

2007
Higher School Certificate
Preliminary Examination

Mathematics

General Instructions

- Reading time – 5 minutes
- Working time – 2 hours
- Board approved calculators may be used
- Write using black or blue pen
- A table of standard integrals is provided
- All necessary working should be shown in every question
- Write your student number and/or name at the top of every page

Total marks – 84

- Attempt Questions 1 – 7
- All questions are of equal value

This paper MUST NOT be removed from the examination room

STUDENT NUMBER/NAME.....

STUDENT NAME / NUMBER

Question 1	Marks
(a) Evaluate $\frac{122}{3.17 \times 10^{15}}$ expressing your answer in scientific notation correct to 3 significant figures	2
(b) Factorise completely:	
(i) $27 - 8x^3$	1
(ii) $x^2 - 4x + 4 - y^2$	2
(c) Express $\frac{2}{\sqrt{3}-2}$ with rational denominator.	2
(d) Simplify by removing parentheses: $\frac{(\sqrt{2})^5}{2}$	1
(e) In $\triangle ABC$, $a = 2.5$ cm, $b = 3.7$ cm and $c = 4.6$ cm. Find the size of $\angle A$ correct to the nearest degree.	2
(f) Solve, giving your answer as an exact fraction:	2

$$\frac{2x-5}{3} - \frac{2-x}{5} = \frac{1}{2}$$

STUDENT NAME / NUMBER

Question 2 *Start a new page* **Marks**

(a) Solve, leaving your answer in exact form: $x^2 + 2x - 7 = 0$ **2**

(b) Solve: $|3 - 2x| \geq 1$ **2**

(c) The value of shares in a large company fell by 2.7% from opening time on Monday morning until closing time the same day. The value of the shares then fell by 3.09% over the corresponding time period on Tuesday. Express the value of the shares at closing time on Tuesday as a percentage of the value at opening time on Monday. **1**

(d) ABC is an equilateral triangle with sides of length 40 centimetres.

(i) Draw a diagram showing this information and mark in the altitude AD **1**

(ii) Calculate the length of AD, correct to 1 decimal place. **2**

(e) Solve the following pair of simultaneous equations: **2**

$$\begin{aligned} 2x - y &= 9 \\ x + 2y &= -3 \end{aligned}$$

(f) Simplify: $\frac{1}{x^2 - 5x + 6} + \frac{1}{x - 3}$ **2**

STUDENT NAME / NUMBER

Question 3 *Start a new page* **Marks**

(a) Differentiate with respect to x :

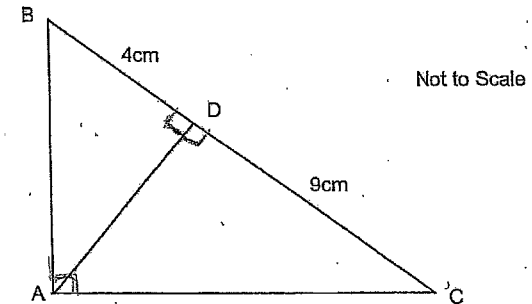
(i) $x(1-x)^7$ **2**

(ii) $\frac{3x}{2-x}$ **2**

(iii) $\sqrt{5-x^4}$ **2**

(iv) $7x - \frac{3}{x} - 2$ **2**

(b)



In the diagram above, $AD \perp BC$ and $BA \perp AC$. $BD = 4$ cm and $DC = 9$ cm.

Copy or trace the diagram onto your worksheet.

(i) Prove that $\triangle ABD$ is similar to $\triangle CAD$. **3**

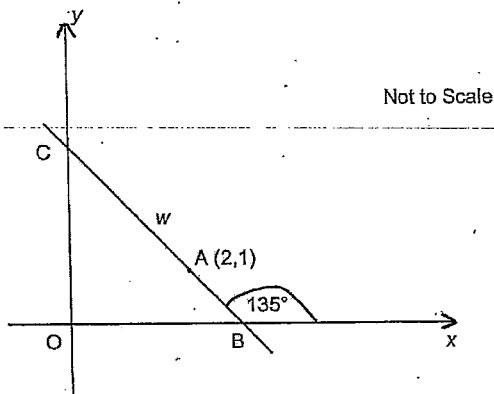
(ii) Find the length of AD, giving reasons. **1**

Question 4

Start a new page

Marks

(a)



In the diagram above, A is the point (2,1). The line w passes through A, making an angle of 135° with the positive x -axis. Line m cuts the x - and y -axes at B and C respectively.

