Mathlete Training Centre
SMOPS 2011

1. (SMOPS 11Q1) Voided

2. (SMOPS 11Q2) Find the value of $(1-\frac{1}{2})\times(1-\frac{1}{3})\times(1-\frac{1}{4})\times\cdots\times(1-\frac{1}{2010})\times(1-\frac{1}{2011})$.

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3. (SMOPS 11Q3) A circle of radius 1 m has some points lying on its circumference. Find the minimum number of points such that at least two points are less than 1 m apart.

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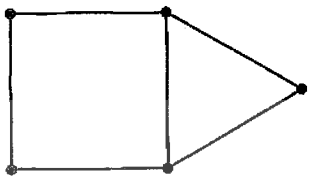
4. (SMOPS 11Q4) Three sides of a four-sided figure are of lengths 4 cm, 9 cm and 14 cm respectively. If the largest possible length of the fourth side is x cm where x is a whole number, find the value of x.

5. (SMOPS 11Q5) Find the largest prime number that divides the number $(1 \times 2 \times 3 \times \cdots \times 97 \times 98) + (1 \times 2 \times 3 \times \cdots \times 98 \times 99 \times 100)$.

6. (SMOPS 11Q6) $ABCD$ is a square and BCE is an equilateral triangle. If BC is 8 cm, find the radius of the circle passing through A, E and D in cm.



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7. (SMOPS 11Q7) Find the value of

$$\frac{19}{20}+\frac{1919}{2020}+\frac{191919}{202020}+\cdots+\frac{\underbrace{1919\ldots19}_{\text{2011 of 19's}}}{\underbrace{2020\ldots20}_{\text{2011 of 20's}}}$$

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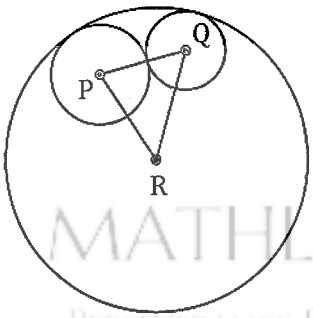
8. (SMOPS 11Q8) The following diagram shows a circle of radius 8 cm with the centre R. Two smaller circles with centres P and Q touch the circle with centre R and each other as shown in the diagram. Find the perimeter of the triangle PQR in cm.



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9. (SMOPS 11Q9) Peter and Jane competed in a 5000 m race. Peter's speed was 4 times that of Jane's. Jane ran from the beginning to the end, whereas Peter stopped running every now and then. When Jane crossed the finish line, Peter was 100m behind. Jane ran a total of x m during the time Peter was not running. Find the value of x.

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10. (SMOPS 11Q10) If numbers are arranged in three rows A, B and C in the following manner, which row will contain the number 1000?

A	1	6	7	12	13	18	19	···
B	2	5	8	11	14	17	20	···
C	3	4	9	10	15	16	21	···

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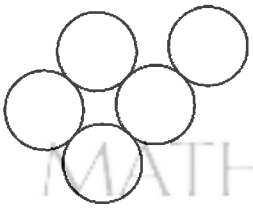
11. (SMOPS 11Q11) The following diagram shows 5 identical circles. How many different straight cuts are there so that the five shaded circles can be divided into two parts of equal area?



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12. (SMOPS 11Q12) A test with a maximum mark of 10 was administered to a class. Some of the results are shown in the table below. It is known that the average mark of those scoring more than 3 is 7 while the average mark of those getting below 8 is 4. Find the number of pupils in the class.

Score	1	2	3	...	8	9	10
Number of pupils	1	3	6		4	6	3

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13. (SMOPS 11Q13) A test comprises of 10 true or false questions. Find the least number of answer scripts required to ensure that there are at least 2 scripts with identical answers to all the 10 questions.

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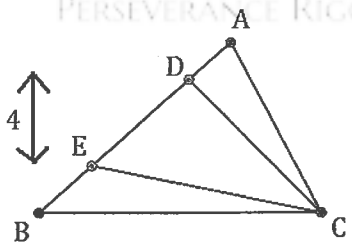
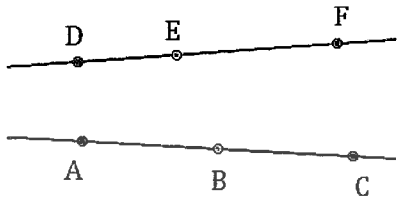
14. (SMOPS 11Q14) P_n is defined as the product of the digits in the whole number n. For example, $P_{19} = 1 \times 9 = 9$, $P_{32} = 3 \times 2 = 6$. Find the value of $P_{10} + P_{11} + P_{12} + \cdots + P_{98} + P_{99}$.

