N5

Prelim Examination 2017 / 18

MATHEMATICS

National Qualifications - National 5

Paper 1 (Non Calculator)

Testing EF and REL

Time allowed - 1 hour 15 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 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 = $\dfrac{4}{3}\pi r^3$

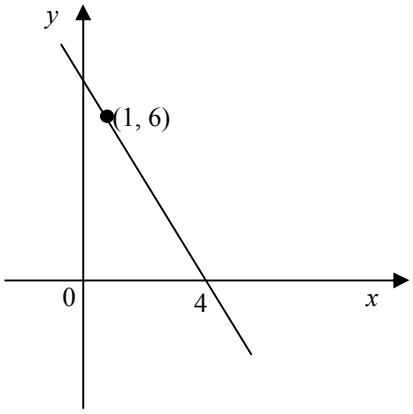
Volume of a cone: Volume = $\dfrac{1}{3}\pi r^2 h$

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 straight line shown in the diagram.
Give your answer in the form $y = mx + c$ **3**



2. **(a)** Remove the brackets and simplify

$$x^{\frac{3}{4}}\left(x^{\frac{1}{4}} + 3x^{-\frac{3}{4}}\right)$$ **3**

(b) Evaluate $64^{-\frac{2}{3}} \times 16$ **3**

Marks

3. Solve the inequality $5-3(2x-3)<2(3-2x)+6$ for $x \in R$ **4**

4. **(a)** Simplify: $\dfrac{\sqrt{75}}{\sqrt{147}}$ **3**

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

$$\frac{21}{2\sqrt{7}}$$ **3**

5. **(a)** Write $x^2 - 6x + 8$ in the form $(x + a)^2 + b$ and write down the values of a and b. **2**

(b) Use your answer to part (a) to write down the minimum value of the function $f(x) = x^2 - 6x + 8$ and the value of x where the minimum occurs. **2**

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

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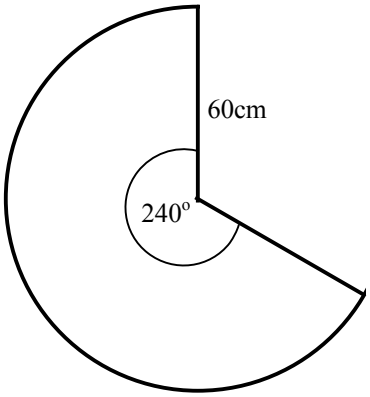
Marks

7. The diagram shows a sector of the circle with radius 60cm and the angle at the centre is 240^o.



Calculate the perimeter of the sector.[use $\pi = 3{\cdot}14$] **4**

Marks

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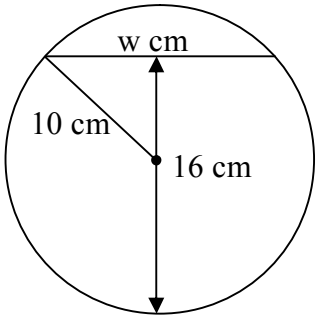
8. A relationship between E, f and g is given by the formula, $E = \frac{k f}{g^2}$, where

Change the subject of the formula to g. **3**

9. Determine the nature of the roots of the equation $2x^2 + 7x + 1 = 0$. **3**

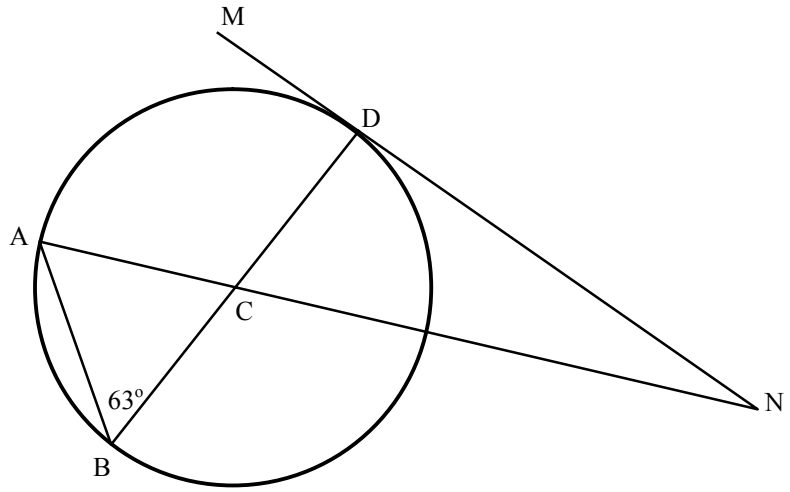
Marks

10. A cross section through a cylindrical pipe is shown in the diagram.



If the depth of the water is 16 cm and the radius is 10 cm, find the width of the water, w cm, in the pipe. **3**

