Revision Test 3

Duration: 1 hour

/30

1. Four points, J, K, L and M lie on a circle of centre O. LMN is a straight line, $\angle KLM = 120°$ and $\angle JMN = 98°$.

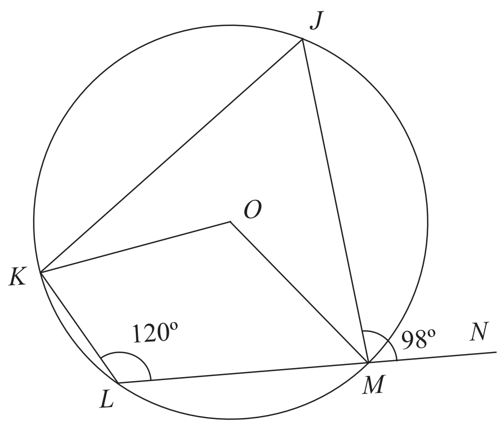
Find

(a) $\angle JKL$,

(b) $\angle KJM$.

Hence,

(c) show that $OKLM$ is a rhombus.



Answer **(a)** $\angle JKL$ = __________ ° [2]

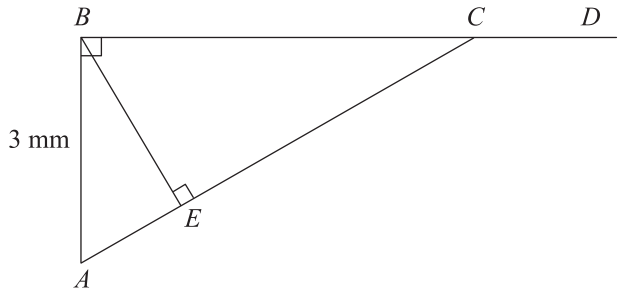
(b) $\angle KJM$ = __________ ° [1]

(c) ____

____

____ [2]

2. The diagram shows a right-angled triangle ABC where $\angle ABC = 90°$. Given that BCD is a straight line, $AB = 3$ mm and $\sin \angle ACB = \frac{1}{2}$.



Calculate

(a) the length AC,

(b) the length of BC,

(c) the shortest distance of point B from AC,

(d) the value of $\cos \angle ACD$.

Give your answers correct to 3 significant figures where necessary.

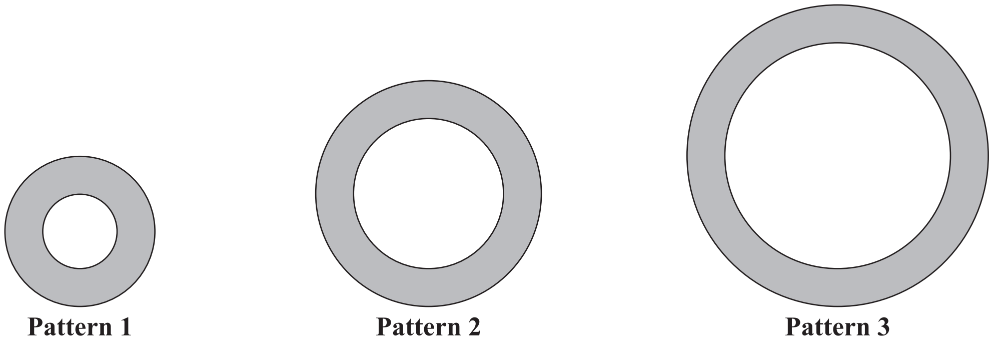
Answer **(a)** $AC =$ ________ mm [1]

(b) $BC =$ ________ mm [1]

(c) ____________ mm [2]

(d) ______________ [2]

3.



Discs of different radii are used to make patterns as shown above.

In each pattern, the radius of the outer disc is 1 cm bigger than the radius of the inner disc. The areas of shaded portions in the above form a sequence.

Pattern 1 contains 2 discs, radius of 1 cm and 2 cm respectively.

The table shows the radius of discs for each pattern.

Pattern	1	2	3		n
Outer radius (cm)	2	3	4		x
Inner radius (cm)	1	2	3		y
Area of shaded portion (cm^2)	$(2^2 - 1^2)\pi$	$(3^2 - 2^2)\pi$	p		A

(a) Write down the expression of p.

(b) Write down, in terms of n, the expression of

(i) x,

(ii) y.

(c) Show that $A = (2n + 1)\pi$.

(d) In Pattern k, the area of the shaded portion is 59π cm^2.

Find

(i) the value of k,

(ii) hence, the perimeter of the shaded portion.

Answer **(c)** [2]

Answer **(a)** ______________ [1]

(b)(i) ______________ [1]

(ii) ______________ [1]

(d)(i) ______________ [2]

(ii) ______________ [3]

4. Given $\overrightarrow{OP} = \begin{pmatrix} 4 \\ 1 \end{pmatrix}$ and $\overrightarrow{PQ} = \begin{pmatrix} 6 \\ -8 \end{pmatrix}$.

