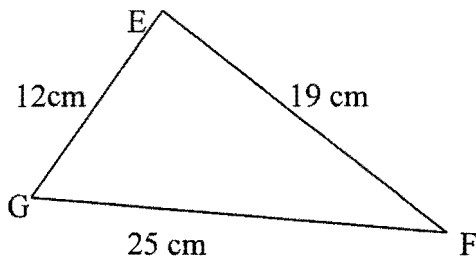


WR 2003

QUESTION 4 (12 MARKS) Use a SEPARATE Sheet of Paper

Marks

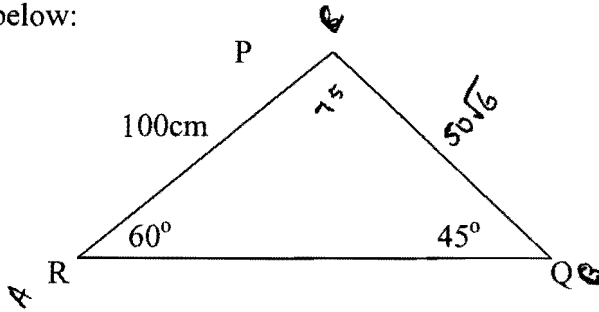
- (a) Find the size of the largest angle in the triangle below, correct to the nearest degree. 2



NOT TO SCALE

*I don't care*

- (b) In  $\triangle PQR$  below:



- (i) Show that the length of PQ is  $50\sqrt{6}$  cm.
- (ii) Hence or otherwise, find the area of the triangle PQR. (correct to 1 decimal place) 2
- (c) (i) Sketch the curve  $y = x^2 - 2x$ . 2
- (ii) Find the area enclosed between the curve  $y = x^2 - 2x$  and the x axis. 1
- (iii) Show that Simpson's Rule using 3 function values gives the exact value when used to calculate the area above. 2
- (iv) Find the volume of the solid formed when the area above is rotated about the x axis. 1

2

WR 2004

Question 4 (12 Marks)

Use a Separate Sheet of paper

Marks

- (a) Show that  $\frac{2 \cos \theta \sin^2 \theta + 2 \cos^3 \theta}{4 \sin \theta} = \frac{1}{2} \cot \theta$ . 3

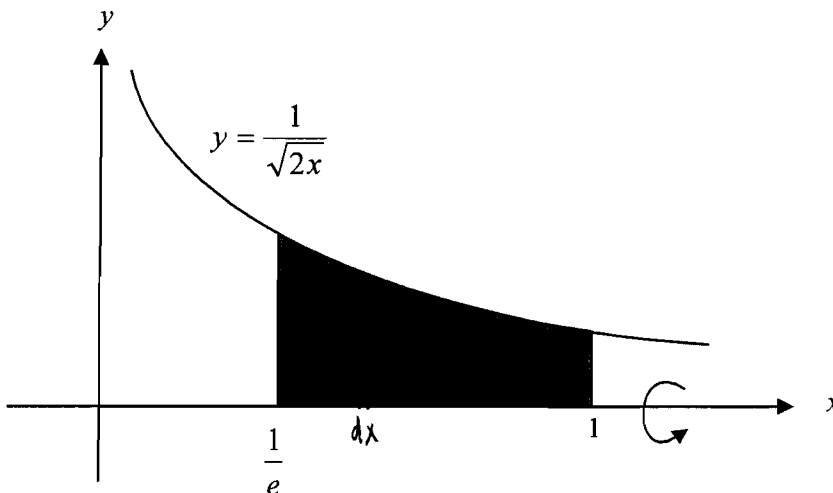
- (b) Two ships leave port A at the same time. In one hour one ship travels 27 nautical miles on a bearing of  $072^\circ$  while the other ship sails 45 nautical miles on a bearing of  $137^\circ$ .
- Draw a diagram to represent this information. **1**
  - Find the distance between the two ships after one hour. **2**
- (c) Solve  $2\cos^2\theta - \cos\theta - 1 = 0$ ,  $0 \leq \theta \leq 2\pi$  **4**
- (d) A 12 centimetre arc of a circle subtends an angle of  $\frac{\pi}{8}$  radians at the centre. Find the area of the resulting sector. **2**

**Trialmath 2005**

**Question 4 (12 marks)**

**Marks**

- (a) Solve  $3\sin x = 1$  for  $0 < x \leq 2\pi$ . **2**  
Express your answer in radians, correct to 2 decimal places.
- (b) (i) Sketch the curve  $y = 2\cos x$  for  $0 \leq x \leq \pi$ . **2**
- (ii) On the diagram for part (i), shade the region enclosed by the curve  $y = 2\cos x$  and the  $x$  and  $y$ -axis as well as the region enclosed by the curve  $y = 2\cos x$ , the line  $x = \pi$  and the  $x$ -axis. **2**
- (iii) Find the total area of the shaded regions described in part (ii). **2**
- (c)



The shaded region shown in the diagram above is bounded by the curve  $y = \frac{1}{\sqrt{2x}}$ , the lines  $x = \frac{1}{e}$  and  $x = 1$  and the  $x$ -axis. This shaded region is rotated about the  $x$ -axis. Find the exact volume of the solid of revolution that is formed.

