

# GCSE Mathematics

## Practice Tests: Set 1

### Paper 3H (Calculator)

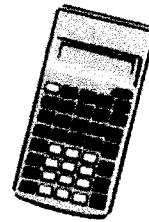
**Time: 1 hour 30 minutes**

You should have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser, calculator.

## Solutions

### Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided – *there may be more space than you need.*
- **Calculators may be used.**
- Diagrams are NOT accurately drawn, unless otherwise indicated.
- You must **show all your working out.**



### Information

- The total mark for this paper is 80
- The marks for **each** question are shown in brackets – *use this as a guide as to how much time to spend on each question.*

### Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

### Practice Tests: Set 1 Regular (3H) – Version 1.1

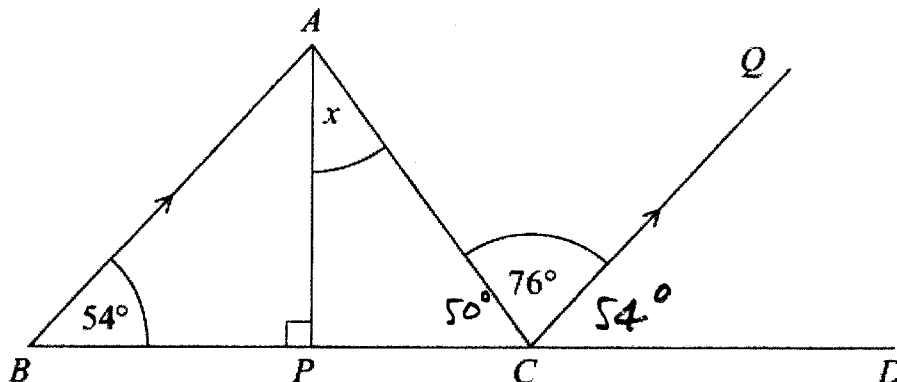
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Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1.



$BPCD$  is a straight line.  
 $BA$  is parallel to  $CQ$ .  
 $AP$  is perpendicular to  $BC$ .

Angle  $ABC = 54^\circ$   
Angle  $ACQ = 76^\circ$

Work out the size of the angle marked  $x$ .  
Give reasons for your answer.

$$\angle QCD = 54^\circ \text{ (corresponding angles equal)}$$

$$\begin{aligned} \angle ACP &= 180 - (76 + 54) \\ &= 50^\circ \end{aligned}$$

(angles on straight line add up to  $180^\circ$ )

$$x = 40^\circ$$

$$(180 - (90 + 50))$$

(angles of  $\triangle$  add to  $180^\circ$ )

$$x = 40^\circ$$

(Total 4 marks)

2. Jenny is organising a party.  
She buys some paper plates and some plastic cups.

Paper plates are sold in packs.  
There are 25 plates in a pack.  
Each pack costs 78p.

$$\begin{aligned} \text{LCM of } 25 \text{ and } 35 \\ &= 5 \times 5 \times 7 \\ &= 175 \end{aligned}$$

Plastic cups are sold in packs.  
There are 35 cups in a pack.  
Each pack costs £1.10

So 7 packs of plates  
and 5 packs of cups

Jenny buys exactly the same number of plates and cups.

What is the least amount of money she pays?

$$\begin{aligned} 7 \times 78p + 5 \times 110p &= 1096p \\ &= £10.96 \end{aligned}$$

£ 10.96 .....

(Total 5 marks)

3. There are only red beads and green beads in a bag.  
The ratio of the number of red beads to the number of green beads is 5 : 9

(a) What fraction of the beads are red?

$$5 + 9 = 14$$

$$\frac{5}{14}$$

.....  
(1)

There is a total of 84 beads in the bag.

(b) How many of the beads are green?

$$\frac{9}{14} \times 84 = 54$$

$$54$$

.....  
(3)

Susie is going to put some more beads in the bag.  
There will still be only red beads and green beads in the bag.

Susie wants to have twice as many green beads as red beads in the bag.

(c) What beads should she put in the bag?  
You must explain your answer.