15. (SMOPS 11Q 15) ABC is a triangle with $BC = 8$ cm. D and E lie on AB such that the vertical distance between D and E is 4 cm. Find the area of triangle CDE in cm^2.



16. (SMOPS 11Q16) The points A, B, C, D, E and F are on the two straight lines as shown. How many triangles can there be formed with any 3 of the 6 points as vertices?



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17. (SMOPS 11Q17) A group of 50 girls were interviewed to find out how many books they had borrowed from the school library in April. The total number of books borrowed by the girls in April was 88, and 18 girls had borrowed only 1 book each. If each girl had borrowed either 1, 2 or 3 books, find the number of girls that have borrowed 2 books each.

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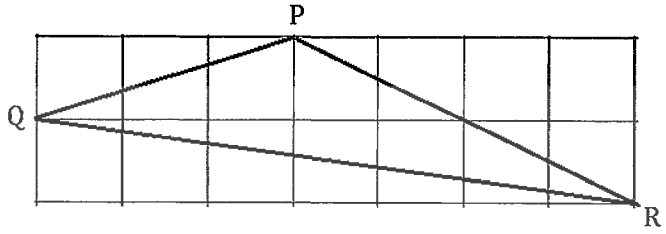
18. (SMOPS 11Q18) The following diagram shows a triangle PQR on a 2 by 7 rectangular grid. Find the sum of $\angle PQR$ and $\angle PRQ$ in degrees.



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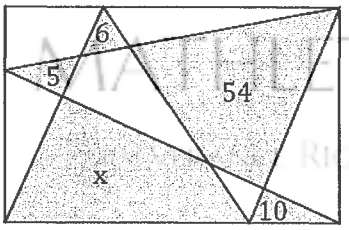
19. (SMOPS 11Q19) The following diagram shows a rectangle where the areas of the shaded regions are 5 cm^2, 6 cm^2, 10 cm^2, 54 cm^2 and x cm^2 respectively. Find the value of x.



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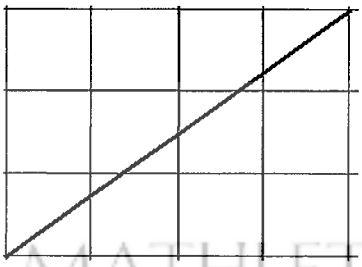
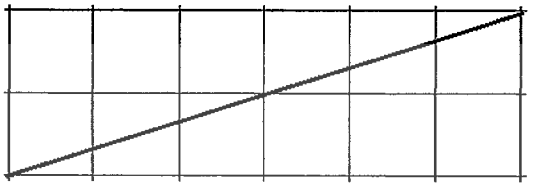
20. (SMOPS 11Q20) The following diagram shows two squares $ABCD$ and $DGFE$. The side CD touches the side DG. If the area of $DEFG$ is 80 cm^2, find the area of the triangle BGE in cm^2.

21. (SMOPS 11Q21) Two points P and Q are 11 cm apart. A line perpendicular to the line PQ is 7 cm from P and 4 cm from Q. How many more lines, on the same plane, are 7 cm from P and 4 cm from Q?

22. (SMOPS 11Q22) The greatest number of points of intersectionn of the gird lines that the diagonal of a rectangle with area 12 cm^2 can pass through is 3 as shown.

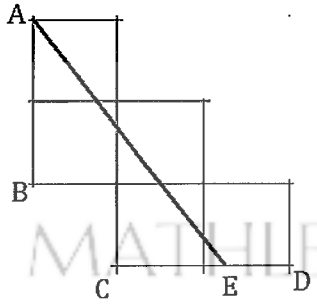




Find the greatest possible number of points of intersecton that the diagonal of a rectangle with area 432 cm^2 can pass through.

23. (SMOPS 11Q23) Given that $(100 \times a + 10 \times b + c) \times (a + b + c) = 1926$ where a, b and c are whole numbers, find the value of $a + b + c$.

