AUSTRALIAN MATHS TRUST

AUSTRALIAN MATHEMATICS COMPETITION

Junior Years 7 & 8

(Australian school years)

THURSDAY 1 AUGUST 2019

NAME: _____

TIME ALLOWED: 75 minutes

INSTRUCTIONS AND INFORMATION

General

1 Do not open the booklet until told to do so by your teacher.

2 NO calculators, maths stencils, mobile phones or other calculating aids are permitted. Scribbling paper, graph paper, ruler and compasses are permitted, but are not essential.

3 Diagrams are NOT drawn to scale. They are intended only as aids.

4 There are 25 multiple-choice questions, each requiring a single answer, and 5 questions that require a whole number answer between 0 and 999. The questions generally get harder as you work through the paper. There is no penalty for an incorrect response.

5 This is a competition not a test; do not expect to answer all questions. You are only competing against your own year in your own country/Australian state so different years doing the same paper are not compared.

6 Read the instructions on the answer sheet carefully. Ensure your name, school name and school year are entered. It is your responsibility to correctly code your answer sheet.

7 When your teacher gives the signal, begin working on the problems.

The answer sheet

1 Use only lead pencil.

2 Record your answers on the reverse of the answer sheet (not on the question paper) by FULLY colouring the circle matching your answer.

3 Your answer sheet will be scanned. The optical scanner will attempt to read all markings even if they are in the wrong places, so please be careful not to doodle or write anything extra on the answer sheet. If you want to change an answer or remove any marks, use a plastic eraser and be sure to remove all marks and smudges.

Integrity of the competition

The AMT reserves the right to re-examine students before deciding whether to grant official status to their score.

Reminder: You may sit this competition once, in one division only, or risk no score.

Junior Division

Questions 1 to 10, 3 marks each

1. $201 - 9 =$

(A) 111 (B) 182 (C) 188 (D) 192 (E) 198

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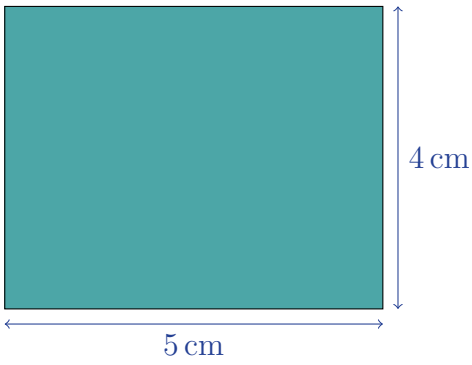
2. This rectangle is 5 cm wide and 4 cm tall.
What is its area in square centimetres?

(A) 9 (B) 10 (C) 18
(D) 20 (E) 40



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3. The table shows the number of boys and girls aged 10 or 11 in year 5.
How many boys aged 11 are in year 5?

(A) 9 (B) 11 (C) 21
(D) 37 (E) 46

	Age 10	Age 11	Total
Girls	14	25	39
Boys	9	?	46
Total	23	62	85

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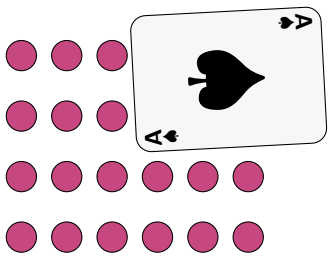
4. The circles are in a regular rectangular pattern. Some circles are hidden by the card.
What fraction of the circles is hidden?

(A) $\frac{1}{3}$ (B) $\frac{2}{3}$ (C) $\frac{1}{4}$
(D) $\frac{1}{6}$ (E) $\frac{1}{18}$



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5. Which one of the following is the largest number?

(A) 4.05 (B) 4.45 (C) 4.5 (D) 4.045 (E) 4.54

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6. What is 25% of $\frac{1}{2}$?

