Name: _____ Teacher: _____

SYDNEY TECHNICAL HIGH SCHOOL

MATHEMATICS - YEAR 9 - MAY COMMON TEST, 2015

Time allowed: 70 minutes

Instructions: *Calculators may be used.

*Necessary working must be shown in the provided spaces.

*Full marks may not be awarded for careless, illegible or messy working.

*Marks are shown next to questions.

*Use blue or black pen only.

Question	Topic	Marks
1	Number	/12
2	Algebra	/12
3	Geometry	/14
4	Indices	/12
5	Surds	/12
6 a,b	Number	/2
c,d	Algebra	/4
e,f,g	Surds	/4
h,i,j,k	Indices	/4
l,m	Geometry	/4

TOTAL	/80

QUESTION 1 – NUMBER (12 marks)

a) Each number shown has the same value: 4.2×1000, 42×10^2, 4.2×10^3

Circle the one that is written in scientific notation.

b) Rewrite each number in scientific notation:

i) 648 _____ 1

ii) 0.0304 _____ 1

c) Round off 618.257 correct to:

i) 2 decimal places. _____ 1

ii) 2 significant figures. _____ 1

d) Round off 0.3047 correct to 2 significant figures. _____ 1

e) Write 6.3×10^{-4} as an ordinary numeral. _____ 1

f) Calculate $(3.3 \times 10^4) \div (4 \times 10^{-2})$. Answer in scientific notation. _____ 1

g) Write 0.72363636 . . . . in simplest recurring form. _____ 1

h) Write $\frac{11}{36}$ as:

i) a recurring decimal in simplest form. _____ 1

ii) a decimal correct to 4 decimal places. _____ 1

i) What are the lower and upper limits of accuracy for a measurement of 37 cm, measured to the nearest cm? _____ and _____ 1

QUESTION 2 – ALGEBRA (12 marks)

a) If $m = -2, n = 3$, what is the value of $mn(m + n)$?

_____

_____

b) Simplify:

i) $4xy + 2y + 3yx$

_____

ii) $8b \times 2b \div 4$

_____

_____

_____

4

iii) $\frac{2m}{3} + \frac{m}{3}$ _____

_____

_____

c) Simplify: 3

i) $\frac{a}{2} - \frac{a}{3}$ _____

_____

_____

ii) $\frac{8b}{3} \div \frac{4b^2}{5}$ _____

_____

_____

iii) $\frac{3}{4a} + 2$ _____

_____

_____

d) Expand and simplify where possible: 4

i) $3(x + y)$ _____

ii) $2(5x + 3) - 2(1 - x)$

_____

_____

iii) $(x + 5)^2$ _____

_____

iv) $(2x + 3)(3x - 1)$ _____

_____

_____

e) What is the perimeter of a rectangle $(x + y)$cm long _____ 1

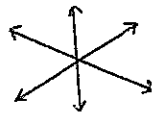
and $(x - y)$ cm wide? Simplify your answer. _____

QUESTION 3 – GEOMETRY (14 marks)

a) Complete:

i) The _____ angle of a triangle equals the sum of the two opposite 1

_____ angles.

ii)  Lines that cross at a common point are called 1

_____ lines.

b) i) Find the size of each interior angle of a regular pentagon.

_____

_____

_____

_____

ii) The interior angle sum of a polygon is 1800°. How many sides does the polygon have?

_____

_____

_____

iii) Each exterior angle of a regular polygon is 10°. How many sides does the polygon have? 3

