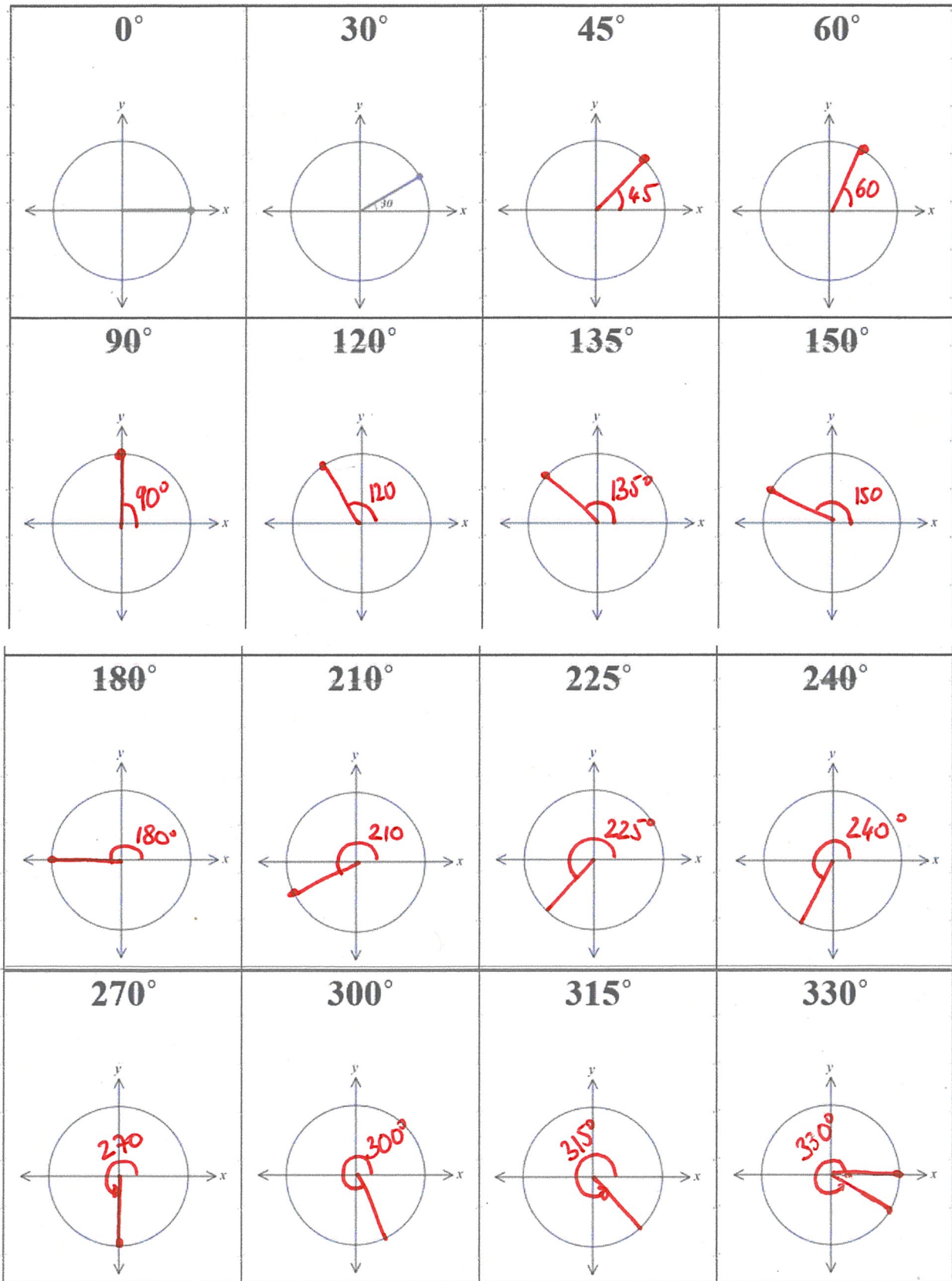
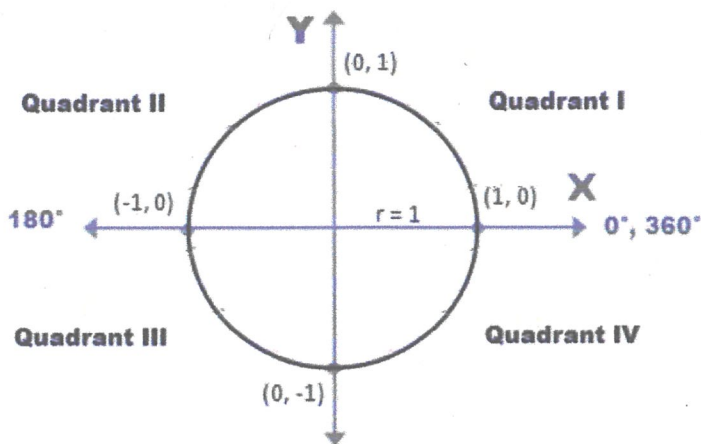


