

1 (1)  $\sin \theta = \frac{BC}{AB} = \frac{\sqrt{5}}{3}$ ,  $\cos \theta = \frac{AC}{AB} = \frac{2}{3}$ ,  $\tan \theta = \frac{BC}{AC} = \frac{\sqrt{5}}{2}$

(2)  $\sin \theta = \frac{BC}{AB} = \frac{8}{10} = \frac{4}{5}$ ,  $\cos \theta = \frac{AC}{AB} = \frac{6}{10} = \frac{3}{5}$ ,  $\tan \theta = \frac{BC}{AC} = \frac{8}{6} = \frac{4}{3}$

(3)  $AB = \sqrt{5^2 + 5^2} = \sqrt{50} = 5\sqrt{2}$  であるから  
 $\sin \theta = \frac{BC}{AB} = \frac{5}{5\sqrt{2}} = \frac{1}{\sqrt{2}}$ ,  $\cos \theta = \frac{AC}{AB} = \frac{5}{5\sqrt{2}} = \frac{1}{\sqrt{2}}$ ,  $\tan \theta = \frac{BC}{AC} = \frac{5}{5} = 1$

(4)  $AC = \sqrt{(\sqrt{13})^2 - 2^2} = \sqrt{9} = 3$  であるから  
 $\sin \theta = \frac{BC}{AB} = \frac{2}{\sqrt{13}}$ ,  $\cos \theta = \frac{AC}{AB} = \frac{3}{\sqrt{13}}$ ,  $\tan \theta = \frac{BC}{AC} = \frac{2}{3}$

(1)  $\sin \theta = \frac{BC}{AB} = \frac{\sqrt{7}}{4}$   
 $\cos \theta = \frac{AC}{AB} = \frac{3}{4}$   
 $\tan \theta = \frac{BC}{AC} = \frac{\sqrt{7}}{3}$

(2)  $\sin \theta = \frac{BC}{AB} = \frac{8}{10} = \frac{4}{5}$   
 $\cos \theta = \frac{AC}{AB} = \frac{6}{10} = \frac{3}{5}$   
 $\tan \theta = \frac{BC}{AC} = \frac{8}{6} = \frac{4}{3}$

(3)  $AB = \sqrt{(\sqrt{3})^2 + 1^2} = \sqrt{4} = 2$  であるから  
 $\sin \theta = \frac{BC}{AB} = \frac{\sqrt{3}}{2}$   
 $\cos \theta = \frac{AC}{AB} = \frac{1}{2}$   
 $\tan \theta = \frac{BC}{AC} = \frac{\sqrt{3}}{1} = \sqrt{3}$

(4)  $AC = \sqrt{(\sqrt{13})^2 - 2^2} = \sqrt{9} = 3$  であるから  
 $\sin \theta = \frac{BC}{AB} = \frac{2}{\sqrt{13}}$   
 $\cos \theta = \frac{AC}{AB} = \frac{3}{\sqrt{13}}$   
 $\tan \theta = \frac{BC}{AC} = \frac{2}{3}$

(1)  $\sin \theta = \frac{BC}{AB} = \frac{8}{10} = \frac{4}{5}$ ,  
 $\cos \theta = \frac{AC}{AB} = \frac{6}{10} = \frac{3}{5}$ ,  
 $\tan \theta = \frac{BC}{AC} = \frac{8}{6} = \frac{4}{3}$

(2)  $\sin \theta = \frac{BC}{AB} = \frac{\sqrt{11}}{6}$ ,  
 $\cos \theta = \frac{AC}{AB} = \frac{5}{6}$ ,  
 $\tan \theta = \frac{BC}{AC} = \frac{\sqrt{11}}{5}$

(3)  $AB = \sqrt{5^2 + 5^2} = \sqrt{50} = 5\sqrt{2}$  であるから  
 $\sin \theta = \frac{BC}{AB} = \frac{5}{5\sqrt{2}} = \frac{1}{\sqrt{2}}$ ,  
 $\cos \theta = \frac{AC}{AB} = \frac{5}{5\sqrt{2}} = \frac{1}{\sqrt{2}}$ ,  
 $\tan \theta = \frac{BC}{AC} = \frac{5}{5} = 1$

