

Year 10 Term 1 Homework

Student Name: _____	Grade: _____
Date: _____	Score: _____

Table of contents

4	Year 10 Term 1 Week 4 Homework	1
4.1	Right-angle triangle trigonometry	1
4.1.1	Sides and ratios	1
4.1.2	Degrees and minutes	3
4.1.3	Finding the size of an angle	4
4.1.4	Finding the length of a side	6
4.2	Bearings	8
4.2.1	Compass bearings	8
4.2.2	The 16 point compass	9
4.2.3	True bearings	10
4.2.4	Opposite bearings	11
4.3	Miscellaneous exercises	12

This edition was printed on October 24, 2016 with worked solutions.
 Camera ready copy was prepared with the **L^AT_EX₂ ϵ** typesetting system.
 Copyright © 2000 - 2016 Yimin Math Centre (www.yiminmathcentre.com)

4 Year 10 Term 1 Week 4 Homework

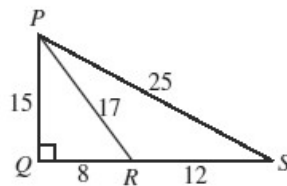
4.1 Right-angle triangle trigonometry

4.1.1 Sides and ratios

The trigonometric ratios are the ratios of pairs of sides in right-angled triangles:

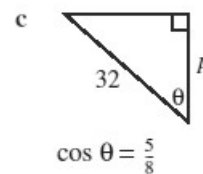
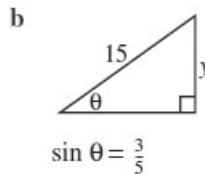
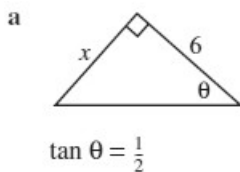
1. $\sin \theta = \frac{\text{Opposite}}{\text{Hypotenuse}}$ (SOH)
2. $\cos \theta = \frac{\text{Adjacent}}{\text{Hypotenuse}}$ (CAH)
3. $\tan \theta = \frac{\text{Opposite}}{\text{Adjacent}}$ (TOA)

Exercise 4.1.1 Find, without simplifying, the value of:



1. $\sin \angle PRQ$ _____
2. $\cos \angle SPQ$ _____
3. $\tan \angle PRQ$ _____
4. $\sin \angle SPQ$ _____
5. $\cos \angle QPR$ _____
6. $\tan \angle SPQ$ _____
7. $\cos \angle PSQ$ _____
8. $\sin \angle QPR$ _____

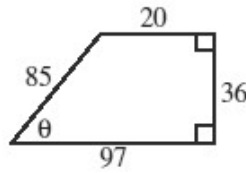
Exercise 4.1.2 Find the value of the pronumeral in each triangle.



1. $x =$ _____
2. $y =$ _____
3. $p =$ _____

Exercise 4.1.3 Further applications

1. Find the values for $\sin\theta$, $\cos\theta$ and $\tan\theta$ in the following figure.



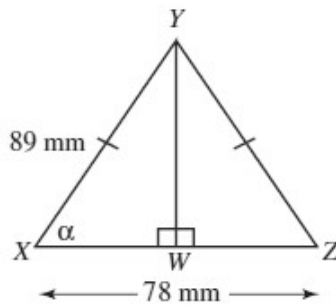
(a) $\sin \theta =$ _____

(b) $\cos \theta =$ _____

(c) $\tan \theta =$ _____

2. In the isosceles triangle XYZ , W is a point on XZ such that $YW \perp XZ$.

If $XY = YZ = 89 \text{ mm}$ and $XZ = 78 \text{ mm}$, find the length of YW and hence find values for $\sin \alpha$ and $\cos \alpha$.



