



KAMBALA

MATHEMATICS

2 UNIT

PRELIMINARY ASSESSMENT TASK #2

MAY 2004

Time Allowed: 50 minutes.

INSTRUCTIONS

- This task contains 3 questions of 14 marks each. Marks for each part question are shown.
- Answer all questions on the writing paper provided. Start each question on a new page.
- Calculators may be used.
- Show all necessary working.
- Marks may be deducted for careless or badly arranged work.

Question 1 (Start a new page)

14 Marks

- (a) A function is defined as follows:

$$f(x) = \begin{cases} x & \text{for } -3 \leq x \leq 3 \\ 2x - 3 & \text{for } 3 < x \leq 5. \end{cases}$$

Evaluate $f(-1) + f(3) + f(5)$.

1

- (a) The function $f(x)$ is given by $f(x) = x^2 - 7$.
Is $f(x)$ an odd or even function or neither? Give reasons for your answer.

2

- (a) If $f(x) = x^2 - 4x + 3$:

(i) Find $f(-1)$

1

(ii) Find the values of x for which $f(x) = 0$

2

(iii) Find the y -intercept of $f(x) = x^2 - 4x + 3$

1

(iv) Sketch $f(x) = x^2 - 4x + 3$ showing where it cuts the x and y axes

1

(iv) State the domain and range of $f(x) = x^2 - 4x + 3$

2

- (a) Sketch the curve $(x + 3)^2 + y^2 = 4$ on suitably labeled axes.

2

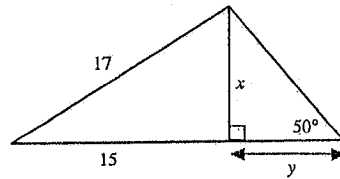
- (a) Sketch the graph of $y = |x| - 3$.

2

Question 2 (Start a new page)

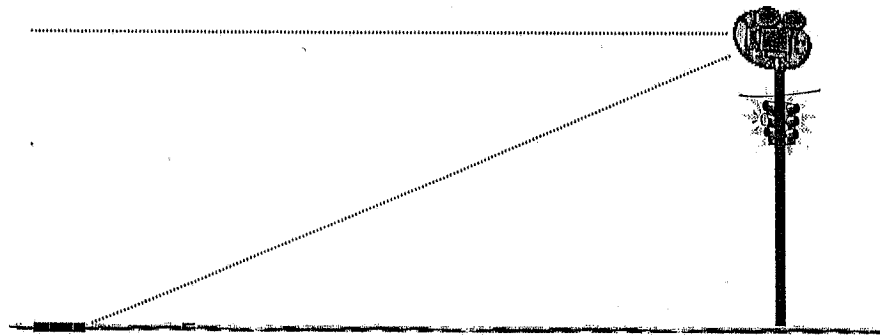
14 Marks

(a) Using the diagram below, find the value of:



- (i) x 2
 (ii) y (to 3 significant figures) 2

(b) The angle of depression from a red light camera mounted on a pole to the stop line of a set of traffic lights is 28° . The stop line is 12.25m from the base of the pole on flat ground.



- (i) Draw a diagram and mark in the above information 1
 (ii) How high above the ground is the red light camera? (to 1 dec.place) 2

(c) If $\tan \alpha = \frac{5}{12}$ and $\cos \alpha$ is negative, find the exact value of $\sin \alpha$. 2

(d) Solve $\sin \theta = 0.187$ for $0^\circ \leq \theta \leq 360^\circ$ giving ALL solutions correct to the nearest minute. 2

(e) Solve $\cos 2x = -\frac{\sqrt{3}}{2}$ for $0^\circ \leq x \leq 360^\circ$ giving ALL solutions. 3

Question 3 (Start a new page)

14 Marks

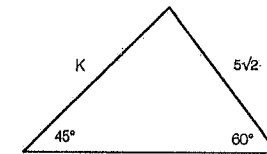
- (a) (i) Sketch a graph of $y = \cos x$ for $0^\circ \leq x \leq 360^\circ$ on suitably labelled axes. 3
 (ii) Mark the value of $\cos 240^\circ$ on the diagram. 1

(b) Find the exact value of $\operatorname{cosec} 330^\circ$ 1

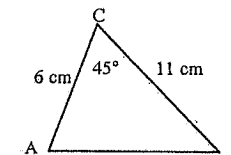
- (c) Simplify:
 (i) $\sin^2 70^\circ + \sin^2 20^\circ$ 1
 (ii) $\sin \theta \cot \theta \sec^2 \theta$ 1

