FIRST YEAR MATHEMATICS EXAM 2015

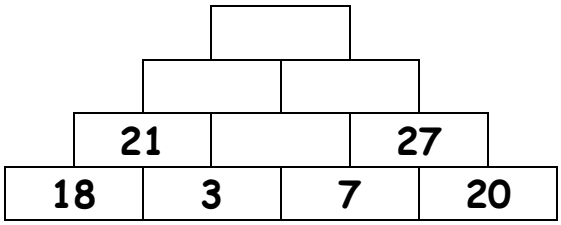
Answer All questions. You must show your work in order to obtain full marks.

Question 1: Natural Numbers and Integers.

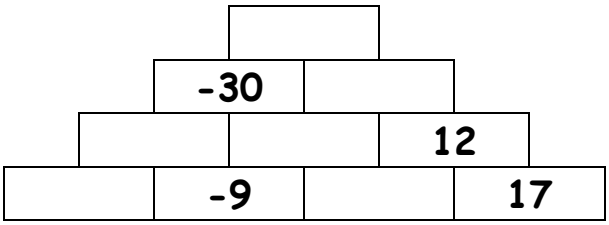
(a) Complete the following Pyramids

Add the two bricks below to get the brick above

(i)

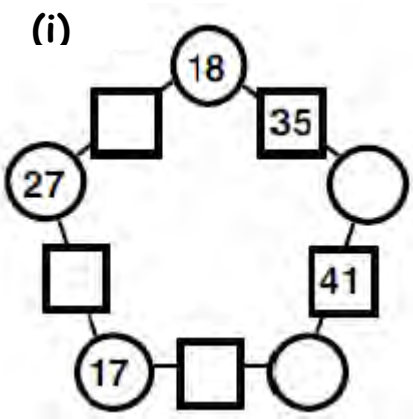


(ii)

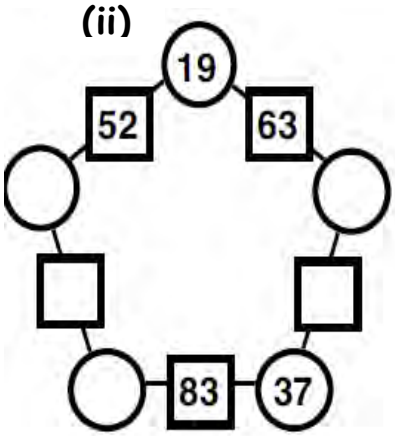


(b) Complete the following Addagons

(i)



(ii)



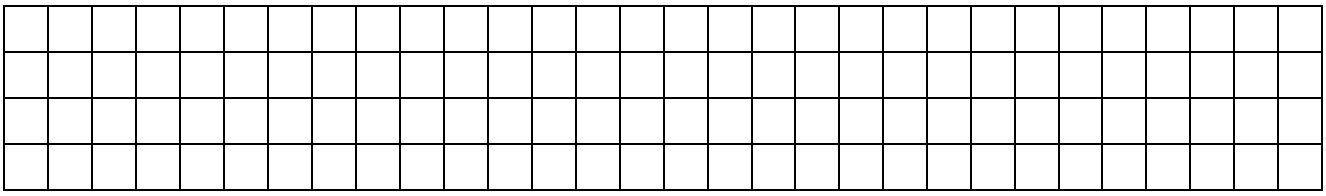
(c) BEMDAS:

