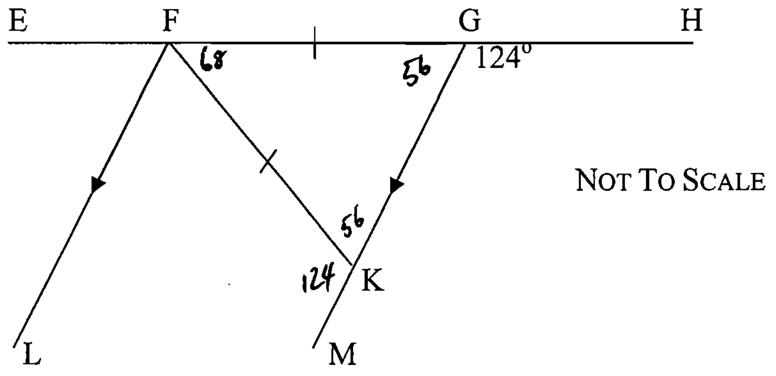
QUESTION 5 (12 MARKS) Use a SEPARATE Sheet of Paper **Marks**

(a) In the figure below, FL || GM and FG = FK.



(i) Prove that $\angle FKG = 56^\circ$ **2**

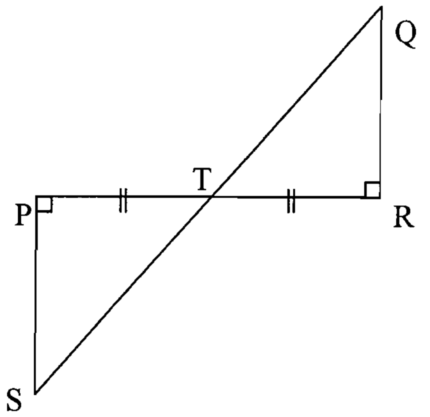
(ii) Hence or otherwise prove that FL bisects $\angle EFK$. **2**

(b) Find :

(i) $\displaystyle\int \frac{3x^4 - 2x}{x^2}\,dx$ **2**

(ii) $\displaystyle\int_0^{\frac{\pi}{2}} 2\sin(3x).dx$ **2**

(c) In the diagram below, $\angle SPT = \angle TRQ = 90^O$ and $PT = TR$.



(i) Prove that $\Delta SPT \equiv \Delta TRQ$ **3**

(ii) Prove that T bisects QS. **1**

WR 2004

Question 5 **(12 Marks)** Use a Separate Sheet of paper **Marks**

(a) The probability that a man lives to the age of 75 is $\frac{3}{5}$ and the probability that his wife will live to the age of 75 years is $\frac{2}{3}$. By drawing a tree diagram or otherwise, find the probability that

i. both will live to the age of 75 **2**

ii. Only the man will live to the age of 75 **1**

iii. Only the wife will live to the age of 75 **1**

iv. At least one of them will live to the age of 75. **2**

(b) If α and β are the two roots of $x^2 - 4x + 2 = 0$, find the value of:

i. $\alpha + \beta$ **1**

ii. $\alpha\beta$ **1**

iii. $\alpha^2\beta + \alpha\beta^2$ **2**

iv. $\alpha^2 + \beta^2$ **2**

Trialmath 2005
Question 5 (12 marks) **Marks**

(a) Consider the function defined by $f(x) = 2x^3 - 3x^2 - 36x + 26$.

(i) Find the coordinates of the stationary points of the curve $y = f(x)$ and determine their nature. **3**

(ii) Find the coordinates of any point of inflexion. **1**

(iii) Sketch the graph of $f(x) = 2x^3 - 3x^2 - 36x + 26$ by showing the above information. **2**

(iv) For what values of x is the curve concave down and decreasing? **2**

(b) For the parabola $4x = 8y - y^2$.

