Killara HIGH SCHOOL

MATHEMATICS

Final Preliminary Examination

Friday 3rd August 2012

General Instructions

- Reading time – 5 minutes
- Working time - 2½ hours
- Write using black or blue pen
- Board approved calculators may be used
- A table of standard integrals is provided at the back of this paper
- All necessary working should be shown in every question
- Start a new booklet for each question

Total Marks – 85

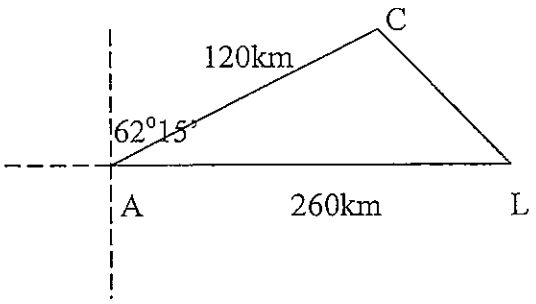
- Attempt questions 1 – 15
- Answer questions 1 – 10 on the multiple choice answer sheet provided
- For questions 11 – 15 start each question in a new booklet

Question Number	Mark
1 – 10	/ 10
11	/ 15
12	/ 15
13	/ 15
14	/ 15
15	/ 15
TOTAL:	**/ 85**

THIS QUESTION PAPER MUST NOT BE REMOVED FROM THE EXAMINATION ROOM

This assessment task constitutes 50% of the Preliminary Course Assessment.

1. A battleship A is 260 k m due west of a lighthouse L. It travels a distance of 120 km on a bearing of N62° 15' E to position C.



NOT TO SCALE

The distance from the lighthouse to the battleships position at C is:

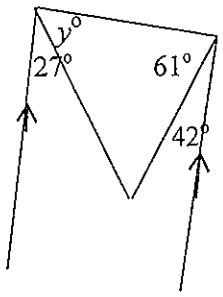
(A) $\sqrt{260^2 - 120^2}$

(B) $\sqrt{120^2 + 260^2 - 2 \times 120 \times 260 \times \cos 62^o\, 15'}$

(C) $\sqrt{260^2 + 120^2 - 2 \times 260 \times 120\, cos 27^o\, 45'}$

(D) $\frac{\sin 27^o\, 45' \times 260}{\sin 62^o\, 15'}$

2. Evaluate x.



NOT TO SCALE

(A) 56°

(B) 92°

(C) 69°

(D) 50°

3. For the quadratic equation $y = ax^2 + bx + c$ and where $a > 0$. The minimum value will be:

(A) $\frac{4ac - b^2}{4a}$

(B) Negative

(C) $\frac{4ac + b^2}{4a}$

(D) $\frac{b^2 - 4ac}{2a}$

4. The percentage of sugar in a proposed drink is 6.8%. The health authority wants this to be reduced to less than 2.475%. What is the least amount of water that needs to be added to 1 litre of this drink in order to achieve this requirement?

