1. (a) Simplify $d + d + d + d + d$

.....

(1)

(b) Simplify $y^2 + y^2$

.....

(1)

(c) Expand $4(3a - 7)$

.....

(2)

(d) Simplify $t \times t^2$

.....

(1)

(e) Simplify $m^5 \div m^3$

.....

(1)

(Total 6 marks)

2. (a) Simplify $4p \times 5q$

.....

(1)

(b) Simplify $d \times d \times d \times d$

.....

(1)

(c) Expand $4(3a - 7)$

.....

(2)

(d) Expand and simplify $2(2n + 3) + 3(n + 1)$

.....

(2)

(e) Simplify $t \times t^2$

.....

(1)

(f) Simplify $m^5 \div m^3$

.....

(1)
(Total 8 marks)

3. (a) Expand and simplify $3(x + 4) + 5(2x + 1)$

.....

(2)

(b) Simplify $t^4 \times t^6$

.....

(1)

(c) Simplify $p^8 \div p^5$

.....

(1)

(d) Simplify $(x^4)^3$

.....

(1)

(Total 5 marks)

4. (a) Simplify $t^6 \times t^2$

.....

(1)

(b) Simplify $\frac{m^8}{m^3}$

.....

(1)

(Total 2 marks)

5. (a) Simplify $t^6 \times t^2$

.....

(1)

(b) Simplify $\frac{m^8}{m^3}$

.....

(1)

(c) Simplify $(2x)^3$

.....

(2)

(d) Simplify $3a^2h \times 4a^5h^4$

.....

(2)
(Total 6 marks)

6. (a) Simplify $t \times t^2$

.....

(1)

(b) Simplify $m^5 \div m^3$

.....

(1)
(Total 2 marks)

7. (a) Simplify $d \times d \times d \times d$

.....

(1)

(b) Simplify $t \times t^2$

.....

(1)

(c) Simplify $m^5 \div m^3$

.....

(1)
(Total 3 marks)

8. (a) Simplify $t^4 \times t^6$

.....

(1)

(b) Simplify $(x^4)^3$

.....

(1)
(Total 2 marks)

9. (a) Simplify $(a^2)^4$

.....

(1)

$2^{30} \div 8^9 = 2^x$

(b) Work out the value of x.

$x =$ .....

(2)
(Total 3 marks)

1. (a) $5d$ 1

B1 for 5d or 5 × d

(b) $2y^2$ 1

B1 for $2y^2$ or $2 \times y^2$

(c) $4 \times 3a - 4 \times 7$
$12a - 28$ 2

M1 for or 4 × 3a or 4 × 7 or 12a or 28
A1 for 12a – 28 cao

(d) t^3 1

B1 for t^3 (accept t^{1+2} oe)

(e) m^2 1

B1 for m^2 (accept m^{5-3} oe)

[6]

2. (a) $20pq$ 1

B1 for 20pq oe

(b) d^4 1

B1 for d^4 cao

(c) $4 \times 3a - 4 \times 7$
$12a - 28$ 2

M1 for 4 × 3a or 4 × 7 or 12a or 28
A1 for 12a – 28 cao

(d) $4n + 6 + 3n + 3$
$7n + 9$ 2

M1 for $4n + 6$ or $3n + 3$
A1 for $7n + 9$
B1 for t^3

(e) t^3 1

B1 for t^3
(accept t^{1+2} oe)

(f) m^2 1

B1 for m^2
(accept m^{5-3} oe)

[8]

3. (a) $13x + 17$ 2

*M1 for $3 \times x + 3 \times 4$ **OR** $5 \times 2x + 5 \times 1$*
A1 cao

(b) t^{10} 1

B1 cao

(c) p^3 1

B1 cao

(d) x^{12} 1

B1 cao

[5]

4. (a) t^{6+2}
t^8 1

B1 for t^8 or for t^{6+2}

(b) m^{8-3}
m^5 1

B1 for m^5 or for m^{8-3}

[2]

5. (a) t^{6+2}
t^8 1

B1 for t^8 or for t^{6+2}

(b) m^{8-3}
m^5 1

B1 for m^5 or for m^{8-3}

(c) $2^3 \times x^3$
$8x^3$ 2

B2 for $8x^3$ cao
(B1 for ax^3, $a \neq 8$ or $2x \times 2x \times 2x$ or $8x^n$ $n \neq 0,3$)

(d) $3 \times 4 \times a^{2+5} \times h^{1+4}$
$12a^7h^5$ 2

B2 for $12a^7h^5$
(B1 for $12a^7h^n$, $n \neq 0,5$ or $12a^mh^5$, $m \neq 0,7$ or ka^7h^5, $k \neq 12$ or $3 \times 4 \times a^{2+5} \times h^{1+4}$)

[6]

6. (a) t^3 1

B1 for t^3 (Accept t^{1+2} oe)

(b) m^2 1

B1 for m^2 (Accept m^{5-3} oe)

[2]

7. (a) d^4 1

B1 for d^4 cao

(b) t^3 1

B1 for t^3 cao (accept t^{1+2} oe)

(c) m^2 1

B1 for m^2 (accept m^{5-3} oe)

[3]

8. No Mark Schemes available.

9. (a) a^8 1

B1 for a^8 *or* $a^{2\times4}$

(b) $2^{30} \div (2^3)^9 = 2^{30} - 27 = 3$ 2

M1 for $(2^3)^9$ or 2^{27} or 2^3 or 8^{10}

A1 for 3 cao

[3]

1. As might be expected, part (a) was answered with the most success. The most common incorrect answer was d^5. By comparison, part (b) was answered poorly. Many candidates gave the answer as y^4, $2y^4$ or $4y$. Some, though, did not attempt it. Just over one quarter of candidates managed to expand $4(3a - 7)$ correctly in part (c). Some only multiplied one term inside the bracket by 4, most often resulting in $12a - 7$. These candidates gained 1 mark as did the many who showed either $4 \times 3a$ or 4×7. There were some who, having got $12a - 28$, then decided that this answer could be simplified. More than half of the candidates got either part (d) or part (e) correct but fewer than expected got both parts correct. A common incorrect answer in (d) was t^2. This could have arisen because candidates did not understand that t meant t^1 or because they did know this but multiplied the indices. Other common incorrect answers were $2t^2$ and $3t$.

