SYDNEY BOYS HIGH SCHOOL
MOORE PARK, SURRY HILLS

2007
YEAR 11 Mathematics 2 Unit
HALF YEARLY EXAM

Mathematics 2 Unit

General Instructions

- Reading Time – 5 Minutes
- Working time – 90 Minutes
- Write using black or blue pen. Pencil may be used for diagrams.
- Board approved calculators maybe used.
- Marks may **NOT** be awarded for messy or badly arranged work.
- All necessary working should be shown in every question.

Total Marks – 70

Examiner: *D.McQuillan*

Marks

(1) Evaluate $\dfrac{5.1^2}{10.1-3.6}$ to 3 decimal places. [1]

(2) Show that the triangle inequality $|x+y| \le |x| + |y|$ is true for $x = 4$ and $y = -7$. [1]

(3) If $\sqrt{80} = a\sqrt{5}$ find the value of a. [1]

(4) Simplify $\dfrac{3a}{b} - \dfrac{a}{2b}$. [1]

(5) Factorise

(i) $x^2 + 10x - 24$ [1]

(ii) $3m^2 - 3mn - m + n$ [1]

(iii) $1 - 8x^3$ [1]

(6) Rationalise the denominator of $\dfrac{\sqrt{5}+7}{3\sqrt{2}}$. [1]

(7) Find the interior angle sum of a 12 sided polygon. [1]

(8) Write $\sqrt[4]{x^5}$ in index form. [1]

(9) Express $0.\dot{5}\dot{4}$ as a fraction. [1]

(10) Simplify $\sqrt{5}+\sqrt{2}-\sqrt{45}+\sqrt{8}$. [2]

(11) Expand and simplify $\left(\sqrt{3}-5\right)\left(\sqrt{3}+5\right)$. [2]

(12) Solve these equation simultaneously [2]

$$2x-9=y$$
$$5x+12=2y$$

(13) Solve

(a) $\left|5x+13\right|=\left|3x+3\right|$. [2]

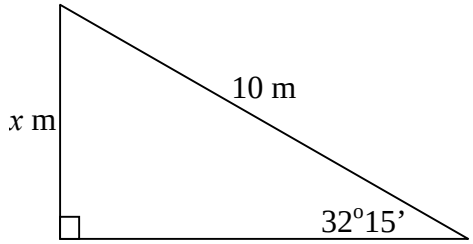
(b) $\left|2x-1\right|>13$. [2]

(14) Simplify $\dfrac{x^2-2x-3}{x^2-4x-5}\times\dfrac{x^2-25}{(x-3)(x+5)}$. [2]

(15) Use the quadratic formula to solve $2x^2-6x-3=0$
leave your answer in simplest surd form. [2]

(16) Write the expression $x^2-6x+12$ in the form $(x-h)^2+k$ using the completing the square method and hence find values of *h* and *k*. [2]

(17) Find the value of *x* (to 2 decimal places). [2]

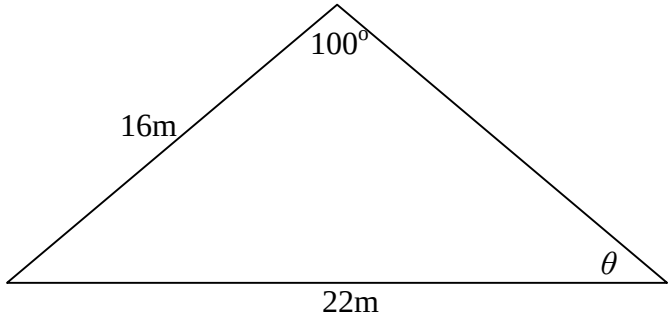


(18) Solve

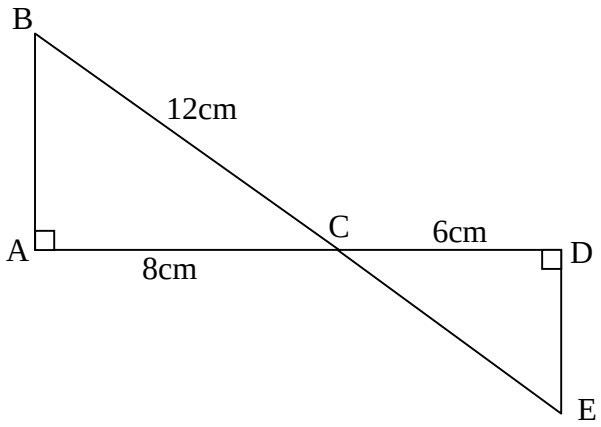
(a) $2^{t-3} = 16$. [2]