Show how to calculate the following – make sure to show all calculations

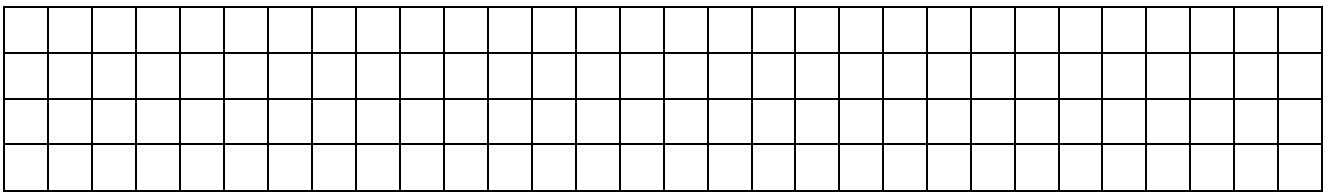
i) $(4 \times -2) - 10 = -18$

ii) $48 \div (4 - 2) + 8 = 32$

iii) $2(4+1)-4(5-4)=6$



iv) $-14+18\div 3+(90\div 10)$ **=** 1



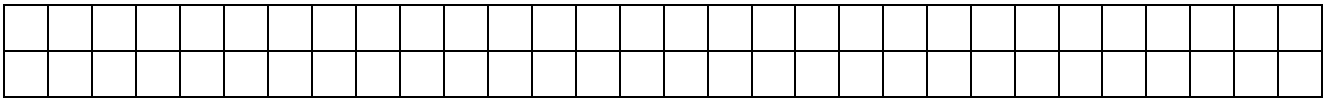
Question 2: Number

(a) Circle all the prime numbers in the table below:

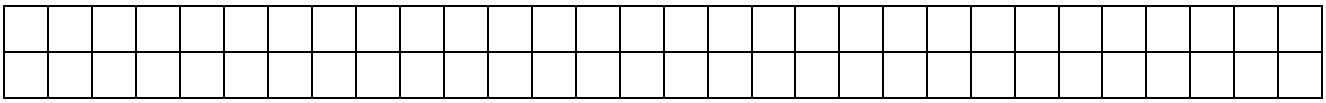
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20

(b)

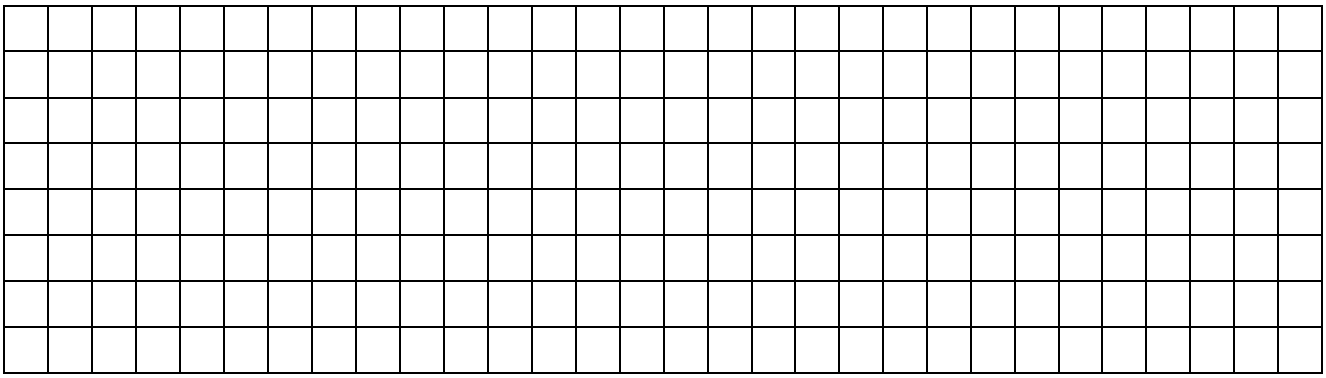
(i) List all the divisors of 18



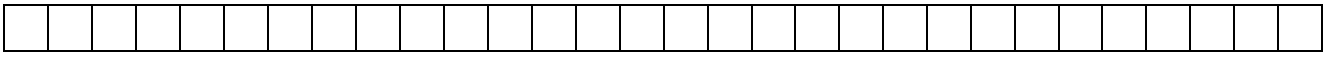
(ii) List all the divisors of 24



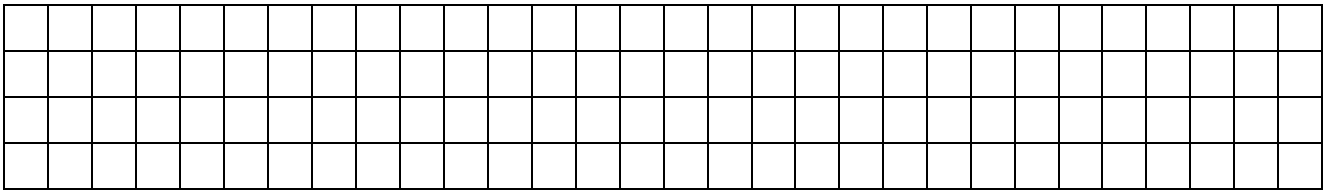
(iii) Write down the highest common factor of 18 and 24



