



# Basic Education

KwaZulu-Natal Department of Basic Education  
REPUBLIC OF SOUTH AFRICA

**MATHEMATICS P2**

**COMMON TEST**

**JUNE 2015**

**NATIONAL  
SENIOR CERTIFICATE**

**GRADE 11**

**MARKS: 100**

**TIME: 2 hours**

**This question paper consists of 10 pages, an information sheet and Diagram Sheets.**

GB 11 MATHS P2

**INSTRUCTIONS AND INFORMATION**

Read the following instructions carefully before answering the questions.

1. Answer ALL the questions.
2. Clearly show all calculations and diagrams that you have used in determining your answers.
3. You may use an approved scientific calculator (non-programmable and non-graphical).
4. If necessary round off answers to TWO decimal places, unless stated otherwise.
5. Answers only will not necessarily be awarded full marks.
6. Diagrams not necessarily drawn to scale.
7. Number the answers correctly according to the numbering system used in this question paper.
8. Write neatly and legible.



kzn education

Department:  
Education  
KWAZULU-NATAL

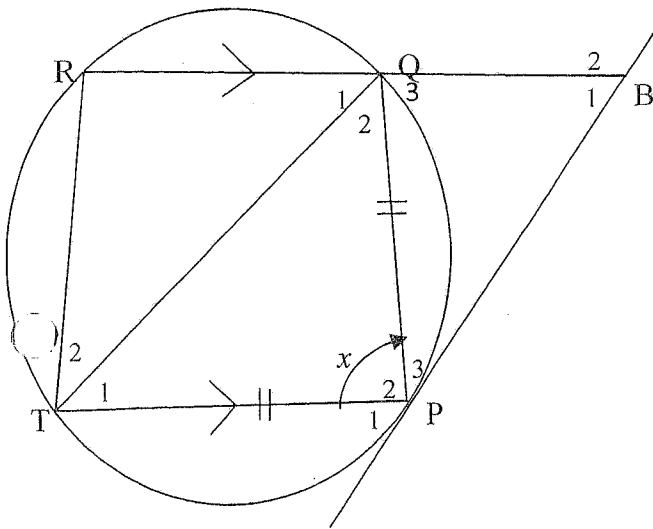
**TO: THE CHIEF INVIGILATOR(S) OF ALL CENTRES OFFERING  
NATIONAL SENIOR CERTIFICATE – COMMON TEST JUNE 2015  
GRADE 11: MATHEMATICS P2**

**ERRATA: MATHEMATICS P2**

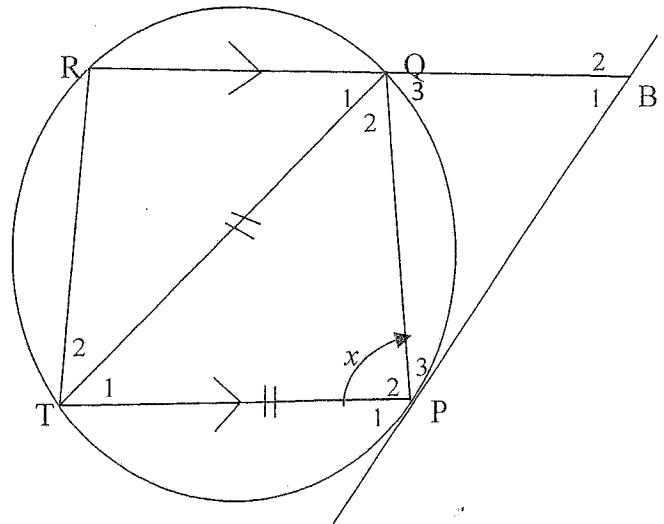
ERROR	CORRECTION
Page 3	Page 3
Question 1:	Question 1:
1.1.7 in the form of $y = mx + x...$	1.1.7 in the form of $y = mx + c...$

**QUESTION FIVE: PAGE 10**

**ERROR**



**CORRECTION**



Kindly ensure that all candidates are informed of the Errata.

**MR R.C. PENNISTON  
SENIOR MANAGER  
PROVINCIAL EXAMINATION ADMINISTRATION**

12/6/2015  
DATE

...Together moving South Africa forward through  
quality education and skills development

