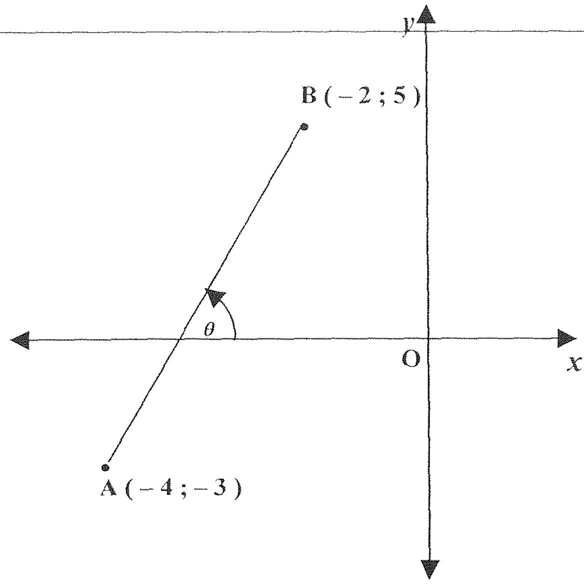
QUESTION 1	[23]



1.1	$AB = \sqrt{(x_2 - x_1)^2 = (y_2 - y_1)^2}$ ✓M $= \sqrt{(-2+4)^2 + (5+3)^2}$ ✓A $= \sqrt{68}$ **OR** $2\sqrt{17}$ ✓CA (3)	1M distance formula 1 A substitution 1 CA solution
1.2	$m_{AB} = \dfrac{y_2 - y_1}{x_2 - x_1}$ ✓M $= \dfrac{5+3}{-2+4}$ ✓A $= 4$ ✓CA (3)	1 M gradient formula 1 A substitution 1 CA solution
1.3	$\tan\theta = 4$ ✓M $\theta = 76{,}0^\circ$ ✓CA (2)	1 M inclination formula 1 CA solution
1.4	$M\left(\dfrac{x_1 + x_2)}{2}; \dfrac{y_1 + y_2}{2}\right)$ ✓M $= M\left(\dfrac{-4+(-2)}{2}; \dfrac{-3+5}{2}\right)$ ✓A $= M(-3; 1)$ ✓CA (3)	1 M midpoint formula 1 A substitution 1 CA solution

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1.5	$m_{line} = \frac{-1}{m_{AB}} = -\frac{1}{4}$ ✓M Eq. of line is $y - y_1 = m(x - x_1)$ ✓M $y - 1 = -\frac{1}{4}(x+3)$ ✓CA $y = -\frac{1}{4}x - \frac{3}{4} + 1$ $= -\frac{1}{4}x + \frac{1}{4}$ ✓CA (4)	1M ⊥ gradient 1M equation of line formula 1 CA substitution 1 CA solution
1.6	For D, y = 0, $0 = -\frac{1}{4}x + \frac{1}{4}$ ✓CA $x = 1$ ✓CA (2) D (1 ; 0)	1A y–value D 1CA x– value of D
1.7	$m_{BD} = \frac{5-0}{-2-1}$ $= -\frac{5}{3}$ ✓CA $m_{BC} = \frac{10-5}{p+2}$ ✓CA $= \frac{5}{p+2}$ ✓CA $\therefore m_{BC} = m_{BD}$ ✓M $\therefore \frac{5}{p+2} = -\frac{5}{3}$ ✓CA $p + 2 = -3$ $p = -5$ ✓CA (6)	1 CA solution 1 CA substitution 1 CA solution 1 M = gradients 1 CA substitution 1 CA solution

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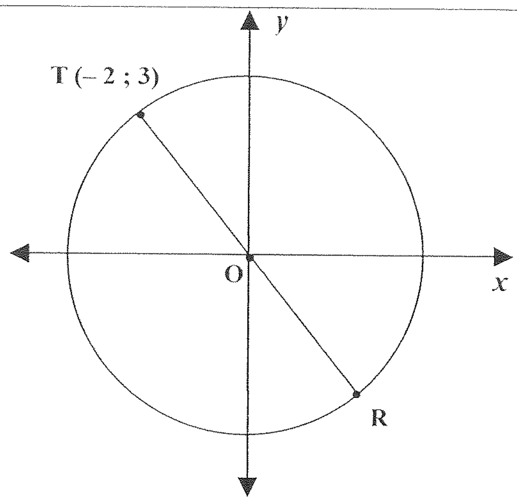
Question 2 [21]



