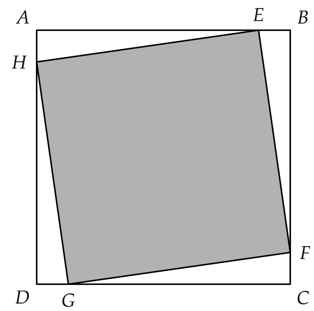
Paper 2, Part A

1. Amanda has two red flags and one white flag. The number of different ways that Amanda can hang at least two flags vertically on a flagpole, is:

   (A) 3 (B) 5 (C) 6 (D) 8 (E) 9

2. Square $EFGH$ has one vertex on each side of a square $ABCD$. Point E is on AB with $AE = 7EB$. The fraction of the area of square $ABCD$ that is contained in the shaded square $EFGH$ is:

   (A) $\frac{5}{8}$ (B) $\frac{49}{64}$ (C) $\frac{25}{32}$

   (D) $\frac{7}{8}$ (E) $\frac{63}{64}$

3. To enter a very private garden you must go through four doors. At each door you must pay an entry fee. If you pay \$$x$ at a given door, then you pay \$ $(2x + 1)$ at the next door, that is, you pay one dollar more than twice a much as you paid at the previous door. If it costs a total of \$56 to get into the garden, the number of dollars you must pay to get through the first door is:

   (A) 15 (B) 7 (C) 6 (D) 4 (E) 3

4. Nora bought 120 candies for \$7.00. She distribute all of the candies between Jack, Mona, and Ian. The candies she gave to Jack cost \$0.05 each, Mona's cost \$0.06 each, and Ian's cost \$0.07 each. Nora gave Jack n more candies than she gave Ian. The value of the number n is:

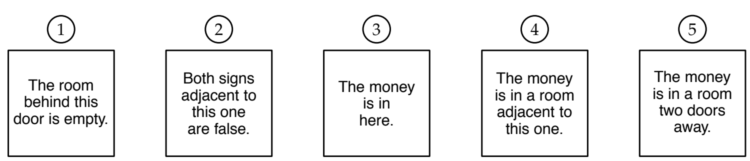
   (A) 20 (B) 120 (C) 100 (D) 50 (E) Not enough information

5. In the diagram start in the bottom left cell and move to the top right cell, adding the numbers as you go. You may move only up and to the right. The largest possible sum is:

9	2	6	3
1	4	5	7
7	3	2	5
2	8	4	1

   (A) 34 (B) 30 (C) 32 (D) 31 (E) 29

6. On a certain game show there are five doors. One door has money behind it; the rest of the doors open into an empty room. On one day the signs shown below are placed on the doors.

   If exactly two of the signs are true and the others are false, the number of the door that has money behind it is:

   (A) 1 (B) 2 (C) 3 (D) 4 (E) 5

7. An automobile travels at v kilometres per hour for 30 km, then at $2v$ kilometres per hour for 20 km, and at $3v$ kilometres per hour for 15 km. The average speed of the automobile, measured in kilometres per hour, over the entire trip is:

(A) $2v$ (B) $\frac{13}{9}v$ (C) $\frac{23}{13}v$ (D) $\frac{4}{3}v$ (E) $\frac{15}{7}v$

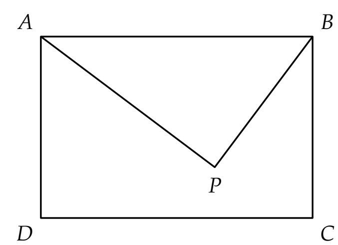
8. A gym container holds 50 balls of two sizes and two colours. Twenty-two balls are large and red, 12 balls are small, and 26 balls are green. The number of balls that are small and green is:

(A) 2 (B) 4 (C) 5 (D) 10 (E) 12

9. A plane carrying mail landed earlier than expected. A motorcyclist picked up the mail and started riding towards the post office. One half hour after the plane arrived the motorcyclist met the mail truck that normally picked up the mail at the airport. The mail truck driver took the mail from the motorcyclist and delivered it to the post office. The mail truck delivered the mail to the post office 20 minutes before it was expected. If the plane landed x minutes early, then the value of x is:

(A) 50 (B) 40 (C) 30 (D) 20 (E) 10

10. In rectangle $ABCD$ the lengths of two of the sides are $AD = 10$ and $CD = 15$. If P is the point inside the rectangle for which $PB = 9$ and $PA = 12$, then the length of the line segment PD is:



(A) $\dfrac{44}{5}$ (B) 9 (C) $\dfrac{48}{5}$

(D) 10 (E) $\dfrac{56}{5}$

Paper 2, Part B

1. Let A be the area of a triangle with sides of lengths 25, 25, and 40. Let B be the area of a triangle with sides 25, 25, and 30. Determine the relation between the areas A and B.

2. Find all ordered pairs of positive integers (x, y) such that $x^2 - y^2 = 140$.

3. An Armstrong number is an integer with n digits that equals the sum of each of its digits raised to the power of n. For example, the three digit number abc is an Armstrong number if $a^3 + b^3 + c^3 = abc$.

   (a) Verify that 371 is a three digit Armstrong number.

   (b) There is a total of four three digit Armstrong numbers. Find two more three digit Armstrong numbers.

   (c) Show that there are no Armstrong numbers with two digits.

4. Write any two digit number and then follow that number by adjoining its reversal. For example, if you start with 13, then you would get 1331. Show that the resulting number is always divisible by 11.

5. In the diagram $ABCD$ is a unit square. The line segment PQ makes a 45° angle with side AB and is a diameter of the shaded semicircle. The semicircle touches the sides of the square at points X and Y. Find the area of the semicircle.