

**Mathematics Specialist Unit 1&2**  
**Test 3 2018**

Calculator Assumed  
**Proof**

**STUDENT'S NAME** \_\_\_\_\_

**DATE:** Thursday 17 May

**TIME:** 20 minutes

**MARKS:** 20

**INSTRUCTIONS:**

Standard Items: Pens, pencils, drawing templates, eraser

Questions or parts of questions worth more than 2 marks require working to be shown to receive full marks.

---

1. (1 mark)

Consider the following statement:

*All prime numbers when squared are odd.*

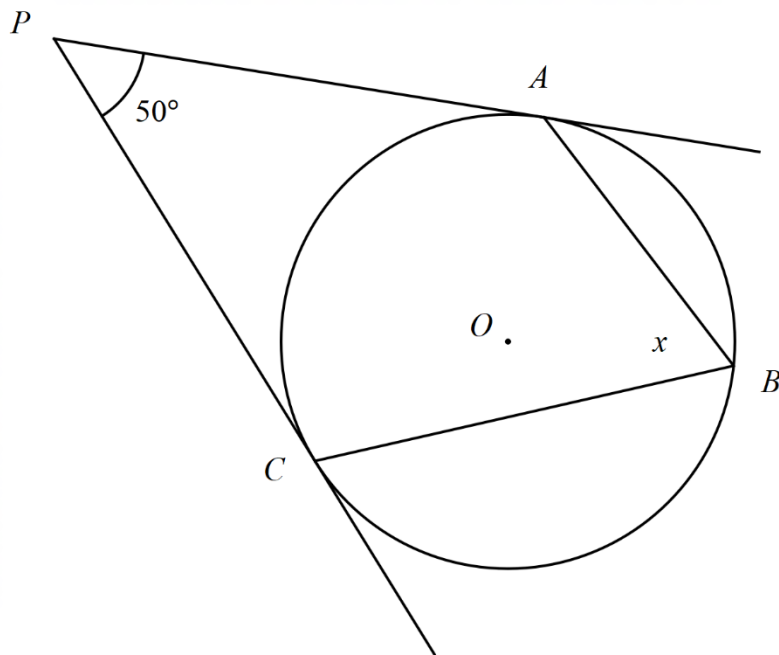
Provide a counter example that shows this statement is false.

2. (8 marks)

Determine, with reasons, that value of each unknown

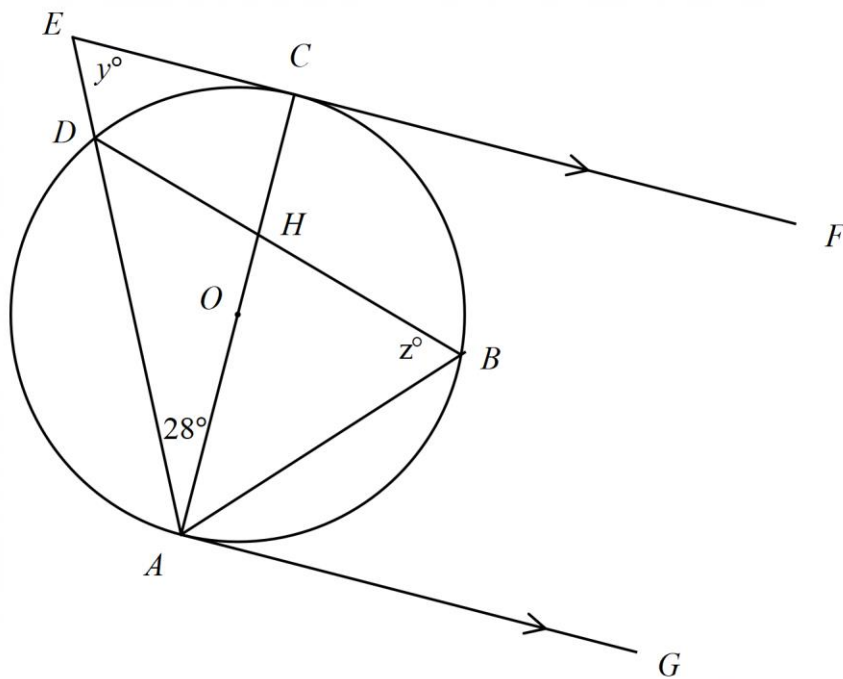
(a)

[4]



(b)

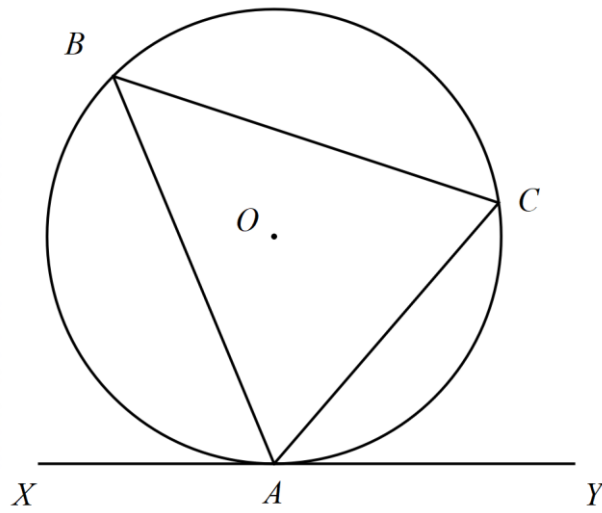
[4]



