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MTSE 2026

Mathematics Talent Search Examination 2026

Class 7–8 | 2 hours



NAME _____

CLASS / SECTION _____ ROLL NO. _____ DATE _____

General Instructions

1. This paper has **25 questions** in total, based on **6 case studies**. Each case study is followed by 2 to 5 questions.
2. Time allowed: **2 hours**. Each question carries **4 marks** (maximum **100 marks**). There is **no negative marking**.
3. Read each case study carefully before answering the questions that follow it. **Calculators are not allowed.**
4. Each question has four options (A, B, C and D), and **only one is correct**.
5. Mark your answers on the **OMR sheet provided**. Fill in the circle for the correct option completely.
6. Write your name and details on the paper and the OMR sheet.

CASE STUDY 1 **The Polygon Detective's Fan** Q 1 – 5	**CASE STUDY 2** **The Product Hidden Between Two Squares** Q 6 – 10	**CASE STUDY 3** **The Repeating Pattern Detective** Q 11 – 15
CASE STUDY 4 **The Equal Share of a Set** Q 16 – 17	**CASE STUDY 5** **The City Grid** Q 18 – 20	**CASE STUDY 6** **The Matchmaker's Count** Q 21 – 25

CASE STUDY 1

The Polygon Detective's Fan



QUESTIONS
1 – 5
5 × 4 = 20 marks

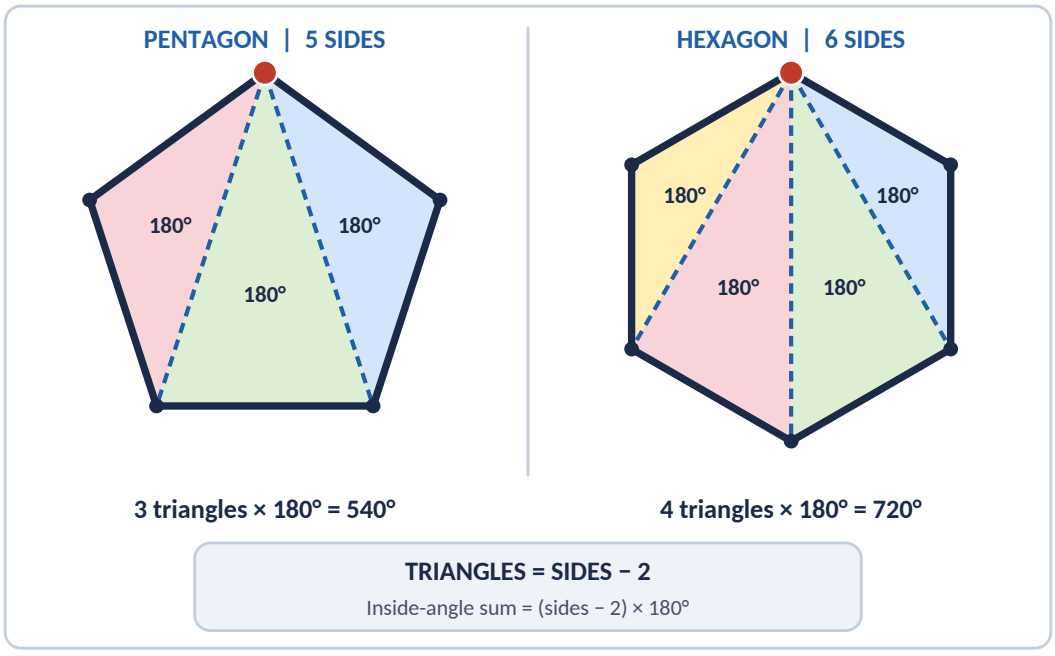
Mira has a map of an irregular park shaped like a **convex polygon** (a polygon where every inside angle is less than 180°). She wants the total of all its inside angles, but measuring every corner with a protractor would take far too long. So she uses a clever shortcut called the **fan trick**.

