OCR
Oxford Cambridge and RSA

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GCSE (9–1) Mathematics
J560/03 Paper 3 (Foundation Tier)
Sample Question Paper

Date – Morning/Afternoon
Time allowed: 1 hour 30 minutes

Model Solutions

You may use:
- A scientific or graphical calculator
- Geometrical instruments
- Tracing paper

First name									
Last name									
Centre number						**Candidate number**				

INSTRUCTIONS
- Use black ink. You may use an HB pencil for graphs and diagrams.
- Complete the boxes above with your name, centre number and candidate number.
- Answer **all** the questions.
- Read each question carefully before you start to write your answer.
- Where appropriate, your answers should be supported with working. Marks may be given for a correct method even if the answer is incorrect.
- Write your answer to each question in the space provided.
- Additional paper may be used if required but you must clearly show your candidate number, centre number and question number(s).
- Do **not** write in the bar codes.

INFORMATION
- The total mark for this paper is **100**.
- The marks for each question are shown in brackets **[ ]**.
- Use the π button on your calculator or take π to be 3.142 unless the question says otherwise.
- This document consists of **20** pages.

Answer **all** the questions

1 **(a)** Solve.

(i) $2x = 18$

$2x = 18$

$x = 9$

(a)(i) $x =$ 9 **[1]**

(ii) $x + 2 = 5$

$x + 2 = 5$

$x = 3$

(ii) $x =$ 3 **[1]**

(iii) $\frac{x}{3} = 15$

$\frac{x}{3} = 15$

$x = 3 \times 15 = 45$

(iii) $x =$ 45 **[1]**

(b) **(i)** Find the value of t when $g = 4$ and $h = 7$.

$t = 12g - 5h$

$t = 12(4) - 5(7)$

$= 48 - 35 = 13$

(b)(i) $t =$ 13 **[2]**

(ii) Rearrange to make r the subject.

