1. Here is a table for a two-stage number machine.
It multiplies by 2 then subtracts 1.
Complete the missing numbers in the table.

× **2** – **1**	
Input	Output
1	1
2	3
3	……..
5	……..
……..	15

(Total 3 marks)

2. A school has a photocopier and a printing machine.
The cost of using the photocopier is given by the rule

Cost of using the photocopier	=	number of copies	×	cost of one copy

The cost of one copy is 4 pence.

Geoff makes 96 copies.

(a) Work out the cost of using the photocopier to make 96 copies.

£ …….

(2)

The cost of using the printing machine is given by the following rule

Cost of using the printing machine	=	number of copies	×	cost of one copy	+	copy fee

The cost of one copy is 3 pence.
The copy fee is 40 pence.

Charlotte makes 96 copies using the printing machine.

(b) Work out the difference in their costs between Geoff and Charlotte.

£ …….

(2)
(Total 4 marks)

3. (a) Simplify $5p + 2q - 3p - 3q$

.....

(2)

$y = 5x - 3$

(b) Find the value of x when $y = 4$

$x =$ .....

(2)

(Total 4 marks)

4. (a) Work out the value of $3p + 4q$ when $p = 5$ and $q = -2$

……

(2)

(b) Given that $y = 4x - 3$, work out the value of x when $y = 11$

$x =$ ……

(3)

(c) Multiply out $7(n - 3)$

……

(1)

(Total 6 marks)

5. You can use this rule to work out the total number of points a football team got last season.

Multiply the number of wins by 3 and then add the number of draws

Last season Rovers had 10 wins and 0 draws.

(a) Use the rule to work out the total number of points Rovers got last season.

.....

(1)

Last season United had 20 wins and 5 draws.

(b) Use the rule to work out the total number of points United got last season.

.....

(2)
(Total 3 marks)

6. (a) Simplify

(i) $e + f + e + f + e$

.....

(ii) $p^2 + p^2 + p^2$

.....

(2)

(b) Work out the value of $5x + 1$ when $x = -3$

.....

(2)
(Total 4 marks)

7. (a) Work out the value of $2a + ay$ when $a = 5$ and $y = -3$

…….

(2)

(b) Work out the value of $5t^2 - 7$ when $t = 4$

…….

(3)
(Total 5 marks)

8. $S = 2p + 3q$

$p = -4$
$q = 5$

(a) Work out the value of S.

$S =$……

(2)

$T = 2m + 30$

$T = 40$

(b) Work out the value of m.

$m =$……

(2)
(Total 4 marks)

9. $v = u + 10t$

Work out the value of v when

$u = 10$ and $t = 7$

$v =$ ……

(Total 2 marks)

10. The cost of a cinema ticket for an adult is £5.50
The cost of the cinema tickets for 13 adults and 9 children is £103

Work out the cost of a cinema ticket for a child.

£ .....

(Total 4 marks)

11. Kalim thinks of a number.
He multiplies the number by 2
He then adds 3

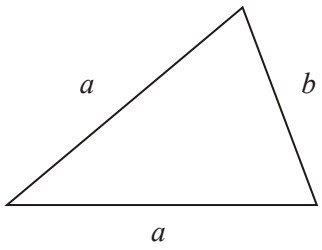
His answer is 27

(a) What number did Kalim think of?

.....

(2)

Emma uses the formula $P = 2a + b$
to find the perimeter P of this triangle.



(b) Find the value of P when $a = 5$ and $b = 3$

P = ...

(2)
(Total 4 marks)

12. $P = 3n$
$n = 6$

(a) Work out the value of P.

$P =$ .....

(1)

$Q = 2c + d$
$c = 3$
$d = 2$

(b) Work out the value of Q.

$Q =$ .....

(2)
(Total 3 marks)

13. $p = 5$
$r = 2$

(a) Work out the value of $4p + 3r$

.....

(2)

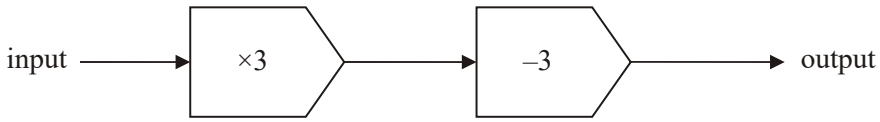
n is an even number.

(b) What type of number is $n + 1$?

.....