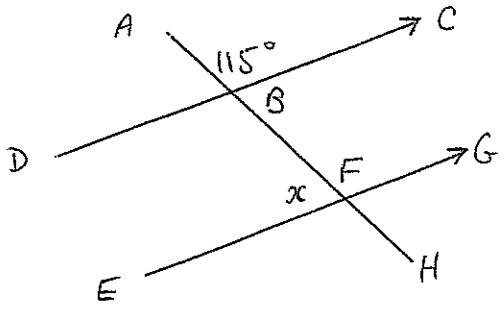
_____

_____

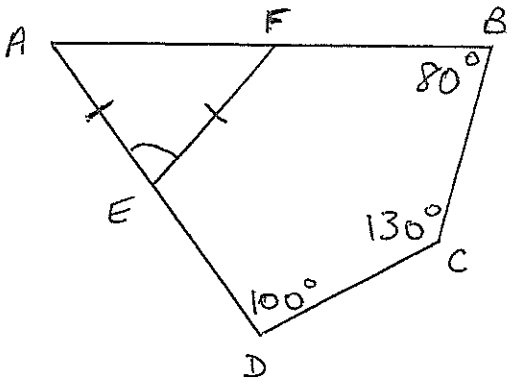
_____

_____

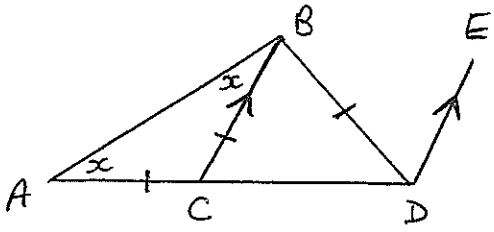
c) Find x, giving reasons: 2



d) Find $\angle AEF$, giving reasons: 3



e) i) Find $\angle BCD$ in terms of x, giving reasons. 1



ii) Find $\angle BDE$ in terms of x, giving reasons. 3

QUESTION 4 – INDICES (12 marks)

a) Write the exact value of 7^{-2} as a basic numeral. 1

b) Simplify: i) $2y^3 \times 3y^2$ _____ ii) $(4x^0)^2$ _____ 6

iii) $n^{18} \div (n^3)^2$ _____ iv) $\frac{(x^2y)^3}{xy^4}$ _____

v) $\sqrt{x^{16}}$ _____ vi) $m^3 + m^3$ _____

c) Evaluate $64^{-7/6}$ _____ 1

d) MULTIPLE CHOICE – Write A, B, C or D only:

i) $\frac{1}{2x^7} = ?$ A. $2x^{-7}$ B. $\frac{1}{2}x^7$ C. $\frac{1}{2}x^{-7}$ D. $(2x)^{-7}$ _____ 1

ii) $\frac{1}{\sqrt{x}} = ?$ A. x^{-1} B. $x^{-1/2}$ C. $x^{1/2}$ D. $\frac{x}{2}$ _____ 1

iii) $10x^{-3} = ?$ A. $\frac{10}{x^3}$ B. $\frac{1}{10x^3}$ C. $(\frac{10}{x})^3$ D. $-10x^3$ _____ 1

iv) $x^{2/3} = ?$ A. $\sqrt{x^3}$ B. $\frac{2x}{3}$ C. $\sqrt[3]{x^2}$ D. $\frac{x^2}{3}$ _____ 1

QUESTION 5 – SURDS (12 marks)

a) Simplify: i) $\sqrt{12}$ _____ iv) $\sqrt{8} + \sqrt{18}$ _____ 5

ii) $\sqrt{5} + \sqrt{5}$ _____ v) $\frac{\sqrt{40}}{\sqrt{8}}$ _____

iii) $4\sqrt{3} \times \sqrt{3}$ _____

b) Simplify:

i) $\frac{3\sqrt{6} \times 4\sqrt{2}}{2\sqrt{3}}$ 1

ii) $3\sqrt{50} + \sqrt{27} - 2\sqrt{32}$ 2

c) Write $4\sqrt{5}$ as an entire surd. 1

d) Expand and simplify $(5 - \sqrt{3})^2$ 1

e) Which surd is half of $\sqrt{48}$? 1

f) Expand and simplify $(2\sqrt{3} \times 5\sqrt{2})^2$ 1

QUESTION 6 – MIXED/HARDER (18 marks)

a) Express "half of 10^{66}" in scientific notation. 1

b) If $x = -3, y = 2$, evaluate $(x^2y)^{-2} \times (xy)^{-1}$ in fraction form. 1