WR 2005

Question 4 (12 Marks)

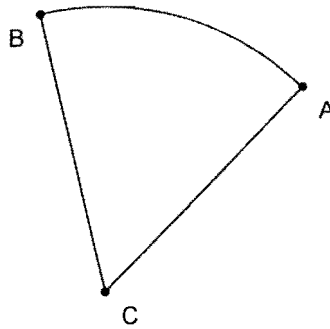
Use a Separate Sheet of paper

Marks

- (a) Bernice contributes to a superannuation fund. She contributes \$250 at the start of every quarter. The investment pays 8%pa interest, compounding quarterly. She continues making contributions for 30 years.

- (i) How much does she contribute altogether? 1
- (ii) What is the value of her initial \$250 investment at the end of the 30 years? 1
- (iii) Find the total value of her superannuation. 3
- (iv) How much of her superannuation lump sum is interest? 1

- (b) The sector ABC has  $r = 5\text{cm}$  and the arc length BA = 5cm. Calculate the area of the sector.



- (c) Find the equation of the tangent to  $y = 2e^x$  at the point (0, 2). 2
- (d) Sketch the graph of  $y = \ln(x - 2)$ , showing the x intercept and the asymptote. 2

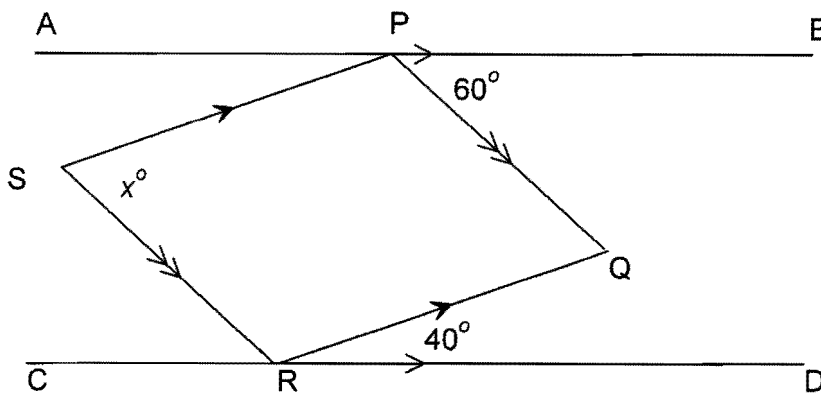
WR 2006

Question 4 (12 Marks)

Use a Separate Sheet of paper

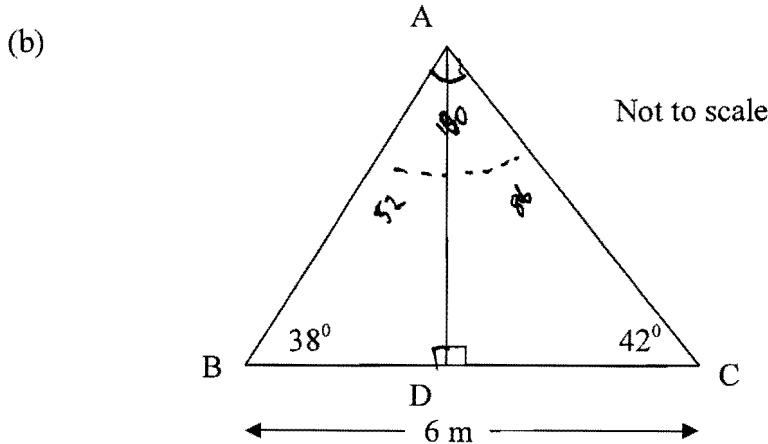
Marks

- (a) In the diagram,  $AB \parallel CD$  and PQRS is a parallelogram. 3



Find the value of  $x$ , giving reasons.

