

Problem Solving for Irish Second level Mathematicians
Thursday, 16th October 2014

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 generally 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!*

1. By how much is 50% of 50 greater than 50% of 40?

(A) 1 (B) 5 (C) 10 (D) 15 (E) 16

2. Which of the following numbers is the largest?

(A) $\frac{3}{4}$ (B) $\frac{3}{5}$ (C) $\frac{2}{3}$ (D) $\frac{5}{7}$ (E) 0.7

3. How many whole numbers between 1 and 40 are either a multiple of 7 or end in a 7?

(A) 6 (B) 7 (C) 8 (D) 9 (E) 10

4. The sun will rise in Galway tomorrow at 08:04 and set at 18:38. At what time will true midday be in Galway tomorrow if true midday is exactly halfway between these two times?

(A) 13:04 (B) 13:17 (C) 13:21 (D) 13:25 (E) 13:38

5. If one loaf of bread can be traded for 4 eggs, and one chocolate bar can be traded for 2 eggs, how many chocolate bars are worth 3 loaves of bread?

(A) 2 (B) 3 (C) 4 (D) 6 (E) 8

6. Three boys ate a total of 18 sweets. If Peter ate more sweets than each of the other two boys, what is the smallest number of sweets that Peter could have eaten?

(A) 5 (B) 6 (C) 7 (D) 8 (E) 9

7. In how many ways can the four people A, B, C and D be seated in four chairs in a row?

(A) 4 (B) 12 (C) 16 (D) 24 (E) 36

8. In a football tournament involving 10 teams, each team plays exactly three games. How many games will be played?

(A) 15 (B) 20 (C) 25 (D) 30 (E) 3^{10}

9. If we write the number $\frac{1}{62500}$ as a decimal with the smallest possible number of digits, how many digits will appear after the decimal point?

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

10. If we arrange the digits of the number 123 in all possible ways, we end up with a total of 6 three-digit numbers 123,132, etc.. What is the sum of these 6 three-digit numbers?

(A) 738 (B) 1002 (C) 1112 (D) 1332 (E) none of these

11. How many simultaneous solutions do the equations $4x + 3y = 4$ and $4x + 2y = 4$ have?

(A) 0 (B) 1 (C) 2 (D) 3 (E) an infinite number

12. Twelve sweaters and eight shirts cost twenty euros more than eight sweaters and twelve shirts. We can say that

- (A) a sweater costs the same as a shirt
 (B) a sweater costs €2.50 more than a shirt
 (C) a sweater costs €4 more than a shirt
 (D) a sweater costs €5 more than a shirt
 (E) a sweater costs €1 less than a shirt
13. Of the 70 students who wrote an exam, 40 were male, 50 were from Galway and 20 were males who were from Galway. How many of the 70 students were neither male nor from Galway?
- (A) 0 (B) 5 (C) 10 (D) 20 (E) 45
14. A car went up a hill at 30 km/h and went down the same hill at a speed of 45km/h. What was the average speed of the car in km/h for the entire journey?
- (A) 40 (B) 37.5 (C) 37 (D) 36 (E) 35.5
15. A chessboard has 64 squares. Suppose that one cent is placed on the first square, 2 cents on the second square, 3 cents on the third square, and so on up to 64 cents on the 64th square. What is the total amount of money (in cents) that will be placed on the board?
- (A) 2080 (B) 2048 (C) 1024 (D) 1020 (E) none of these
16. In a 1000m race, Andrew beat Brian by 200m and Brian beat Charlie by 200m. By how many metres did Andrew beat Charlie? Assume that each person runs at a constant speed.
- (A) 450 (B) 400 (C) 360 (D) 300 (E) 200
17. Suppose that a , b and c are positive whole numbers that satisfy $ab=6$, $ac=18$ and $bc=27$. What is the value of abc ?
- (A) 108 (B) 54 (C) 51 (D) 50 (E) 40
18. Which of the following has the greatest perimeter?
- (A) A square with sides of length 5 cm
 (B) A square with diagonal length equal to $\sqrt{50}$ cm
 (C) A square with area equal to 25 cm^2
 (D) A circle with radius 3.5 cm
 (E) A circle with area $9\pi \text{ cm}^2$
19. When we square the length of the diagonal of a square, the number of cm^2 that results is equal to four times the perimeter of the square in centimetres. What is the area of the square (in cm^2)?
- (A) 64 (B) $16\sqrt{2}$ (C) 16 (D) $8\sqrt{2}$ (E) none of these
20. A class of n students wrote an exam. After the exams were marked, m of the students had their marks raised by 3 each and the remaining students had their marks raised by 1 each. The new average mark of the class is 1.5 more than the original average before the raises. What proportion, $\frac{m}{n}$, of the class had their marks raised by 3?
- (A) $\frac{1}{5}$ (B) $\frac{1}{4}$ (C) $\frac{2}{5}$ (D) $\frac{1}{2}$ (E) $\frac{3}{5}$