Foundation stage 1:

1. Check the following trigonometric identities by using a calculator:

   (a) $\sin 23° = \dfrac{1}{\cos ec\,23°}$

   (b) $\cos 123° = \dfrac{1}{\sec 123°}$

   (c) $\tan 23° = \dfrac{1}{\cot 23°}$

   (d) $\cos ec\,223° = \dfrac{1}{\sin 223°}$

2. Simplify the following **reciprocal** identities:

   (a) $\dfrac{1}{\sin\theta} =$

   (b) $\dfrac{1}{\cos ec\theta} =$

   (c) $\dfrac{1}{\cos\theta} =$

   (d) $\dfrac{1}{\sec\theta} =$

   (e) $\dfrac{1}{\tan\theta} =$

   (f) $\dfrac{1}{\cot\theta} =$

3. Use the reciprocal identities to simplify the followings:

   (a) $\sin\theta\cos ec\theta =$

   (b) $\cos\theta\sec\theta =$

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

   (d) $\cot\alpha\tan\alpha - \cos\beta\sec\beta =$

4. Simplify the following **ratio identities**:

   (a) $\dfrac{\sin\theta}{\cos\theta} =$

   (c) $\dfrac{\cos\theta}{\sin\theta} =$

5. Use the reciprocal identities and the ratio identities to simplify the followings:

   (a) $\tan\alpha\cos\alpha =$

   (b) $\cot\beta\sin\beta =$

(c) $\sin\theta\sec\theta =$

(d) $\cos\theta\cosec\theta =$

6. Check the following complementary identities by using a calculator:
   (a) $\sin 23° = \cos 67°$

   (b) $\cos 23° - \sin 67° = 0$

   (c) $\tan 23° = \cot 67°$

   (d) $\cosec 23° = \sec 67°$

7. Simplify the following **complementary identities**:

   (a) $\sin(90° - \theta) =$

   (b) $\cos(90° - \theta) =$

   (c) $\sec(90° - \theta) =$

   (d) $\cosec(90° - \theta) =$

   (e) $\tan(90° - \theta) =$

   (d) $\cot(90° - \theta) =$

8. Use the complementary identities to simplify the followings:

   (a) $\dfrac{1}{\sec(90° - \theta)} =$

   (b) $\dfrac{1}{\cosec(90° - \theta)} =$

   (c) $\dfrac{\sin(90° - \theta)}{\cos(90° - \theta)} =$

   (d) $\dfrac{\sec(90° - \theta)}{\cosec(90° - \theta)} =$

   (e) $\cos(90° - \theta)\tan(90° - \theta) =$

   (f) $\cos(90° - \theta)\cosec(90° - \theta) =$

2

9. Simplify the following Pythagorean identities by using a calculator:

   (a) $\sin^2 43° + \cos^2 43° =$

   (b) $\sin^2 143° + \cos^2 143° =$

   (c) $\sec^2 43° - \tan^2 43° =$

   (d) $\sec^2 243° - \tan^2 243° =$

   (e) $co\sec^2 43° - \cot^2 43° =$

   (f) $co\sec^2 343° - \cot^2 343° =$

10. Simplify the following **Pythagorean identities**:

   (a) $\sin^2 \theta + \cos^2 \theta =$

   (b) $1 - \cos^2 \theta =$

   (c) $1 + \tan^2 \theta =$

   (d) $\sec^2 \theta - \tan^2 \theta =$

   (e) $1 + \cot^2 \theta =$

   (f) $\cos ec^2\theta - \cot^2 \theta =$

11. Use the Pythagorean identities to simplify the followings:

   (a) $(1 - \sin^2 \theta) \times \sec^2 \theta$

   (b) $(\sec^2 \theta - 1) \times \cot^2 \theta$

   (c) $1 - \tan^2 \theta + \sec^2 \theta$

   (d) $\cot^2 \theta + 1 - \cos ec^2\theta$

12. Prove that:

   (a) $(\sin \theta - \cos \theta)^2 = 1 - 2\sin \theta \cos \theta$

   (b) $2\sec^2 \theta - 3 = 2\tan^2 \theta - 1$

3

Foundation stage 2:

1. Solve the following trigonometric equations involving special trig for $0° \le \theta \le 360°$.

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

    (b) $\sin\theta = -\dfrac{1}{2}$

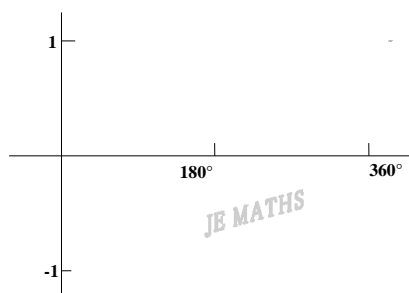   (c) $\cos\theta = \dfrac{1}{\sqrt{2}}$

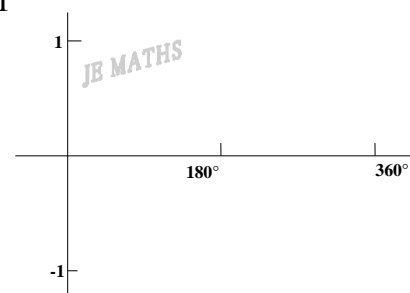   (d) $\cos\theta = -\dfrac{\sqrt{3}}{2}$

    (e) $\tan\theta = \sqrt{3}$

    (f) $\tan\theta = -\dfrac{\sqrt{3}}{3}$

2. Solve the following trigonometric equations involving boundary angles for $0° \le \theta \le 360°$ with the help of a trigonometric graph.

    (a) $\sin\theta = 1$
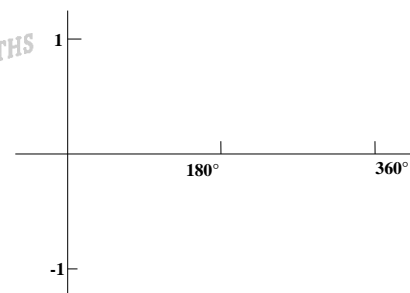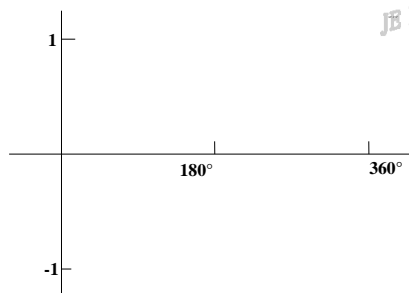
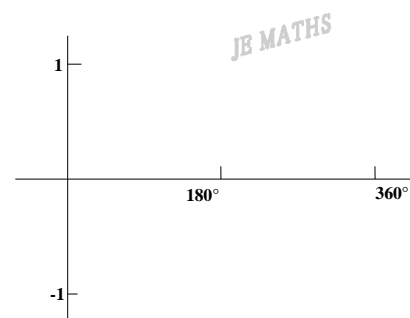   (b) $\sin\theta = -1$

    (c) $\cos\theta = 0$
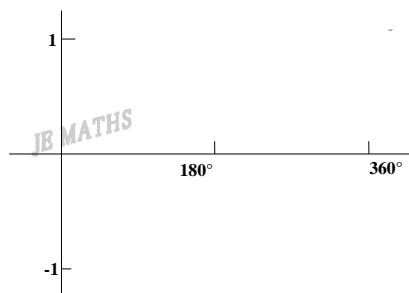
    (d) $\cos\theta = -1$
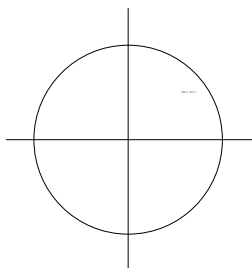
    (e) $\tan\theta = 0$

    (f) $\tan\theta = \infty$

3. Solve the following trigonometric equations involving random angles by using a related acute angle in a unit circle for $0° \le \theta \le 360°$. (1dp)

