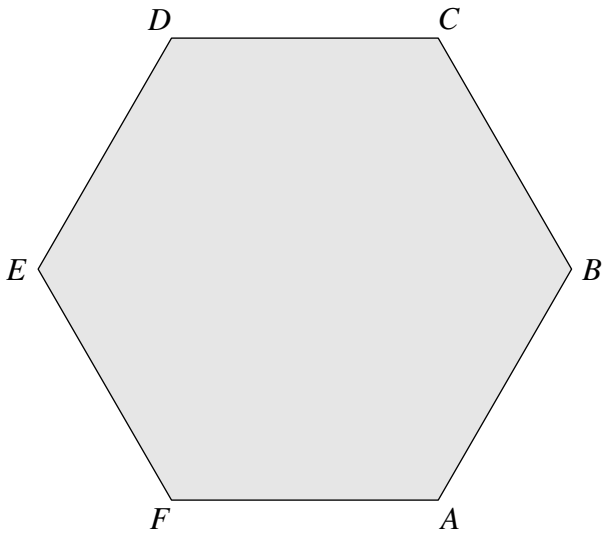
Instructions

- Your team will have 45 minutes to answer 10 questions. Each team will have the same questions.
- Each question is worth a total of 6 marks. However, some questions are easier than others!
- Do not spend too long on any one question without sharing it with the rest of the team.
- You will have to decide your team's strategy for this group competition.
- There is only one response sheet per team.
- Remember to finalise your answers and write them on the response sheet before the end of the round.

QUESTION 1



$ABCDEF$ is a regular hexagon.

What is the area of triangle CDF as a fraction of the area of the hexagon?

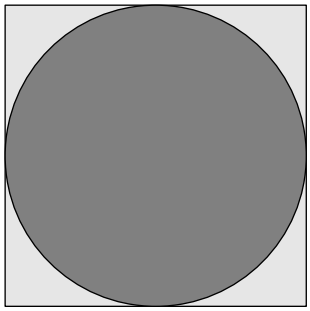
Give your answer as a fraction in its lowest terms.

[6 marks]

QUESTION 2

(a) A circle touches the mid-points of the edges of a square. The ratio of the area of the circle to the area of the square is $\pi : x$.

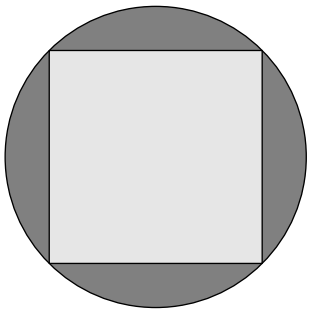
What is the value of x?



[3 marks]

(b) A circle touches the vertices of a square. The ratio of the area of the circle to the area of the square is $\pi : y$.

What is the value of y?



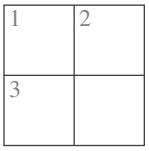
[3 marks]

The area of a circle is equal to π times the square of its radius.

QUESTION 3

(a) What is the *smallest* possible sum of the four non-zero digits that may be placed in the Crossnumber below?

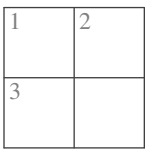
ACROSS	DOWN
1. A square	1. A square
3. A square	2. A square



[3 marks]

