School Name
Mathematics Test 2017

Year 9

Indices

Non Calculator

Skills and Knowledge Assessed:

- Apply index laws to numerical expressions with integer indices (ACMNA209)
- Express numbers in scientific notation (ACMNA210)
- Define rational and irrational numbers and perform operations with surds and fractional indices (ACMNA264)

Name_____

Section 1 Short Answer Section

Write all working and answers in the spaces provided on this test paper.

1.	Write $a \times a \times a \times a \times a \times a \times a \times a \times a$ in index notation. …….
2.	Write 4^5 as a repeated multiplication. …….
3.	Simplify $m^8 \times m^9$, leaving your answer in index notation. …….
4.	Simplify $15^{12} \div 15^3$, leaving your answer in index notation. …….
5.	Simplify $\left(7^9\right)^4$. …….
6.	Write 4.5×10^8 as a single numeral. …….
7.	Simplify $5w^8 \times 9w^7$. …….

8. Simplify $\frac{54p^{18}}{6p^{3}}$.

……

9. Simplify $\left(3e^{7}\right)^{6}$.

……

10. Simplify $\frac{10x^{7} \times 40x^{6}}{\left(5x^{3}\right)^{2}}$.

……

……

11. Write 18^{-1} as a single numeral without using indices.

……

……

12. Write 7 320 000 in scientific notation.

……

13. What is the value of 9^{-2} ?

……

14. What is the value of $\left(\frac{2}{3}\right)^{-2}$?

……

……

15. Write $0.000\,473$ in scientific notation.

……

16. Simplify $(64)^{\frac{1}{2}}$.

……

……

17. Simplify $(8)^{-\frac{1}{3}}$.

……

……

18. Simplify $\left(64x^{8}\right)^{-\frac{1}{2}}$.

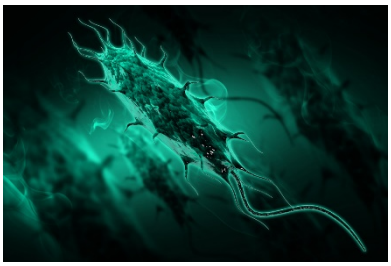
……

19. Simplify $\left(4.8 \times 10^{14}\right) \div \left(1.2 \times 10^{-4}\right)$ writing your answer in scientific notation.

……

……

20. The mass of a single E coli bacteria is about 6.25×10^{-10} g.
What would be the mass of 40 000 000 000 of these bacteria?



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School Name
Mathematics Test 2017

Calculator Allowed

Year 9

Indices

Name_____

Section 2 Multiple Choice Section

Mark all your answers on the accompanying multiple choice answer sheet, not on this test paper. You may do any working out on this test paper. Calculators are allowed for this section.

1. $4 \times 4 \times 4 \times 4 \times 4 = ?$

   A. 5×4 B. 4^5 C. 5^4 D. 44 444

2. $3^4 \times 5^3 = ?$

   A. $3 \times 4 \times 5 \times 3$
   B. $3 \times 3 \times 3 \times 3 \times 5 \times 3$
   C. $3 \times 3 \times 3 \times 3 \times 5 \times 5 \times 5$
   D. 12×15

