N5

Prelim Examination 2015 / 16

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.

© **Pegasys** 2015

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.

Do not write in this margin.

Marks

All questions should be attempted

1. A straight line has equation $3x - 2y = 8$.
Find the gradient and y-intercept of the line. **3**

2. Solve the inequation $3(x + 2) - 4 > 5x + 8$ **3**

3. Evaluate $13 \cdot 5^2 - 11 \cdot 5^2$ **2**

Marks

4. Change the subject of this formula to d.

$$S = \tfrac{1}{3}cd^2$$

3

5. **(a)** Simplify $\dfrac{x^3 \times x^{-5}}{x^{-2}}$ **3**

(b) The function $f(x)$ is given by

$$f(x) = \frac{1}{2}x^{\frac{2}{3}}$$

Evaluate $f(x)$ when $x = 64$ **3**

Do not write in this margin.

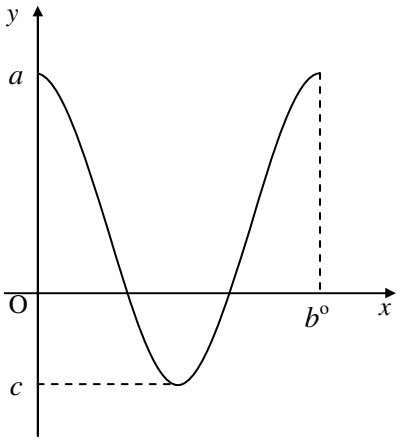
6. **(a)** Express as a fraction with a rational denominator $\dfrac{5+\sqrt{3}}{\sqrt{2}}$ **3**

(b) Simplify $\sqrt{35}\times\sqrt{5}$ leaving your answer as a surd in its simplest form **2**

7. A parabola has equation $y = x^2 - 6x + 12$.

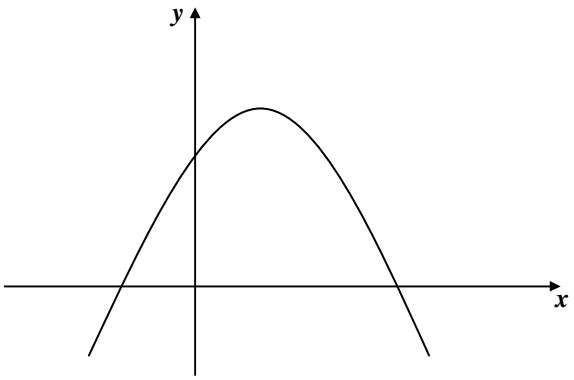
By writing $x^2 - 6x + 12$ in the form $(x-a)^2 + b$, determine the turning point of the parabola and state its nature. **4**

8. The diagram shows part of the graph of $y = 2\cos 4x° + 1$.



Write down the values of a, b and c. **3**

9. The graph below shows a parabola with equation of the form $y = k(x^2 + bx + c)$



(a) By considering the graph, what can you say about the discriminant of $y = k(x^2 + bx + c)$? **1**

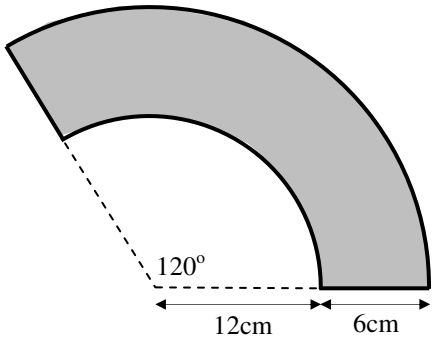
(b) What can you say about the value of k? **1**

Marks

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

$$\frac{3}{x-6} - \frac{5}{x+3} \quad \text{where } x \neq 6 \text{ or } x \neq -3$$

11. The diagram shows a sector of a circle with angle at the centre 120^o.
Other dimensions are shown on the diagram.



Calculate the perimeter of the shaded area. [Use $\pi = 3{\cdot}14$] **6**

End of Question Paper

ADDITIONAL SPACE FOR ANSWERS

N5

Prelim Examination 2015 / 16

MATHEMATICS
National Qualifications - National 5
Paper 2 (Calculator)
Testing EF 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

1. **You may 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.

