education

Department:
Education
PROVINCE OF KWAZULU-NATAL

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NATIONAL SENIOR CERTIFICATE: COMMON TEST MARCH 2017
GRADE 12

TO: THE CHIEF INVIGILATOR OF ALL SCHOOLS OFFERING MATHEMATICS

ERRATA

Please take note of the following change:

PAGE	NUMBER	ERROR	CORRECTION
5	QUESTION 4 (Statement)	... C (–p; q)	C (p; q)

Kindly ensure that candidates are informed of the Errata.

MS N.V. MCAMBI
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13/3/2017
DATE

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Education

KwaZulu-Natal Department of Education
REPUBLIC OF SOUTH AFRICA

MATHEMATICS

COMMON TEST

MARCH 2017

NATIONAL SENIOR CERTIFICATE

GRADE 12

Marks: 100

Time: 2 hours

N.B. This question paper consists of 8 pages and an information sheet.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of 8 questions.
2. Answer **ALL** questions.
3. Clearly show **ALL** calculations, diagrams, graphs, et cetera that you have used in determining your answers.
4. Answers only will not necessarily be awarded full marks.
5. An approved scientific calculator (non-programmable and non-graphical) may be used, unless stated otherwise.
6. If necessary, answers should be rounded off to TWO decimal places, unless stated otherwise.
7. Diagrams are NOT necessarily drawn to scale.
8. Number the answers correctly according to the numbering system used in this question paper. Write neatly and legibly.

QUESTION 1

1.1 Determine the derivative of $f(x)=x^2+3x$ from first principles. (5)

1.2 Evaluate:

1.2.1 $\dfrac{dy}{dx}$ *if* $y=3x^2.\sqrt[3]{8x^4}$ (4)

1.2.2 $f'(x)$ if $f(x)=\dfrac{x^3-5x^2+4x}{x-4}$; $x \neq 4$ (5)

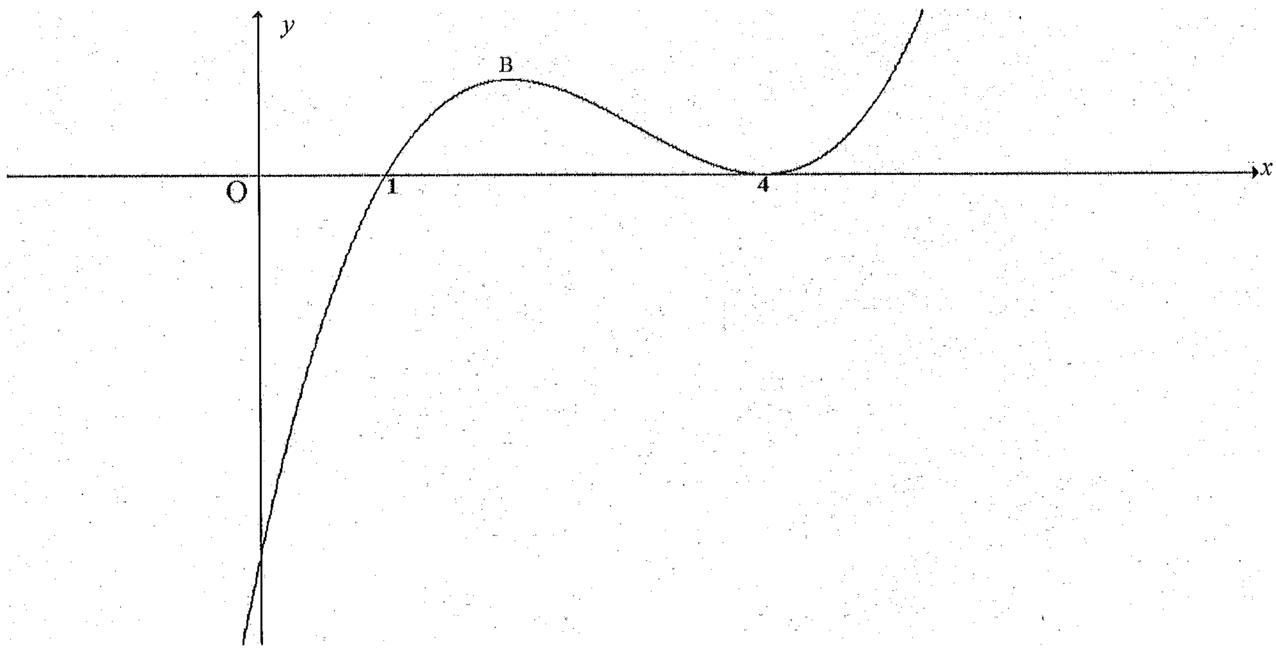
[14]