(4)  $AC = \sqrt{(\sqrt{13})^2 - 2^2} = \sqrt{9} = 3$  であるから  
 $\sin \theta = \frac{BC}{AB} = \frac{2}{\sqrt{13}}$ ,  
 $\cos \theta = \frac{AC}{AB} = \frac{3}{\sqrt{13}}$ ,  
 $\tan \theta = \frac{BC}{AC} = \frac{2}{3}$

$\sin \theta = \frac{BC}{AB} = \frac{8}{17}$      $\cos \theta = \frac{AC}{AB} = \frac{15}{17}$      $\tan \theta = \frac{BC}{AC} = \frac{8}{15}$

2 (1) 0.4067    (2) 0.9903    (3) 7.1154

3 (1) 図から  $\sin \theta = \frac{5}{8} = 0.625$   
 三角比の表から,  $\sin \theta$  の値が 0.625 に近い  $\theta$  を求めると  $\theta \approx 39^\circ$

(2) 図から  $\tan \theta = \frac{6}{5} = 1.2$   
 三角比の表から,  $\tan \theta$  の値が 1.2 に近い  $\theta$  を求めると  $\theta \approx 50^\circ$

(1)  $\cos \theta = \frac{7}{8} = 0.875$  よって, 三角比の表から  $\theta \approx 29^\circ$

(2)  $\tan \theta = \frac{6}{5} = 1.2$  よって, 三角比の表から  $\theta \approx 50^\circ$

(3)  $\sin \theta = \frac{11}{13} = 0.846 \dots\dots$  よって, 三角比の表から  $\theta \approx 58^\circ$

4 (1)  $\sin 40^\circ = \frac{x}{10}$  であるから  
 $x = 10 \times \sin 40^\circ = 10 \times 0.6428 = 6.428$   
 $\cos 40^\circ = \frac{y}{10}$  であるから  
 $y = 10 \times \cos 40^\circ = 10 \times 0.7660 = 7.66$

(2)  $\sin 70^\circ = \frac{x}{8}$  であるから  
 $x = 8 \times \sin 70^\circ = 8 \times 0.9397 = 7.5176$   
 $\cos 70^\circ = \frac{y}{8}$  であるから  
 $y = 8 \times \cos 70^\circ = 8 \times 0.3420 = 2.736$

(1)  $\cos 37^\circ = \frac{x}{5}$  であるから  
 $x = 5 \times \cos 37^\circ = 5 \times 0.7986 = 3.993$   
 $\sin 37^\circ = \frac{y}{5}$  であるから  
 $y = 5 \times \sin 37^\circ = 5 \times 0.6018 = 3.009$

(2)  $\tan 42^\circ = \frac{x}{8}$  であるから  
 $x = 8 \times \tan 42^\circ = 8 \times 0.9004 = 7.2032$

(3)  $\sin 24^\circ = \frac{x}{6}$  であるから  
 $x = 6 \times \sin 24^\circ = 6 \times 0.4067 = 2.4402$

5 図において,  $\tan 27^\circ = \frac{BC}{AC}$  であるから  
 $BC = AC \times \tan 27^\circ = 500 \times 0.5095 = 254.75$   
 よって, 塔の高さは 255 m

6 (1)  $\sin 48^\circ = \sin(90^\circ - 42^\circ) = \cos 42^\circ$   
 (2)  $\cos 69^\circ = \cos(90^\circ - 21^\circ) = \sin 21^\circ$   
 (3)  $\tan 55^\circ = \tan(90^\circ - 35^\circ) = \frac{1}{\tan 35^\circ}$

(1)  $\sin 54^\circ = \sin(90^\circ - 36^\circ) = \cos 36^\circ$   
 (2)  $\cos 61^\circ = \cos(90^\circ - 29^\circ) = \sin 29^\circ$   
 (3)  $\tan 55^\circ = \tan(90^\circ - 35^\circ) = \frac{1}{\tan 35^\circ}$

7 (1)  $\sin^2 \theta + \cos^2 \theta = 1$  から  
 $\cos^2 \theta = 1 - \sin^2 \theta = 1 - \left(\frac{1}{2}\right)^2 = \frac{3}{4}$   
 $\cos \theta > 0$  であるから  
 $\cos \theta = \sqrt{\frac{3}{4}} = \frac{\sqrt{3}}{2}$   
 また  $\tan \theta = \frac{\sin \theta}{\cos \theta} = \frac{1}{2} \div \frac{\sqrt{3}}{2} = \frac{1}{2} \times \frac{2}{\sqrt{3}} = \frac{1}{\sqrt{3}}$