On each unit circle, draw the radius corresponding to each angle. The first two have been done for you.





QUESTION 1 Complete.

- a In the I quadrant, all of the ratios are positive.
- b In the II quadrant, sine is positive but cosine and tangent are negative.
- c In the III quadrant, tangent is positive but sine and cosine are negative.
- d In the IV quadrant, cosine is positive but sine and tangent are negative.

QUESTION 2 In which quadrant could  $\theta$  lie if:

- a  $\sin \theta > 0$ ,  $\cos \theta < 0$  II
- b  $\tan \theta > 0$ ,  $\sin \theta < 0$  III
- c  $\cos \theta > 0$ ,  $\sin \theta > 0$  I
- d  $\tan \theta < 0$ ,  $\cos \theta > 0$  IV

QUESTION 3 In which quadrant (1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup>, 4<sup>th</sup>) will the following angles lie?

- a  $110^\circ$  II      b  $210^\circ$  III      c  $49^\circ$  I      d  $183^\circ$  III
- e  $308^\circ$  IV      f  $25^\circ$  I      g  $97^\circ$  II      h  $282^\circ$  IV

QUESTION 4 Determine whether the given ratio will be positive or negative.

- a  $\sin 170^\circ$  >0      b  $\cos 280^\circ$  >0      c  $\tan 60^\circ$  >0
- d  $\cos 104^\circ$  <0      e  $\tan 125^\circ$  <0      f  $\sin 315^\circ$  <0
- g  $\tan 200^\circ$  >0      h  $\sin 56^\circ$  >0      i  $\cos 225^\circ$  <0
- j  $\cos 70^\circ$  >0      k  $\tan 333^\circ$  <0      l  $\sin 264^\circ$  <0

QUESTION 5 In which quadrant will the following angles lie?

- a  $385^\circ$  I      b  $510^\circ$  II      c  $456^\circ$  II      d  $710^\circ$  IV
- e  $755^\circ$  I      f  $905^\circ$  III      g  $410^\circ$  I      h  $1000^\circ$  IV
- i  $-25^\circ$  IV      j  $-135^\circ$  III      k  $-185^\circ$  II      l  $-300^\circ$  I
- m  $-200^\circ$  II      n  $-79^\circ$  IV      o  $-94^\circ$  III      p  $-265^\circ$  II

1 State whether each of these trigonometric ratios is positive or negative.

- a  $\sin 70^\circ > 0$     b  $\cos 25^\circ > 0$     c  $\tan 110^\circ < 0$     d  $\cos 104^\circ < 0$   
 e  $\tan 18^\circ > 0$     f  $\sin 156^\circ > 0$     g  $\tan 163^\circ < 0$     h  $\sin 108^\circ > 0$   
 i  $\sin 15^\circ 20' > 0$     j  $\tan 81^\circ 17' > 0$     k  $\cos 142^\circ 35' < 0$     l  $\tan 119^\circ 26' < 0$   
 m  $\cos 54^\circ 6' > 0$     n  $\sin 91^\circ 43' > 0$     o  $\cos 174^\circ 30' < 0$     p  $\sin 122^\circ 55' > 0$

2 State whether the angle  $\theta$  is acute or obtuse, where  $0^\circ < \theta < 180^\circ$ , if:

- a  $\sin \theta > 0$  and  $\tan \theta > 0$  *acute*    b  $\sin \theta > 0$  and  $\cos \theta < 0$  *obtuse*  
 c  $\tan \theta < 0$  and  $\cos \theta < 0$  *obtuse*    d  $\cos \theta > 0$  and  $\tan \theta > 0$  *acute*  
 e  $\sin \theta > 0$  and  $\tan \theta < 0$  *obtuse*    f  $\sin \theta > 0$  and  $\cos \theta > 0$  *acute*