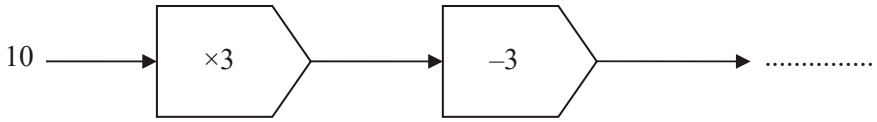
(1)
(Total 3 marks)

14. The diagram shows a mathematical rule.



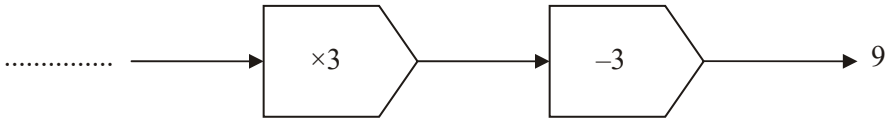
It multiplies a number by 3 and then subtracts 3

(a) Complete the diagram.



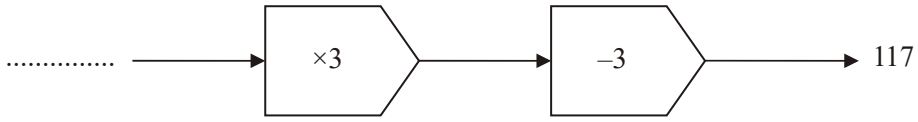
(1)

(b) Complete the diagram.



(1)

(c) Complete the diagram.



(1)
(Total 3 marks)

15. You can use this rule to work out the number of minutes it takes to cook a turkey.

> Multiply the turkey's weight, in kg, by 40.
> Then add 30.

A turkey's weight is 4.5 kg.
Use the rule to work out the number of minutes it will take to cook this turkey.

……

(Total 2 marks)

16. You can use this rule to work out the cost of a taxi journey.

> cost of taxi journey = cost per kilometre × number of kilometres

The cost per kilometre of a taxi journey is 35p.

Use the rule to work out the cost of a taxi journey of 9 km.
Give your answer in pounds (£).

£ ……

(Total 2 marks)

17. Here is a formula for the **perimeter** of a rectangle.

Perimeter = (length × 2) + (width × 2)

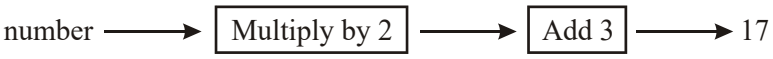
The length of a rectangle is 12 cm.
Its width is 4 cm.

Use the formula to work out the perimeter of this rectangle.

…… cm
(Total 2 marks)

18. James thinks of a number.
He multiplies his number by 2 and then adds 3.
His answer is 17.

The diagram shows this.



Work out the number that James thought of.

……
(Total 1 mark)

19.

Tanya picks strawberries to earn some money.
She puts the strawberries in baskets.

The formula can be used to work out her pay.

Pay = £15 per day + £2 for each full basket

Tanya worked all day on Monday.
She filled 12 baskets with strawberries.

Work out Tanya's pay on Monday.

£ …….

(Total 2 marks)

20. $P = 3a + 5b$

$a = 5.8$
$b = -3.4$

Work out the value of P.

$P =$ .....

(Total 2 marks)

21. You can use this formula to work out the cost of printing a number of leaflets.

printing cost = price per leaflet × number of leaflets + fixed charge

The price per leaflet is £0.32
The number of leaflets is 1400
The fixed charge is £65.50

Work out the printing cost.

£ .....

(Total 3 marks)

22. You can use this rule to work out the distance a car travels.

distance = average speed × time

A car has an average speed of 60 km/h.
It travels for a time of 4 hours.

Use the rule to work out the distance the car travels.

..... km
(Total 2 marks)

23. $v = 15 - 10t$

$t = 4$

Work out the value of v.

v = ...
(Total 2 marks)

24. $T = 5p + 3q$

(a) Work out the value of T when $p = 2$ and $q = 4$

$T =$ .....

(2)

(b) Solve $x + 8 = 13$

$x =$ .....

(1)

(Total 3 marks)

25. Michelle makes dresses.
She uses this rule to work out her pay.

Multiply the number of dresses made by £5 and add £21

Michelle made 6 dresses.

(a) Use the rule to work out her pay.

£ .....

(2)

Andy also makes dresses.
He is paid using the formula

$P = 4n + 32$

P is his pay in pounds (£).

n is the number of dresses he makes.

Andy made 7 dresses.