Now 54 Green 30 Red

Put 6 more Green in bag

for 60 green, 30 red

(3)

(Total 7 marks)

4. The table shows some information about the average adult spending in 2008 as a percentage of average **total** adult spending in 2008.

Item	Percentage
food	11%
housing	11%
leisure	13%
clothes	5%
transport	14%
household goods	8%
other items	38%

In May 2008, Katie spent a total of £425.

She spent £48.45 of the £425 on food.

Compare the percentage that Katie spent on food with the average adult spending on food.

$$\frac{48.45}{425} \times 100 = 11.4\%$$

Katie's percentage spend on food is slightly above the average adult spend on food.

11.4% compared to 11%

**(Total 3 marks)**

5. Coventry Estates sells houses.

In February they sold twice as many houses as in January.

In March they sold 10 more houses than in February.

In April they sold half as many houses as in March.

Coventry Estates sold a minimum of 123 houses from 1st January to 30th April.

Find the least number of houses sold in January.

Let number sold in Jan be  $x$

Jan	$x$
Feb	$2x$
Mar	$2x + 10$
Apr	$x + 5$

$$x + 2x + 2x + 10 + x + 5 \geq 123$$

$$6x + 15 \geq 123$$

$$6x \geq 123 - 15$$

$$6x \geq 108$$

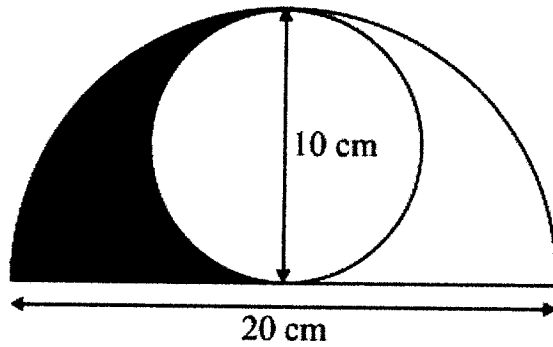
$$x \geq \frac{108}{6}$$

$$x \geq 18$$

At least 18

(Total 5 marks)

6. The diagram shows a circle inside a semicircle.



The circle has a diameter of 10 cm.  
The semicircle has a diameter of 20 cm.

Work out the area shaded.  
Give your answer correct to 1 decimal place.

$$\text{Area of large semi-circle} = \frac{\pi r^2}{2} = \frac{\pi \times 10^2}{2} = 50\pi$$

$$\text{Area of circle} = \pi r^2 = \pi \times 5^2 = 25\pi$$

$$\text{Shaded area} = \frac{\text{Area of semi-circle} - \text{Area of circle}}{2}$$

$$= \frac{50\pi - 25\pi}{2} = \frac{25\pi}{2}$$

$$= 39.3 \text{ cm}^2 \text{ to 1 d.p.}$$

39.3

..... cm<sup>2</sup>

(Total 5 marks)

7. Ali was asked to solve the equation  $6x - 2 = 3(x + 4)$

Here is his working.

$$6x - 2 = 3(x + 4)$$

$$6x - 2 = 3x + 7 \quad \times$$

$$6x = 3x + 9$$

$$3x = 9$$

$$x = 3$$

$$3(x + 4) = 3x + 12$$

Asif's answer is wrong.

What mistake did he make?

.....

.....

**(Total 1 mark)**



8. Sam invests £5000 at 2.8% per annum compound interest for 4 years.

(a) Work out the value of Sam's investment at the end of 4 years.

$$\begin{aligned} \text{Amount} &= 5000 \times 1.028^4 \\ &= \pounds 5583.96 \end{aligned}$$

£ 5583.96  
(3)

Andy invests £12 000 in a variable rate compound interest account.

The interest is

2% for the first year  
3.5% for the second year  
5% for the third year

(b) Work out the value of Andy's investment at the end of 3 years.

$$\begin{aligned} 12000 \times 1.02 \times 1.035 \times 1.05 \\ = \pounds 13,301.82 \end{aligned}$$

£ 13,301.82  
(2)

(Total 5 marks)

9. A rectangular lawn has a length of  $3x$  metres and a width of  $2x$  metres. The lawn has a path of width 1 metre on three of its sides.