3 Express each of the following trigonometric ratios in terms of an acute angle.

- a  $\sin 100^\circ = \sin(180 - 80) = \sin 80$     b  $\cos 140^\circ = \cos(180 - 40) = -\cos 40$     c  $\tan 160^\circ = \frac{\sin 160}{\cos 160} = \frac{\sin 20}{-\cos 20} = -\tan 20$     d  $\cos 125^\circ = -\cos 55$   
 e  $\tan 134^\circ = -\tan 46$     f  $\sin 152^\circ = \sin 28^\circ$     g  $\tan 101^\circ = -\tan 79$     h  $\sin 115^\circ = \sin 65$   
 i  $\cos 108^\circ = -\cos 72$     j  $\sin 164^\circ = \sin 16$     k  $\tan 122^\circ = -\tan 58$     l  $\cos 171^\circ = -\cos 9$

5 Find two possible angles  $\theta$ , where  $0^\circ < \theta < 180^\circ$ , correct to the nearest degree.

- a  $\sin \theta = 0.1564$   
 $\theta = 9^\circ$   
 or  $\theta = 171^\circ$   
 b  $\sin \theta = 0.2657$   
 $\theta = 15^\circ$   
 or  $\theta = 165^\circ$   
 c  $\sin \theta = 0.8371$   
 $\theta = 57^\circ$   
 or  $\theta = 123^\circ$   
 d  $\sin \theta = 0.6049$   
 $\theta = 37^\circ$   
 or  $\theta = 143^\circ$   
 e  $\sin \theta = 0.0695$   
 $\theta = 4^\circ$   
 or  $\theta = 176^\circ$   
 f  $\sin \theta = 0.4224$   
 $\theta = 25^\circ$   
 or  $\theta = 155^\circ$   
 g  $\sin \theta = 0.1827$   
 $\theta = 11^\circ$   
 or  $\theta = 169^\circ$   
 h  $\sin \theta = 0.7599$   
 $\theta = 49^\circ$   
 or  $\theta = 131^\circ$   
 i  $\sin \theta = 0.3914$   
 $\theta = 23^\circ$   
 or  $\theta = 157^\circ$

QUESTION 1 If  $0^\circ \leq \theta \leq 90^\circ$  and  $\sin \theta = 0.528$  write down the value of:

a  $\sin(180^\circ + \theta)$       b  $\sin(360^\circ - \theta)$       c  $\sin(180^\circ - \theta)$

$$\left. \begin{aligned} \sin(180^\circ + \theta) &= -\sin \theta \\ &= -0.528 \end{aligned} \right\} \left. \begin{aligned} \sin(360^\circ - \theta) &= \sin(360^\circ + (-\theta)) \\ &= \sin(-\theta) = -\sin \theta \\ &= -0.528 \end{aligned} \right\} \begin{aligned} \sin(180^\circ - \theta) &= \sin \theta \\ &= 0.528 \end{aligned}$$

QUESTION 2 If  $0^\circ \leq \alpha \leq 90^\circ$  and  $\tan \alpha = 1.237$  write down the value of:

a  $\tan(180^\circ - \alpha)$       b  $\tan(360^\circ - \alpha)$       c  $\tan(180^\circ + \alpha)$

$$\left. \begin{aligned} \tan(180^\circ - \alpha) &= \frac{\sin(180^\circ - \alpha)}{\cos(180^\circ - \alpha)} \\ &= \frac{\sin \alpha}{-\cos \alpha} = -\tan \alpha = -1.237 \end{aligned} \right\} \left. \begin{aligned} \tan(360^\circ - \alpha) &= \tan(360^\circ + (-\alpha)) \\ &= \tan(-\alpha) = -\tan \alpha \\ &= -1.237 \end{aligned} \right\} \begin{aligned} \tan(180^\circ + \alpha) &= \frac{\sin(180^\circ + \alpha)}{\cos(180^\circ + \alpha)} \\ &= \frac{-\sin \alpha}{-\cos \alpha} = \tan \alpha = 1.237 \end{aligned}$$

d  $\tan(-\alpha)$       e  $\tan(360^\circ + \alpha)$

$$\left. \begin{aligned} \tan(-\alpha) &= \frac{\sin(-\alpha)}{\cos(-\alpha)} = \frac{-\sin \alpha}{\cos \alpha} \\ \text{so } \tan(-\alpha) &= -\tan \alpha = -1.237 \end{aligned} \right\} \begin{aligned} \tan(360^\circ + \alpha) &= \tan \alpha = 1.237 \end{aligned}$$

