Foundation stage 1:

1. Find the following rules for the given triangle by using

    $$\cos ec\theta = \frac{1}{\sin\theta}, sec\theta = \frac{1}{\cos\theta} \text{ and } \cot\theta = \frac{1}{\tan\theta}:$$

    (a) $\sin\alpha$ (g) $\cos ec\alpha$
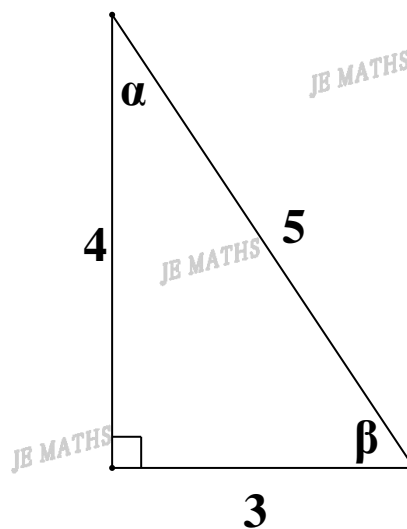
    (b) $\cos\alpha$ (h) $\sec\alpha$

    (c) $\tan\alpha$ (i) $\cot\alpha$

    (d) $\sin\beta$ (j) $\cos ec\beta$

    (e) $\cos\beta$ (k) $\sec\beta$

    (f) $\tan\beta$ (l) $\cot\beta$

2. Use your calculator to find the following trigonometric ratio in 4 decimal places:
    (a) $\sin 37°$ (b) $\sin 37°35'$

    (c) $\cos 37.5°$ (d) $\cos 37°5'$

    (e) $\tan 1°$ (f) $\tan 1'$ (in sci)

3. Use a calculator to find the following missing **acute** angle to the nearest degree if necessary:
    (a) $\sin\theta = 0.777$ (b) $\cos\theta = 7$

    (c) $\tan\theta = 7$ (d) $\sin\theta = \frac{7}{7}$

4. Use a calculator to find the following missing **acute** angle to the nearest minute if necessary:
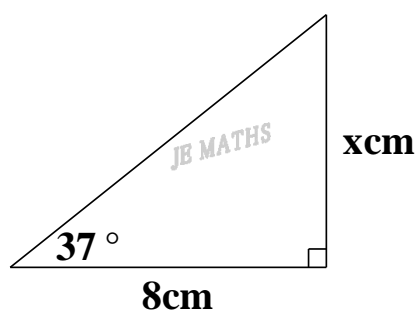
(a) $\sin\theta = 0.666$
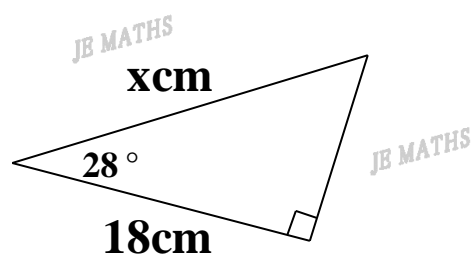
(b) $\cos\theta = \dfrac{2}{3}$

(c) $\tan\theta = 1.5$

(d) $\cos\theta = \dfrac{0}{1}$

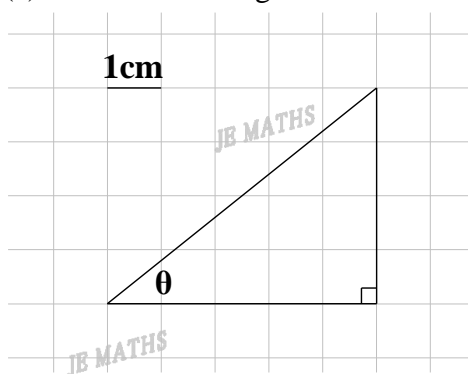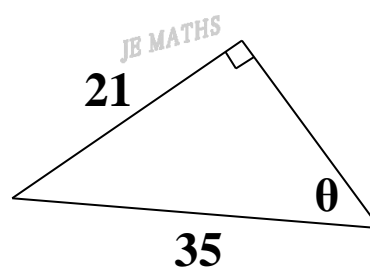5. Find the value of the missing side to one decimal place:

(a)

xcm

37°

8cm

(b)

xcm

28°

18cm

6. Find the value of the missing angle
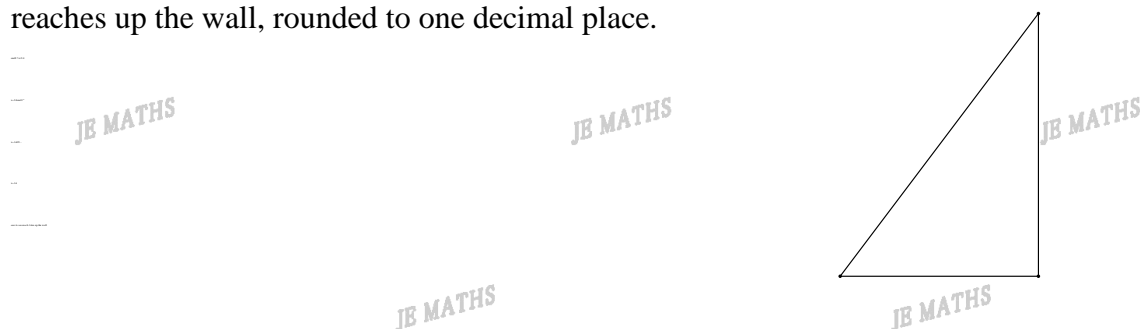(a) to the nearest degree.

1cm

θ

(b) to the nearest minute.

21

θ

35

Foundation stage 2:

1. A single straight ladder, measuring 2.4 meters in length, is positioned against a wall with an angle of inclination of 42 degrees relative to the ground. Calculate the approximate height it reaches up the wall, rounded to one decimal place.

2. Determine the nearest degree of the angle of elevation when viewing a 12-meter distance from the base of an 18-meter tall building located on level ground.

3. A man in a building spots a car on the ground below. When he measures the angle of depression to be 72º5' degrees and the distance along his line of sight to the car is 20 meters. Find the approximate distance that the car is away from the base of the building, to one decimal place.

4. A yacht travels x kilometers on a bearing of 100 ºT. Afterward, it changes course to the west and continues until it is directly south of its initial position. If the eastward distance the yacht has traveled is 9.8km, calculate the approximate value of x, to the nearest kilometer.

N
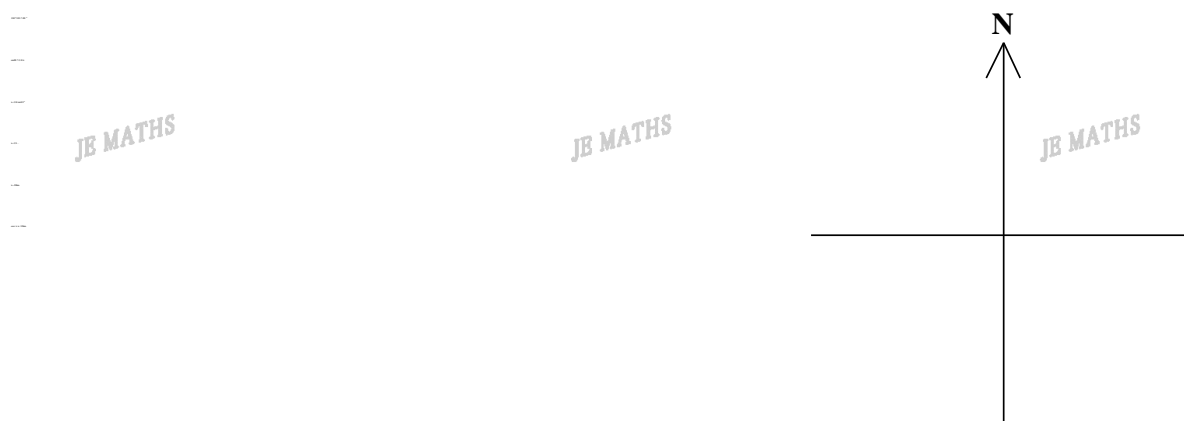
Foundation stage 3:

1. Given that the following rectangular prism.
   (a) Find the length of :
   (i) HF.

   (ii) DF.
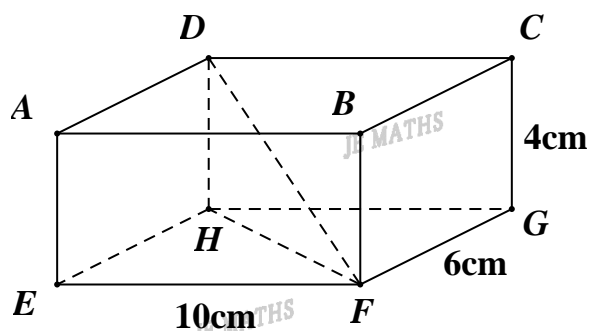

   (iii) ∠ HFD, correct to the nearest degree.

