

Teacher: _____

SYDNEY TECHNICAL HIGH SCHOOL



MATHEMATICS - YEAR 9 - MAY COMMON TEST, 2016

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	/12
4	Indices	/12
5	Surds	/12
6 a,b,c,d	Number	/4
e,f	Algebra	/4
g,h,i	Surds	/4
j,k,l,m	Indices	/4
n,o	Geometry	/4

TOTAL /80

QUESTION 1 – NUMBER (12 marks)

- a) Each number shown has the same value: 7.5×10^3 , 75×10^2 , 7.5×1000 1

Circle the one that is written in scientific notation.

- b) Rewrite each number in scientific notation:

i) 3290 _____ 1

ii) 0.00065 _____ 1

- c) Round off 937.426 correct to:

i) 2 decimal places. _____ 1

ii) 2 significant figures. _____ 1

- d) How many significant figures does 6095 have? _____ 1

- e) Write 7.5×10^{-2} as a basic numeral. _____ 1

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

- g) Write $\frac{11}{36}$ as a decimal correct to 4 decimal places. _____ 1

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

- i) A very accurate measurement of 17.250 mm is recorded. How many significant figures are used? _____ 1

- j) A Gigabyte is one thousand Megabytes. How many Kilobytes are in a Gigabyte? _____ 1

QUESTION 2 – ALGEBRA (12 marks)

- a) If $a = -5$, $b = 2$, what is the value of $(a - b)(a + b)$? b) Simplify $ab + 3a + ba$ 4

- c) Simplify $12x \times 3x \div 9$ d) $\frac{5a}{4} - \frac{a}{4}$ _____

e) Simplify: 3

i) $\frac{2m}{3} + \frac{m}{4}$ _____

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

iii) $3 + \frac{1}{2a}$ _____

f) Expand and simplify where possible: 4

i) $7(x + 3)$ _____

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

iii) $(x + 4)^2$ _____

iv) $(4x - 1)(x + 5)$ _____


g) What is the perimeter of a rectangle with short side of $(a - b)$ cm and long side of $(b + c)$ cm?

Simplify your answer. _____ 1

QUESTION 3 – GEOMETRY (12 marks)

a) Complete:

i) When a trans_____ cuts across two parallel lines, the _____ 1
angles are supplementary.

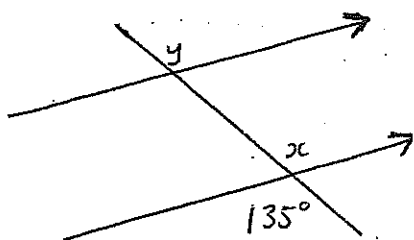
ii)  Many points that lie on one line are called _____ points. 1

b) i) Find the size of each interior angle of a regular hexagon. ii) The interior angle sum of a polygon is 1440° . How many sides does the polygon have? iii) Each exterior angle of a regular polygon is 20° . How many sides does the polygon have? 3

the polygon have?

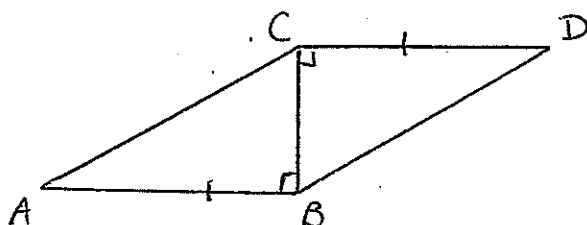
c) Find x and y , giving reasons:

2



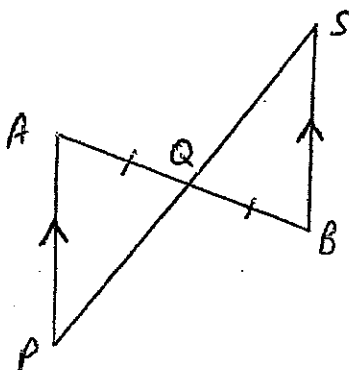
d) Which congruence test is used to prove that $\triangle ABC \equiv \triangle DCB$?

1



e) i) Prove that the two triangles are congruent.

3



ii) Why do we now know that $PQ = SQ$?

