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Form 6

Core Mathematics: Paper II

September 2016

Time: 3 hours

Marks: 150

Please read the following instructions carefully:

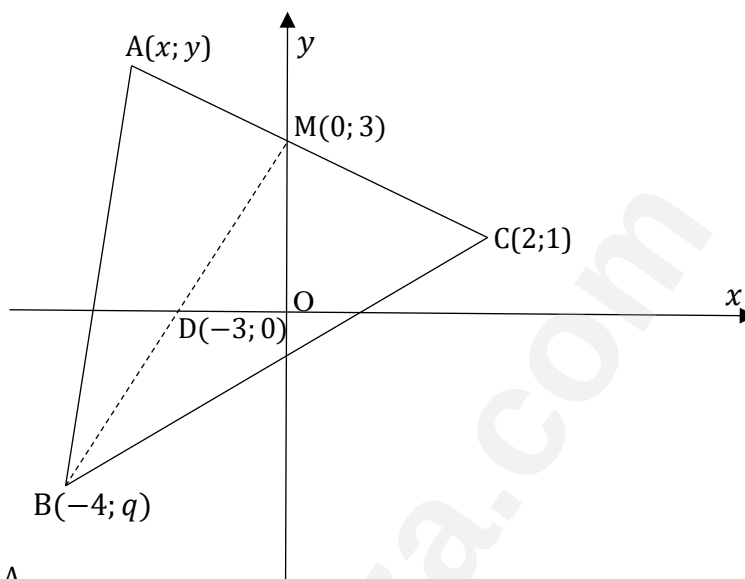
1. This question paper consists of 19 pages and an Information sheet. Please check that your question paper is complete.
2. Write your examination number in the space provided on this question paper.
3. **Answer all the questions on the question paper and hand this in at the end of the examination.**
4. Read the questions carefully.
5. You may use an approved non-programmable and non-graphical calculator, unless otherwise stated.
6. All necessary working details must be clearly shown. Give reasons unless otherwise stated.
7. Round off answers to **1 decimal digit** where necessary, unless otherwise stated.
8. Ensure that your calculator is in **DEGREE** mode.
9. Diagrams are not drawn to scale.
10. It is in your own interest to present your work neatly.
11. The last page can be used for additional working, if necessary. If this space is used, make sure that you indicate clearly which question is being answered.

EXAMINATION NUMBER:

	SECTION A							SECTION B							
Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Mark															
Total	12	15	12	6	13	7	9	13	6	22	11	7	7	8	2
Total		Downloaded from eduresourceza.com							Percentage						
		150											100		

QUESTION 1

Refer to the sketch below: Points $A(x; y)$, $B(-4; q)$, $C(2; 1)$, $D(-3; 0)$ and $M(0; 3)$ are given. M is the midpoint of the line segment AC and BDM is a straight line.



(a) Determine the coordinates of A.

(3)

(b) Determine the equation of the line passing through B, D and M.

(3)

(c) Show that $\widehat{BMC} = 90^\circ$

(2)

(d) Determine the length of BC, leaving your answer in simplified surd form if necessary.

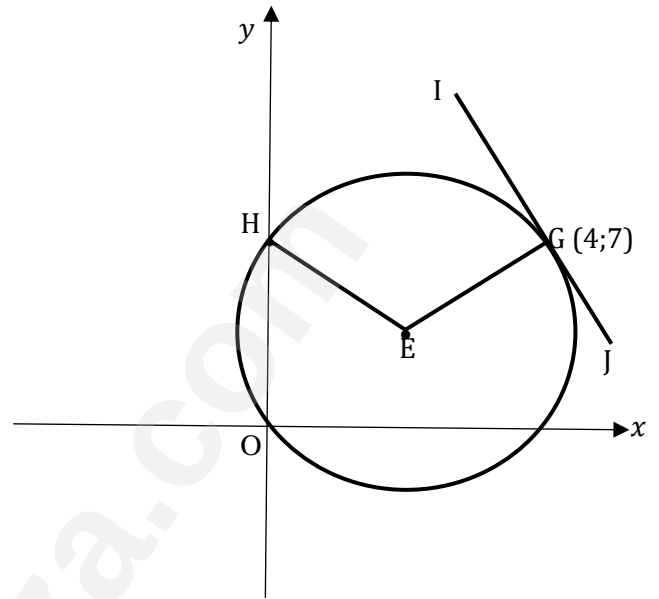
(4)

QUESTION 2

In the figure alongside, the centre of the circle is at E. H is the y-intercept of the circle and the x-intercept is at the origin, O.