(d) Prove that: $(1 + \tan^2 \theta) \cos^2 \theta = 1$ 2

(e) Using the diagram below, find the exact value of K . 3

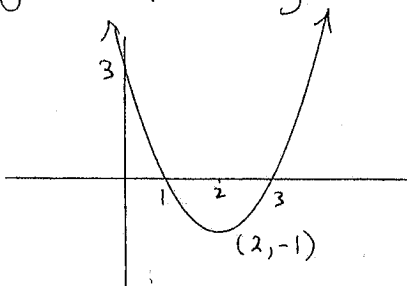


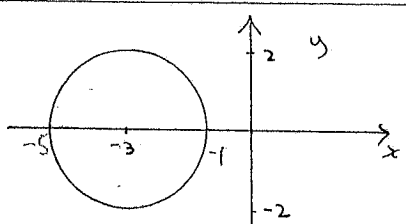
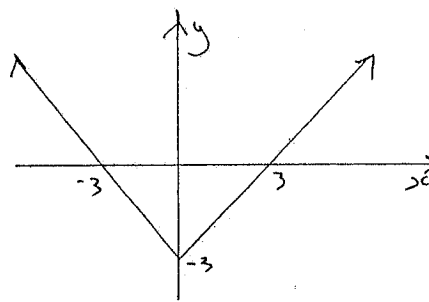
(f) In the diagram below, find the area of $\triangle ABC$, correct to the nearest cm^2 . 2



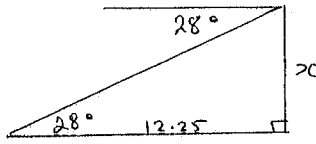

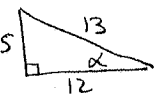

END OF TASK

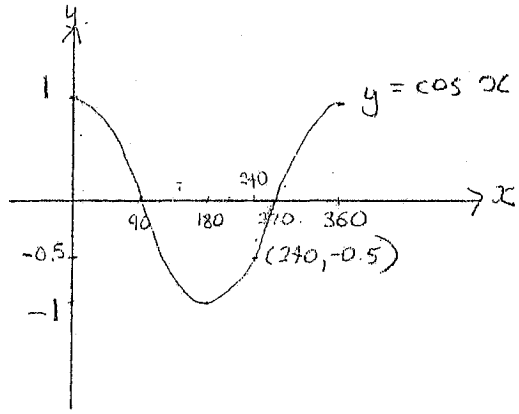
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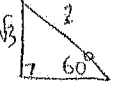
Qn	Solutions	Marks	Comments+Criteria
1(a)	$f(-1) + f(3) + f(5)$ $= -1 + 3 + 7 = 9$	1	
(b)	$f(x) = x^2 - 7$ $f(-a) = (-a)^2 - 7 = a^2 - 7$ $f(a) = a^2 - 7$ $\therefore f(-a) = f(a) \therefore$ even fu	1	
(c)	$f(x) = x^2 - 4x + 3$ (i) $f(-1) = (-1)^2 - 4(-1) + 3 = 8$ (ii) $f(x) = 0$ i.e. $x^2 - 4x + 3 = 0$ $(x-3)(x-1) = 0$ $x = 3, 1$ (iii) y-intercept is $y = 3$ (iv)  (v) D: $x \in \mathbb{R}$ R: $y \geq -1$	1	

Qn	Solutions	Marks	Comments+Criteria
1(a)		2	1mk Correct centre 1mk Drawn with correct radius and x and y intercepts correct
1(b)	$y = x - 3 \iff y + 3 = x $ $y = x - 3$ for $x \geq 0$ $y = -x - 3$ for $x < 0$ 	2	
2(a)	(i) $x^2 = 17^2 - 15^2$ $= 289 - 225$ $= 64$ $x = 8$ (ii) $\tan 50^\circ = \frac{x}{5}$ $y = \frac{8}{\tan 50^\circ}$ $= 6.712... \doteq 6.71$ (3sf)	1	

1mk off if incorrect rounding (only penalise 1x in paper)