1

QUESTION 4 – INDICES (12 marks)

a) Simplify: i) $10y^4 \times 5y^3$ _____

ii) $(5m^0)^2$ _____

6

iii) $(x^8)^3 \div x^4$ _____

iv) $\frac{a^4b}{(ab^2)^3}$ _____

$$v) \sqrt{x^{18}} \quad \underline{\hspace{2cm}}$$

$$vi) x^{15} + x^{15} \quad \underline{\hspace{2cm}}$$

b) Evaluate $8^{-2/3}$ $\underline{\hspace{2cm}}$ 1

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

i) $13^{-1} = ?$ A. $\frac{1}{13}$ B. -13 C. $\frac{-1}{13}$ D. $\frac{13}{1}$ $\underline{\hspace{2cm}}$ 1

ii) $\frac{1}{4x^2} = ?$ A. $4x^{-2}$ B. $\frac{1}{4}x^2$ C. $\frac{1}{4}x^{-2}$ D. $(4x)^{-2}$ $\underline{\hspace{2cm}}$ 1

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

iv) $5x^{-4} = ?$ A. $\frac{5}{x^4}$ B. $\frac{1}{5x^4}$ C. $(\frac{5}{x})^4$ D. $-5x^4$ $\underline{\hspace{2cm}}$ 1

v) $2x^{1/2} = ?$ A. $\sqrt{2x}$ B. $2\sqrt{x}$ C. $\sqrt{x^2}$ D. $\frac{x^2}{2}$ $\underline{\hspace{2cm}}$ 1

QUESTION 5 – SURDS (12 marks)

a) Simplify: i) $\sqrt{27}$ $\underline{\hspace{2cm}}$ ii) $2\sqrt{6} + \sqrt{6}$ $\underline{\hspace{2cm}}$ 4

iii) $\sqrt{8} + \sqrt{2}$ $\underline{\hspace{2cm}}$ iv) $\frac{\sqrt{500}}{\sqrt{5}} + 2\sqrt{6} \times \sqrt{6}$ $\underline{\hspace{2cm}}$

b) Simplify:

i) $\frac{4\sqrt{10} \times 3\sqrt{2}}{2\sqrt{5}}$ 1 ii) $2\sqrt{18} + \sqrt{12} - \sqrt{32}$ 2

$\underline{\hspace{2cm}}$	$\underline{\hspace{2cm}}$
$\underline{\hspace{2cm}}$	$\underline{\hspace{2cm}}$
$\underline{\hspace{2cm}}$	$\underline{\hspace{2cm}}$
$\underline{\hspace{2cm}}$	$\underline{\hspace{2cm}}$

c) Write $10\sqrt{2}$ as an entire surd.

1

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

1

e) Which surd is half of $\sqrt{60}$?

1

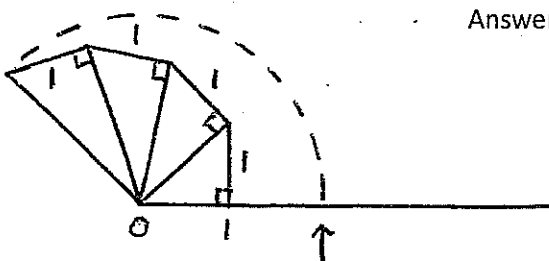
f) Simplify $(3\sqrt{2} \times 2\sqrt{6})^2$

1

g) Which surd is represented by the arrow

on the number line below?

Answer _____ 1



QUESTION 6 – MIXED/HARDER (20 marks)

a) Express "half of 10^{20} " in scientific notation.

1

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

1

c) A googol is 10^{100} . What is a millionth of a hundredth of a googol?

1

d) If $0.1a \times 32.6b = c$, what is $10a \times 3.26b$?

1

e) Simplify $\frac{x}{5} - \frac{x-3}{10x}$

2

f) Subtract the product of $3x$ and $x + 1$ from the product of $5x$ and $x - 2$.