QUESTION 2

2.1 Determine co-ordinates of the points on the curve $y = \frac{4}{x}$ where the gradient of the tangent to the curve is -1. (5)

2.2 The graph of a cubic function with equation $f(x) = x^3 + ax^2 + bx + c$ is drawn.

- $f(1) = f(4) = 0$
- f has a local maximum at B and a local minimum at $x = 4$.



2.2.1 Show that $a = -9$, $b = 24$ and $c = -16$. (4)

2.2.2 Calculate the coordinates of B. (5)

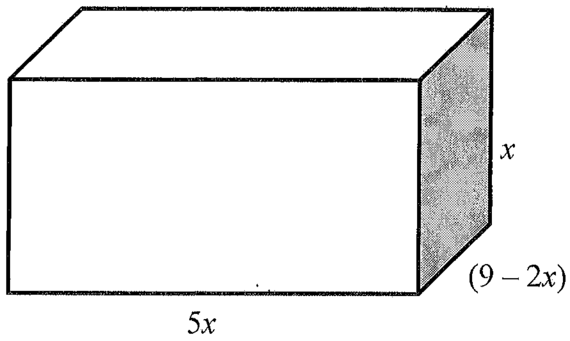
2.2.3 Write down the value(s) of k for which $f(x) = k$ has negative roots only. (2)

2.2.4 Determine the value(s) of x for which f is concave up. (3)

[19]

QUESTION 3

A rectangular box has a length of $5x$ units, breadth of $(9-2x)$ units and its height of x units.



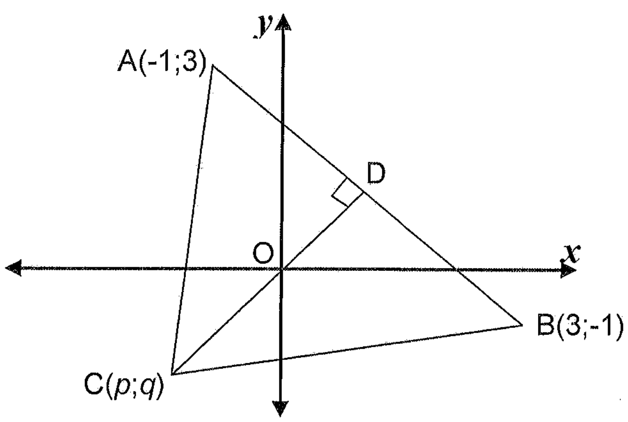
3.1 Show that the volume (V) of the box is given by $V = 45x^2 - 10x^3$. (2)

3.2 Calculate the value of x for which the box will have maximum volume. (5)

[7]

QUESTION 4

In the figure below, A (–1; 3) , B (3; –1) and C (–p; q) are vertices of Δ ABC.
Area of Δ ABC = 12 square units. CD is ⊥ AB.



4.1 Determine the coordinates of D, the midpoint of AB (2)

4.2 Show that $p = q$ (5)

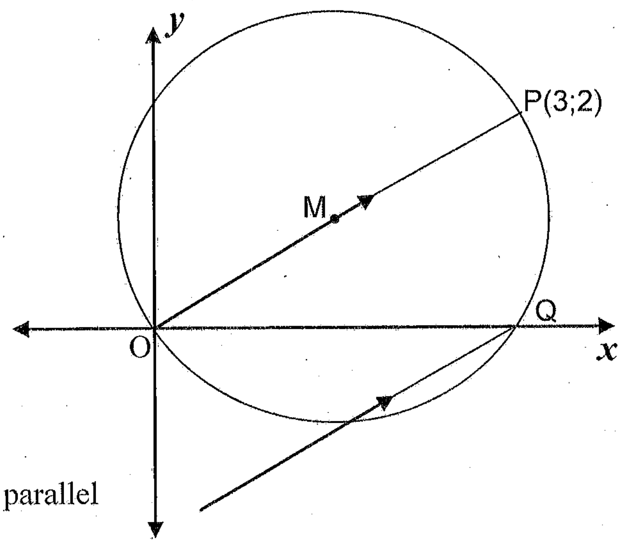
4.3 If p ; $q < 0$, determine the co-ordinates of C. (5)