3. $8^4 \times 8^5 = ?$

   A. 8^9 B. 16^9 C. 8^{20} D. 64^{20}

4. $12^{18} \div 12^6 = ?$

   A. 1 B. 12^3 C. 12^{12} D. 12^{15}

5. $(7^3)^4 = ?$

   A. 7 B. 7^7 C. 7^{10} D. 7^{12}

6. $1.35 \times 10^8 = ?$

A. 1 350 000 B. 13 500 000 C. 135 000 000 D. 1 350 000 000

7. $6^4 \times 6^5 \times 6^2 = ?$

A. 6^{11} B. 6^{12} C. 6^{40} D. 36^{20}

8. $5m^3 \times 4m^5 = ?$

A. $9m^8$ B. $20m^8$ C. $20m^{15}$ D. m^{300}

9. $\frac{36p^{10}}{4p^2} = ?$

A. $9p^5$ B. $9p^8$ C. $32p^5$ D. $32p^8$

10. $\left(4s^7\right)^3 = ?$

A. $12\,s^{10}$ B. $12\,s^{21}$ C. $64s^{10}$ D. $64s^{21}$

11. $5p^4r^5 \times 6p^5q^2r^5 = ?$

A. $11p^9q^2r^{10}$ B. $30p^9q^2r^{10}$ C. $30p^{20}q^2r^{10}$ D. $30p^{20}q^2r^{25}$

12. $\frac{72w^4y^{12}}{6wy^3} = ?$

A. $12w^3y^9$ B. $12w^4y^9$ C. $12w^4y^{10}$ D. $66w^4y^9$

13. $36^{-3} = ?$

A. $-\frac{1}{12}$ B. -36^3 C. $-\frac{1}{36^3}$ D. $\frac{1}{36^3}$

14. $\dfrac{12^{12} \times 12^{4}}{12^{15}} = ?$

A. 0 B. $\dfrac{1}{12}$ C. 1 D. 12

15. $5a^{-6} \times 8a^{3} = ?$

A. $\dfrac{40}{a^{18}}$ B. $\dfrac{40}{a^{9}}$ C. $\dfrac{40}{a^{3}}$ D. $40a^{3}$

16. $45m^{-8} \div 9m^{-2} = ?$

A. $\dfrac{5}{m^{10}}$ B. $\dfrac{5}{m^{6}}$ C. $\dfrac{5}{m^{4}}$ D. $5m^{4}$

17. $\dfrac{15p^{3}q^{-4} \times 25p^{4}q^{2}}{20\,p^{-5}q^{6}} =$

A. $\dfrac{75p^{12}}{4q^{8}}$ B. $\dfrac{75p^{12}q^{8}}{4}$ C. $\dfrac{75q^{8}}{4p^{12}}$ D. $300p^{12}q^{8}$

18. What is the same as $4^{\frac{1}{2}}$?

A. $\sqrt{4}$ B. 4^{2} C. $\sqrt[4]{2}$ D. $\dfrac{1}{4}$

19. $5^{\frac{3}{4}} \times 5^{-\frac{1}{2}} = ?$

A. $\dfrac{1}{\sqrt{5}}$ B. $\dfrac{1}{\sqrt[4]{5}}$ C. $\sqrt[4]{5}$ D. $\sqrt{5}$

20. Simplify $2a^{-\frac{1}{2}} \times (36a)^{\frac{3}{2}}$.

A. $\frac{216}{a}$ B. $\frac{432}{\sqrt{a}}$ C. $216a$ D. $432a$

21. Write 3.48×10^{-4} as a normal numeral.

A. 0.000 003 48 B. 0.000 034 8 C. 0.000 348 D. 0.003 48

22. Write 0.000 005 39 in standard notation.

A. 5.39×10^{-5} B. 5.39×10^{-6} C. 5.39×10^{-7} D. 5.39×10^{-8}

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Mathematics 2017

Multiple Choice Answer Sheet

Indices

Name _____

Completely fill the response oval representing the most correct answer.

1.	A ⬭	B ⬭	C ⬭	D ⬭
2.	A ⬭	B ⬭	C ⬭	D ⬭
3.	A ⬭	B ⬭	C ⬭	D ⬭
4.	A ⬭	B ⬭	C ⬭	D ⬭
5.	A ⬭	B ⬭	C ⬭	D ⬭
6.	A ⬭	B ⬭	C ⬭	D ⬭
7.	A ⬭	B ⬭	C ⬭	D ⬭
8.	A ⬭	B ⬭	C ⬭	D ⬭
9.	A ⬭	B ⬭	C ⬭	D ⬭
10.	A ⬭	B ⬭	C ⬭	D ⬭
11.	A ⬭	B ⬭	C ⬭	D ⬭
12.	A ⬭	B ⬭	C ⬭	D ⬭
13.	A ⬭	B ⬭	C ⬭	D ⬭
14.	A ⬭	B ⬭	C ⬭	D ⬭
15.	A ⬭	B ⬭	C ⬭	D ⬭
16.	A ⬭	B ⬭	C ⬭	D ⬭
17.	A ⬭	B ⬭	C ⬭	D ⬭
18.	A ⬭	B ⬭	C ⬭	D ⬭
19.	A ⬭	B ⬭	C ⬭	D ⬭
20.	A ⬭	B ⬭	C ⬭	D ⬭
21.	A ⬭	B ⬭	C ⬭	D ⬭
22.	A ⬭	B ⬭	C ⬭	D ⬭