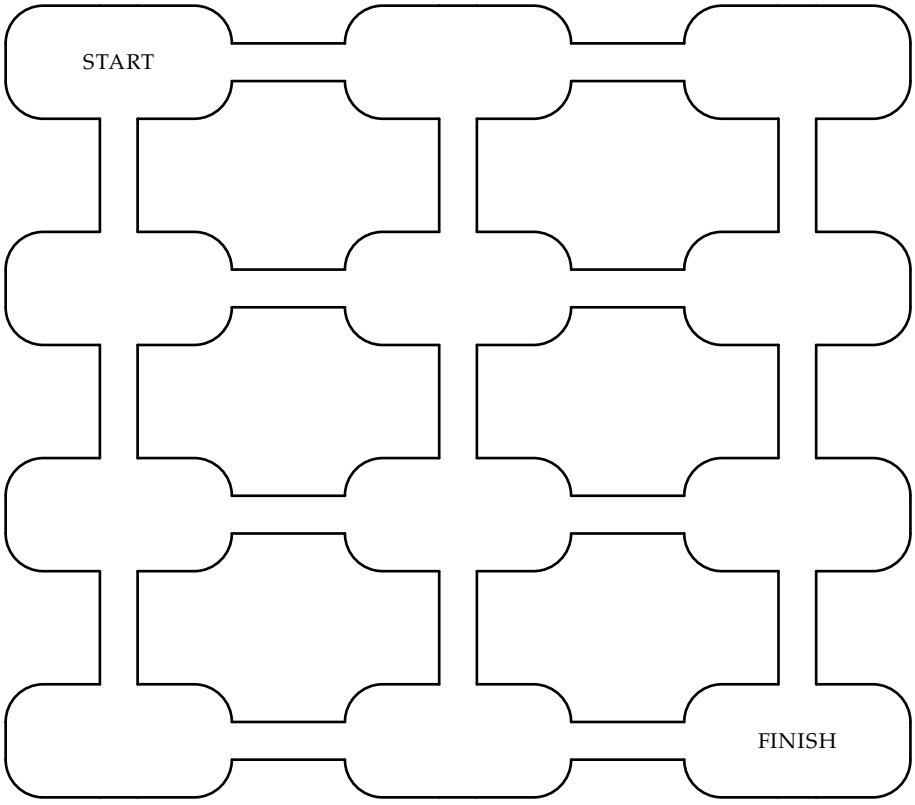
(b) What is the *largest* possible sum of the four non-zero digits that may be placed in the Crossnumber below?

ACROSS	DOWN
1. A square	1. A square
3. A square	2. A square



[3 marks]

Question 4



The diagram shows a burrow consisting of 12 chambers.

A mole moves from one chamber to another by passing through a tunnel.

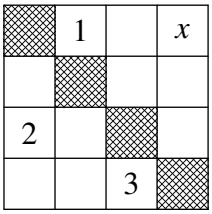
Starting in the top left chamber of the burrow, the mole goes through exactly five tunnels to reach the bottom right chamber.

In how many different ways can this be done?

[6 marks]

Question 5

In a 4×4 grid, four cells are shaded, and the numbers 1, 2 and 3 each lie in a cell, as shown below.



The numbers 5, 6, 7, 8, 9, 10, 11, 12 and 14 are to be placed, once each, in an unshaded cell so that the sum of the numbers in each row and in each column is the same.

What number should be placed in the cell labelled x?

[6 marks]

Question 6

Some of the integers between two and fifty are not prime. Some of these are *special integers*. This means that neither the integer nor double the integer is divisible by a square greater than one.

How many of these *special integers* are there?

[6 marks]

Question 7

Dean took 16 minutes to cycle from his home to Andrew's house. He later took 48 minutes to walk home. Each journey was at a constant speed. On that day Dean cycled 5 miles per hour faster, on average, than he walked.

What is the distance, in miles, between the two houses?

[6 marks]

Question 8

A palindromic number reads the same forwards as backwards.

A two-digit palindromic number is multiplied by 99. The tens digit of the answer is a five.

What is the answer?

[6 marks]

Question 9

(a) Each son in the Jones family has the same number of brothers as sisters. Each daughter has twice as many brothers as sisters.

How many children are there in the Jones family? [3 marks]

(b) Mrs Jones is currently four times as old as her daughter Hannah. Twenty years from now, Mrs Jones will be twice as old as Hannah.

How old is Hannah now? [3 marks]

Question 10

Five children standing in a line each tossed a coin.

At least four of the coins landed the same way up.

Using "H" for Head and "T" for Tail, in how many different ways could the outcome be written down?

[6 marks]

TEAM NUMBER SCHOOL NAME

1. Fraction

0 6

2. (a) Value of x (b) Value of y

(a) 0 3

(b) 0 3

3. (a) Smallest sum (b) Largest sum

(a) 0 3

(b) 0 3

4. Number of ways

0 6

5. Number

0 6

6. Number of integers

0 6

7. Distance between houses

miles 0 6

8. Product

0 6

9. (a) Number of children (b) Hannah's age

(a) 0 3

(b) 0 3

10. Number of ways

0 6

Circle the mark awarded for each question and cross out the others.

FINAL SCORE /60