## Nat 5 Trigonometry
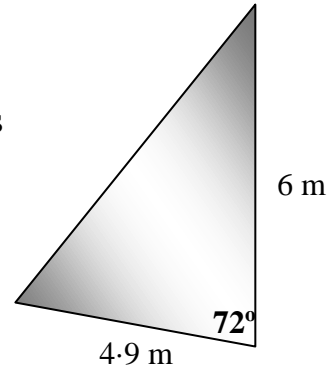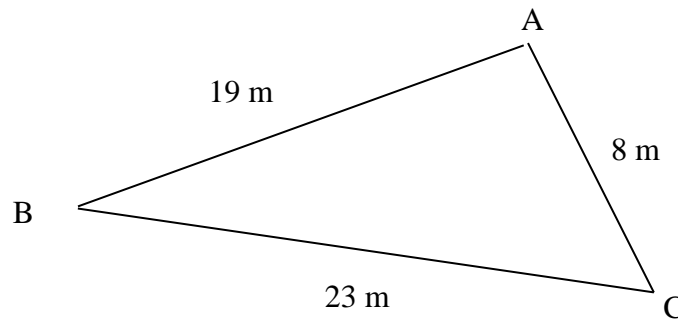
1. A triangular sail has dimensions as shown.

   Two of its edges measure 6 metres and 4·9 metres and the angle between them is 72º.

   Calculate the **area** of the sail.     **2**

   6 m

   72º

   4·9 m

2. Calculate the size of angle B
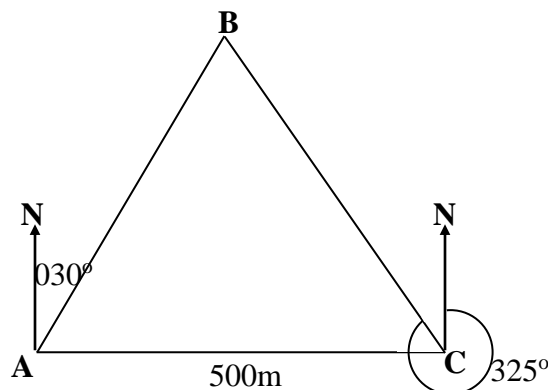
   A

   19 m

   8 m

   B

   23 m     C     **3**

3. The diagram shows the positions of two ships, Arcadia (A) and Corona (C). The Corona is 500metres due East of the Arcadia.

   The lighthouse Blinker (B) is sighted on a bearing 030º from A and on a bearing of 325º from C.

   Calculate how far the Arcadia is from the lighthouse.

   B

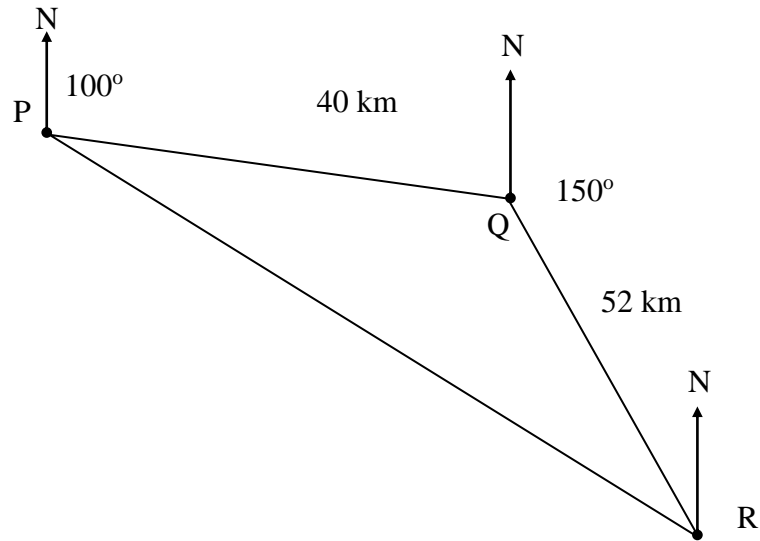   N

   030º

   N

   **4**

   A     500m     C     325º

4. The diagram below represents the positions of three mobile phone masts.

Mast Q is on a bearing of 100º from mast P and is 40km away.
The bearing of mast R from mast Q is 150º.
Masts Q and R are 52 km apart.