(a) $\sin x = \dfrac{1}{3}$

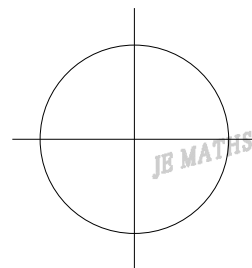(b) $\sin x = -0.6$

(b) $\cos x = 0.1$

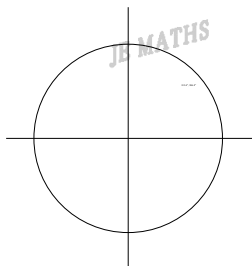(d) $\cos x = -\dfrac{2}{5}$
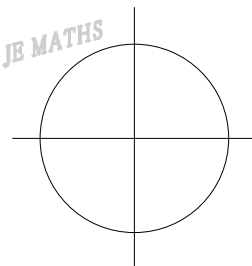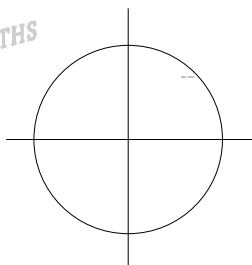
(e) $\tan x = \dfrac{7}{3}$
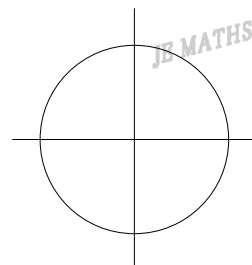
(f) $\tan x = -6.6$

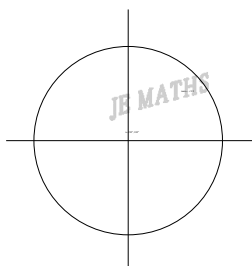4. Solve the following trigonometric equations involving special angles for $0° \le \theta \le 360°$, to the nearest minute.
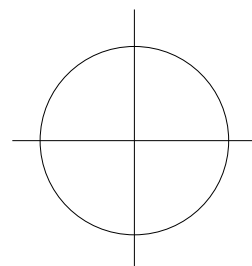
(a) $2\sin x + 1 = 0$

(b) $\sqrt{3}\tan x + 1 = 0$

(c) $\sec x = 2$
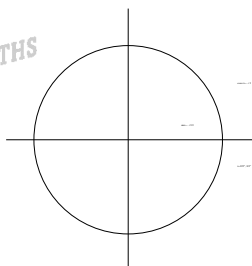
(d) $\cos ecx + \sqrt{2} = 0$
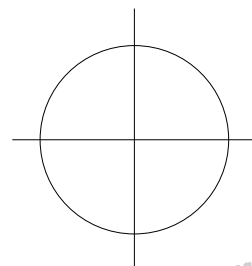
(e) $\cot x + 1 = 0$
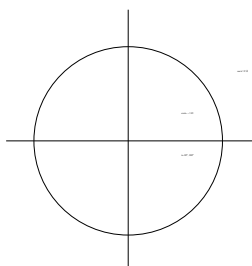
(f) $2 - \sqrt{3}\sec x = 0$
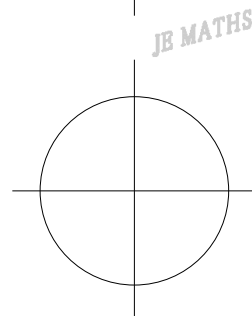
5. Solve the following trigonometric equations involving random angles by using a related acute angle in a unit circle for $-180° \leq \theta \leq 180°$, to the nearest degree.

(a) $4\sin x = 1$

(b) $2\cos ecx = -3$

(b) $3\cos x - 2 = 1$

(d) $2\sec x - 5 = -2$

(e) $-\tan x = 100$

(f) $3 - 4\cot x = 5$

6. Solve the following trigonometric equations involving random angles by using a related acute angle in a unit circle for $0° \leq \theta \leq 540°$, to the nearest degree.

(a) $4\sin x = 1$

(b) $2\cos ecx = -3$

(b) $3\cos x - 2 = 1$

(d) $2\sec x - 5 = -2$

(e) $-\tan x = 100$

(f) $3 - 4\cot x = 5$

Foundation stage 1:

1. (a)
    T

    (b)
    T

    (c)
    T

    (d)
    T

2. (a)
    cosecθ

    (b)
    sinθ

    (c)
    secθ

    (d)
    cosθ

    (e)
    cot θ

    (f)
    tan θ

3. (a)
    sin$\theta\times 1/$sinθ
    $=1$

    (b)
    cos$\theta\times 1/$cosθ
    $=1$

    (c)
    tan$\alpha\times 1/$tanθ
    $=1$

    (d)
    1-1
    $=0$

4. (a)
    tan θ

    (c)
    cot θ

5. (a)
    sin$\alpha/$cos$\alpha\times$cosα
    $=$sinα

    (b)
    cos$\alpha/$sin$\alpha\times$sinα
    $=$cosα

    (c)
    sin$\theta\times 1/$cosθ
    $=$tanθ

    (d)
    cos$\theta\times 1/$sinθ
    $=$cotθ

6. (a)
    T

    (b)
    T

    (c)
    T

    (d)
    T

7. (a)
    $\cos \theta$

    (c)
    $\text{cosec } \theta$

    (e)
    $\cot \theta$

    (b)
    $\sin \theta$

    (d)
    $\sec \theta$

    (d)
    $\tan \theta$

8. (a)
    $\cos(90° - \theta)$
    $= \sin \theta$

    (c)
    $\tan(90° - \theta)$
    $= \cot \theta$

    (e)
    $\sin \theta \times \cot \theta$
    $= \sin \theta \times \cos \theta / \sin \theta$
    $= \cos \theta$