$4r - p = q$

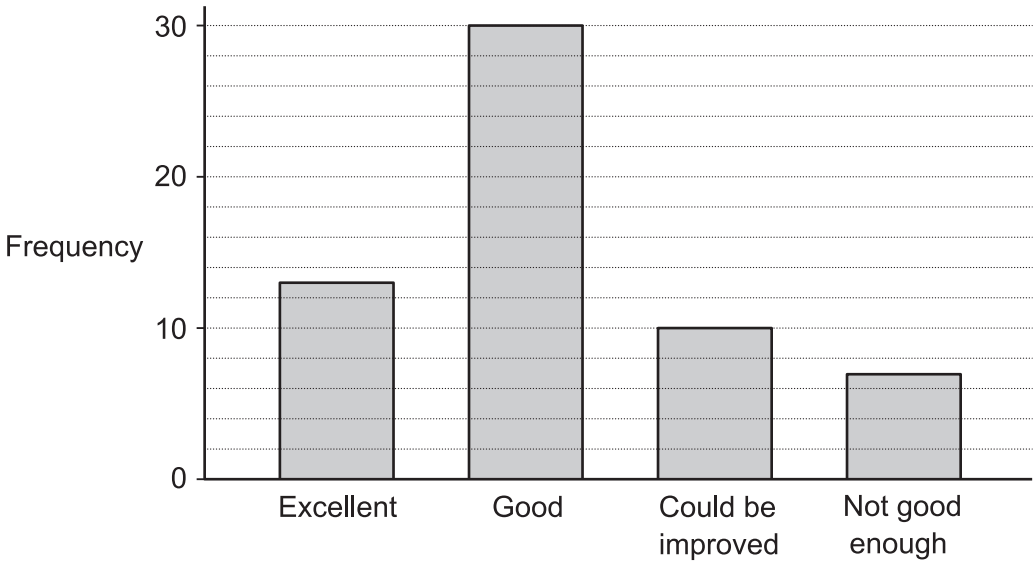
$4r - p = q$

$4r = p + q$

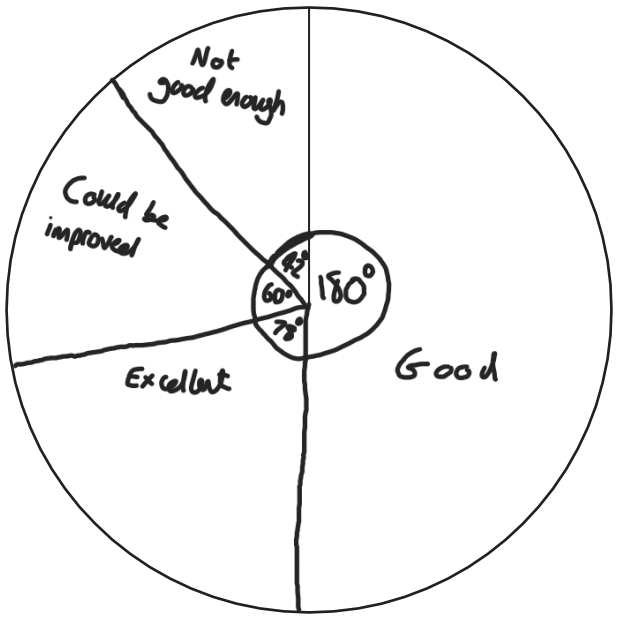
$r = \frac{p+q}{4}$

(ii) $r =$ $\frac{p+q}{4}$ **[2]**

2 Cambury Council asked 60 customers what they thought of the local leisure centre. The results are shown in this bar chart.



Draw and label a pie chart to represent this data.



[5]

60 customers = 360°

1 customer = $\frac{360}{60}$ = 6°

Excellent → 13 × 6 = 78°

Good → 30 × 6 = 180°

Could be improved → 10 × 6 = 60°

Not good enough → 7 × 6 = 42°

3 **(a)** How many 20p coins would you need to make up £7000?

£7000 → 700,000 pence
×100

$\frac{700,000}{20} = 35,000$ 20p coins

(a) ..... 35,000 ..... **[2]**

(b) Each 20p coin weighs 5 g.

Lizzie says

I can lift £7000 worth of 20p coins.

Is Lizzie's claim reasonable?
Show your working and state any assumptions you have made.

As worked out above £7000 is 35000 20p coins.

This weighs $35000 \times 5g = 175,000g = 175kg$

This is not a reasonable claim because a person cannot lift this weight.

..... **[4]**

(c) How have any assumptions you have made affected your answer to part **(b)**?

I have assumed that lizze cannot lift this weight however, Lizza may be an anomally so she may be able to lift that weight if I dont assume she is a odinary person. **[1]**

4 Antonio works Monday, Tuesday and Wednesday.

He starts work at 4.00 pm and finishes at 10.30 pm.
Antonio is paid £10 per hour on weekdays.

One week, he also works for 4 hours on Sunday.
He is paid 50% more on Sundays.

How much does Antonio earn altogether this week?

3 weekdays from 4 to 10:30 is 6.5 hours at £10 per hour.

$6.5 \times 3 \times 10 = £195$

4 hours sunday → 50% extra which is 50% of £10 which is £5 extra per hour.

$4 \times (£10 + £5) = 4 \times £15 = £60$

Total money earnt in week → £195 + £60

£255

£ 255 **[6]**

5 Darren says

I can run 100 m in 15 seconds, so I should be able to run 800 m in 120 seconds.

Do you think that he would take more or less than 120 seconds to run 800 m?
Explain your answer, with reference to any assumptions Darren has made.

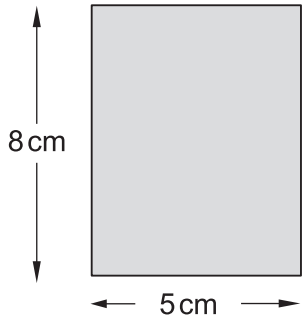
100 = 15 seconds $\xrightarrow{\times 8}$ 800 = 120 seconds

Darrens assumption is in the calculation above.