(A) $\frac{1}{16}$ (B) $\frac{1}{8}$ (C) $\frac{1}{4}$ (D) 1 (E) 2

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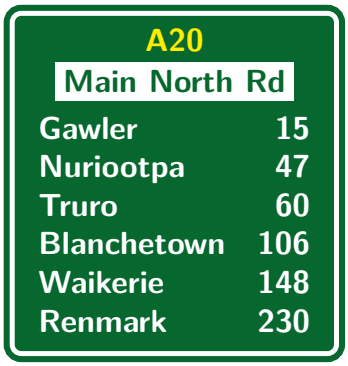
7. We're driving from Elizabeth to Renmark, and as we leave we see this sign.



We want to stop at a town for lunch and a break, approximately halfway to Renmark.

Which town is the best place to stop?

(A) Gawler (B) Nuriootpa (C) Truro (D) Blanchetown (E) Waikerie

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8. This letter  is first rotated by 90° clockwise and then reflected in a horizontal line. It will now look like this.

(A)  (B)  (C)  (D) (E) 

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9. Edith wrote down the whole numbers from 1 to 20 on a piece of paper. How many times did she write the digit 1?

(A) 9 (B) 10 (C) 11 (D) 12 (E) 13

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10. Danny divided a whole number P by another whole number Q on his calculator and got the answer 3.125.

Later, Danny forgot the two whole numbers, but he knew that both were under 30.

The value of Q is

(A) 5 (B) 7 (C) 8 (D) 10 (E) 25

Questions 11 to 20, 4 marks each

11. Every row and every column of this 3×3 square must contain each of the numbers 1, 2 and 3.

1		
	2	N
		M

What is the value of $N + M$?

(A) 2 (B) 3 (C) 4 (D) 5 (E) 6

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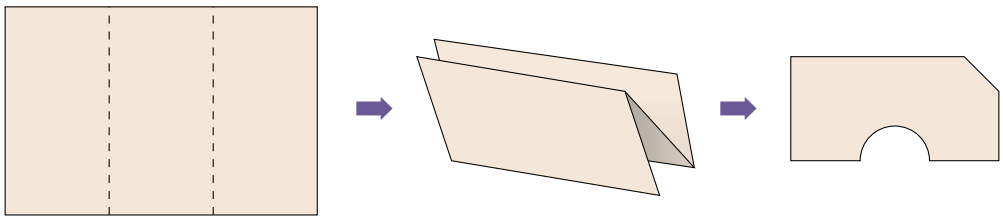
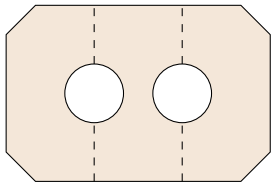
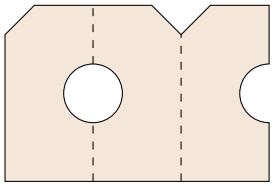
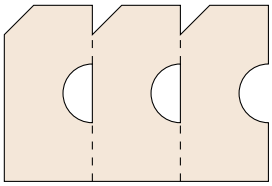
12. A piece of paper is folded in three, then a semi-circular cut and a straight cut are made, as shown in the diagram.

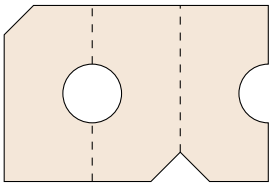


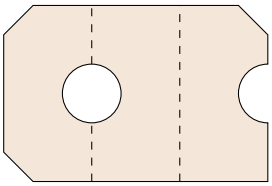
When the paper is unfolded, what does it look like?

(A) 

(B) 

(C) 

(D) 

(E) 

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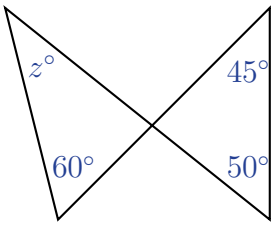
13. What is the value of z?