[12]

QUESTION 5

In the accompanying diagram alongside, P(3; 2) lies on the circumference of a circle with centre M. The circle also passes through the origin. Q is the intercept of the circle with the x-axis.

Determine:



5.1 the co-ordinates of M. (2)

5.2 the gradient of OP. (1)

5.3 the equation of the circle M. (3)

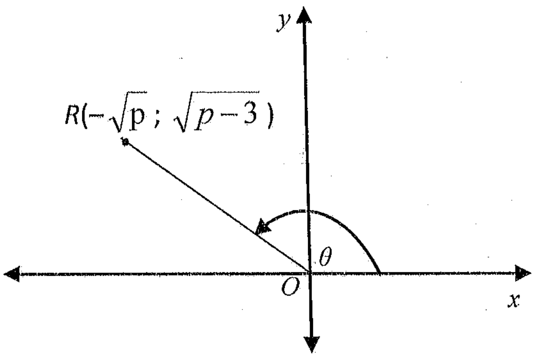
5.4 the co-ordinates of Q. (4)

5.5 the equation of the line through Q, parallel to OP. (3)

[13]

QUESTION 6

6. In the diagram alongside, $R\left(-\sqrt{p}\ ;\ \sqrt{p-3}\right)$ is a point in a Cartesian plane, $R\hat{O}X = \theta$



6.1 Express $\cos^2\theta$ in terms of p. (5)

6.2 Hence, for which real values of p is $\cos^2\theta$ defined? (2)

6.3 Determine $\dfrac{1}{\cos\alpha}$ in terms of p if α and θ are supplementary. (2)

[9]

QUESTION 7

7.1 Simplify WITHOUT the use of a calculator

$$\frac{\cos 225^\circ \,.\, \sin\left(-135^\circ\right) - \sin 330^\circ}{\tan 225^\circ}$$ (6)

7.2 Prove the identity:

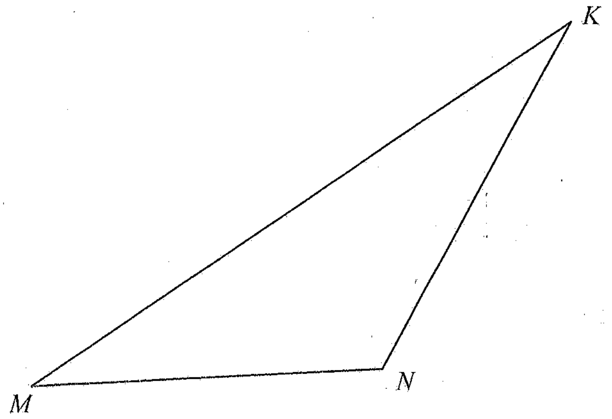
$$\frac{\tan x - \sin x}{\sin^3 x} = \frac{1}{\cos x\,(1 + \cos x)}$$ (5)

7.3 Determine the general solution of $\cos 2x + \cos x - 2 = 0$ (5)

[16]

