N5

UNIT 4

Past Paper Assessment Revision
National 5 Mathematics
Unit 4

SURDS AND INDICES

1. Evaluate $8^{\frac{5}{3}}$

2. Simplify $\frac{n^5 \times 10n}{2n^2}$

3. Simplify $2a \times a^{-4}$

   (a) Multiply out the brackets and simplify:

   $$x^{\frac{1}{2}}\left(x^{-\frac{3}{2}} + x^{-\frac{1}{2}}\right)$$

   (b) Find the exact value of this expression when $x = 6$.

4. Expand $x^{\frac{1}{2}}(3x + x^{-2})$

5. Evaluate $2^0 + 3^{-1}$

6. Express $\sqrt{40} + 4\sqrt{10} + \sqrt{90}$ as a surd in its simplest form.

7. Simplify

   (a) $\sqrt{2} \times \sqrt{18}$
   (b) $\sqrt{2} + \sqrt{18}$

8. Simplify $2\sqrt{75}$

9. Express $\frac{4}{\sqrt{8}}$ with a rational denominator. Give your answer in its simplest form.

10. Express $\frac{4}{\sqrt{6}}$ with a rational denominator. Give your answer in its simplest form.

ALGEBRAIC FRACTIONS

1. Simplify $\frac{(x+4)^2}{x^2-x-20}$

2. Express as a single fraction in its simplest form
$$\frac{1}{p}+\frac{2}{(p+5)}$$

3. Express as a single fraction in its simplest form
$$\frac{4}{x+2}-\frac{3}{x-4}$$

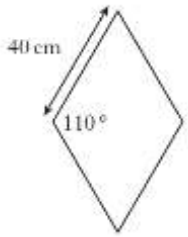
4. Express $\frac{5t}{s} \div \frac{t}{2s^2}$ in its simplest form.

TRIGONOMETRY: TRIANGLE FORMULAE

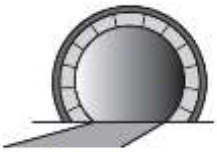
1. Paving stones are in the shape of a rhombus.

   The side of each rhombus is 40 centimetres long.

   Find the area of one paving stone.

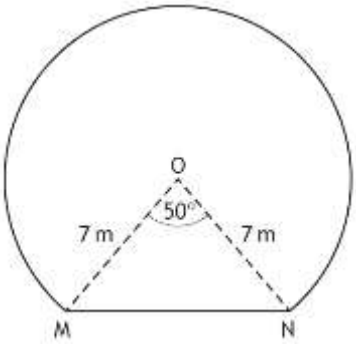


2. The picture shows the entrance to a tunnel which is in the shape of part of a circle.



   The diagram below represents the cross-section of the tunnel.

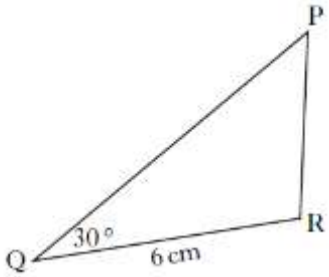
- The centre of the circle is O.
- MN is a chord of the circle.
- Angle MON is 50^o.
- The radius of the circle is 7 metres.



   Calculate the area of the cross-section of the tunnel.

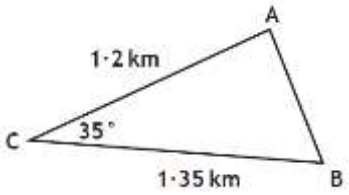
3. In triangle PQR
   - QR = 6 centimetres
   - Angle PQR = 30^o
   - Area of triangle PQR = 15 square centimtres.

   Calculate the length of PQ.

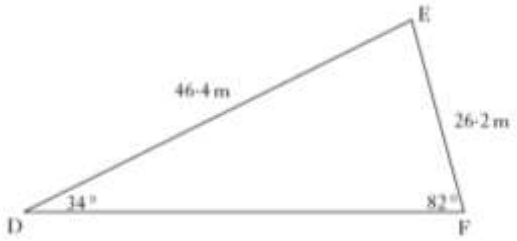


4. Triangle ABC is shown below.

   Calculate the length of AB



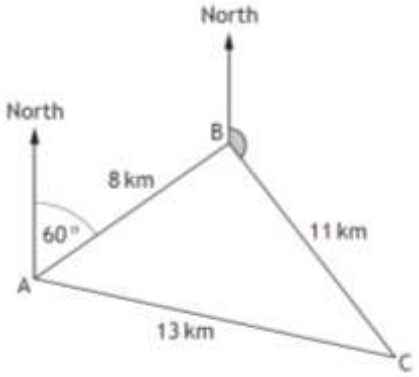
5. As part of their training, footballers run around a triangular circuit DEF.



