DIKTAT MATEMATIKA SD/MI
PRA OSN - IMSO & IMC 2014

ERICK INSTITUTE

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ERICK
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INDONESIA

PEMBINAAN OLIMPIADE MATEMATIKA
PRA OSN & IMSO 2014 (SESI – 1)
ERICK INSTITUTE INDONESIA
OLEH : AHMAD FAIZAL KH, ST, SE, M.Pd

JAWABLAH PERTANYAAN BERIKUT DENGAN JUJUR !

1. Study the following pattern.

   $\frac{1}{1x2}=\frac{1}{2},\frac{1}{1x2}+\frac{1}{2x3}=\frac{2}{3},\frac{1}{1x2}+\frac{1}{2x3}+\frac{1}{3x4}=\frac{3}{4}$

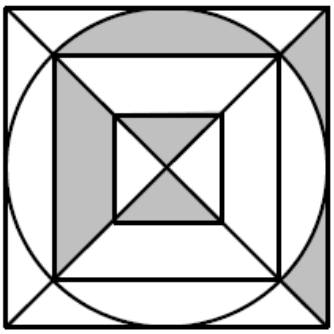
   Given that: $\frac{1}{1x2}+\frac{1}{2x3}+\frac{1}{3x4}+\cdots+\frac{1}{2013x2014}=\frac{a+2}{a+3}$,where *a* is a positive integer. Find the value of *a*.

   (IMSO 2013 Alfonso, Cavite, Philippines)

2. The sum of the digits of a two-digit number $\overline{ab}$ is 6. By reversing the digits, one obtained another two- digit number $\overline{ba}$. If $\overline{ab}-\overline{ba}$ =18 , find the original two-digit number.

   (IMSO 2013 Alfonso, Cavite, Philippines)

3. The side length of the biggest square in the given diagram is 10 cm long. As shown in the diagram, the total shaded regions formed by two diagonals inside the circle and two squares is 26 cm^2. What is the length side of the smallest square in cm?

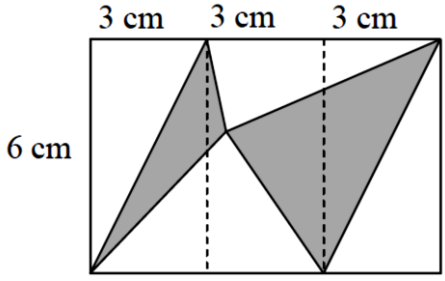
   

   (IMSO 2013 Alfonso, Cavite, Philippines)

4. What is the units digit for the following sum : $3^{2011} + 4^{2012} + 7^{2013}$?

   (IMSO 2013 Alfonso, Cavite, Philippines)

5. In the Figure below, three 6 cm × 3 cm rectangles are placed together in a row. Find the area of the shaded region.

   (IMSO 2013 Alfonso, Cavite, Philippines)

6. The radius of a circle is increased by 100%. Find the percentage increase in the area?

(IMSO 2012 Lucknow, India)

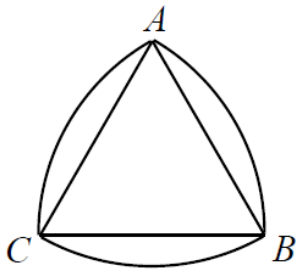
7. Three committees meet today. Of these three committees, one meets every 11 days, a second meets every 15 days, and the third meets every 21 days. What is the number of days before they all meet on the same day again?

(IMSO 2012 Lucknow, India)

8. The hypotenuse of a right triangle has length 10 cm, and the other two sides have lengths y and 3y respectively. Find the area of the triangle, in cm^2.

(IMSO 2012 Lucknow, India)

9. In the diagram below, ABC is an equilateral triangle of side length 7 cm. The arcs AB, BC and CA are drawn with centres C, A and B respectively. Find the total length, in cm, of the three arcs. (Using $\pi = \frac{22}{7}$)



(IMSO 2012 Lucknow, India)

10. In a class of 25 children, 12 wear glasses and 11 wear braces. If 7 wear both glasses and braces, what is the number of those who wear neither?

(IMSO 2012 Lucknow, India)

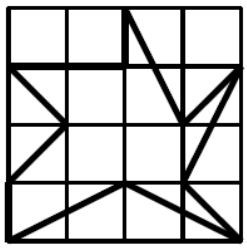
11. IMSO, MOSI and SMIO are some arrangements of the letters I, M, S and O. How many different arrangements are there such that the letter I is not next to the letter O?

(IMSO 2012 Lucknow, India)

12. The product of two positive integers is 1 000 000. Neither of the two numbers contains the digit 0. What is their sum?

(IMSO 2012 Lucknow, India)

13. In the diagram below, each of the small squares in the 4×4 grid measures 1 cm by 1 cm. Find the area of the 11-sided polygon, in cm^2.



(IMSO 2012 Lucknow, India)

14. The teacher gave ten tests during the year, each carrying the same weight. If Mary had got 10 more marks on the last test, her average would have become 92. What was her actual average?

(IMSO 2012 Lucknow, India)

15. The sum of the numbers A, B and C is 390. Given that A is 3 times of B and A is one third of C, find the value of C.

(IMSO 2012 Lucknow, India)

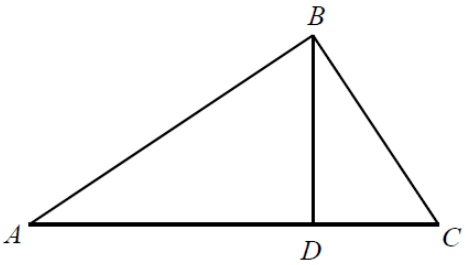
16. Class A has 10 students and class B has 15 students. In a test, the average grade for class A is 60, and the average grade for class B is 66. A new student writes the test in the office. If he is put in class A, its average will become 62. If he is put in class B, what will its average become?

(IMSO 2012 Lucknow, India)

17. Two years ago, Steve was three times as old as Bill, and in three years he will be twice as old as Bill. Find the sum of their ages.

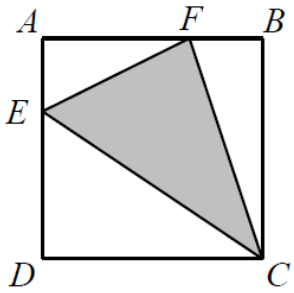
(IMSO 2012 Lucknow, India)

18. In the right diagram, $\angle ABC = \angle BDC = 90°$. If $\frac{AD}{DC} = \frac{9}{4}$. Then what is the value of $\frac{BD}{AC}$



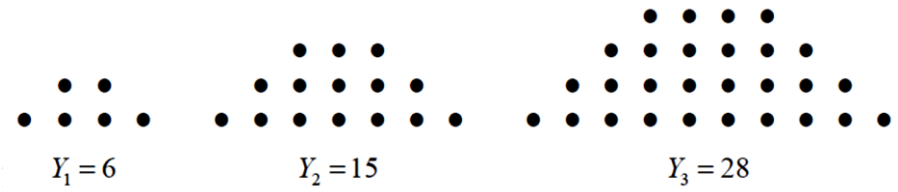
(IMSO 2012 Lucknow, India)

19. In the diagram below, *ABCD* is a square, *E* is a point on *AD* and *F* a point on *AB* such that *DE*=2*AE* and *AF*=2*BF*. What is the ratio of the area of triangle *CEF* to that of square *ABCD*?



(IMSO 2012 Lucknow, India)

20. Consider the following pattern:



21. The average of *x* and *y* is 19. The average of *a*, *b* and *c* is 14. Find the average of *x*, *y*, *a*, *b* and *c*.

(IMSO 2011, Taiwan)

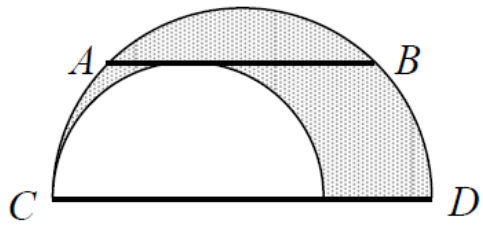
22. Find the units digit for the following sum: $23^{2011} + 37^{2011} + 64^{2011} + 88^{2011}$

(IMSO 2011, Taiwan)

23. There are two positive integers, neither of which has a digit equal to 0, whose product is 8,000. Find the sum of these two positive integers.

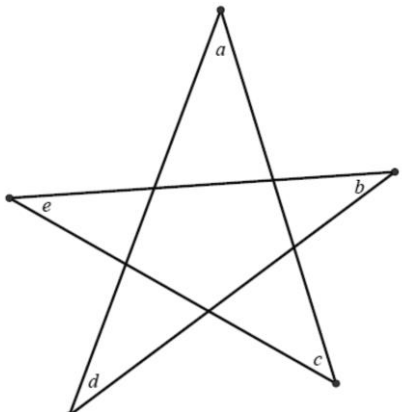
(IMSO 2011, Taiwan)

24. The diagram shows two semicircles with *AB* touching the smaller semicircle and parallel to *CD*. Given *AB* = 14 cm, find the area of the shaded region, in cm^2.



(IMSO 2011, Taiwan)

25. In the diagram shown, find the measure of ∠a +∠b +∠c +∠d +∠e



(IMSO 2011, Taiwan)

26. **(EMIC India 2004)**
Let :

A = 200320032003 X 2004200420042004 and

B = 200420042004 X 2003200320032003.

Find *A* – *B*.

27. **(8th Po leung Kuk, Hongkong)** Given that $1^2 + 2^2 + 3^2 + \cdots + n^2 = \frac{n(n+1)(2n+1)}{6}$
Find The Value of : $1^2 + 3^2 + 5^2 + 7^2 + \cdots + 99^2$

28. **(AITMO Philipina 2009)** Arrange the numbers 2^{847}, 3^{539} ,5^{363} , 7^{308} and 11^{242} from the largest to the smallest.

29. **(PEMIC 2005)** A sequence of digits is formed by writing the digits from the natural numbers in the order that they appear. The sequence starts :
123456789101112 … ;

What is the 2005th digit in the sequence?

30. **(IMSO Math, Taiwan 2007)** The fraction $\frac{2007}{7000}$ is written as a decimal. What digit is in the 2007th place? (In the decimal 0.23456 the digit 4 is in the 3rd place.)

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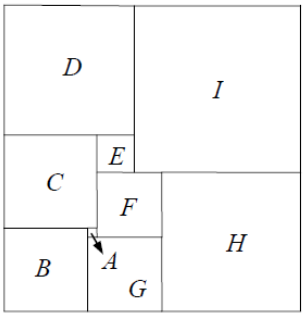
1. What would be the third number from the left of the 75th row of the accompanying triangular number pattern?

$$\begin{array}{ccccccc} & & & 1 & & & \\ & & 2 & 3 & 4 & & \\ & 5 & 6 & 7 & 8 & 9 & \\ 10 & 11 & 12 & 13 & 14 & 15 & 16 \\ & & & \vdots & & & \end{array}$$

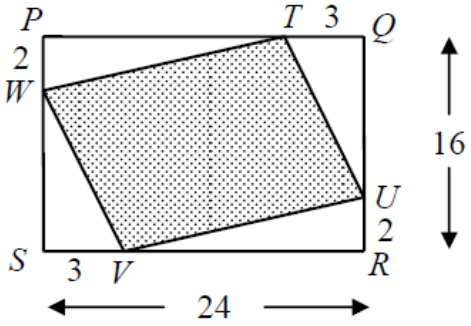
(IMSO 2007)

2. Nine squares are arranged as shown. If square *A* has area 4cm^2 and square *B* has area 324cm^2, then what is the area of square *I*, in square centimeters?



(IMSO 2007)

3. The rectangle *PQRS* measures 24cm by 16cm. Points *T*, *U*, *V* and *W* are on the sides with measurements, in centimeters, as shown. Find the area, in square centimeters, of shaded portion.



(IMSO 2007)

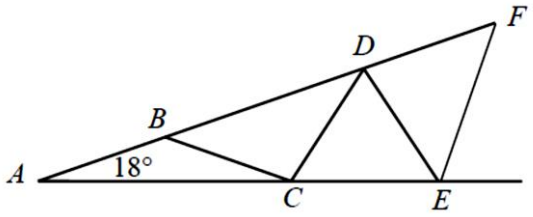
4. The fraction $\frac{2007}{7000}$ is written as a decimal. What digit is in the 2007th place? (In the decimal 0.23456 the digit 4 is in the 3rd place.)