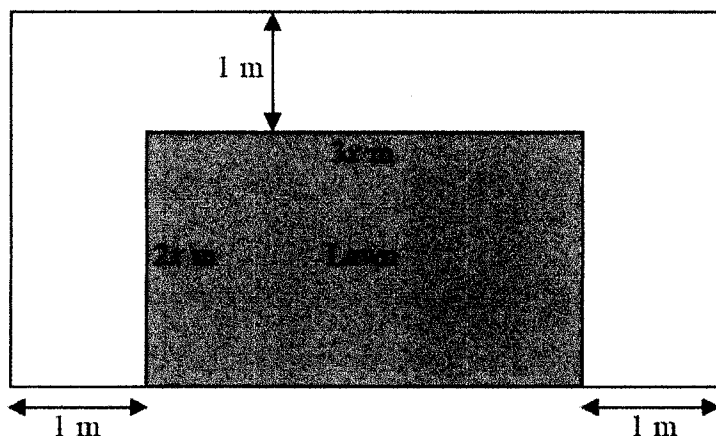


Diagram NOT accurately drawn

The total area of the lawn and the path is  $100 \text{ m}^2$ .

Whole figure

- (a) Show that  $6x^2 + 7x - 98 = 0$

Length  $3x + 2$   
Width  $2x + 1$

$$\text{Area} = (3x + 2)(2x + 1) = 100$$

$$6x^2 + 4x + 3x + 2 = 100$$

$$6x^2 + 7x - 98 = 0$$

(2)

- (b) Calculate the area of the lawn.  
Show clear algebraic working.

$$\begin{array}{r} 6x - 98 \\ -588 \\ \hline 28x - 21 \end{array}$$

$$6x^2 + 28x - 21x - 98 = 0$$

$$2x(3x + 14) - 7(3x + 14) = 0$$

$$(2x - 7)(3x + 14) = 0$$

$$\Rightarrow \begin{array}{l} 2x - 7 = 0 \quad \text{or} \quad 3x + 14 = 0 \\ 2x = 7 \\ x = \frac{7}{2} \end{array}$$

$$\begin{array}{l} 3x = -14 \\ x = -\frac{14}{3} \end{array}$$

no meaning in this problem

$$\text{Area of lawn} = 3x \times 2x = 6x^2$$

$$= 6 \times \left(\frac{7}{2}\right)^2$$

$$= 73.5 \text{ m}^2$$

$$\dots\dots\dots 73.5 \text{ m}^2$$

(5)

(Total 7 marks)

