

# St. Peter the Apostle High School

## Mathematics Dept.



## Practice Prelim Five Paper 2

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**Duration: 1 Hr 30 Mins**

**Marks: 50**

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.

## Formula Sheet

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

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

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

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

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

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

Volume of a pyramid:  $\text{Volume} = \frac{1}{3} Ah$

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

1. Jasper invests £10500 in a bank that pays 3.6% interest per annum.

If Jasper does not withdraw any money, how much will he have in his account after 3 years?

3

2. 46 795 runners took part in the 2011 New York marathon which set a new world record for the number of runners finishing a marathon.

During the race each runner was supplied with 2.5 litres of water.

How many litres of water were supplied altogether?

Give your answer in Scientific Notation correct to 3 significant figures.

2

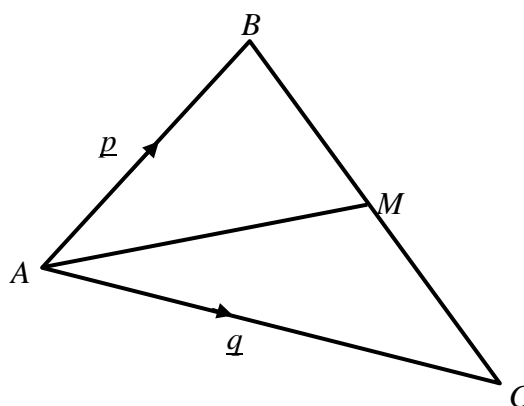
3. In the diagram,  $M$  is the midpoint of  $BC$ .

$\vec{AB}$  represents vector  $p$

$\vec{AC}$  represents vector  $q$

- a) Express  $\vec{BC}$  in terms of  $p$  and  $q$ .

- b) Express  $\vec{BM}$  in terms of  $p$  and  $q$ .



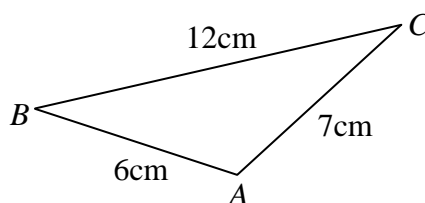
2

1

4. Solve the quadratic equation  $2x^2 - 3x - 4 = 0$  giving your answers correct to one decimal place.

4

5. Calculate the size of the angle  $ABC$  in this triangle.



3

6. I bought an antique painting a few years ago. It has gained 45% in value since it was bought and is now worth £6525.

Calculate how much the painting was worth when it was bought.

3

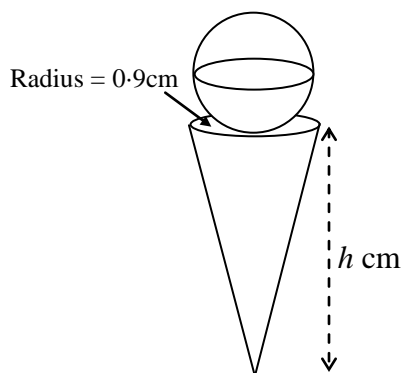
7. A metal bottle stopper is made up from a cone topped with a sphere.

The sphere has diameter 1.5cm.

- a) Calculate the volume of the sphere.

The total volume of the stopper is  $6 \text{ cm}^3$

- b) If the cone has radius 0.9cm, calculate the height,  $h$  cm, of the cone.



8. Last year, for a Mathematical Competition the organisers bought 30 medals and 4 trophies for £37.50

- a) Write down an equation in  $m$  and  $t$  to illustrate this information.

This year they bought in 50 medals and 8 trophies which cost them £66.50.

- b) Form another equation in  $m$  and  $t$  to illustrate this information.

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

9. Over the course of six weeks couple A scored the following marks out of 40 in a dancing competition:

33      30      31      26      36      36

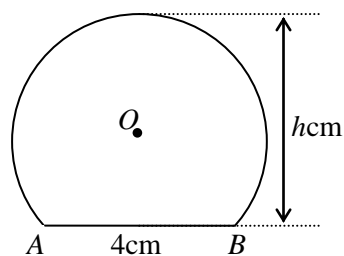
- a) Calculate the mean and standard deviation of these scores.

Over the same six weeks, couple B's scores were, on average, the same as couple A but were slightly less consistent.

- b) Write down a possible standard deviation for couple B's scores.

10. Write the following  $x^2 + 8x - 3$  in the form  $(x + a)^2 + b$  and state its turning point

- 11.** The diagram shows the cross section of a paper weight. It consists of part of a circle with a horizontal base. The centre of the circle is  $O$  and it has radius 5cm.  $AB$  is a chord of the circle and measures 4cm. Calculate the height,  $h$ cm, of the paperweight.



**4**

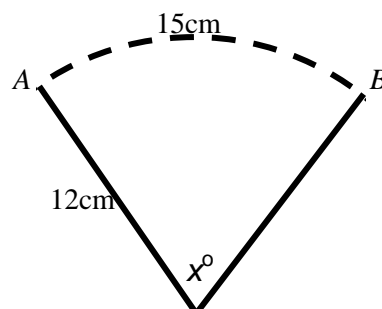
- 12.** A metronome is a music tool which helps players with rhythm and tempo.

A weight on the pendulum is adjusted so that the metronome swings back and forth to give the correct tempo for a piece of music.



For one particular piece the pendulum is set to a length of 12cm and as it swings it traces out an arc of a circle,  $AB$ , of length 15cm.

Calculate, to the nearest degree, the angle  $x^\circ$ , through which the pendulum swings.



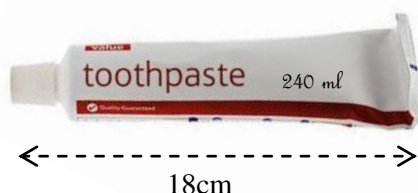
**3**

- 13.** Find the value of  $p$  for which the quadratic equation  $2x^2 + 4x - p = 0$  has equal roots.

**3**

- 14.** These two tubes of toothpaste are mathematically similar. The cost of the tube depends on its volume.

The larger tube is 18cm long and holds 240 ml of toothpaste, the smaller one measures 12 cm.



If the larger tube costs £1.44, how much should the small one cost?

**3**

**Total Marks: 50**

**End of question Paper**