(A) 30 (B) 35 (C) 45 (D) 50 (E) 55



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14. $\dfrac{111111111}{111} =$

(A) 11111 (B) 1001001 (C) 10001 (D) 10101 (E) 1001

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15. Jill has the same number of brothers as she has sisters. Her brother Jack has twice as many sisters as he has brothers. How many children are in the family?

(A) 4 (B) 5 (C) 7 (D) 9 (E) 11

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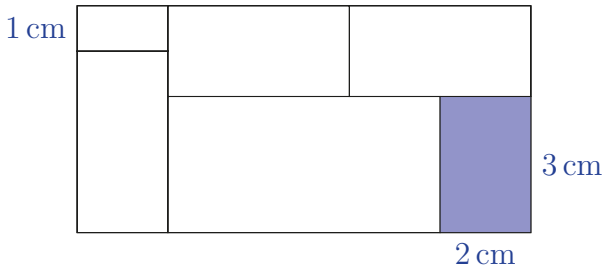
16. The large rectangle shown has been divided into 6 smaller rectangles. The shaded rectangle in the bottom-right corner has dimensions of 2 cm × 3 cm. The remaining five rectangles all have the long side equal to twice the short side. The smallest of these has a width of 1 cm.



What is the total area of the original large rectangle, in square centimetres?

(A) 42 (B) 44 (C) 50 (D) 56 (E) 70

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17. In my dance class, 14 students are taller than Bob, and 12 are shorter than Alice. Four students are both shorter than Alice and taller than Bob. How many students are in my dance class?

(A) 22 (B) 24 (C) 26 (D) 28 (E) 30

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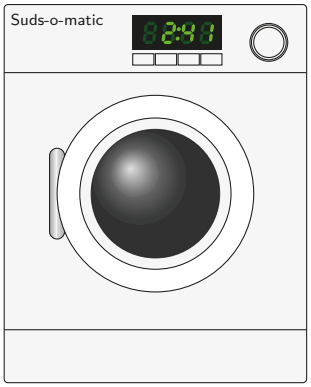
18. My washing machine has a digital display. It counts down the time remaining until the end of the wash, although sometimes I confuse the time remaining with the actual time.

At 1.05 pm yesterday the washing machine displayed 2:41, namely 2 hours and 41 minutes remaining.

When did the washing machine's countdown display happen to agree with the actual time?



(A) 2.41 pm (B) 3.46 pm (C) 2.23 pm (D) 1.36 pm (E) 1.53 pm

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19. A seven-digit number is in the form $20AMC19$, with all digits different. It is divisible by 9.

What is the value of $A + M + C$?

(A) 6 (B) 9 (C) 12 (D) 15 (E) 18

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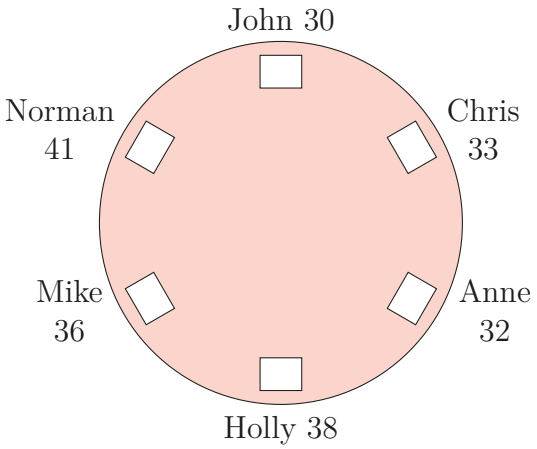
20. John, Chris, Anne, Holly, Mike and Norman are seated around a round table, each with a card with a number on it in front of them. Each person can see the numbers in front of their two neighbours, and says the sum of these two numbers.

John says 30, Chris says 33, Anne says 32, Holly says 38, Mike says 36 and Norman says 41. What number does Holly have in front of her?