100

0

0

100

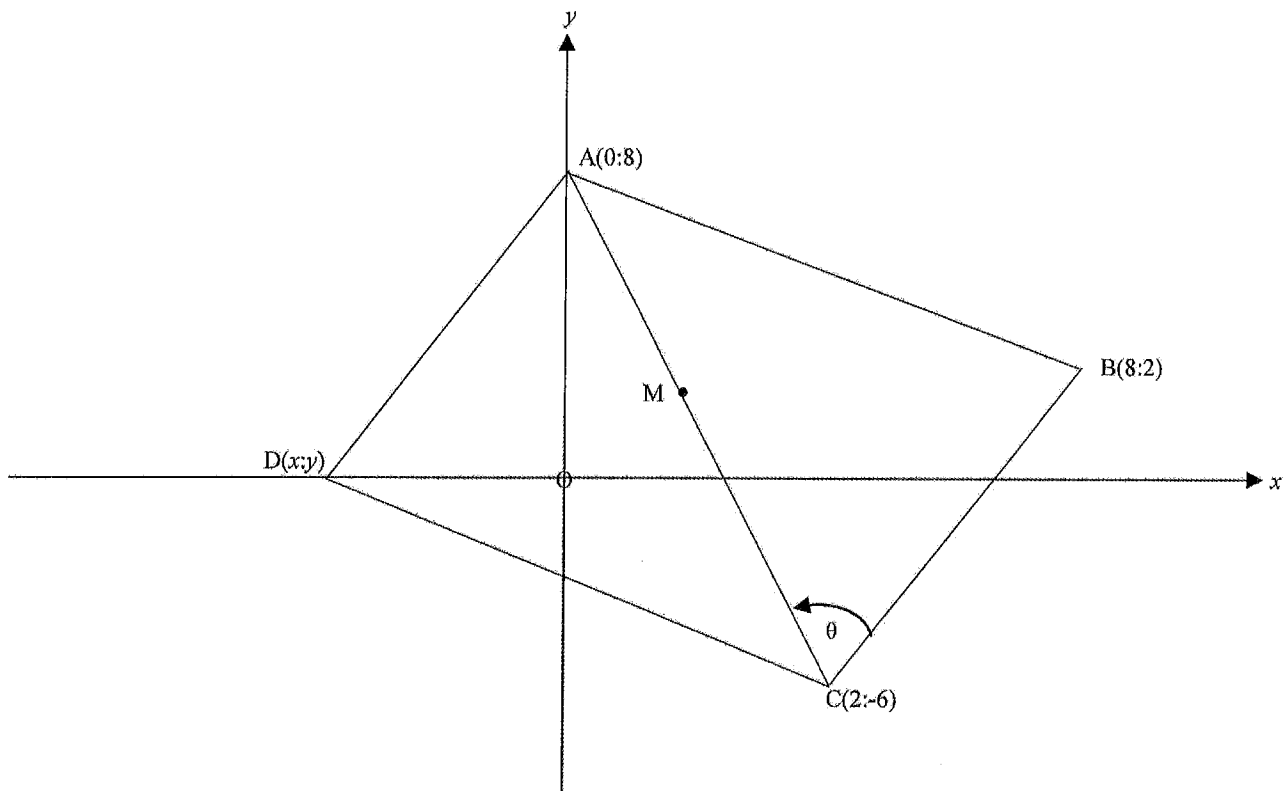
100

100

100

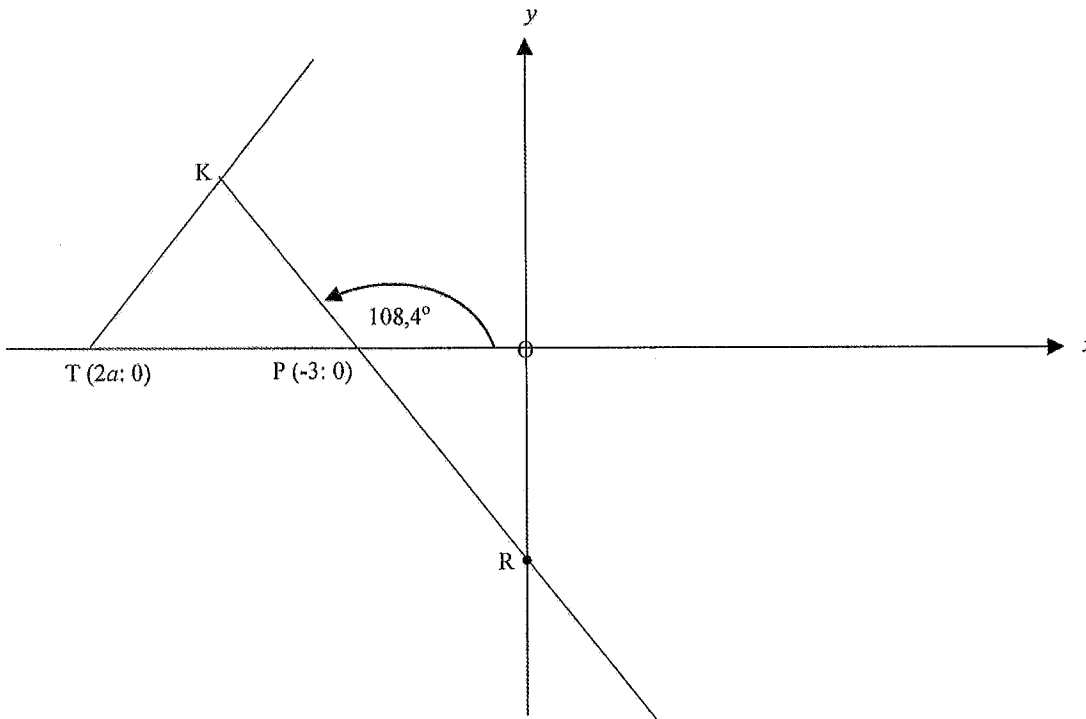
**QUESTION ONE**

- 1.1 In the diagram below  $A(0;8)$ ,  $B(8;2)$ ,  $C(2;-6)$  and  $D(x;y)$  are the vertices of a parallelogram.  $M$  is the midpoint of  $AC$ .  $\widehat{ACB} = \theta$ .



- 1.1.1 Calculate the lengths of  $AB$  and  $BC$ . (4)
- 1.1.2 Determine the coordinates of  $M$ . (3)
- 1.1.3 Prove that  $BM$  is perpendicular to  $AC$ . (4)
- 1.1.4 Prove that  $\widehat{ABC} = 90^\circ$  (4)
- 1.1.5 What type of triangle is  $\triangle ABC$ ? (2)
- 1.1.6 Determine the area of  $\triangle ABC$ . (2)
- 1.1.7 Determine the equation of  $BM$  in the form  $y = mx + c$ . (3)
- 1.1.8 Calculate the size of angle  $\theta$ . (4)
- 1.1.9 Determine the coordinates of  $D$ . (2)
- 1.2 Prove that the point  $(-4;11)$  lies on the line  $3x + 4y = 32$  (3)
- 1.3 Given the points  $P(6;5)$ ;  $Q(3;2)$ ;  $R(2m; m + 4)$  and  $T\left(\frac{5}{2}; \frac{1}{2}\right)$ . Calculate the value of  $m$  if  $PQ$  is parallel to  $RT$ . (4)

- 1.4 In the diagram below P is a point  $(-3;0)$  and T is  $(2a ; 0)$ . The inclination of the line PR is  $108,4^\circ$  and R is the y-intercept of PR.



Calculate:

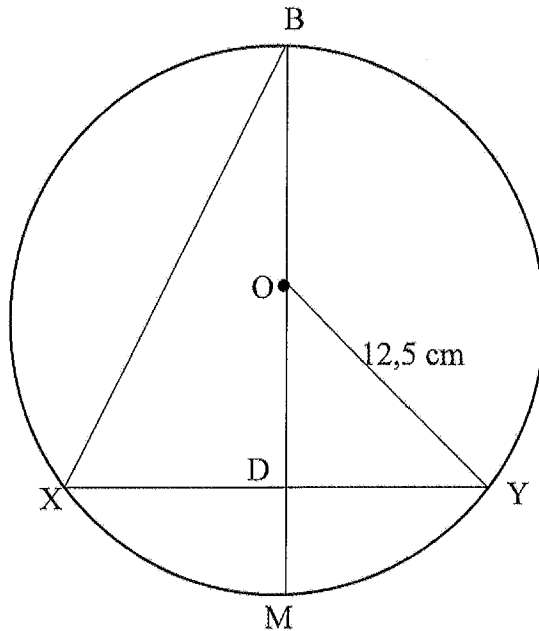
- 1.4.1 the gradient of PR, to the nearest integer value. (2)
- 1.4.2 the equation of PR in the form  $y = mx + c$ . (2)
- 1.4.3 the coordinates of R. (2)
- 1.4.4 If  $T(2a ; 0)$ ;  $Q(a;b)$  and R lie on the same straight line.

Prove that  $b = \frac{-9}{2}$  (4)

[45]

**QUESTION TWO**

- 2.1 Complete the following statement:  
The line drawn from the centre of a circle, perpendicular to a chord \_\_\_\_\_ . (2)
- 2.2 In the diagram BOM is a diameter of a circle with centre O. OD is perpendicular to the chord XY.  $OY = 12,5$  cm and  $XY = 24$  cm.



Calculate the lengths of:

2.2.1 MD. (4)

2.2.2 BX. (4)

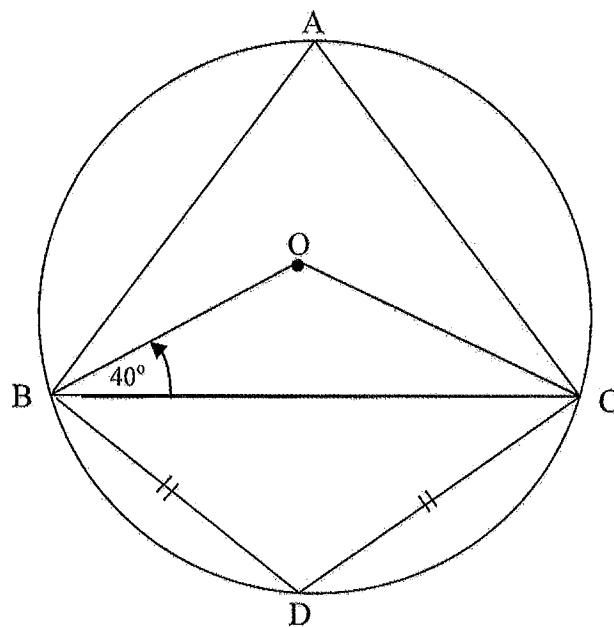
**[10]**

**QUESTION THREE**

3.1 Complete the statement:

The angle subtended by an arc at the centre of the circle is \_\_\_\_\_ . (2)

