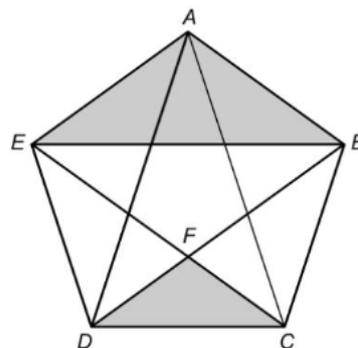


## RIPMWC 2014 Round 1

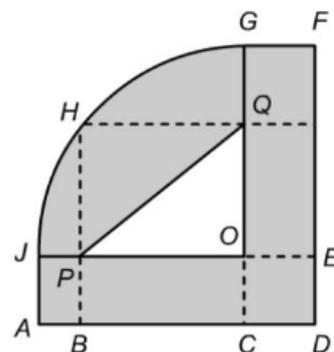
1. A star is made by connecting the vertices of a regular pentagon  $ABCDE$ . The area of the pentagon  $ABCDE$  is  $6.882 \text{ cm}^2$ , and the area of triangle  $ABE$  is  $1.902 \text{ cm}^2$ . What is the area of triangle  $CDF$  in  $\text{cm}^2$

- A. 0.706  
 B. 0.726  
 C. 0.744  
 D. 0.758  
 E. None of the above



2. The sum of the perimeters of shapes  $OPQ$  and  $ABCDEFGHJ$  is 9.95 m.  $OGJ$  is a quarter-circle of radius 1.4 m and  $GF = AJ = 0.4$  m. Taking  $\pi = \frac{22}{7}$ , find the perimeter of rectangle  $OQHP$  in m.

- A. 3.3  
 B. 3.5  
 C. 3.7  
 D. 3.9  
 E. None of the above



3. What is the measure of the angle formed between the hour hand and the minute hand of a clock at 9:24?

- A.  $135^\circ$   
 B.  $137^\circ$   
 C.  $140^\circ$   
 D.  $142^\circ$   
 E. None of the above

4. How many solutions are there to  $\frac{1}{a} + \frac{1}{b} = \frac{8}{15}$  with  $a$  and  $b$  being whole numbers and  $a < b$ ?

- A. 0
- B. 1
- C. 2
- D. 4
- E. None of the above

5. Calculate:

$$\begin{array}{r}
 \frac{2014}{2013 - \frac{2012}{2011 - \frac{2010}{\ddots}}} \\
 \frac{5 - \frac{4}{3 - \frac{2}{1}}}
 \end{array}$$

- A.  $\frac{1}{2014}$
- B.  $\frac{1}{2013}$
- C. 2014
- D. 2013
- E. None of the above

6. How many ways are there to make \$80 using some combination of \$5, \$10 and \$20 notes?

- A. 23
- B. 25
- C. 28
- D. 30
- E. None of the above

7. What is the last digit of

$$2014^{2014} - 2014^{2013} + 2014^{2012} - 2014^{2011} + \dots - 2014^3 + 2014^2 - 2014^1?$$

- A. 2
- B. 4
- C. 6
- D. 8
- E. None of the above

8. After John walked  $x\%$  of the distance from his home to his school at a constant speed, he turned around and walked home, got his bicycle and cycled to his school and back home. John cycles three and a half times faster than he walks. Find the largest possible value of  $x$  so that returning home to get his bicycle did not take more time than him walking all the way to and from his school without his bicycle

- A.  $68\frac{2}{7}$
- B. 70
- C.  $71\frac{3}{7}$
- D.  $72\frac{1}{7}$
- E. None of the above

9. The number 95\_\_94775998 is divisible by 198. What is the missing digit?

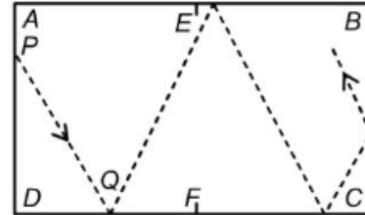
- A. 3
- B. 5
- C. 6
- D. 8
- E. None of the above

10. A pair of positive integers  $(a, b)$  is said to be an 'awesome pair' if  $a^2 - b^2$  is positive and is a factor of 2014. How many awesome pairs are there with both  $a$  and  $b$  less than 100?

