# Mock Grade 8/9

# Maths Booklet 2

Paper 2H
Calculator


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**1**     Solve the equation

$$3x = \sqrt{5}\,(x + 2),$$

    giving your answer in the form $a + b\sqrt{5}$, where $a$ and $b$ are rational.

**(Total for Question 1 is 4 marks)**

**2** Jackson is trying to find the density, in g/cm³, of a block of wood.
The block of wood is in the shape of a cuboid.

He measures
        the length as 11.9 cm, correct to the nearest mm
        the width as 15.2 cm, correct to the nearest mm
        the height as 20.0 cm, correct to the nearest mm

He measures the mass as 2010 g, correct to the nearest 5 g.

By considering bounds, work out the density of the wood.
Give your answer to a suitable degree of accuracy.

You must show all your working and give a reason for your final answer.

**(Total for Question 2 is 5 marks)**

**3** There are some small cubes and some large cubes in a bag.
The cubes are red or the cubes are yellow.

The ratio of the number of small cubes to the number of large cubes is $4:7$

The ratio of the number of red cubes to the number of yellow cubes is $7:11$

(a) Explain why the least possible number of cubes in the bag is 198

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**(1)**

All the **large** cubes are yellow.

(b) Work out the least possible number of large yellow cubes in the bag.

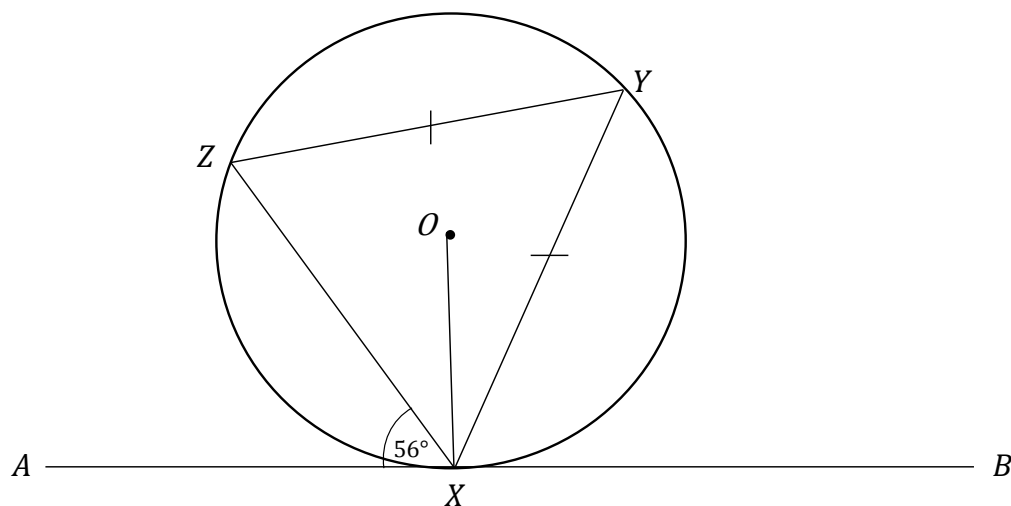.............................................

**(3)**

**(Total for Question 3 is 4 marks)**

**4** In the diagram $X$, $Y$ and $Z$ are points on the circumference of a circle with centre $0$.

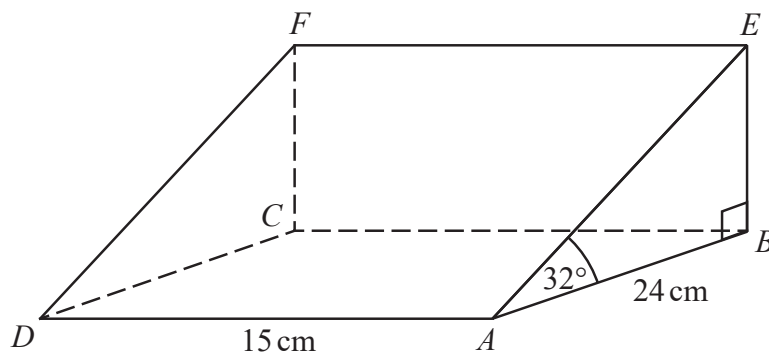The line $AXB$ is the tangent at $X$ to the circle.

