# Section Check In – 1.05 Trigonometry

## Questions

 1. In the triangle, cm and cm. Given that the area of the triangle is cm2, find the possible values of the angle.

 2. Find the exact value of, giving your answer in the form .

 3.\* Show that for a small angle , measured in radians, .

 4.\* A circle has centre and radius cm. Two points  and  lie on the circumference such that angle  radians. Find the perimeter of the minor segment bounded by the arcand the chord .

 5. Prove that .

 6.\* Prove that .

 7. Solve the equation  for .

 8.\* Solve the equation  for .

 9. A boat sails due north from a port. After going a distance of km, the boat changes direction and sails for a further km on a bearing of .

 (a) How far is the boat now from the port?

 (b) On what bearing should the boat now sail to return directly to the port?

10.\* The depth of water in a harbour varies due to the tides. On a particular day, the depth of water, metres, at a time  hours after noon is given by

 .

 (a) Find the depth of water at high tide and determine the time when this occurs.

 (b) Find the depth of water at low tide and determine the time when this occurs.

 (c) When the depth of water is less than  metres, boats are unable to enter or leave the harbour. Between which two times does this occur?

**Extension**

 (a) Use the identities for  and  with  to confirm the identities for  and .

 (b) By taking  and , express  in terms of  and  in terms of .

 (c) Use two different approaches to express  in terms of  and . Use two different approaches to express  in terms of .

 (d) Consider  and  similarly.

 (e) Develop further identities.

## Worked solutions

 1. Using Area ,  and therefore 

 Angle  or 

 2. 

 3. Using the small angle approximations  and ,

 

 

 

 

 4.

*A*

2.15

*O*

*B*

14 cm

14 cm

 Length of arc cm

 Length of chord cm

 [or, using cosine rule,  and ]

 Perimeter of segment cm (to 3 significant figures)

 5. Left-hand side 

 , using identities  and 

 

 , cancelling 

 

 6. Left-hand side , using  identity

 , substituting  and 

 , using identity 

 , cancelling 

 7. Equation is 

 Using , 

 Multiplying both sides by , 

 Using identity  for the left-hand side, 

 Hence  giving solutions 

 8. Equation is 

 Substituting  and identity for , 

 Multiplying by , 

 Expressing in terms of  and , 

 Multiplying both sides by , 

 Expressing in terms of  leads to equation 

Use of quadratic formula gives  and therefore  and 

Formula also gives  and therefore  and 

 Solutions to 3 significant figures are 

 9.

A

P

3 km

40°

B

5 km

 (a) Using cosine rule, 

 

 Boat is km from the port

 (b) Using sine rule,  giving 

 Bearing to sail 

10. Expressing  in form , i.e. in form 

 Comparing,  and 

 Squaring and adding gives  and therefore 

 Dividing gives , i.e.  and therefore 

 Hence depth of water is given by 

 (a) High tide occurs when  and this gives 

 Solving for ,  and hence 

 Changing  hours to minutes,  to nearest whole number

 High tide occurs  hour and  minutes after noon, i.e. at  hours

 Depth of water at high tide is  metres

 (b) Low tide occurs when  and this gives 

 Solving for ,  and hence 

As before,  hours minutes and low tide occurs  hours and  minutes after noon

 Low tide occurs at  hours and depth of water is  metres

 (c) When ,  giving 

 Solving  giving 

 Boats cannot enter or leave harbour between  hours and  hours

**Extension**

 (a) 

 

 (b) 

 

 

 

 (c) For , this can be written as either  or 

Using the  identity together with earlier results leads to  (or a slight variation of this if  has been used)

 For , either approach will lead to 

 (d) Using any of several approaches,  and 

 (e) [Remember that you can check a result by substituting a particular value; this does not prove that the result is correct (because flukes can happen) but it might indicate an error. For example, if you have an expression for , choose an ordinary value such as ; does your expression with this value substituted give the same value as ?]

**OCR Resources**: *the small print*OCR’s resources are provided to support the delivery of OCR qualifications, but in no way constitute an endorsed teaching method that is required by the Board, and the decision to use them lies with the individual teacher. Whilst every effort is made to ensure the accuracy of the content, OCR cannot be held responsible for any errors or omissions within these resources.

© OCR 2020 - This resource may be freely copied and distributed, as long as the OCR logo and this message remain intact and OCR is acknowledged as the originator of this work.

OCR acknowledges the use of the following content: n/a

Please get in touch if you want to discuss the accessibility of resources we offer to support delivery of our qualifications: resources.feedback@ocr.org.uk

We’d like to know your view on the resources we produce. By clicking on ‘Like’ or ‘Dislike’ you can help us to ensure that our resources work for you. When the email template pops up please add additional comments if you wish and then just click ‘Send’. Thank you.

Whether you already offer OCR qualifications, are new to OCR, or are considering switching from your current provider/awarding organisation, you can request more information by completing the Expression of Interest form which can be found here: [www.ocr.org.uk/expression-of-interest](http://www.ocr.org.uk/expression-of-interest)

Looking for a resource? There is now a quick and easy search tool to help find free resources for your qualification:
[www.ocr.org.uk/i-want-to/find-resources/](http://www.ocr.org.uk/i-want-to/find-resources/)