(iv) Write down the first five multiples of 4



(v) Write 48 as a product of Prime factors



(vi) Write down the Lowest common multiple of 12 and 15

Question 3: Fractions/Decimals and Percentages

(a)

What is the Fraction of the Shaded Area ?

1) _____

2) _____

3) _____

4) _____

5) _____

6) _____

7) _____

8) _____

9) _____

10) _____

(b)

Complete the table below using your knowledge of fractions, decimals and percentage conversions:

Problem	Fraction	Decimal	Percent
1.	$\frac{4}{5}$	0.80	
2.		0.375	37.5%
3.	$\frac{11}{20}$		55%
4.	$\frac{7}{8}$		
5.		0.72	

Question 4: Sets

(A)

(a) List the elements of each of these sets:

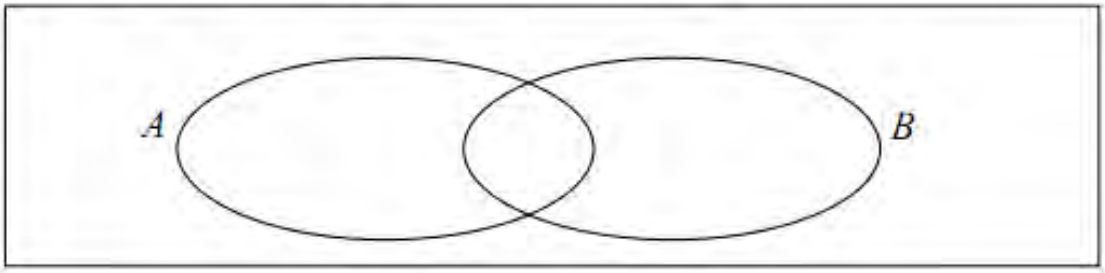
(i) {The positive whole numbers less than 12}

(ii) {The even numbers between 7 and 19}

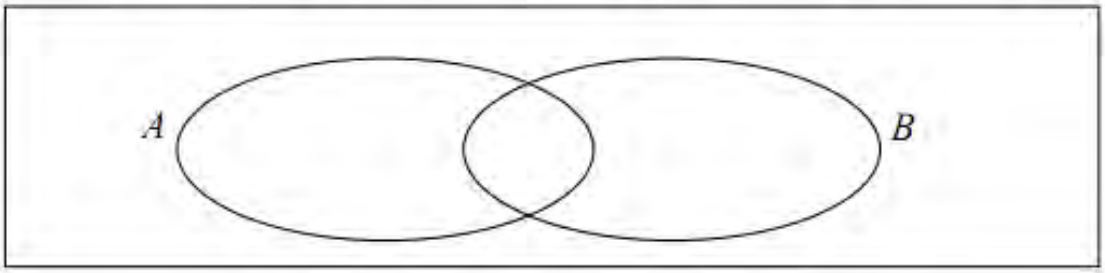
(iii) {The Whole numbers from 2 to 10 inclusive}

(b)

