St Catherine's School

Year: 10 Challenge
Subject: Advanced Mathematics
Time allowed: 1 hour

Date: April 2004

Name:

Directions to candidates:

- All questions are to be attempted.

- All necessary **working** must be shown in every question.
- Full marks may not be awarded for careless or badly arranged work.
- Approved calculators are required.

Section I; 10 Multiple choice questions (10 marks)
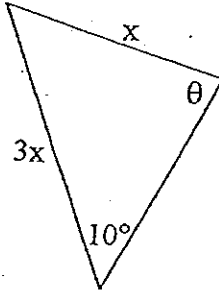Section II: 12 Questions (54 marks)

GOOD LUCK ☺

Section I:(10-Multiple Choice Questions)   (10 Marks)

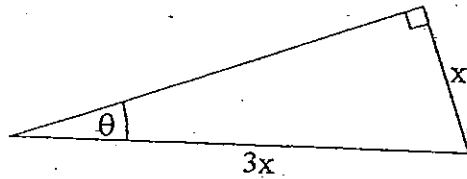**1.**

NOT TO SCALE

Which of the following must be true?

(A) $\theta = 30°$

(B) $\sin\theta = 3\sin 10°$

(C) $\sin\theta = \dfrac{\sin 10°}{3}$

(D) $\cos\theta = \dfrac{1}{3}$

2.

NOT TO SCALE

The size of angle θ is
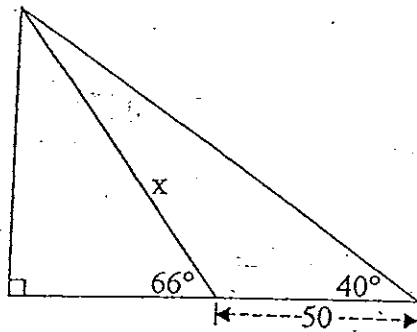
(A) $18°26'$ (B) $18°43'$ (C) $19°28'$ (D) $19°47'$
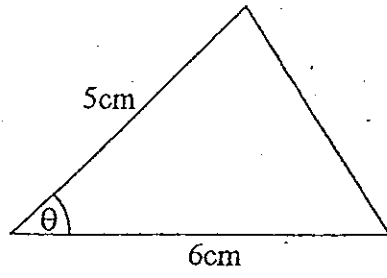

3.

NOT TO SCALE

Which of the following statements is true?

(A) $\dfrac{x}{\sin 40°} = \dfrac{50}{\sin 60°}$

(B) $\dfrac{x}{\sin 40°} = \dfrac{50}{\sin 26°}$

(C) $\dfrac{x}{\sin 66°} = \dfrac{50}{\sin 40°}$

(D) $\dfrac{x}{\sin 26°} = \dfrac{50}{\sin 40°}$

4.

5cm
θ
6cm
NOT TO SCALE

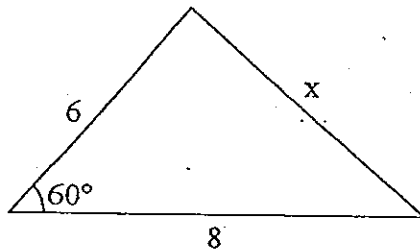Find the value of $\sin\theta$ if the area of this triangle is $10\,\text{cm}^2$

(A) $\dfrac{1}{3}$ (B) $\dfrac{2}{3}$ (C) $\dfrac{3}{2}$ (D) 3

5.

6
x
60°
8
NOT TO SCALE

The value of x is closest to

(A) 2.0   (B) 4.1   (C) 7.2   (D) 8.7

6.

$P\left(-\dfrac{3}{5},\ \dfrac{4}{5}\right)$
θ
O
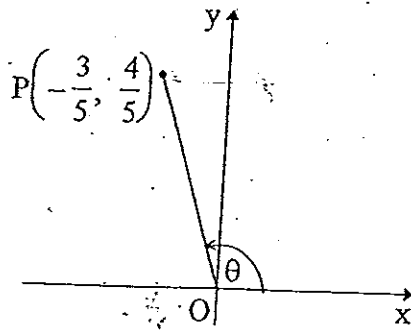
The value of $\sin\theta$ is