3.2 In the diagram A, B, C and D are points on the circle with centre O.  $\widehat{OBC} = 40^\circ$ .  
BD = DC.



Calculate, with reasons, the value of:

3.2.1  $\widehat{BAC}$ . (4)

3.2.2  $\widehat{BDC}$ . (2)

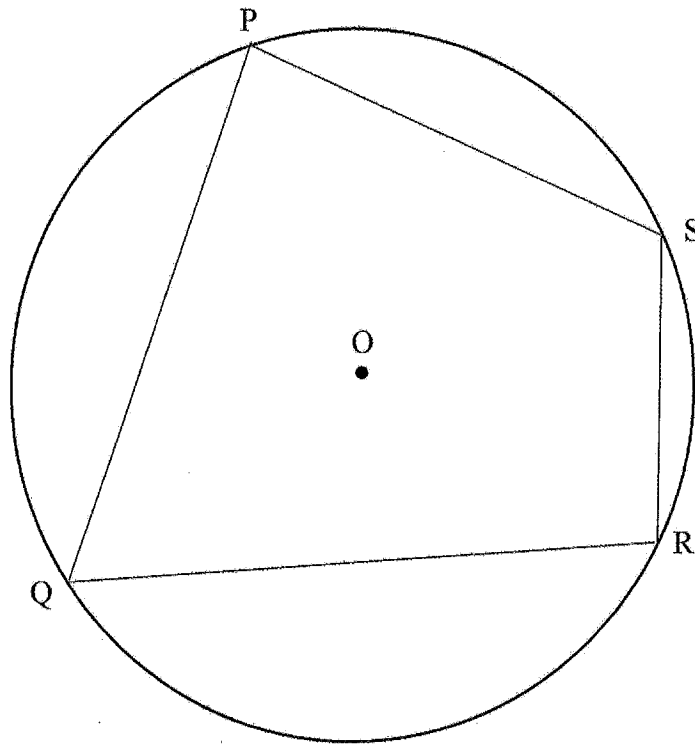
3.2.3  $\widehat{DCB}$ . (2)

[10]



**QUESTION FOUR**

- 4.1 In the diagram below, O is the centre of the circle. Use the diagram to prove the theorem which states that : If PQRS is a cyclic quadrilateral then  $\hat{PQR} + \hat{PSR} = 180^\circ$ . (6)

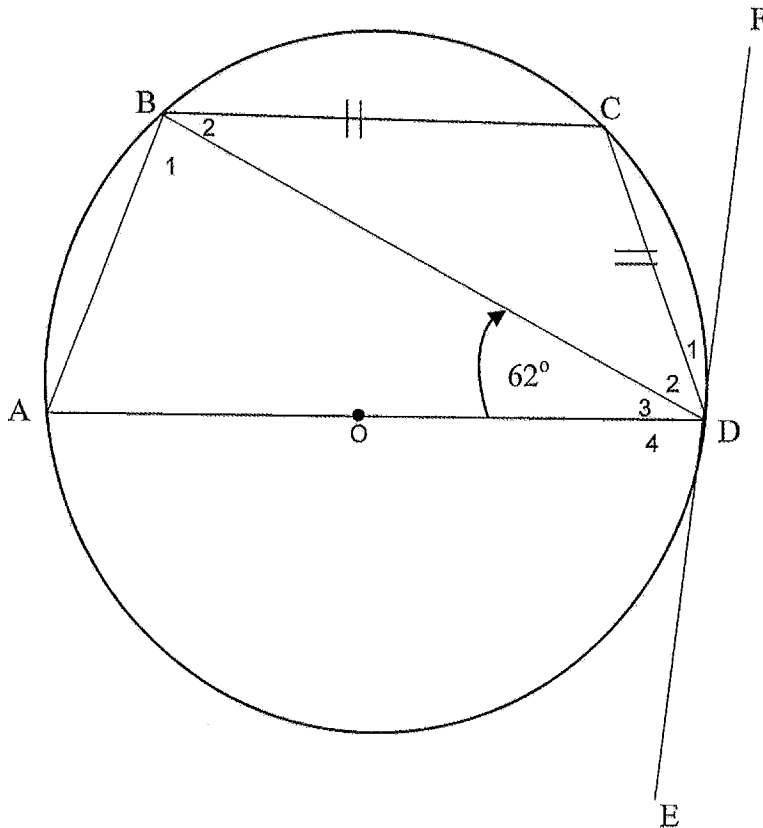


4.2 Complete this statement:

The angle between a tangent to a circle and a chord is \_\_\_\_\_ . (2)

4.3 In the diagram below, AOD is a diameter of the circle and EDF is a tangent to the circle at D.

$\hat{A}DB = 62^\circ$  and  $BC = CD$ .

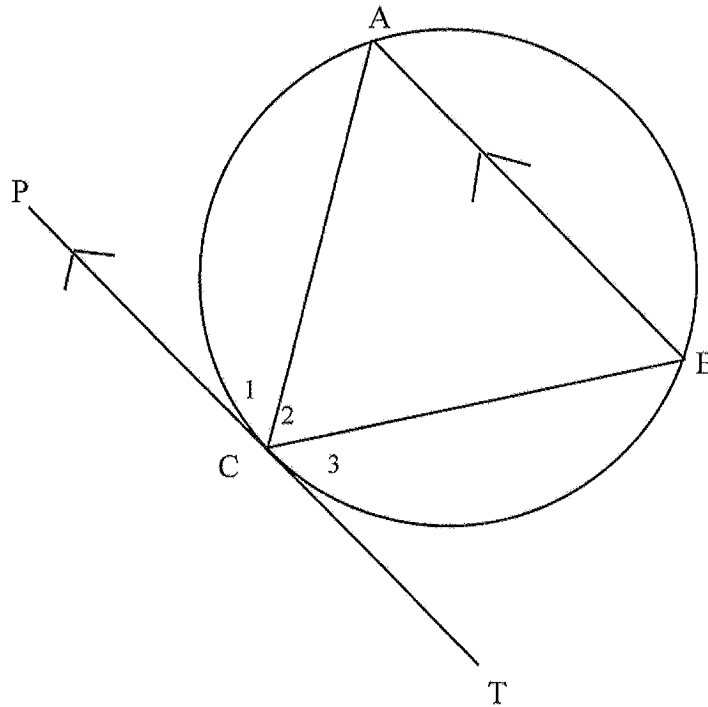


Calculate, with reasons, the numerical value of:

4.3.1  $\hat{BCD}$ . (4)

4.3.2  $\hat{CDF}$ . (4)

4.4 In the diagram, A, B and C are points on the circumference of a circle. PCT is a tangent to a circle at C and also parallel to AB.