- A. 3
- B. 5
- C. 6
- D. 11
- E. None of the above

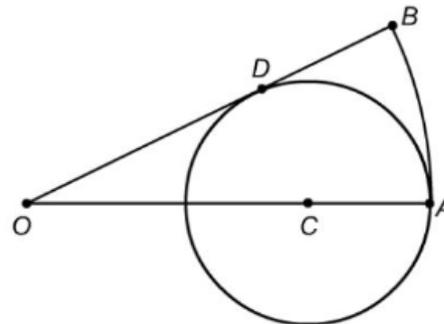
11. A snooker table  $ABCD$  is 370 cm by 180 cm in size. There are pockets in the 4 corners and in the middle of the longer edges (ie. at  $A, B, C, D, E$  and  $F$ ). When a ball is hit, you can assume that it bounces off at the same angle as it hits. A ball is hit towards edge  $DC$  from point  $P$  and goes into pocket  $F$  after 5 bounces. Given that  $P$  is 50 cm from  $A$ , what is the distance  $DQ$  to the nearest cm?

- A. 79  
 B. 81  
 C. 83  
 D. 85  
 E. None of the above



12. In the diagram below,  $OAB$  is a circular sector with  $OA = OB$  and  $\angle AOB = 30^\circ$ . A circle passing through  $A$  is drawn with centre  $C$  on  $OA$ , touching  $OB$  at point  $D$ . If the area of the circular sector  $OAB$  is  $7 \text{ cm}^2$ , find the area of the circle with its centre at  $C$  and radius  $CA$  in  $\text{cm}^2$ .

- A.  $8\frac{4}{7}$   
 B. 9  
 C.  $9\frac{3}{7}$   
 D.  $9\frac{2}{3}$   
 E. None of the above



13. Calculate the sum

$$1 + 2 + 3 - 4 + 5 + 6 + 7 - 8 + 9 + 10 + 11 - 12 + \dots \\ + 2009 + 2010 + 2011 - 2012 + 2013 + 2014$$

- A. 1015057  
 B. 1115057  
 C. 1017057  
 D. 1015570  
 E. None of the above

14. If  $a \oplus b = \frac{1}{\frac{1}{a} + \frac{1}{b}}$  then what is  $(1 \times 2) \oplus (2 \times 3) \oplus (3 \times 4) \oplus \dots \oplus (2013 \times 2014)$ ?

A.  $\frac{2013}{2014}$

B.  $\frac{2014}{2013}$

C.  $\frac{2014}{2015}$

D.  $\frac{2015}{2014}$

E. None of the above

15. Martha writes down a list of numbers where each number is the sum of the two previous numbers on the list. The first two numbers she writes down are both 1s, and so the third number she writes down is  $1 + 1 = 2$ . If she divides the 2014<sup>th</sup> number on the list by 7, what is the remainder?

A. 0

B. 1

C. 3

D. 6

E. None of the above

16. Esther has 25 coins in a single pile and she is trying to split them up so that each coin ends up in a pile by itself. Every time she splits a pile into 2 sub-piles, one with  $a$  coins and the other with  $b$  coins, she gets  $(a \times b)$  points added to her "score". (For example, from a pile with 4 coins and she splits into a sub-pile of 2 coins and another pile with 3 coins, she gets 6 points added to her score). From a starting score of 0 points, what is the largest possible score she can attain?

A. 250

B. 280

C. 300

D. 320

E. None of the above

17. 7 women are standing in a row. Each woman has 3 hats, one red, one blue and one yellow. The woman in the middle (4<sup>th</sup> in the row) has a black hat and a white hat in addition to the 3 hats each has. How many combinations of hats can they wear if no 2 women next to each other wear a hat of the same colour?
- A. 440
  - B. 456
  - C. 470
  - D. 480
  - E. None of the above
18.  $x$  is the smallest whole number whose digits add up to 2014. What is the sum of the first and last digits of  $x^2$ ?
- A. 10
  - B. 12
  - C. 14
  - D. 16
  - E. None of the above
19. How many perfect squares less than 1000 can be written as a sum of 2 consecutive numbers, and also as a sum of 3 consecutive numbers?
- A. 5
  - B. 8
  - C. 11
  - D. 34
  - E. None of the above
20. How many whole numbers  $n$  not more than 2014 are there such that  $\frac{n}{2014}$  is a fraction in its simplest form (ie.  $n$  and 2014 have no common factor  $> 1$ ).
- A. 1078
  - B. 1007
  - C. 968
  - D. 936
  - E. None of the above