Angle ZXA = 56°

$ZY = XY$

Calculate the size of angle $OXY$.

Give a reason for each stage of your working.

**5** The diagram shows a triangular prism.



The base, *ABCD*, of the prism is a square of side length 24 cm.
Angle *ABE* and angle *CBE* are right angles.
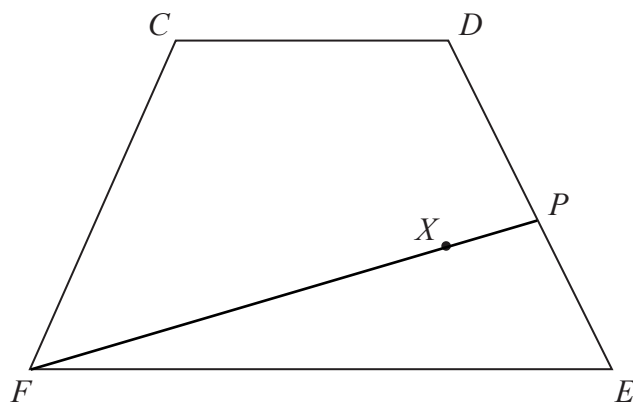Angle *EAB* = 32°

*M* is the point on *DA* such that

$$DM : MA = 4 : 3$$

Calculate the size of the angle between *EM* and the base of the prism.
Give your answer correct to 1 decimal place.

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**(Total for Question 5 is 4 marks)**

**6** *CDEF* is a quadrilateral.



$\overrightarrow{CD} = \mathbf{a}$, $\overrightarrow{DE} = \mathbf{b}$ and $\overrightarrow{FC} = \mathbf{a} - \mathbf{b}$.

*P* is the point on *DE* such that *DP*:*PE* = 3 : 2
*X* is the point on *FM* such that *FX*:*XP* = $n$ : 1
*CXE* is a straight line.

(b) Work out the value of *n*.

$n = $ ......................................................

**(Total for Question 6 is 6 marks)**

**7** A triangle has vertices $P$, $Q$ and $R$.

The coordinates of $P$ are $(a, b)$
The coordinates of $Q$ are $(c, d)$
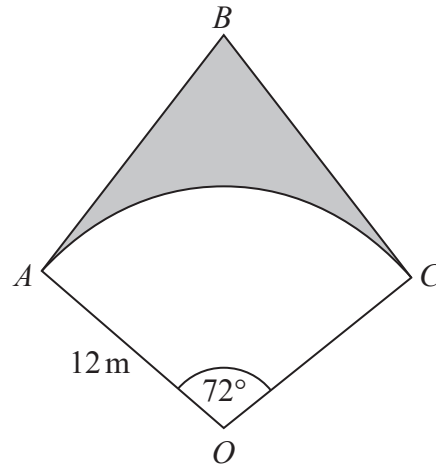The coordinates of $R$ are $(e, f)$

$M$ is the midpoint of $PQ$.
$N$ is the midpoint of $QR$.

Prove that $MN$ is parallel to $PR$.
You must show each stage of your working.

**(Total for Question 7 is 4 marks)**

**8**



*OAC* is a sector of a circle, centre *O*, radius 12 m.

*BA* is the tangent to the circle at point *A*.
*BC* is the tangent to the circle at point *C*.

Angle *AOC* = 72°

Calculate the area of the shaded region.
Give your answer correct to 3 significant figures.

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**(Total for Question 8 is 5 marks)**

**9** There are 15 counters in a bag.
There is an equal number of red counters, blue counters and yellow counters in the bag.
There are no other counters in the bag.

3 counters are taken at random from the bag.

(a) Work out the probability of taking 3 red counters.

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**(2)**

The 3 counters are put back into the bag.

Some more counters are now put into the bag.
There is still an equal number of red counters, blue counters and yellow counters in the bag.
There are no counters of any other colour in the bag.

3 counters are taken at random from the bag.

(b) Is it now less likely or equally likely or more likely that the 3 counters will be red?
You must show how you get your answer.

**(2)**

**(Total for Question 9 is 4 marks)**