- (a) Determine the centre (E) and the radius of the circle (correct to the nearest whole number) if its equation is:

$$x^2 - 4x + y^2 - 7y = 0 \quad (4)$$



- (b) Determine the coordinate H.

- (c) Calculate $\widehat{EHO}$ correct to one decimal digit.

- (d) If IJ is the tangent to the circle at G(4; 7), determine the equation of this tangent.

QUESTION 3

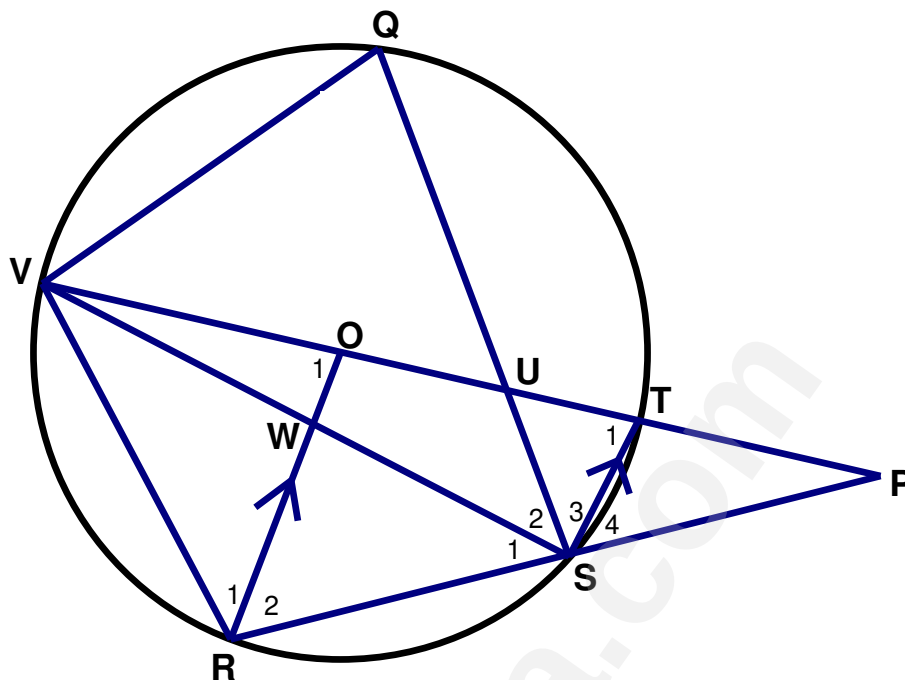
(a) (1) Show that $\sin(540^\circ - x) \cdot \sin(-x) - \sin(90^\circ + x) \cdot \cos(180^\circ - x) = \cos 2x$ (5)

(2) Hence, determine the general solution to:

$$\sin(540^\circ - x) \cdot \sin(-x) - \sin(90^\circ + x) \cdot \cos(180^\circ - x) = -1 \quad (3)$$

(b) Prove that, $\tan \theta + \frac{\cos \theta}{\sin \theta} = \frac{2}{\sin 2\theta}$ (4)

QUESTION 4



In circle QTSRV, centre O, $OR \parallel TS$ and diameter VT is produced to P.

$\widehat{Q} = 80^\circ$.