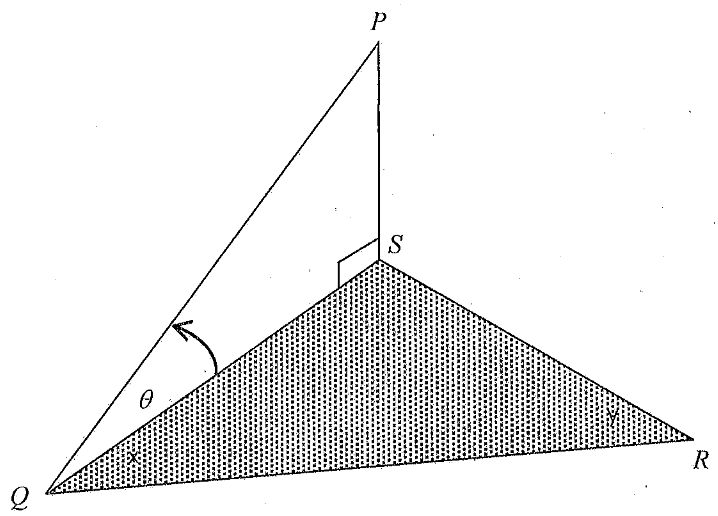
QUESTION 8

8.1 Given Δ KMN, with $\hat{N}$ obtuse, as shown in the diagram below:



Prove that $\dfrac{\sin M}{m} = \dfrac{\sin N}{n}$ (4)

8.2 In the diagram below, S,Q and R are points in the same plane. PS is a vertical telephone mast. The angle of elevation of P from Q is θ. $S\hat{Q}R = x$, $S\hat{R}Q = y$, QR = 10m.



8.2.1 Express PS in terms of QS and θ (2)

8.2.2 Show that $QS = \dfrac{10 \sin y}{\sin (x + y)}$ (4)

[10]

TOTAL: 100

INFORMATION SHEET

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

$A = P(1+ni)$ $\quad A = P(1-ni)$ $\quad A = P(1-i)^n$ $\quad A = P(1+i)^n$

$T_n = a + (n-1)d$ $\quad S_n = \frac{n}{2}\left[2a + (n-1)d\right]$

$T_n = ar^{n-1}$ $\quad S_n = \frac{a\left(r^n - 1\right)}{r-1}\ ; r \neq 1$ $\quad S_\infty = \frac{a}{1-r}\ ; -1 < r < 1$

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

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

$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $\quad M\left(\frac{x_1 + x_2}{2}; \frac{y_1 + y_2}{2}\right)$

$y = mx + c$ $\quad y - y_1 = m(x - x_1)$ $\quad m = \frac{y_2 - y_1}{x_2 - x_1}$ $\quad m = \tan\theta$

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

In ΔABC: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

$a^2 = b^2 + c^2 - 2bc.\cos A$

$area\ \Delta ABC = \frac{1}{2}ab.\sin C$

$\sin(\alpha + \beta) = \sin\alpha.\cos\beta + \cos\alpha.\sin\beta$ $\quad \sin(\alpha - \beta) = \sin\alpha.\cos\beta - \cos\alpha.\sin\beta$

$\cos(\alpha + \beta) = \cos\alpha.\cos\beta - \sin\alpha.\sin\beta$ $\quad \cos(\alpha - \beta) = \cos\alpha.\cos\beta + \sin\alpha.\sin\beta$

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

$\sin 2\alpha = 2\sin\alpha.\cos\alpha$

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

$P(A) = \frac{n(A)}{n(S)}$ $\quad P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$

$\hat{y} = a + bx$ $\quad b = \frac{\sum(x - \bar{x})(y - \bar{y})}{\sum(x - \bar{x})^2}$

MATHS + MLIT - GR 12

QUESTION 1

Penalize once for notational error in Questions 1 to 3.

1.1	$f(x)=x^2+3x$ $f(x+h)=(x+h)^2+3(x+h)$ $=x^2+2xh+h^2+3x+3h$ $f(x+h)-f(x)=2xh+h^2+3h$ $\frac{f(x+h)-f(x)}{h}=\frac{2xh+h^2+3h}{h}$ $=\frac{h(2x+h+3)}{h}$ $=(2x+h+3)$ $f'(x)=\lim_{h\to 0}(2x+h+3)$ $=2x+3$	✓A $x^2+2xh+h^2+3x+3h$ ✓CA $2xh+h^2+3h$ ✓CA $\frac{h(2x+h+3)}{h}$ ✓CA $\lim_{h\to 0}(2x+h+3)$ ✓CA answer	5
	OR $f(x)=x^2+3x$ $f'(x)=\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$ $=\lim_{h\to 0}\frac{(x+h)^2+3(x+h)-(x^2+3x)}{h}$ $=\lim_{h\to 0}\frac{x^2+2xh+h^2+3x+3h-x^2-3x}{h}$ $=\lim_{h\to 0}\frac{2xh+h^2+3h}{h}$ $=\lim_{h\to 0}\frac{h(2x+h+3)}{h}$ $=2x+3$	**OR** ✓A formula ✓A substitution into correct formula ✓CA simplifying ✓CA factors ✓CA answer	5
1.2.1	$\frac{dy}{dx}$ if $y=3x^2.\sqrt[3]{8x^4}$ $y=3x^2.2x^{\frac{4}{3}}$ $y=6x^{\frac{10}{3}}$ $\frac{dy}{dx}=20x^{\frac{7}{3}}$ or $20\sqrt[3]{x^7}$	✓A $2x^{\frac{4}{3}}$ ✓ $6x^{\frac{10}{3}}$ CA ✓CA 20 ✓CA $x^{\frac{7}{3}}$ If exponent is an integer – maximum 2/4 Marks	4