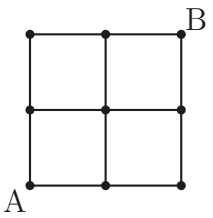
(A) 17 (B) 18 (C) 19 (D) 23 (E) 37



Questions 21 to 25, 5 marks each

21. On this simple system of roads, how many ways are there to get from A to B without visiting any of the 9 intersections more than once?

(A) 8 (B) 10 (C) 12 (D) 14 (E) 16



22. The average time for a class of 30 mathematics students to travel to school is 21 minutes. The boys' average is 25 minutes and the girls' average is 19 minutes. How many boys are in the class?

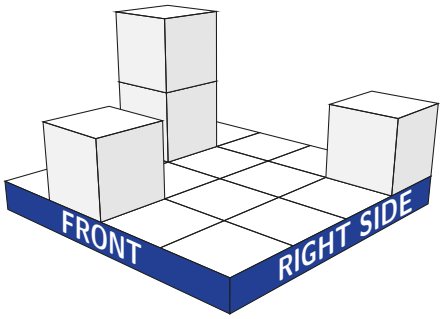
(A) 10 (B) 12 (C) 14 (D) 15 (E) 18

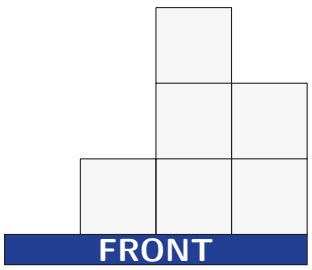
23. A 4 cm × 4 cm board can have 1 cm^3 cubes placed on it as shown.

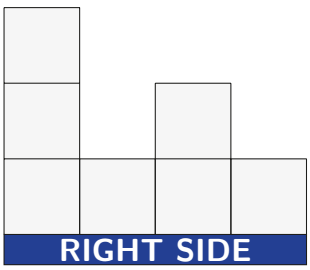
The board is cleared, then a number of these cubes are placed on the grid. The front and right side views are shown.

What is the maximum number of cubes there could be on the board?

(A) 10 (B) 11 (C) 16 (D) 17 (E) 18







24. Three athletes Andy, Bob and Chase took part in a 100-metre race, each running at a constant speed. Andy won the race in 10 seconds.

When Andy crossed the finish line, Bob was 10 metres behind. When Bob crossed the finish line, Chase was 10 metres behind Bob.

When Andy crossed the finish line, how far behind was Chase?

(A) 21 m (B) 20 m (C) 19 m (D) 18 m (E) 17 m

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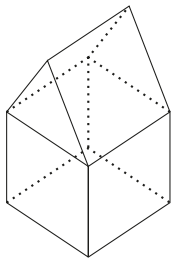
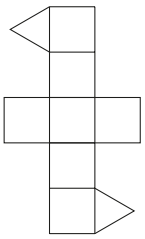
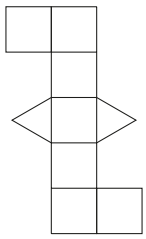
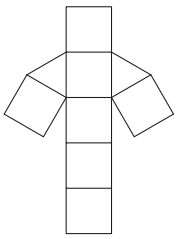
25. Seven squares and two equilateral triangles, all with the same side lengths, are used to form the 3-dimensional 'house shape' shown.

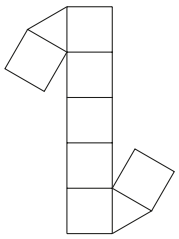


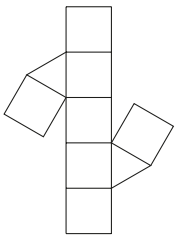
Which of the following diagrams does *not* show a net which can be created by cutting along some of the edges and folding the shape flat?

(A) 

(B) 

(C) 

(D) 

(E) 

For questions 26 to 30, shade the answer as an integer from 0 to 999 in the space provided on the answer sheet.

Questions 26–30 are worth 6, 7, 8, 9 and 10 marks, respectively.