(A) 2747 mls

(B) 1750 mls

(C) 2750 mls

(D) 1747 mls

5. Which of the following answers is equivalent to $2(2^k - 1) + 2^{k+1}$?

(A) $2^{k+2} - 1$

(B) $4^{k+1} - 2$

(C) $4^k - 2$

(D) $2(2^{k+1} - 1)$

6. Write $\frac{3}{\sqrt{5}-\sqrt{2}} + \frac{5}{\sqrt{5}+\sqrt{2}} - \frac{\sqrt{3}+3}{\sqrt{3}}$ as a single fraction

(A) $\frac{8\sqrt{5} + 8\sqrt{2} - 3 - 3\sqrt{3}}{3}$

(B) $\frac{8\sqrt{5}+8\sqrt{2}-3+3\sqrt{3}}{3}$

(C) $\frac{8\sqrt{5}-2\sqrt{2}-3-3\sqrt{3}}{3}$

(D) $8\sqrt{5} - 2\sqrt{2} - 1 - \sqrt{3}$

7. The solutions to the following equation $|2x - 5| + |x + 3| = 13$ are:

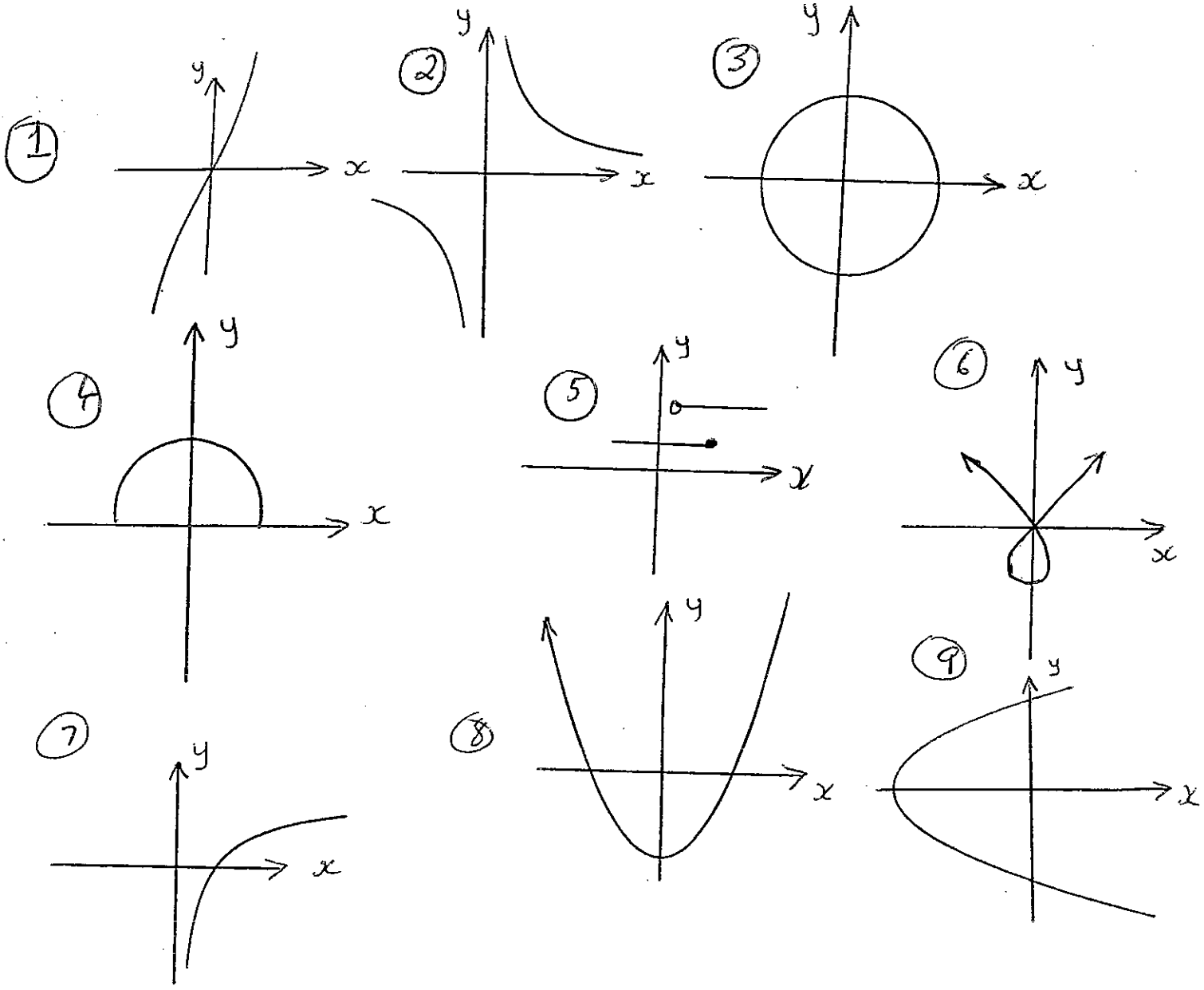
(A) $x = 5, 21$

(B) $x = -5, -\frac{11}{3}$

(C) $x = \frac{-11}{3}, 21$

(D) $x = 5, \frac{-11}{3}$

8. Which of the following answers only includes functions:



(A) 1, 3, 7, 8

(B) 4, 5, 7, 9

(C) 2, 4, 6, 8

(D) 1, 4, 7, 8

9. Complete the square $9x + 16x$

(A) $9x^2 + 16x + 64$

(B) $x^2 + 16x + 64$

(C) $x^2 + \frac{16x}{9} + \frac{64}{81}$

(D) $x^2 + \frac{16x}{9} + \frac{64}{9}$

10. Solve $\sqrt{3}\tan 2x - 1 = 0$ for $-180^o \leq x \leq 180^o$

(A) 30^o, -150^o

(B) 30^o, 210^o, -150^o, -330^o

(C) 15^o, -75^o

(D) 15^o, 105^o, -75^o, -165^o

End of multiple choice section

ANSWER QUESTIONS 11 – 15 IN THE ANSWER BOOKLETS PROVIDED.

Question 11 (15 marks) Use a SEPARATE writing booklet. **Marks:**

(a) Simplify $8\sqrt{48} + 2\sqrt{3}$ **2**

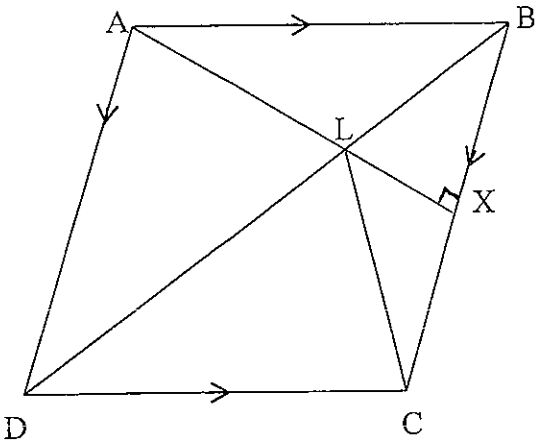
(b) Rationalise the denominator $\frac{\sqrt{5}}{2\sqrt{5}+3}$ **2**

(c) Express 0.00001055721 in scientific notation correct to 3 significant figures. **2**

(d) Evaluate $\frac{\sqrt[3]{3.92}}{(19.24)^2-5.7}$ correct o 3 decimal places. **2**

(e) Solve the equation $(x-3)^2 = 4$ **2**

(f)



NOT TO SCALE

ABCD is a rhombus, AX is perpendicular to BC and intersects BD at L.