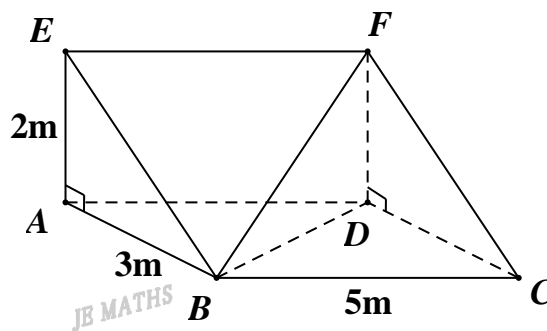2. Given that the following triangular prism.
   (a) Find the length of :
   (i) BD.

   (ii) FB.

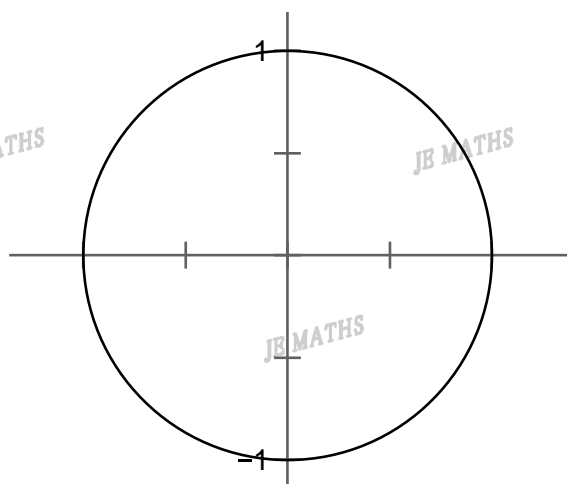   (iii) ∠ HFD, correct to the nearest minute.

Foundation stage 3:

1. Find the following angles on the given number plane with unit circle given:

(a) 30 °   (e) -330 °

(b) 120 °   (f) -240 °

(c) 225 °   (g) 585 °

(d) 300 °   (h) 660 °

2. Use $\sin\theta = \dfrac{y}{r}$, $\cos\theta = \dfrac{x}{r}$ and $\tan\theta = \dfrac{x}{y}$ to find the six trigonometric ratio of the given θ:
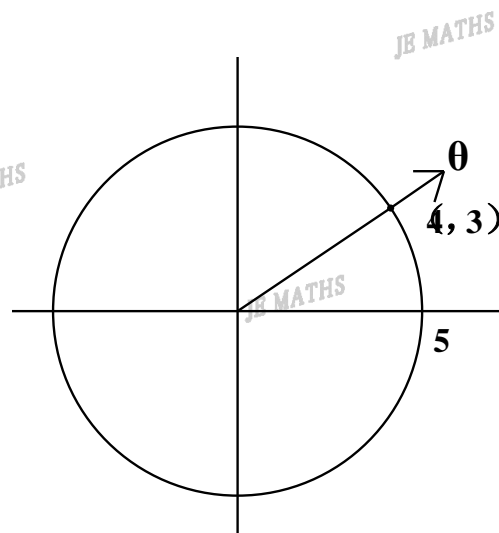
(a)