Find with reasons the size of:

(a) $\widehat{T}_1$ _____ (1)

(b) $\widehat{O}_1$ _____ (1)

(c) $\widehat{S}_1$ _____ (1)

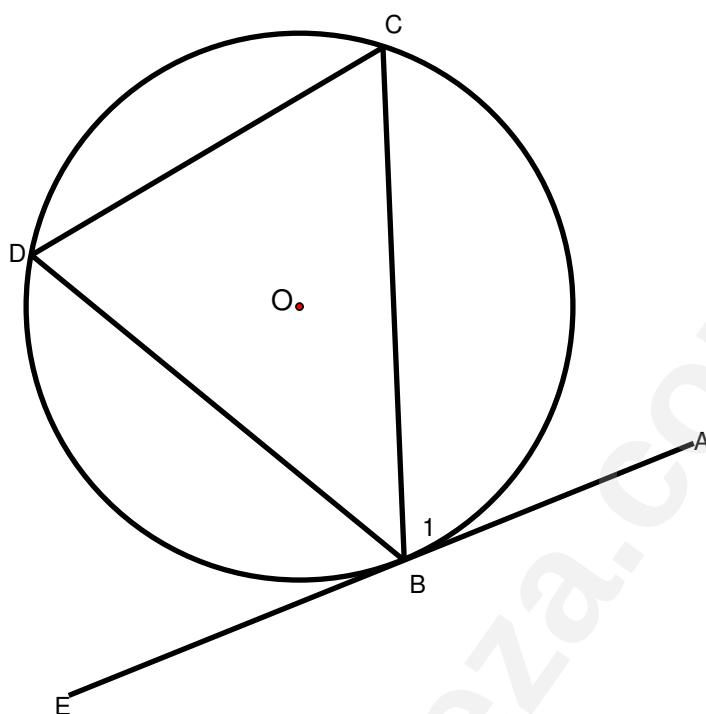
(d) $\widehat{VRS}$ _____ (1)

(e) $\widehat{S}_4$ _____ (2)

[6]

QUESTION 5

(a) Given circle centre O with FCD a tangent. Prove the theorem which states that $\widehat{B}_1 = \widehat{D}$.

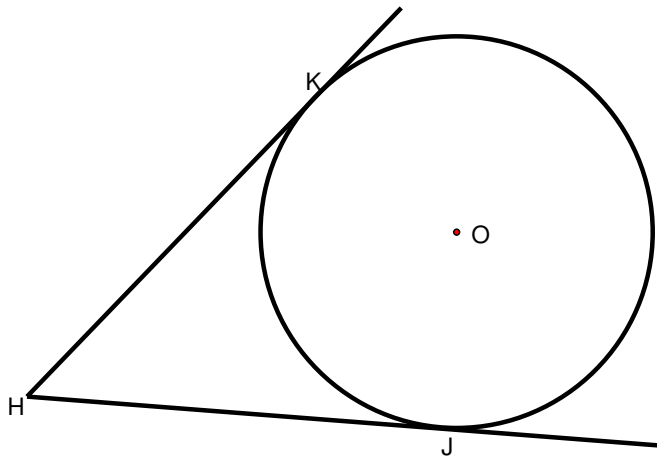


RTP: _____

Construction: _____

Proof: _____

- (b) In the figure HK and HJ are tangents to the circle with centre O. K and J are points on the circumference of the circle.



- (1) By making necessary constructions, prove that HKOJ is a cyclic quadrilateral.

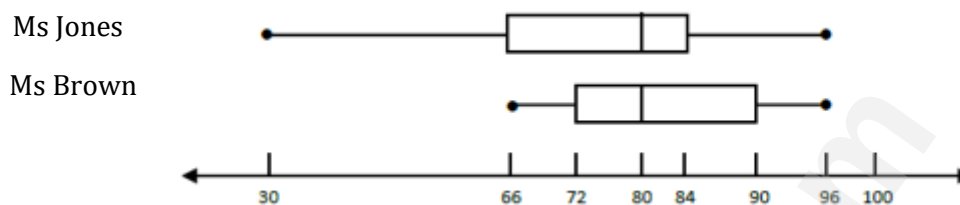
(3)

- (2) If $\widehat{KOJ} = 120^\circ$, what kind of triangle will HKJ be? Show all working and give full reasons to justify your answer.