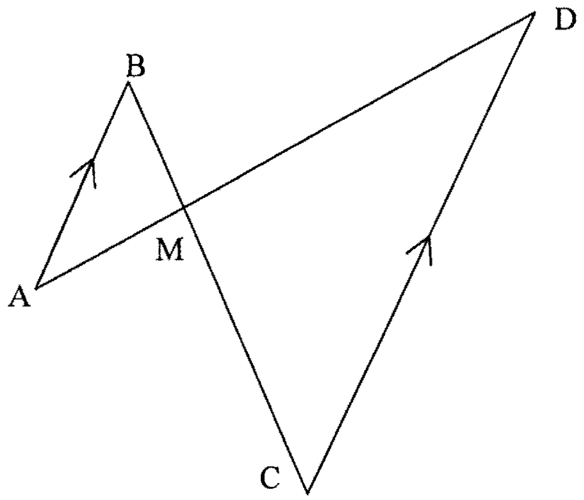
(i) Find the coordinates of the vertex. **2**

(ii) Find the coordinates of the focus. **1**

(iii) Sketch the curve clearly labelling the vertex and focus. **1**

WR 2005

Question 5 (12 Marks) Use a Separate Sheet of paper **Marks**



(a) The figure ABCD has AB || CD. It also has the feature that DA intersects BC at M.

(i) Prove $\Delta AMB \,|||\, \Delta DMC$. **3**

(ii) If AB:CD = 2:5 and area $\Delta AMB = 10u^2$, find the total area of the figure. **1**

(b) (i) Find $\int \cos(4x)dx$ **1**

(ii) Evaluate $\int_1^{e^4} \frac{x}{x^2+4}dx$ **2**

(c) On the Cartesian Plane, sketch the region satisfying the inequalities **3**

$x \geq 2$ $\quad y \geq 4$ $\quad$ and $\quad y \leq 8-x$

(d) A hat contains 3 white marbles, 4 black marbles, 9 red marbles and 4 green marbles. 2 marbles are drawn out without replacement. What is the probability that they are both red? **2**

WR 2006

Question 5 **(12 Marks)** Use a Separate Sheet of paper **Marks**

(a) The equation of a parabola is given by $x^2 - 4x - 2y + 8 = 0$

Find the i. Vertex **2**

ii. Focus **2**

iii. Equation of the normal to the parabola at the point (0, 4). **2**

(b) A woman walks 120 metres on a bearing of 312°, then turns and walks for a further 96 metres on a bearing of 056°.

i. How far is the woman from her starting point to the nearest kilometre? **2**

ii. Hence find the bearing of the woman from her starting point? **2**

(c) Use the table **2**

x	3	3.25	3.5	3.75	4	4.25	4.5
fx	1.0	0.8	0.65	0.55	0.5	0.48	0.45

to find an approximation to the value of the definite integral

$$\int_3^{4\cdot 5} f(x)dx,$$

using Simpson's Rule. Give your answer correct to 3 significant figures.

WR 2007

Question 5 (12 marks) Begin a SEPARATE sheet of paper

(a) Show that $\dfrac{\sec\theta - \sec\theta\cos^4\theta}{1+\cos^2\theta} = \sin\theta\tan\theta$ **3**

(b) (i) Find the value(s) of k for which $x^2 + (2-k)x + 2.25 = 0$ has equal roots **2**

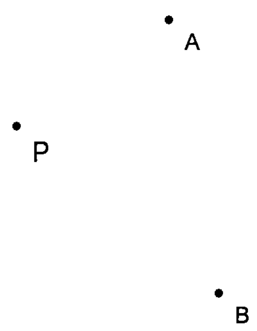
(ii) Find the value(s) of k for which $y = kx + 1$ is tangent to $y = x^2 + 2x + 3\cdot 25$ **1**

(c) A 15cm arc on the circumference subtends an angle of $\dfrac{\pi^c}{5}$ at the centre of a circle. **3**

Find the radius of the circle and the area of the sector.

(d) Boat A sails 15km from port P on a bearing of 055^0

Boat B sails from P for 25 km on a bearing of 135^0



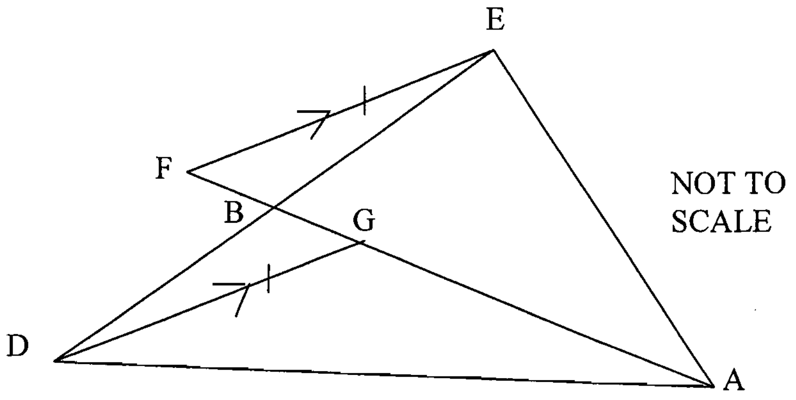
(i) Show the angle APB = 80^0 **1**

(ii) Calculate their distance apart to 1 dec pl. **2**

Trialmaths 2008

Question 5 (12 marks) Use a SEPARATE page/ booklet. **Marks**

(a)