(b) Use the formula to work out his pay.

£ .....

(2)
(Total 4 marks)

26. Viv used this rule to work out the number of points gained by her favourite football team.

Number of points gained	=	number of wins × 3	+	number of draws

Viv's favourite football team had 20 wins and 4 draws.

Work out the number of points gained by her favourite football team.

.....points

(Total 2 marks)

27. $p = 2$

Work out the value of $5p^3$

.....

(Total 2 marks)

28. Navjeet uses this rule to work out his pay.

Pay = Number of hours worked × rate of pay per hour

This week Navjeet worked for 10 hours.
His rate of pay per hour was £4.50

Use this rule to work out his pay.

£…….

(Total 2 marks)

1. 5
9
8 3

B1 cao
B1 cao
B1 cao

[3]

2. (a) 3.84 2

96×4

M1 for 96 × 4 or digits 384
A1 cao

(b) (0).56 2

$3 \times 96 + 40 = 328$

M1 for 3 × 96 + 40 or digits 328 or digits 56
A1 cao accept 56p

[4]

3. (a) $2p - q$ 2

B1 cao for 2p
B1 cao for –q accept (–q + 2p), 2p – 1q and 2p + - q

(b) 1.4 2

$5x = 3 + 4$

M1 for either (+3 or sight of 7) or (÷ 5 or sight of 0.8 and 0.6)
A1 cao accept $\frac{7}{5}$ *or* $1\frac{2}{5}$

[4]

4. (a) 7 2

$3 \times 5 + 4 - 2$

M1 for 3 × 5 + 4 × –2
A1 cao

(b) $3\frac{1}{2}$ oe 3

$4x - 3 = 11$
$4x = 11 + 3$

M1 for 4x – 3 = 11
M1 for 4x = 11 + 3
A1 for $3\frac{1}{2}$ *oe*

(c) $7n - 21$ 1

B1 cao

[6]

5. (a) 30 1

B1 for 30

(b) 65 2

$20 \times 3 + 5$

M1 for 20 × 3 + 5 oe
A1 for 65

[3]

6. (a) (i) $3e + 2f$ 2

B1 for $3e + 2f$

(ii) $3p^2$

B1 for $3p^2$

(b) –14 2

$5 \times -3 + 1$

M1 for $5 \times -3 + 1$
A1 for –14

[4]

7. (a) – 5 2

$2 \times 5 + 5 \times -3 = 10 - 15 =$

M1 substitute e.g 2×5 and 5×-3 or 10 and –15
A1 cao

(b) 73 3

$5 \times 4^2 - 7$
$5 \times 16 - 7$

M1 substitution e.g $5 \times 4^2 - 7$; do not accept $54^2 - 7$
M1 $5 \times 16 - 7$ or $5 \times 4 \times 4 - 7$ or $80 - 7$ (NB 4^2 as 4×4)
A1 cao

[5]

8. (a) $2 \times -5 + 3 \times 5$
7 2

M1 for 2×-4 or $-4 - 4$ or 3×5
or 5+5+5 or –8 or 15
A1 cao

(b) $40 = 2m + 30$
5 2

M1 for $40 = 2m + 30$ or $40 = 2 \times 5 + 30$
or $40 = 10 + 30$ or $2m = 10$
A1 cao

[4]

9. $10 + 10 \times 7$
80 2

M1 for $10 + 10 \times 7$
A1 for 80 cao

[2]

10. $13 \times 5.5(0)$ or $71.5(0)$ 4

M1 for $13 \times 5.5(0)$ or $71.5(0)$ seen

$103 - 71.5(0)$ or $31.5(0)$

M1 for $103 -$ "$71.5(0)$" or $31.5(0)$ seen

$31.5(0) \div 9$

M1 for "$31.5(0)$" + 9
A1 for 3.50 Condone 3.5

[4]

11. (a) $(27 - 3) \div 2$ 2
12

M1 for $(27 - 3) \div 2$
A1 for 12

(b) $2 \times 5 + 3$ 2
13

M1 for $2 \times 5 + 3$
A1 for 13

[4]

12. (a) 3×6
18 1

B1 for 18 cao

(b) $2 \times 3 + 2$
8 2

M1 for $2 \times 3 + 2$
A1 for 8 cao

[3]

13. (a) 26 2

M1 for 4 × 5 + 3 × 2
A1 cao

(b) Odd 1

B1 cao

[3]

