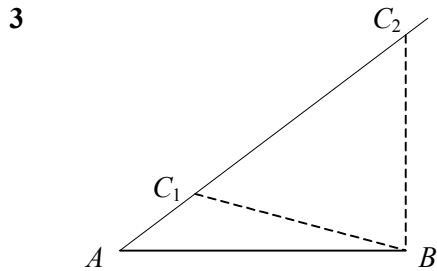


1 $\frac{AC}{\sin 118} = \frac{16}{\sin 26}$
 $AC = \frac{16 \times \sin 118}{\sin 26}$
 $= 32.2 \text{ cm}$

2 $\frac{\sin \angle PRQ}{8.2} = \frac{\sin 57}{11.4}$
 $\sin \angle PRQ = \frac{8.2 \times \sin 57}{11.4} = 0.6033$
 $\angle PRQ = 37.1^\circ$



$$\frac{\sin \angle ACB}{16.2} = \frac{\sin 37}{12.3}$$

$$\sin \angle ACB = \frac{16.2 \times \sin 37}{12.3} = 0.7926$$

$$\angle ACB = 52.4 \text{ or } 180 - 52.4 = 52.4 \text{ or } 127.6$$

$$\angle ABC = 180 - (37 + \angle ACB) = 90.568 \text{ or } 15.432$$

$$\frac{AC}{\sin \angle ABC} = \frac{12.3}{\sin 37}$$

$$AC = \frac{12.3 \times \sin \angle ABC}{\sin 37} = 20.4 \text{ or } 5.4$$

$\therefore \angle ACB = 52.4^\circ, AC = 20.4 \text{ cm}$ or $\angle ACB = 127.6^\circ, AC = 5.4 \text{ cm}$ (all 1dp)

4 $XZ^2 = 7.8^2 + 15.3^2$
 $- (2 \times 7.8 \times 15.3 \times \cos 31.5^\circ)$
 $= 91.422$
 $XZ = 9.56 \text{ cm}$ (3sf)

5 $18^2 = 13^2 + 17^2 - (2 \times 13 \times 17 \times \cos \angle ACB)$
 $\cos \angle ACB = \frac{13^2 + 17^2 - 18^2}{2 \times 13 \times 17}$
 $= 0.3032$
 $\angle ACB = 72.4^\circ$ (1dp)

6 a $\alpha = 180 - (40 + 32) = 108$

$$\frac{x}{\sin 108} = \frac{23.1}{\sin 40}$$

$$x = \frac{23.1 \times \sin 108}{\sin 40}$$

$$x = 34.2 \text{ cm}$$
 (3sf)

b $x^2 = 2.7^2 + 3.8^2$
 $- (2 \times 2.7 \times 3.8 \times \cos 83)$
 $x^2 = 19.229$
 $x = 4.39 \text{ m}$ (3sf)

c $\frac{\sin \alpha}{7.6} = \frac{\sin 61}{10.5}$
 $\sin \alpha = \frac{7.6 \times \sin 61}{10.5} = 0.6331$
 $\alpha = 39.276$
 $\beta = 180 - (61 + 39.276) = 79.724$
 $\frac{x}{\sin 79.724} = \frac{10.5}{\sin 61}$
 $x = \frac{10.5 \times \sin 79.724}{\sin 61}$
 $x = 11.8 \text{ cm}$ (3sf)

7 a $\frac{\sin \alpha}{67} = \frac{\sin 96.5}{92}$
 $\sin \alpha = \frac{67 \times \sin 96.5}{92}$
 $\sin \alpha = 0.7236$
 $\alpha = 46.351$
 $\theta = 180 - 96.5 - \alpha$
 $\theta = 37.1^\circ$ (1dp)

b $1.9^2 = 0.8^2 + 1.7^2$
 $- (2 \times 0.8 \times 1.7 \times \cos \theta)$
 $\cos \theta = \frac{0.8^2 + 1.7^2 - 1.9^2}{2 \times 0.8 \times 1.7}$
 $\cos \theta = -0.02941$
 $\theta = 91.7^\circ$ (1dp)

c $l^2 = 7.4^2 + 8.7^2$
 $- (2 \times 7.4 \times 8.7 \times \cos 43.7)$
 $l^2 = 37.3608, l = 6.1123$
 $\frac{\sin \theta}{7.4} = \frac{\sin 43.7}{6.1123}$
 $\sin \theta = \frac{7.4 \times \sin 43.7}{6.1123} = 0.8364$
 $\theta = 56.8^\circ$ (1dp)