2.1.1	$x^2 + y^2 = r^2$ ✓M $(-2)^2 + (3)^2 = r^2$ ✓A $13 = r^2$ $x^2 + y^2 = 13$ ✓CA (3)	1M equation of circle formula 1 A substitution 1 CA solution
2.1.2	$x^2 + y^2 = r^2$ $(-3)^2 + (-4)^2 = r^2$ $25 = r^2$ ✓A $25 > 13$ ✓CA $\therefore$ C lies outside the circle. ✓CA (3)	1 A Pythagoras 1 CA solution 1 CA conclusion
2.1.3	TR = 2 (OP) ✓M $= 2\sqrt{13}$ ✓CA **OR** $OP = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $= \sqrt{(-2)^2 + (3)^2}$ ✓M $= \sqrt{13}$ $\therefore TR = 2\sqrt{13}$ ✓CA (2)	1 method 1 CA solution 1 Method 1 CA solution

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2.1.4	$m_{TR} = \frac{-3-0}{2-0}$ ✓A $= -\frac{3}{2}$ ✓CA y-int. = 0 ✓A $y = mx + c$ $\therefore y = -\frac{3}{2}x$ ✓CA **OR** $m_{TR} = \frac{-3-0}{2-0}$ ✓A $= -\frac{3}{2}$ ✓CA Eq. of TR is $y - 0 = -\frac{3}{2}(x - 0)$ ✓CA $y = -\frac{3}{2}x$ ✓CA (4)	1 Asubstitution into gradient formula 1 CA m of PR 1 A y–int. = 0 1 CA solution 1 A substitution into gradient formula 1 CA m of PR 1 CA for sub. into st.line formula 1 CA solution
2.1.5	$m_{tan} = \frac{2}{3}$ ✓CA (1)	1 CA gradient of tang.
2.1.6	Eq. of the tangent is $y - y_1 = m(x - x_1)$ ✓M $y - 3 = \frac{2}{3}(x + 2)$ ✓CA $3y = 2x + 13$ ✓CA (3)	1 M equation of line 1 CA substitution 1 CA solution
2.2	$m_{PA} = \frac{y-6}{x+2}$ ✓A $m_{PB} = \frac{y-3}{x+4}$ ✓A $\frac{y-6}{x+2} = 2\left(\frac{y-3}{x+4}\right)$ ✓M $(y-6)(x+4) = 2(y-3)(x+2)$ ✓CA $xy + 4y - 6x - 24 = 2xy + 4y - 6x - 12$ $xy = -12$ ✓CA (5)	

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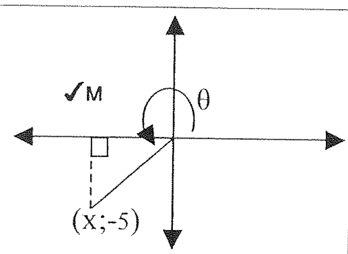
QUESTION 3	[17]

3.1.1	$\sin 2x + \sec y = \sin 2(155°) + \sec 130°$ ✓M $= -2{,}32$ ✓A (2)	1 M substitution 2 A solution
3.1.2	$\tan^2(x-y) = \tan^2(155° - 130°)$ $= \tan^2 25°$ ✓M $= 0{,}22$ ✓A (2)	1 M substitution 1 A solution
3.2.1	$\sin\theta = -\frac{5}{13}$ ✓M ✓M  $x^2 + y^2 = r^2$ $x^2 + (-5)^2 = 13^2$ ✓M $\therefore x^2 = 144$ $x = -12$ ✓CA $\cot\theta + \operatorname{cosec}\theta = \frac{-12}{-5}$ ✓CA $+ \frac{13}{-5}$ ✓CA **OR** $\frac{\cos\theta}{\sin\theta} + \frac{1}{\sin\theta}$ $= \frac{12-13}{5}$ $= \frac{\cos\theta + 1}{\sin\theta}$ $= -\frac{1}{5}$ ✓CA $= \frac{1 + \frac{-12}{13}}{\frac{-5}{13}}$ ✓CA ✓CA $= -\frac{1}{5}$ ✓CA (7)	1 M $\sin\theta$ 1 A correct quadrant 1 M Pythagoras 1 CA value of x 1 CA $\cot\theta$ 1 CA $\sec\theta$ 1 CA solution

