N5

Prelim Examination 2016 / 17

MATHEMATICS

National Qualifications - National 5

Paper 1 (Non Calculator)

Testing EF and REL

Time allowed - 1 hour

Fill in these boxes and read carefully what is printed below

Full name of centre | **Town**

Forename(s) | **Surname**

Date of birth
Day Month Year

Candidate number

Seat number

Total marks - 40

1. You may NOT use a calculator.
2. Use **blue** or **black** ink. Pencil may be used for graphs and diagrams only.
3. Write your working and answers in the spaces provided. Additional space for answers is provided at the end of the booklet. If you use this space, write clearly the number of the question you are attempting.
4. Square ruled paper is provided.
5. Full credit will be given only where the solution contains appropriate working.
6. State the units for your answer where appropriate.
7. Before leaving the examination room you must give up this booklet to the invigilator. If you do not, you may lose all the marks for this paper.

FORMULAE LIST

The roots of $ax^2 + bx + c = 0$ are $x = \dfrac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$

Sine rule: $\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

Cosine rule: $a^2 = b^2 + c^2 - 2bc \cos A$ or $\cos A = \dfrac{b^2 + c^2 - a^2}{2bc}$

Area of a triangle: Area = $\frac{1}{2} ab \sin C$

Volume of a sphere: Volume = $\dfrac{4}{3}\pi r^3$

Volume of a cone: Volume = $\dfrac{1}{3}\pi r^2 h$

Volume of a Pyramid: Volume = $\dfrac{1}{3}Ah$

Standard deviation: $s = \sqrt{\dfrac{\sum(x - \bar{x})^2}{n-1}} = \sqrt{\dfrac{\sum x^2 - (\sum x)^2 / n}{n-1}}$, where n is the sample size.

All questions should be attempted

1. Find the equation of the line passing through (3, – 6) with gradient $\frac{2}{3}$. **3**

2. Find the gradient of the line joining the points (3, 6) and (– 3, 10). **2**

3. **(a)** Simplify $x^{\frac{1}{2}}(x^2 + x^{-5})$ **2**

(b) Evaluate $49^{\frac{3}{2}}$ **2**

Do not write in this margin.

Marks

4. Change the subject of this formula to V.

$$r = \sqrt{\left(\frac{3V}{\pi h}\right)}$$

3

5. **(a)** Simplify $\sqrt{50} + \sqrt{8} - 4\sqrt{2}$ **3**

(b) Express with a rational denominator in its simplest form

$$\frac{3}{\sqrt{18}}$$

3

Do not write in this margin.

Marks

6. A parabola has equation of the form $y = (x + a)^2 + b$.

It has its minimum turning point at (3, 5).

(a) Write down the equation of the parabola. **2**

(b) Determine the point at which the curve crosses the y – axis. **2**

(c) What is the equation of the axis of symmetry of the parabola? **1**

7. Solve the equation $\frac{2x}{5} - \frac{x}{4} = 3$ **3**

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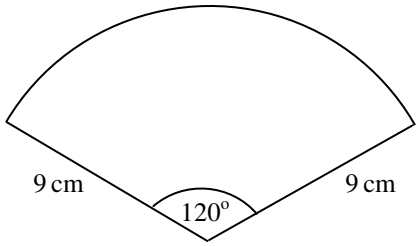
Marks

8. Calculate the perimeter of this sector of the circle which has radius 9 cm and angle at the centre 120^o. [Use $\pi = 3{\cdot}14$] **3**



9. Given that the equation $2x^2 - bx + 8 = 0$ has equal roots, determine the value(s) of b. **3**

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Marks

10. Write as a single fraction in its simplest form: **3**

$$\frac{5}{x-6}-\frac{3}{x+3} \quad ; \; x \neq 6; x \neq -3$$

11. Sketch the graph of the trigonometry function **3**

$$y = -3\sin 2x$$

12. Simplify $\frac{1}{\sin x°}(1-\cos^2 x)°$ **2**

End of Question Paper

N5

Prelim Examination 2016 / 17

MATHEMATICS
National Qualifications - National 5
Paper 2 (Calculator)
Testing E & F and REL