c) Simplify $\frac{x}{3} - \frac{x+1}{6x}$ 2

d) Subtract the sum of $3x^2$ and $2x$ from the product of $4x$ and $x - 2$. 2

e) Simplify: i) $\frac{6+3\sqrt{32}}{8}$ 1

ii) $\frac{\sqrt{27}\times\sqrt{12}}{3\times 2\sqrt{6}}$ 1

f) Expand and simplify $(3\sqrt{y}+2\sqrt{x})^2$ 1

g) Express $\frac{1}{x\sqrt{x}}$ in purely index form. 1

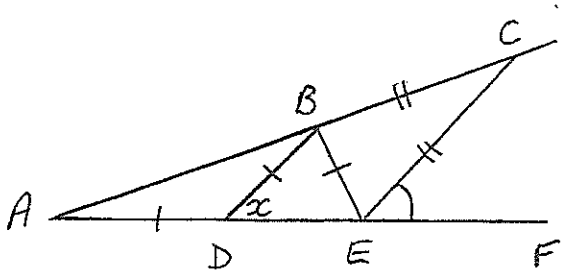
h) Simplify $2^{x-6}+2^{x-6}$ 1

i) Simplify $\frac{(e^{x+1})^2}{e^x}$ 1

j) Find the value of x if $x^{4/3}=16$ 1

k) Simplify $\sqrt{\frac{x^n}{x^{-n}}}$ 1

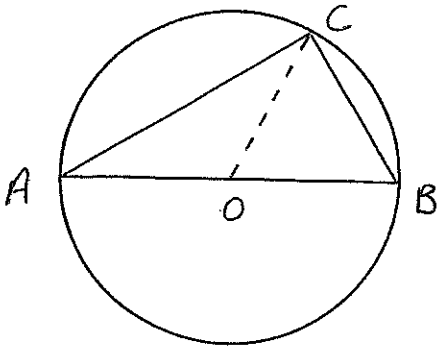
l) If $\angle BDE = x$, find $\angle CEF$ in terms of x (reasons are not required) 1



m) AOB is the diameter of a circle, centre O. 3

Radius OC is shown.

Prove that $\angle ACB = 90°$.



END OF TEST

Name: _____ Teacher: _____

SYDNEY TECHNICAL HIGH SCHOOL

MARKING

MATHEMATICS - YEAR 9 - MAY COMMON TEST, 2015

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c,d	Algebra	/4
e,f,g	Surds	/4
h,i,j,k	Indices	/4
l,m	Geometry	/4
TOTAL		/80

QUESTION 1 – NUMBER (12 marks)

a) Each number shown has the same value: 4.2×1000, 42×10^2, 4.2×10^3

Circle the one that is written in scientific notation.

b) Rewrite each number in scientific notation:

i) 648 6.48×10^2 1

ii) 0.0304 3.04×10^{-2} 1

c) Round off 618.257 correct to:

i) 2 decimal places. 618.26 1

ii) 2 significant figures. 620 1

d) Round off 0.3047 correct to 2 significant figures. 0.30 1

e) Write 6.3×10^{-4} as an ordinary numeral. 0.00063 1

f) Calculate $(3.3 \times 10^4) \div (4 \times 10^{-2})$. Answer in scientific notation. 8.25×10^5 1

g) Write 0.72363636 .... in simplest recurring form. $0.72\dot{3}\dot{6}$ 1

h) Write $\frac{11}{36}$ as:

i) a recurring decimal in simplest form. $0.30\dot{5}$ 1

ii) a decimal correct to 4 decimal places. 0.3056 1

i) What are the lower and upper limits of accuracy for a measurement of 37 cm, measured to the nearest cm? 36.5 and 37.5 1

QUESTION 2 – ALGEBRA (12 marks)

a) If $m = -2, n = 3$, what is the value of $mn(m+n)$? -6

ii) $8b \times 2b \div 4$ $4b^2$ 4

b) Simplify:

i) $4xy + 2y + 3yx$ $7xy + 2y$

iii) $\frac{2m}{3} + \frac{m}{3}$ m

c) Simplify: 3

i) $\frac{a}{2} - \frac{a}{3}$ $\frac{a}{6}$

ii) $\frac{8b}{3} \div \frac{4b^2}{5}$ $\frac{10}{3b}$

iii) $\frac{3}{4a} + 2$ $\frac{3+8a}{4a}$

d) Expand and simplify where possible: 4

i) $3(x+y)$ $3x+3y$

ii) $2(5x+3) - 2(1-x)$ $12x+4$

iii) $(x+5)^2$ $x^2+10x+25$

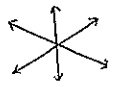
iv) $(2x+3)(3x-1)$ $6x^2+7x-3$

e) What is the perimeter of a rectangle $(x+y)$cm long and $(x-y)$ cm wide? Simplify your answer. 1 $4x$