(i) Copy the diagram into your examination booklet and state why $\angle ADB = \angle CDB$. **1**

(ii) Prove that the triangles ALD and CLD are congruent. **2**

(iii) Show that $\angle DAL$ is a right angle. **1**

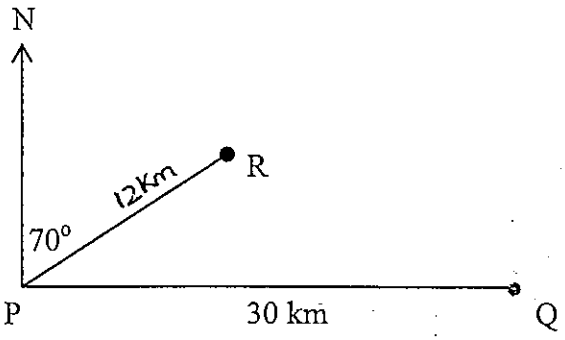
(iv) Hence, or otherwise, find the size of $\angle LCD$, giving reasons. **1**

Question 12 (15 marks) Use a SEPARATE writing booklet. **Marks:**

(a) Express $1.0\dot{2}\dot{6}$ as a simple fraction. **2**

(b) A triangle has sides 7cm, 10cm and 12cm in length. Find the size of the smallest angle, to the nearest degree. **2**

(c)



NOT TO SCALE

The diagram shows a point P which is 30 km due west of the point Q. The point R is 12 km from P and has a bearing from P of 070°.

(i) Find the distance of R from Q, correct to the nearest km. **2**

(ii) Hence find the bearing of R from Q. **2**

(d) Simplify $\frac{5b}{2b+6} \div \frac{b^2}{b^2+b-6} - \frac{b}{b+1}$ **3**

(e) Solve for x : $2^x \times 4^{x+1} = 0.5$ **2**

(f) Solve simultaneously:

$3x - 4y = 13$

$2x - y = 7$ **2**

Question 13 (15 marks) Use a SEPARATE writing booklet. **Marks:**

(a) Solve the inequation $\frac{x}{5} - \frac{x}{2} \geq 3$ and graph the solution on a number line. **3**

(b) A formula used in Physics to determine the acceleration, f, of a simple pulley system with masses M and m at each end is:

$$f = \frac{(M-m)g}{(M+m)}$$

Make 'm' the subject of this formula. **2**

(c) Find the exact value of $\cot 300^\circ$. **1**

(d) If $\sin A = -\frac{2}{3}$ and $\tan A < 0$, find the exact value of $\sec A$. **2**

(e) Show that $\frac{1}{\sin^2\vartheta} + \frac{1}{\cos^2\vartheta} = \sec^2\vartheta \, \operatorname{cosec}^2\vartheta$. **3**

(f) On separate axes, draw neat sketches of the following graphs, showing any important features: **4**

(i) $y = |x+2|$

(ii) $y = 2 + \frac{1}{x}$

Question 14 (15 marks) Use a SEPARATE writing booklet. **Marks:**

(a) A function f is defined as $f(x) = x^2 - 5x + 1$.

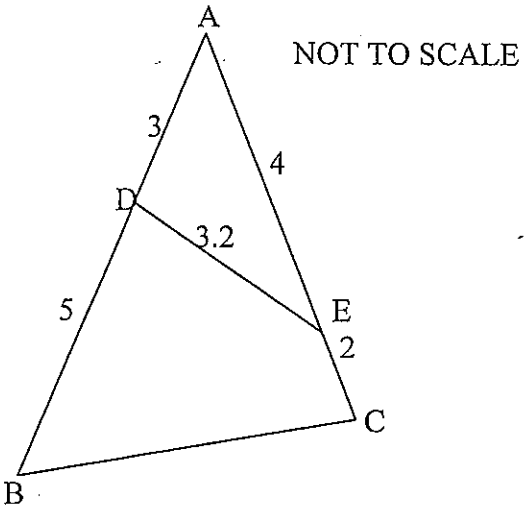
(i) Write an expression for $f(2x)$ **1**

(ii) Solve the equation: $f(2x) = f(x)$ **2**

(b) Find the centre and radius of the circle: $x^2 - 2x + y^2 + 6y - 12 = 0$ **2**

(c) Draw a graph which does not represent a function. By referring to your graph, explain why it is not a *fn*. **1**