- (a) The sum of the first 13 terms of an arithmetical series is 143. Given the third term is 5, find the first three terms. 3

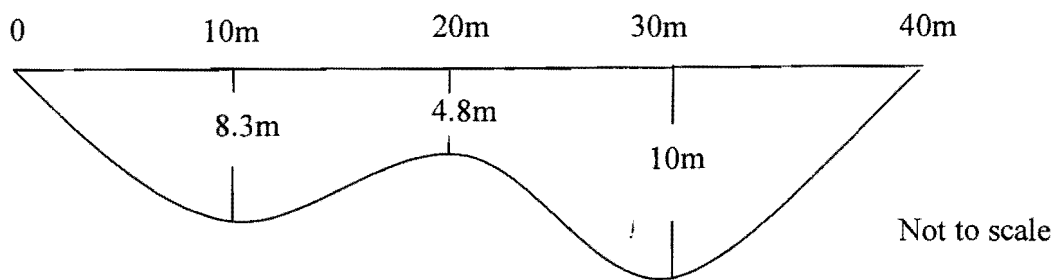


In the above diagram,  $\angle ABC = 38^\circ$ ,  $\angle ACB = 42^\circ$ ,  $BC = 6\text{m}$ . The foot of the perpendicular from A to BC is D.

- (i) Write down an expression for the length of AC. 2

- (ii) Show that  $AD = \frac{6\sin 38^\circ \sin 42^\circ}{\sin 100^\circ}$  and find AD correct to two decimal places. 2

- (c) The following diagram represents a cross-section through a river. The depth of the river is marked every 10 metres.



- (i) Use Simpson's rule with 5 function values to estimate the area of the cross-section. 3

- (ii) If the river is flowing at the rate of 6m/s, what is the volume of water that passes through the cross-section each hour. 2

(c) The mass  $M$  in grams of a radioactive substance may be expressed as  $M = Ae^{kt}$ , where  $t$  is the time in years and  $k$  is a constant.

(i) At time  $t=0$ ,  $M=10$ . Find  $A$ . 1

(ii) After 5 years the mass is 9 grams. Find the mass after 20 years. 3

(d) (i) Show that  $\frac{10}{4x^2 - 25} = \frac{1}{2x - 5} - \frac{1}{2x + 5}$  1

(ii) Hence evaluate  $\int \frac{dx}{4x^2 - 25}$  3

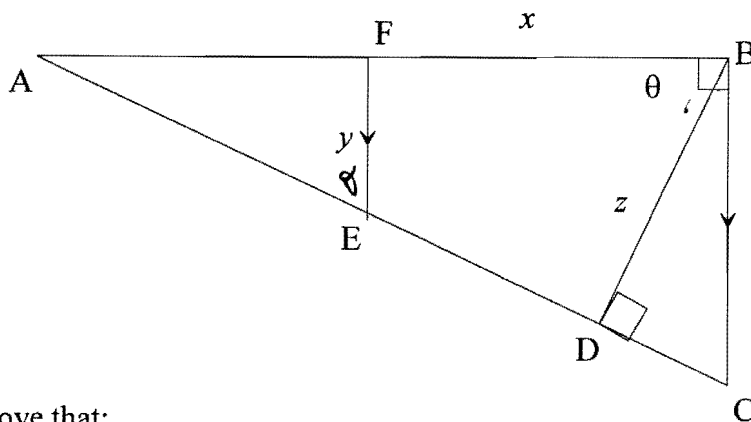
WR 2009

**Question 4 (12 Marks)**

Use a Separate Sheet of paper

**Marks**

(a) The right triangle  $ABC$  is shown below.  $BC \parallel FE$ ,  $BD \perp AC$ ,  $\angle FBD = \theta$ ,  $BF = x$ ,  $EF = y$  and  $BD = z$ .



Prove that:

i.  $\angle FEA = \theta$  2

ii.  $AF = y \tan \theta$  1

iii.  $z = (x + y \tan \theta) \cos \theta$  1

iv.  $z = x \cos \theta + y \sin \theta$  1

a) Show that:

2

$$\sqrt{\frac{\operatorname{cosec}^2 x - \cot^2 x - \cos^2 x}{\cos^2 x}} = \tan x$$

b) Two dice are painted so that the first has four blue and two red faces and the second has one blue and five red faces. The two dice are rolled together.

i) What is the probability that the dice both show blue faces uppermost?

1

ii) What is the probability that different colours show uppermost?

2

c) Ally and Bella are standing on level ground on opposite sides of a tower which is 142 metres high. Ally is due west and measures the angle of elevation of the top of the tower as  $16^\circ$ . Bella is due east and measures the angle of elevation of the top of the tower as  $20^\circ$ .