10. (a) Complete the table of values for  $y = x^2 - 4x - 2$

x	-1	0	1	2	3	4	5
y	3	-2	-5	-6	-5	-2	3

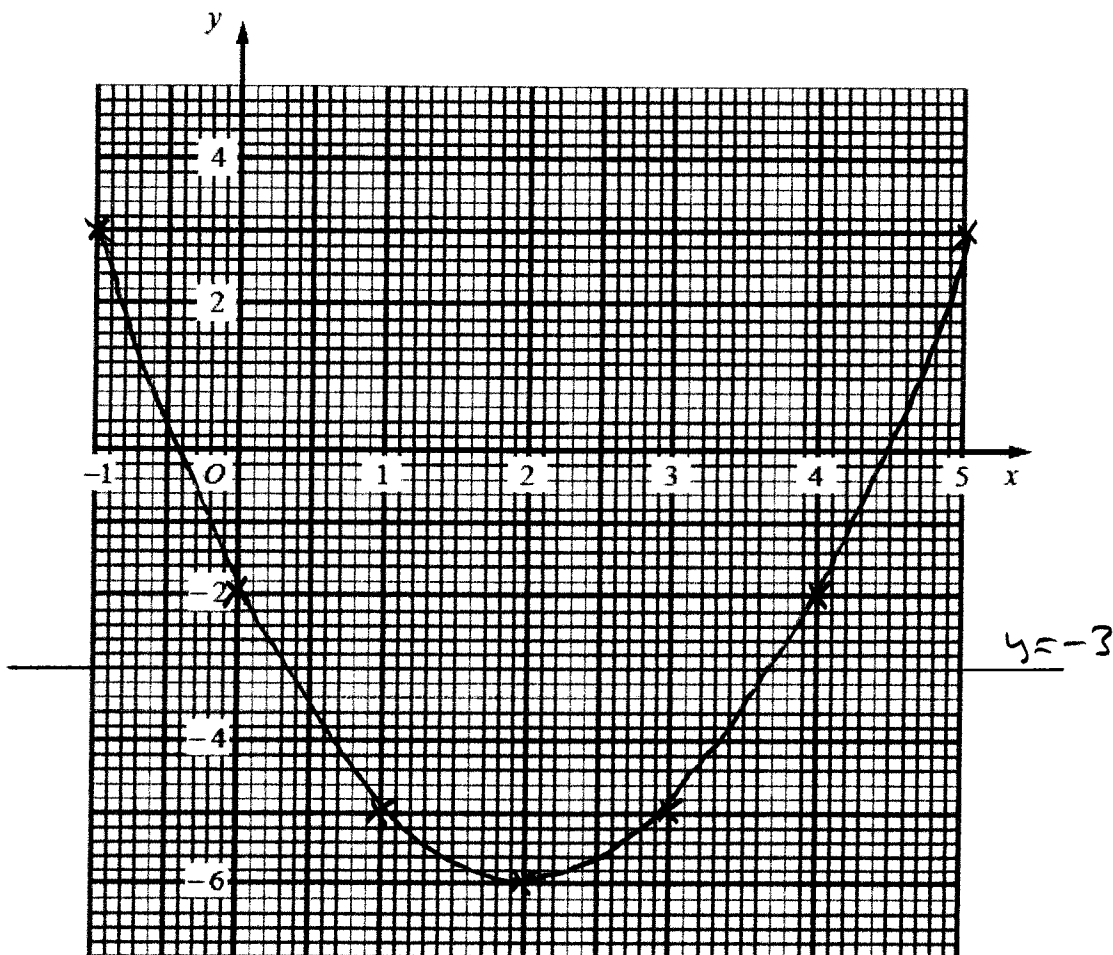
$$\begin{aligned} 2^2 - 4(2) - 2 \\ = 4 - 8 - 2 \\ = -6 \end{aligned}$$

$$\begin{aligned} 3^2 - 4(3) - 2 \\ = 9 - 12 - 2 \\ = -5 \end{aligned}$$

$$(-1)^2 - 4(-1) - 2 = 1 + 4 - 2 = 3$$

(2)

(b) On the grid, draw the graph of  $y = x^2 - 4x - 2$



(2)

(c) Use your graph to estimate the values of  $x$  when  $y = -3$

$$x = \dots 0.3 \dots$$

$$x = \dots 3.6 \dots$$

(2)

(Total 6 marks)

11. In a sale, normal prices are reduced by 12%.

The sale price of a digital camera is £132.88  
Work out the normal price of the digital camera.

Let  $x$  be normal price

$$x \times 0.88 = 132.88$$

$$x = \frac{132.88}{0.88}$$

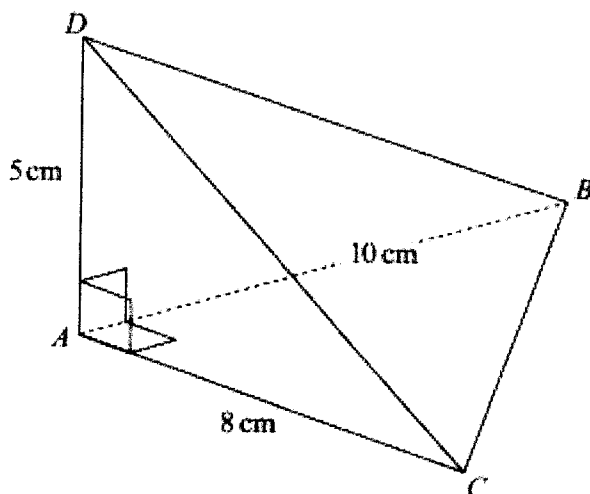
$$x = £151$$

£ ..... 151 .....