Qn	Solutions	Marks	Comments+Criteria
2(b)	 $\tan 28^\circ = \frac{x}{12.25}$ $x = 12.25 \tan 28^\circ$ $= 6.513 \dots \text{ m}$ $\doteq 6.5 \text{ m (1dp)}$	1	
(c)	$\tan \alpha = \frac{5}{12} \quad \cos \alpha < 0$ $\therefore Q3 \quad \text{ie} \quad \sin \alpha < 0$   $\therefore \sin \alpha = -\frac{5}{13}$	1	1 for 5, 12, 13 Δ + sign
		1	1mk indicating 3rd Q and negative
		1	1mk for $\sin \alpha = \frac{5}{13}$ correct magnitude
(d)	$\sin \theta = 0.187$ $\theta = \sin^{-1} 0.187$ $= 10.777 \dots, 180 - 10.777 \dots$ $= 10^\circ 46' 39.93'', 180 - \text{etc}$ $\doteq 10^\circ 47', 169^\circ 13'$	2	1mk for acute solution 1mk for other angle
(e)	$\cos 2x = -\frac{\sqrt{3}}{2} \quad \text{ie} \quad \text{Q2/Q3}$ $0 \leq x \leq 360^\circ$ $0 \leq 2x \leq 720^\circ$ Related Acute angle 30° 	2	1mk for acute θ 1mk for correct solutions for $2x$ 1mk for correctly $\div 2$
	$\text{So } 2x = 180 - 30, 180 + 30, 540 - 30, 540 + 30$ $= 150, 210, 510, 570$ $\therefore x = 75, 105, 255, 285$	1	

Qn	Solutions	Marks	Comments+Criteria
2(c)	$2x = 150, 210, 510, 570$ $x = 75^\circ, 105^\circ, 255^\circ, 285^\circ$		
2(a)		3	1mk correct cos shape (sine wave) $\frac{1}{2}$ mk off for each key point plotted incorrectly
		1	Position on both axes doesn't have to be to scale Need correct quadrant
(b)	$\text{cosec } 330^\circ \quad \text{in Q4}$ $= \frac{1}{\sin 330^\circ}$ $= \frac{1}{-\sin 30^\circ} = -\frac{1}{2}$	1	1mk for recognising inverse of \sin $\frac{1}{2}$ mk for recognising relationship to 30°
(c)	$\text{(i)} \quad \sin^2 70^\circ + \sin^2 20^\circ$ $= \sin^2 70 + (\cos 70^\circ)^2$ $= 1$	1	
	$\text{(ii)} \quad \sin \theta \cot \theta \sec^2 \theta$ $= \sin \theta \cdot \frac{\cos \theta}{\sin \theta} \cdot \frac{1}{\cos^2 \theta}$ $= \frac{1}{\cos \theta} = \sec \theta$	1	

Qn	Solutions	Marks	Comments+Criteria
(d)	<p>RTP: $(1 + \tan^2 \theta) \cos^2 \theta = 1$</p> <p>Proof: LHS = $(1 + \tan^2 \theta) \cos^2 \theta$</p> $= \sec^2 \theta \cdot \cos^2 \theta$ $= \frac{1}{\cos^2 \theta} \cdot \cos^2 \theta$ $= 1 = \text{RHS}$	1 1	
(e)	<p>in Δ $\frac{K}{\sin 60^\circ} = \frac{5\sqrt{2}}{\sin 45^\circ}$</p> $\therefore K = \frac{5\sqrt{2} \sin 60^\circ}{\sin 45^\circ}$ <div style="display: flex; align-items: center;"> <div style="margin-right: 10px;">  </div> <div style="margin-right: 10px;"> $= 5\sqrt{2} \cdot \frac{\sqrt{3}}{2}$ </div> <div style="margin-right: 10px;"> $\frac{1}{\frac{1}{\sqrt{2}}}$ </div> <div style="margin-right: 10px;"> $= \frac{5\sqrt{6}}{2} \cdot \sqrt{2}$ </div> <div> $= \frac{5\sqrt{12}}{2} = 5\sqrt{3}$ </div> </div>	1 1	Correct substitution of values Fully correct simplification
(f)	<p>Area $\Delta ABC = \frac{1}{2} ab \sin C$</p> $= \frac{1}{2} \cdot 6 \cdot 11 \cdot \sin 45^\circ$ $= 33 \cdot \frac{1}{\sqrt{2}}$ $= 23.334 \dots$ $\approx 23 \text{ cm}^2$	1 1	no penalty for rounding error