



**Problem Solving for Irish Second level Mathematicians  
Thursday 18th October 2007**

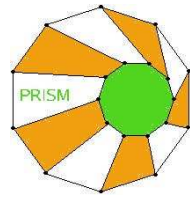
*Junior Level*

**Time allowed: 60 minutes**

**Rules and Guidelines for Contestants**

1. You are **not** allowed to use a calculator or any measuring device (e.g. ruler or protractor).
2. **Use a pencil to fill out the answer sheet.** If you make a mistake, you can erase the error and correct it.
3. Write your name clearly (in block capitals) in the space provided in the answer sheet.
4. You should have some extra sheets of your own paper (or a refill pad) for rough work while you are doing the questions.
5. When you have decided on your answer for a particular question, carefully mark your choice for that question on the answer sheet.
6. Do not make any other marks on the answer sheet other than to write your name and to mark your answers to the questions.
7. Some of the questions are quite difficult, and we do not expect that many people will have time to think about all of them in 60 minutes. You will probably do better if you concentrate on a few rather than trying to guess the answer to all of the questions. The questions at the beginning are easier than those at the end. The problems are meant to encourage you to think! Don't be in a rush to mark your answer to any of the questions - take your time, read the questions carefully and make sure you understand what is being asked before you start to figure out the answer.
8. **There is no pass/fail mark in PRISM.** Correct answers will score one point each; incorrect or omitted answers will score zero.

*Good luck and thank you for participating in PRISM.  
We hope you will enjoy the problems!*



Problem Solving  
for  
Irish  
Second level  
Mathematicians

*Junior Level 2007*

1. Which of the following numbers is not equal to 6?

- (A) The number of faces in a cube.
- (B) The number of sides in a hexagon.
- (C) The number of buttons on a typical mobile phone.
- (D) The number of teams in the Six Nations Rugby tournament.
- (E)  $3 + 3$

2. Which of the following is equal to  $\frac{1}{2} + \frac{1}{3} + \frac{1}{4}$ ?

- (A)  $\frac{13}{12}$    (B)  $\frac{3}{9}$    (C)  $\frac{3}{12}$    (D)  $\frac{1}{12}$    (E) 1

3. Which of the following is equal to  $\frac{0.3}{0.06}$ ?

- (A) 2   (B) 50   (C) 0.5   (D) 3   (E) 5

4. Which of the following numbers is the largest?

- (A)  $2 \times 3 \times 4$    (B)  $5^2$    (C)  $\frac{50}{3}$    (D)  $2 + 3 + 4 + 5$    (E) 20

5. You have one hour to complete the PRISM contest. After 35 minutes what fraction of your time remains?

- (A)  $\frac{1}{2}$    (B)  $\frac{5}{12}$    (C)  $\frac{7}{12}$    (D)  $\frac{1}{3}$    (E)  $\frac{1}{4}$

6. Tom is five years younger than Mary. Two years from now, Mary will be twice as old as Tom. What age is Tom now?

- (A) 5   (B) 8   (C) 10   (D) 3   (E) 4

7. Two apples and three oranges cost €2.80. Three apples and four oranges cost €3.90. How much do two apples and two oranges cost?

- (A) €2.20   (B) €1.00   (C) €1.10   (D) €2.10   (E) €2.50

8. Which of the following is the number of seconds in a week?

(A)  $60 \times 60 \times 24 \times 7$

(B)  $3600 \times 7$

(C) 500000

(D)  $60 + 60 + 24 + 7$

(E)  $60 \times 60 \times 48 \times 3$

9. What is the 2007th letter of this sequence?

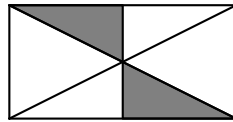
P,R,I,S,M,P,R,I,S,M,P,R,I,S,M,P,R,...

(A) P (B) R (C) I (D) S (E) M

10. Tap A can fill a certain swimming pool in 40 minutes. Tap B can fill the same pool in 20 minutes and tap C can fill the pool in 8 minutes. How many minutes will it take the three taps together to fill the pool?

(A) 5 (B) 4 (C) 6 (D) 8 (E) 20

11. The large rectangle shown below has sides of length 1 and 2. The two shaded triangles are right-angled triangles. What is the total area of the shaded region?



(A) 1 (B) 0.25 (C) 0.5 (D)  $\frac{11}{10}$  (E)  $\frac{2}{\sqrt{17}}$

12. There are 150 houses in a new housing estate. A carpenter is putting numbers on all the doors. Each digit requires 1 screw to attach, and the houses are to be numbered with the numbers 1 to 150. How many screws will the carpenter need in order to complete the task?

(A) 150 (B) 450 (C) 351 (D) 300 (E) 342

13. A gambler goes into a casino and doubles his money. He leaves and pays €8 for his parking. He goes to another casino, doubles his money and leaves. He pays another €8 for his parking and finds that he has no money left. How much money did he have before he entered the first casino?

(A) €8 (B) €6 (C) €4 (D) €10 (E) €0

14. Which of the following numbers is the largest?

- (A)  $\sqrt{5}$  (B)  $\sqrt[3]{11}$  (C) 2 (D)  $\frac{11}{5}$  (E) 2.1

15. A set of ten numbers has an average of 10. If one of the numbers is removed then the average of the remaining nine numbers is 9. The removed number is

- (A) 9 (B) 10 (C) 11 (D) 19 (E) 20

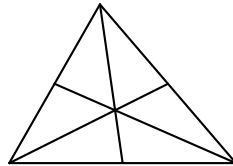
16. A list of ten numbers contains two each of the numbers 0, 1, 2, 3 and 4. The two 0s are next to each other, the two 1s are separated by one number, the two 2s are separated by two numbers, the two 3s are separated by three numbers and the two 4s are separated by four numbers. The list starts 3, 4, ... What is the last number in the list?

- (A) 0 (B) 1 (C) 2 (D) 3 (E) 4

17. If  $ab = 10$  and  $a + b = 20$ , what is  $\frac{1}{a} + \frac{1}{b}$ ?

- (A)  $\frac{1}{2}$  (B)  $\frac{4}{5}$  (C) 1 (D) 2 (E) 3

18. How many triangles are visible in the diagram below? (A triangle is visible if all its edges are drawn in black in the diagram.)



- (A) 20 (B) 16 (C) 7 (D) 6 (E) 15

19. There are 6 players in a chess tournament. Each player plays each of the other players once. There are no draws. Exactly one of the following statements cannot be false. Which one is it?

- (A) At least two players win at least 3 games each.  
(B) Some player wins 5 games.  
(C) There is a player who wins 4 games and loses 1 game.  
(D) There is a player who loses at least 3 games.  
(E) At least one player loses 5 games.

20. What is the remainder when

$1^2 + 3^2 + 5^2 + 7^2 + 9^2 + 11^2 + 13^2 + 15^2 + 17^2 + 19^2 + 21^2 + 23^2 + 25^2 + 27^2 + 29^2 + 31^2$   
is divided by 4?

- (A) 0 (B) 1 (C) 2 (D) 3 (E) 4