

Name _____

[9M3 - 2009]

Year 9 Indices and Surds Topic Test

Time allowed: 35 minutes.

Write all answers on the question paper.

Show all working.

Question 1

(8 marks)

Simplify fully:

a) $5x^3 \times 3x^5$	e) $4y^0 \times (5x)^0$
b) $xy^2 \times x^5y$	f) $2x^5(3x^4 - x)$
c) $3^8 \div 3^4$	g) $(3x^2)^3 \div 9x$
d) $a^6b^2 \div a^4b$	

Question 2

(8 marks)

Simplify the following expressions by rewriting without negative or fractional indices:

(Leave irrational numbers with a $\sqrt{\quad}$ sign) (Show working)

(a) $16^{\frac{3}{2}}$	(b) $20x^2 \div 4x^6$
(c) $(8x^5y^3)^{\frac{1}{3}}$	(d) $2x^{\frac{1}{2}} \div 4x$

Question 3

(2 marks)

Write the following in scientific notation, correct to 3 significant figures:

a) 0.002306

b) 54 010 000

Question 4

(2 marks)

Calculate the following, and write the answer in scientific notation:

a) $1.6 \times 10^{-7} + 8.3 \times 10^{-5}$

b) $5.6 \times 10^{-7} \times 4 \times 10^3$

Question 5

(14 marks)

Simplify fully:

(a) $\sqrt{28}$

(b) $6\sqrt{7} + 3\sqrt{7}$

(c) $2\sqrt{3} + 4\sqrt{13} - \sqrt{3} + 3\sqrt{13}$

(d) $3\sqrt{x} \times 5\sqrt{x}$

(e) $\sqrt{35} \times \sqrt{7}$

(f) $12\sqrt{15} + 3\sqrt{5}$

(g) $\frac{6\sqrt{2}}{2\sqrt{6} \times 3\sqrt{5}}$

(h) $4\sqrt{3}(\sqrt{7} - \sqrt{3})$

(i) $(\sqrt{2} + 7)(\sqrt{2} - 7)$

(j) $(3\sqrt{y} - 4)^2$

Question 6

(4 marks)

Rationalise the denominators and simplify:

(a) $\frac{4}{5\sqrt{8}}$

(b) $\frac{\sqrt{3}}{\sqrt{2}} + \frac{\sqrt{2}}{\sqrt{3}}$

Question 7

(2 marks)

Express with a rational denominator:

$$\frac{5\sqrt{3}-2}{4+\sqrt{2}}$$

Name Solutions (F. Brown)
 Year 9 Indices and Surds Topic Test

Time allowed: 35 minutes.
 Write all answers on the question paper.
 Show all working.

Total

40

(8 marks)

Question 1 Simplify fully:		
a) $5x^2 \times 3x^3$	$= 15x^5$	1
b) $xy^2 \times x^2y$	$= x^3y^3$	1
c) $3^3 \div 3^4$	$= 3^{-1} = \frac{1}{3}$	1
d) $a^6b^2 \div a^4b$	$= a^2b$	1
e) $4y^0 \times (5x)^0$	$= 4 \times 1 \times 1 = 4$	1
f) $2x^2(3x^4 - x)$	$= 6x^6 - 2x^3$	1
g) $(3x^2)^3 \div 9x$	$= 27x^6 \div 9x = 3x^5$	1

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Question 2

Simplify the following expressions by rewriting without negative or fractional indices: (8 marks)
 (Leave irrational numbers with a $\sqrt{\quad}$ sign) (Show working)

a) $16^{\frac{3}{2}}$	$= (\sqrt{16})^3 = 4^3 = 64$	
b) $(8x^2y^3)^{\frac{1}{3}}$	$= 8^{\frac{1}{3}} \times x^{\frac{2}{3}} \times y$	
c) $20x^2 \div 4x^6$	$= 5x^{-4} = \frac{5}{x^4}$	$\frac{5}{x^4}$
d) $2x^{\frac{1}{2}} \div 4x^2$	$= \frac{1}{2} \times x^{-\frac{3}{2}} = \frac{1}{2} \times \frac{1}{x^{\frac{3}{2}}} = \frac{1}{2\sqrt{x}}$	$\frac{1}{2\sqrt{x}}$