(A) $-\dfrac{4}{5}$ (B) $-\dfrac{3}{5}$ (C) $-\dfrac{3}{5}$ (D) $\dfrac{4}{5}$
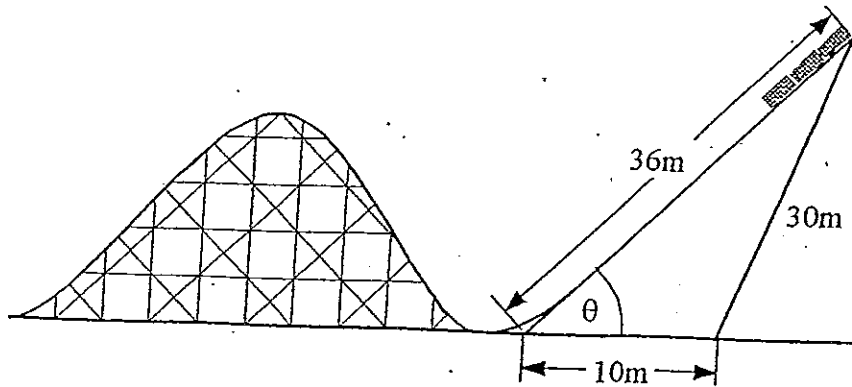
2

7.

FIGURE NOT TO SCALE

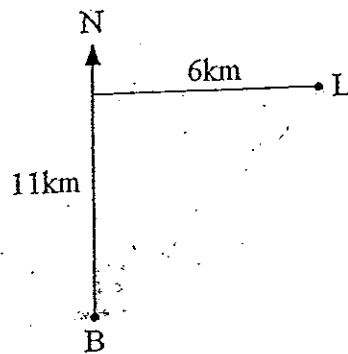The diagram shows a fun-park ride. The angle θ is closest to

(A) 46°　　　　　(B) 56°　　　　　(C) 72°　　　　　(D) 74°

8.

A bushwalker has walked 11km North from base B and then 6km in an easterly direction to a lookout at L.

What is the bearing of L from B (to the nearest degree)?

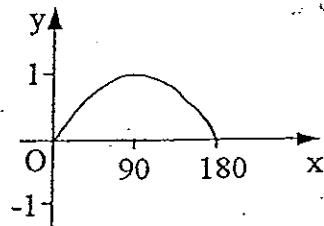(A) 029°　　　　　(B) 033°　　　　　(C) 057°　　　　　(D) 061°
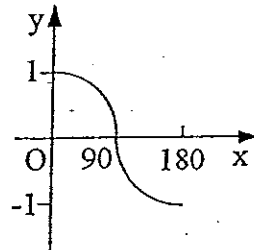
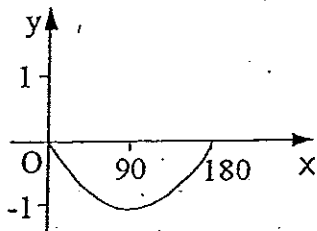9. Which is the graph of $y = \cos x$, where x is measured in degrees and $0° \le x \le 180°$?

(A)

(B)

(C)

(D)

10.

$\tan \theta =$
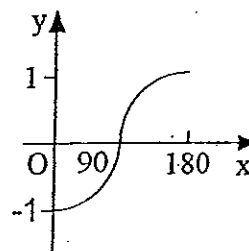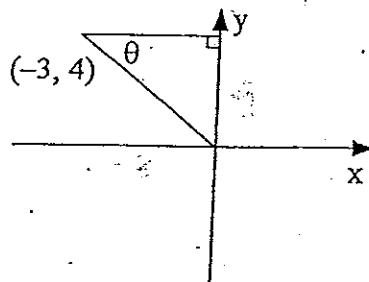
(A) $\dfrac{3}{4}$　　　(B) $\dfrac{4}{3}$　　　(C) $-\dfrac{3}{4}$　　　(D) $-\dfrac{4}{3}$

Section II:(Show all necessary working out)   (54 Marks)

1. Convert (i) 48 km/h to m/s   /2

    (ii) 20 kg/m^2 to g/cm^2 /2

_____

2. In a certain electrical circuit, the electric current 'i' (amps) varies inversely as the resistance R (ohms).

    (i)   What change in 'i' results from doubling R?   /3

    (ii)   If i = 2.0 amps when R = 60 ohms, find
            (a) i when R = 40 ohms   /3

            (b) R when i = 4.8 amps   /2

3. Express the following in the simplest exact form

   (i) $4\sin 60° \cos 60°$ /2

   (ii) $\dfrac{\tan 60°}{\tan 30°}$ /2

   (iii) $\dfrac{12\sin 45°}{\tan 45°}$ /3

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4. Simplify the following

   (i) $\dfrac{\sin(180° - \theta)}{\cos(90° - \theta)}$ /2

   (ii) $\dfrac{\sin(180° + \theta)}{\cos(180° + \theta)}$ /2

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5. Prove that $\cos x \operatorname{cosec} x \tan x = 1$ /2