AB is a median in the triangle DEA i.e. BD=BE. Also FE=DG and FE is parallel to DG.

Copy the diagram into your answer booklet and prove, giving full reasons why FB = BG **3**

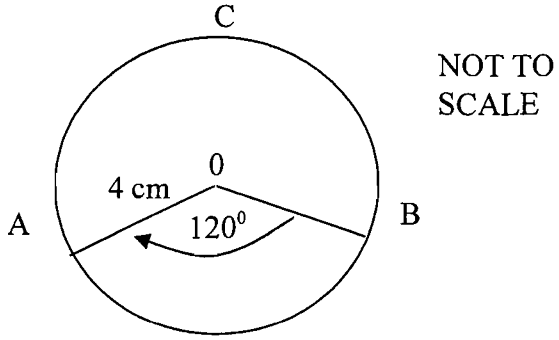
(b) There is one red and three green jellybeans in a jar. One jellybean is selected at random, eaten, and then a second jellybean is selected at random and is also eaten.
Find the probability:

(i) The two jellybeans eaten are both green. **2**

(ii) The red jellybean is the second one eaten. **1**

(c) The circle shown has centre O, radius 4 cm and $\angle AOB = 120^0$. Show that the exact area of the major segment CAB is

$$\frac{32\pi + 12\sqrt{3}}{3} cm^2$$



3

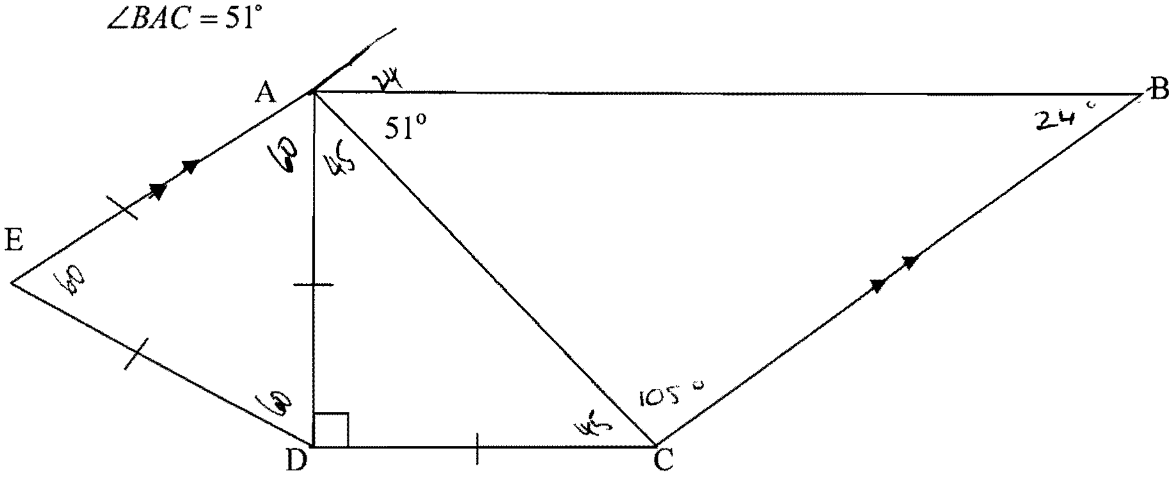
(d) (i) Sketch a neat graph of $y = e^{2x} + 1$ **1**

(ii) Find the area bounded by $y = e^{2x} + 1$, the coordinate axes and the line $x = 1$ **2**

WR 2008

Question 5 (12 marks) Use a SEPARATE writing booklet. **Marks**

a) In the diagram below AE = ED = AD = DC, $\angle ADC = 90^\circ$ and AE || BC.
$\angle BAC = 51^\circ$



i) Find the size of $\angle EAB$. Give reasons for your answer. **3**

ii) Find the size of $\angle ABC$. Give reasons for your answer. **1**

b) A particle moves in a straight line so that its displacement, in metres, is given by