Time allowed - 1 hour and 30 minutes

Fill in these boxes and read carefully what is printed below

Full name of centre | **Town**

Forename(s) | **Surname**

Date of birth
Day Month Year

Candidate number

Seat number

Total marks - 50

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All questions should be attempted

Marks

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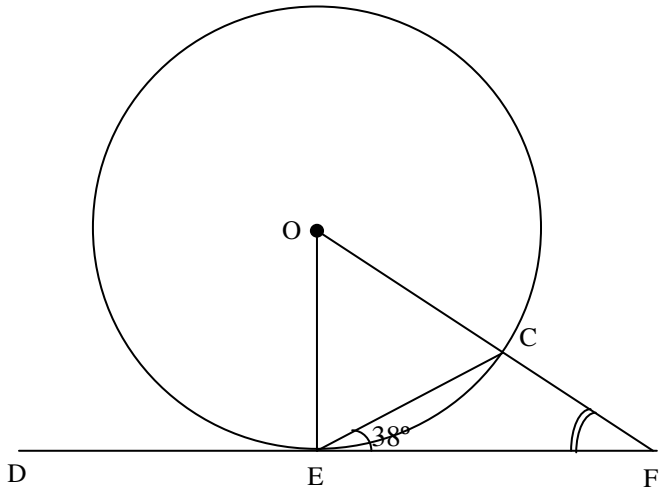
1. The line DF is a tangent to the circle centre O shown below. E is the point of contact of the tangent.

Given that angle CEF is 38°, calculate the size of angle CFE . **3**



2. Write $x^2 - 5x + 1$ in the form $(x+a)^2 + b$. **2**

Marks

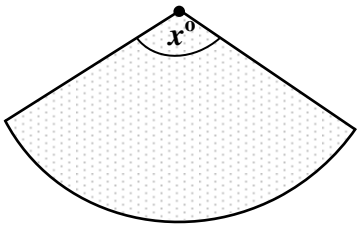
3. The international space station travels around $2 \cdot 3 \times 10^6$ km each time it completes an orbit of the Earth.

It completes 0·65 orbits per hour.

Calculate how far it will travel in 2017.

Give your answer in scientific notation correct to three significant figures. **3**

4. A sensor on a security system covers a horizontal area in the shape of a sector of a circle of radius 10 m.



The area covered by the sensor is 96 square metres.

Find the angle, x^o, at the centre of the sector. **4**

Marks

5. Solve the quadratic equation

$$3x^2 - 9x + 2 = 0$$

using an appropriate formula.
Give your answers correct to 1 decimal place. **4**

6. A function is defined as $f(x) = 5\sin x° + 1$.

(a) Evaluate find the value of $f(30)$ **2**

(b) Find the value(s) of x for which $f(x) = -3;\ \ 0 \leq x \leq 360$ **4**

Marks

7. A motor boat leaves from a particular point on an island and follows a path represented by the line with equation $y - 3x = 2$

Another motor boat leaves a different point on the island and follows a path given by $3y + 2x = -16$.

If the two lines were to be drawn on a coordinate diagram, find, algebraically, the point at which they would meet. **5**

8. Multiply the brackets and simplify $(4x^2 - 5x + 1)(3x - 2)$ **3**

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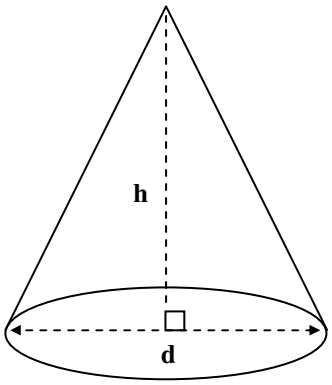
Marks

9. **(a)** Find the volume of this cone which has diameter 18cm and height 20cm. **2**



(b) If the cone is re-modelled into a hemisphere which has the same volume, find the radius of the hemisphere. **3**