(d)



(i) Prove ΔADE is similar to ΔACB. **3**

(ii) Hence find the length BC. **1**

(e) Find the size of an interior angle of a regular 12 sided polygon. **2**

(f) Bricks are ordered in lots of 500. 10% are too badly chipped to be used. If a builder requires 14,500 bricks for a job, what is the minimum number of bricks that he must order? **3**

Question 15 (15 marks) Use a SEPARATE writing booklet. **Marks:**

(a) Given that $f(x) = 2^x + 2^{-x}$, determine whether $f(x)$ is even, odd or neither. Give reasons. **2**

(b) A function is defined by the rule

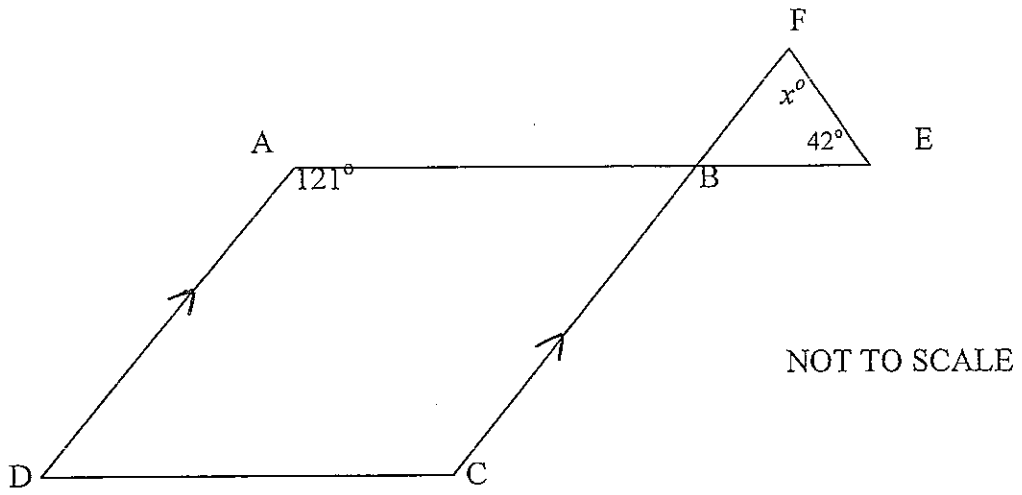
$$g(x) = \begin{cases} 1 \text{ if } x \leq 0 \\ x \text{ if } 0 < x < 3 \\ 16 - x^2 \text{ if } x \geq 3 \end{cases}$$

(i) Sketch this function on a number plane from $x = -4$ to $x = 4$ **2**

(ii) Evaluate $g(-3) + g(1) + g(4)$ **1**

(iii) Find the range of this function for $-4 \leq x \leq 4$ **1**

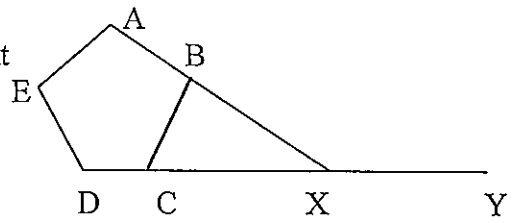
(c) In the diagram below $AD//BC$. **2**



Copy the diagram onto your worksheet and find the value of x, giving reasons.

Question 15 continued: **Marks:**

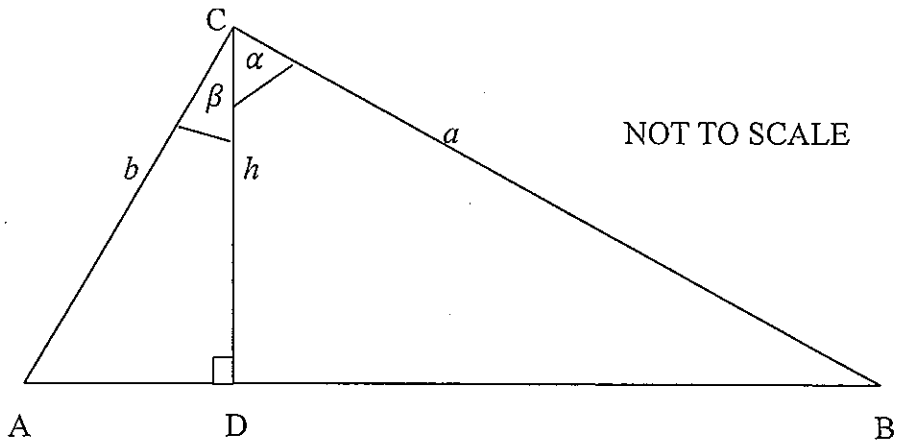
(d) In the diagram ABCDE is a regular pentagon and AB and DC produced meet at X. The point Y lies on DCX produced.



(i) Copy the diagram on to your paper.

(ii) Find the size of ∠BXY giving reasons. **3**

(e)



The diagram above shows a triangle ABC, and CD is perpendicular to AB. It is given that BC = a, AC = b, ∠ ACD = β and ∠ BCD = α.