8 a area

$$= \frac{1}{2} \times 2.1 \times 3.4 \times \sin 66$$

$$= 3.26 \text{ m}^2 \text{ (3sf)}$$

b area

$$= \frac{1}{2} \times 35 \times 68 \times \sin 116$$

$$= 1070 \text{ cm}^2 \text{ (3sf)}$$

c $\frac{\sin \alpha}{5.8} = \frac{\sin 72.4}{6.5}$

$$\sin \alpha = \frac{5.8 \times \sin 72.4}{6.5} = 0.8505$$

$$\alpha = 58.270$$

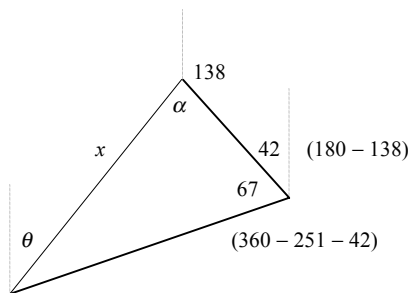
$$\beta = 180 - (72.4 + \alpha) = 49.330$$

area

$$= \frac{1}{2} \times 5.8 \times 6.5 \times \sin 49.330$$

$$= 14.3 \text{ cm}^2 \text{ (3sf)}$$

9



a $x^2 = 4.2^2 + 7.8^2 - (2 \times 4.2 \times 7.8 \times \cos 67)$

$$x^2 = 52.879$$

$$x = 7.27 \text{ miles (3sf)}$$

b $\frac{\sin \alpha}{7.8} = \frac{\sin 67}{7.2718}$

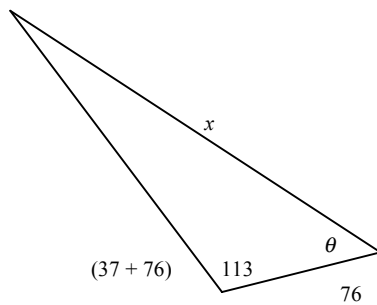
$$\sin \alpha = \frac{7.8 \times \sin 67}{7.2718} = 0.9874$$

$$\alpha = 80.882$$

$$\theta = 138 + \alpha - 180 = 38.882$$

$$\text{bearing} = 039^\circ \text{ (nearest degree)}$$

10



$$x^2 = 3.2^2 + 6.9^2 - (2 \times 3.2 \times 6.9 \times \cos 113)$$

$$x^2 = 75.105$$

$$x = 8.67 \text{ km (3sf)}$$

$$\frac{\sin \theta}{6.9} = \frac{\sin 113}{8.666}$$

$$\sin \theta = \frac{6.9 \times \sin 113}{8.666} = 0.7329$$

$$\theta = 47.130$$

$$\text{bearing} = 180 + 76 + \theta = 303^\circ \text{ (nearest degree)}$$

11 $9.7^2 = 10.4^2 + 11.0^2 - (2 \times 10.4 \times 11.0 \times \cos \angle BAC)$

$$\cos \angle BAC = \frac{10.4^2 + 11.0^2 - 9.7^2}{2 \times 10.4 \times 11.0} = 0.5903$$

$$\angle BAC = 53.819$$

$$\text{area} = \frac{1}{2} \times 10.4 \times 11.0 \times \sin 53.819 = 46.2 \text{ cm}^2$$

12 $\frac{1}{2} \times 22.5 \times YZ \times \sin 34 = 100$

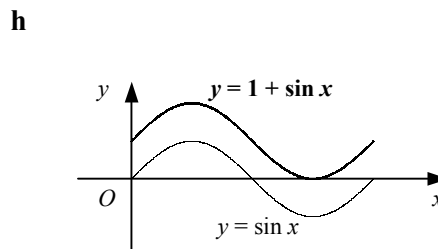
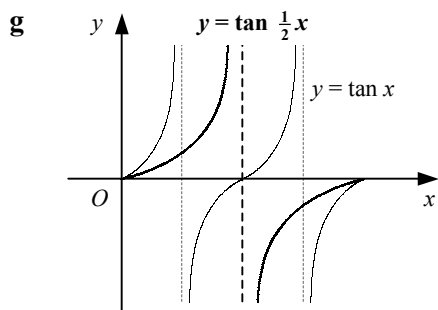
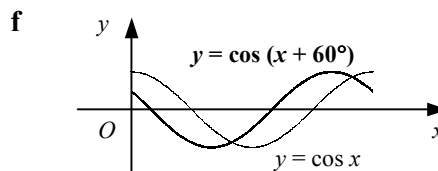
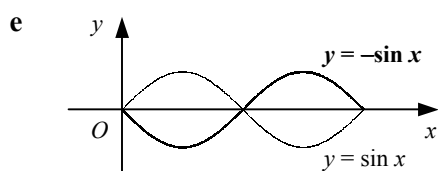
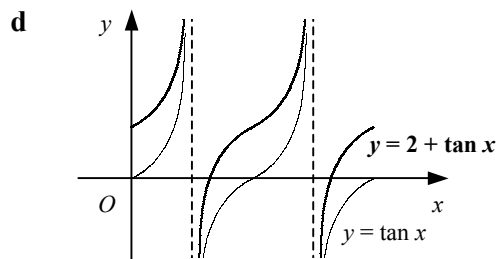
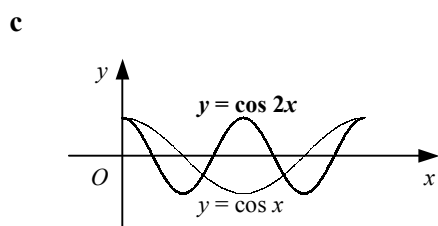
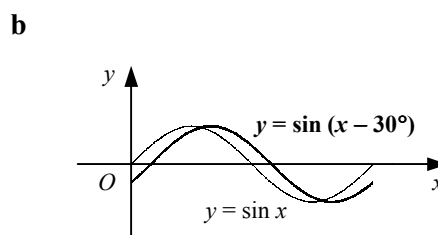
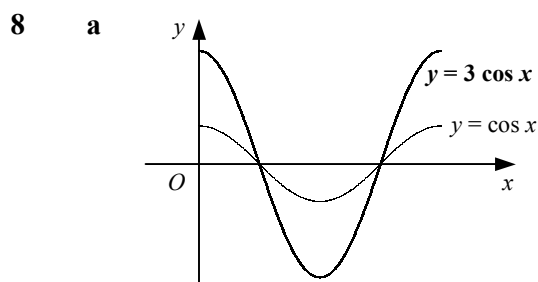
$$YZ = \frac{200}{22.5 \times \sin 34} = 15.896$$