24. (SMOPS 11Q24) The following figure comprises 5 identical squares each of area 16 cm^2. A, B, C and D are vertices of the squares. E lies on CD such that AE divides the 5 squares into two parts of equal areas. Find the length of CE in cm.



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25. (SMOPS 11Q25) Whole numbers from 1 to 10 are separated into two groups, each comprising 5 numbers such that the product of all the numbers in one group is divisible by the product of all the numbers in the other. If n is the quotient of such a division, find the least possible value of n.

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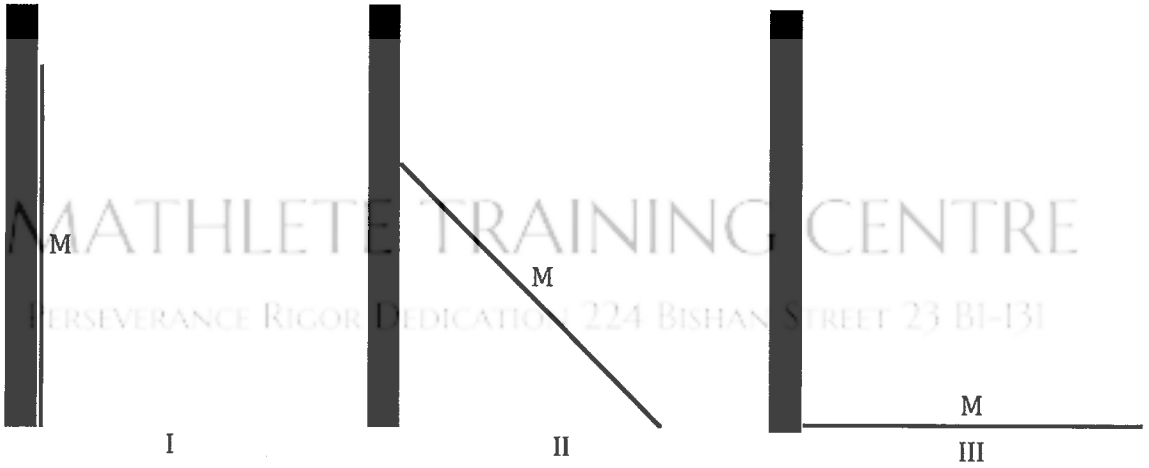
26. (SMOPS 11Q26) Diagram I shows a ladder of 4 m leaning vertically against a wall. It slides down without slipping to II and then finally to a horizontal position as shown as II. If M is at the midpoint of the ladder, find the distance travelled by M during the slide in m.



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27. (SMOPS 11Q27) A theme park issues entrance tikets bearing 5-digit serial numbers from 00000 to 99999. If any adjacent numbers in the serial numbers differ by 5 (for example 12493), customers holding such a ticket could use the ticket to redeem a free drink. Find the number of tickets that have serial numbers with this property.

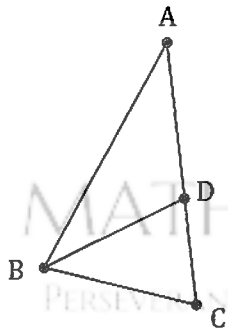
28. (SMOPS 11Q28) S_n is defined as the sum of the digits in the whole number n. For example, $S_3 = 3$ and $S_{29} = 2 + 9 = 11$. Find the value of $S_1 + S_2 + S_3 + \cdots + S_{2010} + S_{2011}$.

29. (SMOPS 11Q29) Anthony, Benjamin and Cain were interviewed to find our how many hours they spend on the computer in a day. They give the following replies.

Anthony:
I spend 4 hours on the computer.
I spend 3 hours on the computer less than Benjamin.
I spend 2 hours on the computer less than Cain.
Benjamin:
Cain spends 5 hours on the computer.
The time I spend on the computer differs from Cain's time by 2 hours.
The time I spent on the computer is not the least among the three of us.
Cain:
I spend more time on the computer than Anthony.
I spend 4 hours on the computer.
Benjamin spends 3 hours on the computer more than Anthony.

If only two of the three statements made by each boy are true, find the number of hours that Anthony spends on the computer each day.

30. (SMOPS 11Q30) ABC is a triangle and D lies on AC such that $AD = BD = BC$. If all the three interior angles of triangle ABC, measured in degrees, are whole numbers, find the greatest possilbe value of $\angle ABC$ in degrees.



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