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3.2.2	$\frac{\sin(180° - x) \cdot \sec(90° - x) \cdot \cos 240°}{\tan(360° - x)}$ $= \frac{\sin x . \operatorname{cosec} x . - \cos 60°}{- \tan x}$ $= \frac{\sin x . \operatorname{cosec} x . - \frac{1}{2}}{- \tan x}$ ✓A ✓A ✓A ✓A $= \frac{\sin x . \frac{1}{\sin x}}{2 . \tan x}$ ✓CA $= \frac{1}{2 \tan x}$ or $\frac{\cot x}{2}$ ✓CA (6)	4 A reduction/special angle 1 CA identity 1 CA solution

QUESTION 4		[12]
4.1	m = 2 ✓A ; p = 1 ✓A ; k = sin 30° ✓M k = 0,86 ✓A (4)	1 A value of a 1 A value of b 1M 1A for value of k
4.2	360° ✓A (1)	1 A
4.3	C (90° ; 0) ✓A (1)	1 A solution
4.4	(150° ; – 0,86) ✓A ✓A or $(150° ; -\frac{\sqrt{3}}{2})$ (2)	1A for x value 1 A for y value
4.5.1	(90° ; 180°) ✓A ✓A ✓M (3)	2A for end values 1M for correct interval
4.5.2	180° ✓A (1)	1A

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Question 5		[9]
5.1	**LHS:** $\tan x \cdot \cot x - \frac{\sin x}{\operatorname{cosec} x}$ $= \tan x \frac{1}{\tan x} - \frac{\sin x}{\frac{1}{\sin x}}$ ✓A ✓A $= 1 - \sin^2 x$ ✓CA $= \cos^2 x$ ✓CA = RHS **OR** **LHS:** $\tan x \cdot \cot x - \frac{\sin x}{\operatorname{cosec} x}$ $= \frac{\sin x}{\cos x}\left(\frac{\cos x}{\sin x}\right) - \frac{\sin x}{\frac{1}{\sin x}}$ ✓CA ✓CA $= 1 - \sin^2 x$ ✓CA $= \cos^2 x$ ✓CA = RHS (4)	2 A identity 2 CA simplification 1 CA identity
5.2	$2 \tan \theta = -3{,}2$ $\tan \theta = -1{,}6$ ✓A R.A $= 58°$ ✓CA $\theta = 180° - 58°$ ✓M or $\theta = 360° - 58°$ ✓CA $= 122°$ or $\theta = 302°$ ✓CA (5)	1A 1CA reference angle 1 M /1 CA quadrants 1CA solutions

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QUESTION 6 **[17]**

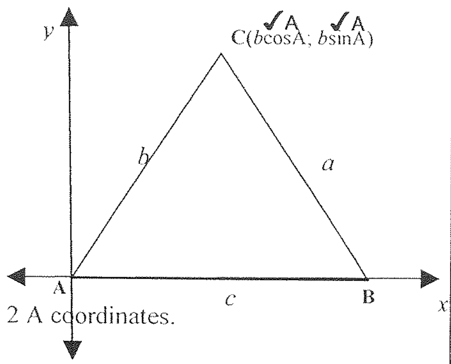
6.1

Area of Δ ABC $= \frac{1}{2}$ base X height ✓M — 1M formula

$= \frac{1}{2}.c.b \sin A$ ✓A — 1A substitution

$= \frac{1}{2}(b).(c).\sin A$

(4)



2 A coordinates.

OR

Constr: Draw CD $\perp$ AB

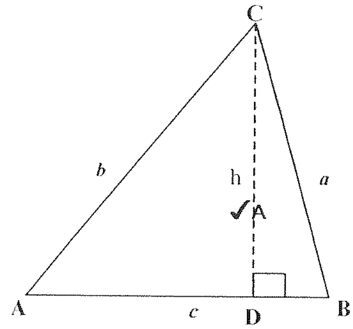
h $=$ b sin A ✓A

Area of Δ ABC $= \frac{1}{2}$ base X height ✓M — 1M formula

$= \frac{1}{2}$(c) (h)