$$XZ^2 = 22.5^2 + 15.896^2 - (2 \times 22.5 \times 15.896 \times \cos 34)$$

$$= 165.906$$

$$XZ = 12.9 \text{ cm (3sf)}$$

- 1 **a** 0.755 **b** -0.354 **c** 0.530 **d** -0.255
- 2 **a** $= \frac{1}{2}$ **b** $= \frac{1}{\sqrt{2}}$ **c** = 1 **d** $= \frac{\sqrt{3}}{2}$
e = 1 **f** $= \frac{1}{\sqrt{3}}$ **g** $= -\cos 60^\circ = -\frac{1}{2}$ **h** $= \sin 45^\circ = \frac{1}{\sqrt{2}}$
i $= \tan 30^\circ = \frac{1}{\sqrt{3}}$ **j** $= -\cos 45^\circ = -\frac{1}{\sqrt{2}}$ **k** $= -\sin 60^\circ = -\frac{\sqrt{3}}{2}$ **l** $= -\tan 60^\circ = -\sqrt{3}$
m $= \cos 30^\circ = \frac{\sqrt{3}}{2}$ **n** $= -\tan 30^\circ = -\frac{1}{\sqrt{3}}$ **o** $= \cos 60^\circ = \frac{1}{2}$ **p** $= \sin 45^\circ = \frac{1}{\sqrt{2}}$
q $= -\tan 45^\circ = -1$ **r** $= \sin 60^\circ = \frac{\sqrt{3}}{2}$ **s** $= \tan 30^\circ = \frac{1}{\sqrt{3}}$ **t** $= -\cos 30^\circ = -\frac{\sqrt{3}}{2}$
- 3 **a** 0.913 **b** -0.851 **c** 0.042 **d** 0.252
- 4 **a** $= \frac{1}{2}$ **b** = 0 **c** $= \frac{1}{\sqrt{2}}$ **d** $= \sqrt{3}$
e $= \frac{1}{2}$ **f** $= \sin \frac{\pi}{3} = \frac{\sqrt{3}}{2}$ **g** $= -\tan \frac{\pi}{4} = -1$ **h** $= -\cos \frac{\pi}{6} = -\frac{\sqrt{3}}{2}$
i $= -\tan \frac{\pi}{3} = -\sqrt{3}$ **j** $= -\cos \frac{\pi}{4} = -\frac{1}{\sqrt{2}}$ **k** $= -\sin \frac{\pi}{6} = -\frac{1}{2}$ **l** $= \tan \frac{\pi}{6} = \frac{1}{\sqrt{3}}$
m $= \sin 0 = 0$ **n** $= -\tan \frac{\pi}{4} = -1$ **o** $= -\cos \frac{\pi}{3} = -\frac{1}{2}$ **p** $= -\sin \frac{\pi}{3} = -\frac{\sqrt{3}}{2}$
- 5 **a** (0, 0), (180, 0), (360, 0), (540, 0), (720, 0)
b (90, 1), (270, -1), (450, 1), (630, -1)
- 6 **a** (0, 0), (180, 0), (360, 0), (540, 0), (720, 0)
b $x = 90, x = 270, x = 450, x = 630$
- 7 **a** stretch by a factor of 3 in the y -direction about the x -axis
b stretch by a factor of $\frac{1}{4}$ in the x -direction about the y -axis
c translation by 60 units in the negative x -direction
d reflection in the y -axis



9 a $(-90^\circ, -2), (90^\circ, 2)$

b $(-180^\circ, 1), (0, 3), (180^\circ, 1)$

c $(-150^\circ, -1), (-90^\circ, 1), (-30^\circ, -1), (30^\circ, 1), (90^\circ, -1), (150^\circ, 1)$

d $(-135^\circ, -1), (45^\circ, 1)$

10 a 360°

b 180°

c 360°

d 180°

e 180°

f 1080°