Education

KwaZulu-Natal Department of Education

REPUBLIC OF SOUTH AFRICA

MATHEMATICS

COMMON TEST

MARCH 2017

MEMORANDUM

NATIONAL SENIOR CERTIFICATE

GRADE 12

MARKS: 100

TIME: 2 hours

This memorandum consists of 12 pages

1.2.2	$f'(x)$ if $f(x)=\dfrac{x^3-5x^2+4x}{x-4}$ $f(x)=\dfrac{x(x^2-5x+4)}{(x-4)}$ $=\dfrac{x(x-1)(x-4)}{(x-4)}$ $=x^2-x$ $f'(x)=2x-1$	✓A factorising ✓A factors ✓CA simplification of f ✓CA✓CAanswer	5
			[14]

QUESTION 2

2.1	$y=\dfrac{4}{x}$ & the gradient of tangent to the curve is – 1. $y=4x^{-1}$ $\dfrac{dy}{dx}=-4x^{-2}=\dfrac{-4}{x^2}$ $\dfrac{-4}{x^2}=-1$ $x^2=4$ $\therefore x=-2$ or $x=2$ $y=-2$ or $y=2$ $(-2;-2)$ $(2;2)$	✓A exponential form ✓A derivative ✓CA derivative $=-1$ ✓ CA x - values ✓ CA $y-$ values If only one coordinate is given - maximum 4/5 Marks	5

2.2.1	$y=(x-1)(x-4)^2$ $=(x-1)(x^2-8x+16)$ $=x^3-9x^2+24x-16$	✓A✓A $(x-1)(x-4)^2$ ✓A squaring binomial ✓A Answer	4
	OR	**OR**	
	$TP:(4;0)$ $f(4)=0$ *and* $f'(4)=0$ $(4)^3+a(4)^2+b(4)+c=0$ $16a+4b+c=-64 \rightarrow (1)$ $f'(x)=3x^2+2ax+b$ $f'(4)=3(4)^2+2a(4)+b=0$ $8a+b=-48 \rightarrow (2)$ $f(1)=1+a+b+c=0$ $a+b+c=-1 \rightarrow (3)$ $(1)-(3):15a+3b=-63 \rightarrow (4)$ $(4)\div 3:5a+b=-21 \rightarrow (5)$ $(2)-(5):3a=-27$ $\therefore a=-9$ *substitutuing* int *o* (5) $:-45+b=-21$ $b=-21+45=24$ *Subst.* $a=-9$ *and* $b=24$ int *o* (3): $-9+24+c=-1$ $c=-1+9-24=-16$	✓ A forming all three equations ✓ A for derivative ✓A for equations (4) and (5) ✓ A substitutions	4
2.2.2	$y=x^3-9x^2+24x-16$ $\dfrac{dy}{dx}=3x^2-18x+24=0$ $x^2-6x+8=0$ $(x-2)(x-4)=0$ $x=2$ $y=4$ $B(2;4)$	✓A derivative ✓A derivative = 0 ✓CA factors ✓ CA $x-$ value ✓CA $y-$ value If the correct coordinate is not specified maximum 4/5 Marks	5
2.2.3	$k<-16$	✓✓AA Answer If $k\le -1$ (1Mark only)	2