$= \frac{1}{2}.c.b \sin A$ ✓A

$= \frac{1}{2}(b).(c).\sin A$



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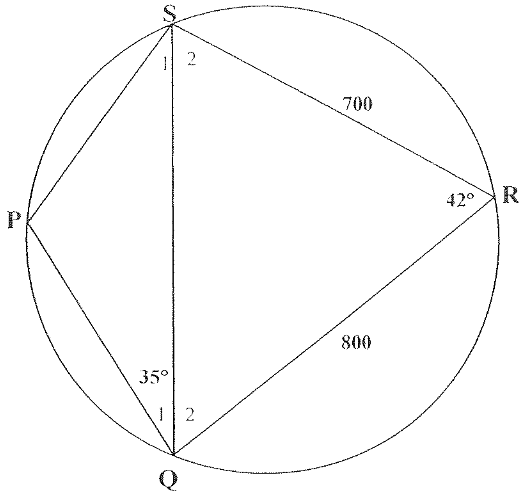
6.2		
6.2.1	Area of $\Delta QRS = \frac{1}{2}.QR.RS.\sin R$ ✓M $= \frac{1}{2}\times 800\times 700\times \sin 42°$ ✓CA $= 187\ 356{,}6\ m^2$ ✓CA (3)	1M area rule 1A substitution 1 CA solution
6.2.2	In Δ QSR $QS^2 = SR^2 + QR^2 - 2(SR)(QR)\cos R$ ✓M $= (700)^2 + (800)^2 - 2(700)(800)\cos 42°$ ✓A ✓CA $= 297\ 677{,}7955..$ $QS = 545{,}6$ m ✓CA (4)	
6.2.3	$\hat{P} = 180° - 42°$ $= 138°$ ✓A ✓R (opp. ∠'s cyclic. quad. supp) (2)	
6.2.4	$\frac{PS}{\sin Q_1} = \frac{QS}{\sin P}$ ✓M $\frac{PS}{\sin 35°} = \frac{545{,}6}{\sin 138°}$ ✓CA ✓CA $\therefore PS = \frac{\sin 35°(545{,}6)}{\sin 138°}$ $= 467{,}7$ m ✓CA (4)	1M sine rule 1 CA substitution 1M manipulation 1 CA solution

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Question 7	[18]

7.1

Const: Join CO and extend to D ✓construction

Proof: ✓S/R

In Δ ACO, $\hat{O}_1 = \hat{A} + \hat{C}_1$ (ext. ∠ of a Δ)

AO = OC (= radii)

but $\hat{A} = \hat{C}_1$ ✓S/R (∠'s opp = s's)

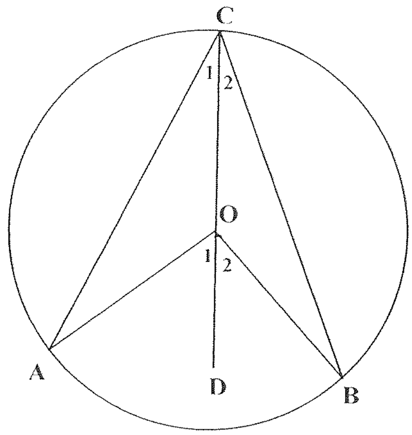
$\therefore \hat{O}_1 = 2\hat{C}_1$ ✓S

similarly $\hat{O}_2 = 2\hat{C}_2$ ✓S

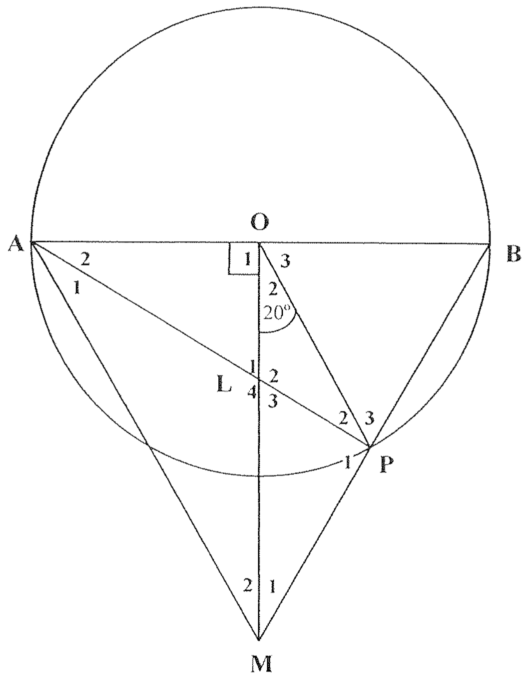
$\therefore \hat{O}_1 + \hat{O}_2 = 2\hat{C}_1 + 2\hat{C}_2$ ✓S