© **Pegasys** 2015

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.

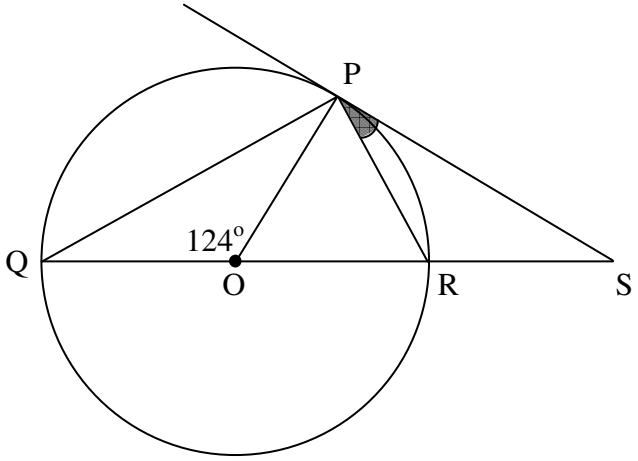
Do not write in this margin.

All questions should be attempted *Marks*

1. Multiply the brackets and simplify $(3x - 1)(2x^2 - 9x + 4)$ **3**

2. A biscuit factory produces 3×10^6 teacakes every week.
Each one weighs 21·95grams.
What is the weight of the teacakes produced every week in kilograms?
Give your answer in scientific notation to three significant figures. **3**

3.



In the diagram shown, PS is a tangent to the circle centre O.
Angle POQ = 124°.

Calculate the size of angle SPR. **3**

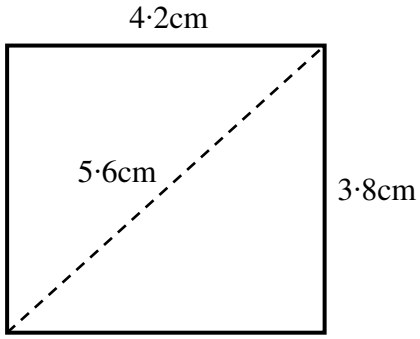
Marks

4. A function is defined as $f(x) = 2x^2 + 7x - 19$.

(a) Evaluate $f(3)$ **2**

(b) Find the value of d for which $f(d) = -4$ and $d > 0$. **4**

5. A garden room measures 4·2m by 3·8m. To check that the corners are right – angled a joiner measured the diagonal of the room and found that it was 5·6m.



Are the corners of the room right – angled? You must justify your answer by calculation. **3**

Marks

6. An electrician bought 3 double sockets and 5 single sockets.
The total cost was £8.86.

(a) Write an equation to illustrate this information. **1**

Another electrician bought 5 doubles and 2 singles for £8.75.

(b) Write an equation to illustrate this information. **1**

(c) Find the cost of 4 double sockets and 4 singles. **4**

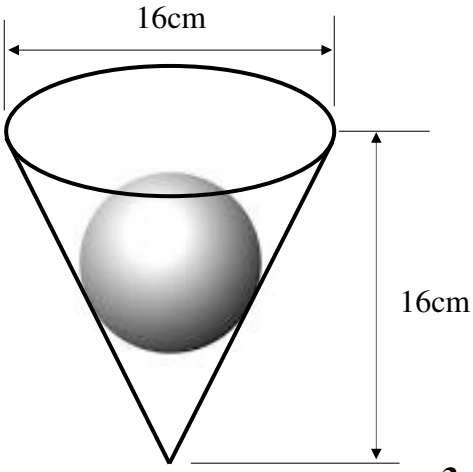
Do not write in this margin.

Marks

7. A hanging ornament is in the shape of a cone with a coloured sphere inside it.

The diameter and height of the cone is 16cm.

The radius of the sphere is 4cm.