$x = \dfrac{4t^2 + t + 8}{4t + 1}$ where t is measured in seconds.

i) Find the initial position of the particle. **1**

ii) Find an expression for the velocity of the particle. **1**

iii) Show that the particle is stationary when $t = \dfrac{-1 + 4\sqrt{2}}{4}$ seconds. **2**

iv) Describe the motion of the particle in the first two seconds. **2**

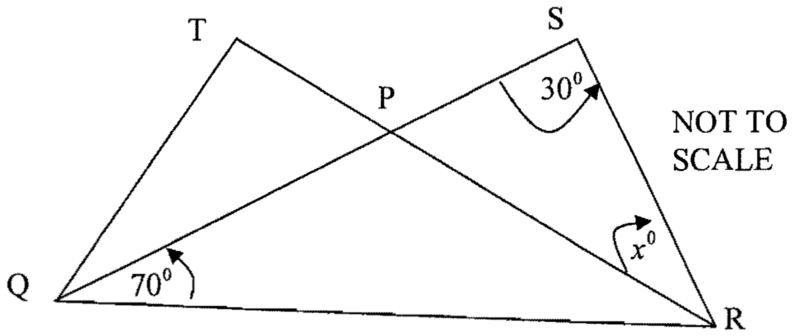
c) Solve the pair of simultaneous equations **2**

$$3x - y = 10$$
$$x = y + 2$$

Trialmath 2009

Question 5 (12 marks) Use a SEPARATE page/ booklet. **Marks**

(a)



The equal sides QP and RP of the isosceles triangle QPR are produced to S and T respectively, such that PS=PT.

$\angle PQR = 70^0$, $\angle PSR = 30^0$ and $\angle PRS = x^0$

(i) Find the size of x. **2**

(ii) Prove there is another angle equal to x^0. **2**

(b) (i) If $y = e^{2x^3}$, find $\frac{dy}{dx}$ **2**

(ii) Hence, or otherwise, evaluate $\int_0^1 x^2 e^{2x^3}\,dx$ **2**

(c) Find the equations of the tangents to the parabola $y = x^2 - 2x - 3$ at the points where the line y = 5 cuts the parabola. **3**

(d) Is the following series an arithmetic or geometric progression? Justify your answer.

$\ln(x) + \ln(x^2) + \ln(x^3) + \ln(x^4) + \ldots\ldots..$ **1**

WR 2009

Question 5 (12 Marks) Use a Separate Sheet of paper **Marks**

(a) In a raffle in which 1000 tickets are sold, there is a first prize of \$1000, a second prize of \$500 and a third prize of \$200. The prize winning tickets are drawn consecutively without replacement, with the first ticket winning first prize.

Find the probability that:

i. a person buying one ticket in the raffle wins:

α. first prize. **1**

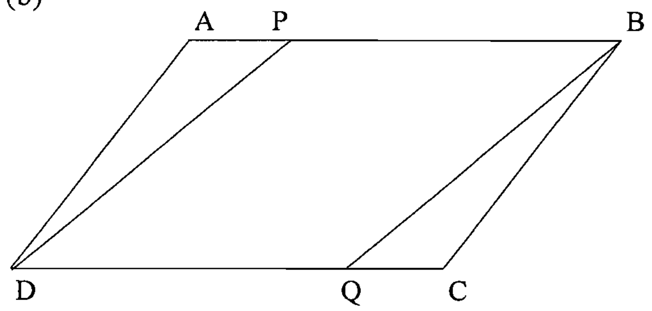
β. at least \$500 **1**

γ. no prizes. **1**

ii. a person buying two tickets in the raffle wins:

α. at least \$500 **1**

(b) **3**



ABCD is a parallelogram, BP = DQ.

Prove DP = BQ

(c) i. Is the series $\log 3 + \log 9 + \log 27 + ...$ arithmetic or geometric? Give reasons for your answer. **2**

iii. Find the sum of the first 10 terms of the series. **1**

(d) Find the radius and centre of the circle with equation **2**

$$4x^2 - 4x + 4y^2 + 24y + 21 = 0$$