Question 2

(Suggested maximum time: 5 minutes)

The sets U, A, and B are defined as follows, where U is the universal set:

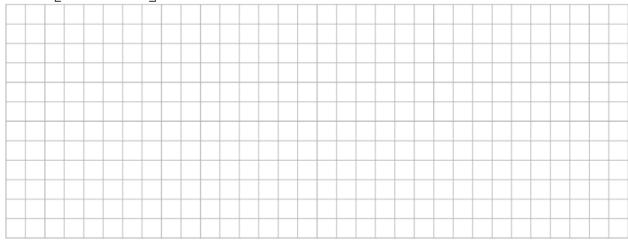
$$U = \{2, 3, 4, 5, \dots, 30\}$$

$$A = \{\text{multiples of 2}\}\$$

$$B = \{\text{multiples of 3}\}\$$

$$C = \{\text{multiples of 5}\}.$$

(a) Find $\# [(A \cup B \cup C)']$, the number of elements in the complement of the set $A \cup B \cup C$.



(b) How many divisors does each of the numbers in $(A \cup B \cup C)'$ have?



(c) What name is given to numbers that have exactly this many divisors?

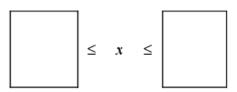


(Suggested maximum time: 5 minutes)

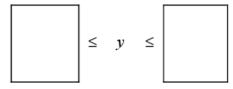
Niamh is in a clothes shop and has a voucher which she \boldsymbol{must} use.

The voucher gives a €10 reduction when buying goods to the value of at least €35. She also has €50 cash.

(a) Write down an inequality in x to show the range of cash that she could spend in the shop.



(b) Niamh buys one item of clothing in the shop, using the voucher as she does so. Write an inequality in y to show the range of possible prices that this item could have, before the €10 reduction is applied.

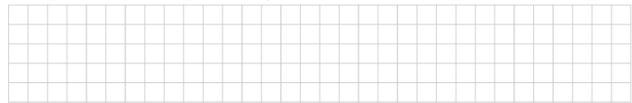


Higher Level Question

(Suggested maximum time: 10 minutes)

n is a natural number.

(a) Write down the next 3 natural numbers, in terms of n.



Hence, or otherwise, complete the following.

(b) Show that the sum of any 3 consecutive natural numbers is divisible by 3.



(c) Prove or disprove the following statement:

"The sum of any 4 consecutive natural numbers is never divisible by 4."



(a) Place the following numbers in order, starting with the smallest:



1.4

 $\sqrt{2}$



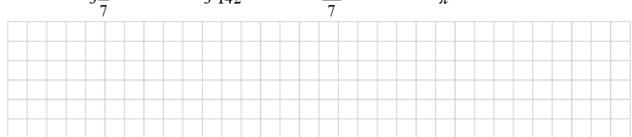
(b) Which one of the following is **not** a rational number? Explain your answer.



3.142

$$\frac{22}{7}$$

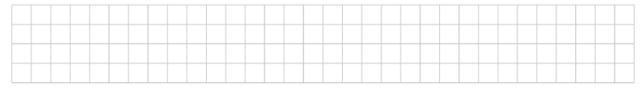
π



(c) (i) Find the values of $\frac{4n^2+1}{13}$, where $n \in \{17, 19, 21\}$.

n	$\frac{4n^2+1}{13}$					
17						
19						
21						

(ii) State which one of your answers is a natural number, and explain your choice.



(a) (i) The columns in the table below represent the following sets of numbers: Natural numbers (\mathbb{N}), Integers (\mathbb{Z}), Rational numbers (\mathbb{Q}), Irrational numbers ($\mathbb{R}\setminus\mathbb{Q}$) and Real numbers (\mathbb{R}).

Complete the table by writing either 'Yes' or 'No' into each box indicating whether each of the numbers $\sqrt{5}$, 8, -4, $3\frac{1}{2}$, $\frac{3\pi}{4}$ is or is not an element of each.

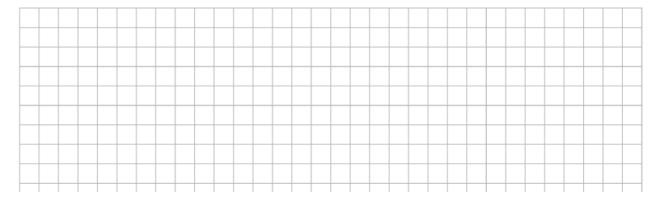
(One box has already been filled in. The 'Yes' indicates that the number 8 is an element of the set of Real numbers, \mathbb{R}).

Number/Set	N	Z	Q	$\mathbb{R}\setminus\mathbb{Q}$	\mathbb{R}
$\sqrt{5}$					
8					Yes
- 4					
3 ½					
$\frac{3\pi}{4}$					

(ii) In the case of $\sqrt{5}$ explain your choice in relation to the set of Irrational numbers ($\mathbb{R}\setminus\mathbb{Q}$) (i.e. give a reason for writing either 'Yes' or 'No').

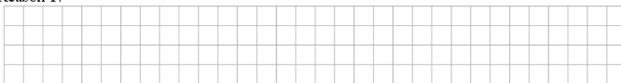


(b) Use the properties of surds to show that $\sqrt{98} - \sqrt{18} + \sqrt{2}$ simplifies to $5\sqrt{2}$.



(a) Give two reasons why -7.3 is not a natural number.

Reason 1:



Reason 2:



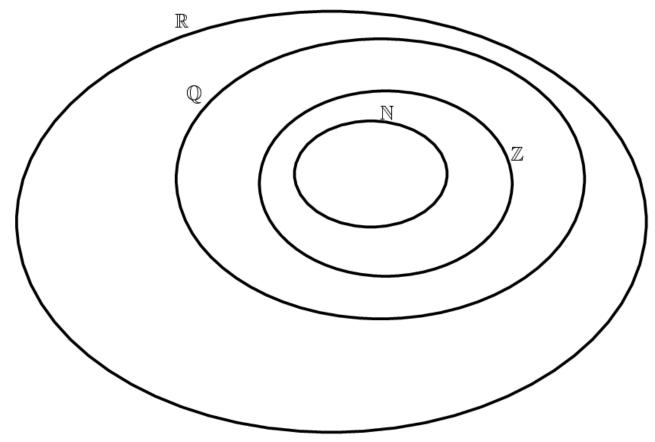
(b) The diagram represents the sets:

Natural Numbers ℕ

Integers \mathbb{Z}

Rational Numbers Q

Real Numbers R



Insert each of the following numbers in the correct place on the diagram:

$$-8$$
, π , $\frac{1}{3}$, 6 , $\sqrt{2}$, -4.5 and 7^{-1} .