Q2. MS RGH

edexcel

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.

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 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 1.0

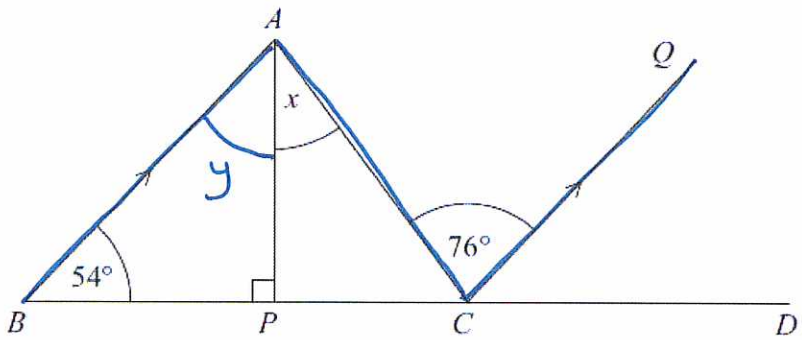
Angles in Parallel Lines

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°
Angle *ACQ* = 76°

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

$B\hat{A}C = A\hat{C}Q = 76^\circ$ | Alternate angles are equal

$\therefore x + y = 76^\circ$

$y = 180^\circ - 54^\circ - 90^\circ = 36^\circ$ | Angles in a triangle = 36°

$\therefore x + 36^\circ = 76^\circ$

$x = 40^\circ$ | (−36)

MORE W! USE YOUR CALCULATOR!

$$\begin{array}{r} {}^{0}\cancel{1}{}^{7}\cancel{8}{}^{1}0 \\ 90 \\ 54 \\ \hline 36 \end{array}$$

(Total 4 marks)

LCM HCF in Context

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.

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

Jenny buys exactly the same number of plates and cups.

What is the least amount of money she pays?

Plates and cups LCM: 25 50 75 100 125 150 175 200
35 70 105 140 175
∴ 175 is the amount of plates and cups

Packs of plates: 175 ÷ 25 = 7

Packs of cups: 175 ÷ 35 = 5

cost of plates: 7 × £0.78 = £5.46

cost of cups: 5 × £1.10 = £5.50

Total cost: £5.46 + £5.50 = £10.96

£ 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 out of 14 parts ∴ $\frac{5}{14}$

.....

(1)

There is a total of 84 beads in the bag.

(b) How many of the beads are green?

Total parts	5+9 = 14 parts
	14 parts = 84
(÷14)	1 part = 6
Green = 9 parts	9 × 6 = 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.

Ratio at start R : G	5 : 9 (×6 ↓, ↓ ×6) 30 : 54
Change to twice as many green as there are red:	30 : 60
Conclusion	∴ 6 more green counters are needed.

(3)

(Total 7 marks)

Percentages of an Amount

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.

Average adult spend: = 11% on food

Katie spend on food: $\frac{£48.25}{£425}$ (×100) = 11.3529...% on food

Comparisen: Katie spent a slightly lager share of her money on food

(Total 3 marks)

Forming and Solving Inequalities

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.

January = ? = x

February = $2x$

March = $2x+10$

April = $\frac{2x+10}{2}$ $(= x+5)$

x must be a whole number

January + February + March + April $\geqslant 123$

$x + 2x + 2x+10 + \frac{2x+10}{5} \geqslant 123$

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

collect $6x+15 \geqslant 123$

(-15) $6x \geqslant 108$

$(\div 6)$ $x \geqslant 18$

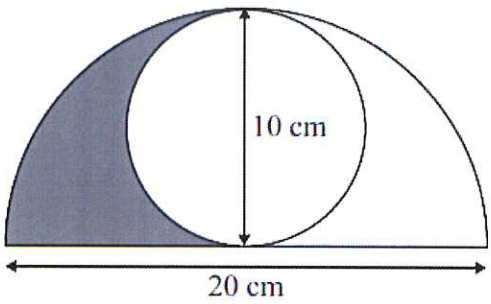
$\therefore x = 18$ (minimum)

.....

(Total 5 marks)

Area of Circles

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.

Quarter of big circle (10): $A = \frac{\pi r^2}{4} = \frac{\pi (10)^2}{4} = 25\pi$

Half of small circle (5): $A = \frac{\pi r^2}{2} = \frac{\pi (5)^2}{2} = 12.5\pi$

Shaded = Total − Non shaded: $A = 25\pi - 12.5\pi = 39.3$ (1 d.p)

39.3 ..... cm^2

(Total 5 marks)

Solving Equations and Expanding Brackets

7. Ali was asked to solve the equation ~~$8x + 1 = 5$~~

* QUESTION MAKES NO SENSE
↖ IGNORE THIS

Here is his working.

$$6x - 2 = 3(x + 4)$$
$$6x - 2 = 3x + 7$$
$$6x = 3x + 9$$
$$3x = 9$$
$$x = 3$$

Asif's answer is wrong.
What mistake did he make?