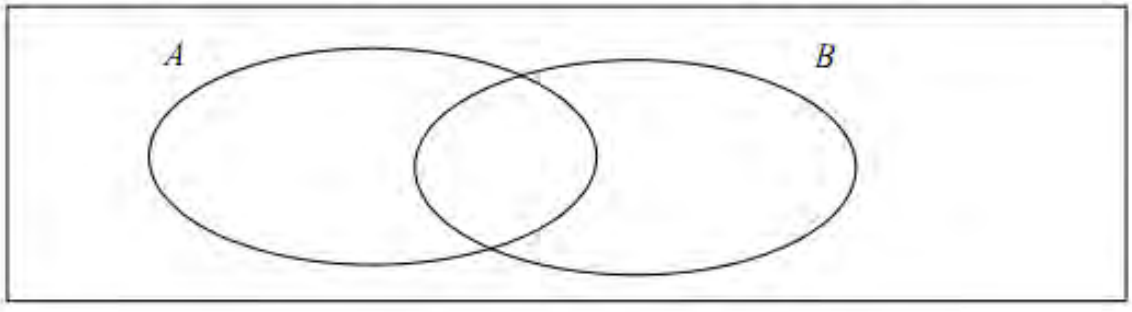
(i) Using the Venn diagram below, shade in the region that represents $A \cap B$.



(ii) Using the Venn diagram below, shade in the region that represents $A \setminus B$.



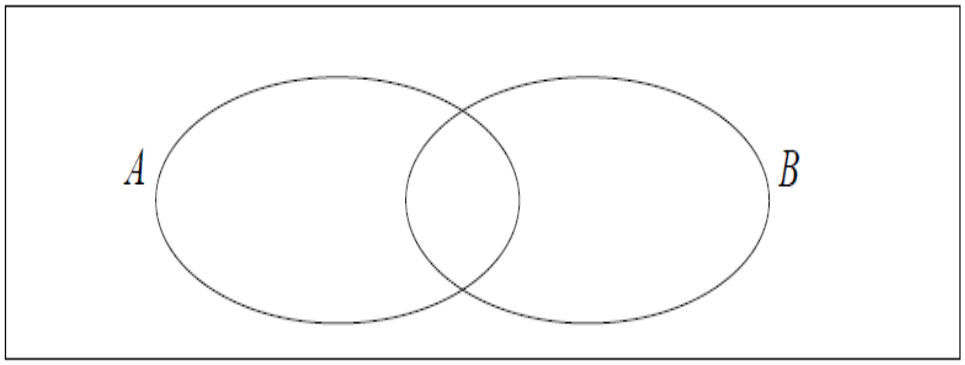
(iii) Using the Venn diagram below, shade in the region that represents $A \cup B$.



(b) U={1,2,3,4,5,6,7,8,9,10}

A = {1, 2, 3, 5, 8,} and B = {2, 4, 5, 7}.

(i) Complete the Venn Diagram



(ii) List the elements of A ∪ B

(iii) List the elements of A ∩ B

(iv) What is # (A ∪ B)?

(v) What is # (A ∩ B)?

Question 5: Algebra

(a) 2ab -4bc + 8dc - 3

(i) How many TERMS are in the above expression?

(ii) Write down the VARIABLES used.

(iii) Write down the CO–EFFICIENTS used.

(iv) Write down the CONSTANT used.

(b) if x = 2, y = 5 and z = -3, find the value of:

(i) x + y

(ii) 2x – y + 3z

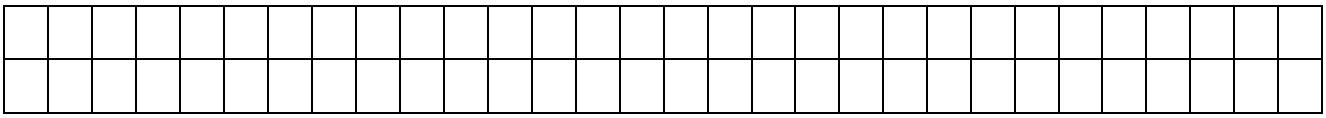
(iii) $6(x - y)^2 + 7z$

(c) Simplify each of the following expressions:

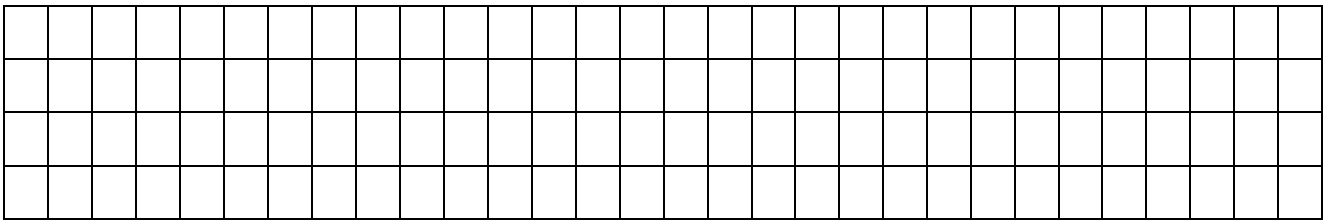
(i) 4a + 5b – 2c + 5a – 7b + 5c

(ii) $6x^2y - 3xy^2 - 2x^2y - xy^2$

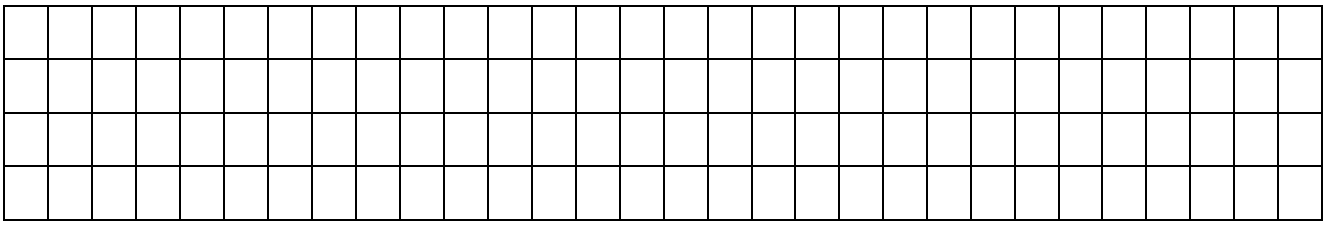
(iii) (3y)(3)