(IMSO 2007)

5. Mary's brother and grandmother both died young. The sum of their lifespans equaled 78 years. Mary's brother died 99 years after their grandmother was born. How many years after their grandmother died was Mary's brother born?

(IMSO 2007)

6. $\triangle ABC$ is an isosceles triangle. We consider segment CD such that $CD=BC$, then $\triangle BCD$ is another isosceles triangle. Next, consider another segment DE such that $DE=CD$ and then $\triangle CDE$ is another isosceles triangle. If $DE=DF$ and $\angle BAC$ =18° as the figure shown, find $\angle DEF$ in degree



(IMSO 2007)

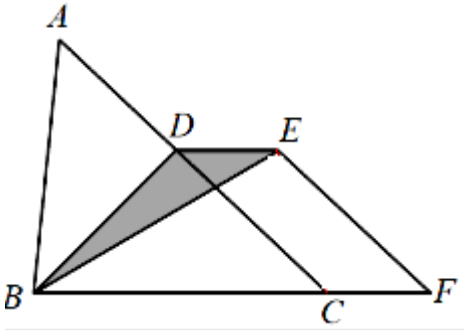
7. Anne asks her teacher his age. He replied 'My age now is a square number but after my birthday it will be a prime number.' Assuming that he is under 65 and more than 20, how old is he?

(IMSO 2007)

8. In one chess league, where each competitor played each of the other competitors once, and once only, a total of 300 games were played. How many competitors were there?

(IMSO 2011)

9. Given that the area of $\triangle ABC$ is 336 cm^2 which is 3 times of the area of parallelogram $DEFC$. What is the area of the shaded region?



(IMSO 2011)

10. Let $\overline{ab}$ be a 2-digit number. If the order of the digits is changed, it makes a new number which is 1 less than one-half of $\overline{ab}$. What is $\overline{ab}$?

(IMSO 2011)

11. In a test, all questions scored equal marks. If you answered 8 of the first 10 questions correctly and only 30% of the remaining questions correctly you would score 40% of the total marks. How many questions are there in the test?

(IMSO 2011)

12. David starts to read a book on the 1st of July. Every day he read the same number of pages and finished the book on the 31st of July of the same year. If on the first day he had read ¼ of the actual number of pages he read and on each of the following days – one page more than on the day before, then he would have finished the book in the same number of days. How many pages did the book have?

(IMSO 2011)

13. Mike began writing integers on a sheet of paper as follows: he wrote 1, 2, and 3, but missed 4; he wrote 5, 6, 7, and missed 8 and 9; he wrote 10, 11 and 12, and missed 13, 14 and 15; then he wrote 16, 17 and 18, and missed 19, 20, 21 and 22, etc . Which number is located on the 2011th position in the series?

(IMSO 2011)

14. Starting with the "1" in the centre, the spiral of consecutive integers continues, as shown. What is the difference between the number that appears directly below 2011 and the number that appears directly above 2011?

	13	14	15	16	17	
	12	3	4	5	18	
	11	2	1	6	19	
27	10	9	8	7	20	
26	25	24	23	22	21	

(IMSO 2011)

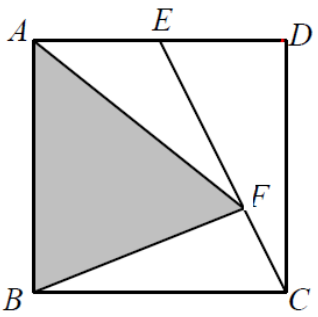
15. A chemist had 8 flasks, A, B, C, D, E, F, G and H, capable of holding 12, 15, 27, 35, 37, 40, 53 and 69 fluid ounces respectively. He filled some with water and then filled all the rest except one with alcohol. He used exactly one and a half times as much alcohol as water. Which flask was left empty?

(IMSO 2011)

16. In a basketball match, John got 23, 14, 11 and 20 scores in the 6th, 7th , 8th and 9th matches respectively. His average scores are higher in the first 9 matches than the first 5 matches. If his average score must be more than 18 in the first 10 matches, at least how many scores must he get in the 10^{th} match?

(IMSO 2011)

17. The area of the square *ABCD* is 60 cm2. If *AE*=*ED* and *EF*=2*FC*, find the area of $\triangle ABF$.



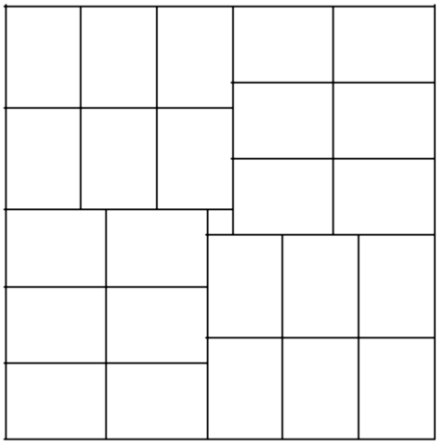
(IMSO 2011)

18. When John walks with his bicycle his average speed is a quarter of his riding speed. He travels to school each day with his bicycle but sometimes walks the bicycle in order to be

with his friend. When going to school one day he walks for twice the time he rides and takes 30 minutes to complete the journey. The next day he rides for twice the time he walks. How long does it take his to get to school on the second day?

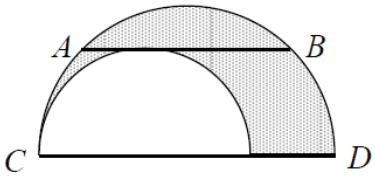
(IMSO 2011)

19. How many rectangular cards of size 3 cm by 4 cm can be cut off at most from a rectangular leaf of size 17 cm by 17 cm?



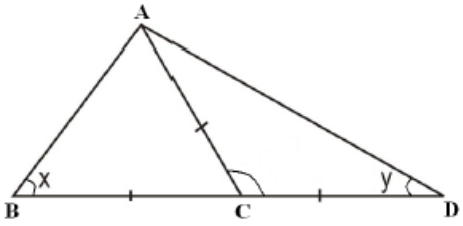
(IMSO 2011)

20. The diagram shows two semicircles with *AB* touching the smaller semicircle and parallel to *CD*. Given *AB* = 14 cm, find the area of the shaded region, in cm^2. $\left(\pi = \frac{22}{7}\right)$.



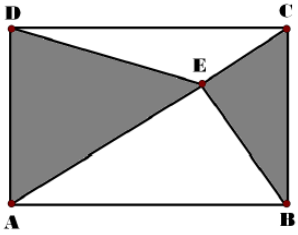
(IMSO 2011)

21. Find the measure of angle ABC as shown in the following figure, where AC = CB = CD, and the measure of angle ADC is 29^O



(IMSO 2008)

22. In the figure ABCD is a rectangle, AB = CD = 24 cm and AD = BC = 5 cm. What is the area of the shaded region, in cm^2?



(IMSO 2008)

23. You are asked to choose three different numbers from 1 to 10. The sum of the three numbers must be 12. How many choices do you have altogether?

(IMSO 2008)

24. Five chairs are arranged in a row. A certain five participants must be seated at those chairs. Two of the five participants may not be seated next to each other. In how many ways can we arrange the seating of those five participants?

(IMSO 2008)

25. Find the sum of all numbers from 1 to 500 that are divisible by 5 but not divisible by 2.

(IMSO 2008)

26. LetM and N be the areas of a big square and a small square, respectively. The perimeter of the big square is equal to 25 times the perimeter of the small square. What is the ratio of M to N?

(IMSO 2008)

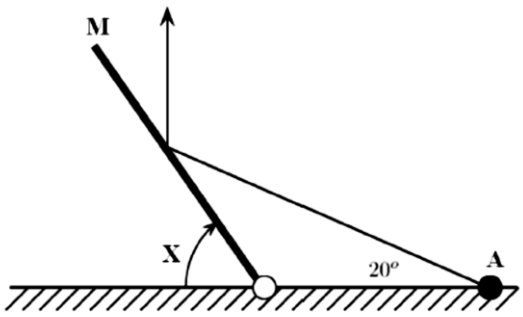
27. Ahmad usually travels from town P to town Q in eight hours. One day, he increased his average speed by 5km per hour so that he arrived 20 minutes earlier. Find his usual average speed, in km per hour.

(IMSO 2008)

28. Nadia wants to make a square using rectangular cards measuring 12.5 cm by 7.5 cm. The cards may not overlap and there may be no gaps between the cards. What is the least number of cards needed?

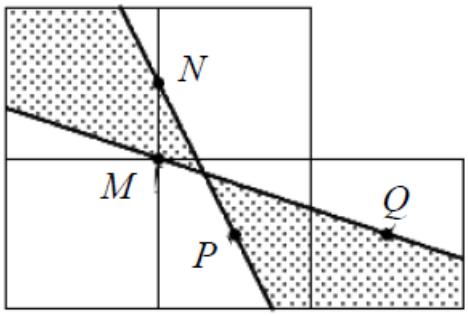
(IMSO 2008)

29. Light from point A makes an angle of 20^{O} to the horizontal plane. It is then reflected by plane mirror M, see the side-view figure on the right. What is the measure of the angle X that makes the reflected light S perpendicular to the horizontal plane?



(IMSO 2008)

30. The diagram below shows five unit squares joined edge to edge. M is a corner, N is the midpoint of a side and P and Q are the centres (intersection point of the two diagonal of a square) of two squares. What is the non-negative difference in the areas of the two shaded regions between PN and QM?



(IMSO 2007)

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JAWABLAH PERTANYAAN BERIKUT DENGAN JUJUR !

1. Amongst the children in a family each boy has many sisters as brothers, but each girl has only half as many sisters as brothers. How many children are there in the family?

   (IMSO 2007)

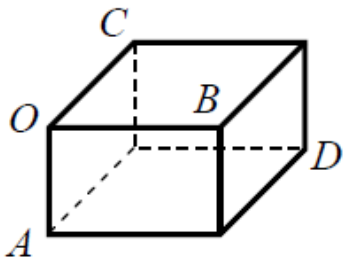
2. A litre of orange fruit juice drink contains 20% orange juice. How many milliliters of orange juice must be added to produce a mixture containing 50% orange juice?

   (IMSO 2007)

3. The sum of seven consecutive odd numbers is 539. What is the smallest of the seven numbers?

   (IMSO 2007)

4. The diagram represents a rectangular box in which the lengths of ages *OA*, *OB* and *OC* are respectively 3, 4 and 5 units. What is the length of *OD* in the same units?



   (IMSO 2007)

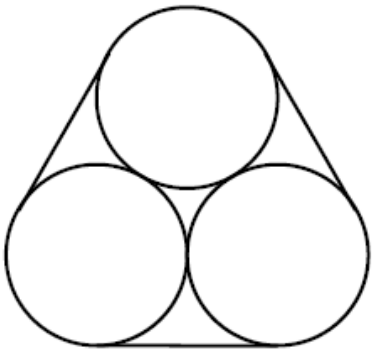
5. What is the least positive integer by which 1512 should be multiplied so that the product is a perfect square?

   (IMSO 2007)

6. In his latest game of bowling Tom scored 189 and this raised his average over a number of games from 178 to 179. To raise his average to 180 with the next game, how many points does he have to score?

   (IMSO 2007)

7. Three pipes of diameter 2 m are held together by a taut metal band as shown. What is the length (in metres) of the metal band?



   (IMSO 2007)

8. The 14 digits in a credit card number are to be written in the boxes below. If the sum of any three consecutive digit is 22, what is the value of x?

			9				x				7		

(IMSO 2007)

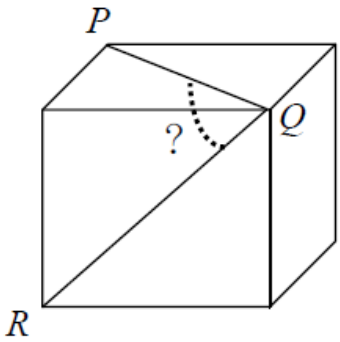
9. 1152 digits are used to number the pages of a book consecutively from page 1. How many pages are there in the book?

(IMSO 2007)

10. By placing a 3 at both ends of a number, its value is increased by 34215. What is the sum of the digits of the original number?