14. (a) 27 1

B1 cao

(b) 4 1

B1 cao

(c) 40 1

B1 cao

[3]

15. 210 2

$4.5 \times 40 + 30$
$= 180 + 30$

M1 for 4.5 × 40 + 30
A1 for 210 **OR** *3.5 hours* *Note: cannot isw*
[SC: 2:10 **OR** 2hr 10 min **OR** 2.1 gets M1 A0]

[2]

16. £3.15 2

35×9

M1 for 35 × 9 OR 0.35 × 9 or digits 315
A1 cao

[2]

17. 32 2

$12 \times 2 + 4 \times 2$

M1 for 12 × 2 + 4 × 2 oe
A1

[2]

18. 7 1

B1

[1]

19. 39 2

15 + (12 × 2)

M1 for valid method that leads to correct answer
A1

[2]

20. 0.4 2

3 × 5.8 + 5 × –3.4

M1 for correct substitution into 3a and 5b or 17.4 and – 17 seen
A1 cao

[2]

21. 513.50 3

0.32 × 1400 + 65.50

M1 for 0.32 × 1400 or 448 seen
M1 for 0.32 × 1400 + 65.50
A1 cao

[3]

22. 240 2

60 × 4

M1 for 60 × 4
A1 for 240 M1
S.C. for 1440

[2]

23. $15 - 10 \times 4$
$15 - 40$
-25 2

M1 for correct substitution to give $15 - 10 \times 4$ or ± 40 seen
A1 cao

[2]

24. (a) $5 \times 2 + 3 \times 4$
22 2

M1 for 5×2 or 3×4 or 10 or 12 seen
A1 cao

(b) 5 1

B1

[3]

25. (a) $21 + 6 \times 5$
51 2

M1 for 6×5 or 30 seen
A1

(b) $32 + 4 \times 7$
60 2

M1 for 4×7 or 28 seen
A1

[4]

26. $20 \times 3 + 4$
64 2

M1 for $20 \times 3 + 4$
A1 cao

[2]

27. $5 \times 2 \times 2 \times 2$
40 2

M1 for 5×2^3 or $5 \times 2 \times 2 \times 2$ oe
A1 cao

[2]

28. 10×4.50
45 2

M1 for 10×4.50
A1 cao

[2]

1. This was another very well answered question with many candidates scoring full marks. If one error were made, it was most likely to be with the final entry, which was an input.

2. **Mathematics A Paper 2**

Full marks on this question were rarely seen. Part (a) was generally more successfully answered than part (b). Candidates generally lost marks on part (a) by writing 384 or 38.40. In part (b) the absence of working cost marks, as about 75% of candidates obtained the answer of 3.28, but failed to work out the difference. Difficulties often arose with the use of decimal points and the concept of writing money correctly.

Mathematics B Paper 15

Part (a) was dealt with very well with 384 being written down by most candidates. The conversion to pounds and pence was a problem for some whilst many just put 384 in the answer space. Part (b) proved to be more troublesome as the calculation of $96 \times 3 + 40$ nearly always produced 328 but the subtraction from (a) was frequently missing.

3. **Paper 2**

Algebraic manipulation is not well understood by candidates at the Foundation Tier. This question confirmed this again this year. This question proved too difficult for most candidates. Part (a) was better answered than part (b). Quite often candidates simplified the term in p correctly, simplifying q was more difficult. Relatively few candidates made any attempts at part (b).

Paper 4

It was disappointing that more candidates did not gain both marks in part (a). One mark was often achieved for $2p$ but many gave the answer in the form
$2p + -q$. $8p - 5q$ was a common incorrect response. In part (b) many of those who correctly substituted $y = 4$ were unable to solve the equation correctly and it was common to see "$4 = 5x - 3$" followed by "$4 - 3 = 5x$". Some candidates used trial and improvement to solve the equation without any reference to algebraic techniques.

4. It was pleasing to see the majority of candidates showing their working in part (a) with many gaining a method mark for '3 × 5' and '4 × –2'. Unfortunately '15 + – 8' was often incorrectly calculated and '23', '–23' and '–7' were common responses. Some candidates wrote '4(–2) = 2' and some used $q = 2$ instead of $q = –2$. In part (b) many candidates correctly substituted $y = 11$ but it was common to see '$11 = 4x – 3$' followed by '$11 – 3 = 4x$'. Where candidates did go on to get '14 ÷ 4', this was often evaluated as 3.2. Candidates are to be encouraged to show all working as they were not penalised in this part for giving an answer of 3.2 if they had clearly shown '$x = \frac{14}{4}$'. Some candidates used trial and improvement to solve the equation without any reference to algebraic techniques. Part (c) was answered quite well although some candidates forgot to multiply the second term of the bracket by 7.