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Year 9

Indices

Non Calculator Section

ANSWERS

Question	Working and Answer
1.	$a \times a \times a \times a \times a \times a \times a \times a \times a = \boldsymbol{a^9}$
2.	$4^5 = \mathbf{4 \times 4 \times 4 \times 4 \times 4}\ (= 1024)$
3.	$m^8 \times m^9 = m^{8+9}$ $= \boldsymbol{m^{17}}$
4.	$15^{12} \div 15^3 = 15^{12-3}$ $= \mathbf{15^9}$
5.	$\left(7^9\right)^4 = 7^{9 \times 4}$ $= \mathbf{7^{36}}$
6.	$4.5 \times 10^8 = \mathbf{450\ 000\ 000}$
7.	$5w^8 \times 9w^7 = \mathbf{45w^{15}}$
8.	$\frac{54p^{18}}{6p^3} = \mathbf{9p^{15}}$
9.	$\left(3e^7\right)^6 = 3^6 \times e^{7 \times 6}$ $= \mathbf{729e^{42}}$

Question	Working and Answer
10.	$\frac{10x^7 \times 40x^6}{(5x^3)^2} = \frac{400x^{13}}{25x^6}$ $= \mathbf{16x^7}$
11.	$18^{-1} = \frac{1}{18^1}$ $= \mathbf{\frac{1}{18}}$
12.	$7\,320\,000 = \mathbf{7.32 \times 10^6}$
13.	$9^{-2} = \frac{1}{9^2}$ $= \mathbf{\frac{1}{81}}$
14.	$\left(\frac{2}{3}\right)^{-2} = \left(\frac{3}{2}\right)^2$ $= \mathbf{\frac{9}{4} = 2\frac{1}{4}}$
15.	$0.000\,473 = \mathbf{4.73 \times 10^{-4}}$
16.	$(64)^{\frac{1}{2}} = \sqrt{64}$ $= \mathbf{8}$
17.	$8^{-\frac{1}{3}} = \frac{1}{\sqrt[3]{8}}$ $= \mathbf{\frac{1}{2}}$
18.	$\left(64x^8\right)^{-\frac{1}{2}}. = \frac{1}{\sqrt{64}} \times \frac{1}{x^4}$ $= \mathbf{\frac{1}{8x^4}}$

Question	Working and Answer
19.	$(4.8 \times 10^{14}) \div (1.2 \times 10^{-4}) = (4.8 \div 1.2) \times 10^{14 - -4}$ $= \mathbf{4.0 \times 10^{18}}$.
20.	$40\,000\,000\,000 = 4.0 \times 10^{10}$ Mass pf Bacteria $= (6.25 \times 10^{-10}) \times (4.0 \times 10^{10})$ $= 6.25 \times 4 \times 10^{0}$ $= 25.00 \times 1$ $= \mathbf{25\,g}$

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Calculator Allowed
Multiple Choice
Section

ANSWERS

Question	Working	M C Answer
1.	$4 \times 4 \times 4 \times 4 \times 4 = 4^5$	**B**
2.	$3^4 \times 5^3 = 3 \times 3 \times 3 \times 3 \times 5 \times 5 \times 5$	**C**
3.	$8^4 \times 8^5 = 8^{4+5} = 8^9$	**A**
4.	$12^{18} \div 12^6 = 12^{18-6} = 12^{12}$	**C**
5.	$(7^3)^4 = 7^{3 \times 4} = 7^{12}$	**D**
6.	$1.35 \times 10^8 = 135\,000\,000$	**C**
7.	$6^4 \times 6^5 \times 6^2 = 6^{4+5+2} = 6^{11}$	**A**
8.	$5m^3 \times 4m^5 = 5 \times 4 \times m^{3+5} = 20m^8$	**B**
9.	$\frac{36p^{10}}{4p^2} = \left(\frac{36p^{10-2}}{4}\right) = 9p^8$	**B**
10.	$\left(4s^7\right)^3 = 4^3 \times s^{7 \times 3} = 64s^{21}$	**D**