Prove that  $AC = BC$

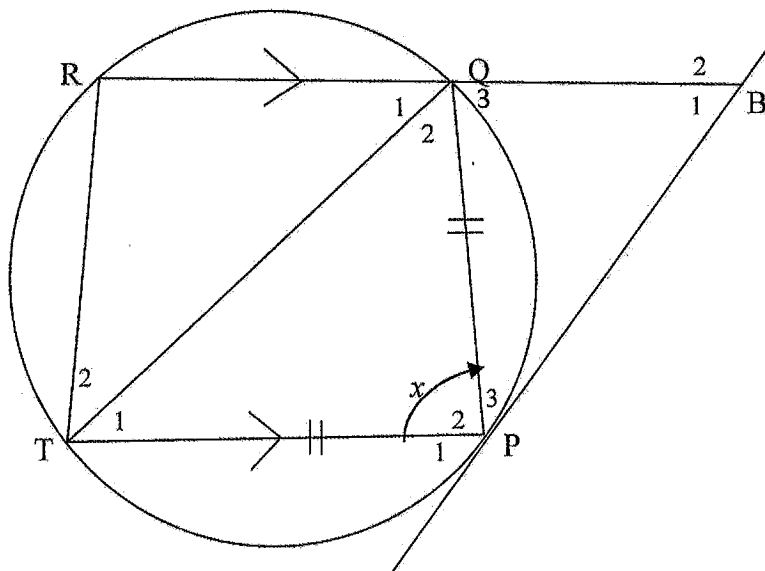
(5)

[21]

**QUESTION FIVE**

In the diagram below, PQRT is a cyclic quadrilateral. PB is a tangent. RQB is a straight line.  $PT \parallel BQR$ .

$PT = QT$  and  $\hat{P}_2 = x$ .



5.1 Write down, with reason,  $\hat{R}$  in terms of  $x$ . (2)

5.2 Write down, with reasons, FIVE other angles each equal to  $x$ . (10)

5.3 Prove that  $QP = BP$  (2)

[14]

**TOTAL: 100**

INFORMATION SHEET: MATHEMATICS  
INLIGTINGSBLAD: WISKUNDE

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$A = P(1 + ni)$$

$$A = P(1 - ni)$$

$$A = P(1 - i)^n$$

$$A = P(1 + i)^n$$

$$\sum_{i=1}^n 1 = n$$

$$\sum_{i=1}^n i = \frac{n(n+1)}{2}$$

$$T_n = a + (n-1)d$$

$$S_n = \frac{n}{2}(2a + (n-1)d)$$

$$T_n = ar^{n-1}$$

$$S_n = \frac{a(r^n - 1)}{r - 1}; \quad r \neq 1$$

$$S_\infty = \frac{a}{1 - r}; \quad -1 < r < 1$$

$$F = \frac{x[(1+i)^n - 1]}{i}$$

$$P = \frac{x[1 - (1+i)^{-n}]}{i}$$

$$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$$

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$M\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$

$$y = mx + c$$

$$y - y_1 = m(x - x_1)$$

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \tan \theta$$

$$(x - a)^2 + (y - b)^2 = r^2$$

$$\text{In } \triangle ABC: \quad \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc \cdot \cos A \quad \text{area } \triangle ABC = \frac{1}{2} ab \cdot \sin C$$

$$\sin(\alpha + \beta) = \sin \alpha \cdot \cos \beta + \cos \alpha \cdot \sin \beta$$

$$\sin(\alpha - \beta) = \sin \alpha \cdot \cos \beta - \cos \alpha \cdot \sin \beta$$

$$\cos(\alpha + \beta) = \cos \alpha \cdot \cos \beta - \sin \alpha \cdot \sin \beta$$

$$\cos(\alpha - \beta) = \cos \alpha \cdot \cos \beta + \sin \alpha \cdot \sin \beta$$

$$\cos 2\alpha = \begin{cases} \cos^2 \alpha - \sin^2 \alpha \\ 1 - 2\sin^2 \alpha \\ 2\cos^2 \alpha - 1 \end{cases}$$

$$\sin 2\alpha = 2 \sin \alpha \cdot \cos \alpha$$

$$(x; y) \rightarrow (x \cos \theta + y \sin \theta; y \cos \theta - x \sin \theta)$$

$$(x; y) \rightarrow (x \cos \theta - y \sin \theta; y \cos \theta + x \sin \theta)$$

$$\bar{x} = \frac{\sum fx}{n}$$

$$\sigma^2 = \frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n}$$

$$P(A) = \frac{n(A)}{n(S)}$$

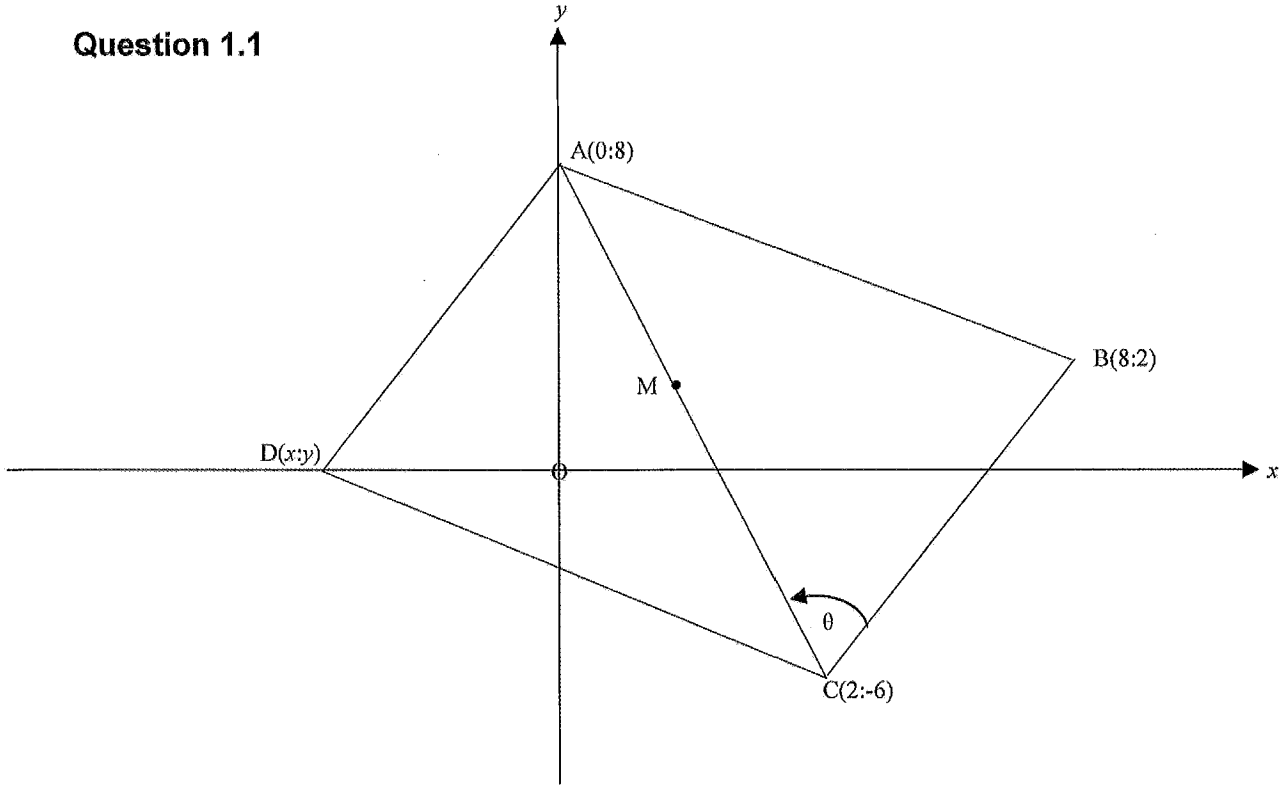
$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