He assumed he would be able to run each set of 100m at the same speed.

However I dont think that will be possible, so he will take longer than 120 seconds to complete the 800 meters. **[3]**

6 Jo makes a pendant from a rectangular piece of silver.



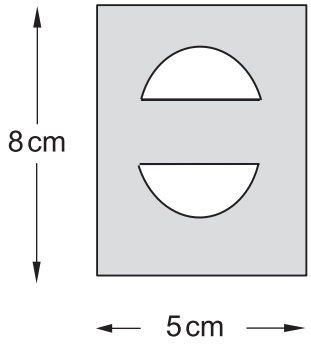
Not to scale

(a) Work out the area of this rectangle.

$5 \times 8 = 40\ cm^2$

(a) ..... 40 ..... cm^2 **[1]**

(b) To complete the pendant, Jo cuts two semicircles of radius 1 cm from the rectangle, as shown below.



Not to scale

Show that the shaded area is 36.9 cm^2 correct to three significant figures. **[4]**

Shaded area → Rectangle − circle area (by combining 2 semi circles)

Circle area $= \pi r^2 = \pi(1)^2 = \pi\ cm^2$

Shaded area → $40 - \pi = 36.8584\ cm^2$

$= 36.9\ cm^2$ to 3sf

(c) The silver Jo uses is 2 mm thick.

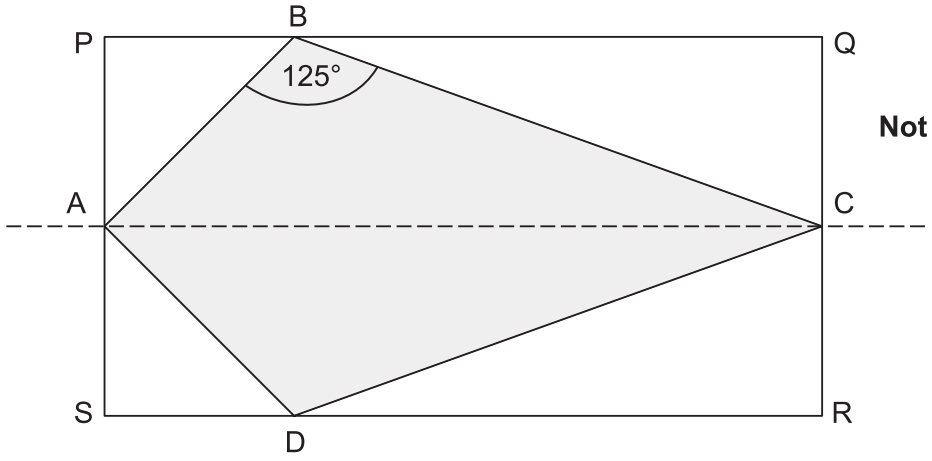
Find the volume of silver in the pendant.
Give your answer in cm^3.

2mm = 0.2cm

$36.9 \times 0.2 = 7.38\ cm^3$

(c) .....7.38..... cm^3 **[3]**

7 PQRS is a rectangle.
A, B, C and D are points on SP, PQ, QR and RS respectively.
AC is the line of symmetry for the diagram.



(a) Angle ABC = 125°.

Write down the size of angle ADC.

(a) Angle ADC = ...125..... ° **[1]**

(b) AP is the same length as PB.

Work out the size of angle BCD.
Show your reasoning clearly.

AP = PB so triangle APB is an isoceles and ∠PAB = ∠PBA

∠APB = 90° as it's a right angle. $\frac{180-90}{2} = 45° = \angle PAB = \angle PBA$

∠CAB = 90 − 45° = 45° as ∠CAP is right angle.

∠CAB = ∠CAD and ∠CAB + ∠CAD = ∠DAB = 45 + 45 = 90°

(b) Angle BCD = ...20..... ° **[4]**

∠BCD = 360 − (90 + 125 + 125) = 360 − 340 = 20°

8 **(a)** The nth term of a sequence is given by $3n + 5$.