(i) By using triangles ACD and BCD, show that $h = b\cos\beta = a\cos\alpha$. **1**

(ii) Show that the area of triangle ACD is equal to $\frac{1}{2}\ ab\sin\beta\cos\alpha$. **1**

(iii) Find another expression for the area of triangle BCD in terms of a, b, α and β. **1**

(iv) Show that the area of triangle ABC is equal to $\frac{1}{2}ab\sin(\alpha + \beta)$ **1**

End of paper

STANDARD INTEGRALS

$$\int x^n\,dx = \frac{1}{n+1}x^{n+1}, \quad n \neq -1; \quad x \neq 0, \text{ if } n < 0$$

$$\int \frac{1}{x}\,dx = \ln x, \quad x > 0$$

$$\int e^{ax}\,dx = \frac{1}{a}e^{ax}, \quad a \neq 0$$

$$\int \cos ax\,dx = \frac{1}{a}\sin ax, \quad a \neq 0$$

$$\int \sin ax\,dx = -\frac{1}{a}\cos ax, \quad a \neq 0$$

$$\int \sec^2 ax\,dx = \frac{1}{a}\tan ax, \quad a \neq 0$$

$$\int \sec ax \tan ax\,dx = \frac{1}{a}\sec ax, \quad a \neq 0$$

$$\int \frac{1}{a^2+x^2}\,dx = \frac{1}{a}\tan^{-1}\frac{x}{a}, \quad a \neq 0$$

$$\int \frac{1}{\sqrt{a^2-x^2}}\,dx = \sin^{-1}\frac{x}{a}, \quad a > 0, \quad -a < x < a$$

$$\int \frac{1}{\sqrt{x^2-a^2}}\,dx = \ln\left(x+\sqrt{x^2-a^2}\right), \quad x > a > 0$$

$$\int \frac{1}{\sqrt{x^2+a^2}}\,dx = \ln\left(x+\sqrt{x^2+a^2}\right)$$

NOTE: $\ln x = \log_e x, \quad x > 0$

Killara HIGH SCHOOL

STUDENT NUMBER: | | | | | | | | | |

Multiple Choice Answer 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 ○

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MATHEMATICS

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STUDENT NUMBER: | | | | | | | | | |

Multiple Choice Answer Sheet
Completely fill the response oval representing the most correct answer.

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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 ●

Question 11

Start here

a) $8\sqrt{48}+2\sqrt{3}$

$=8\times4\sqrt{3}+2\sqrt{3}$

$=32\sqrt{3}+2\sqrt{3}$ ①

$=34\sqrt{3}$ ①

Generally well done, though at least half-a-dozen students said that $32+2=35$ (very careless mistake which cost a mark)

b) $\frac{\sqrt{5}}{2\sqrt{5}+3}\times\frac{2\sqrt{5}-3}{2\sqrt{5}-3}$ ①

$=\frac{10-3\sqrt{5}}{20-9}$

$=\frac{10-3\sqrt{5}}{11}$ ①

• Generally well done.
• Some students did not multiple $\sqrt{5}$ by both $2\sqrt{5}$ and -3 in the numerator and ended up with $\frac{7}{11}$ as their answer.

c) 0.0000105572

$=1.06\times10^{-5}$ (2)

1 mark for correct rounding

1 mark for correct power

• Generally well done.

d) $\frac{\sqrt[3]{3.92}}{(19.24)^2-5.7}=0.004$ (2)

deduct 1 mark for incorrect no. of decimal places.

• Generally well done!

e) $(x-3)^2=4$

$x-3=\pm2$ ①

$x=\pm2+3$

$=1$ or 5 ①

• Generally well done.
• Many students did it as

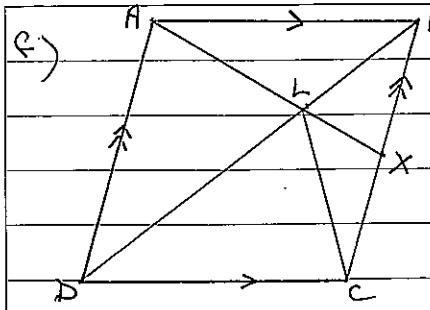
$x^2-6x+9=4$

$x^2-6x+5=0$

$(x-5)(x-1)=0$ ①

$x=5$ or 1 ①

f)



i) $\angle ADX=\angle CDB$ (diagonals of a rhombus bisect angles at the vertices) ①

• many students did not know this or did not make this statement clearly.
• many students managed to prove it in other ways but it was only worth 1 mark.

ii) In Δ's ALD and CLD

LD is common

$\angle ADB=\angle CDB$ (from part (i)) } ①

AD = DC (equal sides of rhombus)

$\therefore \Delta ALD\equiv\Delta CLD$ (SAS) ①

• Generally well done!

iii) $\angle DAL=\angle AXB$ (alternate angles, AD // BC)

$=90^\circ$ since $AX\perp BC$ ①

• Many students still do not mention parallel lines when they say alternate angles.

iv) $\angle LCD=\angle DAL$ (corresponding angle of congruent triangles) ①

$=90^\circ$

• Many students don't give the correct reason or don't state it correctly.