11. MN is a tangent to the circle with centre C and has point of contact D.
Angle CBA = 63^o.



Find the size of angle DNC. **4**

12. A trigonometric function has equation $y = 4\sin 0 \cdot 5x°$.

Write down the period and amplitude of this function. **2**

13. Sketch the graph of $y = 3\sin 2x°$ for $0 \leq x \leq 360$.
Show clearly where the maximum and minimum values occur and where the graph crosses the x – axis. **3**

14. Simplify $\dfrac{\sin x°}{\tan x°}$ **2**

End of Question Paper

N5

Prelim Examination 2017 / 18

MATHEMATICS

National Qualifications - National 5

Paper 2 (Calculator)

Testing E & F and REL

Time allowed - 1 hour and 50 minutes

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Full name of centre | **Town**

Forename(s) | **Surname**

Date of birth
Day Month Year

Candidate number

Seat number

Total marks - 60

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All questions should be attempted

Marks

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1. The Great Pyramid of Giza is square based.

The length of the sides of the base is 755 feet and it is 480 feet high.

Calculate the volume of the pyramid giving your answer in **Scientific Notation** correct **to 3 significant figures**. **3**

2. The function $f(x)$ is given by the formula $f(x) = 2x^2 - 5$, where x is a real number.

(a) Find the value of $f(-3)$. **2**

(b) Find the **values** of a for which $f(a) = 45$. **2**

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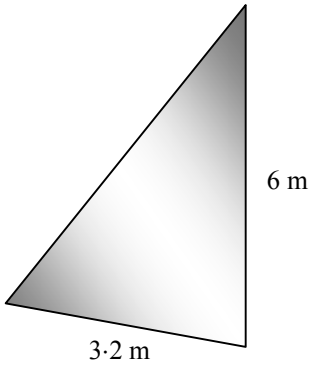
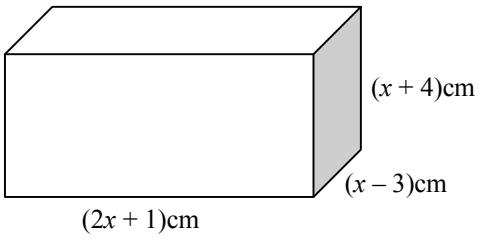
Marks

3. A triangular sail designed for a racing yacht is shown below.
Two of its edges measure 6 metres and 3·2 metres.



Given that the sail has a **perimeter** of 15·5 metres, determine whether or not the sail is right angled. **5**

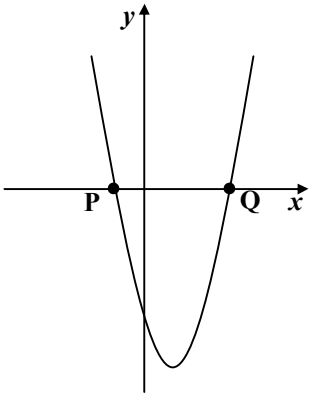
4. A cuboid has length $(2x + 1)$cm, breadth $(x - 3)$cm and height $(x + 4)$cm.
Express the volume of the cuboid in terms of x in its simplest form.