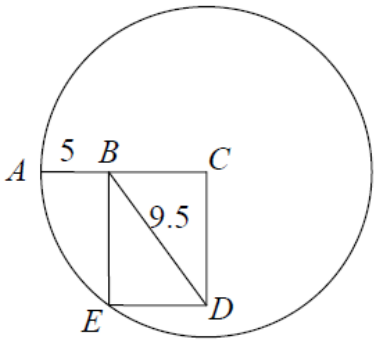
(IMSO 2007)

11. PQ and QR are diagonals on two faces of a cube, as shown. What is the angle formed by PQR, in degree?



(IMSO 2007)

12. Given this circle, with center C and the rectangle $BCDE$ so that AB=5 and BD=9.5, find the diameter of the circle.



(IMSO 2007)

13. An office manager figures out that 40 typists can type 25 complete books in two hours. If he has to cut his work force to two typists, how long would it take them to type ten books?

(IMSO 2007)

14. In an election for school captain, 1320 votes were cast for five candidates. The winner's margins over the other four candidates were 19, 33, 48 and 65. What was the lowest number of votes received by a candidate?

(IMSO 2007)

15. What is the product of :

$$1001 \times \left(1 - \frac{1}{1001^2}\right) \times \left(1 - \frac{1}{1002^2}\right) \times \left(1 - \frac{1}{1003^2}\right) \times \ldots \times \left(1 - \frac{1}{1007^2}\right) \times 2007$$

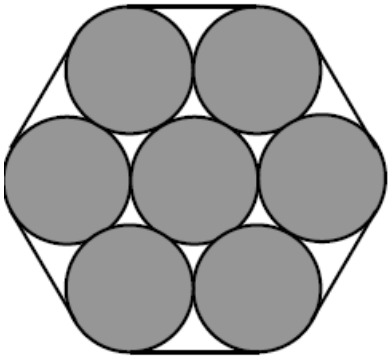
(IMSO 2007)

16. A multiplication magic square has the product of the numbers in each row, column and diagonal the same. If the diagram is filled with positive integers to form a multiplicative magic square, what is the value of *X*?

20		*X*
16		
	4	

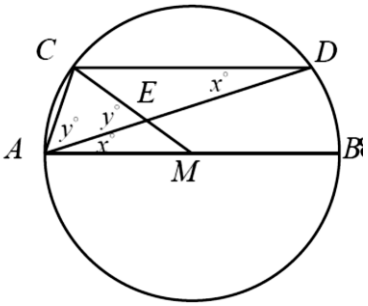
(IMSO 2007)

17. The diagram depicts seven soft drink cans, seen from above, which are held tightly together by means of a ribbon. The circles represent the tops of the cans, and the other curve, which is clearly not a circle, represents the edge of the ribbon. The ends of the ribbon meet exactly; there is no overlap. Given that the cans all have diameter 6 cm, find the exact length of the ribbon



(IMSO 2008)

18. AB is a diameter of a circle with centre M. CD is a chord of this circle which is parallel to AB and C is its extremity nearer to A. MC meets AD at a point E such that AC=EC. Find the size of the angle CAM.



(IMSO 2008)

19. A rectangle is divided into 9 small rectangles, as shown in the diagram, which is not drawn to scale. The areas of 5 of the small rectangles (in suitable units) are given. What is X?

6	9	
	15	18
X		27

(IMSO 2008)

20. *A*, *B*, *C* and *D* are four members of the football team. No two have the same weight. *A* is 8 kg heavier than *C*. *D* is 4 kg heavier than *B*. The sum of the weights of the heaviest and the lightest is 2 kg less than the sum of the weights of the other two people. If the sum of all their weights is 402 kg, what does *B* weigh?

(IMSO 2008)

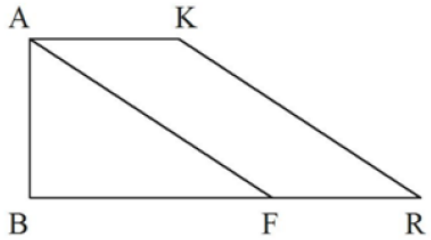
21. Let P = 1 × 2 × 3 × 4 × 5 × 6 × 7 × 8 × 9 × 10 × 11 × 12 × 13 × 14 × 15 and Q = 1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 + 9 + 10 + 11 + 12 + 13 + 14 + 15. What is the remainder when P is divided by Q?

(IMSO 2010)

22. The area of a square ABCD is 36 cm^2. Let E be the midpoint of AB; and F be the midpoint of BC. What is the area of the trapezoid AEFC; in cm^2?

(IMSO 2010)

23. In the figure, angle ABF is a right angle. The area of triangle ABF is equal to the area of parallelogram FRKA: The length of AB;BF and FA are 3 cm, 4 cm and 5 cm respectively. What is the length of FR; in cm?

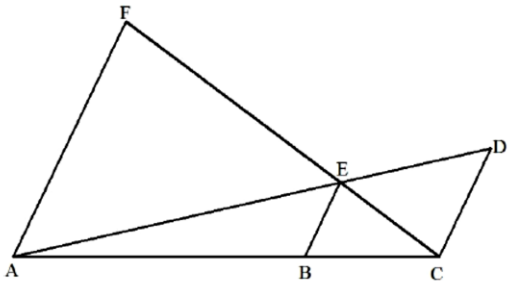


(IMSO 2010)

24. Six bags of marbles contain 18; 19; 21; 23; 25 and 34 marbles, respectively. One bag contains red marbles only. The other _ve bags contain no red marbles. Jane takes three of the bags and George takes two of the others. Only the bag of red marbles remains. If Jane gets twice as many marbles as George, how many red marbles are there?

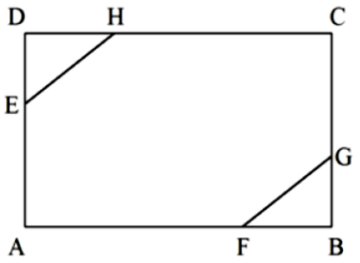
(IMSO 2010)

25. In the figure, AF, BE and CD are parallel. B = 7 cm, BE = 3 cm, and CD = 4 cm. Find the length of AF in cm



(IMSO 2010)

26. In the figure, ABCD is a rectangle, ED = BG = 1/3 BC and BF = DH = 1/3 AB . What is the ratio of the area of AFGCHE to the area of ABCD ?

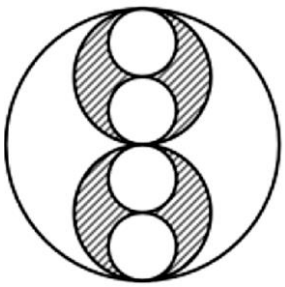


(IMSO 2010)

27. One day Joko drove at the average speed of 50 km/hour from his house to his o_ce. He arrived two minutes late. On the next day, he drove to his office at the average speed of 60 km/hour and arrived one minute early. What is the distance between Joko's house and his office, in km?

(IMSO 2010)

28. In the figure, the diameter of the largest circle is 28 cm. Two circles of diameter 14 cm are inscribed in it. Two circles of diameter 7 cm are inscribed in each of the circles of diameter 14 cm. What is area of the shaded region, in cm^2? $\left(\pi = \frac{22}{7}\right)$



(IMSO 2010)

29. The ratio of Amin's money to Budi's money was 5 : 4. They donated a part of their money for charity. Amin's donation was two times Budi's donation. After that, each of them had $15. How much money was donated by Amin?

(IMSO 2010)

30. A solid rectangular iron is put into a cylinder. The solid has a square base of side length 10 cm and height of 15 cm. The diameter and height of the cylinder are 14 cm and 16 cm, respectively. If water fills $\frac{3}{4}$ of the cylinder, how many cm^3 water will be spilled out? $\left(use : \pi = \frac{22}{7} \right)$.

(IMSO 2010)

PEMBINAAN OLIMPIADE MATEMATIKA
PRA OSN & IMSO 2014 (SESI – 4)
ERICK INSTITUTE INDONESIA
OLEH : AHMAD FAIZAL KH, ST, SE, M.Pd

JAWABLAH PERTANYAAN BERIKUT DENGAN JUJUR !

1. Siti had 60 green apples and 90 red apples for sale. The cost of every three green apples was $10; and every five red apples was $8. She mixed the apples and sold them all. If the selling price of every five mixed apples was $15, how much profit did Siti get from selling all the apples?

   (IMSO 2010)
2. Peter has a three-digit code for a padlock. He has forgotten the code but he knows that all three digits are different. He also knows that if you divide the first digit by the second digit and then square the result, you get the third digit. Find all three-digit codes having this property.

   (IMSO 2010)
3. Using the digits 1, 2, 3, and 4, we obtain 24 four-digit numbers. Those numbers are sorted from the smallest to the largest. the rank of 4213 is

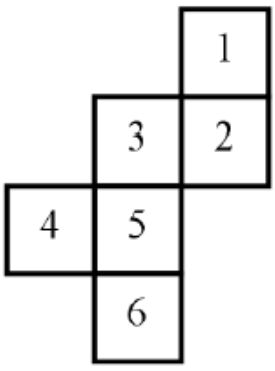
   (IMSO 2008)
4. A rectangle PQRS is inscribed in a semi-circle of radius 10 cm. The points P and Q are on diameter and points R and S are on the circle perimeter. If PQ = 2QR, the area of the region outside the rectangle is . . ..

   (IMSO 2008)
5. The sum of Deny's age and Ali's age is 29. The sum of Banu's age and Carli's age is 35. The sum of Ali's age and Banu's age is 31. Banu is younger than Ali. Among the four people, the oldest is .

   (IMSO 2008)
6. Two distinct straight lines meet at most at one point. Three distinct straight lines meet at most at three points. Eight distinct straight lines meet at most at . . . points.

   (IMSO 2008)
7. Given a 2-digit natural number. If order of the digits are changed then value of new number is exactly 20% more than the value of the given number. The given number is . . ..

   (IMSO 2008)
8. The figure shows a cube net in which each side is numbered from 1 to 6. The product of all numbers on the sides adjacent to the side numbered 1 is



   (IMSO 2008)
9. There are some boxes. These boxes are labelled by 1, 2, 3, 4, and so on. In this way, digit 2 appears 50 times in the labels. The number of boxes is . . .

(IMSO 2008)

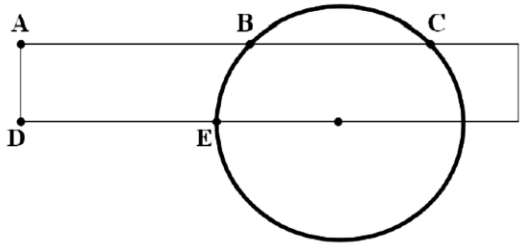
10. A rectangular block of wood of dimension 4 m × 5 m × 6 m was painted. It is then cut into smaller cubes of dimension 1 m × 1 m × 1 m. The number of smaller cubes with two sides painted is N. The number of smaller cubes with three sides painted is M. The ratio of N to M is . . . .

(IMSO 2008)

11. A positive pair of whole numbers that contain no 0 is called commensurable (with each other) if their sums of digits are equal. For example, 14 is commensurable with 5, 14, 32, 1121, and 11111. There are . . . numbers that are commensurable with 10.

(IMSO 2008)

12. A rectangle intersects a circle of radius 5, as shown in the figure. BC = 6 and DE = 7. The length of AC is . . .



(IMSO 2008)

13. There are some black and white balls in a box. The ratio of numbers of black balls to white balls is 3 : 4. Each of the white balls is marked by either A or B. The number of balls A is 23 of the number of balls B. The difference between numbers of balls A and B is 52. The number of the black balls is . . . .

(IMSO 2008)

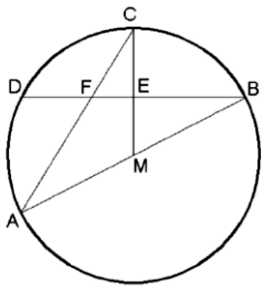
14. There are some black and white balls in a box. The ratio of numbers of black balls to white balls is 3 : 4. Each of the white balls is marked by either A or B. The number of balls A is 23 of the number of balls B. The difference between numbers of balls A and B is 52. The number of the black balls is . . . .

(IMSO 2008)

15. Seventeen unit cubes are arranged to form a solid. The minimum surface area of all possible solids is . . . .

(IMSO 2008)

16. In the figure, M is a center of the circle, F is the intersection of the lines AC and BD, and E is the intersection of the lines CM and BD. The line CM is perpendicular to the line BD. If the measure of angle MBE is 32^o, the measure of angle CFD is . . ..