5. This question was well understood and 90% of candidates were able to substitute numbers into a one stage word formula and 80% into a two stage word formula.

6. In part (a) many candidates were able to simplify $e + f + e + f + e$ correctly but some confused $3e$ with e^3 and gave the answer as $e^3 + f^2$. It was disappointing that only a quarter of the candidates could simplify $p^2 + p^2 + p^2$ correctly in (ii). The most common error was for the powers to be added, leading to either p^6 or $3p^6$. It was pleasing to see the majority of candidates showing their working in part (b) and many gained a method mark for $5 \times –3 + 1$ but, unfortunately, this was sometimes evaluated incorrectly. Common errors were $5 \times –3 = 15$ and $5 \times –3 + 1 = –16$. Some candidates were unable to interpret $5x + 1$ correctly and wrote $5 – 3 + 1 = 3$.

7. This question proved to be a good discriminator. In part (a) many candidates were awarded a mark for correct substitution, but then spoilt their calculation by evaluating 10 – 15 as 25, or –25. Weaker candidates calculated $2 \times 5 + 5 – 3$. In part (b) candidates spoilt their working by evaluating the expression as $(5t)^2$. Many candidates continue to be confused by writing 4^2 as 8. Underlying errors in this question were related to misunderstanding order of operations, squaring, or negative numbers.

8. **Foundation tier**

At this level, the majority of students find algebraic presentation confusing and struggle with the concept of substitution. In saying this, some students managed to achieve method marks in part (a) for showing 3×5 or 15, with only 10% of the candidates able to provide the correct answer of 7. In part (b) around a quarter of the candidates were able to give 5 as the answer but, in general, this was done without any working shown. Hardly any manipulation of algebra was seen in this part of the question.

Intermediate Tier

Candidates very quickly become confused on sight on negative numbers.
The success rate was far higher for (b) than (a). In part (a) most students correctly substituted the numbers, but were then unable to process them, many giving an incorrect answer of 23 or -23. Some students did not multiply, but added. Some did not understand "substitution" and left letters in their answer, usually $-8p + 15q$.
In part (b) many formed the correct equation, but then added the 30 rather than taking it away. Surprisingly, a high proportion of the candidates realised 10 was significant, to the extent that 5 was shown in working but 10 was put on the answer line. Some, having established that $2m = 10$, gave 8 as the answer.

9. **Specification A**

More than three quarters of candidates found the correct value of v. Some, though, evaluated $10 + 10 \times 7$ as 20×7 and weaker candidates worked out $10 + 10 + 7$.

Specification B

The majority of candidates scored full marks. A common wrong answer was 140 [$(10 + 10) \times 7$]. A few candidates wrote $10 + 70$ and failed to complete the solution.

10. Most candidates gained full marks, demonstrating sound reverse operation methods, and few using trial and improvement. It was disappointing to see basic arithmetic errors when candidates had calculators to check their working: £130 – £71.50, ×5.5 and ÷9 all presenting unnecessary problems for some.

11. This question was poorly answered with about half the candidature gaining some success in part (a) though there were very few correct answers to part (b).

12. About 60% of candidates were able to carry out the simple substitution in part (a) correctly. Common incorrect answers were 36, 9, 3 and $3n$. Some did not attempt this question. A similar proportion of candidates were successful in part (b). Those who were not frequently assumed that $2c = 23$ when $c = 3$, leading to an answer of 25. Another common incorrect answer was 7. Sometimes it could be seen that this resulted from candidates working out 2×3 as 5 and then adding 2 to make 7 and a method mark could be awarded. All too often, though, no working was shown and the mark could not be awarded.

13. Both parts of this question were quite well done with about two thirds of candidates scoring 2 marks in each of the two parts. It was surprising, in part (a), to see a significant number of final answers in the form 20 + 6. This could only be awarded 1 mark. Sometimes candidates showed a correct substitution into the expression to gain the method mark but then recorded 26pr as their answer. Candidates who had little understanding of substitution gave 77 as their answer. There was no one common incorrect answer seen in part (b).

14. Again, the success rate on this question was extremely high although a few were unfamiliar with this type of question, giving inappropriate responses such as 'output' in (a) and 'input' in parts (b) and (c).