2

g) Simplify: i) $\frac{10-5\sqrt{20}}{10}$

1

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

1

h) Expand and simplify $(5\sqrt{m} + 2\sqrt{n})^2$

1

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

1

j) Express $3^m + 3^m + 3^m$ in simplest index form

1

k) Simplify $\frac{m^{xy+y}}{m^{-y}}$

1

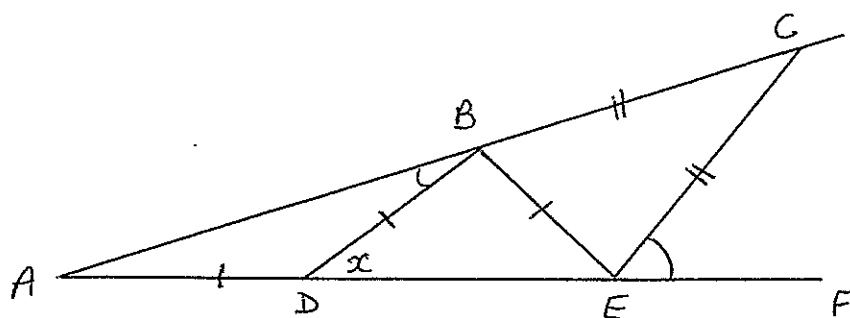
l) Find the value of x if $x^{3/2} = 125$

1

m) Find a quarter of 2^n in simplified index form.

1

n)



In the diagram above, $\angle BDE = x$.

Find, in terms of x :

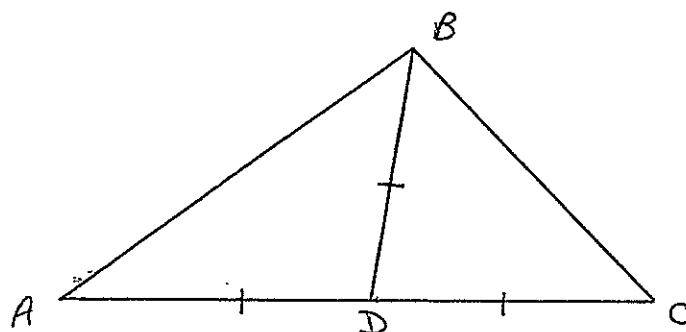
i) $\angle DBA$ (reasons not required)

1

ii) $\angle CEF$ (reasons not required)

1

o)



In $\triangle ABC$, D is on side AC and is equidistant from A , B , C .

Prove that $\angle ABC$ is a right angle.

2

Name: _____

Teacher: _____

SYDNEY TECHNICAL HIGH SCHOOL



ANSWERS

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QUESTION 2 - ALGEBRA (12 marks)

- a) If $a = -5$, $b = 2$, what is the value of $(a - b)(a + b)$?

- b) Simplify $ab + 3a + ba$

- c) Simplify $12x \times 3x \div 9$

- d) $\frac{5a}{4} - \frac{a}{4}$

1

1

1

1

1

1

1

1

1

1

1

1

4

4x²

a

2ab + 3a

(or 1000000)

need both limits

e) Simplify: 3 f) Expand and simplify where possible: 4

i) $\frac{2m}{3} + \frac{m}{4}$ $\frac{11m}{12}$

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

iii) $3 + \frac{1}{2a}$ $\frac{6a+1}{2a}$

i) $7(x+3)$ $7x+21$

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

iii) $(x+4)^2$ $x^2+8x+16$


iv) $(4x-1)(x+5)$ $4x^2+19x-5$

g) What is the perimeter of a rectangle with short side of $(a-b)$ cm and long side of $(b+c)$ cm? Simplify your answer. $2a+2c$

QUESTION 3 - GEOMETRY (12 marks)

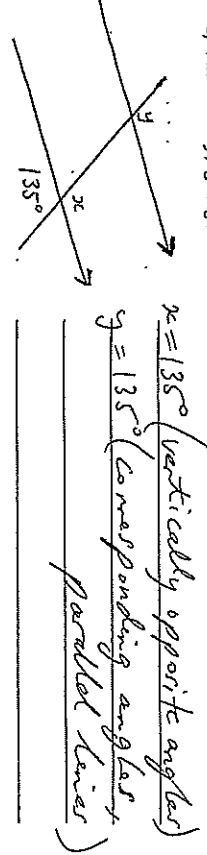
a) Complete:

i) When a transversal cuts across two parallel lines, the co-interior (or adjacent) angles are supplementary. 1

ii)  Many points that lie on one line are called collinear points. 1

b) i) Find the size of each interior angle of a regular hexagon. 120°
ii) The interior angle sum of a polygon is 1440°. How many sides does the polygon have? 10 sides (or $n=10$)
iii) Each exterior angle of a regular polygon is 20°. How many sides does the polygon have? 18