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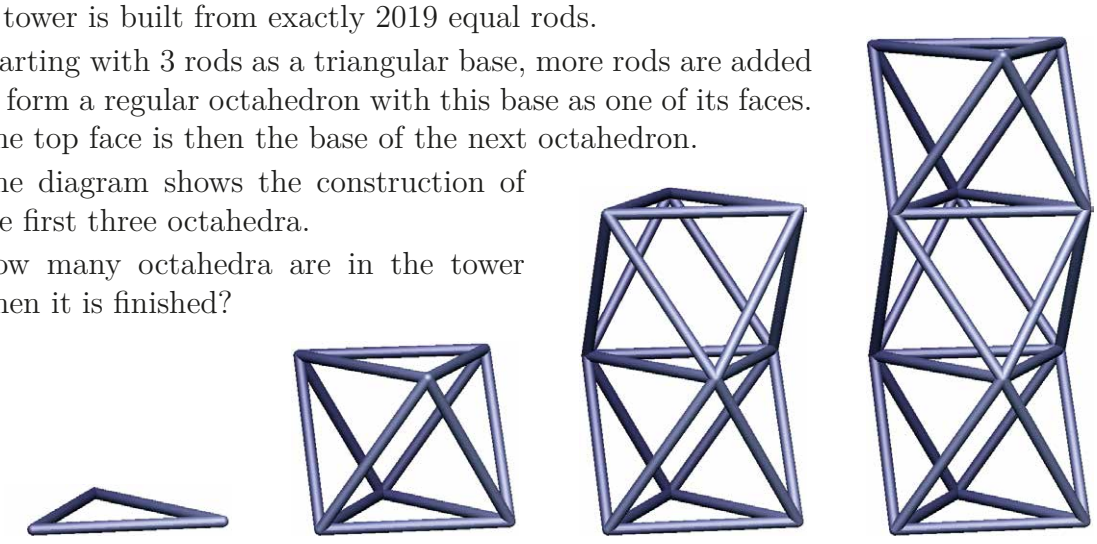
26. A tower is built from exactly 2019 equal rods.

Starting with 3 rods as a triangular base, more rods are added to form a regular octahedron with this base as one of its faces. The top face is then the base of the next octahedron.

The diagram shows the construction of the first three octahedra.

How many octahedra are in the tower when it is finished?



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27. A positive whole number is called *stable* if at least one of its digits has the same value as its position in the number. For example, 78247 is stable because a 4 appears in the 4^{th} position. How many stable 3-digit numbers are there?

28. When I divide an integer by 15, the remainder is an integer from 0 to 14. When I divide an integer by 27, the remainder is an integer from 0 to 26.

For instance, if the integer is 100 then the remainders are 10 and 19, which are different.

How many integers from 1 to 1000 leave the same remainders after division by 15 and after division by 27?

29. In a list of numbers, an *odd-sum triple* is a group of three numbers in a row that add to an odd number. For instance, if we write the numbers from 1 to 6 in this order,