Additional writing space on back page.

Question 12

Answers.

a) Let $x = 1.02626\ldots$

$10x = 10.2626\ldots$

$1000x = 1026.2626\ldots$

$990x = 1016$

$x = \frac{1016}{990}$

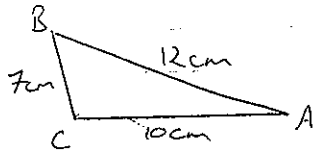
$x = \frac{508}{495} = 1\frac{13}{495}$

★ Many students did not multiply by 1000, choosing 100.

① for this statement or similar

① for simplifying the fraction

b)



$\cos A = \frac{10^2 + 12^2 - 7^2}{2 \times 10 \times 12}$

$= 0.8125\ldots$

$A = \cos^{-1} 0.8125\ldots$

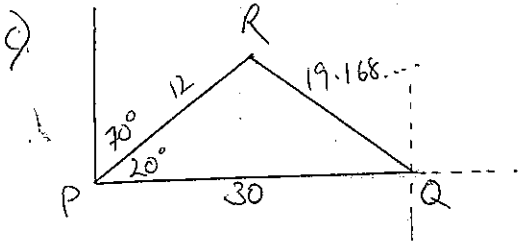
$\doteq 36°$ (to nearest degree)

① for correct substitution

★ Must not list all angles & then not specify which is smallest.

① for correct angle.

c)



i) $RQ = \sqrt{12^2 + 30^2 - 2 \times 12 \times 30 \cos 20}$

$= 19$ km (nearest km)

★ Common to mistake $\angle RPQ = 30°$

① for correct substitution

① for correct answer.

c)ii) $\frac{\sin Q}{12} = \frac{\sin 20°}{19.168\ldots}$

$Q = \sin^{-1}\left(\frac{12 \times \sin 20°}{19.168\ldots}\right)$

$= 12°22'$ (nearest minute)

Bearing of R from Q is

$(270 + 12°22')$

$= 282°22'\ T$

★ Must use unrounded version of RQ. Using 19 gives incorrect answer.

① for correct substitution

① for correctly rounded answer for the bearing.

★ Some students forget to find the bearing

d) $\frac{5b}{2(b+3)} \times \frac{(b+3)(b-2)}{b^2} - \frac{b}{b+1}$

$= \frac{5(b-2)}{2b} - \frac{b}{b+1}$

$= \frac{5(b-2)(b+1) - 2b^2}{2b(b+1)}$

$= \frac{5b^2 - 5b - 10 - 2b^2}{2b(b+1)}$

$= \frac{3b^2 - 5b - 10}{2b^2 + 2b}$

① for changing to inverse multiplication.

① for expressing as one fraction

① for simplified answer.

e) $2^x \times 4^{x+1} = 0.5$

$2^x \times 2^{2x+2} = 2^{-1}$

$3x + 2 = -1$

$3x = -3$

$x = -1$

① for re-writing 0.5 as 2^{-1}

★ Trial and error still needs working

① for final answer.

f) $3x - 4y = 13 \quad -①$

$2x - y = 7 \quad -② \times 4 \Rightarrow ③.$

$8x - 4y = 28 \quad ③$ subtract.

$3x - 4y = 13 \quad ①.$

$5x = 15$

$x = 3$

sub into ②.

$2(3) - y = 7.$

$6 - y = 7$

$y = -1$

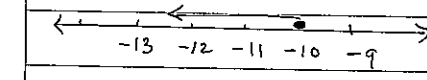
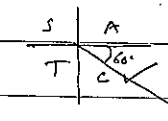
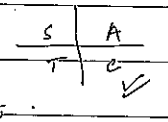
① for evidence of either method (substitution or addition/subtraction)

★ Too many students decided

$5x = 15$

$x = 5$ — This simple mistake cost many marks

① for both answers.

Start here Question 13		
a) $\frac{x}{5} - \frac{x}{2} \geq 3$	Simplifies the inequation 1 mark.	You must ~~then~~ draw the number line with a ruler; Show an even scale with atleast one point on either side of -10.
$2x - 5x \geq 30$		
$-3x \geq 30$ (1 mark).		
$x \leq -10$. 1 mark	Makes x subject of the formula 1 mark.	
	Shows the solution on the number line.	
b) $f = \frac{(M-m)g}{M+m}$		
$f(M+m) = (M-m)g.$	1 mark: wrotes the formula without the denominator.	Most students did this part right.
$fM + fm = Mg - mg$		
$fm + mg = Mg - fM$		
$m(f+g) = M(g-f)$	1 mark: Correctly makes m subject of the formula.	Many students had 'm' on both sides of the formula.
$\therefore m = \frac{M(g-f)}{f+g}.$		
c) $\cot 300°$ 		
$= -\cot 60$		
$= -\frac{1}{\tan 60}$	1 mark: Correct answer with working.	Bald answer will not be accepted for this question.
$= -\frac{1}{\sqrt{3}}.$		
d) $\sin A = -\frac{2}{3}$ 	1 mark: identifies the quadrant and represents the info. with a triangle.	Many students failed to do this successfully. The triangle is drawn with the x-axis.
$\tan A < 0$		
4th quadrant.		