6. Find the exact value of

   (i) $\cos 135°$ /2

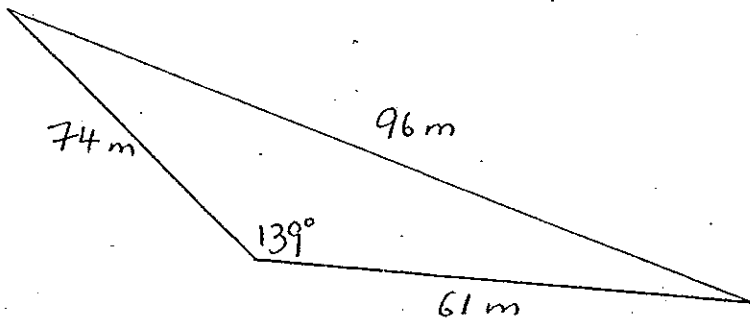   (ii) $\sin 300°$ /2

   (iii) $\tan 210°$ /2

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7. Find the area of the following triangle correct to 2 decimal places. /3

74 m   96 m   139°   61 m

7

8. Find the value of θ , for $0° \le \theta \le 360°$ (leave the answer to the nearest degree)

(i) $\sin \theta = \dfrac{\sqrt{3}}{2}$

/2

(ii) $\cos \theta = -0.6$

/2

9. Solve the following equation for $0° \le \theta \le 360°$
$2\sin \theta = 3\cos \theta$

·/3

10. If $\tan \beta = \dfrac{7}{24}$ and β is acute, find the exact values of
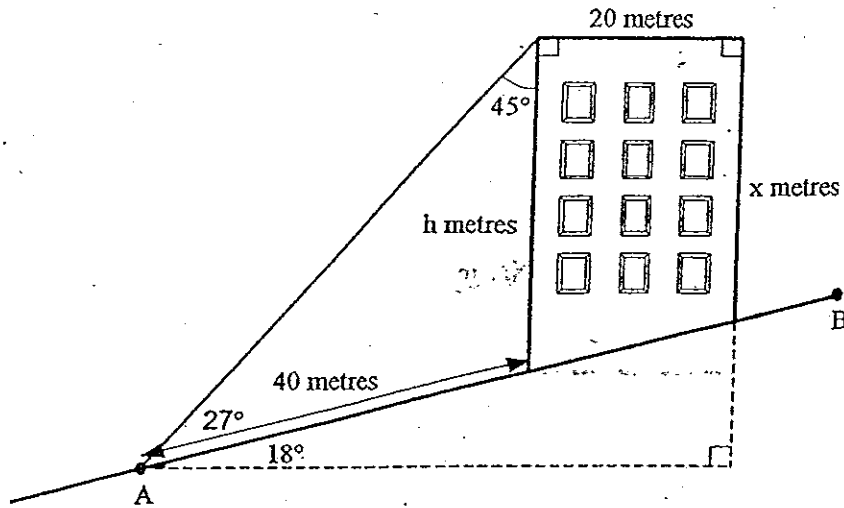
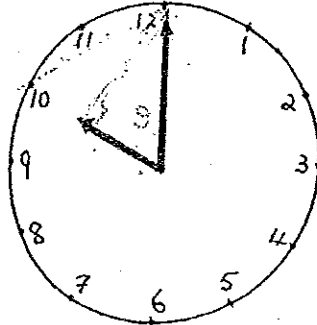(i) $\sec \beta$

/3

(ii) $\cot \beta$

/1

11.

NOT TO SCALE

The diagram shows a building on sloping ground AB.