(Total 3 marks)

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12.



The diagram shows a tetrahedron.

$AD$  is perpendicular to both  $AB$  and  $AC$ .

$AB = 10$  cm.

$AC = 8$  cm.

$AD = 5$  cm.

Angle  $BAC = 90^\circ$ .

Calculate the size of angle  $BDC$ .

Give your answer correct to 1 decimal place.

Pythagoras 3 times

$$CD^2 = 5^2 + 8^2 = 89$$

$$CD = \sqrt{89}$$

$$BD^2 = 5^2 + 10^2 = 125$$

$$BD = \sqrt{125}$$

$$BC^2 = 8^2 + 10^2 = 164$$

$$BC = \sqrt{164}$$

Cosine Rule in  $\triangle CDB$

$$\cos D = \frac{BD^2 + CD^2 - BC^2}{2 \times BD \times CD} = \frac{125 + 89 - 164}{2 \times \sqrt{125} \times \sqrt{89}}$$

$$D = \cos^{-1} \left( \frac{125 + 89 - 164}{2 \times \sqrt{125} \times \sqrt{89}} \right)$$

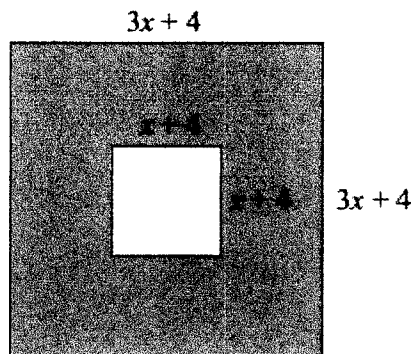
$$\angle BDC = 76.3^\circ$$

$$\underline{\underline{76.3^\circ}}$$

(Total 6 marks)

13. A machine part is made by cutting a small square from the centre of a large square piece of steel.

The dimensions of the machine part are shown on the diagram.  
All measurements are in cm.



The perimeter of the small square is two thirds of the perimeter of the large square.  
Work out the length of a side of the small square.

$$\begin{aligned} \text{Perimeter small square} &= 4(x+4) \\ \text{Perimeter large square} &= 4(3x+4) \end{aligned}$$

$$4(x+4) = \frac{2}{3} \times 4(3x+4)$$

$\div 4$

$$x+4 = \frac{2}{3}(3x+4)$$

$$x+4 = 2x + \frac{8}{3}$$

$$4 - \frac{8}{3} = 2x - x$$

$$\frac{4}{3} = x$$

$$\begin{aligned} \text{Side of small square} &= x+4 \\ &= \frac{4}{3} + 4 = 5\frac{1}{3} \text{ cm} \end{aligned}$$

$$5\frac{1}{3}$$

..... cm

(Total 5 marks)

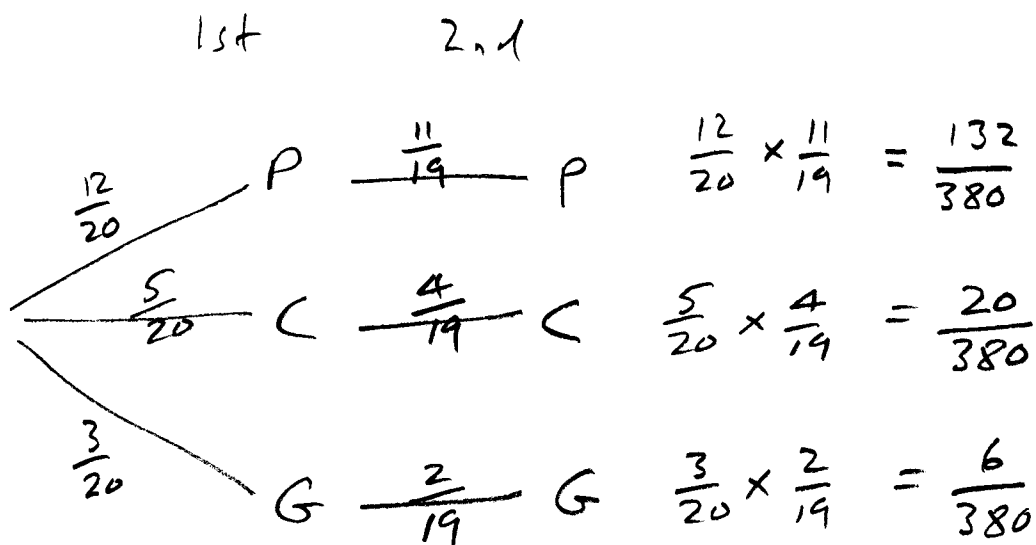
14. Carolyn has 20 biscuits in a tin.