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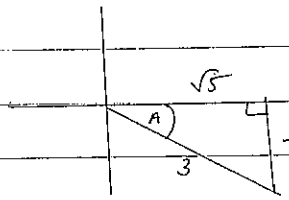

$\therefore \sec A = \frac{1}{\cos A}$

$= \frac{1}{\sqrt{5}/3}$

$= 3/\sqrt{5}$

1 mark: Evaluates $\sec A$ from their triangle. But answer has to be positive.

Many students draw the triangle with Y-axes.

Many students failed to realise that $\tan A < 0$ means $\tan A$ is negative.

e) $\frac{1}{\sin^2\theta} + \frac{1}{\cos^2\theta}$

$\frac{\cos^2\theta + \sin^2\theta}{\sin^2\theta \cos^2\theta}$

$= \frac{1}{\sin^2\theta \cdot \cos^2\theta}$

$= \frac{1}{\sin^2\theta} \cdot \frac{1}{\cos^2\theta}$

$= \operatorname{cosec}^2\theta \cdot \sec^2\theta$

= R.H.S

1 mark: Makes common denominator

1 mark: applies $\sin^2\theta + \cos^2\theta = 1$

1 mark: applies $\frac{1}{\sin^2\theta} = \operatorname{cosec}^2\theta$ and $\frac{1}{\cos^2\theta} = \sec^2\theta$.

You need to start either on LHS or RHS and manipulate to arrive at the result of the other side.

You can't work on both sides and arrive at some common result.

This method is not generally accepted as this will lead to a marking disaster.

PTO.

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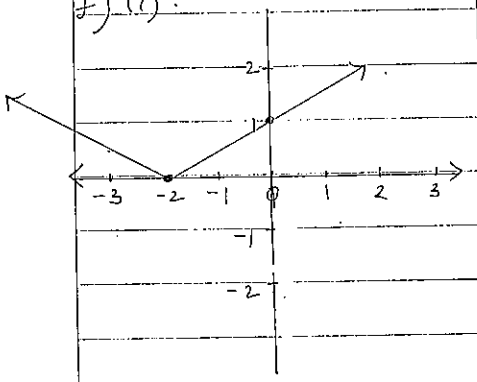
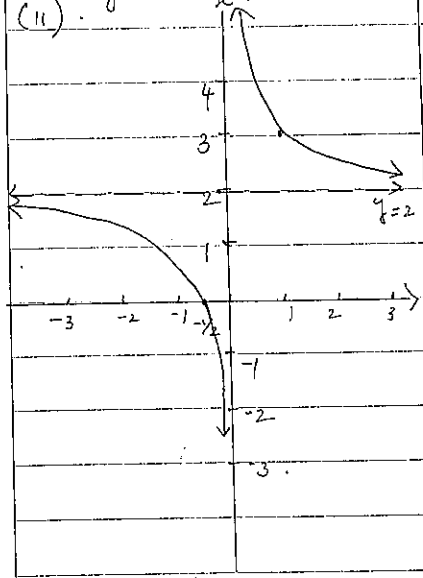
f) (i).



1 mark: Correct intercepts with an even scale shown.

1 mark: Correct shape. (Graph must follow your working).

(ii). $y = 2 + \frac{1}{x}$.



1 mark: Correct intercepts and asymptote labelled.

1 mark: even scale and correct shape.

Grading Criteria

- one third page by
- Ruler used for axes
- Even scale marked
- just writing the intercepts is not enough.

Many students are confused about the lines $x = 2$ and $y = 2$.

Consequently, they had marked $x = -2$ as the asymptote.

- Substituting $y = 0$ gives the x-intercept, not the asymptote!

You may ask for an extra Writing Booklet if you need more space.

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Q14

(a) Start here $f(x) = x^2 - 5x + 1$

(i) $f(2x) = (2x)^2 - 5(2x) + 1$

$= 4x^2 - 10x + 1$ (1/1)

(ii) $4x^2 - 10x + = x^2 - 5x + 1$

$3x^2 - 5x = 0$ (1/2)

$x(3x - 5) = 0$

$x = 0$ or $\frac{5}{3}$ (1/2)

b) $x^2 - 2x + y^2 + 6y - 12 = 0$

$x^2 - 2x + (-1)^2 + y^2 + 6y + (3)^2 = 22$

$(x-1)^2 + (y+3)^2 = 22$.

centre $(1, -3)$ (1/2)

Radius $= \sqrt{22}$ (1/2)

c) Draw a graph and explain why G is not a function (1/1)

Q(i) Prove ΔADE III ΔACB

$\frac{AD}{AC} = \frac{3}{6}$ and $\frac{AE}{AB} = \frac{4}{8}$ (1/3)

Also the included angle A is common. (1/3)

Two sides are proportional and the included angle is equal! (1/3)

≒ 10% of students did $(2x)^2 = 2x^2$

$2x^2 \neq 4x^2$

$(2x)^2$ is not equal to $2x^2$

$(2x)^2 = 4x^2$

well done!