QUESTION 4

4.1	$D\left(\frac{x_1+x_2}{2};\frac{y_2+y_2}{2}\right)$ $D\left(\frac{-1+3}{2};\frac{3-1}{2}\right)$ $D\,(1;1)$ [Answer only full marks]	✓A Correct substitution ✓A Answer	2
4.2	$M_{AB}=\frac{-1-3}{3+1}=-1$ $\therefore M_{CD}=1$ $k=0$ equation of the line CD is $y=x$ C lies on line CD, therefore co – ordinates of C must satisfy the above equation substituting $C(p;q)$ gives $q=p$. **OR** $M_{AB}=\frac{-1-3}{3+1}=-1$ $\therefore M_{CD}=1$ $\frac{q-0}{p-0}=1$ $\frac{q}{p}=1$ $p=q$	✓A correct subst into formula ✓A gradient value ✓A $k=0$ ✓A $y=x$ ✓A conclusion **OR** ✓A correct subst into formula ✓A gradient value ✓✓AA $\frac{q-0}{p-0}=1$ ✓A $\frac{q}{p}=1$	5 5

2.2.4	$f''(x)=6x-18>0$ $x>3$ [$x=\frac{2+4}{2}=3$ *or* $x=-\frac{b}{3a}=-\frac{(-9)}{3(1)}=3$]	✓ CA $6x-18$ ✓ CA $6x-18>0$ ✓ CA answer (If x is between x-coordinates of both turning points) **Answer only full marks**	3
			[19]

QUESTION 3

3.1	$V=l\times b\times h$ $=5x(9-2x)(x)$ $=45x^2-10x^3$	✓A formula ✓A substitution	2
3.2	$V'=90x-30x^2$ $90x-30x^2=0$ $30x(3-x)=0$ $x=0$ or $x=3$ Therefore the box will have a maximum at $x=3$ **OR** $V'=90x-30x^2$ $90x-30x^2=0$ $30x(3-x)=0$ $x=0$ or $x=3$ $f''(x)=90-60x$ $f''(3)=90-60(3)=-90<0$ Therefore the box will have a maximum at $x=3$	✓A derivative ✓A derivative equal to 0 ✓CA factors ✓CA x values ✓CA choosing $x=3$ (greater x value) **OR** ✓A derivative ✓A derivative equal to 0 ✓CA factors ✓CA x values ✓CA choosing $x=3$	5 5
			[7]

QUESTION 5

5.1	$M\left(\frac{x_1+x_2}{2};\frac{y_1+y_2}{2}\right)$ $M\left(\frac{0+3}{2};\frac{0+2}{2}\right)$ $M\left(\frac{3}{2};1\right)$ Answer only full marks	✓A $x-$value ✓A $y-$value	2
5.2	$M_{OP}=\frac{2-0}{3-0}=\frac{2}{3}$	✓A answer	1
5.3	$\left(x-\frac{3}{2}\right)^2+(y-1)^2=OP^2$ $OP^2=\left(-\frac{3}{2}\right)^2+(1)^2$ $=\frac{13}{4}$ $radius=\frac{\sqrt{13}}{2}$ $\therefore$ *the equation of circle M is* $\left(x-\frac{3}{2}\right)^2+(y-1)^2=\frac{13}{4}$	✓CA subst coordinates of centre into equation ✓CA subst of O(0;0) ✓CA radius value ✓CA equation of circle	4
5.4	$x-$int*ercept*$;y=0$ $\left(x-\frac{3}{2}\right)^2+(0-1)^2=\frac{13}{4}$ $x^2-3x+\frac{9}{4}+1=\frac{13}{4}$ $x^2-3x=0$ $x(x-3)=0$ $x=0\ or\ x=3$ $\therefore Q(3;0)$	✓CA subst $y=0$ into equation of circle ✓CA expansion ✓CA x values ✓CA coordinates of Q	4
5.5	Equation of the line through Q is	✓CA gradient of $\frac{2}{3}$ ✓CA subst of coordinates of Q	