Explain why 21 is not a term in this sequence.

$3n+5=21 \rightarrow 3n=16 \rightarrow n=\frac{16}{3}=5.\dot{3}$

n has to be an integer which is a whole number. This is not the case here so 21 is not a term in the sequence. **[2]**

(b) Here are the first three terms in a sequence.

1 2 4

This sequence can be continued in different ways.

(i) Find one rule for continuing the sequence and give the next two terms.

Rule 1 Multiply by 2 each time

Next two terms 8 16 **[2]**

(ii) Find a second rule for continuing the sequence and give the next two terms.

Rule 2 Add 1 more to difference each time. 4 last.

Next two terms 7 11 **[2]**

9 Three friends, Ann (A), Bob (B) and Carol (C), go on holiday together.

(a) They book a row of three seats on the plane.
When they arrive at the plane they sit in a random order.

(i) List all the different orders they could sit on the three seats.
The first one has been done for you.

Seat 1	Seat 2	Seat 3
A	B	C
A	C	B
B	A	C
B	C	A
C	A	B
C	B	A

[2]

(ii) What is the probability that Ann and Carol sit next to each other?

4 times from 6
so 4/6 = 2/3

(a)(ii) 2/3 **[1]**

(iii) What is the probability that Bob sits in seat 1 with Ann next to him?

1 time out of 6 → 1/6

(iii) 1/6 **[1]**

(b) Ann, Bob and Carol have a total budget of £500 to rent a holiday apartment.
The apartment normally costs £50 per night, but they can get a 20% discount if they book early.

Calculate how many extra nights they can stay in the apartment if they book early.

£500 will last 10 days at £50 per night

£50 × 10 = £500

20% discount of £50 → 0.8 × £50 = £40 per night

$\frac{£500}{£40} = 12.5 = 12$ nights

12 − 10 = 2 extra nights if get discount.

(b) .....2..... nights **[4]**

10 Calculate.

(a) $\sqrt{3136}$

$\sqrt{3136} = 56$

(a) .....56..... **[1]**

(b) $\sqrt[4]{625}$

$\sqrt[4]{625} = 5$

(b) .....5..... **[1]**

(c) 5^{-2}

$5^{-2} = \frac{1}{25}$

(c) .....1/25..... **[1]**

11 Ema has done some calculations.

For each calculation, explain how you know the answer is wrong without working out the correct answer.