    (b)
    $\sin(90° - \theta)$
    $= \cos \theta$

    (d)
    $\cos(90° - \theta)/\sin(90° - \theta)$
    $= \sin \theta / \cos \theta$
    $= \tan \theta$

    (f)
    $\sin \theta \times 1/\sin(90° - \theta)$
    $= \sin \theta \times 1/\cos\theta$
    $= \tan \theta$

9. (a)
    1

    (c)
    1

    (e)
    1

    (b)
    1

    (d)
    1

    (f)
    1

10. (a)
    1

    (c)
    $\sec^2 \theta$

    (e)
    $\text{cosec}^2 \theta$

    (b)
    $\sin^2 \theta$

    (d)
    1

    (f)
    1

11. (a)

$\cos^2\theta \times 1/\cos^2\theta$

$= 1$

(b)

$\tan^2\theta \times 1/\tan^2\theta$

$= 1$

(c)

$1+(\sec^2\theta-\tan^2\theta)$

$= 1+1$

$= 2$

(d)

$(\cot^2\theta-\csc^2\theta)+1$

$= -1 + 1$

$= 0$

12. (a)

LHS $= \sin^2\theta-2\sin\theta\cos\theta+\cos^2\theta$

$= 1-2\sin\theta\cos\theta$

$= $ RHS

(b)

LHS $= 2(1+\tan^2\theta)-3$

$= 2+2\tan^2\theta-3$

$= 2\tan^2\theta-1$

Foundation stage 2:

1. (a)
    60º, 120º

    (b)
    210º, 330º

    (c)
    45º, 315º

    (d)
    150º, 210º

    (e)
    60º, 240º

    (f)
    150º, 330º

2. (a)
    90º

    (b)
    270º

    (c)
    90º,270º

    (d)
    180º

    (e)
    0º, 180º

    (f)
    90º, 270º

3. (a)
    19.5º, 160.5º

    (b)
    216.9º, 323.1º

    (b)
    84.3º, 275.7º

    (d)
    113.6º, 246.4º

    (e)
    66.8º, 246.8º

    (f)
    98.6º, 278.6º

4. (a)
    $\sin x = -1/2$
    $x = 210º, 330º$

    (b)
    $\tan x = -\sqrt{3}/3$
    $x = 150º, 330º$

    (c)
    $\cos x = 1/2$
    $x = 60º, 300º$

    (d)
    $\csc x = -\sqrt{2}$
    $\sin x = -\sqrt{2}/2$
    $x = 225º, 315º$

    (e)
    $\cot x = -1$
    $\tan x = 1$
    $x = 45º, 225º$

    (f)
    $\sec x = 2/\sqrt{3}$
    $\cos x = \sqrt{3}/2$
    $x = 30º, 330º$

10

5. (a)

    14º, 166º

    (b)

    cosecx=-3/2

    sinx=-2/3

    x=42º, 222º

    (b)

    cosx=1

    x=0º

    (d)

    secx=3/2

    cosx=2/3

    x=-48º, 312º

    (e)

    tanx=-100

    x=-89º, 91°

    (f)

    -2 = 4cotx

    cotx = -1/2

    tanx = -2

    x=-63º, 117º

6. (a)

    x=14º, 166º, 374º

    (b)

    cosecx=-3/2

    sinx=-2/3

    x=222º, 318º

    (b)

    cosx=1

    x=0º, 360º

    (d)

    secx=3/2

    cosx=2/3

    x=48º, 312º, 408º

    (e) $-\tan x = 100$

    tanx=-100

    x=91º, 271º, 451°

    (f)

    -2 = 4cotx

    cotx = -1/2

    tanx = -2

    x=117º, 297º, 477º