11.	$5p^4r^5 \times 6p^5q^2r^5 = 5 \times 6 \times p^{4+5} \times q^2 \times r^{5+5}$ $= 30p^9q^2r^{10}$	**B**
12.	$\frac{72w^4y^{12}}{6wy^3} = \left(\frac{72}{6}\right) \times w^{4-1} \times y^{12-3}$ $= 12w^3y^9$	**A**
13.	$36^{-3} = \frac{1}{36^3}$	**D**
14.	$\frac{12^{12} \times 12^4}{12^{15}} = \frac{12^{16}}{12^{15}}$ $= 12^1$ $= 12$	**D**
15.	$5a^{-6} \times 8a^3 = 5 \times 8 \times a^{-6+3}$ $= 40a^{-3}$ $= \frac{40}{a^3}$	**C**
16.	$45m^{-8} \div 9m^{-2} = \frac{45}{9} \times m^{-8--2}$ $= 5m^{-8+2}$ $= 5m^{-6}$ $= \frac{5}{m^6}$	**B**

17.	$\frac{15p^3q^{-4} \times 25p^4q^2}{20p^{-5}q^6} = \frac{15p^3q^{-4} \times 5 \cancel{25}p^4q^2}{4 \cancel{20}p^{-5}q^6}$ $= \frac{75p^7q^{-2}}{4p^{-5}q^6}$ $= \frac{75p^{7--5}q^{-2-6}}{4}$ $= \frac{75p^{12}q^{-8}}{4}$ $= \frac{75p^{12}}{4q^8}$	**A**
18.	$4^{\frac{1}{2}} = \sqrt{4}$	**A**
19.	$5^{\frac{3}{4}} \times 5^{-\frac{1}{2}} = = 5^{\frac{3}{4}+\left(-\frac{1}{2}\right)}$ $= 5^{\frac{1}{4}}$ $= \sqrt[4]{5}$	**C**
20.	$2a^{-\frac{1}{2}} \times (36a)^{\frac{3}{2}} = 2a^{-\frac{1}{2}} \times \sqrt{36^3}\, a^{\frac{3}{2}}$ $= 2a^{-\frac{1}{2}} \times 216\, a^{\frac{3}{2}}$ $= 2 \times 216 \times a^{-\frac{1}{2}+\frac{3}{2}}$ $= 432a^1$ $= 432a$	**D**
21.	$3.48 \times 10^{-4} = 0.000\,348$	**C**
22.	$0.000\,005\,39 = 5.39 \times 10^{-6}$	**B**

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Multiple Choice Answer Sheet

Indices

Name _____

Completely fill the response oval representing the most correct answer.

1.	A ○	B ●	C ○	D ○
2.	A ○	B ○	C ●	D ○
3.	A ●	B ○	C ○	D ○
4.	A ○	B ○	C ●	D ○
5.	A ○	B ○	C ○	D ●
6.	A ○	B ○	C ●	D ○
7.	A ●	B ○	C ○	D ○
8.	A ○	B ●	C ○	D ○
9.	A ○	B ●	C ○	D ○
10.	A ○	B ○	C ○	D ●
11.	A ○	B ●	C ○	D ○
12.	A ●	B ○	C ○	D ○
13.	A ○	B ○	C ○	D ●
14.	A ○	B ○	C ○	D ●
15.	A ○	B ○	C ●	D ○
16.	A ○	B ●	C ○	D ○
17.	A ●	B ○	C ○	D ○
18.	A ●	B ○	C ○	D ○
19.	A ○	B ○	C ●	D ○
20.	A ○	B ○	C ○	D ●
21.	A ○	B ○	C ●	D ○
22.	A ○	B ●	C ○	D ○