4.3	using $\frac{1}{2}AB.CD=12$ $\frac{1}{2}\sqrt{(3+1)^2+(-1-3)^2}.CD=12$ $\sqrt{4^2+4^2}\ .\ CD=24$ $CD=\frac{24}{\sqrt{32}}=3\sqrt{2}$ $(p-1)^2+(q-1)^2=(3\sqrt{2})^2$ $(p-1)^2+(q-1)^2=18$ $2(p-1)^2=18$ $(p-1)^2=9$ $p-1=\pm3$ $p=-2\ or\ 4$ $q=-2\ or\ 4$ $\therefore p=-2;q=-2$ $\therefore C(-2;-2)$ **OR** $\Delta CDB\equiv\Delta CDA$ *SAS* $CA=CB$ $C(p;p)$ $CD=\sqrt{(p-1)^2+(p-1)^2}$ $AB=\sqrt{(1-3)^2+(1+1)^2}=\sqrt{8}$ $6=\frac{1}{2}\sqrt{8}\sqrt{(p+1)^2+(p-3)^2}$ $12=\sqrt{8}\sqrt{(p-1)^2+(p-1)^2}$ $144=8[(p-1)^2+(p-1)^2]$ $144=8[2p^2-4p+2]$ $144=16p^2-32p+16$ $9=p^2-2p+1$ $p^2-2p-8=0$ $(p-4)(p+2)=0$ $p=4\ or\ p=-2$ $n/a\quad q=-2$ $\therefore C(-2;-2)$	✓A Area formula of ΔABC and equating to 12 ✓A distance of AB ✓CA length of CD ✓CA subst into distance formula for CD ✓CA coordinates of C (both values must be negative) **OR** ✓A length of CD ✓A distance of AB ✓CA Area formula of ΔCDA and equating to 6 ✓CA p - values ✓CA coordinates of C	5 5
			[12]

	$y=\frac{2}{3}x+c$ $subst\ (3;0)$ $0=\frac{2}{3}(3)+c$ $\therefore c=-2$ $\therefore y=\frac{2}{3}x-2$	✓CA equation of the line	3
			[13]

QUESTION 6

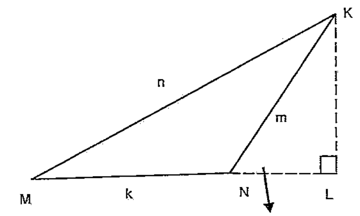
6.1	$OR^2=\left(-\sqrt{p}\right)^2+\left(\sqrt{p-3}\right)^2$ $=p+p-3$ $=2p-3$ $OR=\sqrt{2p-3}$ $\cos^2\theta=\left(\frac{\left(-\sqrt{p}\right)}{\sqrt{2p-3}}\right)^2$ $=\frac{p}{2p-3}$	✓A $OR^2=\left(-\sqrt{p}\right)^2+\left(\sqrt{p-3}\right)$ ✓A $2p-3$ ✓CA $OR=\sqrt{2p-3}$ ✓CA substitution of cos θ ✓CA answer	5
	OR	**OR**	
	$OR^2=\left(-\sqrt{p}\right)^2+\left(\sqrt{p-3}\right)^2$ $=p+p-3$ $=2p-3$ $OR=\sqrt{2p-3}$ $\cos^2\theta=1-\sin^2\theta$ $=1-\left[\frac{\sqrt{p-3}}{\sqrt{2p-3}}\right]^2$ $=1-\frac{p-3}{2p-3}$ $=\frac{2p-3-p+3}{2p-3}$ $=\frac{p}{2p-3}$	✓A $OR^2=\left(-\sqrt{p}\right)^2+\left(\sqrt{p-3}\right)$ ✓A $2p-3$ ✓CA $OR=\sqrt{2p-3}$ ✓CA substitution of sin θ ✓CA answer	5
6.2	$2p-3>0$ *and* $p\geq 0$ $p>\frac{3}{2}$	✓✓CA $p>\frac{3}{2}$	2
6.3	$\frac{1}{\cos\alpha}=\frac{1}{\cos(180°-\theta)}=\frac{-1}{\cos\theta}$ $=\frac{\sqrt{2p-3}}{\sqrt{p}}$	✓A $\frac{-1}{\cos\theta}$ ✓A answer	2
			[9]