QUESTION 3 – GEOMETRY (14 marks)

a) Complete:

i) The exterior angle of a triangle equals the sum of the two opposite interior angles. 1 (need both)

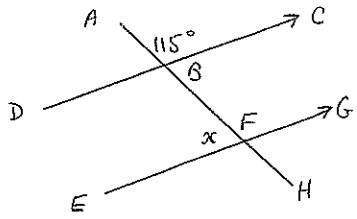
ii)  Lines that cross at a common point are called concurrent lines. 1

b) i) Find the size of each interior angle of a regular pentagon. 108°

ii) The interior angle sum of a polygon is 1800°. How many sides does the polygon have? 12

iii) Each exterior angle of a regular polygon is 10°. How many sides does the polygon have? 36 3

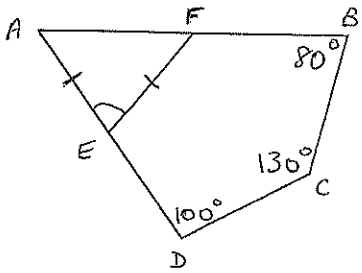
c) Find x, giving reasons: (various) 2



$\angle BFG = 115^\circ$ (corresponding angles, parallel lines)

$\therefore x = 65^\circ$ (angles on straight line)

d) Find $\angle AEF$, giving reasons: (various) 3

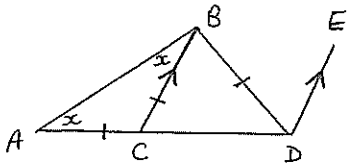


$\angle A = 50^\circ$ (angle sum quadrilateral)

$\angle AFE = 50^\circ$ (base angles, isosceles $\triangle AFE$)

$\therefore \angle AEF = 80^\circ$ (angle sum of triangle)

e) i) Find $\angle BCD$ in terms of x, giving reasons. 1



$\angle BCD = 2x$ (exterior angle of triangle)

ii) Find $\angle BDE$ in terms of x, giving reasons. 3

$\angle BDC = 2x$ (base angles, isosceles $\triangle BCD$)

$\angle CBD = 180 - 4x$ (angle sum $\triangle BCD$)

$\therefore \angle BDE = 180 - 4x$ (alternate angles, parallel lines)

QUESTION 4 – INDICES (12 marks)

a) Write the exact value of 7^{-2} as a basic numeral. $\frac{1}{49}$ 1

b) Simplify: i) $2y^3 \times 3y^2$ $6y^5$ ii) $(4x^0)^2$ 16 6

iii) $n^{18} \div (n^3)^2$ n^{12} iv) $\frac{(x^2y)^3}{xy^4}$ $\frac{x^5}{y}$

v) $\sqrt{x^{16}}$ x^8 vi) $m^3 + m^3$ $2m^3$

c) Evaluate $64^{-7/6}$ $\frac{1}{128}$ (or 0.0078125) 1

d) MULTIPLE CHOICE – Write A, B, C or D only:

i) $\frac{1}{2x^7} = ?$ A. $2x^{-7}$ B. $\frac{1}{2}x^7$ C. $\frac{1}{2}x^{-7}$ D. $(2x)^{-7}$ C 1

ii) $\frac{1}{\sqrt{x}} = ?$ A. x^{-1} B. $x^{-1/2}$ C. $x^{1/2}$ D. $\frac{x}{2}$ B 1

iii) $10x^{-3} = ?$ A. $\frac{10}{x^3}$ B. $\frac{1}{10x^3}$ C. $(\frac{10}{x})^3$ D. $-10x^3$ A 1

iv) $x^{2/3} = ?$ A. $\sqrt{x^3}$ B. $\frac{2x}{3}$ C. $\sqrt[3]{x^2}$ D. $\frac{x^2}{3}$ C 1