$\sin\theta =$ $\cos ec\theta =$

$\cos\theta =$ $\sec\theta =$

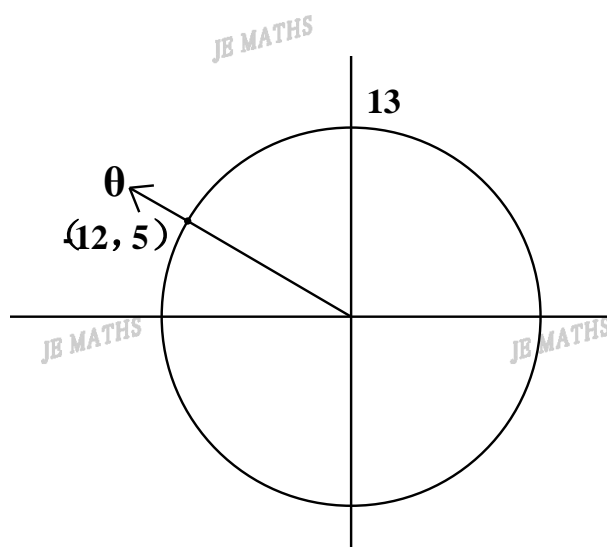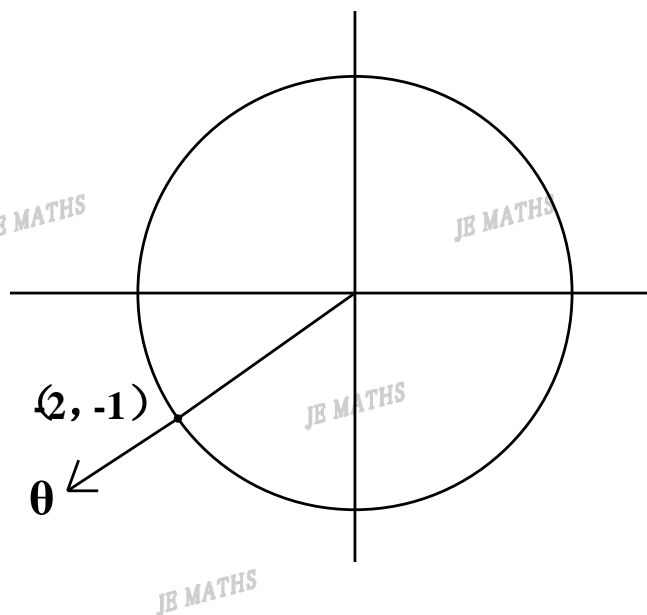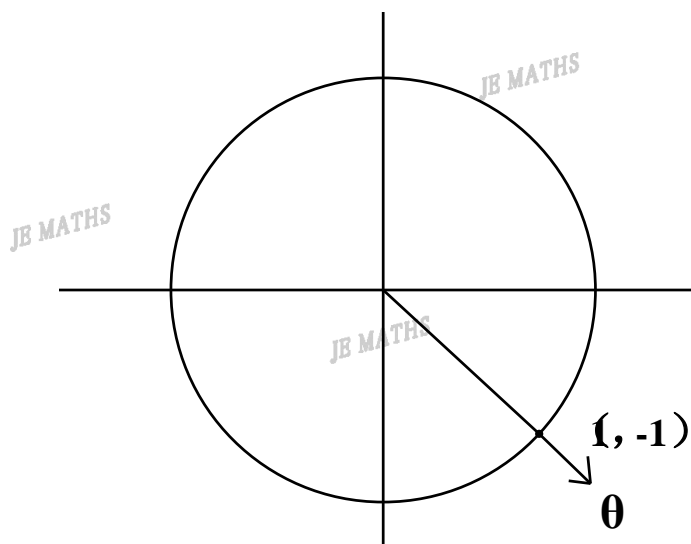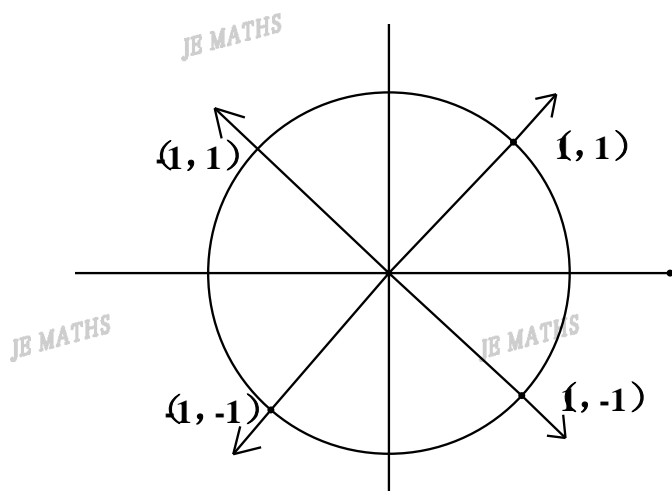$\tan\theta =$ $\cot\theta =$

(4, 3)

5

(b)

$\sin\theta =$ $\cos ec\theta =$

$\cos\theta =$ $\sec\theta =$

$\tan\theta =$ $\cot\theta =$

13

(12, 5)

(c) $r =$

$\sin\theta =$ $\qquad$ $\cos ec\theta =$

$\cos\theta =$ $\qquad$ $\sec\theta =$

$\tan\theta =$ $\qquad$ $\cot\theta =$

$(2, -1)$

θ

(d) $r =$

$\sin\theta =$ $\qquad$ $\cos ec\theta =$

$\cos\theta =$ $\qquad$ $\sec\theta =$

$\tan\theta =$ $\qquad$ $\cot\theta =$

$(1, -1)$

θ

3. Find the exact value of the following trigonometric ratio from the given graph:

(a) $\sin 45° =$ $\qquad$ (b) $\sin 135° =$

(c) $\cos 45° =$ $\qquad$ (d) $\cos 315° =$

(e) $\tan 45° =$ $\qquad$ (f) $\tan 225° =$

$(1, 1)$ $\quad$ $(1, 1)$

$(1, -1)$ $\quad$ $(1, -1)$

Foundation stage 3:

1. Use ASTC rule to determine the sign (+ or -) of the following trigonometric ratio:

Angle location	1st	2nd	3rd	4th
sin				
cos				
tan				

2. Find the related (acute) angle of each angle:
   (a) 20 °   (b) 140 °

   (c) 250 °   (d) 310 °

3. Rewrite the following trigonometric ratio in the related angle with correct sign:
   (a) sin 130°   (b) sin 230°

   (c) cos 140°   (d) cos 340°

   (e) tan 220°   (f) tan 320°

4. Find the boundary angle:

	0 °	90 °	180 °	270 °	360 °
sin					
cos					
tan					

5. Find the exact value of the following 30 ° and 60 ° special trigonometric ratio:

	30 °	60 °	120	150 °	210 °	240 °	300 °	330 °
sin								
cos								
tan								

7

Foundation stage 4:

1. Use Pythagoras' theorem and $\sin\theta = \dfrac{y}{r}$, $\cos\theta = \dfrac{x}{r}$ and $\tan\theta = \dfrac{x}{y}$

to find the value of the basic trig ratio:

(a)

$\sin\theta =$

$\cos\theta =$

$\tan\theta =$

(b)

$\sin\theta =$

$\cos\theta =$

$\tan\theta =$

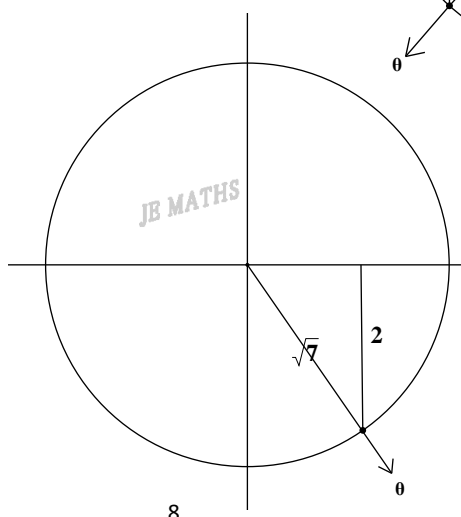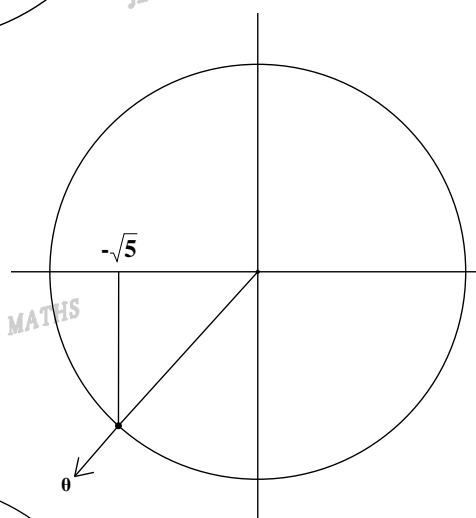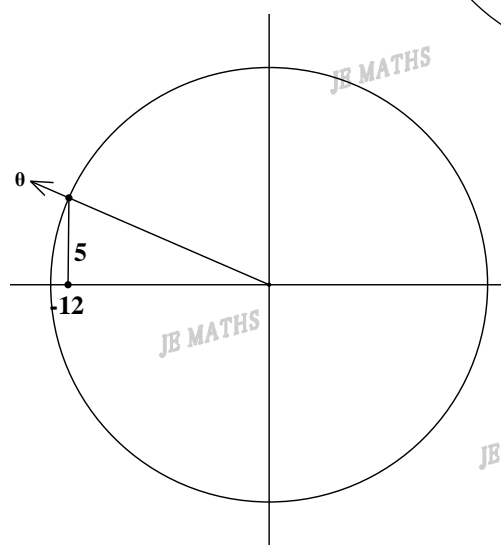(c)

$\sin\theta =$

$\cos\theta =$

$\tan\theta =$

(d)