$$\hat{y} = a + bx$$

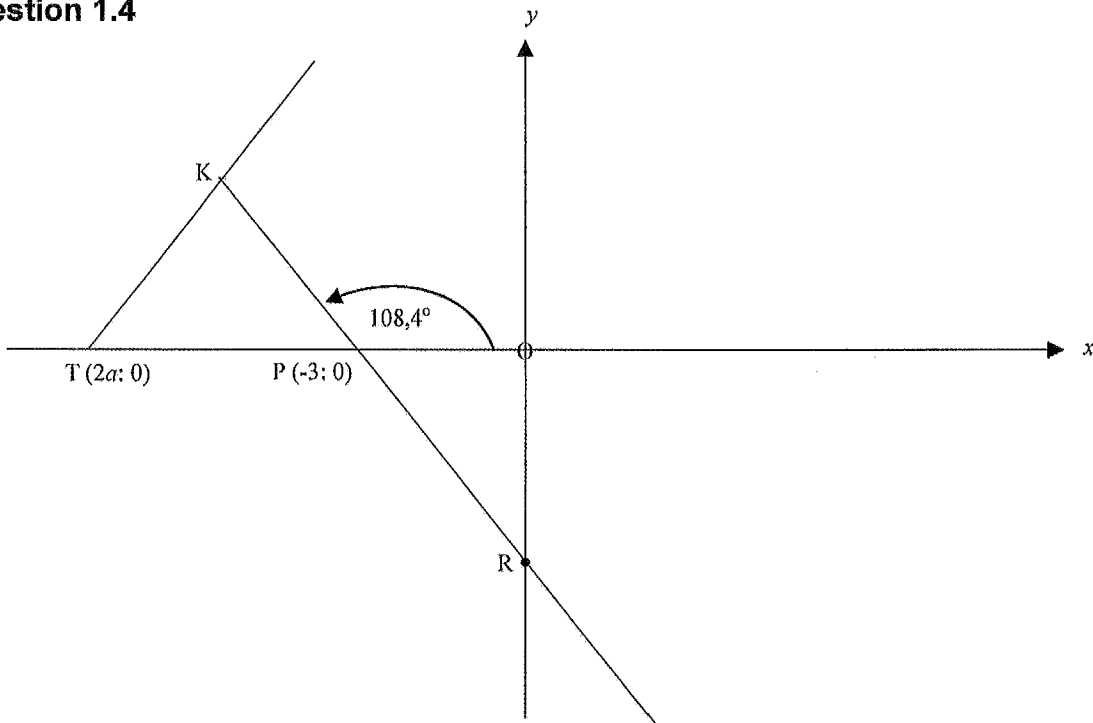
$$b = \frac{\sum (x - \bar{x})(y - \bar{y})}{\sum (x - \bar{x})^2}$$

