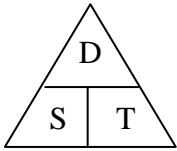


**CREDIT - 2004 Paper II**

1. Distance, Speed and Time



Given speed, time  
Find Distance.

$$D = ST$$

$$S = 3 \times 10^8 \text{ metres per second.}$$

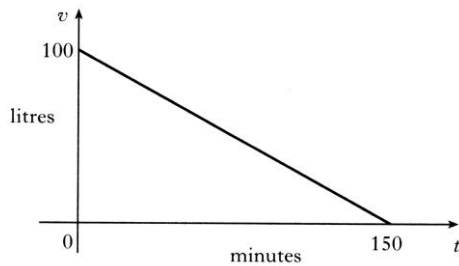
$$T = 8 \text{ hours} = 8 \times 60 \times 60 = 28800 \text{ seconds.}$$

Always make sure units are consistent.

$$\text{So: } D = 3 \times 10^8 \times 28800 \text{ use calculator.}$$

$$D = 8.64 \times 10^{12} \text{ metres.}$$

2.



- a) To find the equation, we need the gradient,  $m$  and  $c$ , where the line cuts the  $y$ -axis.

$$\text{gradient} = \frac{\text{rise}}{\text{run}} = \frac{-100}{150} = -\frac{2}{3}$$

line cuts  $y$ -axis at 100

$$\text{Using: } y = mx + c$$

with  $v$  for  $y$  and  $t$  for  $x$

$$\text{Equation is: } v = -\frac{2}{3}t + 100$$

- b) Losing 30 litres of water means  
We want  $t$  when  $v = 100 - 30 = 70$

Use the equation above putting  $v = 70$

$$70 = -\frac{2}{3}t + 100$$

$$\text{and re-arranging, } \frac{2}{3}t = 100 - 70$$

$$\frac{2}{3}t = 30 \rightarrow 2t = 90 \rightarrow t = 45$$

It takes 45 minutes to lose 30 litres.

3.

	$x$	$x - \bar{x}$	$(x - \bar{x})^2$
	52	1	1
	50	-1	1
	51	0	0
	49	-2	4
	52	1	1
	53	2	4
	50	-1	1
<b>TOTAL</b>	357		12

$$\text{a) Mean} = \frac{\sum x}{n} = \frac{357}{7} = 51$$

$$\text{b) S.D.} = \sqrt{\frac{12}{6}} = \sqrt{2} = 1.414\dots = 1.4$$

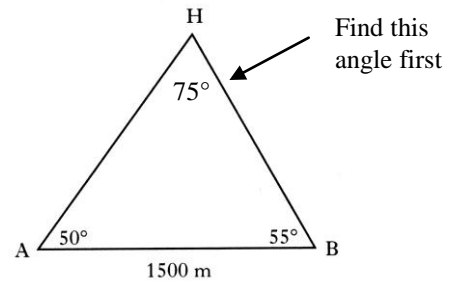
4. Drug decreases by 20% every hour.

A decrease of 20% means 80% remains.

Noon	250 mg
1.00 pm	$250 \times 0.8$
2.00 pm	$250 \times 0.8 \times 0.8$
3.00 pm	$250 \times 0.8 \times 0.8 \times 0.8$

So at 3.00 pm, 128 mg are left.

5.



We need to find the shorter of the two distances HA or HB.  
In a triangle, the smaller side is opposite the smaller angle.

First find the angle at H:  $50 + 55 = 105$ , so  $H = 75^\circ$

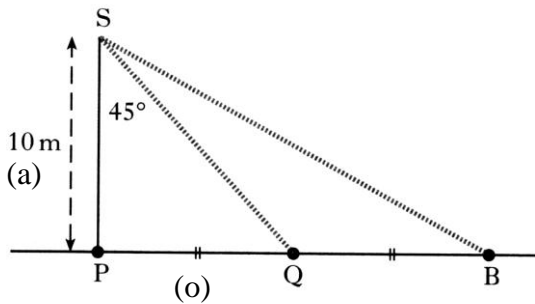
Shorter side is opposite  $\angle HAB$  (smallest angle)

Shortest side is HB

$$\text{Use the sine rule: } \frac{HB}{\sin 50} = \frac{1500}{\sin 75}$$

$$HB = \frac{1500}{\sin 75} \times \sin 50 = 1189.6 = 1190 \text{ m}$$

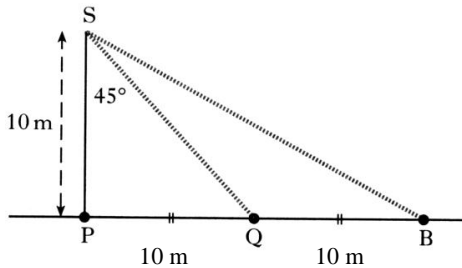
6.



First use SOH-CAH-TOA in triangle SPQ to find PQ.

$$\tan 45 = \frac{PQ}{10} \quad PQ = 10 \tan 45 \quad PQ = 10$$

You might also note that triangle SPQ is isosceles, since angle SPQ is  $90^\circ$ , thus angle SQP =  $45^\circ$  and so  $PQ = PS$ .



Since Q is mid-point of PB, then  $QB = 10\text{m}$  thus  $PB = 20\text{m}$ .

Use SOH-CAH-TOA in triangle SPB to find angle PSB.

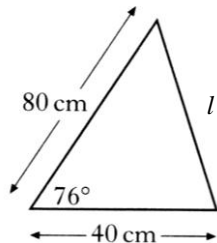
Again we use tangent ratio.

$$\tan PSB = \frac{20}{10} \quad \angle PSB = \tan^{-1}(2) = 63.4^\circ$$

So spotlight must swing  $63.4 - 45 = 18.4^\circ$  more.