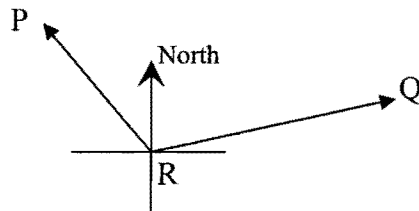
i) Draw a diagram to illustrate this information.

1

ii) Calculate the distance between Ally and Bella.

2

d) Peta and Quentin are pilots of two light planes which leave Resthaven station at the same time. Peta flies on a bearing of  $330^\circ$  at a speed of 180 km/h and Quentin flies on a bearing of  $080^\circ$  at a speed of 240 km/h. Copy the diagram below onto your answer page and mark the information on the diagram.



i) How far apart are Peta and Quentin after 2 hours?

2

ii) What is the bearing of Quentin from Peta after 2 hours.

2

### Trialmath 2009

Question 4 (12 marks) Use a SEPARATE page/ booklet.

Marks

(a) Sketch the graph  $y = 4 \sin 2x$  in the domain  $-\frac{\pi}{2} \leq x \leq \frac{\pi}{2}$

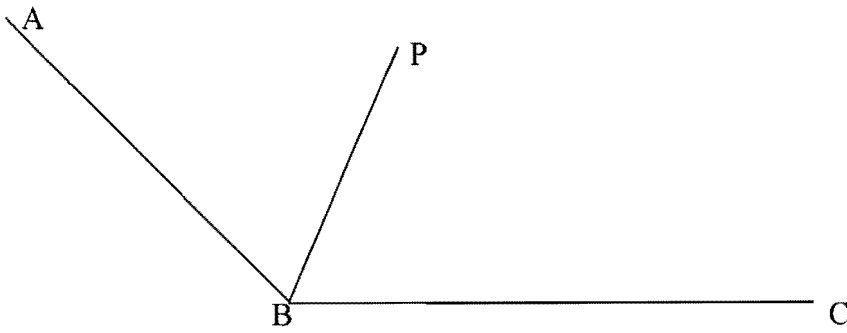
2

(b) Solve the equation  $9^x - 10(3^x) + 9 = 0$

2

(b)

2

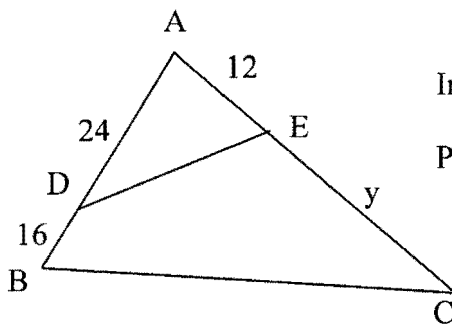


In the diagram above, the perpendicular distance from the point P to the lines AB and BC is equal.

Prove that PB bisects  $\angle ABC$ .

(c)

4



In the diagram,  $\angle ADE = \angle ACB$

Prove that  $\triangle AED$  is similar to  $\triangle ABC$ .

Hence find the value of  $y$ .

(d) Prove that  $\frac{\sin^2 x}{1 - \cos x} + \frac{\sin^2 x}{1 + \cos x} = 2$

3

**WR 2007**

**Question 4** (12 marks) Begin a SEPARATE sheet of paper

(a) Let  $m$  and  $n$  be positive whole numbers with  $m > n$

(i) Show that  $m^2 + n^2$ ,  $m^2 - n^2$ ,  $2mn$  obey Pythagoras' Theorem 2

(ii) Which Pythagorean Triad is generated when  $m = 10$  and  $n = 3$ ? 1

(b) Consider the curve  $y = x^4 - \frac{4}{3}x^3 - 2x^2 + 4x + 3$

(i) Obtain  $y'$  and  $y''$  for this function 2

(ii) Show that  $x = -1$  and  $x = 1$  satisfy  $y' = 0$  and find the  $y$  coordinates. 2

(iii) Find the  $x$  coordinates of the two points of inflexion. 1

(iv) Determine the nature of each of the stationary points. 2

(v) Sketch the curve for the domain  $-2 \leq x \leq 2$  2

- (b) The federal government distributes \$500 million in order to stimulate the economy. Each recipient spends 80% of the money that he or she receives. In turn, the secondary recipient spends 80% of the money that they receive, and so on. What was the total spending that results from the original \$500 million into the economy? **2**
- (c) A ship sails from port A, 60 nautical miles due west, to a port B. It then proceeds a distance of 50 nautical miles on a bearing of  $210^\circ$  to a port C.
- i. Draw a diagram to illustrate the information given. **1**
- ii. Find the distance (nearest nautical mile) and bearing of C from A. **4**