(a)   Use the information in the diagram to
      establish the size of angle PQR.                    **2**

(b)   Hence find the distance from mast P **to** mast R.    **3**

5.    Sketch the graph of  $y = 3\sin2x°,\quad 0 \le x \le 360°$    **3**

6.    Write the following in order  of size, starting with the smallest.

            cos 90°      cos 100°     cos 300°

      Justify your answer                                  **2**

**7.** Solve the equation $7\cos x° + 1 = 5,$ $\quad 0 \le x \le 360°$ **3**

**8.** A Ferris wheel at a fairground turns at a steady rate.

The height, $h$ metres, of one of the cars above the ground at a time $t$ seconds is given by the formula
$h = 9 + 4\sin t°$

(a) What is the height of the car after 25 seconds? **2**

(b) Find the **two** times during the first turn when the car is at a height of 12.5 metres above the ground **3**

**9.** Simplify $\quad \dfrac{\cos^3 x°}{1 - \sin^2 x°}$ **2**

Answers
1. Area $= \frac{1}{2} \times 6 \times 4·9 \times \sin 72°$ , **14 m²**
2. $CosB = \dfrac{19^2 + 23^2 - 8^2}{2 \times 19 \times 23}$ , $CosB = \dfrac{413}{437} = 0.94508009$ , **B = 19°**
3. $\angle BAC = 60°$ , $\angle BCA = 55°$ , so $\angle ABC = 65°$
   Use Sine rule to find AB $\quad$ AB $= (500\sin 55°) \div \sin 65°$ , **AB = 452m**
4. (a) $360° - 150° - \mathbf{80°} = \mathbf{130°}$
   (b) PR² $= 40² + 52² - 2 \times 40 \times 52 \times \cos 130°$
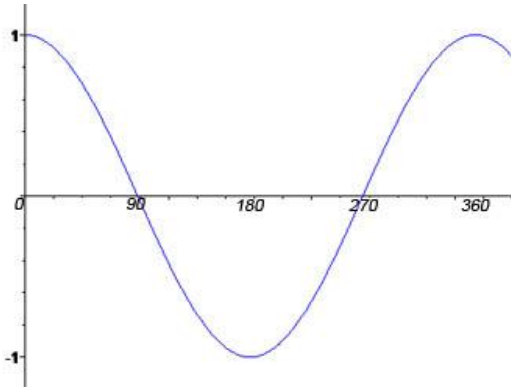   PR² = 6977.99645 $\qquad\qquad$ **PR = 83.5 km**
5.
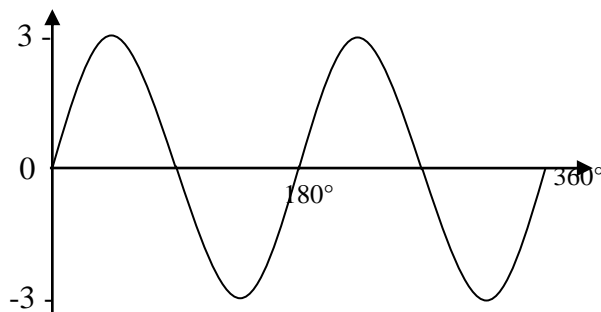


Max 3, min -3, two repetitions in 360°

6. From the graph of $y = \cos x°$



Cos 90° = 0
Cos 100° < 0 , below the x-axis
Cos 300° > 0, above the x-axis

In order, smallest first

Cos 100°, Cos 90°, Cos 300°

7. cos $x$ = 4/5,    $x$ = **55°** and $x$ = 360° - 55°= **305°**
8. (a)    $h = 9 + 4 \sin(25°) = $ **10.7 metres**
   (b)    12.5 = 9 + 4sin$t$°,
         sin$t$ = 3.5/4,  $t$ = 61° and $x$ = 180° - 61°= **119°**
9. Use sin²x + cos²x = 1,    $\dfrac{\cos^3 x}{1 - \sin^2 x}$  =  $\dfrac{\cos^3 x}{\cos^2 x}$  = cosx
   So   cos²x = 1 - sin²x

Extra help – Trigonometry

|   | Examples to read | Questions to try |
|---|---|---|
| 1 | Area Formulae<br>Ex 25.1 Page 292 | Q1 Page 293 |
| 2 | Cosine Rule for an angle<br>Ex 26.4 Page 303 | Q1 Page 303 |
| 3 | Sine Rule and bearings<br>Ex 27.2 Page 309 | Q1 Page 309,  Q3 Page 310 |
| 4 | Cosine Rule for sides and z-angles<br>Ex 27.1 Page 307/8 | Q3 Page 309,   Q5 Page 310 |
| 5 | Transformation of Sine Graph<br>Ex 23.4 Page 255 | Q1,2 Page 257 |
| 6 | Key points on the Cosine Graph<br>Ex 24.1 Page 272 | Q1 Page 272 |
| 7/8 | Solving Trig Equations<br>Ex 24.7 Pages 278/9 | Q1 Page 279<br>Q3 & 4 Page 279 |
| 9 | Trig Identities<br>Ex 24.12 Page 287 | Q1 & 4 Page 287 |