**DIAGRAM SHEETS**

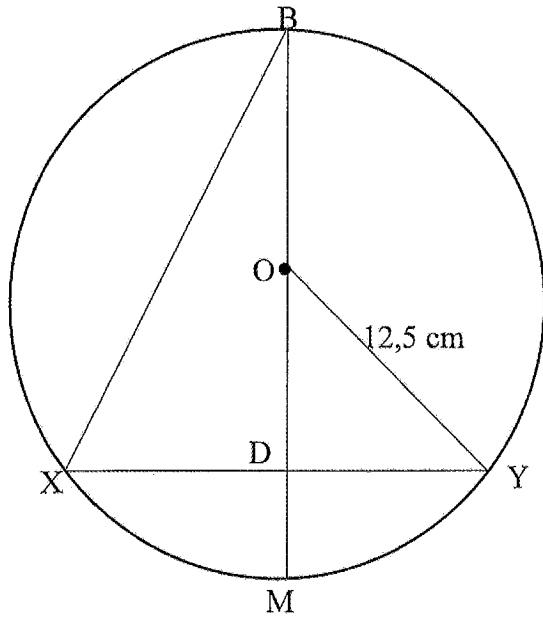
**Question 1.1**



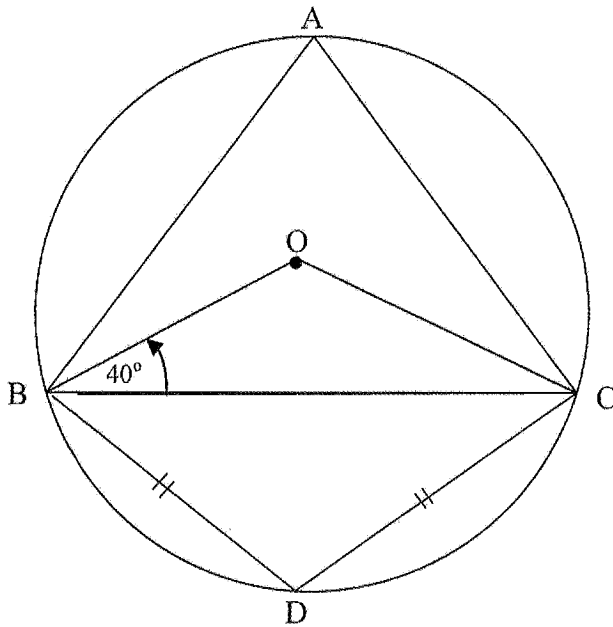
**Question 1.4**



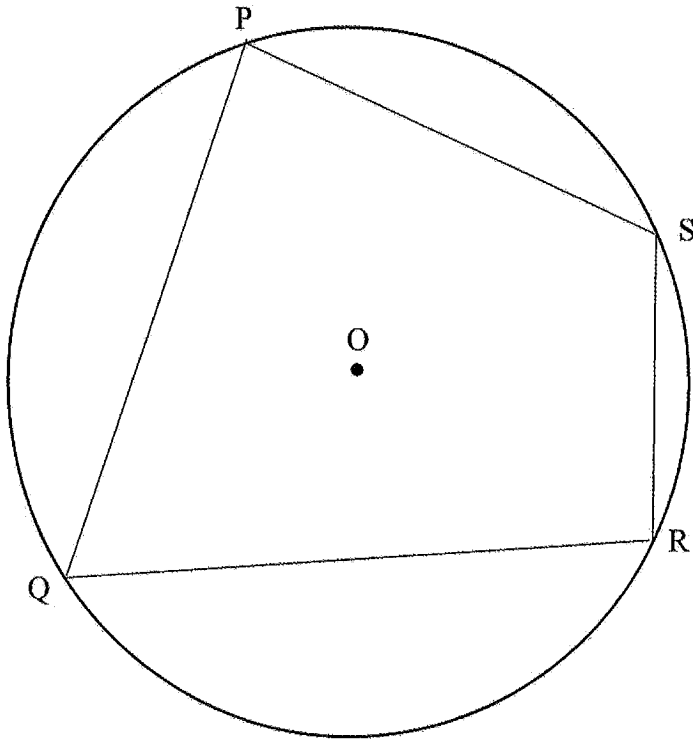
**Question 2.2**



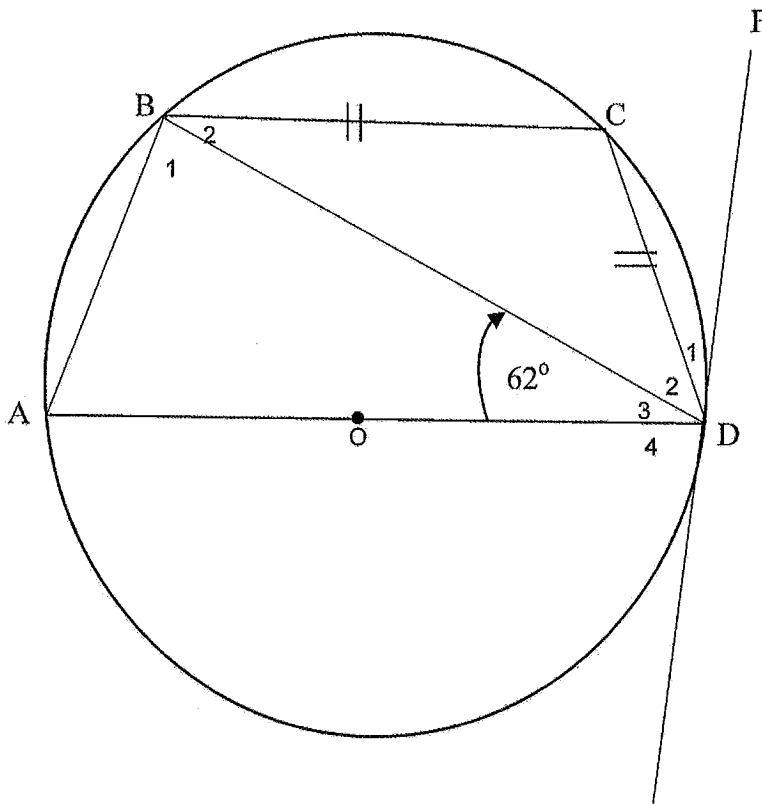
**Question 3.2**



Question 4.1

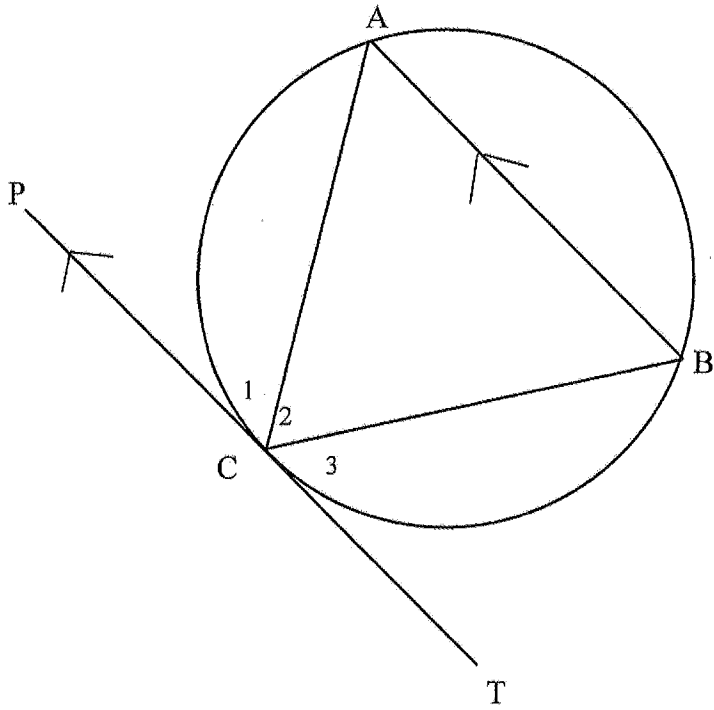


Question 4.3

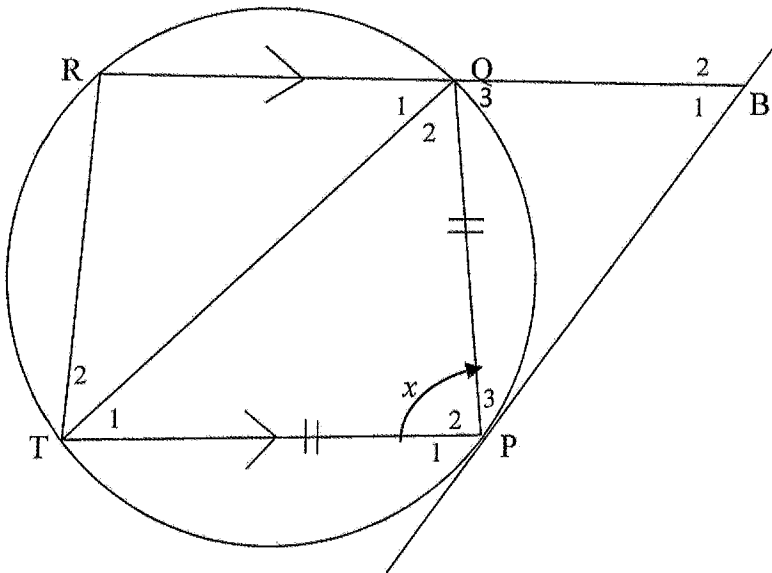


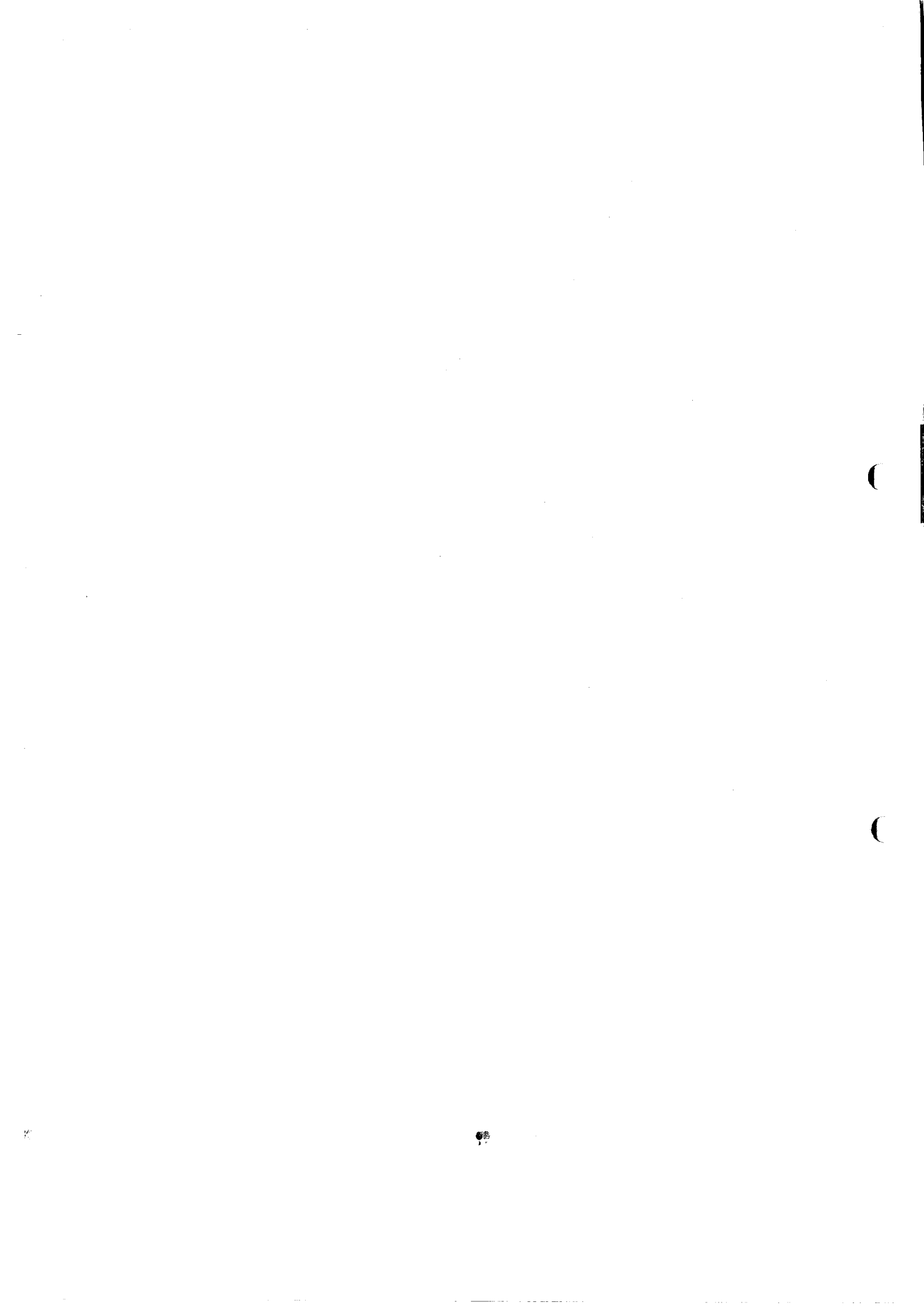


**Question 4.4**



**Question 5**







# Basic Education

KwaZulu-Natal Department of Education  
REPUBLIC OF SOUTH AFRICA

MATHEMATICS P2

JUNE COMMON TEST 2015

MEMORANDUM

NATIONAL  
SENIOR CERTIFICATE

GRADE 11

MARKS: 100

This memorandum consists of 9 pages.

### QUESTION 1

1.1.1	$AB = \sqrt{(0-8)^2 + (8-2)^2} \checkmark$ $= 10 \checkmark$ $BC = \sqrt{(8-2)^2 + (2+6)^2} \checkmark$ $= 10 \checkmark$	A: Correct substitution CA: Correct answer (4)
1.1.2	$M = \left( \frac{0+2}{2} \frac{8-6}{2} \right) \checkmark$ $= (1:1) \checkmark$	A: Correct substitution CA: Correct answer (3)
1.1.3	$m_{BM} = \frac{2-1}{8-1}$ $= \frac{1}{7} \checkmark$ $m_{AC} = \frac{8+6}{0-2}$ $= -7 \checkmark$ $\frac{1}{7}x - 7 = -1 \checkmark$ $\therefore$ BM is perpendicular to AC $\checkmark$	CA: Correct substitution into gradient formula. CA: Gradient BM CA: Gradient AC CA: Multiplying gradients (4)

<p>1.1.4 <math>mAB = \frac{8-2}{0-8}</math>  <math>= -\frac{6}{8} \checkmark</math>  <math>mBC = \frac{8}{6} \checkmark</math>  <math>-\frac{3}{4} \times \frac{4}{3} = -1 \checkmark</math>  <math>\therefore \hat{ABC} = 90^\circ \checkmark</math></p>	<p>CA: Gradient CA                  CA: Gradient CA                  CA: Multiplying gradients                  CA: Conclusion (4)</p>
<p>1.1.5 Right-angled - Isosceles triangle                  A: Right-angled                  A: Isosceles. (2)</p>	<p>A: Right-angled                  A: Isosceles. (2)</p>
<p>1.1.6 Area = <math>\frac{10 \times 10}{2} \checkmark</math>  <math>= 10 \text{ sq units} \checkmark</math></p>	<p>A: Correct substitution                  CA: Correct answer. (2)</p>
<p>1.1.7 <math>y = mx + c</math>  <math>mBM = \frac{1}{7}</math> and <math>M(1:1)</math>  <math>1 = \frac{1}{7}(1) + c \checkmark</math>  <math>c = \frac{6}{7} \checkmark</math>  <math>\therefore y = \frac{1x}{7} + \frac{6}{7} \checkmark</math></p> <p style="text-align: center;"><b>OR</b></p> <p><math>y-1 = \frac{1}{7}(x-1) \checkmark</math>  <math>y = \frac{1x}{7} + \frac{6}{7} \checkmark</math>  <math>y-2 = \frac{1}{7}x(x-8) \checkmark</math>  <math>y = \frac{1x}{7} + \frac{6}{7} \checkmark</math></p>	<p>CA: Correct substitution                  CA: Correct answer (3)                  CA: Correct substitution                  CA: Correct answer (3)                  CA: Correct substitution                  CA: Simplification                  CA: Correct answer (3)                  CA: Correct substitution                  CA: Simplification                  CA: Correct answer. (3)</p>

