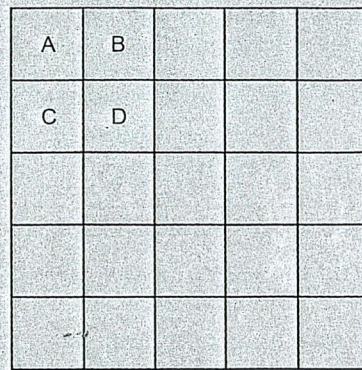




40. You want to paint the 25 small squares in the figure in such a way that no two contiguous squares are painted in the same colour. Two squares are contiguous if they touch each other horizontally (squares A and B and squares C and D), vertically (squares A and C and squares B and D) or diagonally (squares A and D and squares B and C). What is the minimum number of colours needed to accomplish this work?



- A) 8                      B) 5                      C) 6  
D) 4                      E) 7

41. The difference between two positive prime numbers is 1. What is their sum?

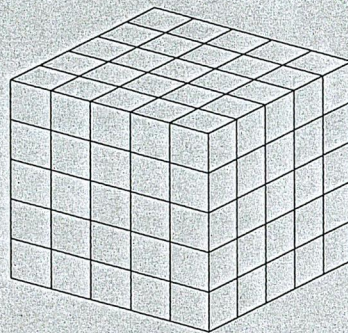
- A) 12                      B) 5                      C) 8                      D) 13                      E) 3

42. Which of the following has a value closest to the product of  $998 \times 999 \times 1\,000$ ?

- A)  $10^6$                       B)  $10^7$                       C)  $10^8$   
D)  $10^{10}$                       E)  $10^9$

43. Matusalem is looking at a large  $5 \times 5 \times 5$  cube from a certain angle (without moving and without moving the cube). How many of the small cubes are hidden (a cube is hidden if none of its faces can be seen)?

- A) 64                      B) 27                      C)  $5^3$   
D) 81                      E) 54



44. Due to a mechanical failure, the hour hand of a clock stops at exactly 10:30. However the minute hand continues to turn normally. After 15 minutes, what will the measure of the angle formed by the hour and minute hands be?

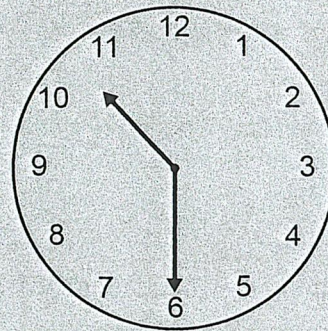
- A)  $40^\circ$                       B)  $60^\circ$                       C)  $45^\circ$   
D)  $30^\circ$                       E)  $90^\circ$

45. Which of the following is the smallest fraction?

- A)  $5/6$                       B)  $18/19$                       C)  $3/4$   
D)  $12/17$                       E)  $15/16$

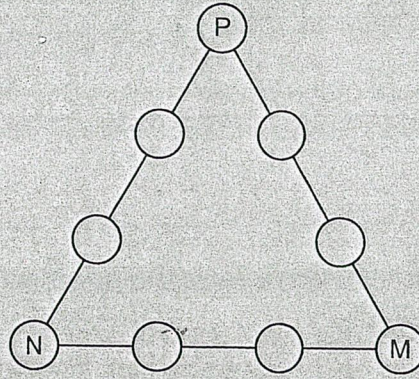
46. Some prime numbers can be written as the sum of two square numbers:  $5 = 1 + 4 = 1^2 + 2^2$ ,  $13 = 4 + 9 = 2^2 + 3^2$ ,  $17 = 1 + 16 = 1^2 + 4^2$ . Which of the following prime numbers cannot be written this way?

- A) 29                      B) 37                      C) 11  
D) 41                      E) 101



47. Place the digits from 1 to 9 in the circles in such a way that the sum of the four digits on each side of the triangle is 23. To get this sum of 23, the sum of  $P + M + N$  must be equal to

A) 31                      B) 21                      C) 15  
 D) 24                      E) 26



48. If  $10N = 5M$ , then  $8N/5M = ?$

A) 0.8                      B) 0.6                      C) 1.2  
 D) 0.4                      E) 0.5

49. Mathew's car is travelling at 80 km/h, Mathilda's car is travelling at 100 km/h. Mathilda is 2 km behind Mathew. How many minutes will it take her to catch up to Mathew?

A) 12                      B) 6                      C) 5                      D) 15                      E) 10

50. The Pythagoreans discovered that:

$$1 = 1^2, 1 + 3 = 2^2, 1 + 3 + 5 = 3^2, 1 + 3 + 5 + 7 = 4^2, 1 + 3 + 5 + 7 + 9 = 5^2, \dots$$

Nicomachus discovered that:

$$1 = 1^3, 3 + 5 = 2^3, 7 + 9 + 11 = 3^3, 13 + 15 + 17 + 19 = 4^3, 21 + 23 + 25 + 27 + 29 = 5^3, \dots$$

As a young number theorist, you can conclude that:

$$1^3 + 2^3 + 3^3 + 4^3 + 5^3 + 6^3 + 7^3 + 8^3 = ?$$

A)  $31^2$                       B)  $40^2$                       C)  $36^2$                       D)  $45^2$                       E)  $41^2$

