

Name:

Mark:

Teacher:



Repton School

IB Standard Level Mathematical Studies Year 12 Assessment January 2013

Time allowed: 1 Hour Marks: 58

Full marks are not necessarily awarded for a correct answer with no working. Answers must be supported by working and/or explanations. Where an answer is incorrect, some marks may be given for a correct method, provided this is shown by written working. You are therefore advised to show all working.

- You **are** permitted access to a calculator for this paper.
- Answer all questions in the spaces provided.
- Unless otherwise stated in the question, all numerical answers should be exact, or rounded to 3 significant figures.
- Write in blue or black pen and draw diagrams in pencil.
- Do not use correction fluid or tape.

Required Formulae

Topic 1—Number and algebra

1.2	Percentage error	$\varepsilon = \left \frac{v_A - v_E}{v_E} \right \times 100\%$, where v_E is the exact value and v_A is the approximate value of v
1.7	The n th term of an arithmetic sequence The sum of n terms of an arithmetic sequence	$u_n = u_1 + (n-1)d$ $S_n = \frac{n}{2}[2u_1 + (n-1)d] = \frac{n}{2}(u_1 + u_n)$

1. If $x = 3.1 \times 10^4$ and $y = 2.4 \times 10^{-7}$, calculate the values of the following, expressing your answers in the form $a \times 10^k$, where $1 \leq a < 10$ and $k \in \mathbb{Z}$.

(a) x^2

(b) $\frac{x}{y}$

Working:

Answers:

(a)

(b)

(Total 4 marks)

2. The first five terms of an arithmetic sequence are shown below.

2, 6, 10, 14, 18

- (a) Write down the sixth number in the sequence.
- (b) Calculate the 200th term.
- (c) Calculate the sum of the first 90 terms of the sequence.

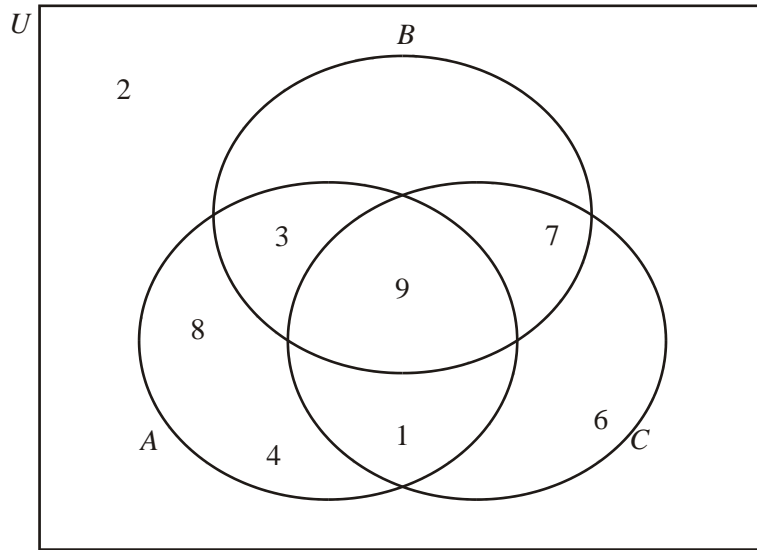
Working:

Answers:

- (a)
- (b)
- (c)

(Total 8 marks)

3. In the Venn diagram below, A , B and C are subsets of a universal set $U = \{1,2,3,4,6,7,8,9\}$.



List the elements in each of the following sets.

- (a) $A \cup B$
- (b) $A \cap B \cap C$
- (c) $(A' \cap C) \cup B$

Working:

Answers:

- (a)
- (b)
- (c)

(Total 8 marks)

4. 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.

Answers:

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

(Total 8 marks)

5. The n^{th} term of an arithmetic sequence is given by $u_n = 63 - 4n$.
- (a) Calculate the values of the first two terms of this sequence. (2)
- (b) Which term of the sequence is -13 ? (2)
- (c) Two consecutive terms of this sequence, u_k and u_{k+1} , have a sum of 34. Find k . (3)

Working:

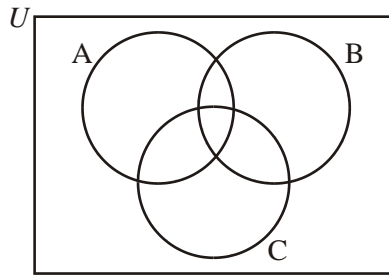
Answers:

- (a)
- (b)
- (c)

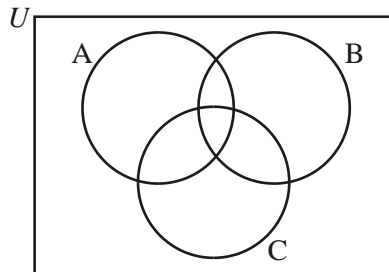
(Total 7 marks)

6. Shade the given region on the corresponding Venn Diagram.

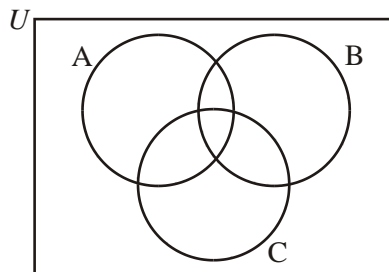
(a) $A \cap B$



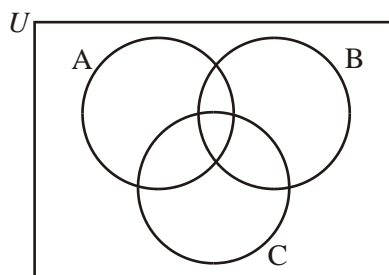
(b) $C \cup B$



(c) $(A \cup B \cup C)'$



(d) $A \cap C'$



(Total 8 marks)

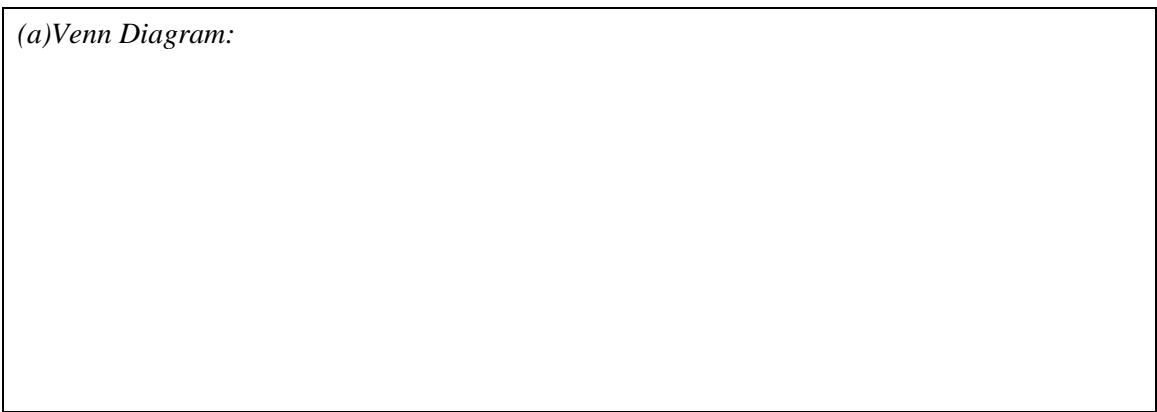
7. The following results were obtained from a survey concerning the reading habits of students.

- 60 % read magazine P
- 50 % read magazine Q
- 50 % read magazine R
- 30 % read magazines P and Q
- 20 % read magazines Q and R
- 30 % read magazines P and R
- 10 % read all three magazines

- (a) Represent all of this information on a Venn diagram. (4)
- (b) What percentage of students read exactly two magazines? (1)
- (c) What percentage of students read at least two magazines? (1)
- (d) What percentage of students do not read any of the magazines? (1)

(Total 7 marks)

(a) Venn Diagram:



Working:



Answers:

- (b)
- (c)
- (d)

8. (a) Convert 0.001673 litres to millilitres (ml). Give your answer to the nearest ml.

The SI unit for energy is Joules. An object with mass m travelling at speed v has energy given by $\frac{1}{2}mv^2$ (Joules).

- (b) Calculate the energy of a comet of mass 351 223 kg travelling at speed 176.334 m/sec. Give your answer correct to six significant figures.

In the SI system of units, distance is measured in metres (m), mass in kilograms (kg) and time in seconds (s). The momentum of an object is given by the mass of the object multiplied by its speed.

- (c) Write down the correct combination of SI units (m, kg, s) for momentum.

Working:

Answers:

- (a)
- (b)
- (c)

(Total 8 marks)