$\sin\theta =$
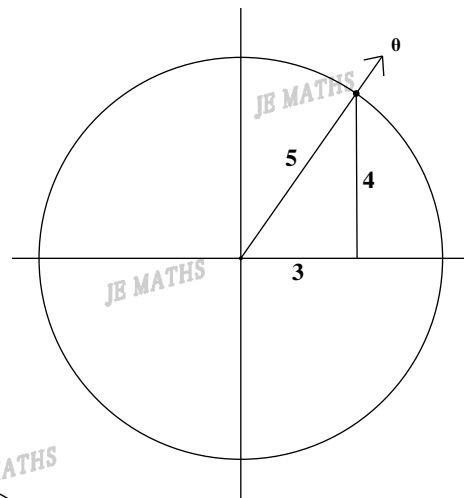
$\cos\theta =$

$\tan\theta =$

2. Simplify the following trigonometry reduced formula for an acute angle α :

(a) $\sin(180° - 15°) =$

(b) $\cos(180° - 25°) =$

(c) $\tan(180° - 35°) =$

(d) $\sin(180° + 15°) =$

(e) $\cos(180° + 25°) =$

(f) $\tan(180° + 35°) =$

(g) $\sin(360° - 15°) =$

(h) $\cos(360° - 25°) =$

(i) $\tan(360° - 35°) =$

3. Simplify the following trigonometry reduced formula for an acute angle α :

(a) $\sin(180° - \alpha) =$

(b) $\cos(180° - \alpha) =$

(c) $\tan(180° - \alpha) =$

(d) $\sin(180° + \alpha) =$

(e) $\cos(180° + \alpha) =$

(f) $\tan(180° + \alpha) =$

(g) $\sin(360° - \alpha) =$

(h) $\cos(360° - \alpha) =$

(i) $\tan(360° - \alpha) =$

4. Simplify: $\dfrac{\sin(360° - \alpha)}{\cos(180° - \alpha)}$.

5. Let $\sin\theta = -\dfrac{3}{5}$, where $90° \le \theta \le 270°$, use trigonometry reduced formula to find:

   (a) the quadrant of θ.

   (b) $\cos\theta$ (c) $\tan\theta$

6. Let $\cos\theta = \dfrac{\sqrt{3}}{3}$, where $180° \le \theta \le 360°$, use trigonometry reduced formula to find:

   (a) the quadrant of θ.

   (b) $\sin\theta$ (c) $\tan\theta$

7. Given that $\tan\theta = -\dfrac{1}{3}$, find possible values of:

   (a) $\cos\theta$.   (b) $\sin\theta$

Foundation stage 1:

1. (a)
   3/5

   (b)
   4/5

   (c)
   3/4

   (d)
   4/5

   (e)
   3/5

   (f)
   4/3

   (g)
   5/3

   (h)
   5/4

   (i)
   4/3

   (j)
   5/4

   (k)
   5/3

   (l)
   3/4

2. (a)
   0.6018

   (b)
   0.6099

   (c)
   0.7934

   (d)
   0.7976

   (e)
   0.0175

   (f)
   2.9089×10^{-4}

3. (a)
   50.9…=51º

   (b)
   n.a.

   (c)
   81.8…=82º

   (d)
   90 º

4. (a)
   41º45'32.72''
   =41º46'

   (b)
   48º11'22.87''
   =48º11''

   (c)
   0º1'34.27'…
   =0º2'
   =2'

   (d)
   90 º

5. (a)
    tan37°=x/8
    x=8tan37°
    x=6.02…
    x=6.0

    (b)
    cos28°=18/x
    x=18/cos28°
    x=20.38…
    x=20.4

6. (a)
    $\tan\theta=4/5$
    $\theta=\tan^{-1}(4/5)$
    $\theta=38.6…°$
    $\theta=39°$

    (b)
    $\sin\theta=21/35=3/5$
    $\theta=\sin^{-1}(3/5)$
    $\theta=36°52'11.63''$
    $\theta=36°52'$

Foundation stage 2:
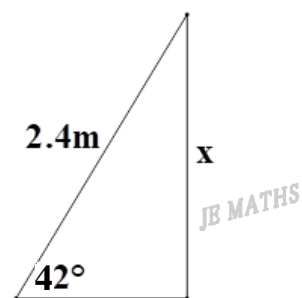
1. $\sin 42°=x/2.4$
   $x=2.4\sin 42°$
   $x=1.605…$
   $x=1.6$
   ans: it can reach 1.6m up the wall