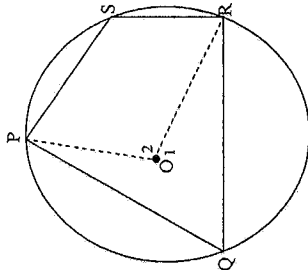
<p>1.1.8 <math>mAC = -7</math>  <math>mBC = \frac{4}{3}</math>  <math>\tan \theta = -7</math>  <math>RA = 81,9^\circ \checkmark</math>  <math>\tan \theta = \frac{3}{4}</math>  <math>RA = 53,1^\circ \checkmark</math>  <math>\therefore \theta = 180^\circ - (81,9^\circ + 53,1^\circ)</math>  <math>= 45^\circ \checkmark \checkmark</math></p>	<p>CA: 81,9°                  CA: 53,1°                  CA: Correct answer (4)</p>
<p>1.1.9 D is <math>(-6, 0) \checkmark</math></p>	<p>CA: Correct answer. (2)</p>
<p>1.2 <math>3(-4) + 4(1) = 32 \checkmark</math>  <math>32 = 32 \checkmark</math>  <math>\therefore (-4, 1)</math> lies on the line <math>\checkmark</math></p>	<p>A: Correct substitution                  CA: Simplification                  CA: conclusion. (3)</p>
<p>1.3 <math>mPQ = mRT</math>  <math>1 = \frac{m+4 - \frac{1}{2}}{2m - \frac{5}{2}} \checkmark</math>  <math>2m - \frac{5}{2} = m + \frac{7}{2} \checkmark</math>  <math>m = 6 \checkmark</math></p>	<p>AA: Equating two gradients                  CA: Simplification                  CA: Correct answer. (4)</p>
<p>1.4                  1.4.1 <math>\tan 108,4^\circ = -3 \checkmark</math>  <math>\therefore m = -3 \checkmark</math></p>	<p>A: Correct substitution                  CA: Correct answer (2)</p>

<p>1.4.2 <math>0 = -3(-3) + c</math>  <math>c = -9</math>  <math>\therefore y = -3x - 9</math></p> <p style="text-align: center;"><b>OR</b></p> <p><math>y - 0 = -3(x + 3)</math>  <math>y = -3x - 9</math></p>	<p>CA: Correct substitution (2)                  CA: Correct answer (2)                  CA: Correct substitution (2)                  CA: Correct answer (2)</p>
<p>1.4.3 R is <math>(0, -9)</math></p>	<p>CA: Correct answer (2)</p>
<p>1.4.4 <math>\frac{b-0}{a-2a} = \frac{b+9}{a-0}</math>  <math>ab = ab + 9a - 2ab - 18a</math>  <math>2ab = -9a</math>  <math>b = -\frac{9}{2}</math></p>	<p>AA: Equating two gradients (4)                  CA: Simplification (4)                  CA: Correct answer. (4) [45]</p>
<b>QUESTION 2</b>	
<p>2.1 bisects the chord ✓</p>	<p>AA: Correct answer (2)</p>
<p>2.2</p> <p>2.2.1 <math>DY = 12\text{cm}</math> ✓  <math>OD^2 = (12,5)^2 - (12)^2</math> ✓  <math>\therefore OD = \sqrt{12,25}</math>  <math>\therefore OD = 3,5</math> ✓  <math>\therefore MD = 12,5 - 3,5</math>  <math>= 9\text{cm}</math> ✓</p>	<p>A: length of DY (2)                  CA: Correct substitution (2)                  CA: Length of OD (2)                  CA: Length of MD (4)</p>