17. Two candles of the same height were lit at the same time. The first took four hours to burn completely while the second one took two hours. Assume that each candle burns at a constant rate. Then it takes . . . hour for the first candle to be thrice the height of the second candle.

(IMSO 2008)

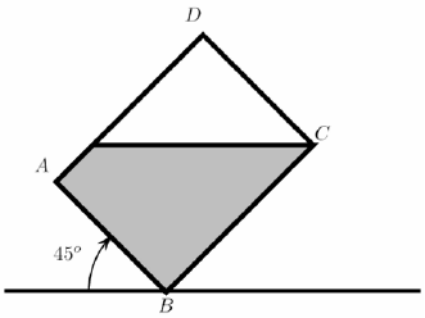
18. Five one-digit positive numbers are sorted from the smallest to the largest. Their average is equal to the forth number. The second number is different from the forth number. These five numbers that give that the maximum product are . . .

(IMSO 2008)

19. The volume of a rectangular box is 2008 cm3. In centimeters, the length, width and height of the box are whole numbers. The largest possible surface area of the box is . . . .

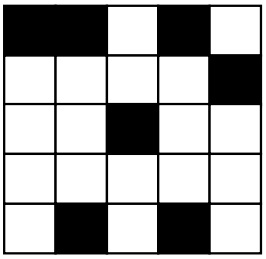
(IMSO 2008)

20. A rectangular cross section of a can ABCD with base AB of length 40 cm and the height BC is filled by water of depth two third of BC. When AB is tiled at 45^o (see figure), the water just came up to C. The height BC is . . . cm.



(IMSO 2008)

21. A big square is formed from twenty five small squares. Some of the small squares are black. To make the big square symmetric about both diagonals, at least … additional small squares are needed to be colored black.

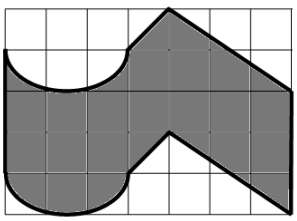


(IMSO 2009)

22. In a training program, an athlete must eat 154 eggs, during a period of time from November 8th till November 14th. Every day in this period he must eat 6 more eggs than the previous day. The number of eggs he eats on November 13th is …

(IMSO 2009)

23. In the following 5 × 7 grid, the area of the shaded region is … unit square.



(IMSO 2009)

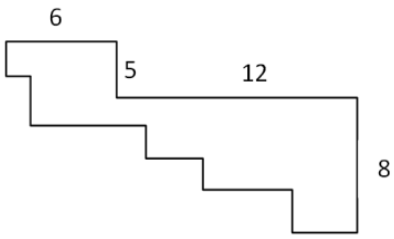
24. Mrs. Anna has 4 children: Alex, Brad, Christine, and Dennis. Alex is not the youngest, but he is younger than Dennis. If Brad's age is the same as the mean of the ages of Alex and Dennis, then the oldest one is …

(IMSO 2009)

25. In a math test, a correct answer will be marked 5 points and a wrong answers -2 points. Tom answered all of the 35 questions and got a total score of 140. The number of questions Tom answered correctly is …

(IMSO 2009)

26. The following shape is made from horizontal and vertical lines. The lengths of some of the lines are given. The perimeter of the shape is … unit.

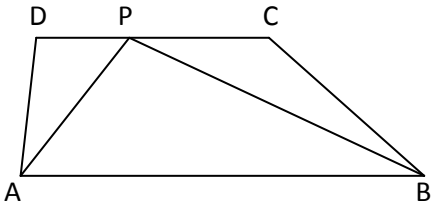


(IMSO 2009)

27. Use numbers 2, 3, 4, 5, 7, and 8 exactly once to form two three-digit numbers P and Q. If $P - Q$ is a positive number; the smallest possible value of $P - Q$ is ...

(IMSO 2009)

28. ABCD is a trapezoid (trapezium) with AB parallel to CD. The ratio of AB : CD is 3 : 1. The point P is on CD. The ratio of the area of triangle APB to the area of trapezoid ABCD is …



(IMSO 2009)

29. I have some marbles and some empty boxes. If I try to put 9 marbles on each box, then there will be 2 empty boxes. If I try to put 6 marbles in each box, then there will be 3 remaining marbles. I have … boxes.

(IMSO 2009)

30. In a football competition, if a team wins it will get 3 points. If it draws it will get 1 point, and if it loses it will get 0 points. After playing 20 times, Team B gets the total score of 53. Team B loses at least … times.

(IMSO 2009)

PEMBINAAN OLIMPIADE MATEMATIKA
PRA OSN & IMSO 2014 (SESI – 5)
ERICK INSTITUTE INDONESIA
OLEH : AHMAD FAIZAL KH, ST, SE, M.Pd

JAWABLAH PERTANYAAN BERIKUT DENGAN JUJUR !

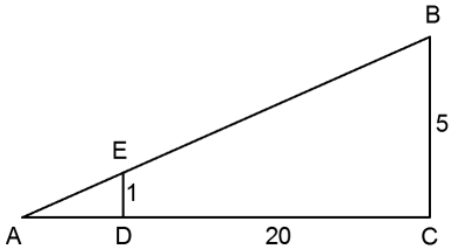
1. Among 8 points located in a plane, five of them lie on one line. Any three points are selected from those 8 points as corner points of a triangle. There are at most … triangles that can be formed

(IMSO 2009)

2. ABCDE is a five-digit positive number. ABCDE1 is three times 1ABCDE. ABCDE is … .

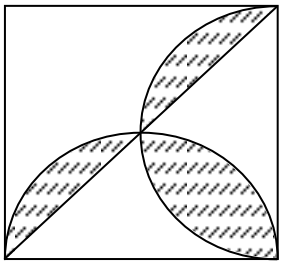
(IMSO 2009)

3. In the diagram below, BC=5, DE=1 and DC=20, where D lies on AC and E lies on AB. Both ED and BC are perpendicular to AC. The length of AD is … .
(Note: the figure is not in proportional scale)



(IMSO 2009)

4. In the figure, two half-circles are inscribed in a square. These two half-circles intersect at the center of the square. If the side of the square has length 14 cm, then the area of the shaded region is … cm^2.



(IMSO 2009)

5. The areas of 3 sides of a block are 44 cm2, 33 cm2, and 48 cm2. The volume of the block is … cm^3.

(IMSO 2009)

6. Bob bought a coat and a shirt. The normal prices of both items are the same, but when Bob bought them, the shirt was discounted by 50% and the coat was discounted by 25%. If he bought them for $130 what was the normal price of the shirt?

(IMSO 2009)

7. The area of a rhombus is 36 cm^2. One of its diagonals has length twice of the other diagonal. What is the length of the smaller diagonal of the rhombus?

(IMSO 2009)

8. I plan to travel by car from City A to City B. I travel the first half of the distance with the speed of 30 km/hour. In order to get my average traveling speed of 40 km/hour, what speed should I take for the second half of the distance?

(IMSO 2009)

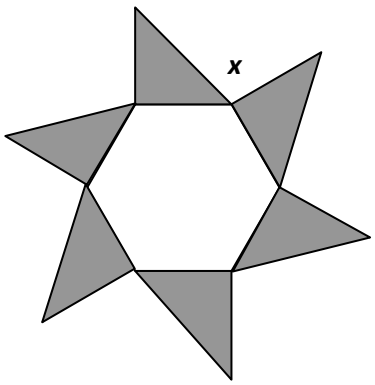
9. The mean value of the mathematics marks of the nine students is 70. When Lambert's mark is added, the mean value will be 69. When John's mark is added, the mean value will be 72. What will the mean value be, if Lambert's and John's marks are both added?

(IMSO 2009)

10. Andy bought three packages of goods, each worth $ 35, $ 30, and $ 40. The first package contains 2 books, 1 pencil, and 1 eraser. The second package contains 1 book, 1 pencil, 2 erasers. The third package contains 3 books and 2 erasers. Andy wants to buy the fourth package containing 2 books, 1 pencil, and 3 erasers. What is the price of the fourth package?

(IMSO 2009)

11. The following figure shows a regular hexagon. On each side of the hexagon, there is an isosceles right triangle. One side forming a right angle is a side of the hexagon. Determine the angle x.



(IMSO 2009)

12. Mum's kitchen scale is set incorrectly, but otherwise it works fine. When she weighs a bag of sugar, it shows 1.5 kg. When she weighs a bag of flour, it shows 1.3 kg. However, when she weighs both items together, it shows 2.5 kg. If she weighs a piece of butter of weight 0.3 kg, what number does the scale show?

(IMSO 2009)

13. Alan, Billy, Candy, and David are queuing (lining up) in alphabetical order. Alan is in the 7th position from the front while David is in the 9th position from the back. The number of persons between Alan and Billy is the same as those between Candy and David. In total, there are 48 persons in the queue, and six of them are between Billy and Candy. How many persons are there between Alan and Candy?

(IMSO 2009)

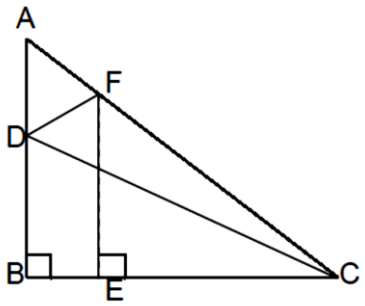
14. A rectangle has two axes of symmetry, the vertical axis and the horizontal axis. If the rectangle is folded with respect to the vertical axis, we obtain a rectangle with perimeter 40 cm. If the rectangle is folded with respect to the horizontal axis, we obtain a rectangle with perimeter 50 cm. What is the original perimeter of the rectangle?

(IMSO 2009)

15. Brad and Jake traveled 9 km from A to B. First Jake used his bicycle at 8 km/hour and left the bicycle at a certain place. Then he walked 5 km/hour to reach B. On the other hand, Brad walked at 4 km/hour, then took Jake's bicycle, and rode at 10 km/hour to reach B. If they started to travel and arrived at B at the same time, how many minutes did Jake leave his bike before it was used by Brad?

(IMSO 2009)

16. In the figure, BC = 25 cm, BE = 8 cm, and AD = 4 cm. What is the area of the triangle CDF?



(IMSO 2009)

17. Tom has a contract to dig out some foundations and it must be done in 30 days. His own machine, which he wishes to use as much as possible, would take 50 days to do all the work. He can hire a bigger machine which would finish the job in 21 days. There is only enough room for one machine at a time. What is the least number of days for which he must hire the bigger machine?

(IMSO 2009)

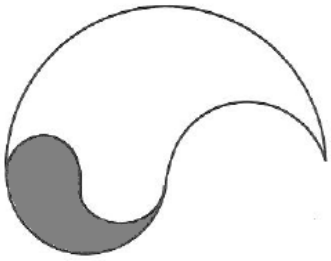
18. The average of x and y is 19.The average of a, b and c is 14.Find the average of x, y, a, b and c.

(IMSO 2011)

19. The sum of the three smallest prime numbers and another prime number n is 2021. Find the value of n.

(IMSO 2011)

20. The figure is made up of semicircles of diameter 2 *cm*, 4 *cm* and 8 *cm*. What fraction of the figure is shaded?



(IMSO 2011)

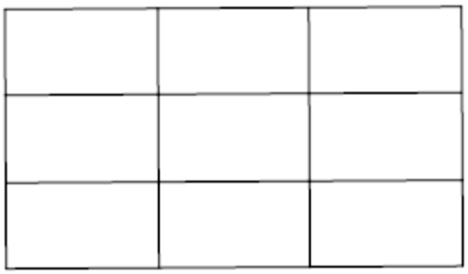
21. The sum of the numbers A, B and C is 390. Given A is 3 times of B and A is one third of C, find the value of C.

