Solutions by
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GCSE (9-1) Grade 4

Indices

Instructions

Use **black** ink or ball-point pen.
Fill in the boxes at the top of this page with your name.
Answer **all** questions.
Answer the questions in the spaces provided
– there may be more space than you need.
Show all your working out

Information

The marks for **each** question are shown in brackets.
Use this as a guide as to how much time to spend on each question.
Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed

Advice

Read each question carefully before you start to answer it
Attempt every question
Check your answers if you have time at the end

1. (a) Simplify $m^3 \times m^6$

m^9

.....

(1)

(b) Simplify $\frac{p^8}{p^2}$

p^6

.....

(1)

(c) Simplify $(2n^3)^4$

$16n^{12}$

.....

(2)

(4 marks)

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2. (a) Simplify $m^6 \times m^7$

(1)

m^{13}

.....

(b) Simplify x^0

(1)

1

.....

(c) Simplify $(16y^6)^{\frac{1}{2}}$

(2)

$4y^3$

.....

(4 marks)

---

3. (a) Simplify $m^5 \div m^3$

m^2

.....

(1)

(b) Simplify $5x^4y^3 \times x^2y$

$5x^6y^4$

.....

(2)

(3 marks)

---

4. (a) Simplify $a^4 \times a^5$

a^9

.....

(1)

(b) Simplify $\dfrac{45e^6 f^8}{5ef^2}$

$9e^5f^6$

.....

(2)

(c) Write down the value of $9^{\frac{1}{2}}$

3

.....

(1)

(4 marks)

---

5. (a) Simplify $m^2 \times m^4$

m^6

.....

(1)

(b) Simplify $y^7 \div y^5$

y^2

.....

(1)

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

m^{15}

.....

(2)

(4 marks)

---

6. Simplify fully

(a) $p^2 \times p^7$

p^9 .....**(1)**

(b) $\dfrac{3q^4 \times 2q^5}{q^3}$

$\dfrac{6q^9}{q^3}$ $= 6q^6$

.....**(2)**

(c) $(2xy^3)^5$

$25x^5y^{15}$

.....**(2)**

(4 marks)

---

7. (a) Simplify $15y^6 \div 3y^2$

$5y^4$

(2)

(b) Simplify $7wx^2 \times 3w^3x$

$21w^4x^3$

(2)

(4 marks)

---

8. Work out the value of

(a) $(2^2)^3$ $(4)^3 = 64$

64

(1)

(b) $(\sqrt{3})^2$

3

(1)

(c) $\sqrt{2^4 \times 9}$ $\sqrt{2^4} \times \sqrt{9} = 4 \times 3 = 12$

(2)

(d) 4^{-2} $\frac{1}{4^2} = \frac{1}{16}$

(1)

(5 marks)

---

9. (a) Write down the value of $49^{\frac{1}{2}}$

7

(1)

(b) Simplify

(i) $\frac{x^6}{x^2}$

x^4

(ii) $(y^4)^3$

y^{12}

(2)

(3 marks)

---

10. Simplify $\dfrac{15a^3 b^7}{3a^2 b^3}$

$5ab^4$

.....

(2 marks)

---

11. $7^5 \times 7^6 = 7^3 \times 7^k$

$7^{11} = 7^{3+k}$

Find the value of k.

$k =$ 8

(2 marks)

---

12. (a) Simplify $p^3 \times p^2$

p^5

(1)

(b) Simplify $\dfrac{q^3 \times q^4 \times q^1}{q^2}$

$\dfrac{q^8}{q^2} = q^6$

(2)

(3 marks)

---

13. Find the value of

(i) $36^{\frac{1}{2}}$

6

(ii) 3^{-2}

$\dfrac{1}{3^2} = \dfrac{1}{9}$

(2 marks)

---

14. (a) Write as a power of 7

(i) $7^8 \div 7^3$

7^5

.....

(ii) $\dfrac{7^2 \times 7^3}{7}$

$\dfrac{7^5}{7}$ $= 7^4$

.....

(3)

(b) Write down the reciprocal of 2

$\frac{1}{2}$

.....

(1)

(4 marks)

---

15. (a) Simplify

$12y^3 \div 3y^5$

$4y^{-2}$

.....

(2)

(b) Simplify

$2w^3x^2 \times 3w^4x$

$6w^7x^3$

.....

(2)

(4 marks)

---

16. (a) Work out the value of

(i) 4^2

16

.....

(ii) $\sqrt{64}$

8

.....

(iii) 3×2^3

3×8 $= 24$

.....

(3 marks)

---

17. Simplify

(i) $x^4 \times x^5$

x^9

(ii) $\frac{p^8}{p^3}$

p^5

(iii) $3s^2t^3 \times 4s^4t^2$

$12s^6t^5$

(iv) $(q^3)^4$

q^{12}

(6 marks)

18. Simplify fully

(i) $(p^3)^3$

p^9

(ii) $\frac{3q^4 \times 2q^5}{q^3}$

$\frac{6q^9}{q^3}$

$= 6q^6$

(4 marks)

19. Work out

(i) 4^0

1

(ii) 4^{-2}

$\frac{1}{4^2}$

$\frac{1}{16}$

(iii) $16^{\frac{3}{2}}$

$(\sqrt{16})^3 = 4^3 = 64$

(4 marks)

20. (a) Find the value of

(i) $64°$

1

(ii) $64^{\frac{1}{2}}$

8

(iii) $64^{-\frac{2}{3}}$

$\left(\frac{1}{64}\right)^{\frac{2}{3}} = \left(\frac{1}{4}\right)^2 = \frac{1}{16}$

(4 marks)