Mira's Fan Trick

- **Pick one corner** (vertex) of the polygon.
- **Draw diagonals** from that corner to every other corner that is not directly next to it.
- **Count the triangles.** The diagonals divide the polygon into a fan of triangles.
- **Use the triangles:** the inside angles of every triangle add up to **180°**.

To understand the pattern to find the angle sum in a polygon, let's start with a triangle. A triangle makes one triangle in the fan. Each extra side adds one more triangle, so a polygon with n sides makes $n - 2$ triangles. Together, these triangles fill the polygon, and their angles make up all its inside angles.

So the total of the inside angles is $(n - 2) \times 180°$.



Questions

1 The inside angles of a convex polygon add up to 1980°. How many sides does it have?

A. 13 **B.** 11 **C.** 12 **D.** 14

2 From one corner of a convex polygon, 9 diagonals are drawn. What is the total of the inside angles of the polygon?

A. 1,620° **B.** 1,800° **C.** 1,980° **D.** 2,160°

3 A regular polygon has all sides equal and all angles equal. Each inside angle measures 156°. How many sides does it have?

A. 20 **B.** 18 **C.** 15 **D.** 12

4 A convex polygon has n sides. One inside angle measures 100° and each of the other inside angles measures 140°. How many sides does the polygon have?

A. 9 **B.** 10 **C.** 7 **D.** 8

5 Polygon A has k sides and Polygon B has $(k + 3)$ sides. The sum of the inside angles of Polygon B is exactly double that of Polygon A. How many triangles does Mira make if she divides Polygon B from a single corner?

A. 8 **B.** 6 **C.** 5 **D.** 4

CASE STUDY 2

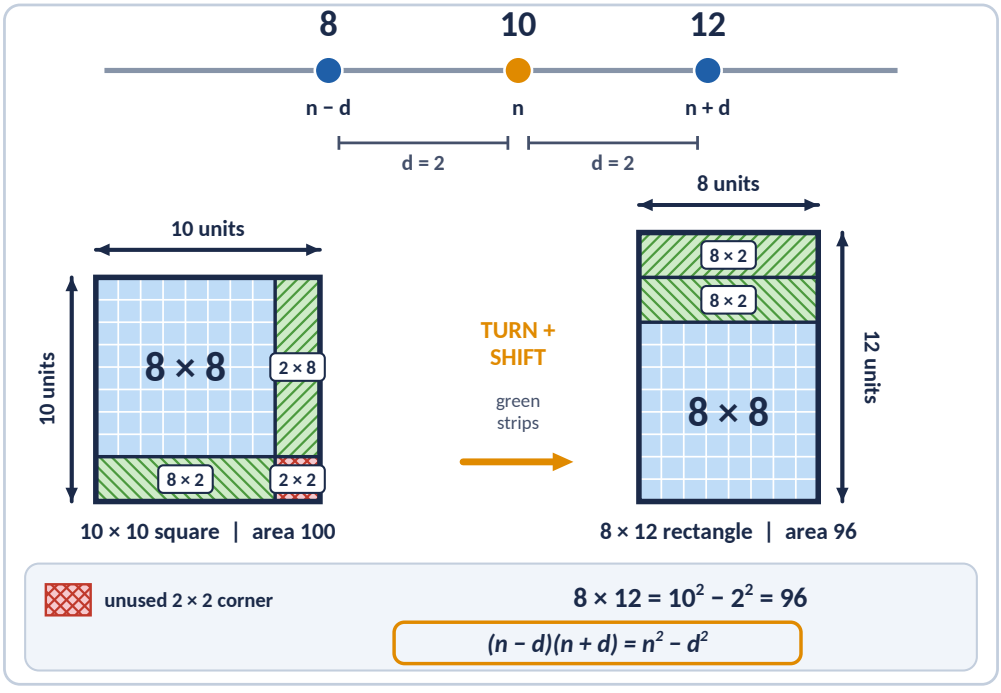
The Product Hidden Between Two Squares



QUESTIONS
6 – 10
5 × 4 = 20 marks

Mina looks at 8 × 12. The numbers 8 and 12 are both 2 units away from their midpoint, 10: one is 10 − 2, the other 10 + 2.