(i)   Show that the height (h metres) of the taller side of the building is 25.68 metres.   /2
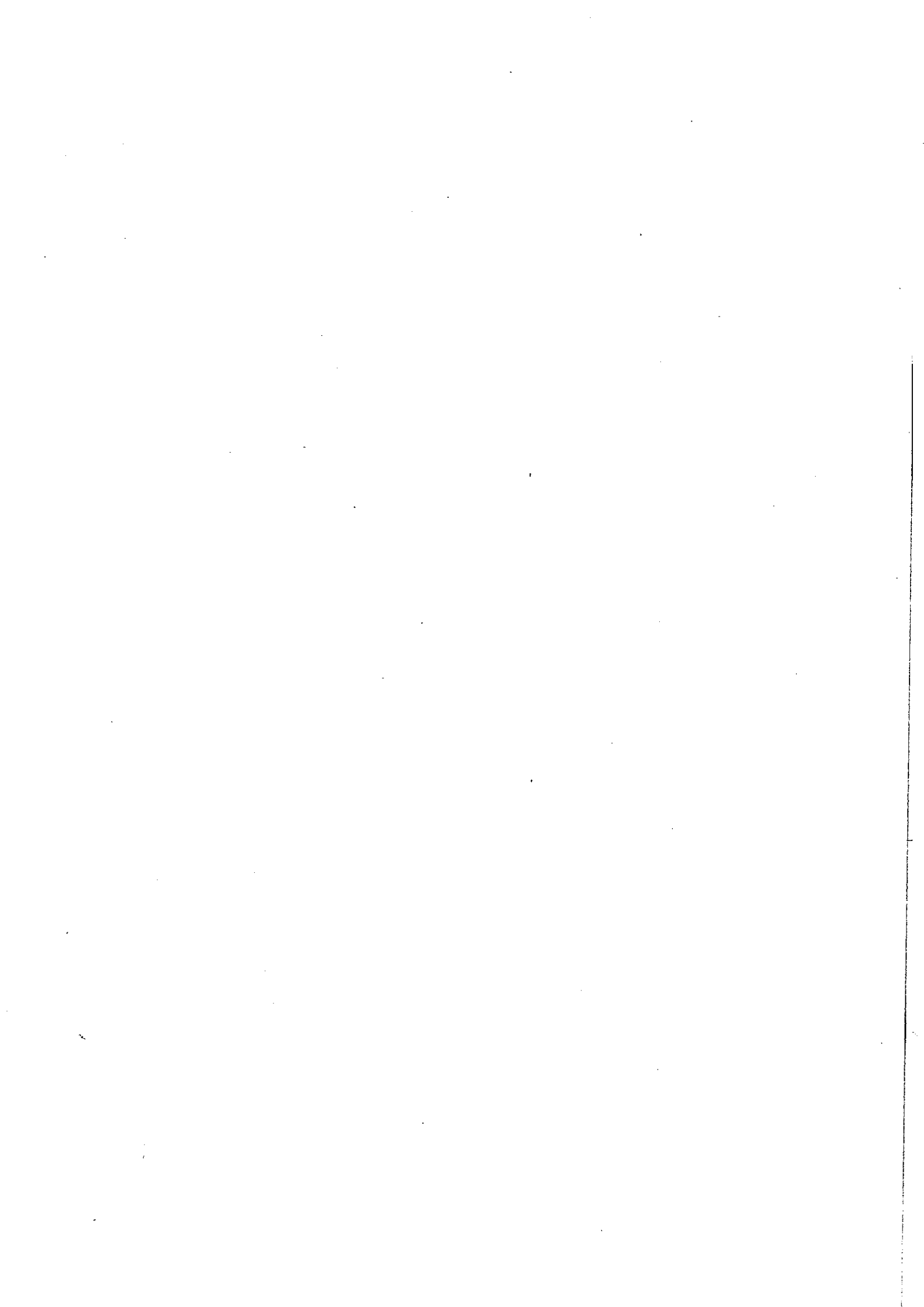
(ii)   Find the height (x metres) of the shorter side of the building .   /3

12. The diagram below shows the hands of a clock at 10 a.m.

(i) What is the angle between the hands? /1

(ii) If the minute and hour hands are of length 6cm, 4cm respectively, Calculate the distance between the tips of these hands, correct to the nearest mm. /3

END OF TEST
PLEASE CHECK YOUR WORK

ANSWERS TO ST CATHERINE'S APRIL 2004 TEST

1	B	2	C	3	B	4	B	5	C
6	D	7	A	8	A	9	B	10	D

SECTION II:

1 i	$13\frac{1}{3}$ m/s	**ii**	$2\,\text{g/cm}^2$	**2 i**	i is halved	**ii a**	3 amps	**b**	25 ohms
3 i	$\sqrt{3}$	**ii**	3	**iii**	$6\sqrt{2}$	**4 i**	1	**ii**	$\tan\theta$
5	Check ans	**6 i**	$-\dfrac{1}{\sqrt{2}}$	**ii**	$-\dfrac{\sqrt{3}}{2}$	**iii**	$\dfrac{1}{\sqrt{3}}$	**7**	$1480.73\ \text{m}^2$
8 i	$60^0, 120^0$	**ii**	$127^0, 233^0$	**9**	$56.3^0, 236.3^0$	**10 i**	$1\frac{1}{24}$	**ii**	$3\frac{3}{7}$
11 i	25.68 m	**ii**	19.18 m	**12 i**	60^0	**ii**	529 mm		

Updated on 17/8/06