3 students used quadratic formula to find solutions.

Small number have given only one solution.

Careless mistakes $\sqrt{2}$. instead of $\sqrt{22}$ and (-1.3) instead of $(1, -3)$.

well done, only 2 students made mistake on this!

well done in included angle A.

Small percent forgot to mention included angle is equal.

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(ii) $\frac{BC}{3.2} = \frac{2}{1}$

$BC = 6.4$ (1)

e) $\frac{(n-2)180}{n} = \frac{(12-2)180^\circ}{12}$ (1/2)

$= 150^\circ$ (1/2)

f) Good bricks = 450 per lot

$\frac{14500}{450} = 32.2$ (1/3)

∴ he orders 33 lots (1/3)

Minimum number is

33×500

$= 16500$ bricks (1/3)

well done!

well done!

≒ 5% of students did not calculate the minimum number of bricks that he must order.

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Q 15 · A D Madden

a) $f(x) = 2^x + 2^{-x}$

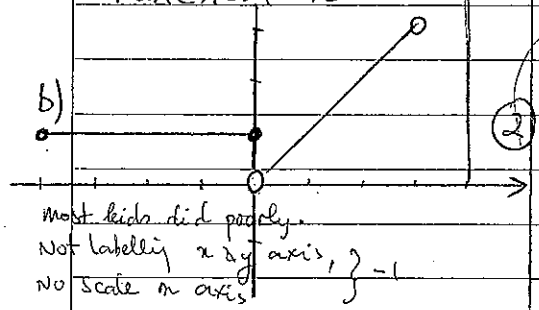
$f(-x) = 2^{-x} + 2^x$ ①

Since $f(x) = f(-x)$ ①

Function is EVEN

good

b)



Most kids did poorly.
Not labelling x & y axis, } -1
No scale on axis

ii) $g(-3) + g(1) + g(4) = 1 + 1 + 0$

$= 2$ ✓ ① okay

iii) Range : $0 \leq y \leq 7$ ①

kids find it is difficult to find the range of discontinuous function

c) $\angle ABC = 59^\circ$

(Conterior $\angle$'s, AD ∥ BC)

$\angle ABC = \angle EBF$ (Vertically opposite angles) ①

No reason or incorrect reason -1

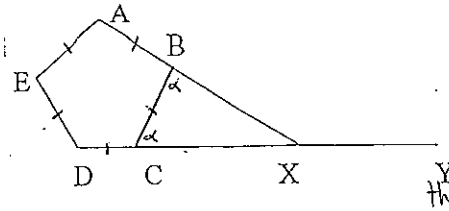
$x + 59 + 42 = 180$

(Angle sum of Δ)

$x = 79^\circ$ ①

most kids did well

d)



Some used interior ∠s' of polygon

d) $\angle CBX = \angle BCX$ (Exterior angles of regular pentagon) ✓ ①

Exterior angle $= \frac{360}{5}$

$= 72^\circ$ ✓ ①

$\angle BXY = 144^\circ$ ✓ (Exterior angle of Δ equals sum of 2 opposite interior angles) ② ①

most kids did well

e) (i) In Δ ABC, $\cos\beta = \frac{h}{b}$ $\therefore h = b\cos\beta$

In Δ BCD, $\cos\alpha = \frac{h}{a}$ $\therefore h = a\cos\alpha$

$\therefore h = b\cos\beta = a\cos\alpha$ ①

ii) Area of $\triangle ACD = \frac{1}{2} AC \times CD \sin\beta$

$= \frac{1}{2} \times b \times h \sin\beta$

$= \frac{1}{2} \times b \times a\cos\alpha \times \sin\beta$ ①

$= \frac{1}{2} ab \sin\beta\cos\alpha$

iii) Area of $\triangle BCD = \frac{1}{2} \times a \times h \sin\alpha$

$= \frac{1}{2} \times a \times b\cos\beta \sin\alpha$ ①

$= \frac{1}{2} ab\cos\beta \sin\alpha$

iv) Area of $\triangle ACB =$

$\frac{1}{2} \times AC \times BC \sin(\alpha+\beta)$

$= \frac{1}{2} ab \sin(\alpha+\beta)$ ①

quite a few add (ii) + (iii) to get $A = \frac{1}{2} ab(\sin\alpha\cos\beta + \cos\beta\sin\alpha)$

If you need more space to answer this question.

Y Theory must have this factorization step