, $B = 6.5$ and $D = 26$. [2 marks]

(c) In this part of the question, A, B, C and D have the values found in part (a). Additionally, the length and the width of each room are whole numbers.

Let P be the perimeter of the apartment. Find all possible values of P.

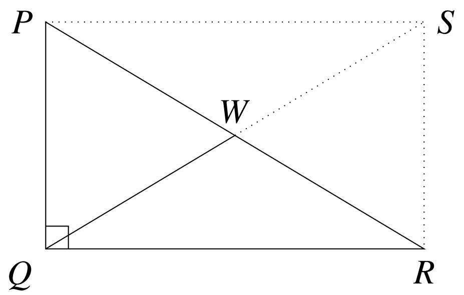
Enter the following on the answer sheet:

(i) The smallest possible value of P. [3 marks]

(ii) The largest possible value of P. [3 marks]

2. (a) Triangle PQR has a right angle at Q and W is the midpoint of the side PR. Given that $PQ = 6$ and $QR = 8$, use the diagram below to find the length of QW.

[2 marks]



(b) Triangle ABC has a right angle at B and $AB < BC$. Let M be the midpoint of AC. Let D be the reflection of C in the line BM (extended beyond M).

Given that angle DAC is 56° find the size of the angle

(i) ACD, [4 marks]

(ii) BAC. [4 marks]

3. For any real number x, the *integer part* of x, $\lfloor x \rfloor$, is the largest whole number which is smaller than or equal to x. For example, $\lfloor 2.3 \rfloor = 2$, $\lfloor 2.8 \rfloor = 2$ and $\lfloor 2 \rfloor = 2$.

(a) Find all positive integers a such that $\left\lfloor \frac{a}{5} \right\rfloor = 7$.

Enter the following on the answer sheet:

(i) The number of possible values of a. [1 mark]

(ii) The smallest possible value of a. [1 mark]

(iii) The largest possible value of a. [2 marks]

(b) Find all positive integers b such that $\left\lfloor \frac{b}{3} \right\rfloor - \left\lfloor \frac{b}{5} \right\rfloor = 3$.

Enter the following on the answer sheet:

(i) The number of possible values of b. [2 marks]

(ii) The smallest possible value of b. [2 marks]

(iii) The largest possible value of b. [2 marks]

4. (a) You have three red and four blue cubes. The cubes of the same colour are identical.

This part of the question is about the number of ways to distribute all seven cubes among some boxes, following these rules:

- A box may be empty (so it is possible to put all seven cubes in one box).
- The boxes are considered different (so putting all seven cubes in the first box counts as a different solution from putting all seven cubes in the second box).

(i) How many ways are there to distribute all seven cubes among two boxes? [2 marks]

(ii) How many ways are there to distribute all seven cubes among three boxes, so that no colour appears in all three boxes? [3 marks]

(b) The *factorial* of a positive integer n is defined as $n! = 1 \times 2 \times 3 \times \cdots \times n$. For example, $3! = 1 \times 2 \times 3 = 6$.

In how many ways can we write $10! = abc$, where a, b, c are positive integers, such that there is no factor greater than one which is common to all three of them?

Reorderings of a, b, c count as different solutions. For example, $120 \times 54 \times 560$ is not allowed because all three numbers share a common factor of 2, while $640 \times 162 \times 35$ is allowed and counts as a different solution from $162 \times 640 \times 35$.

Note: This question part may have a four digit answer. [5 marks]

5. This question is about finding winning strategies in two-player games. We say that a player has a *winning strategy* if they can win the game no matter what moves the other player makes.

(a) In the first game, Players A and B start with a pile of 100 counters and take turns to remove either 2 or 3 counters from the pile. Player A goes first. The winner is the player who removes the final counter. If only one counter remains, the result is a draw.

Work out the winning strategy for Player B and then answer this question:

At three different points in the game, there are 98, 73 and 47 counters at the start of Player B's turn. On the answer sheet, enter the number of counters player B should remove in each case.

(For example, if you think that they should remove 2 counters in each case, enter 222 as your answer.) [3 marks]

(b) In the second game, Players A and B start with a pile of N counters and take turns to remove 1, 3 or 4 counters from the pile. Player A goes first. The winner is the player who removes the final counter.

(Note: If there are only two counters left, the current player must remove one counter.)

Parts (i) and (ii) each give a value of N for which Player B has a winning strategy. In each part, the three-digit answer is the number of counters Player B should remove on their first turn in response to Player A removing 1, 3 and 4 counters, respectively.

(For example, if you think that Player B should remove 1 counter when Player A removes 1, 1 counter when Player A removes 3, and 3 counters when Player A removes 4, your answer should be 113.)

(i) $N = 7$ [1 mark]

(ii) $N = 9$ [1 mark]

Note: There may be more than one correct answer. You only need to choose one of them.

(iii) For how many values of N between 100 and 200, inclusive, does Player B have a winning strategy? [5 marks]

