St. Peter the Apostle High School

Mathematics Dept.

N5 Practice Prelim Seven Paper 2

Duration: 1 Hr 20 Mins **Marks: 45**

1. Attempt ALL questions.
2. You **MAY** use a calculator.
3. Write your solutions on the blank paper provided.
4. Full credit will be given only where the solution contains appropriate working.
5. Square-ruled paper will be provided if necessary.

Based on Credit Prelim 08/09

Formula Sheet

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.

Marks

1. During the 2004 Athens Olympic games the BBC recorded audience figures for different events.

$1{\cdot}07 \times 10^7$ people watched Paula Radcliffe compete in the marathon.

$8{\cdot}8 \times 10^6$ people watched Kelly Holmes win in the 800 metres.

a) How many more people watched the marathon than the 800 metres? **Answer in scientific notation.** **2**

b) Express this as a percentage of the 800 metres audience to the nearest percent. **2**

2. Solve the inequation: $3(2 - x) + 7 \geq 2x - 6$, where x is a **whole** number. **3**

3. Last year, for a Mathematical Competition the organisers bought 50 medals and 8 trophies for £58.50
Let m be the price of a medal and t the price of a trophy.

a) Write down an equation in m and t to illustrate this information. **1**

This year they bought in 52 medals and 13 trophies which cost them 20% more than last year.

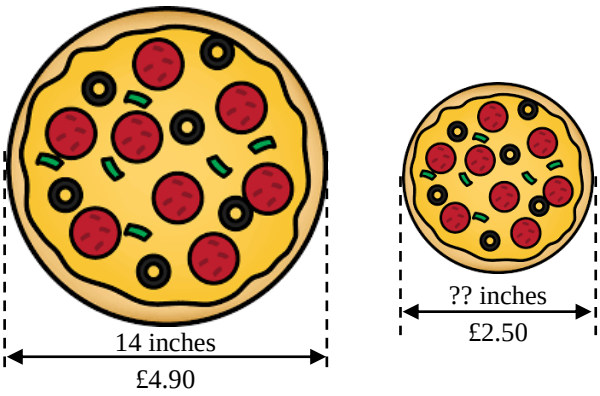
b) Write down an equation in m and t to illustrate this information. **2**

c) Assuming that the cost of a medal and a trophy remained the same for both years, find **algebraically** the cost of 1 medal and 1 trophy. **4**

4. ADSA sell pizzas in 2 different sizes.

Their 14 inch pizza costs £4.90
and the smaller pizza costs £2.50

If the prices are mathematically similar to the area of the pizza, calculate the diameter of the smaller pizza.
(There is no need to calculate the area!)

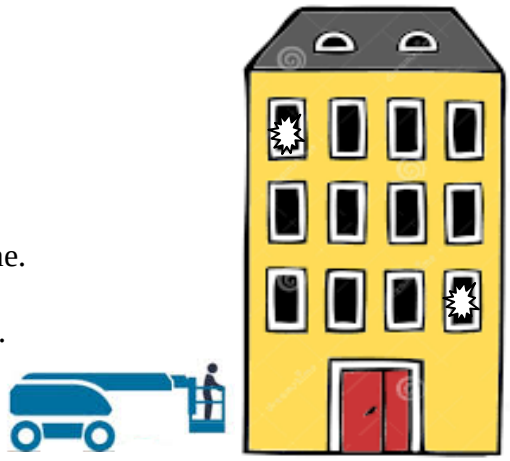


4

5. Solve the following equation: $2x^2 - 5x - 5 = 0$
giving your answer correct to 2 significant figures. **5**

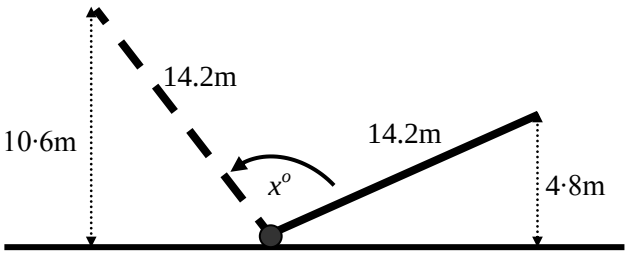
Marks

6. Two windows are broken in a block of flats and the owner has hired a crane to allow him to carry out the repairs.



For the arm of the crane to reach each window it must be full extended. The arm is 14.2m long.

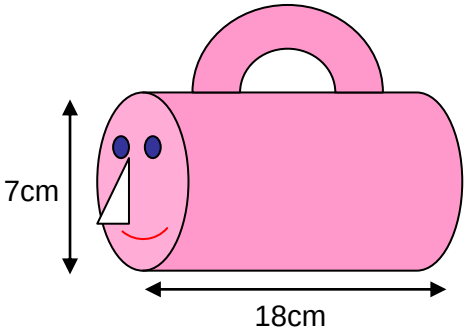
The diagram below represents the arms of the crane. The lower window is 4·8m above the ground and the higher window is 10·6m above the ground.



