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| EGC_Black | **MATHEMATICS:SPECIALIST**  **SEMESTER 1 2018**  **TEST 1**  **Calculator Free** |

Reading Time: 2 minutes

Time Allowed: 15 minutes Total Marks: 13

**1.** [4 marks -1, 1, 2]

Vectors  and  are as shown on the grid below.

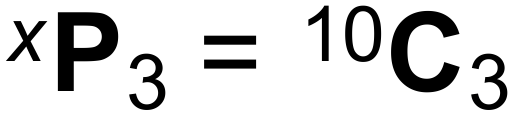


On the grid above, sketch and label the vectors  where



**2.** [6 marks -2, 4 ]

(a) Evaluate 

1. Solve for x **

**3.** [3 marks]

A bag is known to contain 1 white ball, 2 green balls, 3 blue balls, 4 yellow balls and 5 red balls.

Gillian selects balls at random from the bag.

Use the pigeonhole principle to determine how many balls have to be drawn to guarantee that Gillian has at least three of one colour. Justify your answer.

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| EGC_Black | **MATHEMATICS:SPECIALIST**  **SEMESTER 1 2018**  **TEST 1**  **Calculator Assumed** |

Reading Time: 3 minutes

Time Allowed: 47 minutes Total Marks: 45

**4.** [8 marks – 2, 2, 2, 2]

4-digit numbers are made from the digits 1, 2, 3, 4, 5, (no repetition of digits allowed).

1. How many such 4-digit numbers can be made?
2. How many of those in (i) have a 3 as the first digit?
3. How many of those in (i) end with 13?

(d) How many of those in (i) are even?

**5.** [3 marks]

How many digits greater than 900000 can be formed by arranging some or all of the

following digits in a row? Digits may not be used more than once.

3, 1, 5, 4, 2, 9, 8

**6.** [6 marks – 1, 2, 3]

Find how many ways we can select a tuck shop roster of 6 mothers from a group of 18 mothers if

(a) there are no restrictions

(b) 2 particular mothers insist on working together or not at all.

(c) 2 particular mothers refuse to work together.

**7.** [3 marks ]

A student has 3 Mathematics books, 4 History books and 5 English books. In how many ways can he

arrange them on a shelf if he keeps books on the same subject together.

**8.** [4 marks ]

Consider the set of integers between 1 and 1000 inclusive

Using the Inclusion-Exclusion Principle for Two Sets/Events

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Determine how many of these integers are divisible by 3 or 5.

**9.** [6 marks- 2, 2, 2 ]

1. How many different arrangements can be made from the letters of the word

BLACKBOARD?

(b) How many of these arrangements have the two A’s together?

(c) How many of these arrangements begin with the two B’s?

**10.** [3 marks]

From a class of 6 boys and 4 girls, 3 boys and 2 girls are to be selected for a debating team. How many speaking orders are there?

**11.** [5 marks]

Two vectors have magnitudes of 45 N and 60 N and the angle between their directions is 130°. Sketch a diagram to show their sum and use trigonometry to calculate the magnitude of the resultant and the angle it makes with the smaller vector.

**12.** [7 marks – 4, 3]

A jet can maintain a speed of 600km/h in still air. It needs to fly to a location 850km away on a bearing of but will encounter wind at 67km/h blowing from .

a) Determine what bearing the plane needs to take to reach the required location

b) Determine how long the journey would take to the nearest minute.