The diagram compares their product with a 10 × 10 square. The blue 8 × 8 square and the two green strips can be rearranged to make an 8 × 12 rectangle. To do this, Mina turns the vertical 2 × 8 strip sideways. She places both 8 × 2 strips above the blue square, one on top of the other. The red 2 × 2 corner is left out.



So the rectangle's area is the large square's area minus the small corner's area:

$$8 \times 12 = 10 \times 10 - 2 \times 2 = 100 - 4 = 96.$$

The same picture works for any two numbers equally spaced around a midpoint n. If their distance from the midpoint is d, their product is:

$$(n - d)(n + d) = n^2 - d^2.$$

The algebra says the same thing: when the brackets are multiplied, the middle terms $+nd$ and $-nd$ cancel.

Questions

6 Find 1,997 × 2,003. If you make use of the method above, it would be quicker.

A. 4,000,009 **B.** 3,999,997 **C.** 3,999,991 **D.** 3,999,901

7 Two numbers add up to 160 and differ by 6. What is their product?

A. 6,391 **B.** 6,397 **C.** 6,400 **D.** 6,409

8 Find the exact value of expression 20,007 × 19,993 − 20,010 × 19,990.

A. 400,000,000 **B.** 149 **C.** 51 **D.** −51

9 Two positive whole numbers differ by 6 and their product is 2,295. What is their sum?

A. 90 **B.** 94 **C.** 98 **D.** 96

10 What is the value of $(1-\frac{1}{2^2})(1-\frac{1}{3^2})(1-\frac{1}{4^2})\cdots(1-\frac{1}{10^2})$? Hint: $1-\frac{1}{k^2}=(1-\frac{1}{k})(1+\frac{1}{k})$

A. $\frac{1}{2}$ **B.** $\frac{11}{20}$ **C.** $\frac{9}{20}$ **D.** $\frac{3}{5}$

CASE STUDY 3

The Repeating Pattern Detective



QUESTIONS
11 – 15
5 × 4 = 20 marks

Mina watches a traffic light change in the order red, yellow, green. Then the same order begins again. The first, fourth and seventh lights are red; the second, fifth and eighth are yellow; the third, sixth and ninth are green.

Red, yellow, green is one **cycle**. A cycle is one full run of the pattern. After each cycle, the pattern starts again. So, to know what appears far along the sequence, Mina does not need to list every item: she needs to know where that position falls within a cycle.

The same idea works for the repeating pattern A, B, C. The first 15 letters make five complete cycles. The 16th is A and the 17th is B. The 18th letter is C. It is the last letter of the 6th cycle.

Cycles appear in many kinds of patterns—for example, the days of the week, the last digits of powers of 2 (2, 4, 8, 6, ...) and the repeating decimal digits of 1/7 (142857, 142857, ...).

Questions

11 Beads are strung in the repeating order Red, Green, Blue, Yellow, Red, Green, Blue, Yellow, ... What colour is the 50th bead?

A. Red **B.** Yellow **C.** Blue **D.** Green

12 The fraction 1/7 as a decimal is 0.142857142857... What is the 2,026th digit after the decimal point?

A. 1 **B.** 4 **C.** 7 **D.** 8

13 A 31-day month has exactly five Fridays, five Saturdays and five Sundays. On which day of the week does the month begin?

A. Thursday **B.** Friday **C.** Saturday **D.** Sunday

14 The numbers 3, 7, 1, 5 repeat in that order, forever (3, 7, 1, 5, 3, 7, 1, 5, ...). What is the sum of the first 50 numbers?