(IMSO 2011)

22. What is the smallest number that can be expressed as the sum of two squares in two different ways?

(IMSO 2011)

23. How many rectangles are there in the 3x3 grid shown?



(IMSO 2011)

24. Find the smallest positive integer with exactly 30 factors.

(IMSO 2011)

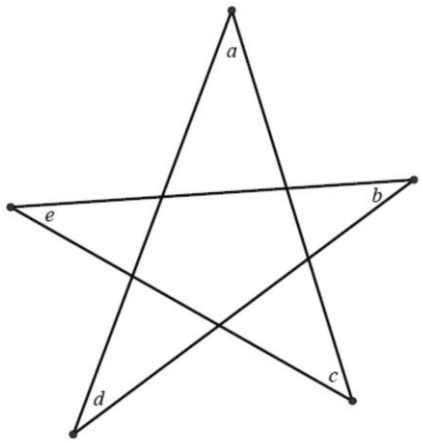
25. The number 119 is very amazing. When divided by 2, it leaves a remainder of 1. When divided by 3, it leaves a remainder of 2. When divided by 4, it leaves a remainder of 3. When divided by 5, it leaves a remainder of 4. When divided by 6, it leaves a remainder of 5. Find the smallest three-digit number, larger than 119, which has this property

(IMSO 2011)

26. Pedro can finish a job in 14 minutes while his younger brother Juan can finish the same job in 7 minutes. How long will it take the two of them to finish the job together?

(IMSO 2011)

27. In the diagram shown, find the measure of $\angle a + \angle b + \angle c + \angle d + \angle e$.



(IMSO 2011)

28. The sum of the two digits of Emma's age this year is 5. Seven years from now, her age will be 2 less than the reverse of the digits of her age this year. How old is Emma now?

(IMSO 2011)

29. Half of the punch in the bowl is pure mango juice. When 6 more cups of pure mango juice are added to the bowl, 2/3 of the resulting punch in the bowl is pure mango juice. How many cups of punch were in the bowl to start with?

(IMSO 2011)

30. Five test scores have a mean (average score) of 88, a median (middle score) of 89, and a mode (most frequent score) of 93. What is the sum of the two lowest test scores?

(IMSO 2011)

PEMBINAAN OLIMPIADE MATEMATIKA
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JAWABLAH PERTANYAAN BERIKUT DENGAN JUJUR !

1. The area of a rectangle with integer sides is 2011 cm2. Find its largest possible perimeter, in cm.

(IMSO 2011)

2. A 6-digit number, $\overline{8ab8ab}$ is divisible by 12 where a and b are distinct. Find the last two digits of the 6-digit number for it to be as small as possible.

(IMSO 2011)

3. Of 100 students in a certain school, 17 like math, 80 like MTV and 4 neither like math nor MTV. How many students like math and MTV?

(IMSO 2011)

4. Lani's mother promised to give her a call between 2:30 p.m. and 4:00 p.m. Sometime during this period, Lani left her cell phone inside her locker for 40 minutes. What is the probability that Lani missed her mother's call?

(IMSO 2011)

5. Find all possible six-digit number x2011y that is divisible by 36, where x and y are digits.

(IMSO 2011)

6. A palindrome is a number that can be read the same forwards and backwards. For example, 246642, 131 and 5005 are palindromic numbers. Find the smallest even palindrome that is larger than 56789 which is also divisible by 7.

(IMSO 2011)

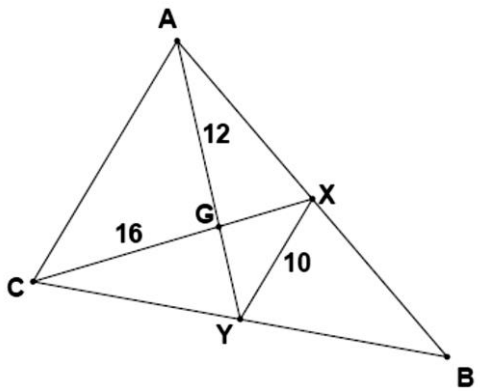
7. How many ways can we select six consecutive positive integers from 1 to 999 so that the tailing of the product of these six consecutive positive integers end with exactly four 0's?

(IMSO 2011)

8. 276 pupils are seated in a school hall. There are 22 rows of seats and each row has 15 seats. At least how many rows have an equal number of pupils?

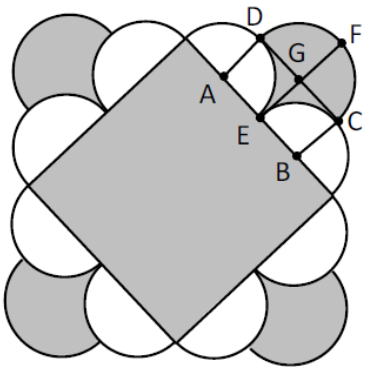
(IMSO 2011)

9. In triangle ABC, let X and Y be the midpoints of side AB and BC respectively. Let AY and CX intersect at G. If AG = 12, CG = 16 and XY = 10, what is the area of triangle GXY?



(IMSO 2011)

10. The figure on the right shows a square and 12 congruent semicircles. In particular, points C and D are endpoints while points A and B are the centers of the semicircles. If the length of AB is 2011, find the total area of all the regions that are shaded?



(IMSO 2011)

11. A palindrome is a number which reads the same backwards as forwards. A car odometer read 26962 km. After two hours driving the odometer showed the next palindrome. What was the average speed of the car, in km per hour?

(IMSO 2012)

12. Class A has 10 students and class B has 15 students. In a test, the average grade for class A is 60, and the average grade for class B is 66. A new student writes the test in the office. If he is put in class A, its average will become 62. If he is put in class B, what will its average become?

(IMSO 2012)

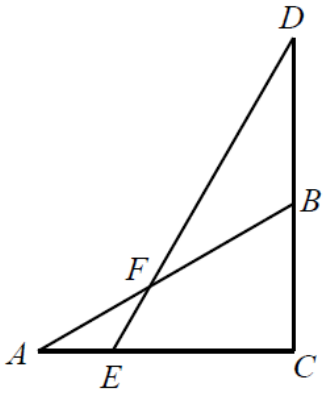
13. Two years ago, Steve was three times as old as Bill, and in three years he will be twice as old as Bill. Find the sum of their ages

(IMSO 2012)

14. A three-digit number is multiplied by a two-digit number whose tens' digit is 9. The product is a four-digit number whose hundreds digit is 2. How many three-digit numbers satisfy this condition?

(IMSO 2012)

15. ABC is a triangle with a right angle at C. E is a point on AC and D is a point on the extension of CB such that triangle DEC is similar to triangle ABC. AB cuts DE at F, and AE=EF. Calculate $\angle$ABC, in degrees



(IMSO 2012)

16. When a two-digit number is divided by the sum of its digits, what is the largest possible remainder?

(IMSO 2012)

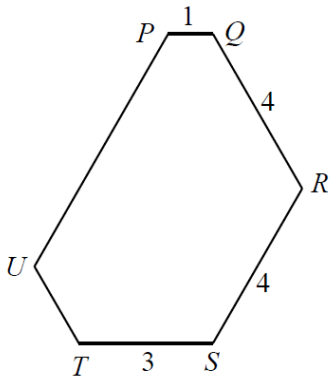
17. The product of 1110, 1111, 1112 and 1113 is the thirteen digit number 152628x755760, with one digit replaced by x. What is the value of x?

(IMSO 2013)

18. Each of A, B, C and D either always tells the truth or always tells lies. A says C always tells lies. B says A always tells lies. C says D always tells the truth. D says either A or C always tells lies. Who always tells lies?

(IMSO 2013)

19. In the Figure below each of the interior angles of hexagon PQRSTU is 120° . Given that PQ = 1 cm, QR = RS = 4 cm and ST = 3 cm. Find the perimeter of the hexagon PQRSTU.

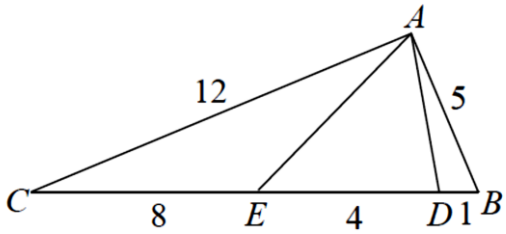


(IMSO 2013)

20. Nine lines, parallel to the base of a triangle, divide each of the other sides into 10 equal segments and the area into 10 distinct parts. Find the area of the original triangle, if the area of the largest of these parts is 76 cm^2.

(IMSO 2013)

21. In the figure below, AB= 5 cm, AC= 12 cm, DB= 1 cm, ED= 4 cm, CE= 8 cm. What is the size of $\angle$EAD, in degrees?



(IMSO 2013)

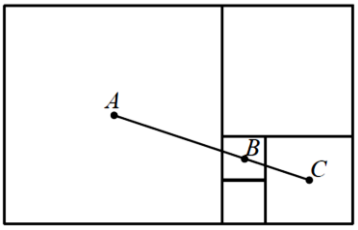
22. Find the smallest multiple of 9 which is not divisible by the sum of its digits

(IMSO 2013)

23. Cut a cube by two planes parallel to the base of the cube into three rectangular blocks. The ratio of surface areas of these three blocks is 3 : 4 : 5. Find the ratio of their volumes in simplified form.

(IMSO 2013)

24. The diagram below shows five squares of respective side lengths 1, 1, 2, 3 and 5. The centres A, B and C of three of the squares lie on a straight line. What is the ratio of the length BC to the length AB?



(IMSO 2013)

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JAWABLAH PERTANYAAN BERIKUT DENGAN JUJUR !

1. Tentukan sisanya jika
   a. 7^{1000} dibagi 24
   b. 7^{348} dibagi 8
   c. 45^{2001} dibagi 41
   d. 8^{103} dibagi 13
   e. 3^{47} dibagi 23
2. Tentukan angka satuan dari $17^{103} + 5$
3. Tunjukkan bahwa $3^{105} + 4^{105}$ habis dibagi 7
4. **(OSK 2012)** Sisa pembagian dari 13^{2012} oleh 10 adalah…
5. **(OSN 2011)** The remainder of the division of 9^{26} by 26 is . . . .
6. **(OSN 2010)** The remainder of (3457689 × 9876543 × 7777): 5 is . . . .
7. Tentukan sisanya jika
   $1 + 2 + 2^2 + 2^3 + \ldots + 2^{2013}$ dibagi 5
8. Tentukan angka terakhir dari 777^{333}
9. Tentukan 2 angka terakhir dari 3^{1234}
10. **(OSK 2012)** Dua digit terakhir dari 6^{2012} adalah
11. Sederhanakan bentuk berikut tanpa menggunakan kalkulator :
    a. 2013 x 2014 – 2012 x 2015
    b. 123456789^2 – 1234567890 x 123456788
    c. $\frac{2013^3-1998^3-15^3}{2013\times1998\times15}$
    d. $\sqrt{2011 \times 2012 \times 2013 \times 2014 + 1}$
    e. $\frac{2006}{20052005^2-20052004.20052006}$
12. **(OSK 2012)** Banyaknya faktor positif dari 2012 adalah …
13. **(OSK 2012)** Decimal ke 2012 ketika 1/7 diekspresikan dalam bentuk decimal adalah
14. **(OSK 2011)** Angka ke-2011 di belakang koma pada bentuk desimal dari 1/7 adalah .
15. **(OSK 2012)** Jika bilangan pecahan untuk bilangan decimal 0, 14714747 … adalah a/b, maka tentukan nilai a + b.
16. **(OSN 2007)** Sisa pembagian (130x131x133x134x135x⋯x145) oleh 132 adalah ...
17. **(OSN 2010)** Misalkan 10000 = a x b x c, dengan a,b,c adalah bilangan-bilangan asli yang tidak memiliki angka 0. Jika a,b dan c boleh sama, maka nilai terkecil yang mungkin dari a + b + c adalah …

18. **(OSN 2008)** The average of the numbers 9, 99, 999, 9999, 99999, 999999, 9999999, 99999999 and 999999999 is ...
19. **(OSN 2008)** Izzuddin adds the first 2008 natural number, that is, 1 + 2 + 3 + … + 2008. The last digit of the result is ...
20. Jika $\frac{2013}{7000}$ ditulis dalam bentuk desimal, maka angka ke-2013 di belakang koma adalah …
21. Jika jumlah dua bilangan positip adalah 24, maka nilai terkecil dari jumlah kebalikan bilangan-bilangan tersebut adalah … .
22. Jika A = 1 + 11 + 111 + 1111 + … + $\underbrace{1111\ldots11}_{2008\text{ angka}}$, maka 5 angka terakhir dari A adalah..
23. Bilangan tiga digit 2A3 jika ditambah dengan 326 akan menghasilkan bilangan tiga digit 5B9. Jika 5B9 habis dibagi 9, maka A + B =
24. Diketahui 2012 bilangan bulat positif berurutan. Jika setiap bilangan tersebut dibagi 5, kemudian sisa-sisa pembagiannya dijumlahkan, maka hasil penjumlahan sisa-sisanya adalah…
25. Diketahui n bilangan bulat positif. Jika n ditambah angka-angka pembentuknya menghasilkan 313, maka semua nilai n yang mungkin adalah …
26. Jika bilangan bulat x dan y dibagi 4, maka bersisa 3. Jika bilangan x – 3y dibagi 4, maka bersisa…
27. **(IMC, Korea 2010)** What is the sum of the digits of the number $10^{2010} - 2010$?
28. **(HEMIC, Hongkong 2007)** The product of two three-digit numbers $\overline{abc}$ and $\overline{cba}$ is 396396, where a > c. Find the value of $\overline{abc}$.
29. **(HEMIC, Hongkong 2007)** Find how many three-digit numbers satisfy all the following conditions:
    if it is divided by 2, the remainder is 1,
    if it is divided by 3, the remainder is 2,
    if it is divided by 4, the remainder is 3,
    if it is divided by 5, the remainder is 4,
    if it is divided by 8, the remainder is 7.
30. **(ENAEMIC 2006)** How many natural numbers less than 1000 are there, so that the sum of its first digit and last digit is 13?
31. **(PEMIC 2009)** Observe the sequence 1, 1, 2, 3, 5, 8, 13, … . Starting from the third number, each number is the sum of the two previous numbers. What is the remainder when the 2009th number in this sequence is divided by 8?
32. **(PEMIC 2009)** Find the smallest positive integer whose product after multiplication by 543 ends in 2009.
33. **(AITMO, Philipina 2009)** How many four-digit multiples of 9 are there if each of the digits are odd and distinct?

