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| EGC_Black | **MATHEMATICS:SPECIALIST**  **SEMESTER 1 2015**  **TEST 1**  **Resource Free** |

Time Allowed: 20 minutes Total Marks: 20

**1.** [1, 2, 3, 3 marks]

The points A, B and C have coordinates (-2, 7), (3, 6) and (10, -1) respectively.

(a) Determine the vector .

(b) Determine exactly.

(c) Determine the position vector of the point D that divides the line segment CA internally in the ratio 1:3.

(d) Determine the position vector of point E where

**2.** [1, 1, 3 marks]

Two vectors are and .

Find

(a)

(b)

(c) a vector in the same direction as but half the magnitude of .

**3.** [2, 2, 2 marks]

A true statement is “if a quadrilateral is regular then it has four equal sides”.

(a) Write the converse of the statement and explain whether or not the converse is true.

(b) Write the inverse of the statement and explain whether or not the inverse is true.

(c) Write the contrapositive of the statement and explain whether or not the contrapositive is true.

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Time Allowed: 40 minutes Total Marks: 36

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

In the triangle below, , , *C* is a point such that and *D* is the midpoint of *OB*.

*O*

*A*

*B*

*C*

*D*

(a) Express the following in terms of and/or .

(i)

(ii)

(iii)

(b) If and , determine .

**5.** [4, 1, 1 marks]

(a) Use the method of contradiction to prove that a triangle with sides 5 cm, 6 cm and 7 cm is not right angled.

(b) Find a counter-example to show that the following conjecture is not true.

and then

(c) Find an example to show that the following conjecture is true.

such that

**6.** [5 marks]

25°



2500 N

2000 N

1800 N

50°

Three tractors are being used to pull a car out of some mud. The forces being applied and the directions in which they are pulling are shown in the diagram to right.

Determine the resultant of the forces, giving your magnitude to the nearest Newton and the direction to the nearest degree above/below the horizontal force.

**7.** [1, 1, 4 marks]

The diagram shows a trapezium in which = and *M* is the midpoint of *AC*. extended meets at *P*.

*P*

*O*

*A*

*B*

*C*

*M*

Let and **.**

Find in terms of and/or .

(a)

(b)

(c) Given that and that and show that and .

**8.**  [2, 4 marks]

(a) If **V**A = 3**i** − 5**j** and A**V**B = 8**i** + 3**j** , find **V**B.

(b) To a person jogging due East at 8 km/h, the wind seems to come from the South with a speed of 5 km/h. Find the true magnitude and direction from which the wind is blowing.

**9.** [7 marks]

A helicopter pilot takes off from an airport and heads towards a mountain peak 200 km due east of the airport. A wind of 40 km/h is blowing from a bearing of 120°. The helicopter has a cruising speed of 120 km/h in still air.

Determine the bearing (to the nearest tenth of a degree) the pilot must steer in order to fly directly to the mountain peak, and how long the journey will take, to the nearest minute.