8

Question 3
 Write the following in scientific notation, correct to 3 significant figures:
 a) 0.002306
 $= 2.31 \times 10^{-3}$

(2 marks)

2

b) 54 010 000
 $= 5.40 \times 10^7$

(2 marks)

2

Question 4

Calculate the following, and write the answer in scientific notation:
 a) $1.6 \times 10^7 + 8.3 \times 10^5$
 $= 8.3 \times 10^5$

(2 marks)

2

b) $5.6 \times 10^7 \times 4 \times 10^3$
 $= 2.24 \times 10^{-3}$

Question 5

Simplify fully:

(a) $\sqrt{28}$	$= \sqrt{4 \times 7} = 2\sqrt{7}$	1
(b) $6\sqrt{7} + 3\sqrt{7}$	$= 9\sqrt{7}$	1
(c) $2\sqrt{3} + 4\sqrt{13} - \sqrt{3} + 3\sqrt{13}$	$= \sqrt{3} + 7\sqrt{13}$	1
(d) $3\sqrt{x} \times 5\sqrt{x}$	$= 15x$	1
(e) $\sqrt{35} \times \sqrt{7}$	$= \sqrt{35 \times 7} = \sqrt{245} = 7\sqrt{5}$	1
(f) $12\sqrt{15} \div 3\sqrt{5}$	$= \frac{12\sqrt{15} \times \sqrt{5}}{3\sqrt{5} \times \sqrt{5}} = \frac{12\sqrt{75}}{3 \times 5} = \frac{12 \times 5\sqrt{3}}{15} = 4\sqrt{3}$	1
(g) $\frac{6\sqrt{2}}{2\sqrt{6} \times 3\sqrt{5}}$	$= \frac{6\sqrt{2}}{6\sqrt{2} \times \sqrt{2} \times \sqrt{3} \times \sqrt{5}} = \frac{1}{\sqrt{15}}$	1
(h) $4\sqrt{3}(\sqrt{7} - \sqrt{3})$	$= 4\sqrt{21} - 12$	1
(i) $(\sqrt{2} + 7)(\sqrt{2} - 7)$	$= (\sqrt{2})^2 - 7^2 = 2 - 49 = -47$	1
(j) $(3\sqrt{5} - 4)^2$	$= (3\sqrt{5})^2 - 2 \times 3\sqrt{5} \times 4 + 4^2 = 45 - 24\sqrt{5} + 16$	1

(14 marks)

14

(4 marks)

Question 6
Rationalise the denominators and simplify:

$$(a) \frac{4}{5\sqrt{8}} = \frac{4}{5\sqrt{8}} \times \frac{\sqrt{8}}{\sqrt{8}}$$

$$= \frac{4\sqrt{8}}{40}$$

$$= \frac{4 \times 2\sqrt{2}}{40} = \frac{8\sqrt{2}}{40} = \frac{\sqrt{2}}{5}$$

~~4~~

$$(b) \frac{\sqrt{3} + \sqrt{2}}{\sqrt{2} + \sqrt{3}} = \frac{\sqrt{3}}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} + \frac{\sqrt{2}}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$$

$$= \frac{\sqrt{6}}{2} + \frac{\sqrt{6}}{3}$$

$$= \frac{3\sqrt{6} + 2\sqrt{6}}{6}$$

$$= \frac{5\sqrt{6}}{6}$$

$$\begin{aligned} \frac{\sqrt{6}}{\sqrt{2} + \sqrt{3}} &= \frac{3 + 2}{\sqrt{6}} \\ &= \frac{5}{\sqrt{6}} \times \frac{\sqrt{6}}{\sqrt{6}} \\ &= \frac{5\sqrt{6}}{6} \end{aligned}$$

(2 marks)

Question 7

Express with a rational denominator:

$$\frac{4 + \sqrt{2}}{4 - \sqrt{2}} = \frac{4 + \sqrt{2}}{4 - \sqrt{2}} \times \frac{4 + \sqrt{2}}{4 + \sqrt{2}}$$

$$= \frac{(4 + \sqrt{2})(4 + \sqrt{2})}{16 - 2}$$

$$= \frac{20\sqrt{2} - 5\sqrt{6} - 8 + 2\sqrt{2}}{14}$$

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