15. This question was well understood by most candidates. However confusion arose in how to present their answer. 2.10, 2h 10m or 2:10 were common incorrect answers.

16. Most realised that they had to multiply 35 by 9 thus scoring a method mark. However although they produced 315 they failed to appreciate that their answer was in pence and the answer was required in pounds.

17. Use of the formula was generally well handled. Often the two parts (length × 2) and (width × 2) were dealt with individually and then combined together at the end of the process to get the correct answer. 12 × 2 + 4 × 4 was often seen leading to no marks.

18. The majority of candidates were able to work out that James had thought of the number 7.

19. There were many correct responses (nearly 75% of candidates) to calculating the payment for working on Monday. The most common incorrect answer was £24. Some indicated their method of dealing with the problem whilst others gave their answer without any indication of working. The formula was often not used as many favoured a less rigid but structured approach. Working out £15 + £2 + £2 + £2 +... or showing £15 + £24 was fairly common.

20. There were a surprising number of errors made in this question largely as a result of ignoring the negative sign in –3.4 and giving a solution of 34.4 (3 × 5.8 + 5 × 3.4). An answer of –34.4 was also common. Without using calculators, 3 × 5.8 = 15.24 and 5 × –3.4 = –15.20 was a typical method and some worked out (3 + 5.8) + (5 – 3.4).

21. It was encouraging to note that many solutions indicated an understanding of the method required to obtain the printing cost with over 70% scoring at least 1 mark on his question. The first stage of multiplying '0.32' by '1400' generally provided the correct digits '448'. The place value caused all sorts of problems in the actual calculation, particularly when adding '65.5'. Method marks were awarded for the recognition of the first and second stages in the working. The answer did not always appear as a correctly written '£' quantity and candidates need to be aware of the need to write '£513.50' rather than '£513.5'. Only 18% scored all 3 marks.

22. Working out the time was well answered with over 70% of the candidates scoring both marks. Arithmetic let down at least 11% of the candidates who showed 60 × 4 but then wrote the final answer as 280, 230 and even 64! Many more wrote these incorrect answers without any working and so were not able to score the method mark.

23. Many candidates scored one mark for correct substitution but then failed to complete the calculation by either using incorrect order of operations to give an answer of 20 [(15 – 10)× 4] or by calculating 40 –15 to give 25, or 40 +15 giving an answer of 55.

24. The process of two multiplications followed by an addition in an algebraic formula did not work out successfully, or even partly so, in 75% of responses. Evaluating '5p' when ' $p = 2$' sometimes resulted in '52' which, combined with the similarly produced '34', gave rise to a final answer of '86'. Recognising that '5p' represented '5 × p ' was not evident in the majority of cases. Solving ' $x + 8 = 13$' was perhaps best approached by 'looking' at the equation rather than attempting to manipulate the terms. Nearly all candidates were able to identify x as 5.

25. For part (a) the combination of '6 dresses' with '£5' and '£21' using a rule was rewarded if the '6' was multiplied by the '5' which it frequently was, with nearly three quarters of the candidates obtaining the correct answer of £51. However, other combinations also appeared and these did not lead to fruitful outcomes. There were considerable fewer correct answers to part (b) with only just over a quarter of the candidates scoring both marks. It was not unusual to see the given formula ignored in favour of the one given in the first part of the question. Multiplying '4' by '7' and then adding on to '32' was called for, but stages in the working were often not recorded which jeopardised the chance of picking up the method mark. 47 +32 = 79 was a common incorrect response.

26. This was well answered with nearly two thirds of the candidates scoring both available marks. A common error was to add the 4 to the 20 first (reaching 24) and then multiplying this by 3 to obtain an answer of 72. It was also surprising to see how many candidates wrote 20 × 3 = 63 and then added 4 to get 67! Where working was shown, these candidates were able to access the method mark but answers of 67 without working scored no marks.

27. A third of the candidature did gain full marks in this question but far too often there were mistakes made in the interpretation of $5p^3$. $(5 \times 2)^3$ was the most common error resulting in an incorrect answer of 1000, although an answer of 30 (5×2×3) seen many times. 52^3 and 52×3 were seen but less often.

28. Well over 80% of the candidates felt comfortable with using the rule to work out the rate of pay. There was some evidence that a calculator was not used successfully, or even at all, as around 6% of the candidates wrote 10 × £4.50 but then failed to write down the product correctly.