She has

- 12 plain biscuits
- 5 chocolate biscuits
- 3 ginger biscuits

Carolyn takes at random two biscuits from the tin.

Work out the probability that the two biscuits were **not** the same type.



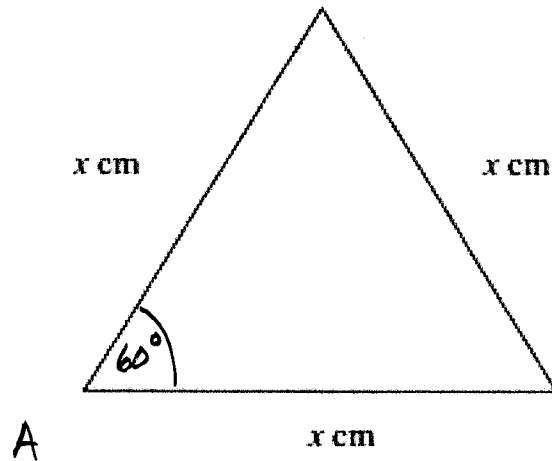
$$\begin{aligned} P(\text{Same type}) &= \frac{132}{380} + \frac{20}{380} + \frac{6}{380} \\ &= \frac{158}{380} = \frac{79}{190} \end{aligned}$$

$$\begin{aligned} P(\text{Not same}) &= 1 - P(\text{Both same}) \\ &= \frac{111}{190} \end{aligned}$$

$$\frac{111}{190}$$

(Total 4 marks)

15. The diagram shows an equilateral triangle.



The area of the equilateral triangle is  $36 \text{ cm}^2$ .

Find the value of  $x$ .

Give your answer correct to 3 significant figures.

$$\text{Area of } \Delta = \frac{1}{2}bc \sin A$$

$$= \frac{1}{2} \times x \times x \times \sin 60^\circ = 36$$

$$x^2 = \frac{36 \times 2}{\sin 60^\circ}$$

$$x = \sqrt{\frac{72}{\sin 60^\circ}}$$

$$x = 9.118$$

$$x = 9.12 \text{ cm to 3 s.f.}$$

$$x = \underline{\quad 9.12 \quad}$$

(Total 3 marks)