- Angle EDF = 34^o
- Angle DFE = 82^o
- DE = 46.4 metres
- EF = 26.2 metres

How many **complete** circuits must they run to cover at least 1000 metres?

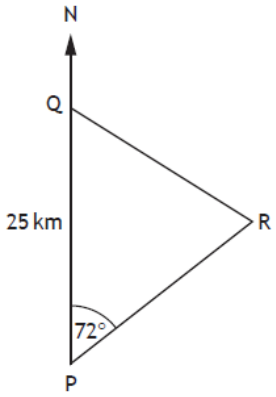
6. In a race, boats sail round three buoys represented by A, B, and C in the diagram below.



- B is 8 kilometres from A on a bearing of 060^o.
- C is 11 kilometres from B.
- A is 13 kilometres from C.

(a) Calculate the size of angle ABC.
(b) Hence find the size of the shaded angle.

7. In the diagram below P, Q and R represent5 the positions of Portlee, Queenstown and Rushton respectively.

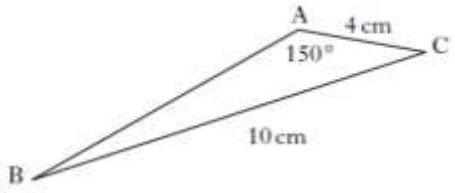


- Portlee is 25 kilometres due South of Queenstown.
- From Portlee, the bearing of Rushton is 072^{o}.
- From Queenstown, the bearing of Rushton is 128^{o}.

Calculate the distance between Portlee and Rushton.
Do not use a scale drawing.

8. In triangle ABC

- AC = 4 centimetres
- BC = 10 centimetres
- Angle BAC = 150^{o}

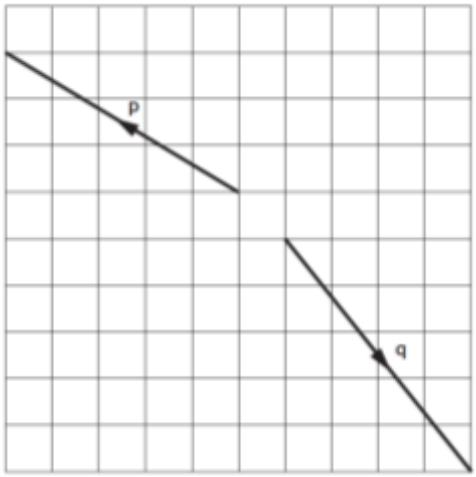


Given that $\sin 30 = \frac{1}{2}$, show that $\sin B = \frac{1}{5}$

VECTORS

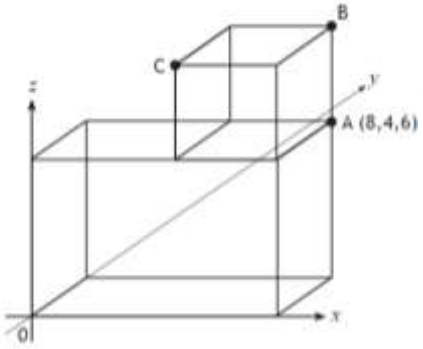
1. Find $|\underline{\boldsymbol{u}}|$, the magnitude of vector $\underline{\boldsymbol{u}} = \begin{pmatrix} 6 \\ -13 \\ 18 \end{pmatrix}$

2. The vectors $\underline{\boldsymbol{p}}$ and $\underline{\boldsymbol{q}}$ are shown in the diagram below.
   Find the resultant vector $\underline{\boldsymbol{p}} + \underline{\boldsymbol{q}}$.
   Express your answer in component form.



3. Find the resultant vector $2\underline{\boldsymbol{u}} - \underline{\boldsymbol{v}}$ when $\underline{\boldsymbol{u}} = \begin{pmatrix} -2 \\ 3 \\ 5 \end{pmatrix}$ and $\underline{\boldsymbol{v}} = \begin{pmatrix} 0 \\ -4 \\ 7 \end{pmatrix}$.
   Express your answer in component form.

4. The diagram shows a cube placed on top of a cuboid, relative to the coordinate axes.



   A is the point (8, 4, 6).
   Write down the coordinates of B and C.