3. (5 marks)

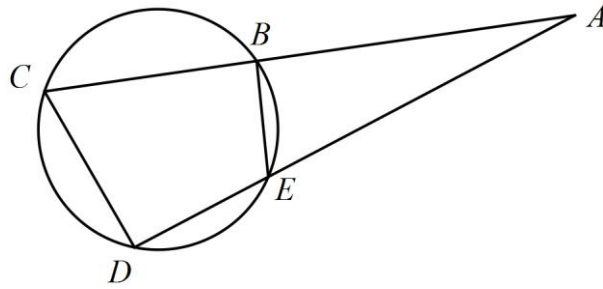
Prove the Alternate Segment Theorem

*i.e.* for the circle below, centre  $O$ , prove  $\angle CA Y = \angle ABC$



4. (6 marks)

Two sides of the cyclic quadrilateral  $BCDE$  are extended to meet at  $A$ , as shown in the diagram.



(a) Prove that triangles  $ADC$  and  $ABE$  are similar. [3]

(b) If  $AB = 15$ ,  $BC = 21$ ,  $AE = 12$  and  $BE = 6$  cm, determine the lengths of  $DE$  and  $CD$ . [3]

**Mathematics Specialist Unit 1&2  
Test 3 2018**

Calculator Assumed  
**Proof**

**STUDENT'S NAME** \_\_\_\_\_

**DATE:** Thursday 17 May

**TIME:** 30 minutes

**MARKS:** 30

**INSTRUCTIONS:**

Standard Items: Pens, pencils, drawing templates, eraser

Special Items: Three calculators, notes on one side of a single A4 page (these notes to be handed in with this assessment)

Questions or parts of questions worth more than 2 marks require working to be shown to receive full marks.

---

5. (6 marks)

Write each of the following mathematical statement in words:

(a) *for all*  $x \exists y$  such that  $y < x$  [2]

(b)  $x^3 = y^3 \Rightarrow x = y$  [1]

(c) for the above statement in part (b);

(i) Write down the converse of this statement and state whether it is true or false, and if it is false, provide a counter-example. [2]

(ii) Amend the statement in part (b) using an equivalence statement. [1]

6. (7 marks)

Consider the following statement:

*If you draw any nine playing cards from a standard deck, then you will have at least three cards all of the same suit.*

(a) Prove this statement. [3]

(b) Write down the contrapositive of this statement and state whether it is true or false, and if it is false, provide a counter-example. [2]

(c) Write down the inverse of this statement and state whether it is true or false, and if it is false, provide a counter-example. [2]

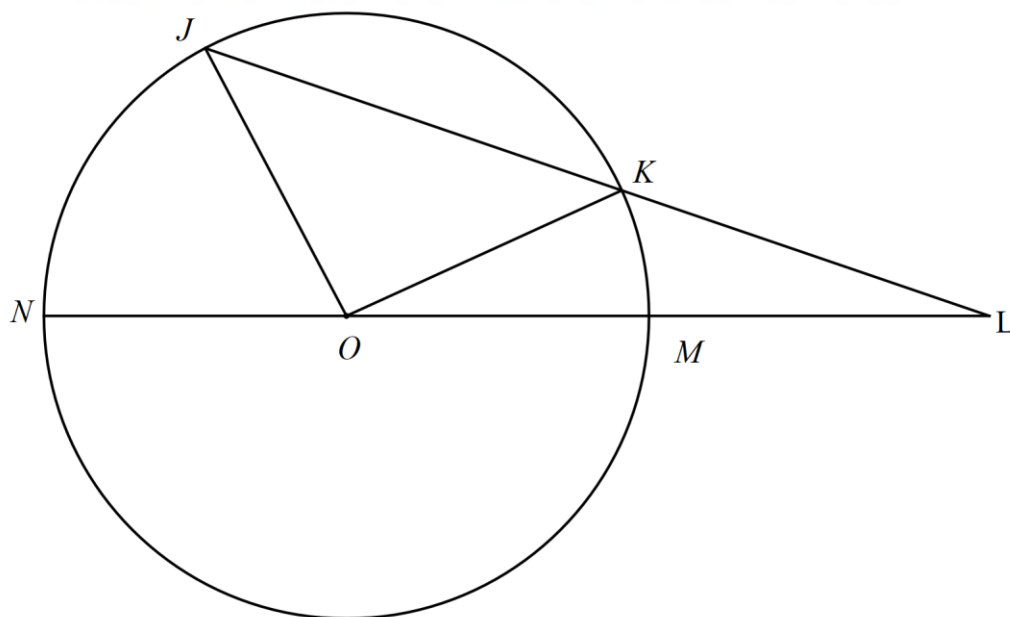
7. (6 marks)

The points  $J$ ,  $K$ ,  $M$  and  $N$  are points on the circumference of the circle centre  $O$ , shown below.

Let  $\angle JON = \beta$  and  $\angle KLM = \theta$

The length  $KL$  is equal to the radius of the circle.

Prove that  $\beta = 3\theta$



8. (4 marks)

Consider the diagram with the following information:

$BD$  bisects  $\angle ABC$   
 $\angle ADB$  is acute

Prove, by contradiction, that  $AB \neq BC$