A. 192 **B.** 208 **C.** 212 **D.** 202

15 What is the last digit of $2^{2026} + 3^{2026}$?

A. 1 **B.** 3 **C.** 5 **D.** 7

CASE STUDY 4

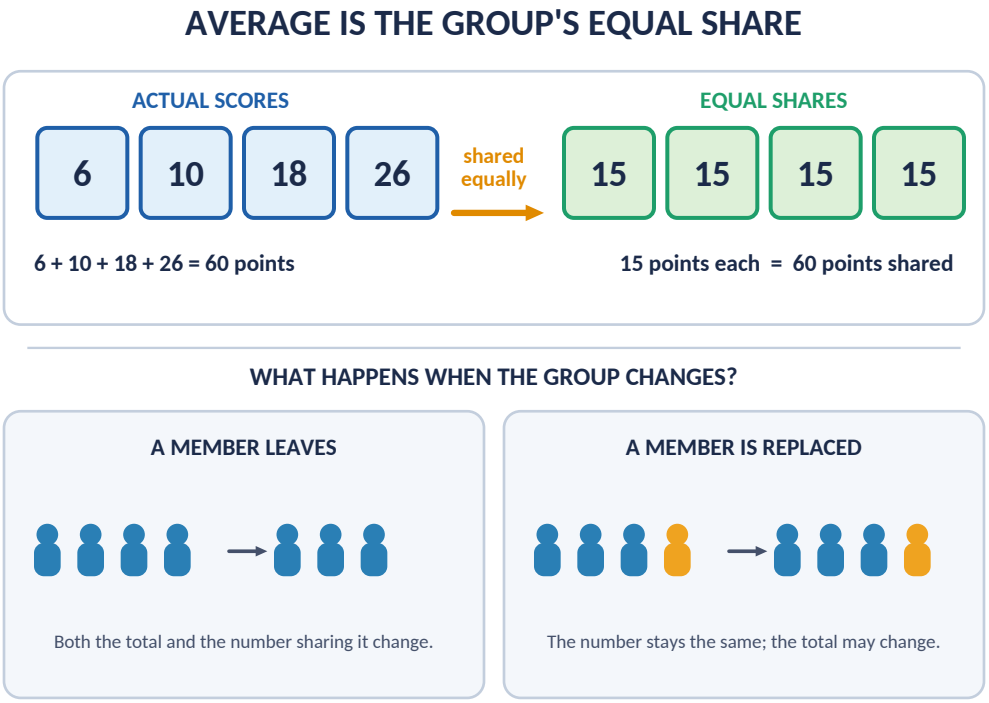
The Equal Share of a Set



QUESTIONS
16 – 17
2 × 4 = 8 marks

Imagine adding all the scores of a group and sharing the total equally. The average is the share each person gets. The scores can be different, but the average is one number for the whole group.

For example, a group scores **6, 10, 18 and 26** points. The total is 60 points. Shared equally, each person gets **15 points**. So the average is 15 points.



When someone leaves, the total becomes smaller and fewer people share it. When one student replaces another, the number of people stays the same. The total goes up or down by the difference between the two scores. **Average = total ÷ number of people.**

Questions

16 Five numbers have an average of 22. One of the numbers is 14. If 14 is removed, what is the average of the remaining four numbers?

A. 24 **B.** 22 **C.** 23 **D.** 26

17 A team of 8 students in a Class 7 Maths Olympiad club has an average quiz score of 82. One student who scored 70 leaves the team and is replaced by a new student. If the team's average score rises from 82 to 85, what score did the new student achieve?