(b) $x^4 - 10x^2 + 9 = 0$. [2]

(19) Find θ to the nearest degree. [2]



(20) Given the figure



(a) Prove that ΔABC is similar to ΔDEC. [2]

(b) Hence find the length of CE. [1]

(21) Find the exact value of

(a) $\cos 45°$ [1]

(b) $\tan 180°$ [1]

(c) $\sin 300°$ [2]

(22) Simplify $\cos\theta\sin(90° - \theta) + \sin\theta\cos(90° - \theta)$. [2]

(23) Simplify $\left(\frac{27y^6}{8}\right)^{-\frac{2}{3}}$. [2]

(24) Sketch a graph of $y = \cos x$ where $-180° \le x \le 180°$. [2]

(25) Solve $\cos\theta = -\frac{\sqrt{3}}{2}$ for $0° \le \theta \le 360°$ [2]

(26)

(a) Show that $2x^2 + 9x - 5 = (2x - 1)(x + 5)$. [1]

(b) Hence solve $2x^2 + 9x - 5 \le 0$. [1]

(c) Graph the solutions on a number line. [1]

(27) From camp, a hiker walks due north for 8 km, then 6 km due west to a lake.

(a) Draw a neat diagram to represent this information. [1]

(b) How far is the hiker from camp? [2]

(c) What is the bearing of the camp from the lake (to the nearest degree)? [2]

(28) In a right-angled triangle, one of the sides adjacent to the right angle is 4 cm longer than the other. Find the exact length of the hypotenuse if the area of the triangle is 96 cm^2. [3]

(29) Find the points of intersection of the line $y = 3x + 2$ and the parabola $y = x^2 - 7x - 9$. [3]

(30) Show that $\frac{(\sin A + \cos A)^2}{\cos A} = 2\sin A + \sec A$. [3]

(31) Solve $\tan^2 \phi = 1$ for $0° \leq \phi \leq 360°$ [3]

End of Exam

Maths 4R11 Half Yearly 2007 2 unit class.

(1) $\frac{26.01}{6.5} \doteqdot 4.002$ (3DP) (1)

(2) $|4+-7| \leq |4|+|-7|$
$|-3| \leq 4+7$
$3 \leq 11$ true (1)

(3) $\sqrt{80} = \sqrt{16\times5} = 4\sqrt{5} \Rightarrow a=4$ (1)

(4) $\frac{6a-a}{2b} = \frac{5a}{2b}$ (1)

(5) (i) $(x+12)(x-2)$ (1)
(ii) $3m(m-n)-1(m-n)$
$=(3m-1)(m-n)$ (1)
(iii) $(1-2x)(1+2x+4x^2)$ (1)

(6) $\frac{(\sqrt{5}+7)}{3\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{\sqrt{10}+7\sqrt{2}}{6}$ (1)

(7) $\frac{360}{12} = 30 \Rightarrow$ interior is $150^\circ \times 12 = 1800^\circ$ (1)

(8) $x^{\frac{5}{4}}$ (1)

(9) $\frac{54}{99} = \frac{6}{11}$ (1)

(10) $\sqrt{5}+\sqrt{2}-3\sqrt{5}+2\sqrt{2}$
$=-2\sqrt{5}+3\sqrt{2}$ (2)

(11) $3+5\sqrt{3}-5\sqrt{3}-25 = -22$ (2)

(12) $y=2x-9$
$2y=5x+12$

$2(2x-9)=5x+12$
$4x-18=5x+12$
$-30=x$

and $y=2\times-30-9$
$=-69$
$(-30,-69)$ (2)

(13) (a) $5x+13=3x+3$
$2x=-10$
$x=-5$ ✓

$5x+13=-3x-3$
$8x=-16$
$x=-2$ ✓ (2)

(b) $2x-1>13$
$2x>14$
$x>7$
and
$2x-1<-13$
$2x<-12$
$x<-6$ (2)

The Sydney High School
Founded 1 October 1883

Phone: (02) 361 6970
(02) 361 6991
Fax: (02) 361 6206

Sydney High School
Moore Park
Surry Hills 2010

(25) $\cos\theta = -\frac{\sqrt{3}}{2}$

quad 2, 3.

