High School
Mathematics Test 2014

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 $7 \times 7 \times 7 \times 7 \times 7$ in index notation.

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2. Write $w^2 \times b^3$ in expanded notation.

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3. Simplify $2^8 \times 2^9$, leaving your answer as an index.

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4. Simplify: $\dfrac{a^3 \times a^5}{a^2}$.

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5. Simplify $3m^7 \times 4m^8$.

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6. Simplify $\frac{48p^{12}}{8p^4}$.

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7. Simplify $(2r^4)^6$.

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8. Simplify $\frac{5d^3e^4 \times 6d^2e}{10d^2e^8}$

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9. Write $5^{-2} \times 3^2$ as a numeral without indices.

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10. Evaluate 4^{-4}, writing your answer without indices.

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11. Write 9.524×10^7 as a normal numeral.

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12. What is the value of $36^{\frac{1}{2}}$?

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13. Evaluate $9^{\frac{3}{2}}$, writing your answer without indices.

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14. Evaluate $8^{-\frac{2}{3}}$.

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15. Simplify : $\frac{15w^2x^3}{4u^2y} \times \frac{12u^3w^4}{5x^4y^3}$.

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16. Write 5.087×10^{-4} as a normal decimal numeral.

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17. Write 0.000 0367 in standard notation.

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18. The average number of strands of hair on a human head is 150 000.
The population of Perth, WA is approximately 2 million people.
Estimate the number of strands of human hair on the heads of the people of Perth.
Give your answer in standard notation.

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High School
Mathematics Test 2014

Year 9 — *Indices* — Calculator Allowed

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. $5 \times 5 \times 5 \times 5 \times 5 \times 5 = ?$

   A. 5×6 B. 6×5 C. 5^6 D. 6^5

2. $4^5 = ?$

   A. $4 \times 4 \times 4 \times 4$ B. $4 \times 4 \times 4 \times 4 \times 4$

   C. $4+4+4+4+4$ D. $5 \times 5 \times 5 \times 5$

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

   A. 3^9 B. 3^{20} C. 9^9 D. 9^{20}

4. $8^{10} \div 8^5 = ?$

   A. 1^2 B. 8^2 C. 8^4 D. 8^5

5. $\left(2^3\right)^2 = ?$

   A. 2^5 B. 2^6 C. 4^5 D. 4^6

6. $2a^2 \times 3a^3 = ?$

   A. $5a^5$ B. $5a^6$ C. $6a^5$ D. $6a^6$

7. $\dfrac{12m^{12}}{3m^4} = ?$

   A. $4m^3$ B. $4m^8$ C. $9m^3$ D. $9m^8$

8. $\left(2b^3\right)^5 = ?$

   A. $2b^8$ B. $2b^{15}$ C. $32\,b^8$ D. $32\,b^{15}$

9. $7a^5c \times 2a^3c^3 =$

   A. $9a^8c^4$ B. $14a^8c^3$ C. $14a^8c^4$ D. $14a^{15}c^3$

10. $\dfrac{24p^8r^6}{4p^2r^3} =$

A. $6p^6r^3$ B. $6p^4r^2$ C. $6p^4r^3$ D. $6p^6r^2$

11. $\left(2e^3g^2\right)^4 = ?$

A. $8\,e^7\,g^6$ B. $8\,e^{12}\,g^8$ C. $16\,e^7\,g^6$ D. $16\,e^{12}\,g^8$

12. $5^0 = ?$

A. 1 B. 2.5 C. 5 D. 50

13. $8^{-2} = ?$

A. -16 B. $-\dfrac{1}{64}$ C. $\dfrac{1}{16}$ D. $\dfrac{1}{64}$

14. $2x^{-3} \times 4x^{-4} = ?$

A. $\dfrac{8}{x^{-7}}$ B. $\dfrac{8}{x^7}$ C. $7x^8$ D. $8x^7$

15. $\dfrac{36\,b^{-5}\,d^{-6}}{4\,b^3\,d^{-10}} =$

A. $\dfrac{d^4}{9b^8}$ B. $\dfrac{9b^8}{d^4}$ C. $\dfrac{9d^4}{b^8}$ D. $\dfrac{b^8}{9d^4}$

16. $5^{\frac{3}{2}}$ can be written as:

A. $\sqrt{5}^{\,3}$ B. $\sqrt[3]{5}^{\,2}$ C. $\dfrac{1}{\sqrt{5^3}}$ D. $\dfrac{1}{5^3}$

17. $\left(25s^6\,v^8\right)^{\frac{1}{2}} = ?$

A. $5s^3v^4$ B. $5\,s^{\frac{7}{2}}\,v^{\frac{17}{2}}$ C. $\dfrac{25s^3v^4}{2}$ D. $\dfrac{25\,s^{\frac{7}{2}}\,v^{\frac{17}{2}}}{2}$