The brackets are expanded incorrectly:
$3 \times 4 \neq 7$

(Total 1 mark)

Repeated Percentage change

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.

Start x multiplier^t = End

Multiplier = 1 + 2.8%
= 1.028

£5000 × 1.028^4 = £5583.96

£ 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.

Start x multiplier^t = End

2nd year : £12000 × 1.02^1 = £12240

3rd year : £12240 × 1.035^1 = £12668.40

£12668.40 × 1.05 = £13301.82

£ 13301.82

(2)

(Total 5 marks)

Forming and Solving Equations

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.

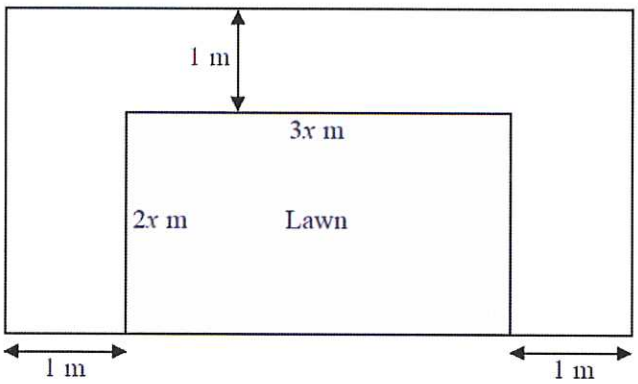


Diagram **NOT** accurately drawn

The total area of the lawn and the path is 100 m^2.

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

Area of lawn and path: (l x w)

Length = $3x+2$
width = $2x+1$

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

expand

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

$0 = 6x^2+7x-98$ ☐

(2)

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

To find the area of the lawn we must find x.

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

$a=6$, $b=7$, $c=-98$

$-b \pm \sqrt{b^2-4ac}$ / $2a$

$x = \frac{-(7) \pm \sqrt{(7)^2-4(6)(-98)}}{2(6)}$

$x_+ = \frac{7}{2}$

$x_- = \frac{-14}{3}$

$\therefore x = \frac{7}{3}$ since dimensions must be positive

Area of lawn = l x w

length = $3x = 3(\frac{7}{2}) = 10.5$

width = $2x = 2(\frac{7}{2}) = 7$

$A = 10.5 \times 7 = 73.5$

73.5 ..... m^2

(5)

(Total 7 marks)

Plotting Quadratics

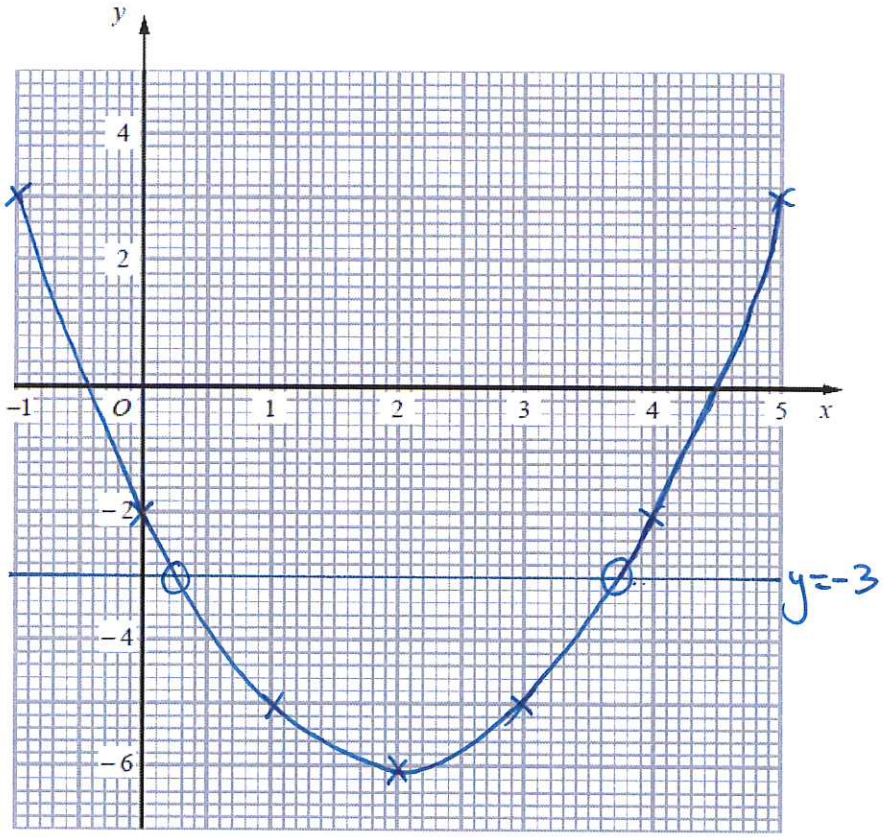
10. (a) Complete the table of values for $y = x^2 - 4x - 2$