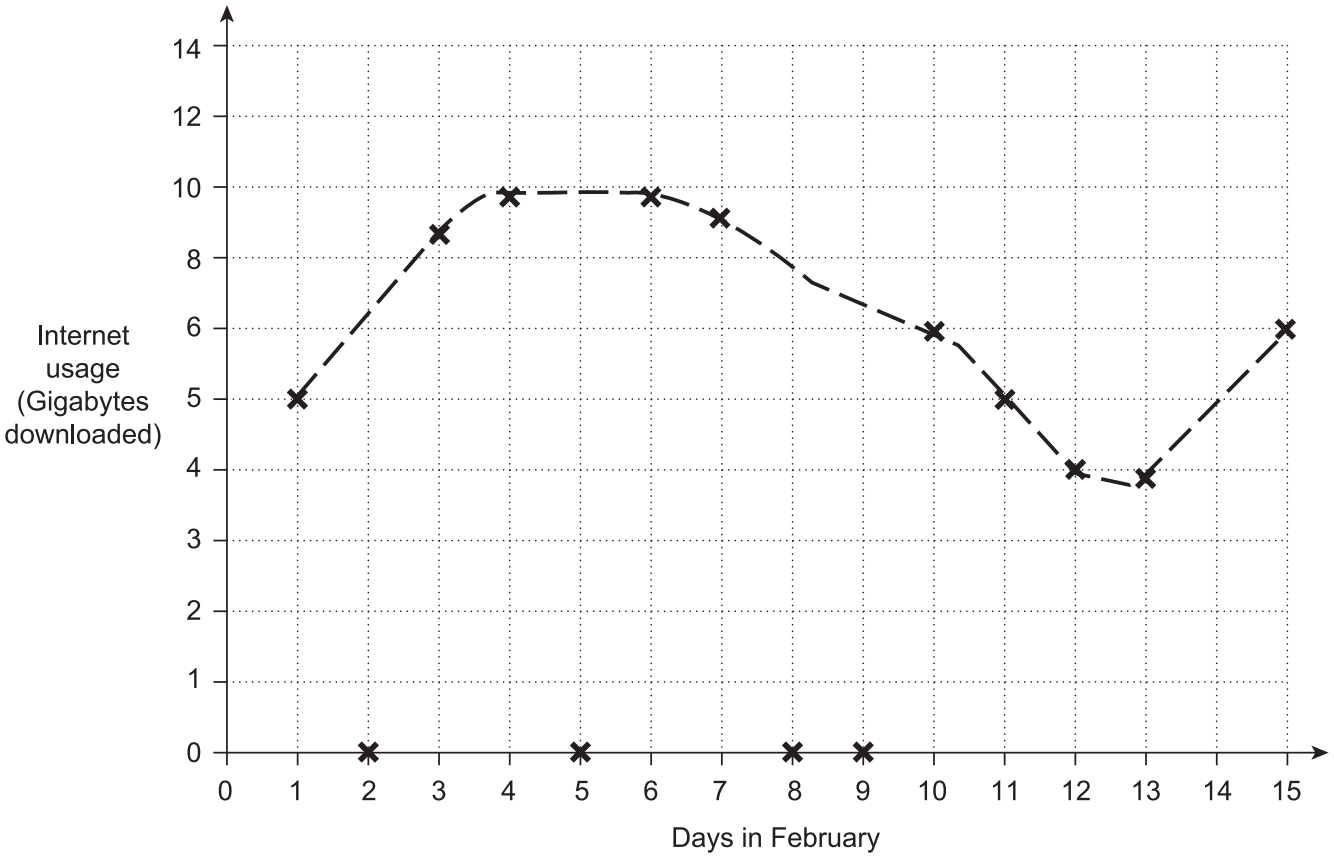
(a) $0.38 \times 0.26 = 0.827$

Answer should have 4 decimal places as you are multiplying 2 decimal places by 2 . $2 \times 2 = 4$ **[1]**

(b) $\frac{3}{4} + \frac{2}{3} = \frac{5}{7}$

Answer should be bigger than 1 as both 3/4 and 2/3 are bigger than 1/2 . **[1]**

12 Shinya's internet service provider gives him a graph of his internet usage in the first part of February.



State two reasons why this graph is misleading.

1 y – axis scale is not linear

2 Days where y=0 are not included in the line .

[2]

13 **(a)** Mia cycled 23 km, correct to the nearest km.

What is the least distance Mia could have cycled?

$22.5 \leqslant 23 < 23.5$

So least is 22.5 km

(a) 22.5 km **[1]**

(b) A number x, rounded to one decimal place, is 4.7.
So the error interval for x is given by $4.65 \leqslant x < 4.75$.

(i) A number y, rounded to **two** decimal places, is 4.13.

Write down the error interval for y.