A. 94 **B.** 85 **C.** 88 **D.** 96

CASE STUDY 5

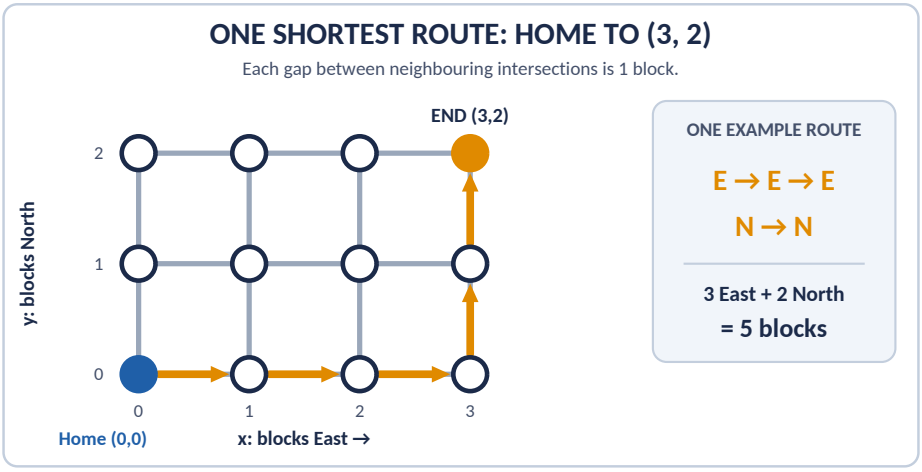
The City Grid



QUESTIONS
18 – 20
3 × 4 = 12 marks

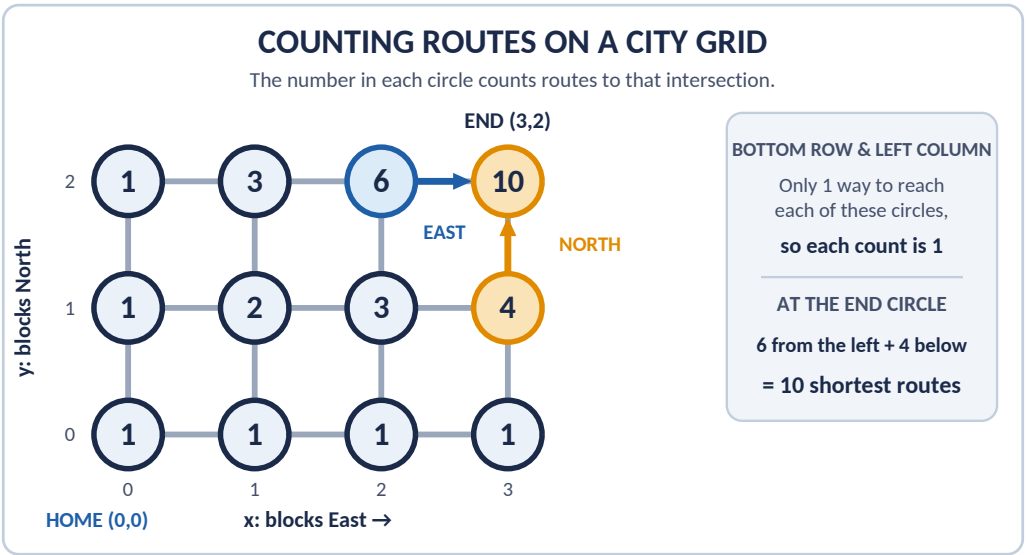
Imagine a cab travelling through a city laid out in a square grid. Each circle marks an **intersection**, and each street between neighbouring intersections is **one block**.

The cab starts at Home, (0,0), and can travel only **East** or **North**. To reach (3,2), for example, it can travel 3 blocks East and 2 blocks North: **5 blocks altogether**. This is one of the routes.



Counting the Routes

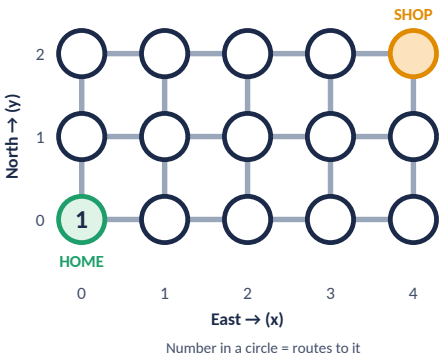
To reach an intersection, the cab's last step is either **East** from the circle on its left or **North** from the circle below it. These are the only two possibilities, so the number of routes to an intersection is the sum of the route counts in those two circles.