$y = (-1)^2 - 4(-1) - 2 = 3$
$y = (2)^2 - 4(2) - 2 = -6$
$y = (3)^2 - 4(3) - 2 = -5$

x	–1	0	1	2	3	4	5
y	3	–2	–5	–6	–5	–2	3

(2)

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



(2)

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

$x =$ 3.75

$x =$ 0.25

(2)

(Total 6 marks)

Reverse Percentages

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.

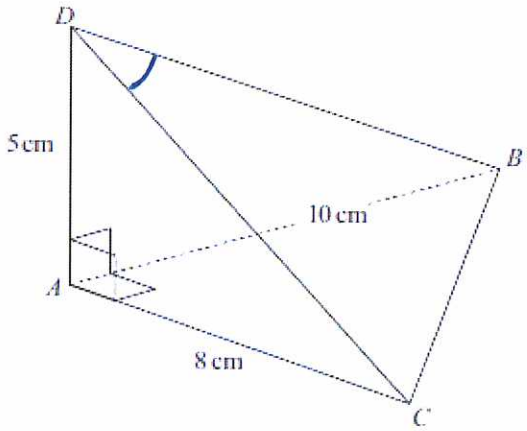
	100% − 12% = 88%
	£132.88 = 88%
(÷88)	£1.51 = 1%
(×100)	£151 = 100%

£ 151

(Total 3 marks)

3D Trigonometry / Pythagoras

12.



The diagram shows a tetrahedron.

To find $B\hat{D}C$ we need BD, BC, CD

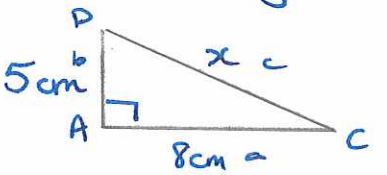
AD is perpendicular to both AB and AC.

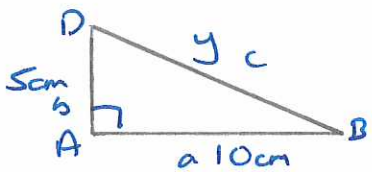
$AB = 10$ cm.
$AC = 8$ cm.
$AD = 5$ cm.

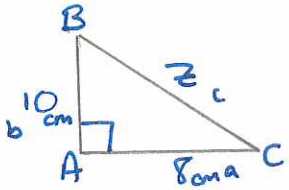
Angle $BAC = 90°$.

Calculate the size of angle BDC.
Give your answer correct to 1 decimal place.

Three triangles:







Pythagoras: $a^2+b^2=c^2$

$8^2+5^2=c^2$

$89=c^2$

$\sqrt{89}=c=9.43\ldots=x$

$a^2+b^2=c^2$

$10^2+5^2=c^2$

$125=c^2$

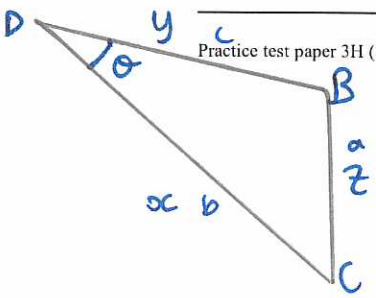
$\sqrt{125}=c=11.18\ldots=y$

$a^2+b^2=c^2$

$8^2+10^2=c^2$

$164=c^2$

$\sqrt{164}=c=12.80\ldots=z$



Cosine Rule (angles): $\cos\theta=\dfrac{b^2+c^2-a^2}{2bc}$

$\cos\theta=\dfrac{(\sqrt{89})^2+(\sqrt{125})^2-(\sqrt{164})^2}{2(\sqrt{89})(\sqrt{125})}$

$\cos\theta=0.23702$

$\therefore\quad \theta=76.3°$ (1 d.p.)