$4.125 \leqslant y < 4.135$

(b)(i) $4.125 \leqslant y < 4.135$ **[2]**

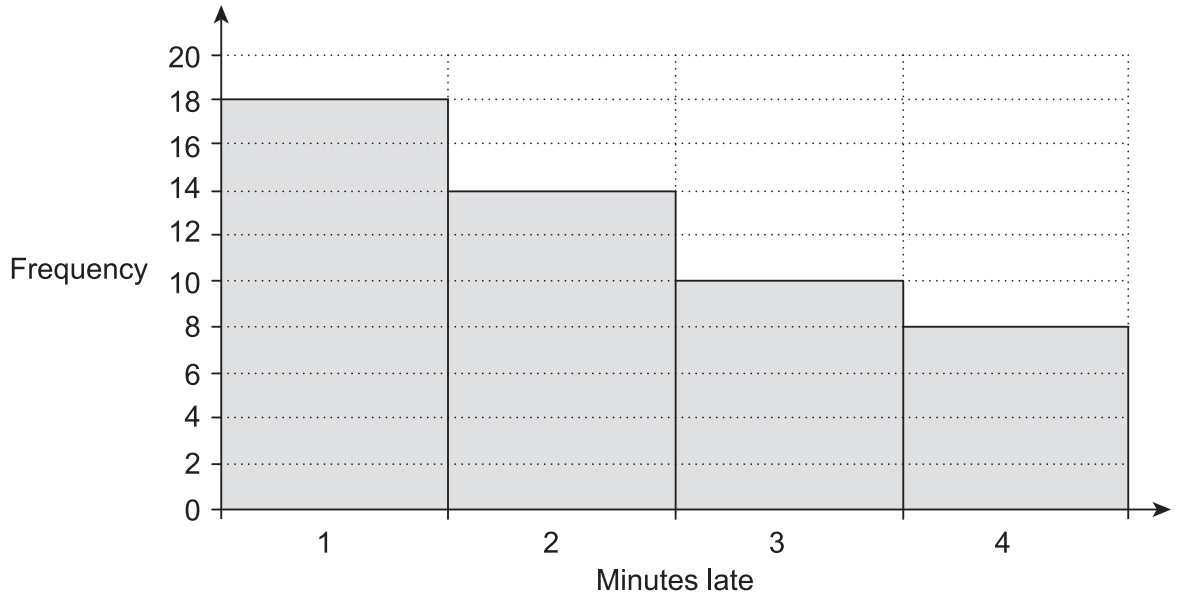
(ii) A number z, rounded to two significant figures, is 4700.

Write down the error interval for z.

$4650 \leqslant z < 4750$

(ii) $4650 \leqslant z < 4750$ **[2]**

14 This frequency diagram summarises the number of minutes Astrid's train was late over the last 50 days.



(a) Use information from this diagram to estimate the probability that her train will be 4 minutes late tomorrow.

Frequency for 4 / Total Frequency → 8 / 18+14+10+8

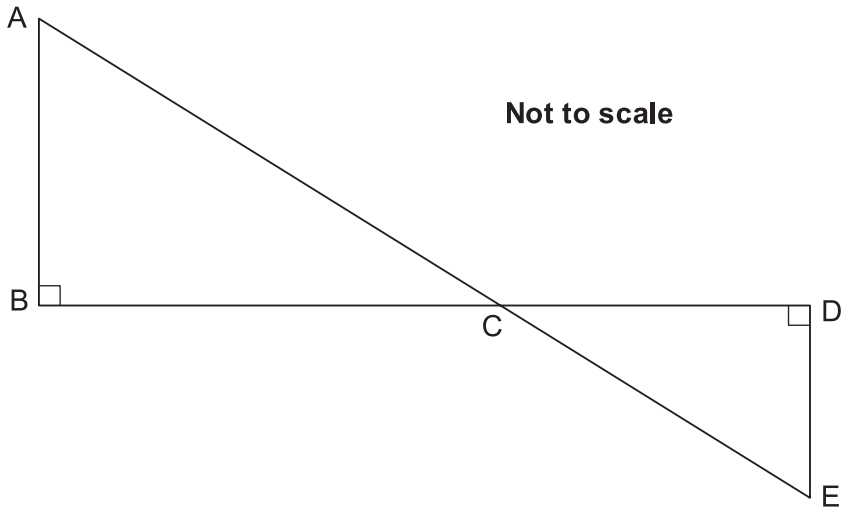
= 8/50

(a) 8/50 **[2]**

(b) Explain whether your answer to part **(a)** gives a reliable probability.