(4)

QUESTION 6

The box and whisker plot below summarises the final test scores for Ms Jones and Ms Brown's Form 6 Mathematics classes.



- (a) Describe the features in the scores that are the same for both classes. (2)

- (b) Calculate the interquartile Range for Ms Brown's class. (2)

- (c) Ms Jones considers the median of each class and reports that there are no significant differences in the performance between the two classes.

Is Ms Jones's conclusion valid? Support your answer with reasons.

(3)

[7]

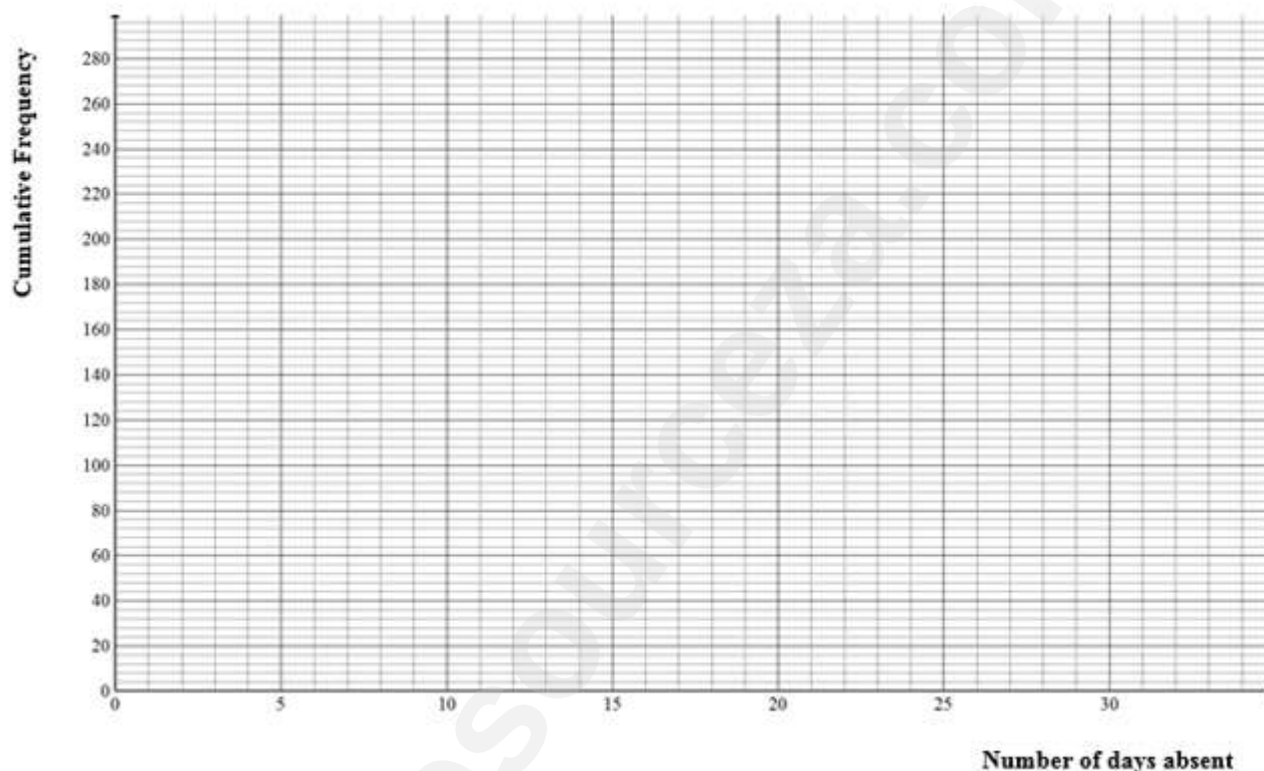
QUESTION 7

The following table shows the absenteeism of 280 employees of a company in one year.