2. $\tan\theta=18/12=3/2$
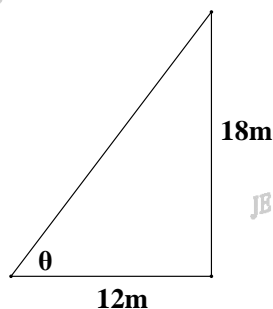 $\theta=\tan^{-1}(3/2)$
   $\theta=56.3…°$
   $\theta=56°$
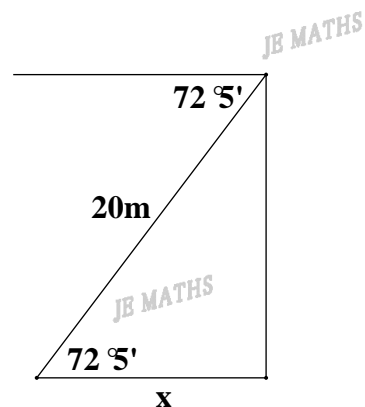   ans: the angle of elevation is 56°

3. $\cos 72°5'=x/20$
   $x=20\cos 72°5'$
   $x=6.15…$
   ans: the car is 6.2m away from the base of the building

4. $180°-100°=80°$
   $\sin 80°=9.8/x$
   $x=9.8/\sin 80°$
   $x=9.9...$
   $x=10$km
   ans: x is 10km

Foundation stage 3:

1. (a)

    (i)

    HF=√(10²+6²)

    =√136

    =2√34cm

    (ii)

    DF=√[4²+(√136)²]

    =√152

    =2√38cm

    (iii)

    cos θ=2√34/2√38=√(17/19)

    $\theta = cos^{-1}(\sqrt{17/19})$

    θ=18.9…º

    θ=19 °

2. (a)

    (i)

    BD=√(BC²+DC²)

    =√(3²+5²)

    =√34m

    (ii)

    EB=√(EA²+AB²)

    =√(2²+3²)

    =√13

    FB=√(EB²+EF²)

    =√[(√13)²+5²]

    =√38

    (iii)

    tanθ=2/√34

    $\theta = tan^{-1}(2/\sqrt{34})$

    θ=18º55'54.56''

    θ=18º 56'

14

Foundation stage 3:

1.

$120°$ $(240°)$ $30°$ $(330°)$

$225°$ $(585°)$ $300°$ $(660°)$

2. (a)

$\sin\theta =$ 3/5

$\cos ec\theta =$ 5/3

$\cos\theta =$ 4/5

$\sec\theta =$ 5/4

$\tan\theta =$ 3/4

$\cot\theta =$ 4/3

(b)

$\sin\theta =$ 5/13

$\cos ec\theta =$ 13/5

$\cos\theta =$ -12/13

$\sec\theta =$ -13/12

$\tan\theta =$ 5/-12=-5/12

$\cot\theta =$ -12/5

(c)   r = $\sqrt{(2^2+1^2)}=\sqrt{5}$

$\sin\theta =$ $\cos ec\theta =$

$-1/\sqrt{5}$ $-\sqrt{5}$

$\cos\theta =$ $s ec\theta =$

$-2/\sqrt{5}$ $-\sqrt{5}/2$

$\tan\theta =$ $\cot\theta =$

$-1/-2=1/2$ 2

(d) r $=\sqrt{(1^2+1^2)}=\sqrt{2}$

$\sin\theta =$ $\cos ec\theta =$

$-1/\sqrt{2}$ $-\sqrt{2}$

$\cos\theta =$ $s ec\theta =$

$1/\sqrt{2}$ $\sqrt{2}$

$\tan\theta =$ $\cot\theta =$

$-1/1=-1$ -1

3.   (a)   (b)

   $\sqrt{2}/2$ $\sqrt{2}/2$

   (c)   (d)

   $\sqrt{2}/2$ $\sqrt{2}/2$

   (e)   (f)

   1   1

Foundation stage 3:

1.

Angle location	1st	2nd	3rd	4th
sin	+	+	-	-
cos	+	-	-	+
tan	+	-	-	+

2. (a)
$20°$

(b)
$180°-140°=40°$

(c)
$250°-180°=70°$

(d)
$360°-310°=50°$

3. (a)
$= \sin(180°-130°)$
$= \sin50°$

(b)
$= -\sin(230°-180°)$
$= -\sin50°$

(c)
$= -\cos(180°-140°)$
$= -\cos40°$

(d)
$= \cos(360°-340°)$
$= \cos20°$

(e)
$= \tan(220°-180°)$
$= \tan40°$

(f)
$= -\tan(360°-320°)$
$= -\tan40°$

4.

	0°	90°	180°	270°	360°
sin	0	1	0	-1	0
cos	1	0	-1	0	1
tan	0	∞	0	∞	0

5.