34. **(AITMO, Philipina 2009)** From the first 30 positive integers, what is the maximum number of integers that can be chosen such that the product is a perfect square?
35. **(IMSO, 2008)** The product of all the digits in 166 is $1 \times 6 \times 6 = 36$. List as many numbers as possible, between 100 and 1000, whose product of its digits is 36.
36. **(IMSO, 2011)** Find all possible six-digit number $\overline{x2011y}$ that is divisible by 36, where x and y are digits.
37. **(EMIC India 2004)** Compute: $1^2 - 2^2 + 3^2 - 4^2 + \ldots - 2002^2 + 2003^2 - 2004^2 + 2005^2$
38. **(7th Po leung Kuk, Hongkong)** Find the value of :

$$\frac{1}{2} + \left(\frac{1}{3} + \frac{2}{3}\right) + \left(\frac{1}{4} + \frac{2}{4} + \frac{3}{4}\right) + \left(\frac{1}{5} + \frac{2}{5} + \frac{3}{5} + \frac{4}{5}\right) + \cdots + \left(\frac{1}{100} + \frac{2}{100} + \cdots + \frac{99}{100}\right)$$

39. Jika $(3 + 4)(3^2 + 4^2)(3^4 + 4^4)(3^8 + 4^8)(3^{16} + 4^{16})(3^{32} + 4^{32}) = (4^x - 4^y)$. Maka x – y =
40. Nilai x yang memenuhi persamaan $4x(3^{2006} + 1) = 3^{2009} - 3^{2007} + 24$ adalah

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JAWABLAH PERTANYAAN BERIKUT DENGAN JUJUR !

Pemfaktoran dan Penguraian

1. Jika $A = 5^x + 5^{-x}$ dan $B = 5^x - 5^{-x}$ maka $A^2 - B^2$ adalah ····
2. Jika $\frac{3a+4b}{2a-2b} = 5$ maka tentukan nilai dari $\frac{a^2+2b^2}{ab}$!
3. Jika $a = b + 2$, $a^2 = b^2 + 20$ dan $3(a+b)^2c + 3(a+b)c^2 + c^3 = 197 + (a+b)^3$, Tentukan nilai dari c.
4. Selesaikan persamaan $x^2 + \frac{x^2}{(x+1)^2} = 3$.
5. Jika $\frac{x^3+3x^2y}{x+3y} - \frac{27y^3+9xy^2}{3y+x} = x + 3y$, maka nilai $x = \cdots$
6. Jika $a^3 - b^3 = 24$ dan $a - b = 2$, maka tentukan nilai dari $(a + b)^2$
7. Jika $x + y = 4$ dan $xy = -12$, maka tentukan nilai dari $x^2 + 5xy + y^2$
8. Tentukan penyelesaian yang real dari persamaan $x^3 + x - 8 = \frac{8}{x^2}$
9. Jumlah semua bilangan riril x yang memenuhi persamaan berikut adalah
   $(5^x - 25)^3 + ((25)^x - 5)^3 = (5^x + (25)^x - 30)^3$
10. Jika $p + \frac{1}{p} = 3$. Tentukan nilai dari
    a. $p^3 + \frac{1}{p^3}$
    b. $p^3 - \frac{1}{p^3}$

Barisan dan Deret

1. **(OSP 2011)** Nilai paling sederhana dari $\left[\frac{3}{1+\frac{1}{3}}\right] \times \left[\frac{4}{2+\frac{1}{4}}\right] \times \left[\frac{5}{3+\frac{1}{5}}\right] \times \left[\frac{6}{4+\frac{1}{6}}\right] \times \ldots \times \left[\frac{59}{57+\frac{1}{59}}\right] \times \left[\frac{60}{58+\frac{1}{60}}\right]$ adalah ....
2. **(OSP 2011)** Hitunglah $\left(\frac{3-2}{2\times3}\right) + \left(\frac{4+3}{3\times4}\right) + \left(\frac{5-4}{4\times5}\right) + \left(\frac{6+5}{5\times6}\right) + \left(\frac{7-6}{6\times7}\right) + \left(\frac{8+7}{7\times8}\right) + \left(\frac{9-8}{8\times9}\right) = \ldots..$
3. **(OSP 2011)** Diketahui:
   $x = \frac{1}{1^5} + \frac{1}{2^5} + \frac{1}{3^5} + \frac{1}{4^5} + \frac{1}{5^5} + \cdots$
   dan $y = \frac{1}{1^5} + \frac{1}{3^5} + \frac{1}{5^5} + \frac{1}{7^5} + \frac{1}{9^5} + \cdots$. Nilai $\frac{y}{x} = \ldots$
4. **(OSP 2011)** Nilai x yang memenuhi jumlahan berikut :
   $\frac{x}{11x13} + \frac{x}{13x15} + \frac{x}{15x17} + \cdots + \frac{x}{2009x2011} = \frac{11}{2011}$ adalah ....
5. Tentukan nilai dari perkalian berikut .

$\left(1-\frac{1}{2}\right)\times\left(1-\frac{1}{3}\right)\times\left(1-\frac{1}{4}\right)\times\left(1-\frac{1}{5}\right)\times\ldots\times\left(1-\frac{1}{2012}\right)$

6. Sisi-sisi sebuah segitiga siku-siku membentuk barisan aritmatika. Jika sisi hipotenusa sama dengan 20, maka keliling segitiga tersebut adalah ····
7. **(OSK 2012)** Hitunglah jumlah dari 1000 + 1 – 2 + 3 – 4 + … + 2003 – 2004 + 2005 – 2006 + 2007 - 2008 + 2009 – 2010 – 2011 + 2012 = …
8. Jika nilai $100B = 100^2 + 99^2 - 98^2 - 97^2 + 96^2 + 95^2 - 94^2 - 93^2 + \cdots + 4^2 + 3^2 - 2^2 - 1^2$, maka nilai B adalah …
9. **(OSN 2007)** Diketahui 9 + 99 + 999 + 9999 + …+ $\underbrace{999\ldots999}_{99\ angka}$= N. Hasil penjumlahan semua angka pada N adalah ...
10. Jika : $S_1 = 1, S_2 = S_1 - 3, S_3 = S_2 + 5, S_4 = S_3 - 7, S_5 = S_4 + 9, \ldots$ adalah suku-suku suatu barisan bilangan, Tentukan S_{2013}
11. Jika : $1 + \frac{1}{4} + \frac{1}{9} + \frac{1}{16} + \frac{1}{25} + \cdots = a$, maka $\frac{1}{9} + \frac{1}{25} + \frac{1}{49} + \cdots = \cdots$
12. Nilai dari $2009^2 - 2008^2 + 2007^2 - 2006^2 + 2005^2 - \cdots + 3^2 - 2^2 + 1^2$ adalah
13. Diketahui :

    A = $\frac{1}{1+\sqrt{2}} + \frac{1}{\sqrt{2}+\sqrt{3}} + \frac{1}{\sqrt{3}+2} + \ldots + \frac{1}{\sqrt{9999}+100}$ Bilangan kuadrat terdekat dengan A adalah ….
14. Nilai x yang memenuhi persamaan : $\sqrt{x\sqrt{x\sqrt{x}\ldots}} = \sqrt{4x + \sqrt{4x + \sqrt{4x + \cdots}}}$ adalah ····
15. Misalkan p dan q bilangan asli dengan $p > q$. Jika $\sqrt{94 + 2\sqrt{2013}} = \sqrt{p} + \sqrt{q}$, tentukan nilai dari $p - q$.
16. Jika $5^{3x} = 8$, maka $5^{3+x} = \cdots\cdots$
17. Misalkan $3^a = 4$, $4^b = 5$, $5^c = 6$, $6^d = 7$, $7^e = 8$, dan $8^f = 9$. Berapakah hasil kali abcdef ?
18. Diketahui $3^x = 2013$ dan $671^y = 2013$. Tentukan nilai dari $\frac{1}{x} + \frac{1}{y}$.
19. Jika x, y dan z memenuhi

    $2^{x+y} = 10$

    $2^{y+z} = 20$

    $2^{z+x} = 30$

    Tentukan nilai dari 2^{2x}
20. Jika a + 1= b + 2 = c + 3 = d + 4 = a + b + c + d + 5. Tentukan nilai a + b + c + d
21. Jika a $(a^2 - 1) = 1$, Tentukan nilai dari $a^4 + a^3 - a^2 - 2a + 1$
22. Jika $\frac{m}{a-b} = \frac{n}{b-c} = \frac{p}{a-c}$, Buktikan m + n = p
23. Jika $2^a = 3^b = 6^c$. Buktikan bahwa $c = \frac{ab}{a+b}$
24. If a@b = $\frac{a+b}{a-b}$,find n such that 3@n=3 .

(Unversity of Stanford Mathematics Tournament 2000, General Test)

25. Find x− y, given that $x^4 = y^4 + 24$,

    $x^2 + y^2 = 6$ and $x + y = 3$.

    (Harvard University-Massachusetts Institute of Technology Math Tournament, March 2001)

26. Misalkan x_1= 97, x_2=$\frac{2}{x_1}$, x_3=$\frac{3}{x_2}$, x_4=$\frac{4}{x_3}$,…., x_8 = $\frac{8}{x_7}$ Tentukan $x_1.x_2.\ldots x_8$.

27. If a and b are positive integer such that $a^2 - b^4 = 2009$.

    Find the value of a + b.

28. Jika $\frac{1}{a} - \frac{1}{b} = \frac{1}{4}$, Nilai dari $\frac{2b-3ab-2a}{b-a-2ab}$ + 2013 adalah ....

29. Hitunglah nilai :

    $2^{2013} - \left(2^{2012} + 2^{2011} + 2^{2010} + \ldots + 2^3 + 2^2 + 2 + 1\right)$

30. **(OSP 2011)** If A-B = 2009, B-C = -2010 dan C-D = 2011,then the value of $\frac{A-D}{(A-C)(B-D)}$ is…

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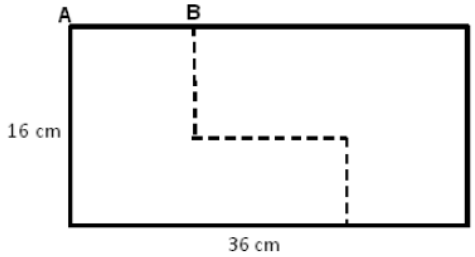
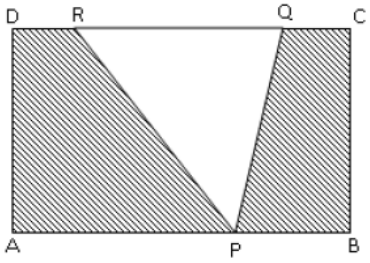
JAWABLAH PERTANYAAN BERIKUT DENGAN JUJUR !