$\cos\theta = \frac{\sqrt{3}}{2} \Rightarrow \theta = 30^\circ$

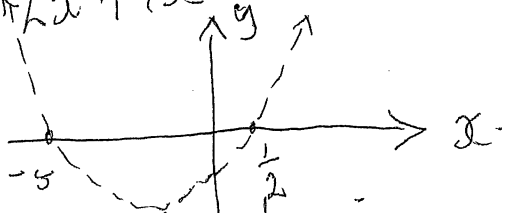
so $180 - 30 = 150^\circ$ (2)

$180 + 30 = 210^\circ$

(26) (a) $(2x-1)(x+5) = 2x^2 + 10x - x - 5$ (1)

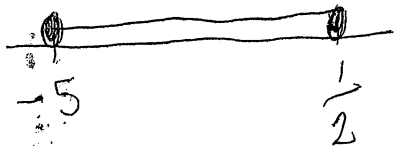
$= 2x^2 + 9x - 5$

(b) $2x^2 + 9x - 5 \leq 0$

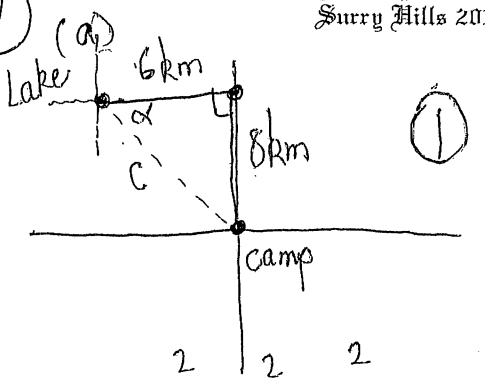


below or touching

$-5 \leq x \leq \frac{1}{2}$ (1)

(c) 

(1)

(27) 

(1)

(b) $6^2 + 8^2 = c^2$

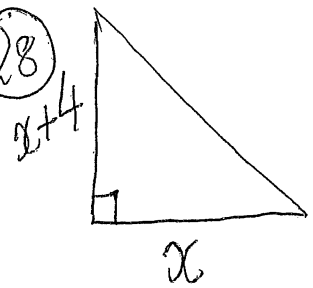
$c = 10$ km (2)

(c) $\sin\alpha = \frac{8}{10}$

$\alpha \doteqdot 53^\circ$

true bearing is $90 + 53 = 143^\circ$T

or $S37^\circ E$ (2)

(28) 

area $= \frac{1}{2} \times x \times (x+4) = 96$

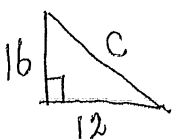
$x^2 + 4x = 192$

$x^2 + 4x - 192 = 0$

$(x+16)(x-12) = 0$

$x = -16, \quad x = 12$

use $x = 12$

so 

$c^2 = 12^2 + 16^2$

$c = 20$ cm (3)

(29) $y = 3x + 2$
$y = x^2 - 7x - 9$ }

$x^2 - 7x - 9 = 3x + 2$

$x^2 - 7x - 3x - 9 - 2 = 0$

$x^2 - 10x - 11 = 0$

$(x - 11)(x + 1) = 0$

$x = -1$ and $x = 11$

$y = 3x - 1 + 2$
$= -3 + 2$
$= -1$
$(-1, -1)$

$y = 3 \times 11 + 2$
$= 33 + 2$
$= 35$
$(11, 35)$ (3)

(30) LHS $\dfrac{\sin^2 A + 2\sin A\cos A + \cos^2 A}{\cos A}$

$= \dfrac{1}{\cos A} + \dfrac{2\sin A\cos A}{\cos A}$

$= \sec A + 2\sin A$

$=$ RHS (3)

(31) $\tan^2 \phi = 1$
$\tan \phi = \pm 1$

$\tan \phi = 1$
quad 1, 3
$\phi = 45°$

$\tan \phi = -1$
quad 2, 4
$180 - 45 = 135°$
$180 + 45 = 225°$
$360 - 45 = 315°$ (3)