$= 2(\hat{C}_1 + \hat{C}_2)$

$\therefore A\hat{O}B = 2A\hat{C}B$ (6)



7.2



7.2.1(a)

$\hat{O}_3 = 70°$ ✓S

$\therefore \hat{A}_2 = 35°$ ✓S ✓R (∠at the centre = 2. ∠ at cir)

(3)

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7.2.1 (b)	$\hat{P}_2 + \hat{P}_3 = 90°$ ✓S (∠s in a semi-circle) ✓R $\therefore \hat{P}_1 = 90°$ ✓S/R (adj. ∠s on a st.line) **OR** (3)	$\hat{O}_3 = 70°$ ✓S/R (adj. supp. ∠'s) $\hat{P}_3 = \frac{110°}{2} = 55°$ ✓S/R (sum of ∠ s in a Δ) $\hat{P}_1 = \hat{A}_2$ (∠'s opp. == s's) $\therefore \hat{P}_1 = 90°$ ✓S/R (adj. supp ∠'s)
7.2.2	$\hat{O}_1 = 90°$ (given) $\hat{P}_1 = 90°$ (proved) ✓S/R ∴ AOPM is cyclic (= ∠s sub. by same line segment) ✓R **OR** $\therefore \hat{M}_1 = 180° - (90° + 55°)$ (∠'s in a Δ) $= 35°$ ✓S/R $\therefore \hat{A}_2 = \hat{M}_1$ (= 35°) ∴ AOPM is cyclic (= ∠sub. by same line segm.) ✓R (2)	
7.2.3	$\hat{M}_1 = 35°$ ✓S (∠'s in same segm.) ✓R (2)	
7.2.4	PBOL is cyclic quad. ✓S $\hat{P}_1 = \hat{O}_2 + \hat{O}_3 = 90°$ ✓R **OR** ext. ∠= int.opp. ∠ ✓R **OR** $\hat{O}_1 = \hat{P}_2 + \hat{P}_3 = 90°$ ✓R (2)	

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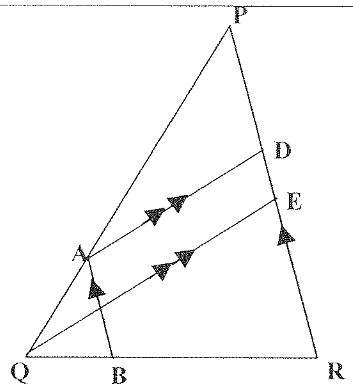
Question 8		[7]
		
8.1	In Δ PQR, AB // PR $\frac{QB}{QR} = \frac{2}{7}$ ✓S (line // to one side of a Δ) ✓R (2)	
8.2	In Δ PQE, AD // QE $\frac{PD}{DE} = \frac{PA}{AQ}$ (line // to one side of a Δ) ✓S/R $= \frac{5}{2} = \frac{5y}{2y}$ (given) ✓S ER = PE = 7y (given) ✓S $\frac{DE}{PR} = \frac{2y}{7y + 7y}$ ✓A $= \frac{1}{7}$ ✓A (5)	

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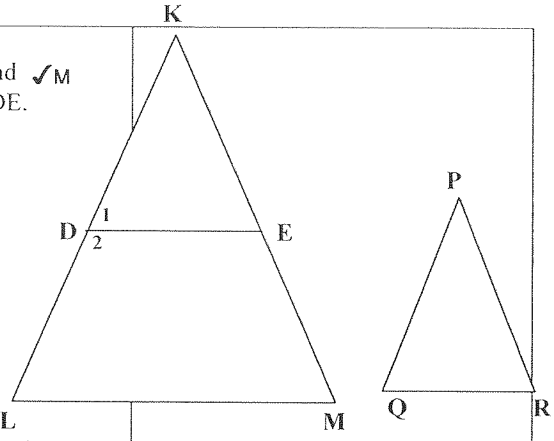
Question 9	[26]

9.1



Const: Mark a point D on KL such that KD = PQ and ✓M
E is a point on KM such that KE = PR. Join DE.