$$6 \qquad 4 \qquad 2 \qquad 1 \qquad 3 \qquad 5$$

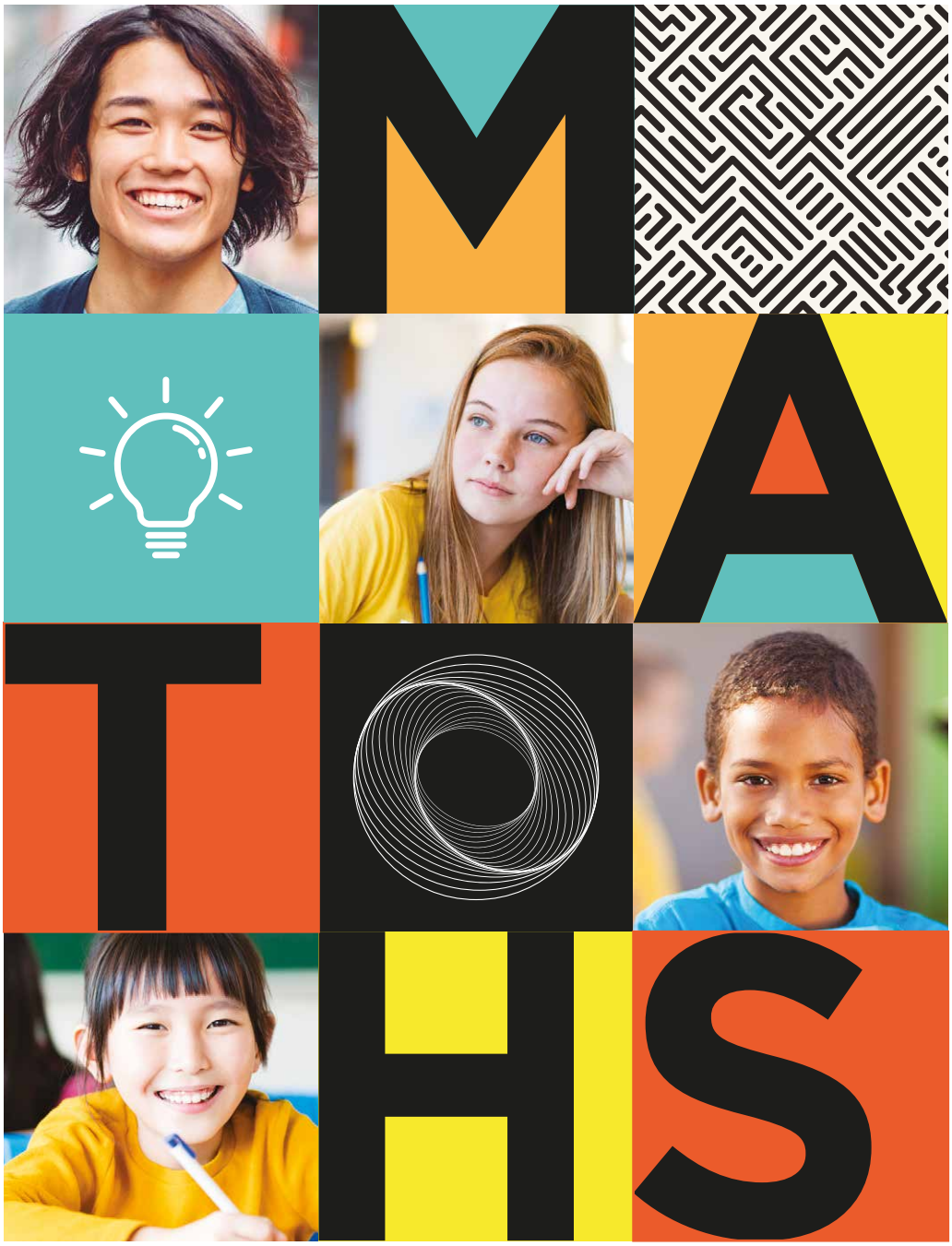
then there are exactly two odd-sum triples: $(4, 2, 1)$ and $(1, 3, 5)$.

What is the greatest number of odd-sum triples that can be made by writing the numbers from 1 to 1000 in some order?

30. The Leader of Zip decrees that the digit 0, since it represents nothing, will no longer be used in any counting number. Only counting numbers without 0 digits are allowed.

So the counting numbers in Zip begin 1, 2, 3, 4, 5, 6, 7, 8, 9, 11, 12, ... , where the tenth counting number is 11.

When you write out the first one thousand allowable counting numbers in Zip, what are the last three digits of the final number?



SOLVE PROBLEMS. CREATE THE FUTURE.

Problems are part of life and we've made it our mission to equip young students with the skills to solve more of them. Problem solving is a life skill and by developing it, students can create more choices for themselves and the future.

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