16. Prove algebraically that the product of two odd numbers is **always** an odd number.

Let 2 odd numbers be  $2m+1$  and  $2n+1$   
where  $m, n$  are integers

$$(2m+1)(2n+1)$$

$$= 4mn + 2n + 2m + 1$$

$$= 2(2mn + n + m) + 1 \quad \text{which is odd}$$

↑

note  $2mn + m + n$  is an integer

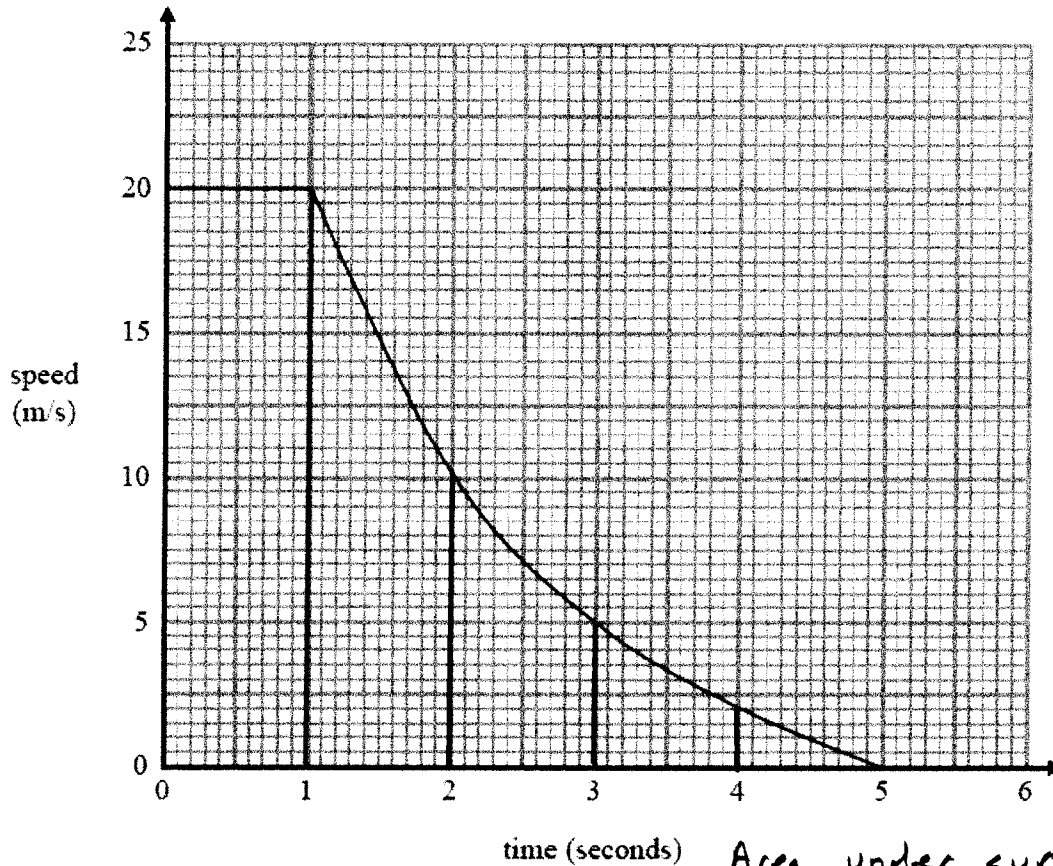
**(Total 3 marks)**

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17. A car is approaching a set of traffic lights.  
The traffic lights turn red.

It takes the car 4 seconds to slow down to a stop.

Here is the speed-time graph for the 5 seconds until the car stops.



Area under curve

represents distance

- (a) Work out an estimate for the distance the car travels in these 5 seconds.

Trapezium Rule

$$A \approx \frac{1}{2} [20 \cdot 5 + 2(20 \cdot 5 + 10 + 5 + 2) + 0] = 47.75 \text{ m}$$

47.75

..... m

(3)

- (b) Is your answer to (a) an underestimate or an overestimate of the actual distance the car travels in these 5 seconds?

Give a reason for your answer.

overestimate because trapezia would have top edges above graph.

(1)

(Total 4 marks)

18. A farmer wants to estimate the number of rabbits on his farm.

On Monday he catches 120 rabbits.

He puts a tag on each rabbit.

He then lets the rabbits run away.

On Tuesday the farmer catches 70 rabbits.

15 of these rabbits have a tag on them.

Work out an estimate for the total number of rabbits on the farm.

You must write down any assumptions you have made.

Assume rabbits roam independently and do not stick together in groups.

$\frac{15}{70}$  of second sample are tagged

so assume  $\frac{15}{70}$  of population are tagged

so 120 represents  $\frac{15}{70}$  of population

Whole population estimate  $120 \times \frac{70}{15} = 560$

Estimate of rabbits on farm = 560

(Total 4 marks)

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TOTAL FOR PAPER IS 80 MARKS