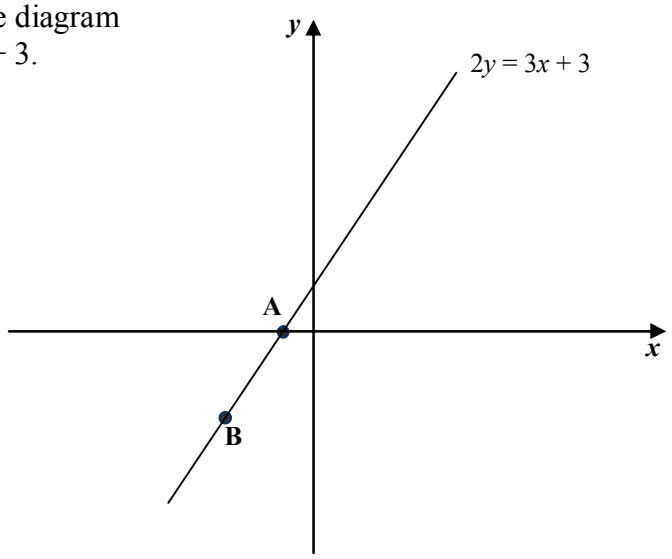
5

Marks

5. The graph in the diagram has equation $y = 3x^2 - 5x - 2$ and cuts the x – axis at P and Q.
Find the distance PQ. **4**



6. The straight line in the diagram has equation $2y = 3x + 3$.



(a) Find the coordinates of **A**, the point where the line cuts the x-axis. **2**

(b) The point **B** with coordinates (x, y), is also shown on the line.
Given that, at this point, the x and y coordinates are equal, find the coordinates of **B**. **3**

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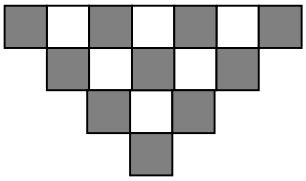
Marks

7. Megan designs wall art using grey and white tiles.

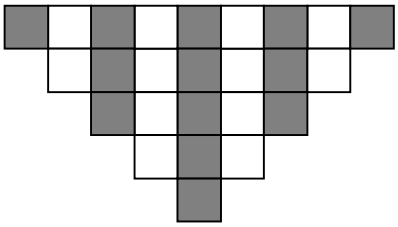
Here are two of her designs and their cost;

Diagram 1



Cost: £15.80

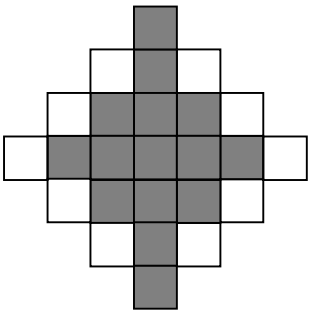
Diagram 2



Cost: £23·90

(a) Using Diagrams 1 and 2 construct two equations in g and w, where g is the cost of a grey tile and w is the cost of a white tile. **2**

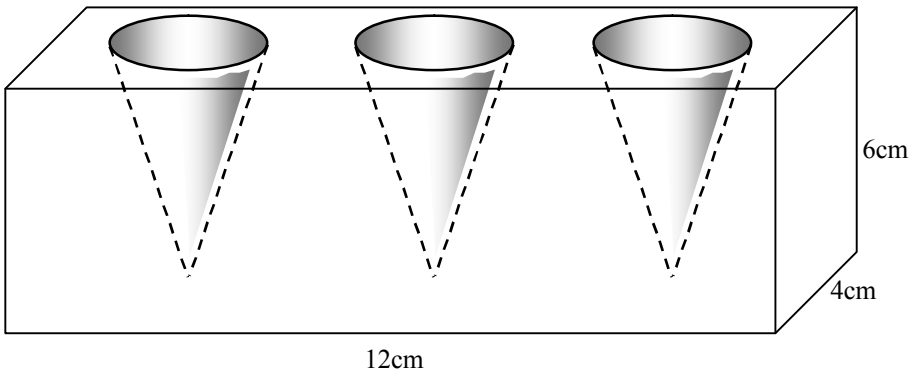
(b) How much would this design cost? **4**



Do not write in this margin.

Marks

8. A glass candle holder is in the shape of a cuboid with three cones removed.



The cuboid measures 12 cm by 4 cm by 6 cm.

The cones each have a diameter of 3 cm and a height of 5 cm.

Calculate the volume of glass in the candle holder. **4**

9. Solve the equation $x^2 + 4x - 7 = 0$.

Give your answer(s) **correct to 2 significant figures.** **4**

10. A quadratic function has equation $y = x^2 + 2x - 15$.
Make a sketch of this function showing clearly its turning point and the intercepts with the x and y–axes. **5**

Marks

Do not write in this margin.