(2)  $\sin^2 \theta + \cos^2 \theta = 1$  から  
 $\sin^2 \theta = 1 - \cos^2 \theta = 1 - \left(\frac{3}{5}\right)^2 = \frac{16}{25}$   
 $\sin \theta > 0$  であるから  
 $\sin \theta = \sqrt{\frac{16}{25}} = \frac{4}{5}$   
 また  $\tan \theta = \frac{\sin \theta}{\cos \theta} = \frac{4}{5} \div \frac{3}{5} = \frac{4}{5} \times \frac{5}{3} = \frac{4}{3}$

(3)  $1 + \tan^2 \theta = \frac{1}{\cos^2 \theta}$  から

$$1 + 3^2 = \frac{1}{\cos^2 \theta}$$

よって  $\cos^2 \theta = \frac{1}{10}$

$\cos \theta > 0$  であるから  $\cos \theta = \sqrt{\frac{1}{10}} = \frac{1}{\sqrt{10}}$

$\tan \theta = \frac{\sin \theta}{\cos \theta}$  より

$$\sin \theta = \tan \theta \times \cos \theta = 3 \times \frac{1}{\sqrt{10}} = \frac{3}{\sqrt{10}}$$

$\sin^2 \theta + \cos^2 \theta = 1$  から

$$\cos^2 \theta = 1 - \sin^2 \theta = 1 - \left(\frac{3}{4}\right)^2 = \frac{7}{16}$$

$\cos \theta > 0$  であるから  $\cos \theta = \sqrt{\frac{7}{16}} = \frac{\sqrt{7}}{4}$

また  $\tan \theta = \frac{\sin \theta}{\cos \theta} = \frac{3}{4} \div \frac{\sqrt{7}}{4} = \frac{3}{4} \times \frac{4}{\sqrt{7}} = \frac{3}{\sqrt{7}}$

$\sin^2 \theta + \cos^2 \theta = 1$  から

$$\sin^2 \theta = 1 - \cos^2 \theta = 1 - \left(\frac{4}{5}\right)^2 = \frac{9}{25}$$

$\sin \theta > 0$  であるから  $\sin \theta = \sqrt{\frac{9}{25}} = \frac{3}{5}$

また  $\tan \theta = \frac{\sin \theta}{\cos \theta} = \frac{3}{5} \div \frac{4}{5} = \frac{3}{5} \times \frac{5}{4} = \frac{3}{4}$

$1 + \tan^2 \theta = \frac{1}{\cos^2 \theta}$  から  $1 + 3^2 = \frac{1}{\cos^2 \theta}$

よって  $\cos^2 \theta = \frac{1}{10}$

$\cos \theta > 0$  であるから  $\cos \theta = \sqrt{\frac{1}{10}} = \frac{1}{\sqrt{10}}$

$\tan \theta = \frac{\sin \theta}{\cos \theta}$  より  $\sin \theta = \tan \theta \times \cos \theta = 3 \times \frac{1}{\sqrt{10}} = \frac{3}{\sqrt{10}}$

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$\theta$	$0^\circ$	$30^\circ$	$45^\circ$	$60^\circ$	$90^\circ$	$120^\circ$	$135^\circ$	$150^\circ$	$180^\circ$
$\sin \theta$	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0
$\cos \theta$	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0	$-\frac{1}{2}$	$-\frac{1}{\sqrt{2}}$	$-\frac{\sqrt{3}}{2}$	-1
$\tan \theta$	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	/	$-\sqrt{3}$	-1	$-\frac{1}{\sqrt{3}}$	0