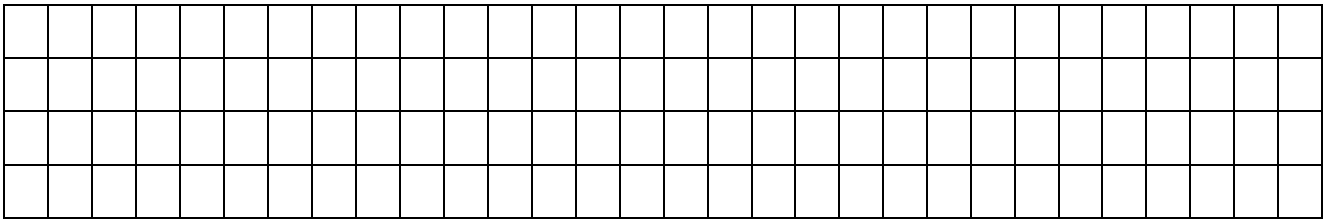
(iv) $(5x)(2x^2)(7)$



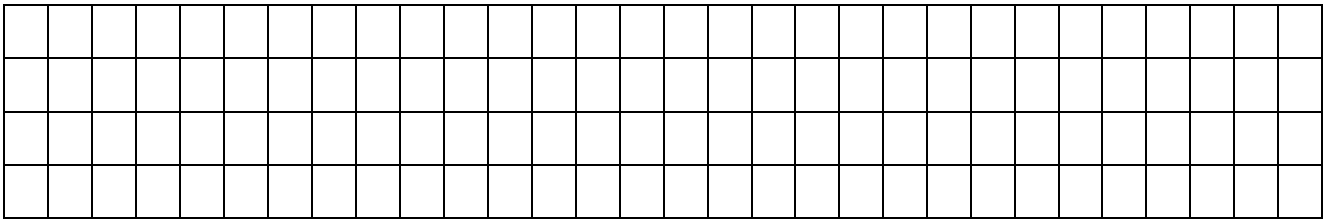
(v) $(x)(3xy)(y^2)$



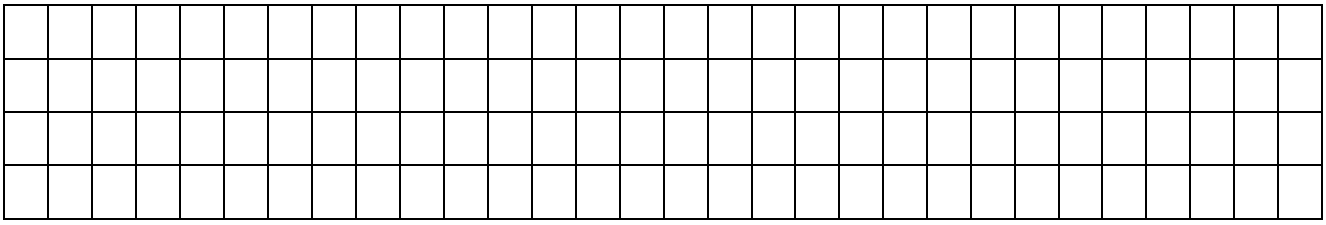
(vi) $3(x + 7)$



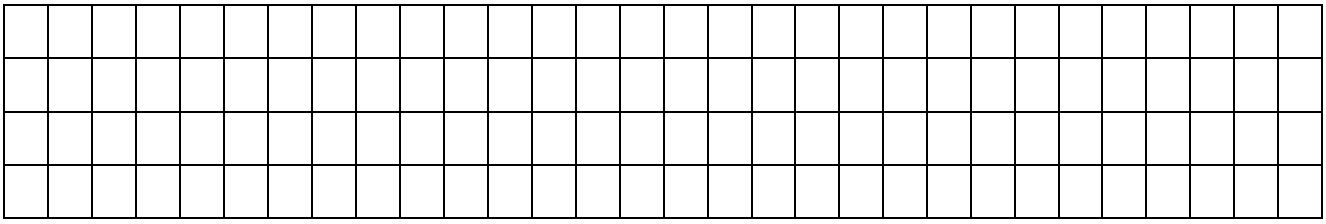
(vii) $6(3x^2 + 7x + 1) + 5(x^2 + x + 2)$