1. **(OSN 2011)** Sebanyak 11 persegi disusun membentuk sebuah persegi panjang seperti gambar berikut. Persegi kecil di bawah mempunyai panjang sisi 1,5 cm dan persegi di samping kanannya mempunyai panjang rusuk 3 cm. Luas persegi panjang tersebut adalah . . .cm^2

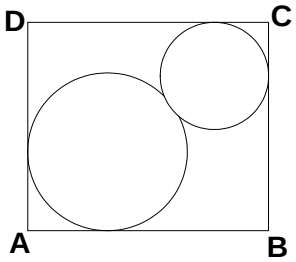
2. **(OSN 2011)** Kita ingin membuat bangun berbentuk persegi dari sehelai kertas berbentuk persegi panjang berukuran 16 X 36 cm dengan cara memotongnya seperti di bawah ini kemudian menggabungkannya kembali menjadi persegi. Panjang AB adalah . . . cm.



3. **(OSN 2011)** Luas persegipanjang ABCD berikut ini adalah 60 cm^2 dengan panjang BC = 6 cm. Jika diketahui bahwa CQ = RD = 2 cm, berapakah luas daerah yang diarsir?

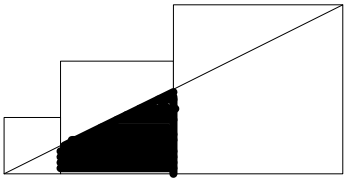


4. **(OSP 2011)** Perhatikan gambar berikut



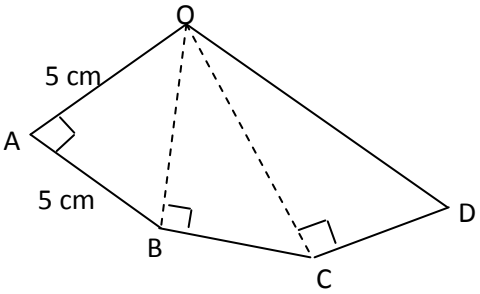
Dua lingkaran dengan jari-jari 17 dan 9 bersinggungan. Jika AB = 50 , maka luas persegi panjang ABCD adalah ….

5. **(OSP 2011)** Three squares with sides of length two,four and six units,respectively,are arranged side-by side



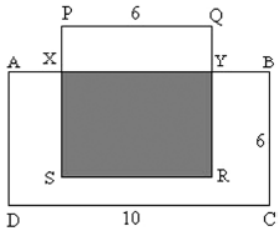
What is the area of the shaded quadrilateral?

6. **(OSP 2011)** Perhatikan gambar berikut.



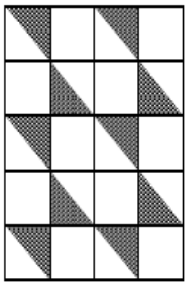
Jika $\angle OAB = \angle OBC = \angle OCD = 90°$ dan panjang AB = BC = CD, maka jumlah panjang dari OB, OC, dan OD adalah ....

7. **(OSP 2011)** Pada gambar ABCD adalah persegipanjang, PQRS adalah persegi. Bila daerah diarsir adalah setengah dari luas persegi panjang ABCD, maka panjang PX adalah...

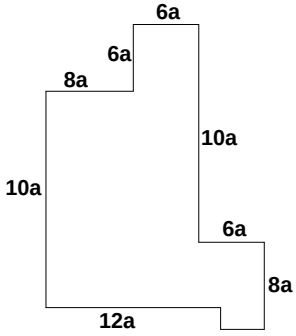


8. **(OSP 2011)** Perhatikan gambar berikut ini.

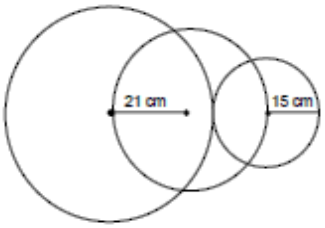
Perbandingan daerah berwarna gelap dengan daerah yang terang adalah ...



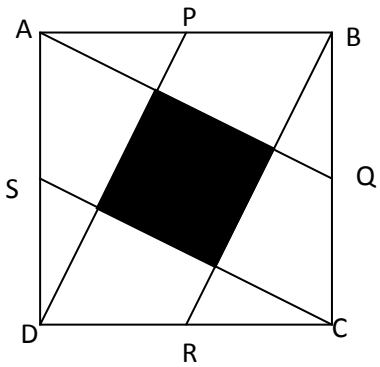
9. **(OSP 2011)** The perimeter of figure below is 304 cm. Find the area



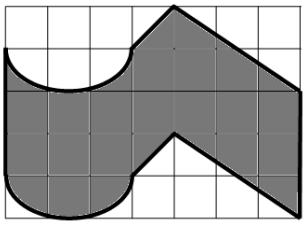
10. **(OSP 2011)** How many centimeters are in the diameter of the largest circle?



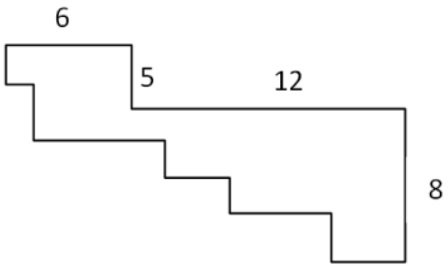
11. **(OSP 2011)** Pada gambar di samping, ABCD adalah persegi. P, Q, R, dan S adalah titik tengah dari AB, BC, CD dan DA berurutan. Tentukan perbandingan dari daerah yang diarsir dan yang tidak diarsir!



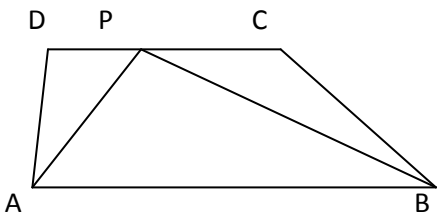
12. **(IMSO 2009)** In the following 5 × 7 grid, the area of the shaded region is … unit square.



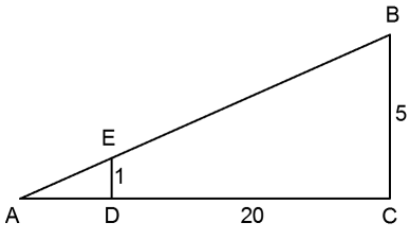
13. **(IMSO 2009)** The following shape is made from horizontal and vertical lines. The lengths of some of the lines are given. The perimeter of the shape is … unit.



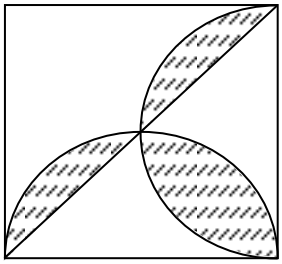
14. **(IMSO 2009)** ABCD is a trapezoid (trapezium) with AB parallel to CD. The ratio of AB : CD is 3 : 1. The point P is on CD. The ratio of the area of triangle APB to the area of trapezoid ABCD is …



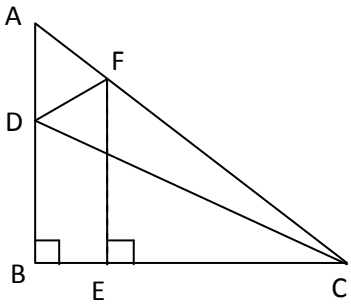
15. **(IMSO 2009)** In the diagram below, BC=5, DE=1 and DC=20, where D lies on AC and E lies on AB. Both ED and BC are perpendicular to AC. The length of AD is … .
(Note: the figure is not in proportional scale)



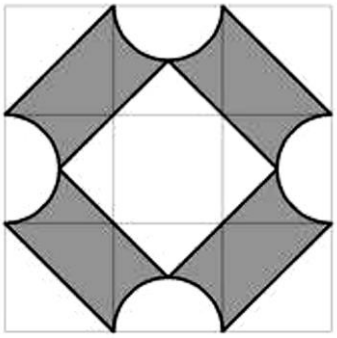
16. **(IMSO 2009)** In the figure, two half-circles are inscribed in a square. These two half-circles intersect at the center of the square. If the side of the square has length 14 cm, then the area of the shaded region is … cm^2.



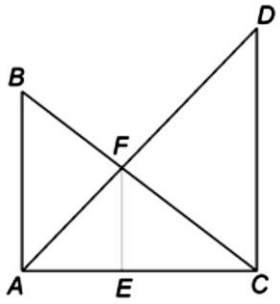
17. **(IMSO 2009)** In the figure, BC = 25 cm, BE = 8 cm, and AD = 4 cm. What is the area of the triangle CDF?



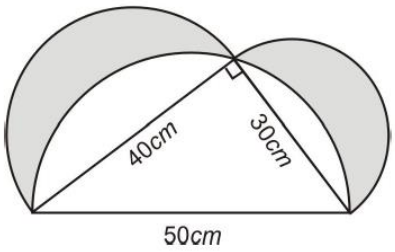
18. **(OSN 2009)** The length of sides of a square board is 63 *cm*.
Find the area of the shaded region.



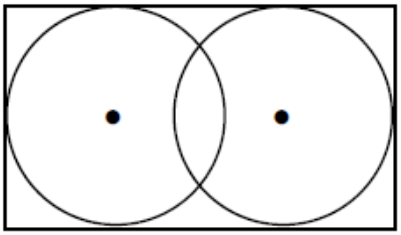
19. **(OSN 2009)** Pada gambar berikut, diketahui *AB* = 3*cm* dan *CD* = 4*cm*. Sisi *AB*, *EF*, dan *CD* masing-masing tegak lurus pada *AC*. Berapakah panjang *EF*?



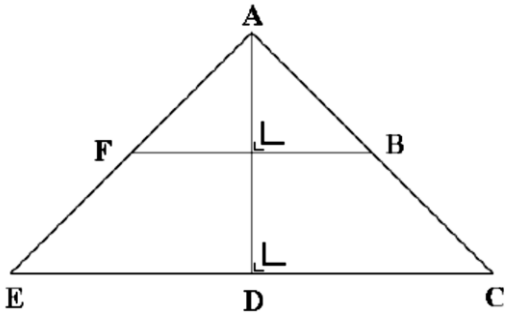
20. **(OSN 2006)** Pada gambar di bawah, ketiga sisi segitiga merupakan diameter (garis tengah) suatu setengah lingkaran. Hitunglah luas daerah yang diarsir. (Ambil π = 3,14).



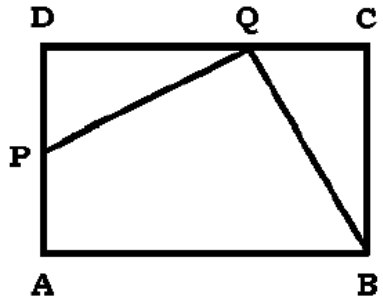
21. **(OSN 2006)** Dua lingkaran dengan jari-jari sama saling berpotongan dan menyinggung sisi-sisi persegipanjang seperti terlihat pada gambar di bawah ini. Panjang persegipanjang adalah 10 cm, sedangkan jarak antara kedua pusat lingkaran sama dengan $\frac{2}{3}$ lebar persegipanjang. Berapakah jari-jari lingkaran tersebut?



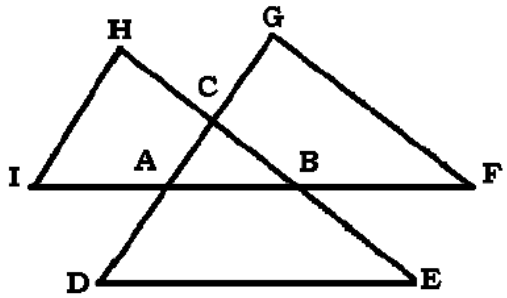
22. **(OSN 2006)** Diketahui AD = DE = DC = 4. Luas D*ABF* = $\frac{1}{4}$ D*ACE*. . Berapakah panjang BF?



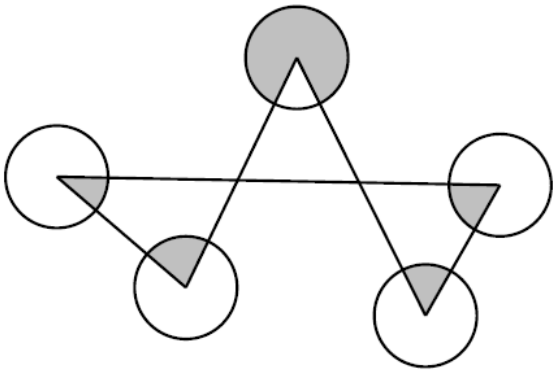
23. (OSN 2004) Diketahui ABCD adalah sebuah persegipanjang dengan AB = 3cm dan BC = 2cm. Jika BC =DQ dan DP = CQ, tentukan luas daerah ABQP.