Find the angle, x^o, the crane had to turn through to get to the higher window from the lower window. **4**

7. Trig Equations - Not covered yet!

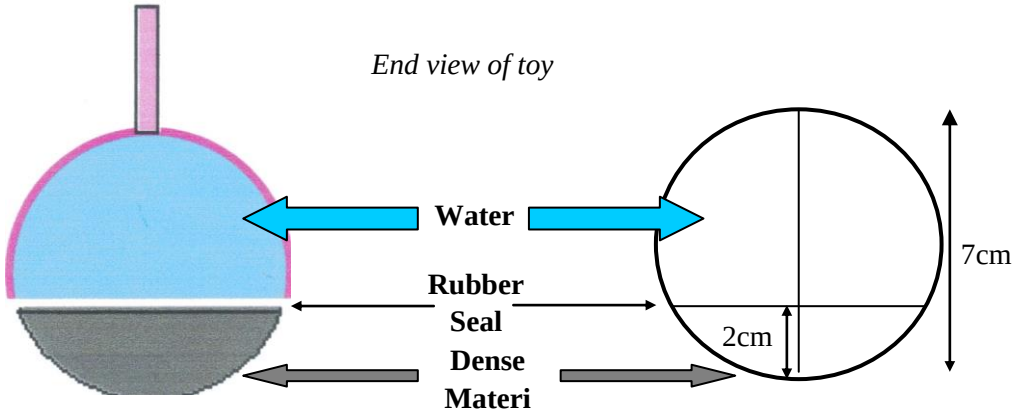
8. Shown is a children's swimming toy consisting of a plastic cylinder connected to a handle.



The toy is thrown into deep water where it sinks and the swimmer is then encouraged to retrieve it.

To make it easy to pick up, the cylinder is weighted on the underside with a dense material and the upper part fills with water when submerged.

The 2 sections are separated by a rubber seal.



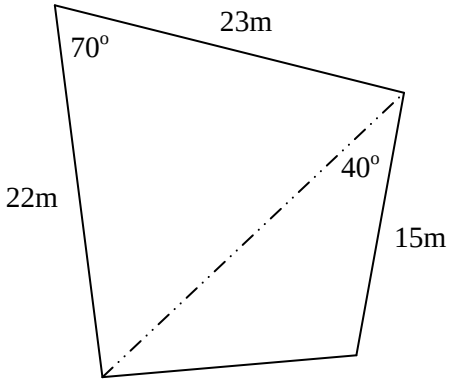
The cylinder has a diameter of 7cm and length 18cm.
The depth of the dense material is 2cm.

Calculate the area of seal required to keep the two substances separate. **5**

Marks

9. Trig Equations/Graphs - Not covered yet!

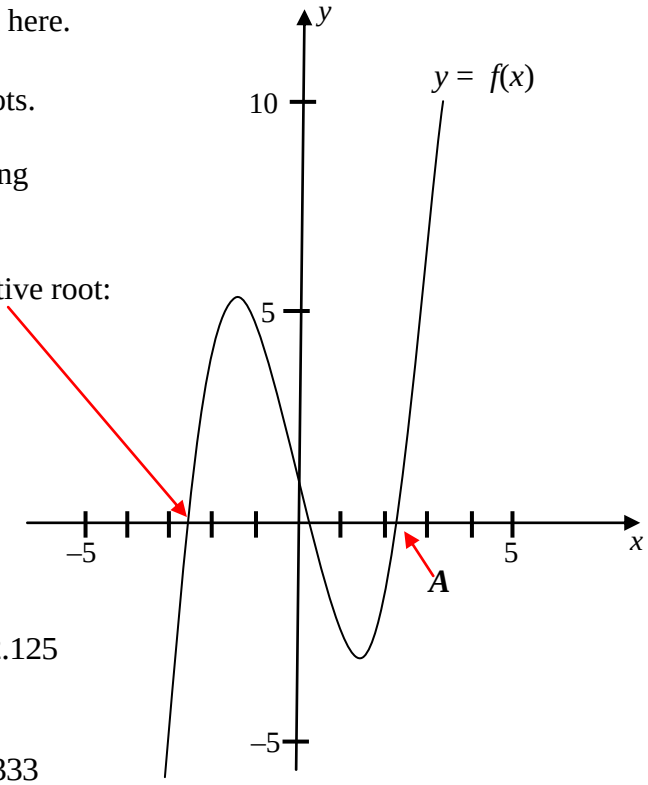
10. The sketch opposite shows a plot of land purchased to build a house on.



At present the land is valued at £280 per square metre.

Calculate the value of the plot shown to the nearest £10. **7**

11. Part of the graph of $f(x) = x^3 - 5x + 1$ is shown here.



It has 3 roots, a negative root and two positive roots.

ITERATION is a mathematical method for finding approximate values of a root.

Iteration is shown below in order to find the negative root:

e.g. $f(-2) = (-2)^3 - 5(-2) + 1 = 3$
$f(-3) = (-3)^3 - 5(-3) + 1 = -11$

Since the values of $f(x)$ change from positive to negative a root must exist between –2 and –3

Now try $f(-2.5) = (-2.5)^3 - 5(-2.5) + 1 = -2.125$
So a root exists between –2 and –2.5

Now try $f(-2.3) = (-2.3)^3 - 5(-2.3) + 1 = 0.333$
So a root exists between –2.3 and –2.5

Now try $f(-2.4) = (-2.4)^3 - 5(-2.4) + 1 = -0.824$
So a root exists between –2.3 and –2.4

Now try $f(-2.35) = (-2.35)^3 - 5(-2.35) + 1 = -0.227875$
So a root exists between –2.3 and –2.35

Hence the root is $x = -2.3$ correct to 1 decimal place.

Iteration is **NOT** part of National 5 but this question has been used to revise Functions. If you cannot follow the steps ask your teacher for help.

Follow the steps above to use **iteration** to find the value of the positive root marked ***A***, correct to one decimal place. **Show all steps in your calculation.** **6**

Total Marks: 45

End of question Paper