(a) Calculate the volume of the cone giving your answer correct to 2 significant figures. **3**

(b) The space round the sphere is be filled with clear liquid.

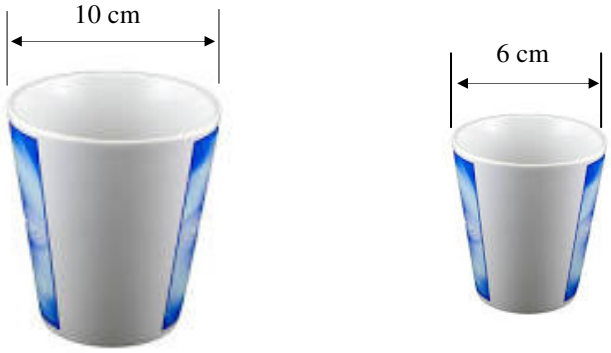
Kieran has 800 millilitres of liquid. Is this enough to fill the cone?

Justify your answer by calculation. **4**

Marks

8. Solve the equation $5\cos x° + 2 = -2$, for $0 \leq x < 360$. **4**

9. The two mugs below are mathematically similar.



If the large mug holds 785 millilitres of coffee when full, how much coffee does the smaller mug hold when full? **3**

Do not write in this margin.

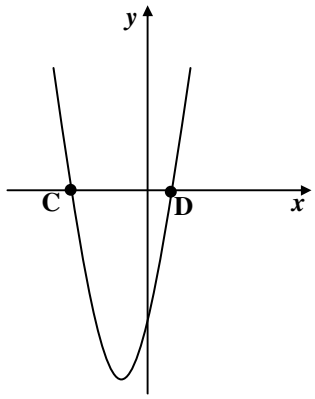
Marks

10. The parabola in the diagram has equation

$$y = 2x^2 + 7x - 3$$

and cuts the x-axis at **C** and **D**.

Find the x - coordinates of the points **C** and **D** giving your answers correct to 2 decimal places.



5

Do not write in this margin.

Marks

11. The following number pattern can be used to find the sum of consecutive square whole numbers.

$$1^2 + 2^2 = \frac{4 \times 3 \times 5}{12}$$

$$1^2 + 2^2 + 3^2 = \frac{6 \times 4 \times 7}{12}$$

$$1^2 + 2^2 + 3^2 + 4^2 = \frac{8 \times 5 \times 9}{12}$$

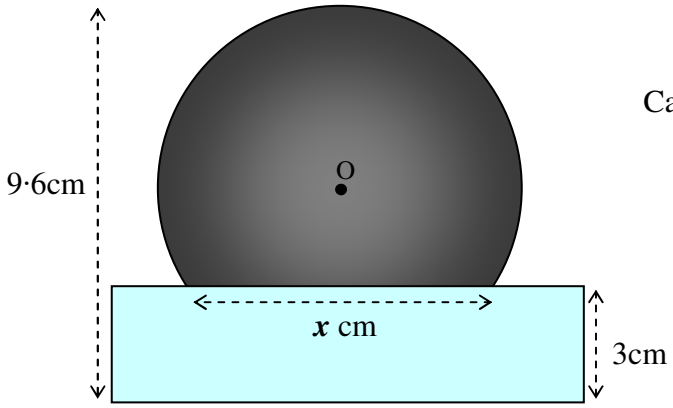
$$1^2 + 2^2 + 3^2 + \ldots\ldots + 8^2 = \frac{16 \times 9 \times 17}{12}$$

Write out $1^2 + 2^2 + 3^2 + \ldots\ldots + 12^2$ in the same way **and calculate** the sum of the first twelve square whole numbers. **3**

Do not write in this margin.

12. A bowling trophy consists of a glass circle set into a rectangular wooden plinth as shown in the diagram. The diameter of the circle, centre O, is 8cm and the height of the trophy is 9·6 cm.

Marks



Calculate the length marked ***x*** on the diagram.

4

End of Question Paper

ADDITIONAL SPACE FOR ANSWERS

ADDITIONAL SPACE FOR ANSWERS