3. If $\cos \theta = \frac{55}{73}$, find values for $\sin \theta$ and $\tan \theta$.

4.1.2 Degrees and minutes

Angles are measured in degrees, minutes and seconds:

- 1 degree = 60 minutes ($1^\circ = 60'$)
- 1 minute = 60 seconds ($1' = 60''$)
- The degrees, minutes and seconds key $\boxed{\text{DMS}}$ or $\boxed{^\circ / ' ''}$

Exercise 4.1.4 Round off each angle, correct to the nearest degree:

1. $38^\circ 15' =$ _____
2. $82^\circ 48' =$ _____
3. $23^\circ 24' =$ _____

Exercise 4.1.5 Round off each angle, correct to the nearest minute:

1. $15^\circ 25' 46'' =$ _____
2. $68^\circ 22' 30'' =$ _____
3. $126^\circ 45' 28'' =$ _____

Exercise 4.1.6 Evaluate the following trigonometric expressions, correct to 2 decimal places:

1. $\sin 28^\circ 28' =$ _____
2. $24.5 \tan 12^\circ 35' =$ _____
3. $\cos 43^\circ 42' =$ _____
4. $12.8 \cos 35^\circ 26' =$ _____
5. $\frac{12}{\sin 25^\circ 48'} =$ _____
6. $\frac{26.4}{\tan 56^\circ 18'} =$ _____
7. $\frac{\sin 22^\circ 35'}{\cos 44^\circ 20'} =$ _____
8. $\frac{\cos 15^\circ}{\sin 25^\circ 50' + \tan 12^\circ 24'} =$ _____

4.1.3 Finding the size of an angle

Use the **shift** or **2nd F** key followed by the appropriate trigonometric function key to find the size of an angle (\sin^{-1} , \cos^{-1} and \tan^{-1}).

Exercise 4.1.7 Find the acute angle θ , correct to the nearest minute:

1. $\sin \theta = 0.9641$ _____

2. $\cos \theta = 0.6124$ _____

3. $\tan \theta = 0.0899$ _____

4. $\sin \theta = 0.5863$ _____

5. $\cos \theta = 0.2662$ _____

6. $\tan \theta = 1.4085$ _____

Exercise 4.1.8 Find the acute angle θ , correct to the nearest minute:

1. $\sin \theta = \frac{3}{5}$ _____

2. $\cos \theta = \frac{1}{4}$ _____

3. $\tan \theta = \frac{2}{7}$ _____

Exercise 4.1.9 Further applications

1. If $\cos \theta = 0.3752$, find $\tan \theta$ and $\sin \theta$, correct to 4 decimal places.

2. Find the acute angle β , correct to the nearest minute:

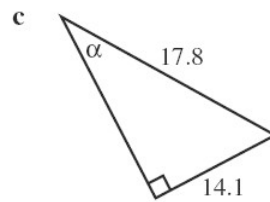
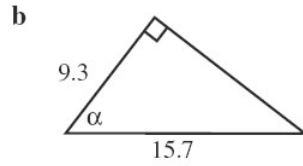
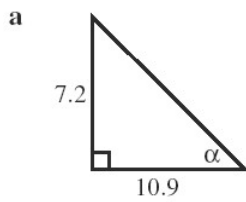
(a) $\frac{2}{\cos \beta} = 9$

(b) $3 \sin \beta + 8 = 9$

(c) $\frac{7 \tan \beta}{2} = 6$

Exercise 4.1.10

1. Find the size of the angle α . all lengths are in centimetres, correct to nearest minute:



(a) $\alpha =$ _____

(b) $\alpha =$ _____

(c) $\alpha =$ _____

2. Draw a diagram and mark on it all the given information, to answer each of the following, correct to nearest degree:

(a) In $\triangle ABC$, $\angle B = 90^\circ$, $AC = 9$ cm and $BC = 7$ cm. Find $\angle C$.

(b) In $\triangle IJK$, $\angle I = 90^\circ$, $IK = 13$ cm and $JK = 14.8$ cm. Find $\angle K$.

