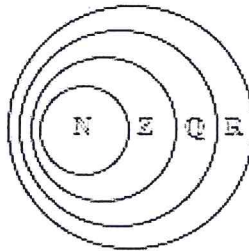


Q.1 Calculate the following. (1 mark)

(a) $2 \times 2 + (5 - 3) - 3^2 \times 4$

(b) $(3 \times 2)(-2^2) + 5 - 3 \times 6$

Q.2 The following diagram represents the hierarchy of number systems.
Explain the meaning of each symbol and the relationship between the number sets. (1 mark)



Q.3 Give an example of each of the following number systems and explain why it is a member of its defined set. (2 marks)

(a) Irrational

(b) Rational

(c) Natural

(d) Integer

Q4. Regarding the decimal, binary and hexadecimal numbering systems, perform the following: (3 marks)

(a) Add 10111_2 and 10101_2

(b) Convert 1111_2 to Base10

(c) Convert 25_{10} to Base2

(d) Convert $7E34_{16}$ to Base10

(e) Convert 42617_{10} to Base16

- Q.1 Considering each of the following numbers shown with indices, perform the instructions shown. (2 marks)

(a) Simplify $\frac{3^5}{3^3}$ to show as a single argument

(b) Express 2^{-3} as an argument with a positive index

- Q.2 Considering each of the following numbers shown with indices, simplify to root form and state if each is a surd or not. (3 marks)

(a) $3^{\frac{1}{2}}$

(b) $7^{\frac{2}{3}}$

- Q.3 Solve the following. (3 marks)

(a) Express $3^4 = 81$ as a log

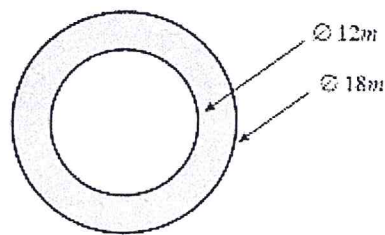
(b) Solve $\log_4 64$

(c) Express $\log 4 + \log 3 - \log 6$ as a single log

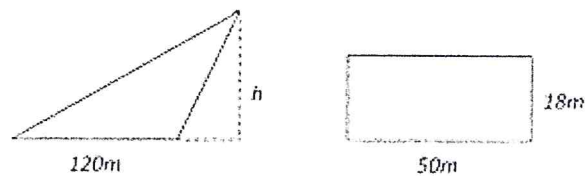
Q1. Given the circles shown in the diagram below (2 marks)

(a) what is the area of the shaded region between the two circles, in terms of π ?

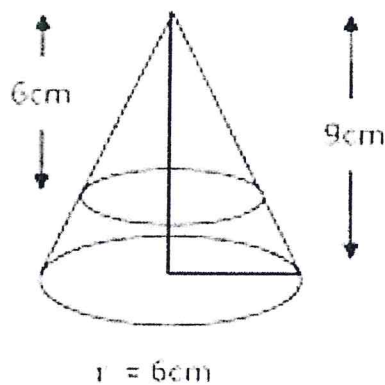
(b) what is the difference in perimeter of the two circles?



Q.2 The triangle and rectangle shown have equal area. What is the correct solution for h ? (1 mark)



Q.3 What is the capacity of the smaller cone, shown within the larger cone, in terms of π ? (1 mark)



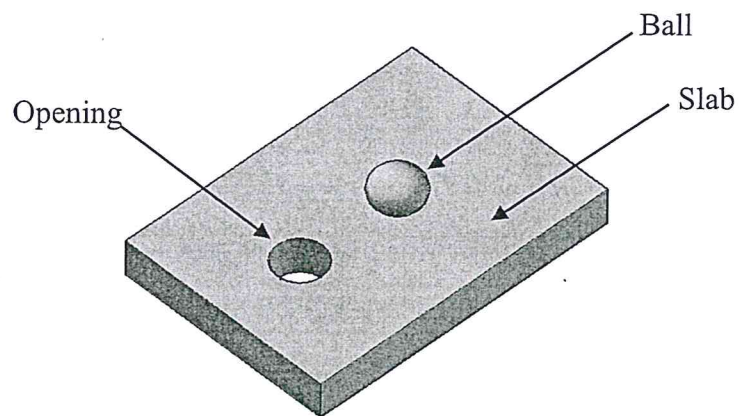
Q.4 Given that the slab below has length 2100mm, width 1500mm and thickness 350mm, and the ball has a volume of $0.065m^3$ calculate the following:

(a) the volume of the cylindrical opening in the slab

(b) the radius of the ball

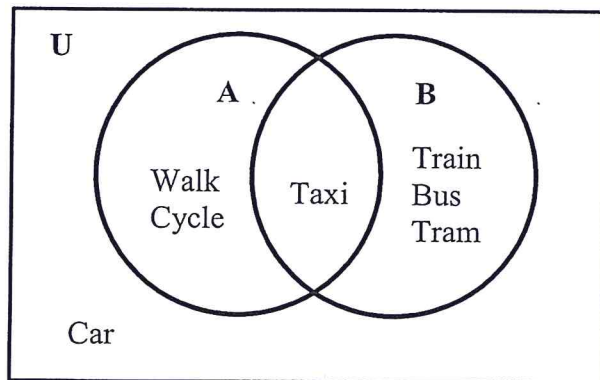
(c) the volume of the resultant slab

(3 marks)



Q.1 Given the Venn diagram below, determine the following sets, in each case using correct set notation and listing the elements necessary. (2.5 marks)

- (a) A
- (b) U
- (c) $A \cup B$
- (d) $A \cap B$
- (e) B'



Q.2 Perform the following operations on the given sets. (2.5 marks)

- (a) If $A = \{1, 3, 5, 7, 9\}$ and $B = \{2, 3, 5, 7\}$, what is $A \cup B$?
- (b) If $A = \{1, 3, 5, 7, 9\}$ and $B = \{2, 3, 5, 7\}$, what is $A \cap B$?
- (c) If $X = \{a, e, i, o, u\}$ and $Y = \{a, b, c, d, e\}$, then what is $Y - X$?

Q.3 The music department of a college is planning lessons for 30 students. 16 students say they want to play piano, 16 want to play violin, and 11 want to take flute lessons. Five say they want to take both piano and flute lessons and of these, 3 wanted to take violin lessons also. Five want only flute lessons and 8 want only violin lessons. (1 mark)

- (a) Construct a Venn diagram to display the above information.
- (b) How many students want to play piano only?

Section 5

BOOLEAN LOGIC

6 marks

- Q.1 Complete the following truth tables, stating which Boolean operator is being applied in each case. (4 marks)

(a) $p \cdot q$

p	q	$p \cdot q$
0	0	
0	1	
1	0	
1	1	

(b) p'

p	p'
0	
1	

(c) $p + q$

p	q	$p + q$
0	0	
0	1	
1	0	
1	1	

(d) $p \oplus q$

p	q	$p \oplus q$
0	0	
0	1	
1	0	
1	1	

- Q.2 Use truth tables to show the following logical equivalences of De Morgan's Laws. (2 marks)

(a) $(p \cdot q)'$ is logically equivalent to $p' + q'$ (b) $(p + q)'$ is logically equivalent to $p' \cdot q'$

- Q.1 Each member of a computer society is given an access code, which consists of two **different** letters (RP, LH, ZK, KZ, but not KK or ZZ). How many members could the society have, if each member has a different code?
(1 mark)
- Q.2 In how many ways can the letters of the word LINEAR be arranged:
(a) if there are no restrictions,
(b) if they must begin with R,
(c) if the first two letters must be vowels?
(3 marks)
- Q.3 How many different ways are there of arranging the letters of CALCULATOR, if the letters are taken:
(a) 7 at a time
(b) 5 at a time
(c) 2 at a time
(3 marks)
- Q.4 There are 7 women and 5 men in a coding club. A team of four must be chosen. How many teams are possible
(a) If there are no restrictions
(b) If there must be more women than men
(2 marks)

- Q.1 With regard to the probability of an event occurring:
- (a) What is the value of an event definitely occurring?
 - (b) What is the value of an impossible event?
 - (c) Give an example of an event with 0.5 probability. Explain your answer.
(2 marks)
- Q.2 A bag of marbles contains different colours. Three are blue, four are white and five are red. One marble is chosen at random. Find the probability that the marble is:
- (a) red
 - (b) blue or white
 - (c) not red
(3 marks)
- Q.3 A casino opens a new game where a player must roll a specific number on a single die and draw a specific card from a deck of cards to win.
What is the probability of a player successfully winning this game?
(1 mark)
- Q.4 Consider the event of rolling two dice.
- (a) Write down the probability of each possible score
 - (b) Create a graph to display the data from (a) above
 - (c) From the graph, what is the most common score when rolling two dice?
(3 marks)

- Q.1 An internet service provider commissioned a survey of how long college students spent on social media sites on their smartphones each week. 15 students were surveyed and the results are tabulated below.

Time spent on social media (Hrs)	0 – 2	2 – 4	4 – 6	6 – 8	8 – 10
No. of students	7	5	1	1	1

Note on intervals: e.g. 2-4 means 2 hrs or more but less than 4 hrs

- (a) State whether the data above is discrete or continuous, giving a reason for your answer.
- (b) State whether the above sample is representative of the entire student population giving a reason for your answer.
- (c) Display the above data on a histogram.
- (d) Determine whether the distribution is skewed, giving a reason for your answer.
- (e) What is the range of the data?
- (f) Which is the modal group in the above table?
- (g) What is the median value?
- (h) Calculate the mean and standard deviation of the above data.

(8 marks)