(a) Calculate $|\overrightarrow{PQ}|$.

(b) Express $\overrightarrow{OQ}$ as a column vector.

(c) Hence, write down the coordinates of Q.

(d) Given that $OPQR$ is a trapezium such that OP is parallel to RQ and $RQ = 2OP$.

(i) Express $\overrightarrow{RQ}$ as a column vector.

(ii) Find the coordinates of R.

(e) Find the numerical value of $\frac{\text{area of triangle } OPR}{\text{area of triangle } PQR}$.

Answer **(a)** ______________________ [1]

(b) ______________________ [1]

(c) ______________________ [1]

(d)(i) ______________________ [2]

(ii) ______________________ [2]

(e) ______________________ [2]

–End–

Solutions to Revision Test 3

1. **(a)** $\angle JML = 180° - 98°$ (sum $\angle$s of str. line)
$= 82°$ [1]
$\angle JKL = 180° - 82°$ ($\angle$s in opp segments are supp)
$= 98°$ [1]

(b) $\angle KJM = 180° - 120°$ ($\angle$s in opp segments are supp)
$= 60°$ [1]

(c) $\angle KOM = 2 \times \angle KJM$ ($\angle$s at centre $= 2\angle$s at circumference)
$= 120°$ [1]
$\angle KOM = \angle KLM = 120°$ [1]
$OK = OM =$ radius
$\therefore$ $OKLM$ is a rhombus.

2. **(a)** $\sin \angle ACB = \dfrac{AB}{AC}$
$\dfrac{1}{2} = \dfrac{3}{AC}$
$AC = 6$ mm [1]

(b) $BC = \sqrt{6^2 - 3^2}$
$= \sqrt{27}$
$= 5.20$ mm (3 s.f.) [1]

(c) Area of $\triangle ABC = \dfrac{1}{2} \times AC \times BE$
$= \dfrac{1}{2} \times BC \times AB$
$\dfrac{1}{2} \times 6 \times BE = \dfrac{1}{2} \times \sqrt{27} \times 3$ [1]
$BE = \dfrac{\sqrt{27} \times 3}{6}$
$= 2.60$ mm (3 s.f.) [1]

(d) $\cos \angle ACD = -\cos \angle ACB$ [1]
$= -\dfrac{BC}{AC}$
$= -\dfrac{\sqrt{27}}{6}$
$= -0.866$ [1]

3. **(a)** $p = (4^2 - 3^2)\pi$ [1]

(b) **(i)** $x = (n + 1)$ [1]
(ii) $y = n$ [1]

(c) $A = [(n + 1)^2 - n^2]\pi$ [1]
$= (n^2 + 2n + 1 - n^2)\pi$
$= (2n + 1)\pi$ (shown) [1]

(d) **(i)** $A = 59\pi$
$(2k + 1)\pi = 59\pi$ [1]
$k = 29$ [1]

(ii) Perimeter $= 2\pi(R + r)$
$= 2\pi[(29 + 1) + (29)]$ [2]
$= 371$ cm (3 s.f.) [1]

4. **(a)** $|\overrightarrow{PQ}| = \sqrt{6^2 + (-8)^2}$
$= 10$ units [1]

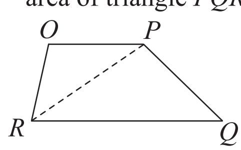
(b) $\overrightarrow{PQ} = \overrightarrow{OQ} - \overrightarrow{OP}$
$\overrightarrow{OQ} = \overrightarrow{PQ} + \overrightarrow{OP}$
$= \begin{pmatrix} 6 \\ -8 \end{pmatrix} + \begin{pmatrix} 4 \\ 1 \end{pmatrix}$
$= \begin{pmatrix} 10 \\ -7 \end{pmatrix}$ [1]

(c) Coordinates of $Q = (10, -7)$. [1]

(d) **(i)** Since $RQ \parallel OP$, $\overrightarrow{RQ} = 2\overrightarrow{OP}$ [1]
$= 2\begin{pmatrix} 4 \\ 1 \end{pmatrix}$
$= \begin{pmatrix} 8 \\ 2 \end{pmatrix}$ [1]

(ii) $\overrightarrow{RQ} = \overrightarrow{OQ} - \overrightarrow{OR}$
$\overrightarrow{OR} = \overrightarrow{OQ} - \overrightarrow{RQ}$
$= \begin{pmatrix} 10 \\ -7 \end{pmatrix} - \begin{pmatrix} 8 \\ 2 \end{pmatrix}$
$= \begin{pmatrix} 2 \\ -9 \end{pmatrix}$ [1]
$\therefore$ Coordinates of $R = (2, -9)$. [1]

(e) $\dfrac{\text{area of triangle } OPR}{\text{area of triangle } PQR} = \dfrac{\frac{1}{2} \times OP \times \text{height}}{\frac{1}{2} \times RQ \times \text{height}}$



$= \dfrac{OP}{RQ}$ [1]
$= \dfrac{1}{2}$ [1]