18. What is 58 400 000 when written in standard notation?

A. 5.84×10^8 B. 5.84×10^7 C. 58.4×10^6 D. 584×10^5

19. What is 0.000 003 72 when written in standard notation?

A. 0.372×10^{-5} B. 3.72×10^{-5} C. 3.72×10^{-6} D. 37.2×10^{-6}

20. $2.4 \times 10^4 \times 5.5 \times 10^3 = ?$

A. 1.32×10^{-7} B. 1.32×10^6 C. 1.32×10^7 D. 1.32×10^8

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Indices

Multiple Choice Answer Sheet

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 ⬭

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Indices

ANSWERS

Section 1 (1 mark each)	
	Working and Answers
1.	$7 \times 7 \times 7 \times 7 \times 7 = 7^5$
2.	$w^2 \times b^3 = w \times w \times b \times b \times b$
3.	$2^8 \times 2^9 = 2^{8+9} = 2^{17}$
4.	$\frac{a^3 \times a^5}{a^2} = \frac{a^8}{a^2} = a^6$
5.	$3m^7 \times 4m^8 = 12m^{15}$
6.	$\frac{48p^{12}}{8p^4} = 6p^8$
7.	$\left(2r^4\right)^6 = 2^6 r^{24}$ $= 64 r^{24}$
8.	$\frac{5d^3e^4 \times 6d^2e}{10d^2e^8} = \frac{30d^5e^5}{10d^2e^8}$ $= \frac{3d^3}{e^3}$
9.	$5^{-2} \times 3^2 = \frac{1}{5^2} \times 3^2$ $= \frac{1}{25} \times 9$ $= \frac{9}{25}$
10.	$4^{-4} = \frac{1}{4^4}$ $= \frac{1}{4 \times 4 \times 4 \times 4}$ $= \frac{1}{64}$
11.	$9.524 \times 10^7 = 95\,240\,000$

12.	$36^{\frac{1}{2}} = \sqrt{36}$ $= 6$
13.	$9^{\frac{3}{2}} = \sqrt{9}^{\,3}$ $= 3^3$ $= 27$
14.	$8^{-\frac{2}{3}} = \frac{1}{\sqrt[3]{8}^{\,2}}$ $= \frac{1}{2^2}$ $= \frac{1}{4}$
15.	$\frac{15w^2x^3}{4u^2y} \times \frac{12u^3w^4}{5x^4y^3} = \frac{3\,(15)w^2(x^3)}{4\,u^2y} \times \frac{12\,3(u^3)uw^4}{5\,(x^4)\,xy^3}$ $= \frac{9uw^6}{xy^4}$
16.	$5.087 \times 10^{-4} = 0.0005087$
17.	$0.000\,0367 = 3.67 \times 10^{-5}$
18.	Number of strands $= (1.5 \times 10^5) \times (2 \times 10^6)$ $= 1.5 \times 2 \times 10^5 \times 10^6$ $= 3 \times 10^{11}$

Section 2 (1 mark each)		
	Working	Answers
1.	$5 \times 5 \times 5 \times 5 \times 5 \times 5 = 5^6$	C
2.	$4^5 = 4 \times 4 \times 4 \times 4 \times 4$	B
3.	$3^4 \times 3^5 = 3^9$	A
4.	$8^{10} \div 8^5 = 8^5$	D
5.	$\left(2^3\right)^2 = 2^6$	B
6.	$2a^2 \times 3a^3 = (2 \times 3)a^{2+3}$ $= 6a^5$	C
7.	$\frac{12m^{12}}{3m^4} = \left(\frac{12}{3}\right) m^{12-4}$ $= 4m^8$	B
8.	$\left(2b^3\right)^5 = 2^5 \times b^{3 \times 5}$ $= 32b^{15}$	D
9.	$7a^5c \times 2a^3c^3 = 14a^8c^4$	C
10.	$\frac{24p^8r^6}{4p^2r^3} = 6p^6r^3$	A
11.	$\left(2e^3g^2\right)^4 = 2^4 e^{3 \times 4} \times g^{2 \times 4}$ $= 16\, e^{12} g^8$	D
12.	$5^0 = 1$	A
13.	$8^{-2} = \frac{1}{8^2} = \frac{1}{64}$	D
14.	$2x^{-3} \times 4x^{-4} = 8x^{-3+-4}$ $= 8x^{-7}$ $= \frac{8}{x^7}$	B

15.	$\frac{36\,b^{-5}\,d^{-6}}{4\,b^{3}\,d^{-10}} = 9b^{-5-3}\,d^{-6--10}$ $= 9b^{-8}\,d^{4}$ $= \frac{9d^{4}}{b^{8}}$	C
16.	$5^{\frac{3}{2}} = \sqrt{5}^{\,3}$	A
17.	$\left(25s^{6}\,v^{8}\right)^{\frac{1}{2}} = \sqrt{25}\,s^{6\times\frac{1}{2}}\,v^{8\times\frac{1}{2}}$ $= 5\,s^{3}\,v^{4}$	A
18.	$58\,400\,000 = 5.84 \times 10^{7}$	B
19.	$0.000\,003\,72 = 3.72 \times 10^{-6}$	C
20.	$2.4 \times 10^{4} \times 5.5 \times 10^{3} = 1.32 \times 10^{8}$	D

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Multiple Choice Answer Sheet

Name ___Marking Sheet

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 ○	○
19.	A ○	B ○	C ●	D ○
20.	A ○	B ○	C ○	D ●