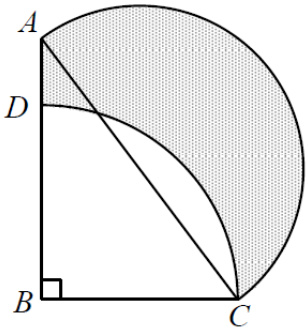
24. (OSN 2004) Find the sum of the measures of angles, D + E + F + G + H + I, in the following figure



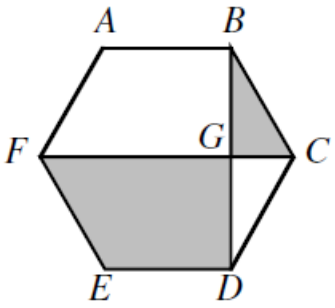
25. (PEMIC, Philipina 2009) In the figure, the centers of the five circles, of same radius 1 cm, are the vertices of the triangles. What is the total area, in cm2, of the shaded regions?



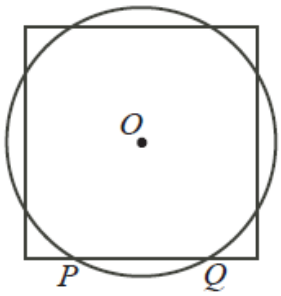
26. **(PEMIC, Philipina 2009)** In the given figure, *ABC* is a right-angled triangle, where ∠*B* = 90°, *BC* = 42 cm and *AB* = 56 cm. A semicircle with *AC* as a diameter and a quarter-circle with *BC* as radius are drawn. Find the area of the shaded portion, in cm^2.



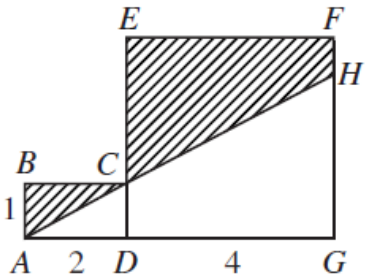
27. In the regular hexagon *ABCDEF*, two of the diagonals, *FC* and *BD*, intersect at *G*. The ratio of the area of quadrilateral *FEDG* to the area of Δ *BCG* is



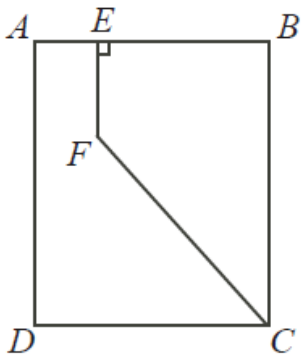
28. In the diagram, the circle and the square have the same centre O and equal areas. The circle has radius 1 and intersects one side of the square at P and Q. What is the length of PQ?



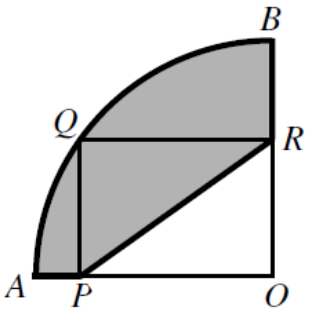
29. In the diagram, *DEFG* is a square and *ABCD* is a rectangle. A straight line is drawn from *A*, passes through *C* and meets *FG* at *H*. The area of the shaded region is



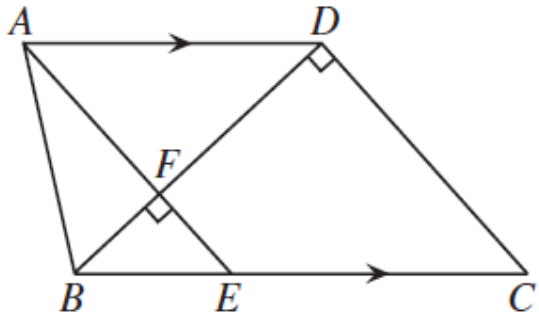
30. In the diagram, rectangle ABCD is divided into two regions, AEFCD and EBCF, of equal area. If EB = 40, AD = 80 and EF = 30, what is the length of AE?



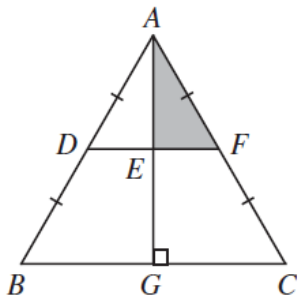
31. In the diagram, AOB is a quarter circle of radius 10 and PQRO is a rectangle of perimeter 26. The perimeter of the shaded region is



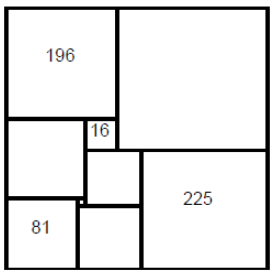
32. In trapezoid *ABCD*, *AD* is parallel to *BC*. Also, *BD* is perpendicular to *DC*. The point *F* is chosen on line *BD* so that *AF* is perpendicular to *BD*. *AF* is extended to meet *BC* at point *E*. If *AB* = 41, *AD* = 50 and *BF* = 9, what is the area of quadrilateral *FECD*?



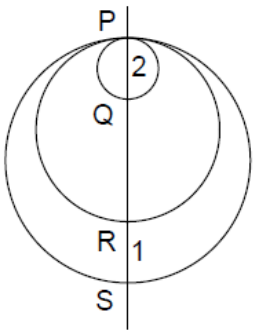
33. In the diagram, triangle *ABC* is isosceles with *AB* = *AC* , and *AG* is perpendicular to *BC*. Point *D* is the midpoint of *AB*, point *F* is the midpoint of *AC*, and *E* is the point of intersection of *DF* and *AG*. What fraction of the area of Δ*ABC* does the shaded area represent?



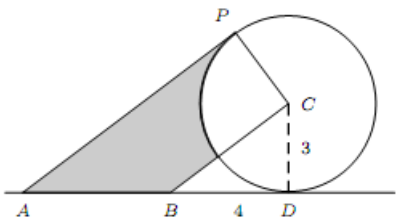
34. Persegipanjang pada gambar dibagi menjadi persegi dengan ukuran berbeda, dengan luas sebagaimana ditunjukkan. Tentukan luas dari persegi panjang tersebut.



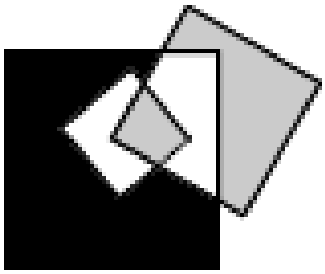
35. PQRS is a common diameter of the three circles. The area of the middle circle is the average of the areas of the other two. If PQ = 2 and RS = 1 then the length of QR is



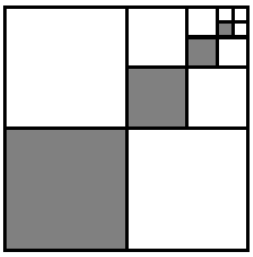
36. Perhatikan gambar. Lingkaran berpusat di C memiliki jari – jari 3 cm. Garis AP menyinggung lingkaran di titik P. Garis BC sejajar dengan AP. Jika BD = 4 cm. Jika luas daerah yang diarsir adalah A



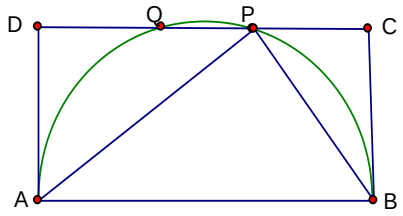
37. The diagram on the right shows a square with side 3 cm inside a square with side 7 cm and another square with side 5 cm which intersects the first two squares. What is the difference between the area of the black region and the total area of the grey regions ?



38. The pattern of shading one quarter of a square is shown in the diagram. If this pattern is continued indefinitely, what fraction of the large square will eventually be shaded?

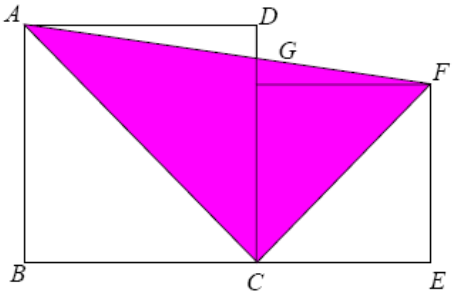


39. In the figure, ABCD is a rectangle with *AB*=5 such that the semicircle on *AB* as diameter cuts *CD* at two points. If the distance from one of them to *A* is 4, find the area of *ABCD*.



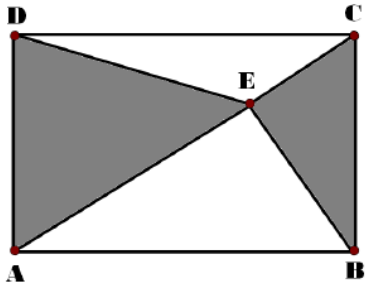
World Youth Mathematics Intercity Competition
Individual Contest, 2008

40. Perhatikan gambar berikut. Panjang sisi persegi yang besar adalah 4 cm dan yang kecil adalah 3 cm. Tentukan luas daerah yang diarsir dalam cm2.

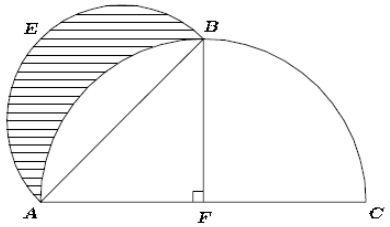


(*Philippines Elementary Mathematics International Contest, Tagbilaran City – Bohol, 25 May 2005*)

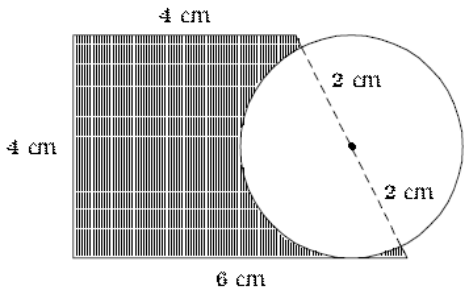
41. In the figure ABCD is a rectangle, AB = CD = 24 cm and AD = BC = 5 cm. What is the area of the shaded region, in cm^2?



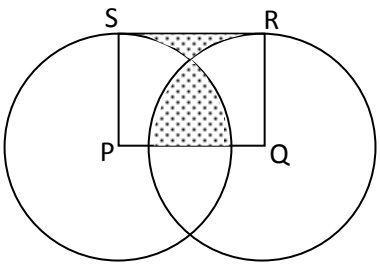
42. Pada gambar yang ditunjukkan di bawah, ABC dan AEB merupakan setengah lingkaran. F merupakan titik tengah dari AC dan AF = 4. Berapakah luas daerah yang diarsir…?



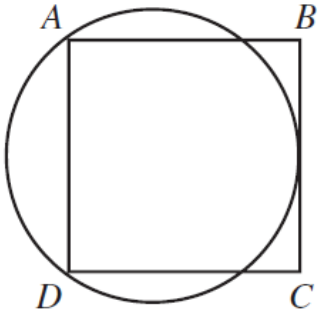
43. Pada gambar di bawah ini, luas daerah yang diarsir adalah…



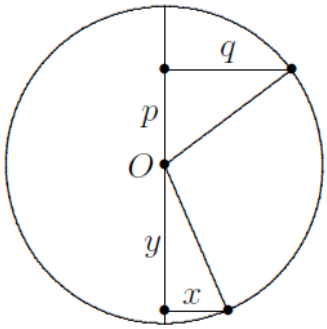
44. Consider the figure, congruent radii PS and QR intersect tangent SR. If the two disjoint shaded regions have equal areas and if PS = 10 cm, what is the area of quadrilateral PQRS?



45. Square ABCD has sides of length 10. A circle is drawn through *A* and *D* so that it is tangent to *BC*, as shown. What is the area of the circle?



46. In the figure below, the two triangles are right triangles with sides of lengths x, y, p, and q, as shown. Given that $x^2+y^2+p^2+q^2 = 72$, find the circumference of the circle



BAGIAN KEDUA