Number of days absent	Frequency	Cumulative frequency
$0 < d \leq 5$	32	
$5 < d \leq 10$	67	
$10 < d \leq 15$	131	
$15 < d \leq 20$	43	
$20 < d \leq 25$	7	

(a) On the grid below, draw an Ogive, using the information in the table above.

(4)



(b) Using the given information, determine the approximate number of employees absent:

(1) 13 days or less

(1)

(2) more than 17 days

(1)

(c) Determine:

(1) the median number of days absent

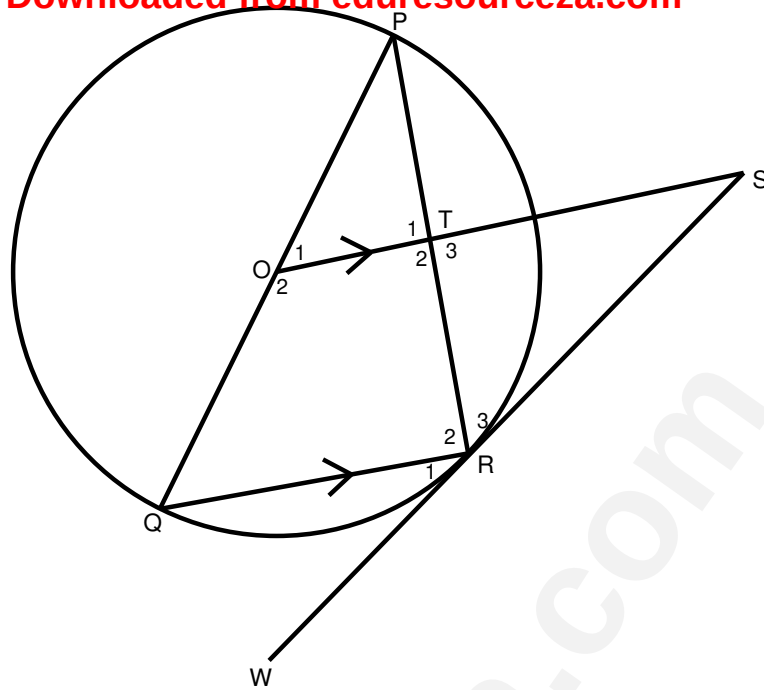
(1)

(2) the percentage of workers absent for more than 20 days.

(2)

SECTION B

QUESTION 8



In the figure, O is the centre of the circle. SRW is a tangent. $OS \parallel QR$.

(a) Prove that $PT = TR$. (3)

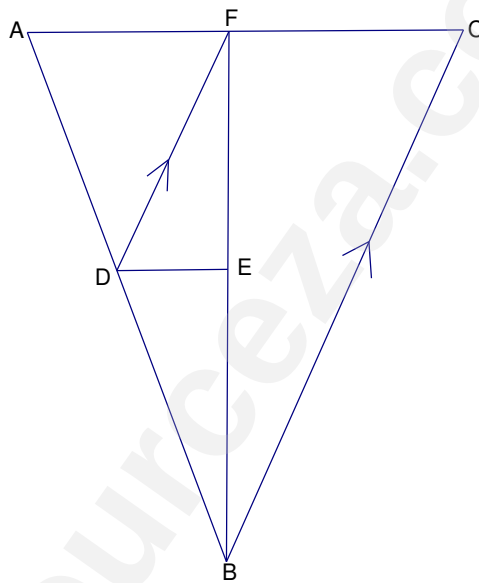
(b) Why is $\hat{T}_1 = 90^\circ$? (1)

(c) Prove that OPSR is a cyclic quadrilateral. (3)

(d) $\triangle STR \parallel \triangle PTO$ (3)

(3)

Prove that ADEF is a trapezium.