In (e) common incorrect answers were m^8 and $m^{\frac{5}{3}}$.

2. This question was done well by the majority of the candidates. In part (a), most candidates were able to write down the answer $20pq$. Common incorrect answers here were $4p5q$, 9pq, $20p^2$ and $20q^2$. In part (b), the vast majority of candidates were able to write down the answer d^4. A very common incorrect answer here was $4d$. In part (c), about half the candidates were able to gain both marks. Common incorrect answers here were $12a - 7$, $7a - 28$ and $12a - 21$. In part (d), about three quarters of the candidates were able to score both marks and many that didn't were able to score a mark for either $4n + 6$ or $3n + 3$. Common incorrect answers here were $(4n + 6) + (3n + 1) = 7n + 7$ and $(4n + 3) + (3n + 3) = 7n + 6$ (each gaining 1 mark); and $(4n + 3) + (3n + 1) = 7n + 4$ (for 0 marks). A surprising number of candidates multiplied the expressions $(4n + 3) \times (3n + 3)$ instead of adding them. Parts (e) and (f) were generally done well. Common incorrect answers here were $(t \times t^2 =) t^2$ and $(m^5 \div m^3 =) m^{5/3}$ or m^{15}.

3. Around 62% of candidates gained full marks in part (a). The most common error was to make a mistake in multiplying out one of the brackets. Over 85% of candidates answered part (b) correctly this dropped to 80% for part (c) and 56% for part (d).

4. **Specification A**

A surprising number of candidates correctly answered both parts of this question. Though t^{12} was common, more gave the correct answer. The success rate was even higher in part (b), showing that work on indices is certainly accessible to Foundation students.

Specification B

In part (a) there was great confusion between indices and multipliers.

Many candidates had coefficients before t eg $2t^6$, $12t$, etc. Often the indices were written too large, and answers could only be interpreted as $t8$. Others left room for doubt between $t8$ and t^8. The most common incorrect answer was t^{12}.

In part (b) there were similar difficulties and noticeably fewer correct answers than (a). Many tried to divide the powers and then had difficulty with $8 \div 3$. The most common incorrect response was m^{11}. In both parts there were relatively few blank responses and the success rate was 47% for (a) and 32% for (b).

5. **Specification A**

Candidates were equally successful in part (a) and (b) with the vast majority giving the correct answer in each part. In part (c) the most common error was to cube only one part of the product leading to either $8x$ or $2x^3$ Some candidates wrote out $2x \times 2x \times 2x$ and thus gained a mark but went on to simplify incorrectly. Confusion adding rather multiplying to cube 2 led to $6x^3$ In part (d) many candidates confused the operation of the numbers and indices, leading to answers including $7a^7h^5$ from $3 \times 4 = 12$ and 12a10h4 from $2 \times 5 = 10$ and $4 \times 1 = 4$. Some candidates included + signs between their terms, for example $12a^7 + h^4$.

Specification B

Parts (a) and (b) were very successfully answered.

Part (c) produced a wise variety of responses. As well as the correct $8x^3$ there were $8x$, $2x^3$, $6x^3$ as well as the incomplete $2x \times 2x \times 2x$.

Full marks were awarded to $8 \times x^3$

Part (d) also yielded a wide variety of responses apart from the correct $12a^7h^5$. A common error was to regard the power in h as zero and offer the answer $12a^7h^5$. Even more common was to add the coefficients to get $7a^7h^5$.

6. In part (a) simplifying $t \times t^2$ was asked for and some correct results of t^3 were seen. Generally though it did appear that the topic of dealing with indices is one that perhaps needs more practice. Solutions like '$t\ t\ t$' , '$2t$' or '$2tt$' indicated a lack of being able to apply a power rule. Maybe writing $t \times t^2$ as $t \times t \times t$ initially might have point them in the right direction. By far the most common incorrect response to (a) was $2t^2$.

Simplifying $m^5 \div m^3$ in part (b) proved to be equally challenging. Here the most common incorrect responses were m^8 and $35mm$. Only 20% of the candidates got both parts correct with a further 29% getting just one part correct.

7. In part (a) $4d$ and d^3 (misread) were the most common errors here in an otherwise confidently answered question. In part (b), an answer of t^2 was often seen, candidates clearly interpreting $t \times t^2$ as $t^0 \times t^2$ and then finding the sum of 0 and 1. In part (c), m^8 was the usual error but in general this was well answered.

8. Both parts of this question were answered well. Candidates achieved the most success in part (a) where t^{24} was the most common incorrect answer. Common incorrect answers in part (b) were x^7 and $3x^{12}$.

9. In part (a), the majority of candidates were able to write down the answer a^8. The most common error was a^6.

In part (b), only the best candidates were able to gain both marks for this question. The most common error was to ignore the base numbers and simply take the difference in the powers to get $x = 21$. A significant number of those candidates who recognised the need to replace 8 with 2^3 where then unable to simplify $(2^3)^9$ correctly to. This was often written as 2^{12} (common) or 2^{11}.