QUESTION 7

7.1	$\dfrac{\cos 225^\circ \cdot \sin(-135^\circ) - \sin 330^\circ}{\tan 225^\circ}$ $= \dfrac{\cos(180^\circ + 45^\circ) \cdot -\sin(180^\circ - 45^\circ) - \sin(360^\circ - 30^\circ)}{\tan(180^\circ + 45^\circ)}$ $= \dfrac{-\cos 45^\circ \cdot (-\sin 45^\circ) - (-\sin 30^\circ)}{\tan 45^\circ}$ $= \dfrac{-\frac{1}{\sqrt{2}} \cdot \left(\frac{-1}{\sqrt{2}}\right) + \frac{1}{2}}{1}$ $= \frac{1}{2} + \frac{1}{2}$ $= 1$	✓A – cos 45° ✓A – sin 45° ✓A –sin 30° ✓A tan 45° ✓CA substitution ✓CA answer	6

7.2	LHS $= \dfrac{\tan x - \sin x}{\sin^3 x}$ $= \dfrac{\frac{\sin x}{\cos x} - \sin x}{\sin^3 x}$ $= \dfrac{\sin x\left(\frac{1}{\cos x} - 1\right)}{\sin^3 x}$ $= \dfrac{1 - \cos x}{\cos x\,(\sin^2 x)}$ $= \dfrac{1 - \cos x}{\cos x\,(1 - \cos^2 x)}$ $= \dfrac{1 - \cos x}{\cos x\,(1 - \cos x)\,(1 + \cos x)}$ $= \dfrac{1}{\cos x\,(1 + \cos x)}$ = RHS	✓A $\dfrac{\sin x}{\cos x}$ ✓A removing $\sin x$ as common factor ✓A $\dfrac{1 - \cos x}{\cos x\,(\sin^2 x)}$ ✓A $\sin^2 x = 1 - \cos^2 x$ ✓A factorising	5
7.3	$\cos 2x + \cos x - 2 = 0$ $2\cos^2 x - 1 + \cos x - 2 = 0$ $2\cos^2 x + \cos x - 3 = 0$ $(2\cos x + 3)(\cos x - 1) = 0$ N/A $\therefore \cos x = 1$ $x = 0^\circ + n.\ 360^\circ,\ n \in Z$	✓A writing cos 2x as $2\cos^2 x - 1$ ✓A std. form equation ✓CA factors ✓CA $\cos x = 1$ ✓CA answer	5
			[16]

QUESTION 8

8.1	By area formula $Area\,of\ \Delta KMN=\frac{1}{2}kn\sin M=\frac{1}{2}km\sin N$ $dividing\ by\ \frac{1}{2}kmn\ yeilds$ $\frac{\sin M}{m}=\frac{\sin N}{n}$	✓✓AA $Area\,of\ \Delta KMN=\frac{1}{2}kn\sin M=\frac{1}{2}km\sin N$ ✓✓AA $dividing\ by\ \frac{1}{2}\ kmn\,yeilds$	4
	 $Draw\ KL\perp MN\ extended$ (180°-KNM) $\Delta KLM\ :\ KL=n\sin M\ and$ $\Delta KLN\ :\ KL=m\sin(180^\circ-KNM)$ $=m\sin KNM$ $\therefore n\sin M=m\sin KNM$ $\therefore \frac{\sin M}{m}=\frac{\sin N}{n}$	✓A construction ✓A $KL=n\sin M$ ✓A $KL=m\sin KNM$ ✓A $n\sin M=m\sin KNM$	4
8.2.1	PS = QS Tan θ	✓✓AA Answer	2
8.2.1	$\frac{QS}{\sin R}=\frac{QR}{\sin S}$ $but\ QSR=180^\circ-(x+y)$ $\therefore \frac{QS}{\sin y}=\frac{10}{\sin(180^\circ-(x+y))}$ $\frac{QS}{\sin y}=\frac{10}{\sin(x+y)}$ $\therefore QS=\frac{10\sin y}{\sin(x+y)}$	✓A Application of sine rule ✓A calculation of angle QSR ✓A substitution into sine rule ✓A reduction formulae	4
			[10]

Total Marks: 100