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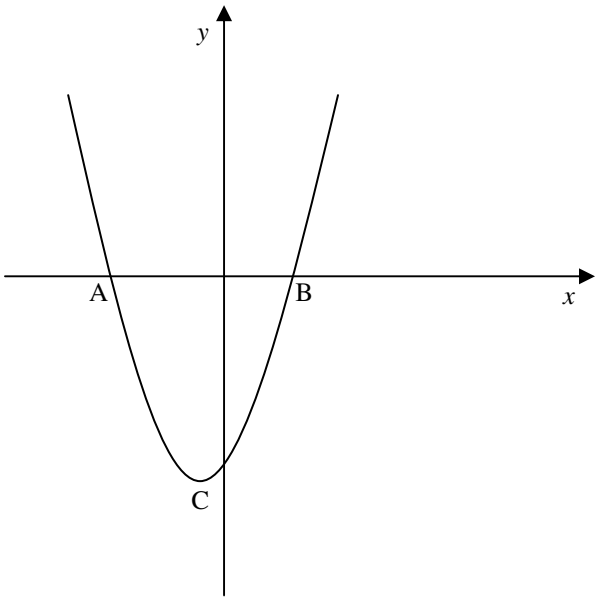
Marks

10. Paul was asked to make a sketch of the graph of $y = x^2 + 3x - 10$.

This is the graph that he drew.



Find the numbers that should be placed at the points A, B and the coordinates of point, C, the turning point of the parabola. **5**

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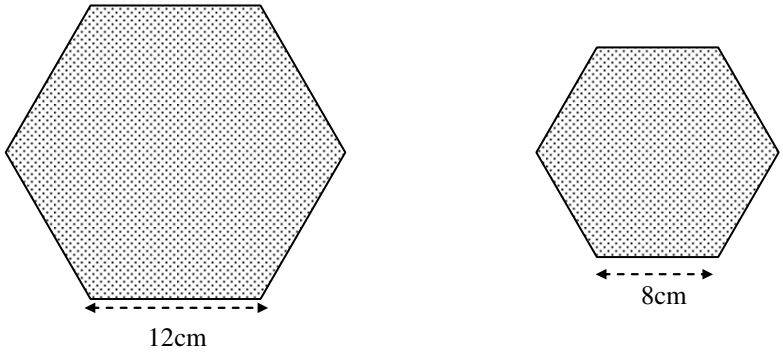
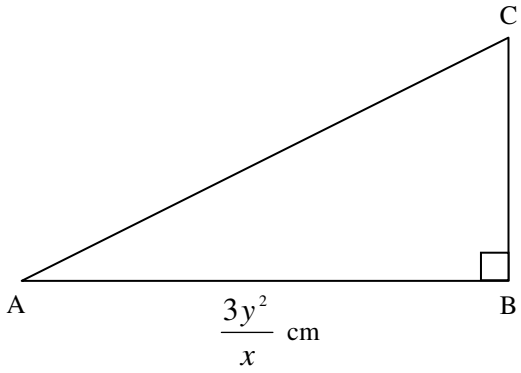
Marks

11. These two hexagons are mathematically similar.



If the area of the smaller hexagon is 144cm², find the area of the larger one. **3**

12.



In triangle ABC, AB is $\frac{3y^2}{x}$ cm and its **area** is $6y$ cm².

Calculate the length of BC, expressing your answer in its simplest form. **3**

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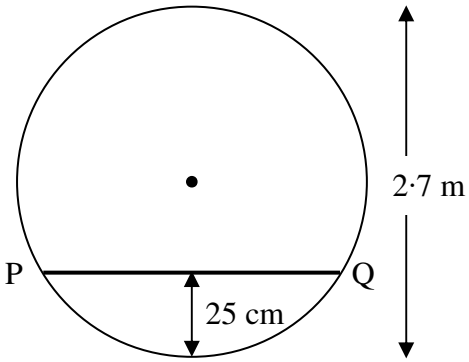
Marks

13. 

A circular service tunnel of diameter 2·7 metres has a metal platform, PQ, whose centre is 25 centimetres from the bottom of the tunnel.

Calculate the width of the platform. **4**

End of Question Paper