1. Consider the numbers 5, 0.5, $\sqrt{5}$ and −5. Complete the table below, showing which of the number sets, $\mathbb{N}$, $\mathbb{R}$ and $\mathbb{Q}$ these numbers belong to.

Working:

Answers:

	$\mathbb{N}$	$\mathbb{R}$	$\mathbb{Q}$
5			✓
0.5	✗		
$\sqrt{5}$	✗		
−5		✓	

(Total 8 marks)

2. Given $\mathbb{Z}$ the set of integers, $\mathbb{Q}$ the set of rational numbers, $\mathbb{R}$ the set of real numbers.

(a) Write down an element that belongs to $\mathbb{R} \cap \mathbb{Z}$.

(b) Write down an element that belongs to $\mathbb{Q} \cap \mathbb{Z}'$.

(c) Write down an element that belongs to $\mathbb{Q}'$.

(d) Use a Venn diagram to represent the sets $\mathbb{Z}$, $\mathbb{Q}$ and $\mathbb{R}$.

Working:

Answers:

(a) ....

(b) ....

(c) ....

(d) ....

(Total 6 marks)

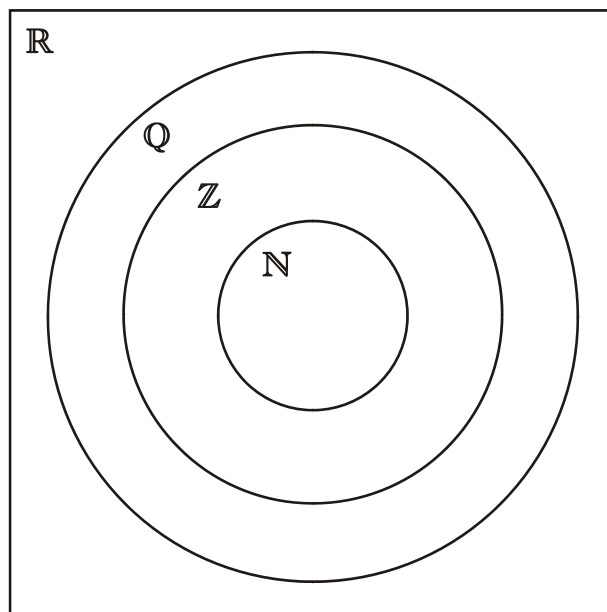**3.** The Venn diagram below shows the universal set of real numbers $\mathbb{R}$ and some of its important subsets:

$\mathbb{Q}$: the rational numbers,
$\mathbb{Z}$: the integers,
$\mathbb{N}$: the natural numbers.

Write the following numbers in the correct position in the diagram.

$$-1,\ 1,\ \pi,\ \frac{7}{16}, 3.333\dot{3},\ \sqrt{3}\ .$$

Working:

4. (a) Write down the following numbers in increasing order.

$3.5, 1.6 \times 10^{-19}, 60730, 6.073 \times 10^5, 0.006073 \times 10^6, \pi, 9.8 \times 10^{-18}$.

(b) Write down the median of the numbers in part (a).

(c) State which of the numbers in part (a) is irrational.

Working:

Answers:

(a) ....

....

....

....

....

....

....

(b) ....

(c) ....

(Total 6 marks)

1.

	$\mathbb{N}$	$\mathbb{R}$	$\mathbb{Q}$
5	✓	✓	✓
0.5	✗	✓	✓
$\sqrt{5}$	✗	✓	✗
–5	✗	✓	✓

(A1)(A1)   (C2)
(A1)(A1)   (C2)
(A1)(A1)   (C2)
(A1)(A1)   (C2)

[8]

2. (a) For example, 2, –3 *etc*   (A1)   (C1)

(b) For example, $\frac{3}{5}\left(\text{not } \frac{6}{1}\right)$ (A1)   (C1)

(c)   For example, $\sqrt{2}$, π (A1)   (C1)

(d)

For $\mathbb{Z} \subset \mathbb{Q}$ (A1)
For $\mathbb{Z} \subset \mathbb{R}$ (A1)
For $\mathbb{Q} \subset \mathbb{R}$ (A1)
Accept $\mathbb{R}$ as U.   (C3)
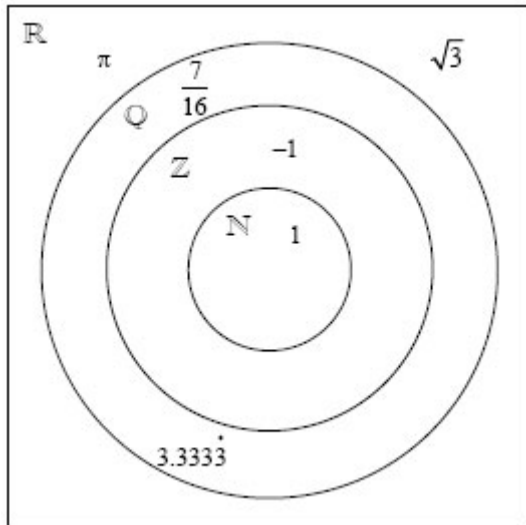
[6]

3.

(A1) (A1)
(A1)

(A1)

(A1)

(A1)   (C6)

Notes: *For any number entered exactly once, in the correct position, award* (A1) *if incorrect award* (A0).

If all numbers entered in all regions award (A0).

If any number is entered in more than one region, penalize that number as follows:

(i)   If none of the regions is correct award (A0)

(ii) If one of the regions is correct but other appearances of that number are in the COMPLEMENT of the correct set, award (A0) *the first time this is seen.*

(iii) If one of the regions is correct but other appearances of that number are in a SUBSET of the correct set award (A0) *the first time this is seen.*

Apply each of (ii) and (iii) at most once and award ft marks when the error is seen repeatedly, however, (ii) and (iii) may not both be applied to the same number and if both these errors are present with more than one number involved, follow through cannot be used until both penalties have been applied.

[6]

4. (a) 1.6×10^{-19}, 9.8×10^{-18}, π, 3.5, 0.006073×10^6, 60730, 6.073×10^5 (A4) (C4)

        Notes: *Award* (A1) *for π before 3.5*

                  Award (A1) *for 1.6×10^{-19} before 9.8×10^{-18}*

                  Award (A1) *for the three numbers containing 6073 in the correct order.*

                  Award (A1) *for the pair with negative indices placed before 3.5 and π and the remaining three numbers placed after (independently of the other three marks).*

                  Award (A3) *for numbers given in correct decreasing order.*

                  Award (A2) *for decreasing order with at most 1 error*

(b) The median is 3.5.   (A1)(ft)   (C1)

        Note: *Follow through from candidate's list.*

(c) π is irrational.   (A1) (C1)

                                            [6]