QUESTION 3 Given that  $\cos 60^\circ = 0.5$  find:

a  $\cos 240^\circ$       b  $\cos 120^\circ$       c  $\cos 300^\circ$       d  $\cos 420^\circ$

$$\left. \begin{aligned} \cos 240^\circ &= -\cos 60^\circ \\ &= -0.5 \end{aligned} \right\} \left. \begin{aligned} \cos 120^\circ &= -\cos 60^\circ \\ &= -0.5 \end{aligned} \right\} \left. \begin{aligned} \cos 300^\circ &= \cos(-60^\circ) \\ &= \cos 60^\circ = 0.5 \end{aligned} \right\} \begin{aligned} \cos 420^\circ &= \cos(360^\circ + 60^\circ) \\ &= \cos 60^\circ \\ &= 0.5 \end{aligned}$$

QUESTION 4 If  $\sin 23^\circ = 0.391$  (correct to 3 decimal places), write down the value, to 3 decimal places, of:

a  $\sin 337^\circ$       b  $\sin 203^\circ$       c  $\sin(-23^\circ)$       d  $\sin 157^\circ$

$$\left. \begin{aligned} \sin 337^\circ &= \sin(360^\circ - 23^\circ) \\ &= \sin(-23^\circ) = -\sin 23^\circ \\ &= -0.391 \end{aligned} \right\} \left. \begin{aligned} \sin 203^\circ &= \sin(180^\circ + 23^\circ) \\ &= -\sin 23^\circ \\ &= -0.391 \end{aligned} \right\} \left. \begin{aligned} \sin(-23^\circ) &= -\sin 23^\circ \\ &= -0.391 \end{aligned} \right\} \left. \begin{aligned} \sin 157^\circ &= \sin(180^\circ - 23^\circ) \\ &= \sin 23^\circ \\ &= 0.391 \end{aligned} \right\}$$

e  $\sin 383^\circ$       f  $\sin 563^\circ$       g  $\sin(-157^\circ)$       h  $\cos 67^\circ$

$$\left. \begin{aligned} \sin 383^\circ &= \sin(360^\circ + 23^\circ) \\ &= \sin 23^\circ \\ &= 0.391 \end{aligned} \right\} \left. \begin{aligned} \sin 563^\circ &= \sin(360^\circ + 203^\circ) \\ &= \sin 203^\circ \\ &= \sin(180^\circ + 23^\circ) \\ &= -\sin 23^\circ \\ &= -0.391 \end{aligned} \right\} \left. \begin{aligned} \sin(-157^\circ) &= \sin 157^\circ \\ &= -\sin(180^\circ - 23^\circ) \\ &= -\sin 23^\circ \\ &= -0.391 \end{aligned} \right\} \left. \begin{aligned} \cos 67^\circ &= \cos(90^\circ - 23^\circ) \\ &= \sin 23^\circ \\ &= 0.391 \end{aligned} \right\}$$

Find two possible angles  $\alpha$ , where  $0 < \alpha < 360$ , correct to the nearest degree.

$\cos \alpha = 0.4578$        $\cos \alpha = 0.1234$        $\cos \alpha = -0.56$

$$\left. \begin{aligned} \alpha &= 63^\circ \text{ or} \\ \alpha &= -63^\circ \text{ which is } 297^\circ \end{aligned} \right\} \left. \begin{aligned} \alpha &= 83^\circ \\ \alpha &= -83^\circ \text{ which is } 277^\circ \end{aligned} \right\} \left. \begin{aligned} \alpha &= 124^\circ \\ \alpha &= -124^\circ \text{ which is } 236^\circ \end{aligned} \right\}$$

b Find the obtuse angle  $\theta$ , correct to the nearest degree.

a  $\cos \theta = -0.5218$       b  $\tan \theta = -0.1243$       c  $\cos \theta = -0.1921$

$$\left. \begin{aligned} \theta &= 121^\circ \end{aligned} \right\} \left. \begin{aligned} \theta &= -7^\circ \\ \text{or } \theta &= 173^\circ \end{aligned} \right\} \left. \begin{aligned} \theta &= 101^\circ \end{aligned} \right\}$$