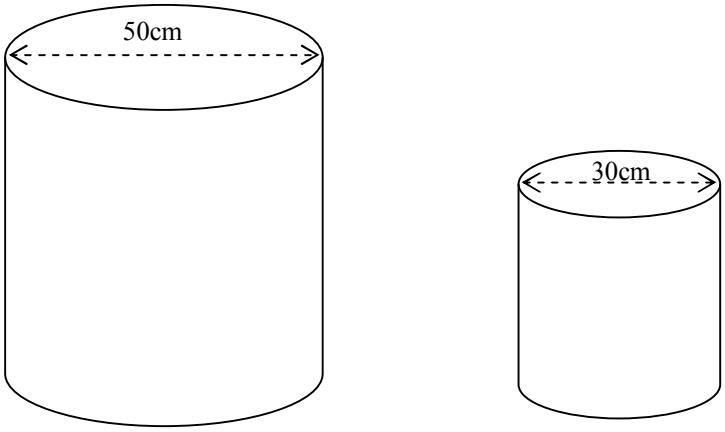
11. (a) Factorise $3x^2 - 8x - 3$ **2**

(b) **Hence** factorise $3(x+2)^2 - 8(x+2) - 3$ leaving your answer in its simplest form. **3**

Marks

12. These two cylindrical cooking oil tanks are mathematically similar.

The larger one has a capacity of 19·625 litres.



Ryan has three bottles of cooking oil each with a capacity of 1·5 litres.

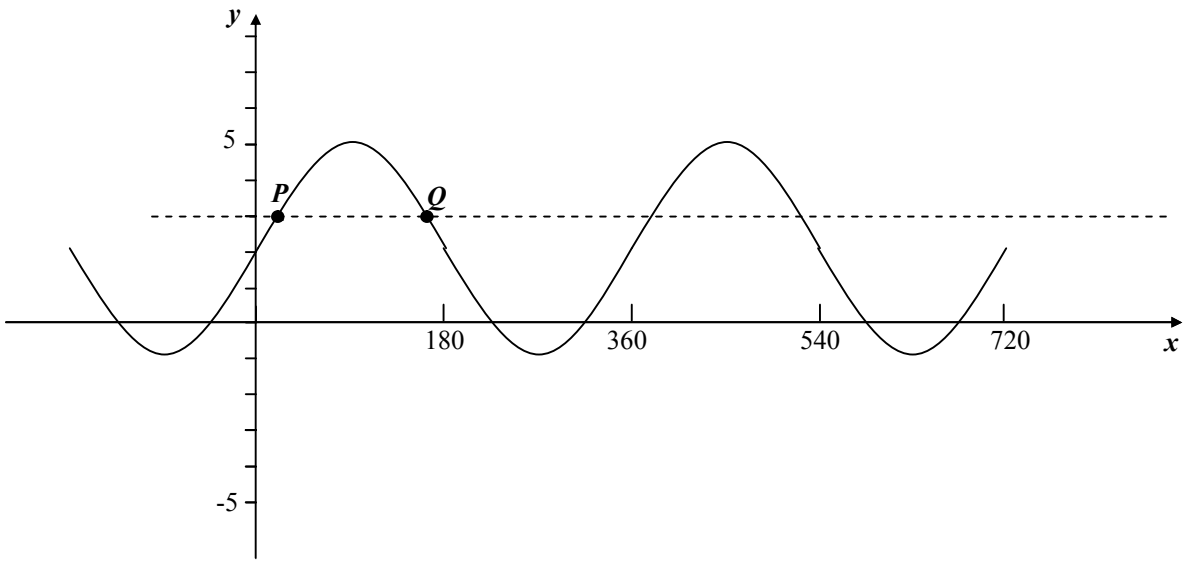
Would he be able to pour them all into the smaller tank without it running over?

Explain your answer by calculation. **4**

Do not write in this margin.

Marks

13. The diagram below shows part of the graph $y = a\sin x^o + b$ and the line $y = 3$.



(a) State the values of a and b. **2**

(b) The line $y = 3$ cuts the graph at P and Q.

Find the x-coordinates of P and Q. **4**

End of Question Paper