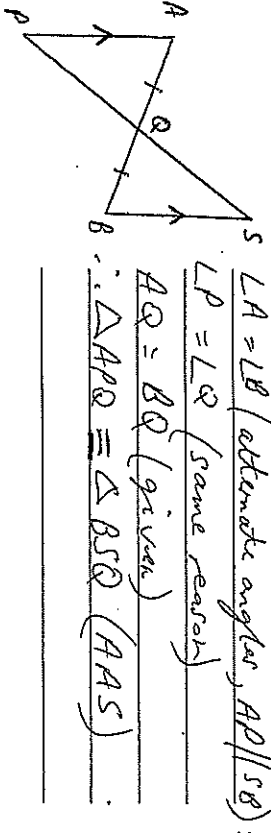
c) Find x and y , giving reasons: 2



d) Which congruence test is used to prove that $\triangle ABC \equiv \triangle DCB$? 1



e) i) Prove that the two triangles are congruent. 3



ii) Why do we now know that $PQ = SQ$? 1

Corresponding sides in congruent triangles.

QUESTION 4 - INDICES (12 marks)

a) Simplify: i) $10y^4 \times 5y^3$ $50y^7$ 6

iii) $(x^8)^3 \div x^4$ x^{20}

iv) $\frac{a^4b}{(ab^2)^3}$ $\frac{a}{b^5}$

g) Simplify: i) $\frac{10-5\sqrt{20}}{10}$

1

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

1

n)

$1-\sqrt{5}$

$\frac{3}{\sqrt{6}} \cdot \left(\text{or } \frac{\sqrt{6}}{2} \right)$

h) Expand and simplify $(5\sqrt{m} + 2\sqrt{n})^2$

1

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

1

$25m + 20\sqrt{mn} + 4n$

$x^{-\frac{3}{2}}$

j) Express $3^m + 3^m + 3^m$ in

1

k) Simplify $\frac{m^{2x+y}}{m^{-y}}$

1

simplest index form

3^{m+1}

m^{2y+2y}

l) Find the value of x if $x^{3/2} = 125$

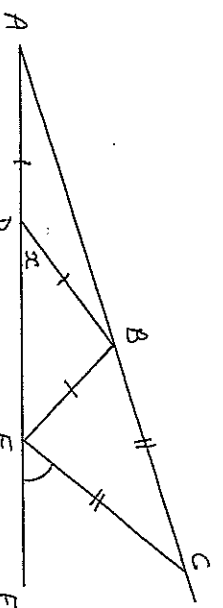
1

m) Find a quarter of 2^n in simplified index form.

1

$x = 25$

2^{n-2}



In the diagram above, $\angle BDE = x$.

Find, in terms of x :

i) $\angle DBA$ (reasons not required)

1

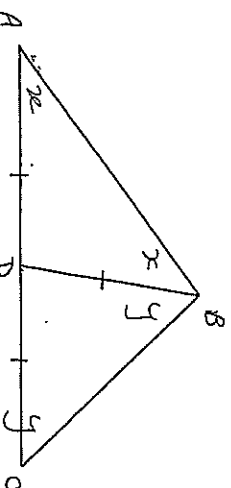
ii) $\angle CEF$ (reasons not required)

1

$\frac{x}{2}$ or $\frac{1}{2}x$

$180^\circ - 2\frac{1}{2}x$
(or $180^\circ - 5\frac{x}{2}$)

o)



In $\triangle ABC$, D is on side AC and is equidistant from A , B , C .

Prove that $\angle ABC$ is a right angle.

2

Make in equal base angles is isosceles triangles ABD and BDC as shown

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

$\therefore x + y = \angle ABC = 90^\circ$ as reqd.