QUESTION 5 – SURDS (12 marks)

a) Simplify: i) $\sqrt{12}$ $2\sqrt{3}$ iv) $\sqrt{8} + \sqrt{18}$ $2\sqrt{2} + 3\sqrt{2} = 5\sqrt{2}$ 5

ii) $\sqrt{5} + \sqrt{5}$ $2\sqrt{5}$ v) $\frac{\sqrt{40}}{\sqrt{8}}$ $\sqrt{5}$.

iii) $4\sqrt{3} \times \sqrt{3}$ 12

b) Simplify:

i) $\frac{3\sqrt{6} \times 4\sqrt{2}}{2\sqrt{3}}$ 12 1

ii) $3\sqrt{50} + \sqrt{27} - 2\sqrt{32}$ $15\sqrt{2} + 3\sqrt{3} - 8\sqrt{2} = 7\sqrt{2} + 3\sqrt{3}$ 2

c) Write $4\sqrt{5}$ as an entire surd. $\sqrt{80}$ 1

d) Expand and simplify $(5 - \sqrt{3})^2$ $28 - 10\sqrt{3}$ 1

e) Which surd is half of $\sqrt{48}$? $2\sqrt{3}$ or $\sqrt{12}$ 1

f) Expand and simplify $(2\sqrt{3} \times 5\sqrt{2})^2$ 600 1

QUESTION 6 – MIXED/HARDER (18 marks)

a) Express "half of 10^{66}" in scientific notation. 5×10^{65} 1

b) If $x = -3, y = 2$, evaluate $(x^2y)^{-2} \times (xy)^{-1}$ in fraction form. $-\frac{1}{1944}$ 1

c) Simplify $\frac{x}{3} - \frac{x+1}{6x}$ $\frac{2x^2}{6x} - \frac{x+1}{6x} = \frac{2x^2 - x - 1}{6x}$ 2

d) Subtract the sum of $3x^2$ and $2x$ from the product of $4x$ and $x - 2$. $4x(x-2) - (3x^2 + 2x) = 4x^2 - 8x - 3x^2 - 2x = x^2 - 10x$ 2

e) Simplify: i) $\frac{6+3\sqrt{32}}{8}$ 1

$\frac{3+6\sqrt{2}}{4}$

ii) $\frac{\sqrt{27}\times\sqrt{12}}{3\times 2\sqrt{6}}$ 1

$\frac{\sqrt{6}}{2}$ or $\frac{3}{\sqrt{6}}$

f) Expand and simplify $(3\sqrt{y}+2\sqrt{x})^2$ 1

$9y + 12\sqrt{yx} + 4x$

g) Express $\frac{1}{x\sqrt{x}}$ in purely index form. 1

$x^{-3/2}$

h) Simplify $2^{x-6}+2^{x-6}$ 1

2^{x-5}

i) Simplify $\frac{(e^{x+1})^2}{e^x}$ 1

e^{x+2}

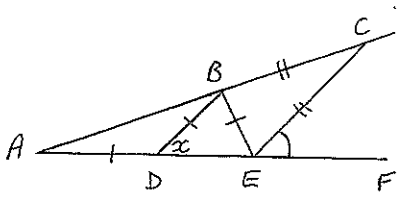
j) Find the value of x if $x^{4/3}=16$ 1

$x = 8$.

k) Simplify $\sqrt{\frac{x^n}{x^{-n}}}$ 1

x^n

l) If $\angle BDE = x$, find $\angle CEF$ in terms of x (reasons are not required) 1

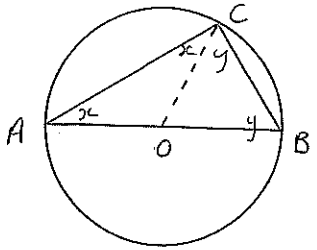


$180^\circ - \frac{5x}{2}$

m) AOB is the diameter of a circle, centre O. 3

Radius OC is shown.

Prove that $\angle ACB = 90°$.



AO = BO = CO (equal radii)

∴ △AOC, △BOC are isosceles

Mark in equal base angles as shown

$2x + 2y = 180^\circ$ (angle sum △ ABC)

$\therefore x + y = 90^\circ$

$\therefore \angle ACB = 90^\circ$ as required.

END OF TEST