7. Use cosine rule (SAS)

Let length of rod =  $l$



$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$l^2 = 40^2 + 80^2 - 2 \times 40 \times 80 \times \cos 76^\circ$$

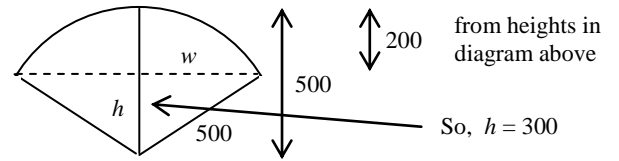
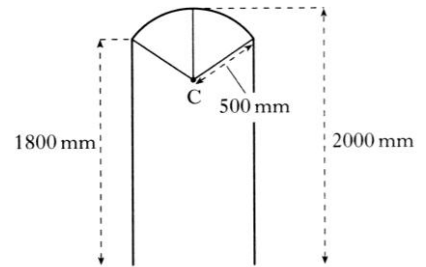
$$l^2 = 1600 + 6400 - 6400 \times \cos 76^\circ$$

$$l^2 = 6451.69... \rightarrow l = 80.322... \text{ cm}$$

Hence length of rod = 80 cm (2 sig figs)

8. Draw a diagram of the circular part.

We will use Pythagoras in the circle.



By Pythagoras

$$500^2 = w^2 + 300^2$$

$$\text{Hence: } 500^2 - 300^2 = w^2 \quad w^2 = 160000$$

$$w = 400$$

This is half the width of the door.

$$\text{Width of door} = 2 \times 400 = 800 \text{ cm}$$

9. Volume of a prism =  $A \times h$   
where  $A$  is area of cross section.

A regular pentagon is made up of 5 triangles.

$$\text{Angle AOB is: } 360^\circ \div 5 = 72^\circ$$

$$\text{Area triangle} = \frac{1}{2} ab \sin C = \frac{1}{2} \times 10 \times 10 \times \sin 72$$

$$= 50 \times \sin 72 = 47.55... \text{ cm}^2$$

$$\text{Area cross section} = 5 \times 47.55... = 237.76.. \text{ cm}^2$$

$$\text{Volume of prism: } = 237.76.. \times 8 = 1902.11...$$

$$\text{Volume of box} = 1902 \text{ cm}^3.$$

$$10. \quad 4 \sin x + 1 = -2$$

$$4 \sin x = -3$$

$$\sin x = -\frac{3}{4} \quad \text{ignore minus sign.}$$

$$x = \sin^{-1} 0.75 \quad (\text{acute}) \quad x = 48.6^\circ$$

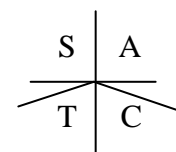
Use ASTC

Sine is negative (-)

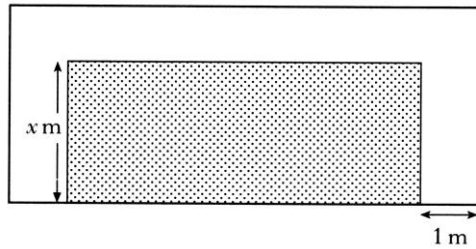
So quadrants 3, 4

$$x = 180 + 48.6^\circ \quad \text{and} \quad x = 360 - 48.6^\circ$$

$$\text{Solutions are: } x = 228.6^\circ \quad \text{and} \quad 311.4^\circ$$

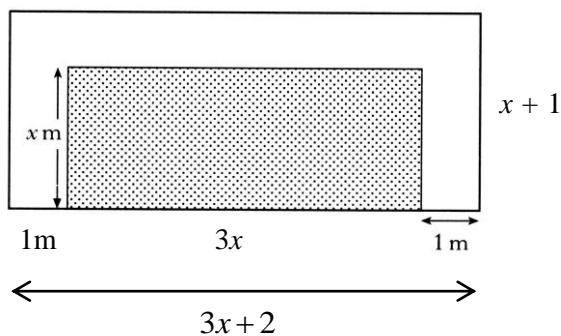


11.



Mark on the diagram, the information given:

The breadth of the lawn is  $x$  metres.  
 The length of the lawn is three times its breadth.  
 The area of the lawn equals the area of the path.  
 also the 1 metre width of the path



11a). Area of lawn =  $x \times 3x \rightarrow 3x^2$

Area of garden =  $(3x+2)(x+1)$

Area of path = Area garden – area lawn

$$= (3x+2)(x+1) - 3x^2$$

Area lawn = area of path

So,

$$3x^2 = (3x+2)(x+1) - 3x^2$$

$\uparrow$                        $\uparrow$   
 area lawn       =    area path

Now simplify this expression.

$$3x^2 = 3x^2 + 3x + 2x + 2 - 3x^2$$

$$3x^2 = 3x^2 + 5x + 2 - 3x^2$$

$$3x^2 = 5x + 2$$

Now take everything over to left hand side:

So,  $3x^2 - 5x - 2 = 0$  as required.

11b). Solve the equation by factorising:

$$3x^2 - 5x - 2 = 0$$

$$\Rightarrow (3x+1)(x-2) = 0$$

So,  $3x+1=0 \Rightarrow 3x=-1 \Rightarrow x=-\frac{1}{3}$

or  $x-2=0 \Rightarrow x=2$

Cannot have negative length, so  $x=2$

Length of lawn =  $3x$

So, length of lawn = 6 metres.

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END OF QUESTION PAPER (Rev. March 2007)