3. A straight stretch of railway track has a gradient of $\frac{4}{15}$. Calculate the angle at which the track rises, correct to nearest minute.

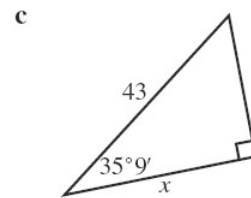
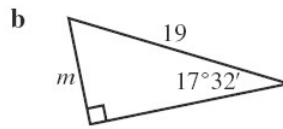
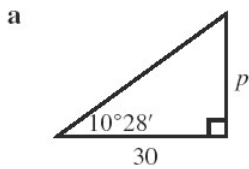
4.1.4 Finding the length of a side

To find the length of the opposite or adjacent sides:

- determine which ratio is to be used
- write down a trigonometric equation
- multiply both sides by the denominator and evaluate using a calculator.

Exercise 4.1.11

1. Find the value of the pronumeral in each of these, correct to 1 decimal place. All lengths are in centimetres:

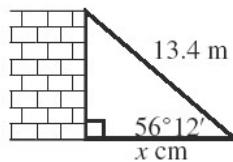


(a) $p =$ _____

(b) $m =$ _____

(c) $x =$ _____

2. A ladder of length 13.4 m leans against a wall and makes an angle of $56^{\circ}12'$ with the ground. How far is the foot of the ladder from the base of the wall? Answer correct to nearest centimetre.



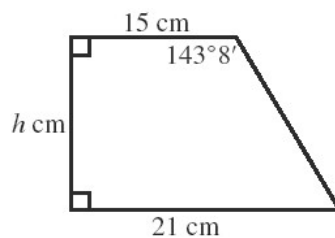
3. Draw a diagram and mark on it all of the given information, to answer each of the following:

(a) In $\triangle XYZ$, $\angle Y = 90^\circ$, $\angle X = 64^\circ 17'$ and $XZ = 28$ cm. Find the length of XY , correct to 2 decimal places.

(b) In $\triangle ABC$, $\angle A = 90^\circ$, $\angle B = 46^\circ 50'$ and $AC = 65$ cm. Find the length of BC , correct to 4 significant figures.

(c) In $\triangle LMN$, $\angle L = 90^\circ$, $\angle N = 22^\circ 17'$ and $MN = 47$ cm. Find the length of LN , correct to nearest millimetre.

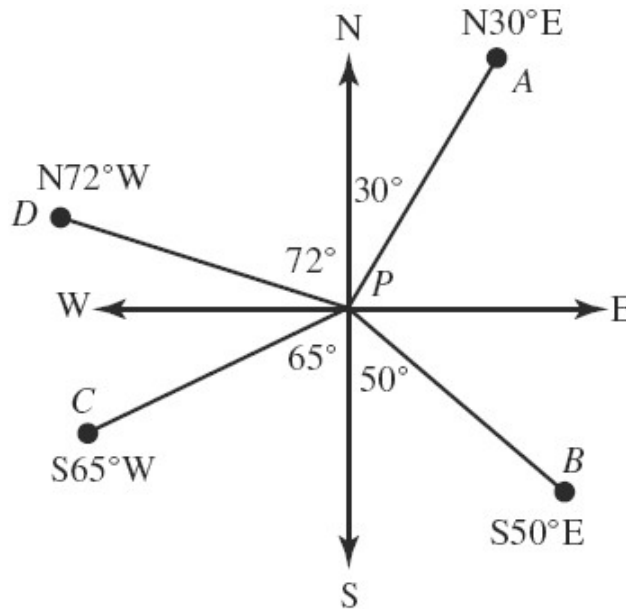
4. Find the height of this trapezium, correct to 1 decimal place.