Questions

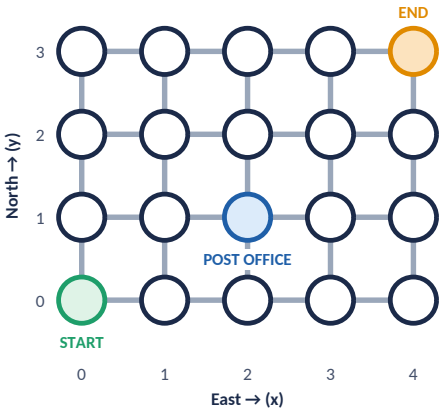
18 Aarav starts at Home (0, 0). He must deliver a parcel to the Shop at (4, 2). How many different shortest routes can he take?

A. 10 **B.** 12 **C.** 18 **D.** 15



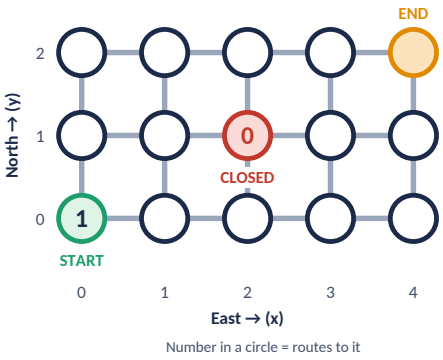
19 Aarav starts at (0, 0). He must deliver a parcel to (4, 3). On the way he must stop at the Post Office at (2, 1). How many different shortest routes can he take?

A. 35 **B.** 21 **C.** 18 **D.** 9



20 Aarav goes from (0, 0) to (4, 2). The intersection (2, 1) is closed, so he cannot pass through it. How many different shortest routes can he take?

A. 6 **B.** 9 **C.** 12 **D.** 15



CASE STUDY 6

The Matchmaker's Count



QUESTIONS **21 – 25**
5 × 4 = 20 marks

Imagine hosting a tournament where every player must play against every other player exactly once. How can we count all the matches without accidentally counting any match twice?

The secret is to watch what happens as players walk onto the court one by one!

To count the matches without counting any pair twice, watch what happens as players arrive:

1st Player	walks in: Nobody is there yet —> 0 matches.
2nd Player	walks in: Plays against Player 1 —> +1 new match.
3rd Player	walks in: Plays against the 2 players already there —> +2 new matches.
4th Player	walks in: Plays against the 3 players already there —> +3 new matches.
5th Player	walks in: Plays against the 4 players already there —> +4 new matches.

So with 5 players, the total is 1 + 2 + 3 + 4 = 10 matches. Each new player plays every player who is already there. Use this pattern to find the number of matches. You can also use it to find the number of players.

Questions

21 Seven players each play against every other player once. How many matches are played?

A. 18 **B.** 21 **C.** 28 **D.** 42

22 In a tournament, every player plays every other player once. There are 45 matches in all. How many players took part?

A. 10 **B.** 9 **C.** 11 **D.** 45

23 Eight players finish all their matches. Then two new players join. Each new player plays every player they have not played yet. This includes the other new player. How many more matches are played?

A. 15 **B.** 16 **C.** 17 **D.** 18

24 In a 10-player tournament, each player writes down how many matches they played. All 10 numbers are added. The total is 90. How many matches were played in all?

A. 90 **B.** 50 **C.** 45 **D.** 20

25 Seven players are at a chess tournament. Each player must play one game against every other player. Several games can happen at the same time, but a player can play only one game in each time slot. What is the smallest number of time slots needed to finish all the games?

A. 21 **B.** 7 **C.** 6 **D.** 3