[13]

QUESTION 10

(a) Simplify, without the use of a calculator and showing all working:

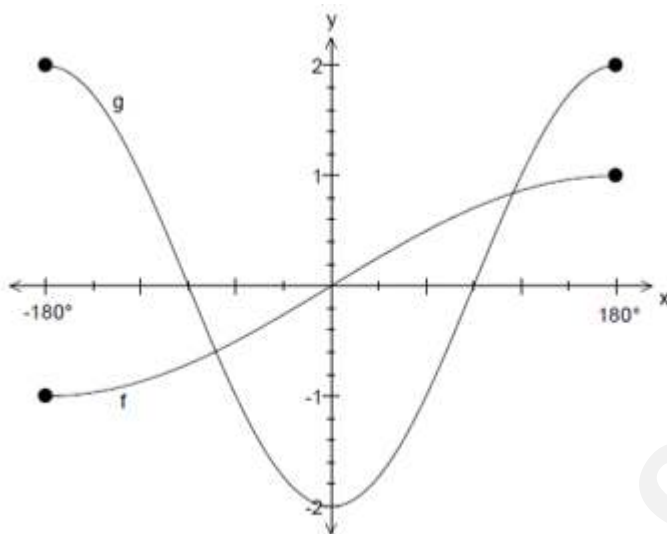
$$\sin 124^\circ \cdot \cos 64^\circ - \sin 214^\circ \cdot \cos 26^\circ \quad (5)$$

(b) If $q = \sin 35^\circ$, write $\frac{\cos 70^\circ}{\sin 325^\circ}$ in terms of q . (4)

(c) Solve for α if $2 \cos 2\alpha + 5 \cos \alpha = 4$ and $\alpha \in [-90^\circ; 360^\circ]$. (7)

(d) In the diagram, two functions, f and g are shown.

$$f(x) = \sin px \text{ and } g(x) = q \cos x \text{ for } x \in [-180^\circ; 180^\circ].$$



Write down the value of :

(1) p (1)

(2) q (1)

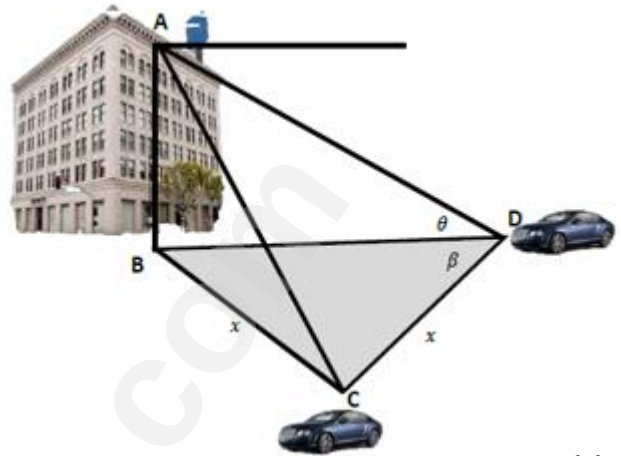
(3) the amplitude of g . (1)

(4) the period of $h(x)$ if $h(x) = \sin 4px$. (2)

(e) if $j(x) = \sin px + k$, for which value(s) of k , ($k > 0$), will the functions g and j never meet? (1)

[illegible]