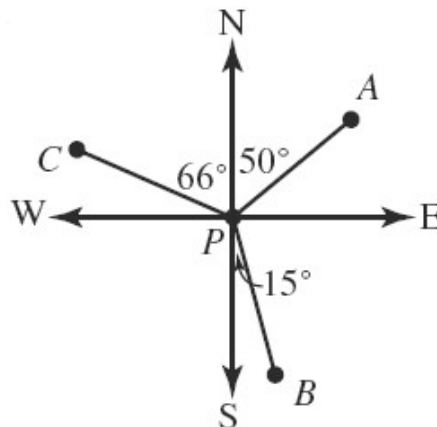
4.2 Bearings

4.2.1 Compass bearings

A Compass bearing is a deviation from north or south and towards east or west. For example a bearing such as NE means $N45^\circ E$. Similarly NW means $N45^\circ W$. While a bearing of $N30^\circ E$ means a deviation of 30° from north towards the east as shown below.



Exercise 4.2.1 Find the compass bearings from P of the points A, B, C.



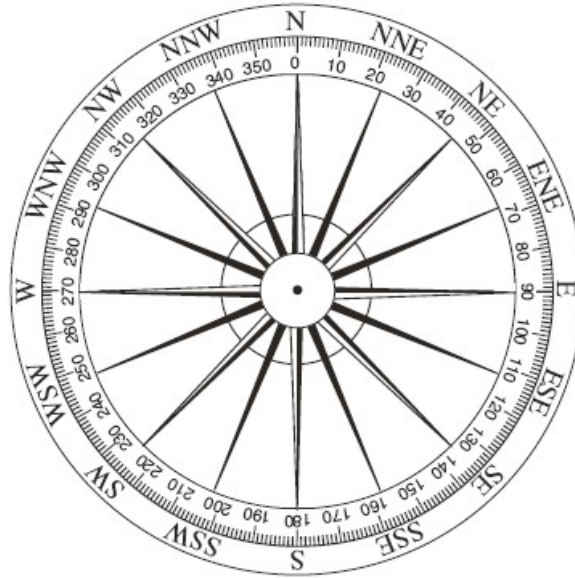
1. Point A _____

2. Point B _____

3. Point C _____

4.2.2 The 16 point compass

The 16 point compass, or mariner’s compass, was used by mariners to determine directions while at the sea. The direction on the 16 point compass are given as deviation from the four cardinal directions and towards the four intermediate directions (i.e. NE NW, SE, SW)



Exercise 4.2.2

1. How many degrees is the angle between:

- (a) NNE and ENE? _____
- (b) NW and SW? _____
- (c) SSW and SE? _____
- (d) SSW and NNE? _____

2. You are facing North-West and turn anti-clockwise through 90°. In which direction are you now facing?

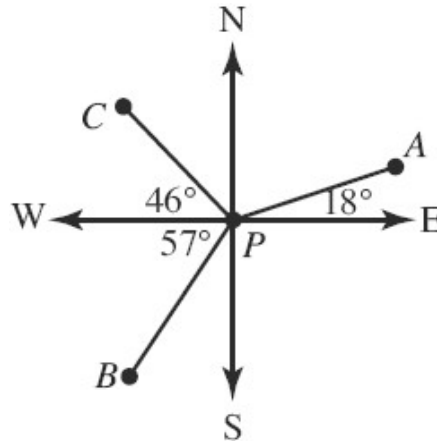
3. You makes 4 equal turns from NE to SE. What angle is each turn?

4.2.3 True bearings

True bearing is a deviation from north, measured in a clockwise direction. True bearings are written using three digits.