<p>2.2.2 <math>BD = 12,5 + 3,5</math>  <math>= 16</math> ✓  <math>BX^2 = XD^2 + BD^2</math>  <math>= 12^2 + 16^2</math> ✓  <math>BX = \sqrt{400}</math> ✓  <math>= 20\text{cm}</math> ✓</p>	<p>CA: Length of BD. (4)                  CA: Correct substitution (4)                  CA: Simplification (4)                  CA: Correct answer. (4) [10]</p>
<b>QUESTION 3</b>	
<p>3.1 twice the size of the angle subtended by the same arc at the circle. ✓ ✓</p>	<p>AA: Correct answer. (2)</p>
<p>3.2</p> <p>3.2.1 <math>\hat{OCB} = 40^\circ</math> (OB = OC) ✓  <math>\hat{BOC} = 100^\circ</math> (int. <math>\angle</math>'s of a triangle) ✓  <math>\hat{BAC} = 50^\circ</math> (<math>\angle</math> at centre) ✓</p>	<p>A: S/R (4)                  CA: Statement (4)                  CA: S/R (4)</p>
<p>3.2.2 <math>\hat{BDC} = 130^\circ</math> (cyclic quad) ✓</p>	<p>CA: S (2)                  CA: R (2)</p>
<p>3.2.3 <math>\hat{DCB} = 25^\circ</math> (BD = CD) ✓</p>	<p>CA: S (2)                  CA: R (2) [10]</p>

QUESTION 4

4.1



Proof

Construct OP and OR. ✓

$\hat{O}_1 = 2\hat{P}\hat{S}\hat{R}$  ( $\hat{\angle}$  at centre) ✓

$\hat{O}_2 = 2\hat{P}\hat{Q}\hat{R}$  ( $\hat{\angle}$  at centre) ✓

$\hat{O}_1 + \hat{O}_2 = 360^\circ$  (Revolution) ✓

$2\hat{P}\hat{S}\hat{R} + 2\hat{P}\hat{Q}\hat{R} = 180^\circ$  ✓

$\therefore \hat{P}\hat{S}\hat{R} + \hat{P}\hat{Q}\hat{R} = 180^\circ$  ✓

OR

Let  $\hat{P}\hat{Q}\hat{R} = x$  ✓

$\hat{O}_2 = 2x$  ( $\hat{\angle}$  at centre) ✓

$\hat{O}_1 = 360^\circ - 2x$  (Revolution) ✓

$\hat{P}\hat{S}\hat{R} = 180^\circ - x$  ( $\hat{\angle}$  at centre) ✓

$\therefore \hat{P}\hat{Q}\hat{R} + \hat{P}\hat{S}\hat{R} = 180^\circ$  ✓

A: Construction

A: Statement & reason

A: Statement & reason

A: Statement & reason

A: Correct substitution

A: Conclusion

A:  $\hat{P}\hat{Q}\hat{R} = x$

AA: statement and reason

A: S/R

A: S/R

A: conclusion (6)

4.2 Equal to an angle in the alternate circle segment ✓

4.3

4.3.1  $\hat{A}\hat{B}\hat{D} = 90^\circ$  (diameter) ✓

$\hat{B}\hat{A}\hat{D} = 28^\circ$  (alt angles of D) ✓

$\hat{B}\hat{C}\hat{D} = 152^\circ$  ✓ (cyclic quad) ✓

AA: Correct answer (2)

A: S/R

CA: S/R

CA: S/R (4)

<p>4.3.2 <math>\widehat{BDC} = 14^\circ \checkmark</math> (BC = CD) <math>\checkmark</math>  <math>\therefore \widehat{CDF} = 14^\circ \checkmark</math> (<math>\widehat{ADF} = 90^\circ</math>) <math>\checkmark</math></p>	<p>CA: Statement CA: Reason  CA: Statement CA: Reason</p> <p>(4)</p>
<p>4.4 <math>\widehat{C}_1 = \widehat{A} \checkmark</math> (alt. <math>\angle</math>'s AB    FT) <math>\checkmark</math>  <math>\widehat{C}_1 = \widehat{B} \checkmark</math> (Tan - chord) <math>\checkmark</math>  <math>\therefore \widehat{A} = \widehat{B} \checkmark</math>  <math>\therefore AC = BC</math></p> <p style="text-align: center;">OR</p> <p><math>\widehat{C}_3 = \widehat{B}</math> (alt <math>\angle</math>'s AB    FT) <math>\checkmark</math>  <math>\widehat{C}_3 = \widehat{A}</math> (tan chord) <math>\checkmark</math>  <math>\therefore \widehat{A} = \widehat{B} \checkmark</math>  <math>\therefore AC = BC</math></p>	<p>A: Statement A: Reason  A: Statement A: Reason  A: Conclusion</p> <p>(5)</p> <p>A: Statement A: Reason  A: Statement A: Reason  A: Conclusion</p> <p>[21]</p>

<p><b>QUESTION 5</b></p>		
<p>5.1 <math>\widehat{R} = (180^\circ - x) \checkmark</math> (cyclic quad) <math>\checkmark</math></p>		<p>A: Statement A: Reason</p>
<p>5.2 <math>\widehat{P}_2 = \widehat{Q}_2 = x \checkmark</math> (QT = PT) <math>\checkmark</math>  <math>\widehat{P}_2 = \widehat{Q}_2 = x \checkmark</math> (alt <math>\angle</math>'s RB    TP)  <math>\widehat{Q}_3 = \widehat{RTP} = x \checkmark</math> (ext. <math>\angle</math>' of cyclic quad)  <math>\widehat{Q}_2 = \widehat{P}_1 = x \checkmark</math> (tan chord)  <math>\widehat{P}_1 = \widehat{B}_1 = x \checkmark</math> (corresp. <math>\angle</math>'s RB    TP)</p>		<p>A: Statement A: Reason  A: Statement A: Reason  A: Statement A: Reason  A: Statement A: Reason  A: Statement A: Reason</p> <p>(10)</p>
<p>5.3 <math>\widehat{Q}_3 = \widehat{B}_1</math> (proven) <math>\checkmark</math>  <math>\therefore QP = BP \checkmark</math></p>		<p>A: Statement A: Conclusion</p> <p>(2) [14]</p>

**GRADE 11 MATHEMATICS P2 JUNE 2015**  
**COGNITIVE LEVEL ANALYSIS GRID SUMMARY**

LEVEL	1 KNOWLEDGE	2 ROUTINE	3 COMPLEX	4 PROBLEM SOLVING
1.1.1	4			
1.1.2		3		
1.1.3		4		
1.1.4		4		
1.1.5	2			
1.1.6	2			
1.1.7		3		
1.1.8			2	
1.1.9		2		
1.2		3		
1.3			4	
1.4.1	2			
1.4.2		2		
1.4.3	2			
1.4.4			4	
2.1	2			
2.2.1			4	
2.2.2			4	
3.1	2			
3.2.1		4		
3.2.2		2		
3.2.3		2		
4				6
5.1	2			
5.2.1			4	
5.2.2		4		
5.3			5	
6.1	2			10
6.2				
6.3			2	
%	20%	33%	31%	16%