	30°	60°	120	150°	210°	240°	300°	330°
sin	1/2	√3/2	√3/2	1/2	-1/2	-√3/2	-√3/2	-1/2
cos	√3/2	1/2	-1/2	-√3/2	-√3/2	-1/2	1/2	√3/2
tan	√3/3	√3	-√3	-√3/3	√3/3	√3	-√3	-√3/3

Foundation stage 4:

1. (a) (3, 4)
    $\sin\theta =$
    4/5

    $\cos\theta =$
    3/5

    $\tan\theta =$
    4/3

    (b) (-12, 5)
    $\sin\theta =$
    5/13

    $\cos\theta =$
    -12/13

    $\tan\theta =$
    5/-12=-5/12

    (c) (-√5,-√5)
    $\sin\theta =$
    -√5/√10=-1/√2=-√2/2

    $\cos\theta =$
    -√5/√10=-1/√2=-√2/2

    $\tan\theta =$
    1

    (d) (√3, -2)
    $\sin\theta =$
    -2/√7

    $\cos\theta =$
    √3/√7=√21/7

    $\tan\theta =$
    -2/√3

2. (a)
    sin15°

    (c)
    -tan35°

    (e)
    -cos15°

    (g)
    -sin15°

    (i)
    -tan35°

    (b)
    -cos25°

    (d)
    -sin15°

    (f)
    tan25°

    (h)
    cos25°

3. (a)
    $\sin\alpha$

    (c)
    $-\tan\alpha$

    (e)
    $-\cos\alpha$

    (g)
    $-\sin\alpha$

    (i)
    $-\tan\alpha$

    (b)
    $-\cos\alpha$

    (d)
    $-\sin\alpha$

    (f)
    $\tan\alpha$

    (h)
    $\cos\alpha$

4. $-\sin\alpha / -\cos\alpha = \tan\alpha$

5. (a)
since $\sin\theta < 0$ and $90° \leq \theta \leq 270°$
then θ in the 3rd quadrant

(b)
$\cos\theta < 0$
$\sin\theta = \sin(180°+\alpha)$
$\quad = -\sin\alpha = -3/5$
$\sin\alpha = 3/5$
From the acute RtΔ,
$\cos\alpha = 4/5$ and $\tan\alpha = 3/4$
$\cos\theta = \cos(\alpha+180°)$
$\quad = -\cos\alpha = -4/5$

(c)
$\tan\theta > 0$
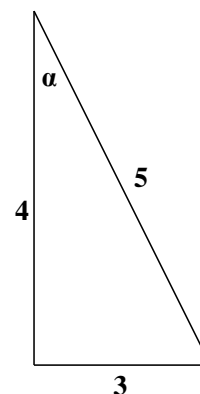$\tan\theta = \tan(180°+\alpha)$
$\quad = \tan\alpha = 3/4$

6. (a)
since $\cos\theta > 0$ and $180° \leq \theta \leq 360°$
then θ in the 4th quadrant

(b) $\sin\theta$
$\sin\theta < 0$
$\cos\theta = \cos(360°-\alpha)$
$\quad = \cos\alpha = \sqrt{3}/3$
$\cos\alpha = \sqrt{3}/3$
From the acute RtΔ,
$\sin\alpha = \sqrt{6}/3$ and $\tan\alpha = \sqrt{6}/\sqrt{3} = \sqrt{2}$
$\sin\theta = \sin(360°-\alpha)$
$\quad = -\sin\alpha = -\sqrt{6}/3$

(c)
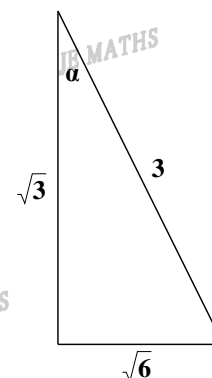$\tan\theta < 0$
$\tan\theta = \tan(360°-\alpha)$
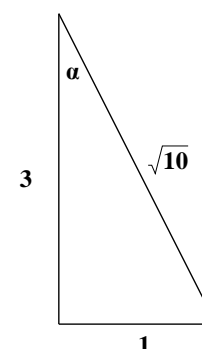$\quad = -\tan\alpha = -\sqrt{2}$

7. (a)
θ could be in the 2nd and 4th quadrant
$\cos\theta$ could be positive and negative
$\cos\theta = \pm 3/\sqrt{10}$

(b)
$\sin\theta$ could be positive and negative
$\sin\theta = \pm 1/\sqrt{10}$