Exercise 4.2.3

1. Find the true bearing from P of the points A , B and C .



2. Adam drove 82 km on a bearing of 062° . How far east was he then from his starting point?

3. David flew a light plane 118 km on a bearing of 308° . How far north was he then from his starting point?

4. After turning anti-clockwise through 225° , you are facing East. In which direction were you facing at the start?

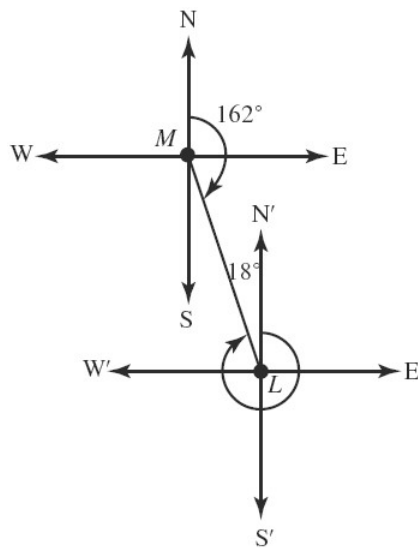
4.2.4 Opposite bearings

To find the bearing of A from B given the bearing of B from A:

- Draw a compass at B and mark on this compass the angle from north around to the ray BA.
- On the compass with centre A, find the acute angle between BA and the north-south axis.
- Use parallel line properties to find the required bearing on the compass with centre B.
- Opposite bearing always differ by 180°

Exercise 4.2.4

1. The bearing of L from M is 162° . Find the bearing of M from L.



2. Keith sailed 19 km due east from R to S, then sailed 22 km due north to T. Find the bearing of:

(a) T from R

(b) R from T

4.3 Miscellaneous exercises

Exercise 4.3.1

1. If $\sin \theta = \frac{24}{25}$, find values for $\cos \theta$ and $\tan \theta$

2. If $\tan \theta = \frac{x}{y}$, find expressions for $\sin \theta$ and $\cos \theta$

3. evaluate each expression, correct to 4 significant figures:

(a) $\frac{16}{\tan 72^\circ 25'}$ = _____

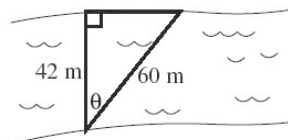
(b) $\frac{2 \sin 52^\circ 28'}{5 \cos 18^\circ 14'}$ = _____

(c) $\frac{23 \cos 15^\circ 24'}{5 \tan 9^\circ 46'}$ = _____

(d) $\frac{\sin 42^\circ 12' + \cos 14^\circ 28'}{\tan 47^\circ 39'}$ = _____

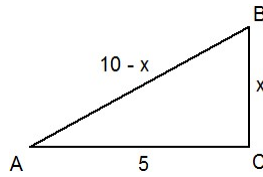
4. In $\triangle OPQ$, $\angle Q = 90^\circ$, $OQ = 15.9$ cm and $OP = 25.6$ cm. Find $\angle P$, correct to nearest minute.

5. While trying to swim across a river. Ben was swept downstream by the current. The river is 42 m wide, but Ben had to swim 60 m to get across. At what angle was he dragged downstream?



Exercise 4.3.2

1. In the diagram $\angle ACB$ is a right angle. Find the value of x .



2. Solve the pair of simultaneous equations: $2x - y = 7$ and $x + 2y = 1$

3. A quadrilateral is formed from the points $A(1, 4)$, $B(6, 3)$, $C(5, -2)$ and $D(-3, -3)$.

(a) Show that the diagonals of ABCD are perpendicular.

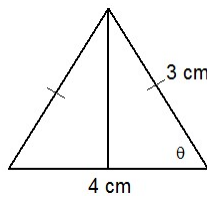
(b) Find the midpoints of the diagonals.

(c) What kind of the quadrilateral is ABCD?

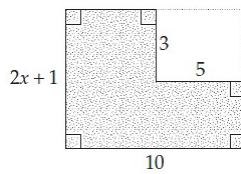
Exercise 4.3.3

1. Solve the equation $4x + 7 = 3(x - 5)$.

2. From the given figure find the values of $\sin \theta$, $\cos \theta$ and $\tan \theta$.



3. Find an expression in term of x for the area of the following figure.



4. Mary invests \$10,000 at 7% p.a compounded annually. During which year her investment be doubled?