My answer does give a reliable probability because a large sample size was used. **[1]**

15 In the diagram below, AE and BD are straight lines.



(a) Show that triangles ABC and EDC are similar.

$\angle ABC = \angle CDE = 90°$ right angles

$\angle ACB = \angle DCE$ as vertically opposite angles are equal.

$\angle BAC = \angle CED$ as angles in a triangle total 180°.

Three equal angles hence they are similar.

[3]

(b) The length DE is 3.5 m.
The ratio BC : CD = 3 : 1.

Find the length AB.

$\frac{3}{1} = \frac{AB}{3.5}$

$3 = \frac{AB}{3.5} \rightarrow AB = 3 \times 3.5 = 10.5\text{ m}$

(b) 10.5 m **[2]**

16 Leo is using these numbers to make a new number.

11	**1**	**3**	**6**

- He can use brackets, +, −, × and ÷ as often as he wishes.
- He cannot use any number more than once.
- He cannot use powers.
- He cannot put numbers together, e.g. he can't use 136.

What is the biggest number he can make?
Show how he can make this number.

$(3+1)\times 6\times 11 = 264$

Add the two smaller numbers 3 and 1 because if you multiply by 1 you will get same answer.
Then multiply by bigger numbers.
$(3+1)\times 6\times 11 = 264$ **[4]**

17 180 g of copper is mixed with 105 g of zinc to make an alloy.

The density of copper is 9 g/cm^3.
The density of zinc is 7 g/cm^3.

(a) Work out the volume of copper used in the alloy.

Volume = $\frac{\text{Mass}}{\text{Density}} = \frac{180}{9} = 20\,\text{cm}^3$ copper

(a) ..... 20 ..... cm^3 **[2]**

(b) What is the density of the alloy?

Density = $\frac{\text{Mass}}{\text{volume}}$

First we need zinc volume

$\frac{105}{7} = 15\,\text{cm}^3$

Then total density → $\frac{180+105}{20+15} = \frac{57}{7}$ g/cm^3

(b) ..... 57/7 ..... g/cm^3 **[4]**

18 (a) (i) Solve.

$5x + 1 > x + 13$

$5x+1 > x+13$

$4x > 12$

$x > 3$

(a)(i) ..... $x > 3$ ..... **[3]**

(ii) Write down the largest integer that satisfies $5x - 1 < 10$.

$5x-1 < 10$

$5x < 11$

$x < 11/5$

$x < 2.2$

So $x = 2$

(ii) ..... 2 ..... **[1]**

(b) Solve.

$3x^2 = 75$

$3x^2 = 75$

$x^2 = 75/3 = 25$

$x = \sqrt{25} = \pm 5$

(b) $x =$ ..... ± 5 ..... **[2]**

(c) Solve.

$4x + 3y = 5$
$2x + 3y = 1$

① $4x + 3y = 5$

② $2x + 3y = 1$

$2x = 4$

$x = 2$

Use $x = 2$ in ② → $2(2) + 3y = 1$

$4 + 3y = 1$

$3y = -3$

$y = -1$

(c) $x =$ .....

$y =$ ..... -1 .....

[3]

19 Here are the interest rates for two accounts.

Account A	Account B
Interest: 3% per year compound interest.	Interest: 4% for the first year, 3% for the second year and 2% for the third year.
No withdrawals until the end of three years.	Withdrawals allowed at any time.

Derrick has £10 000 he wants to invest.

(a) Calculate which account would give him most money if he invests his money for 3 years. Give the difference in the interest to the nearest penny.

If use A → €10,000 × $(1.03)^3$ = €10927.27

If use B → €10,000 × 1.04 × 1.03 × 1.02 = €10926.24

€10927.27 − €10926.24 = €1.03 more from A

€1.03 = 103p

(a) Account ....A..... by .....103..... p **[5]**

(b) Explain why he might **not** want to use Account A.

Because he can't withdraw any of his money if he needs it in all the 3 years. **[1]**