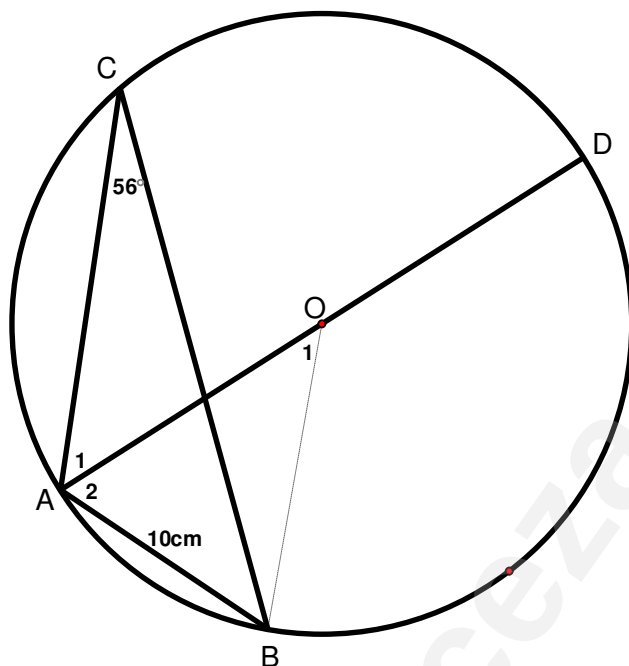
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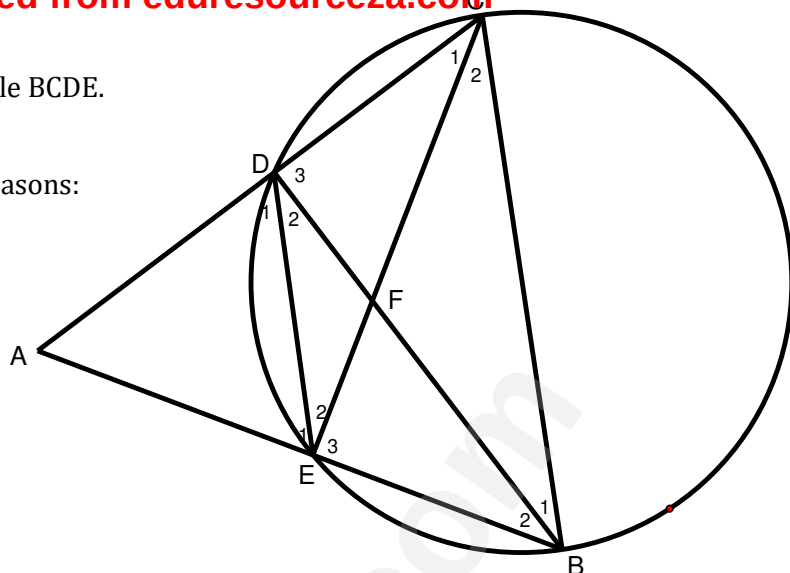
(4)

(3)

By making a suitable construction, determine the length of the diameter of the circle (to the nearest whole number).



Prove the following, stating all necessary reasons:



(a) BE. BA = BF.BD

(5)

(b) DE is a tangent to circle EFB.

(3)

QUESTION 15

The table below shows the marks gained in a test by a group of students.

Mark	1	2	3	4	5
Number of students	5	10	P	6	2

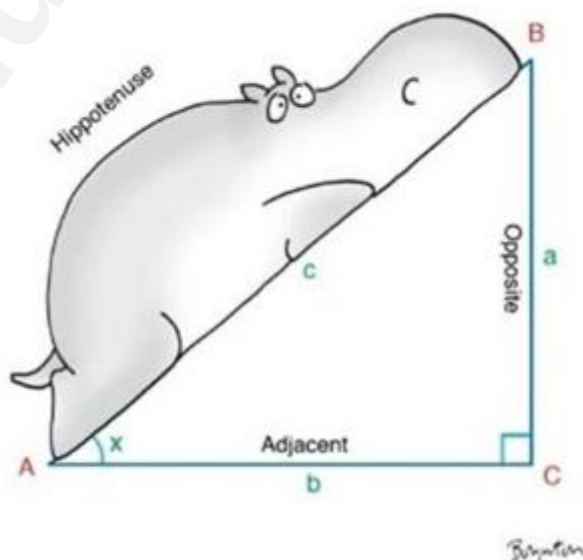
The median is 3 and the mode is 2.

Find two possible values of p .

[2]

TOTAL FOR SECTION B: 76 marks

THE END



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QUESTION 4 [7]

- a) Both classes have
- 1) the same median
 - 2) the same maximum value
 - 3) the same IQR.
- any 2 ✓✓ (2)

b) $IQR = 90 - 72 = 18$ (2)

- c) No, conclusion not valid

Mr S	Ms du Pels
> Min value = 30	> Min value = 66
> Upper quartile range from 84-96	> Upper quartile range from 90-96
> Lower quartile range between 30 and 60	> Lower quartile range between 66 and 72
> Bottom ½ of class between 30 and 80	> Bottom ½ of class between 66 and 80

✓ any 2 valid reasons (3)

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