

2018 Workshop problems Handouts (4 pages):

From 2014

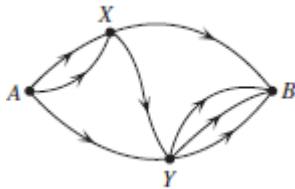
(Prepared last year – to be given to students to take home)

1. In the summation below $D=B+C$. What is the value of $A+B+C+D$?

$$\begin{array}{r} 2BA \\ + C6D \\ \hline 8AD \end{array}$$

2. What is the smallest whole number N such that $5^N > 4000000$?

3. In how many ways can you walk from Point A to point B if you must walk along the directions marked by arrows?

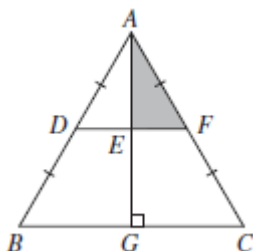


4. Suppose that when a man is at point A (see the figure for Question 13), the probability that he walks along any of the three paths is $\frac{1}{3}$. If he is at point X the probability that he walks along any of the 2 paths is $\frac{1}{2}$. If he is at point Y, the probability that he walks along any of the three paths is $\frac{1}{3}$. Two men walk independently from point A to point B. What is the probability that both choose the same path?

5. $\triangle ABC$ is equilateral with side 4. $AD = DB$, and $\triangle ADF$ is equilateral.

What is the difference between the area of $EF CG$ and $\triangle AEF$?

Express your answer as \sqrt{N} where N is a positive whole numbers.



From 2015

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6. N , $N + K$, and $N + 2K$ are all integers and $K > 0$.
 $N(N + K)(N + 2K) = P$ where P is prime.

What is the value of N ?

7. Jake tossed a coin 5 times and got at least one head.
What is the probability that he got exactly 4 heads?
Express your answer as a common fraction in lowest terms.
8. You can use the digits 2, 0, 1, and 5 to form three digit numbers (but only the digit 1 is allowed to be used more than once). How many numbers can be formed? Examples for valid numbers: 111, 101, 251, 502.
9. A regular polygon has 120 sides. How many non congruent regular polygons can be drawn using corners of this polygon as their corners?
10. Yoko is more than 8 years old and is younger than 50.
The sum of all factors of her age is twice her age.
What is her age (in years)? Note that 1 and N are factors of N .

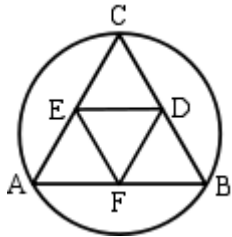
From 2015

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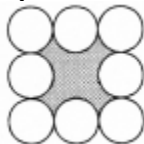
11. Express $\frac{1}{2015} + \frac{2}{2015} + \dots + \frac{9}{2015}$ as a fraction in lowest terms.

12. It takes 10 hours for 10 identical tractors to plow a 10 hectare field. How much time (in hours) does it take one tractor to plow a one hectare field?

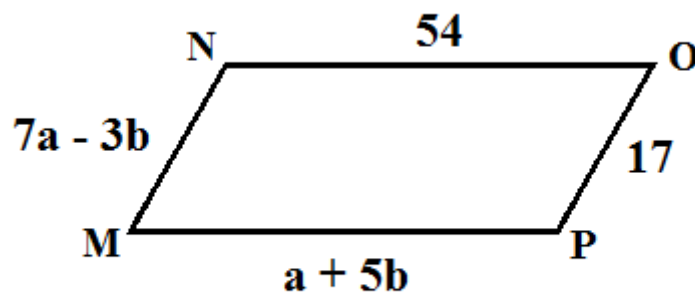
13. ABC is an equilateral triangle inscribed in a circle with radius 1. D , E , and F are mid points of the sides of ABC . What is the area of triangle DEF ? Express your answer as $\frac{p\sqrt{q}}{n}$ where p and q are primes and n is a whole number.



14. The area of each of the circles is $\frac{16}{\pi}$. Each circle is tangent to two others and the lines connecting their centres form a square. What is the perimeter of the shaded region?



15. The figure below is a parallelogram. What is the value of $3a - b$?



Answers:

Page 1

1. 18

2. 10

3. 11

4. $\frac{1}{9}$

5. $\sqrt{3}$

Page 2

6. -3

7. $\frac{5}{31}$

8. 27

9. 14

10. 28

Page 3

11. $\frac{9}{403}$

12. 10

13. $\frac{3\sqrt{3}}{16}$

14. 24

15. 10