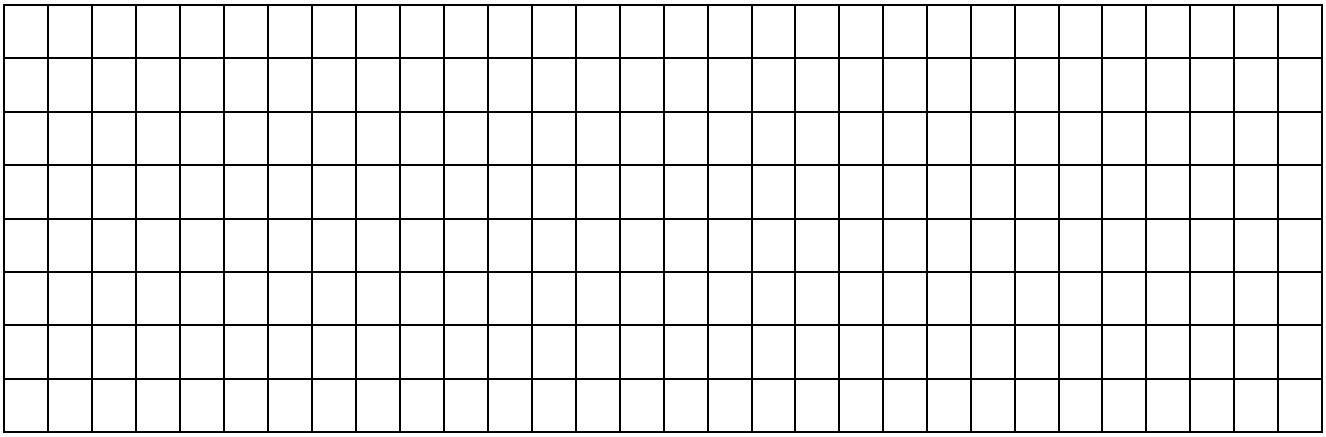
(viii) $6y(y + 10)$



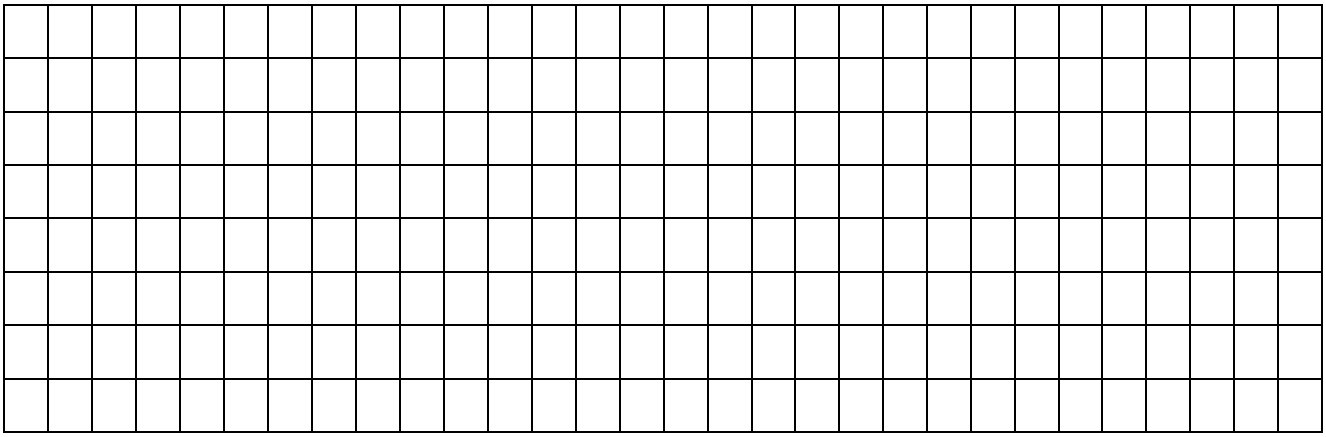
(ix) $2a(9a^2 + 1)$



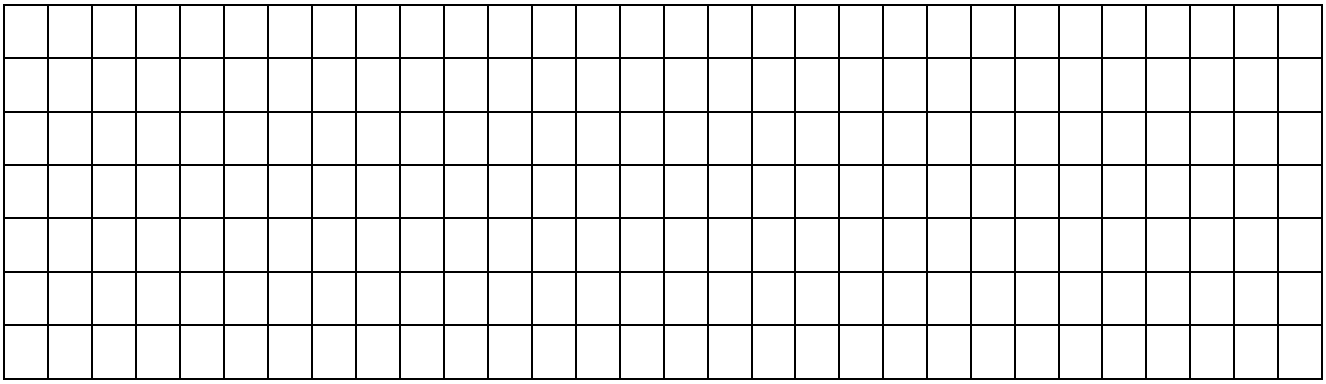
(x) (x + 2)(x + 4)



(xi) (3x + 1)(4x – 5)