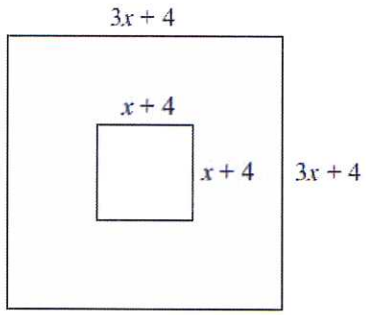
.....°

(Total 6 marks)

Forming and Solving Equations

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.

P(small square) = $\frac{2}{3}$ P(large square)

collect

expand

$(-\frac{32}{3})$

$(-4x)$

$(\div 4)$

Small square side = $x+4$

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

$4x+16$

$= \frac{2}{3}(12x+16)$

$4x+16$

$= 8x + \frac{32}{3}$

$4x + \frac{16}{3}$

$= 8x$

$\frac{16}{3}$

$= 4x$

$\frac{4}{3}$

$= x$

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

$= \frac{16}{3}$

$\frac{16}{3}$ ..... cm

(Total 5 marks)

Dependent Probability Trees

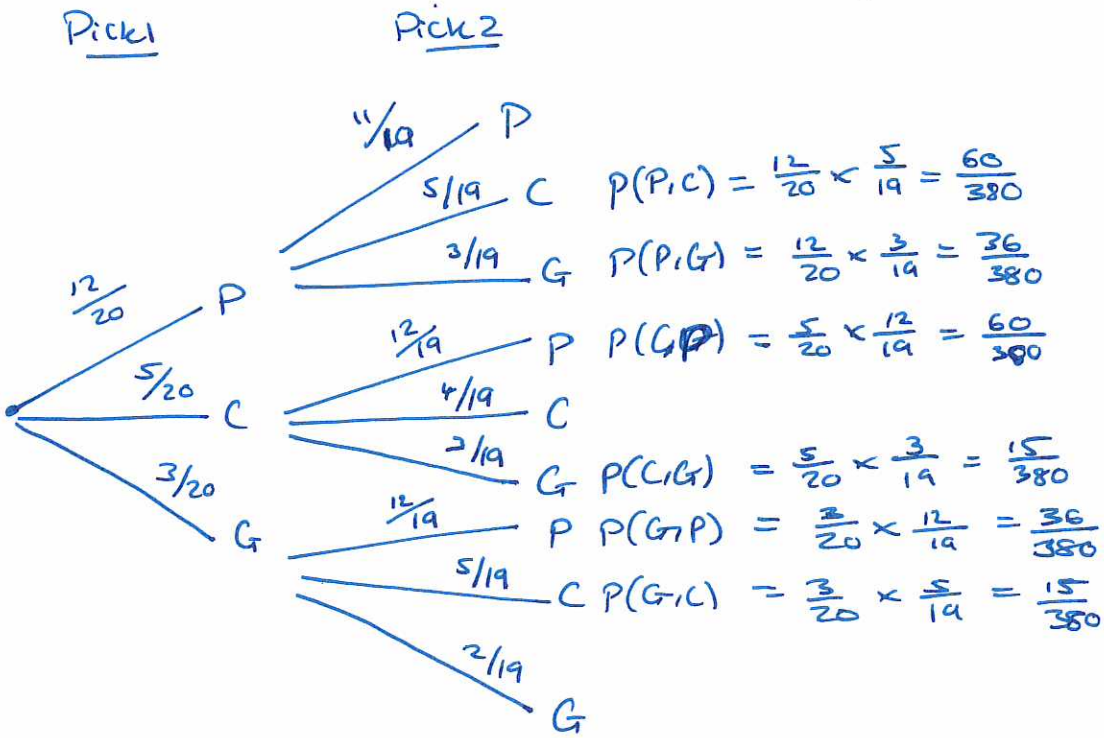
14. Carolyn has 20 biscuits in a tin.

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.



P(NOT the same type) = P(P,C) + P(P,G) + P(C,P) + P(C,G) + P(G,P) + P(G,C)

$$= \frac{60+36+60+15+36+15}{380}$$

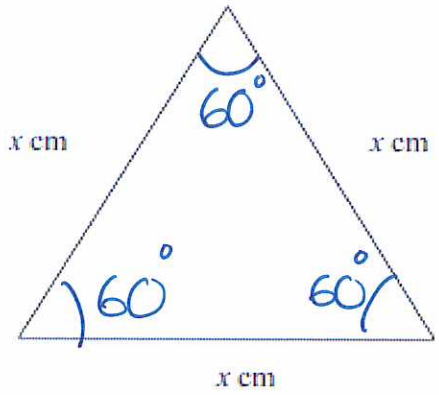
$$= \frac{222}{380}$$

.....