Proof: Δ KDE $\equiv$ Δ PQR (SAS) ✓S/R

$\therefore \hat{D}_1 = \hat{Q}$ ✓S ($\equiv$)

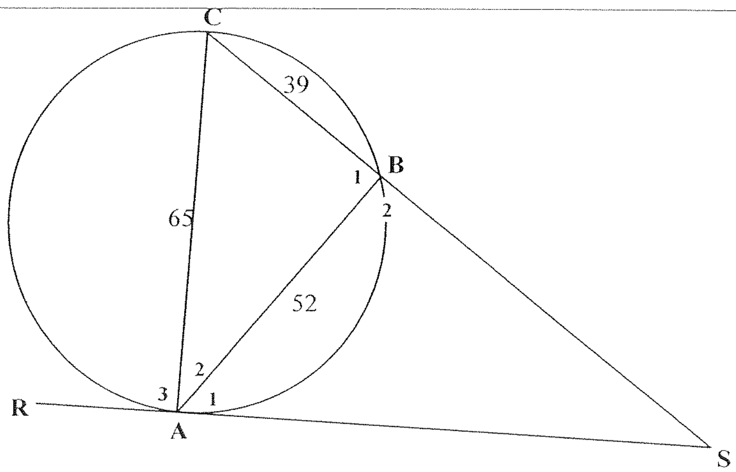
but $\hat{Q} = \hat{L}$ (given)

$\therefore \hat{D}_1 = \hat{L}$ ✓S

$\therefore$ DE // LM (corr. $\angle$s =) ✓S/R

$\frac{KL}{KD} = \frac{KM}{KE}$ ✓S (line // to one side of a Δ) ✓R

$\frac{KL}{PQ} = \frac{KM}{PR}$ (Const.) (7)



9.2.1 (a)

$AC^2 = 65^2 = 4225$ ✓S

$AB^2 + BC^2 = 52^2 + 39^2$

$= 4225 = AC^2$ ✓S

$\therefore \hat{B}_1 = 90°$ (converse of Pythagoras) ✓S/R (3)

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9.2.1 (b)	AC is the diameter of circle ABC ✓S (conv. ∠ in semi–circle) ✓R ∴ $C\hat{A}S = 90°$ ✓S (tan ⊥ diameter) ✓R ∴ CS is a diameter of circle through ACB (conv. ∠ in semi–circle) ✓R (5)	
9.2.1 (c)	In Δ BCA and Δ BAS $\hat{C} = \hat{A}_1$ ✓S (tan-chord) ✓R $\hat{B}_1 = \hat{B}_2 = 90°$ ✓S (proved) $\hat{A} = \hat{S}$ (sum of the ∠s of a Δ) Δ BAS /// Δ BCA (∠ ∠ ∠) ✓R (4)	
9.2.2	$\frac{BS}{BA} = \frac{BA}{BC}$ ✓S (∠ ∠ ∠) ✓R $\frac{BS}{52} = \frac{52}{39}$ ✓A $\therefore BS = \frac{52.52}{39} = 69,3$ ✓CA (4)	
9.2.3	In Δ ABC, $\cos C = \frac{BC}{AC}$ ✓S In Δ ACS, $\cos C = \frac{AC}{SC}$ ✓S $\cos C . \cos C = \frac{BC}{AC} . \frac{AC}{SC} = \frac{BC}{SC}$ ✓S **OR** LHS: $\cos^2 C = (\frac{AC}{CS})^2$ ✓S **OR** $\left(\frac{39}{65}\right)^2$ $= \left(\frac{65}{39 + 69,3}\right)^2 = 0,36$ ✓S RHS: $\frac{BC}{SC} = \frac{39}{39 + 69,3} = 0,36 = LHS$ ✓S (3)	

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