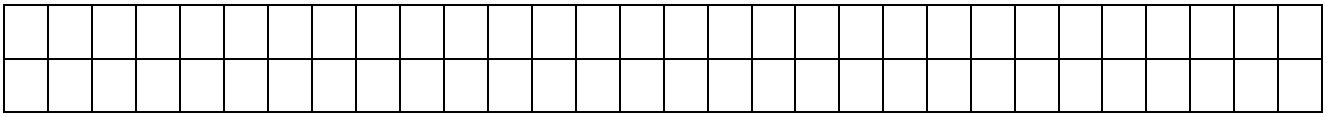


(xii) $(x + 4)^2$

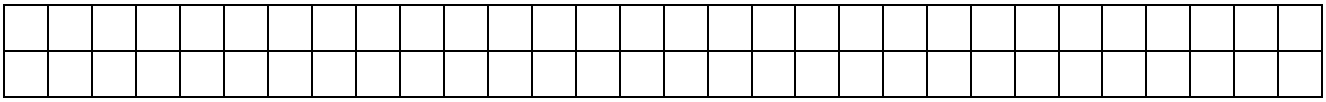


(d) Solve the following Linear Equations.

(i) 3x = 6



(ii) -40 = 8a



(iii) x + 6 = 13

(iv) 3x – 7 = 20

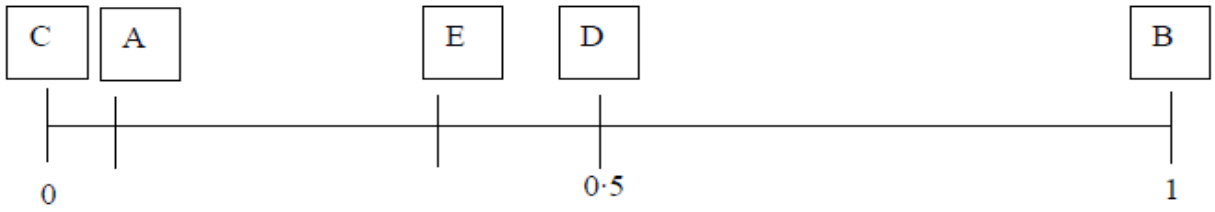
(v) 4y + 1 = 3y + 5

(vi) 3(x – 2) = 2(x + 1)

Question 6: Fundamental Principle of Counting and Probability

Question 6(a)

The probability that each of the events A, B, C, D and E will happen is shown on the probability scale below.



The statements below refer to three of these events. Place one of the events A, B, C, D or E beside the statement that best describes it.

	Event
This event is certain to happen.	
This event is very unlikely to happen.	
This event has a 50% chance of happening.	

Question 6(b)

Una rolls a die and flips a coin. One of the possible outcomes is (1, Head).

(a) Write out the remaining eleven possible outcomes in the table below.

(1, Head)	

(b) How many outcomes consist of an odd number and a Tail? _____

(c) What is the probability that the outcome will contain a prime number? $\frac{\quad}{\quad}$

Question 6(c)

A restaurant advertises its lunch menu using the sign below.

(a) The menu has a choice of five starters and nine main courses. How many items must appear on the dessert menu to justify the above claim of 180 different lunches?

(b) On a particular day one of the starters and one of the main courses is not available. How many different three course lunches is it possible to have on that day?

Question 7: Number Patterns

(a)

Given the linear pattern 2,5,8,11,14 ……

Find the following:

i) The start term

ii) The common difference

iii) The nth term

iv) The 10th term

(b)

Here is a repeating pattern of geometric shapes

Find the following:

i) What are the next two shapes?

ii) List the positions of the first squares. Is there a pattern?

iii) Which shape forms the pattern 3, 6, …..?

iv) What is the 21st shape?

v) What is the 37th shape?

vi) If the 61st shape is a triangle, what is the 62nd shape?

Question 8: Mathematical Definitions

(i) What are Natural Numbers?

(ii) What letter do we use for Integers?

(iii) What are Consecutive numbers?

(iv) State the Fundamental Principle of Counting?

(v) What are Non-Prime Numbers called?

(vi) What are Rational Numbers?