(Total 4 marks)

Area of a triangle sine

15. The diagram shows an equilateral triangle.



The area of the equilateral triangle is 36 cm^2.

Find the value of x.
Give your answer correct to 3 significant figures.

Area $= \frac{1}{2}ab\sin C$

Area $= \frac{1}{2}(x)(x)\sin(60)$

$36 = \frac{1}{2}x^2\sin(60)$

$(\times 2)$ $\quad 72 = x^2\sin(60)$

$(\div \sin(60))$ $\quad \frac{72}{\sin(60)} = x^2$

$\sqrt{\text{ANS}}$ $\quad \sqrt{\frac{72}{\sin(60)}} = x = 9.12$ cm (3s.f)

$x =$ 9.12

(Total 3 marks)

Algebraic Proof

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

integer $= n$

even $= 2n$

odd $= 2n+1$

different odd $= 2m+1$

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

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

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

Conclusion:

2 multiplied by anything is an even number

$\therefore 2(2nm + n + m)$ is even

$\therefore 2(2nm + n + m) + 1$ is odd

□

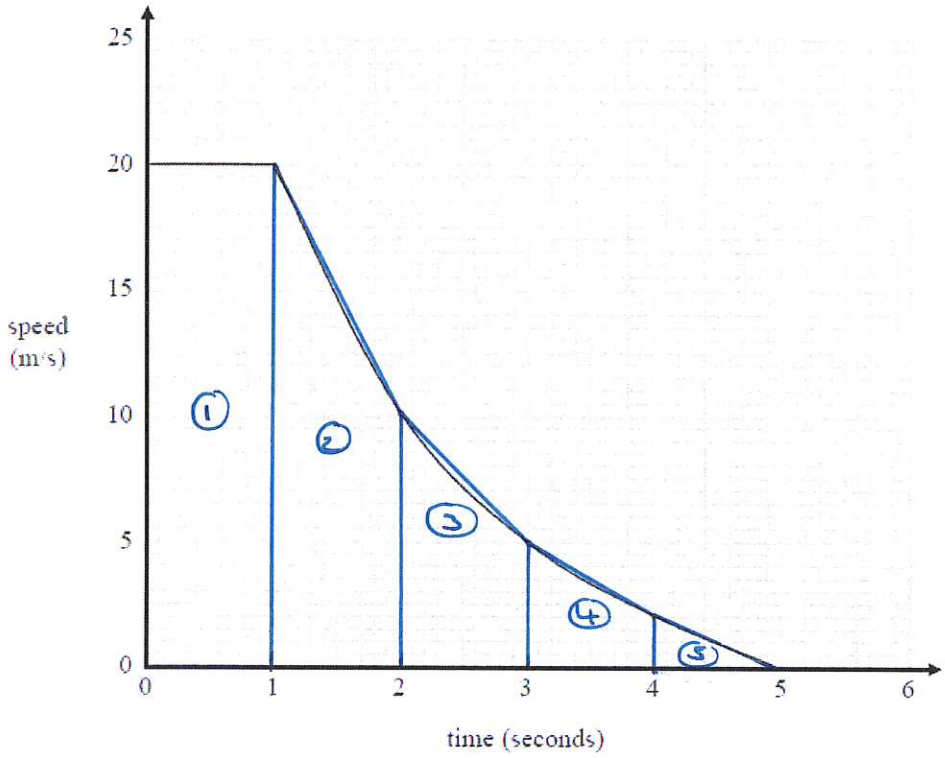
(Total 3 marks)

Velocity Time Graphs

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.



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

① $A = l \times w$
② $A = \frac{h(a+b)}{2}$
③ $A = \frac{h(a+b)}{2}$
④ $A = \frac{h(a+b)}{2}$
⑤ $A = \frac{b \times h}{2}$

$A = 1 \times 20 = 20m$
$A = \frac{1(20+10)}{2} = 15m$
$A = \frac{1(10+5)}{2} = 7.5m$
$A = \frac{1(5+2)}{2} = 3.5m$
$A = \frac{1 \times 2}{2} = 1m$

Total = 20m + 15m + 7.5m + 3.5m + 1m
= 47

..... 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 since the shapes go above the speed-time graph readings.

(1)

(Total 4 marks)

Capture Recapture

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.

"OUT OF" $\frac{120}{x} = \frac{15}{70}$

CROSS MULTIPLY $8400 = 15x$

$(\div 15)$ $560 = x$

Conclusion: We assumed that the same number of rabbits were on the farm on both Monday and Tuesday.

(Total 4 marks)

TOTAL FOR PAPER IS 80 MARKS