9 (1)  $\sin 130^\circ = \sin(180^\circ - 50^\circ) = \sin 50^\circ = 0.7660$

(2)  $\cos 178^\circ = \cos(180^\circ - 2^\circ) = -\cos 2^\circ = -0.9994$

(3)  $\tan 159^\circ = \tan(180^\circ - 21^\circ) = -\tan 21^\circ = -0.3839$

(1)  $\sin 145^\circ = \sin(180^\circ - 35^\circ) = \sin 35^\circ = 0.5736$

**別解**  $\sin 145^\circ = \sin(90^\circ + 55^\circ) = \cos 55^\circ = 0.5736$

(2)  $\cos 168^\circ = \cos(180^\circ - 12^\circ) = -\cos 12^\circ = -0.9781$

**別解**  $\cos 168^\circ = \cos(90^\circ + 78^\circ) = -\sin 78^\circ = -0.9781$

(3)  $\tan 159^\circ = \tan(180^\circ - 21^\circ) = -\tan 21^\circ = -0.3839$

10 (1)  $\sin \theta = \frac{1}{\sqrt{2}}$  を満たす  $\theta$  は、表より  $\theta = 45^\circ, 135^\circ$

(2)  $\cos \theta = -\frac{\sqrt{3}}{2}$  を満たす  $\theta$  は、表より  $\theta = 150^\circ$

(3)  $\tan \theta = -1$  を満たす  $\theta$  は、表より  $\theta = 135^\circ$

(1)  $\sin \theta = \frac{1}{2}$  を満たす  $\theta$  は、表より  $\theta = 30^\circ, 150^\circ$

(2)  $\cos \theta = \frac{1}{\sqrt{2}}$  を満たす  $\theta$  は、表より  $\theta = 45^\circ$

(3)  $\tan \theta = -\frac{1}{\sqrt{3}}$  を満たす  $\theta$  は、表より  $\theta = 150^\circ$

11  $\cos^2 \theta = 1 - \sin^2 \theta = 1 - \left(\frac{1}{3}\right)^2 = \frac{8}{9}$

$90^\circ \leq \theta \leq 180^\circ$  のとき、 $\cos \theta \leq 0$  であるから

$$\cos \theta = -\sqrt{\frac{8}{9}} = -\frac{2\sqrt{2}}{3}$$

また  $\tan \theta = \frac{\sin \theta}{\cos \theta} = \frac{1}{3} \div \left(-\frac{2\sqrt{2}}{3}\right) = -\frac{1}{2\sqrt{2}} = -\frac{\sqrt{2}}{4}$

(1)  $\sin^2 \theta + \cos^2 \theta = 1$  から  $\cos^2 \theta = 1 - \sin^2 \theta = 1 - \left(\frac{3}{4}\right)^2 = \frac{7}{16}$

$90^\circ \leq \theta \leq 180^\circ$  のとき、 $\cos \theta \leq 0$  であるから

$$\cos \theta = -\sqrt{\frac{7}{16}} = -\frac{\sqrt{7}}{4}$$

$$\tan \theta = \frac{\sin \theta}{\cos \theta} = \frac{3}{4} \div \left(-\frac{\sqrt{7}}{4}\right) = \frac{3}{4} \times \left(-\frac{4}{\sqrt{7}}\right) = -\frac{3}{\sqrt{7}}$$

(2)  $\sin^2 \theta + \cos^2 \theta = 1$  から  $\sin^2 \theta = 1 - \cos^2 \theta = 1 - \left(-\frac{1}{2}\right)^2 = \frac{3}{4}$

$\sin \theta \geq 0$  であるから  $\sin \theta = \sqrt{\frac{3}{4}} = \frac{\sqrt{3}}{2}$

また  $\tan \theta = \frac{\sin \theta}{\cos \theta} = \frac{\sqrt{3}}{2} \div \left(-\frac{1}{2}\right) = \frac{\sqrt{3}}{2} \times (-2) = -\sqrt{3}$

**参考**  $\theta = 120^\circ$  である。

(3)  $\frac{1}{\cos^2 \theta} = 1 + \tan^2 \theta = 1 + (-3)^2 = 10$

よって  $\cos^2 \theta = \frac{1}{10}$

$90^\circ \leq \theta \leq 180^\circ$  のとき、 $\cos \theta \leq 0$  であるから  $\cos \theta = -\sqrt{\frac{1}{10}} = -\frac{1}{\sqrt{10}}$

また  $\sin \theta = \tan \theta \times \cos \theta = -3 \times \left(-\frac{1}{\sqrt{10}}\right) = \frac{3}{\sqrt{10}}$