



**Problem Solving for Irish Second level Mathematicians
Thursday 19th October 2006**

Junior Cycle

Time allowed: 60 minutes

Rules and Guidelines for Contestants

1. The candidate number (on the top right of your answer sheet) is the number you must have in order to get your result. Write this number down somewhere and keep it safe. **You must know this number in order to get your result.**
2. You are **not** allowed to use a calculator or any measuring device (e.g. ruler or protractor).
3. **Use a pencil to fill out the answer sheet.** B or HB pencils are the best for this. If you make a mistake, you can erase the error and correct it.
4. Write your name clearly (in block capitals) in the space provided in the answer sheet.
5. You should have some extra sheets of your own paper (or a refill pad) for rough work while you are doing the questions. **Do not** hand these up at the end.
6. When you have decided on your answer for a particular question, carefully mark your choice for that question in the way shown on the answer sheet - with a horizontal line through your choice. An X or a tick mark will not count.
7. Remember that the marking will be done by a machine. Do not make any other marks on the answer sheet other than to write your name and to mark your answers to the questions. **Any scribbles or other marks could mean that your answer sheet will not be marked.** Also, **do not fold or bend the answer sheet.**
8. 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.
9. **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!*



JUNIOR CYCLE PROBLEMS 2006

- Which one of the following numbers is **not** equal to 2?
 - The number of wheels on a bicycle.
 - The number of shoes in a pair.
 - The number of teams that contested the 2006 All-Ireland Senior hurling final.
 - The number of sides in a triangle.
 - The number of hours between 11p.m. on October 19 and 1a.m. on October 20 (in the same year).
- Which one of the following numbers is **not** equal to 6?
 - The number of faces of a cube.
 - The number of musicians in a string quartet.
 - The number of eggs in a half-dozen.
 - The combined number of legs in the horse/rider combination that won the 2006 Irish Grand National.
 - The combined number of wheels on one tricycle, one bicycle and one unicycle.
- Which one of the following numbers is the largest?

(A) 3^2 (B) 8 (C) 2×3 (D) $\frac{15}{2}$ (E) $\frac{20}{3}$
- Andy, Benny and Charlie have 21 apples between them. Andy thinks to himself "If Charlie gave me two of his apples, we would all have the same number of apples". How many apples does Andy have?

(A) 4 (B) 7 (C) 6 (D) 8 (E) 5
- Which of the following numbers is the largest?

(A) $\frac{17}{20}$ (B) $\frac{9}{10}$ (C) $\frac{4}{5}$ (D) $\frac{13}{15}$ (E) $\frac{3}{4}$
- Which of the following numbers is equal to $10^7 - 999,999$?

(A) 1 (B) 11 (C) 9,000,001 (D) 9,999,999 (E) 9,111,111
- A drawer contains 10 white socks, 10 black socks and 10 blue socks (and nothing else). The light is not working and Jerome is packing in the dark to go on an overnight trip. What is the minimum number of socks that he must pack if he wants to be certain that he will have a pair of the same colour?

(A) 3 (B) 4 (C) 22 (D) 6 (E) 2

8. In a building at the zoo there are zebras and ostriches. If these animals have a total of 26 legs and 18 eyes, how many ostriches are there?

- (A) 4 (B) 6 (C) 3 (D) 5 (E) 9

9. A certain street contains 100 houses. If the houses are to be numbered 1 to 100, how many times will the digit 9 appear?

- (A) 20 (B) 10 (C) 19 (D) 9 (E) 12

10. A rabbit falls into a dry well, 29.9 metres deep. When she attempts to climb out, she finds that she can climb three metres every day. However she cannot climb continuously, and every day as she rests she slips back two metres. How many days does it take for the rabbit to get out of the well?

- (A) 27 days (B) 30 days (C) 10 days (D) 28 days (E) 29 days

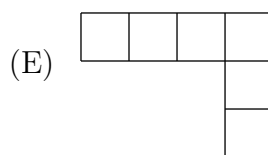
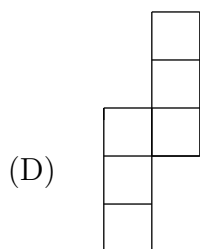
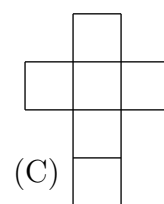
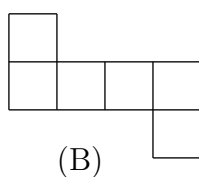
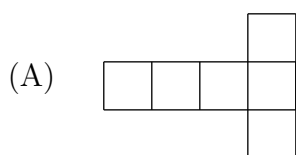
11. How many positive 2-digit whole numbers are odd? (Please note that the positive 2-digit whole numbers are those in the range 10–99 inclusive).

- (A) 90 (B) 50 (C) 46 (D) 44 (E) 45

12. John gives half his money to Emma, who then gives half of that to Séamus, who then gives half of that to John. What fraction of his original amount does John now have?

- (A) $\frac{1}{2}$ (B) $\frac{3}{4}$ (C) $\frac{5}{8}$ (D) $\frac{3}{8}$ (E) $\frac{1}{8}$

13. Which of the following diagrams *cannot* be cut out around its outline and folded to make a cube having the six squares in the diagram as faces?



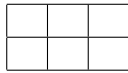
14. If $a + b = 10$ then what is $a^2 + b^2 + 2a + 2b + 2ab$?

- (A) 25 (B) 100 (C) 120 (D) 200 (E) 101

15. If a length of 4 kms of fence can enclose a square plot of 100 hectares of land, how many hectares of land will 8 kms of fence enclose in a square?

- (A) 400 (B) 200 (C) 250 (D) 150 (E) 300

16. How many rectangles are visible in the figure below?



- (A) 1 (B) 7 (C) 18 (D) 12 (E) 6

17. An amoeba is placed in a jar and each minute it doubles its size by splitting its cells in two. Suppose that the jar will be completely filled in 10 minutes. How long (in minutes) would it take to fill the jar if instead of one amoeba there had been two amoebas in it to start?

- (A) 10 (B) 9 (C) 5 (D) 1 (E) 6

18. In an art class, a student is given a white cube and told to paint two of its faces red and one face green. How many differently coloured cubes could the student produce?

- (A) 60 (B) 15 (C) 1 (D) 2 (E) 3

19. What is the remainder when 2^{100} is divided by 5?

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

20. Ann, Betty and Cathy are sisters. One of them always tells the truth, one of them always lies and one of them sometimes tells the truth and sometimes lies.

Betty says "Ann sometimes lies, but not always".

Cathy says "Ann always lies".

Betty says "Cathy sometimes lies, but not always".

Ann says "Cathy sometimes lies, but not always".

Which one of the following statements is **false**?

- (A) Betty lies, at least sometimes.
(B) Cathy tells the truth, at least sometimes.
(C) It is possible to determine from the given information which of the three always tells the truth.
(D) Ann tells the truth, at least sometimes.
(E) It is possible to determine from the given information which of the three always lies.