Copy or trace the diagram showing the above information. Also add any further information as obtained in parts (iii), (iv) and (v)

- | | | |
|-------|---|---|
| (i) | Find the gradient of BC. | 1 |
| (ii) | Show that the equation of BC is $x + y - 3 = 0$. | 2 |
| (iii) | Find the coordinates of B and C. | 2 |
| (iv) | Calculate the length of BC. | 1 |
| (v) | D is the point (4,5). Find the perpendicular distance from D to BC. | 1 |
| (vi) | Calculate the area of quadrilateral OBDC, where O is the origin (0,0). | 2 |
| (b) | Find the equation of the normal to the curve $y = 3x^2 - 2$ at the point where $x = 2$ on it. | 3 |

Question 5

Start a new page

Marks

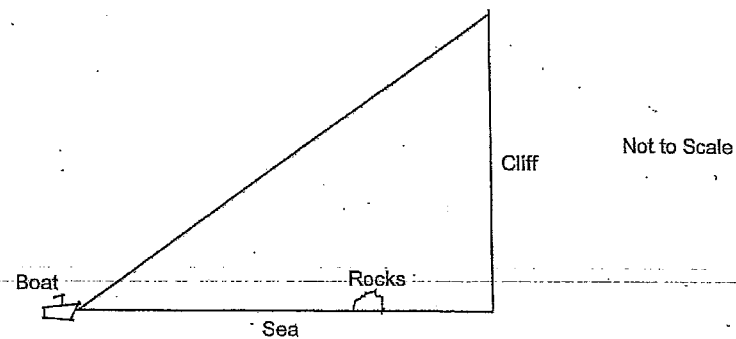
(a) Given that α and β are the roots of the quadratic equation

$$3x^2 - x + 5 = 0,$$

find the value of:

- | | | |
|-------|---|---|
| (i) | $\alpha\beta$ | 1 |
| (ii) | $\alpha + \beta$ | 1 |
| (iii) | $\alpha^2 + \beta^2$ | 1 |
| (iv) | $\frac{\alpha}{\beta} + \frac{\beta}{\alpha} + 1$ | 1 |
| (b) | (i) Simplify: $\tan^2 A(1 - \sin^2 A)$ | 2 |
| | (ii) Hence, or otherwise, solve: $4 \tan^2 A(1 - \sin^2 A) = 1$, for $0^\circ \leq A \leq 360^\circ$ | 2 |

(c)



The diagram above shows a boat at sea. The cliff is vertical and 84 metres high. The rocks are 145 metres from the base of the cliff. From the top of the cliff, the angle of depression to the boat is 24° .

- | | | |
|------|---|---|
| (i) | Copy or trace the diagram showing the above information. | 1 |
| (ii) | Calculate the distance from the rocks to the boat (to the nearest metre). | 3 |

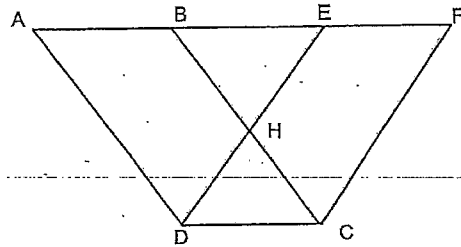
STUDENT NAME / NUMBER

Question 6

Start a new page

Marks

(a)



Not To Scale

A, B, E and F are collinear points. ABCD and EFCD are parallelograms. BC and ED intersect at H such that H is the mid-point of BC. Copy or trace the diagram onto your worksheet.

- (i) Prove that $\triangle BHE \cong \triangle CHD$. 3
- (ii) Show that $DC = BE$. 1
- (iii) Hence or otherwise, show that $AF = 3 \cdot DC$. 1

- (b) For the function defined by: $f(x) = \begin{cases} 3 - x^2 & \text{for } -3 \leq x \leq -1 \\ 2x & \text{for } -1 < x < 1 \\ x^2 - 1 & \text{for } 1 \leq x \leq 3 \end{cases}$
- (i) Evaluate $f(-2)$ 1
 - (ii) $f(1)$ 1
 - (ii) Sketch the graph of the function in the given domain. 3
 - (iii) State the range of the function. 1

- (c) Express, in terms of k , the condition for which the quadratic equation: $2x^2 - (k-3)x + 7k = 0$ has no real roots. Do NOT simplify the expression or find the value(s) of k . 1

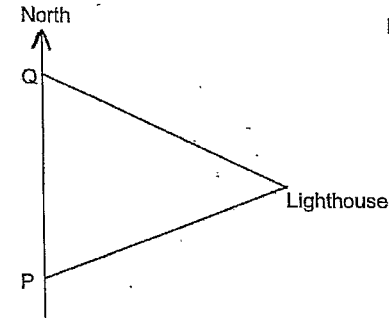
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Question 7

Start a new page

Marks

(a)



Not to Scale

From a ship at point P and sailing due North, the bearing of a lighthouse is $043^\circ T$. After sailing a further 24 kilometres to point Q, the bearing of the lighthouse is $126^\circ T$.

- (i) Copy or trace the diagram showing this information. 1
- (ii) Calculate the distance from the ship to the lighthouse when the second bearing is taken, correct to 2 decimal places. 3

- (b) For the parabola $y = 2x^2 + 4x - 1$:
- (i) Find the coordinates of the vertex and the focus. 2
 - (ii) Find the equations of the axis and the directrix. 2
 - (iii) Draw a neat sketch showing all of the above information. 1

- (c) (i) Draw a neat sketch showing the graphs: 2

$$x^2 + y^2 = 4 \text{ and } y = 2^x$$

- (ii) Shade the region on your sketch where $x^2 + y^2 \geq 4$ and $y \leq 2^x$ 1

End of Paper

**NSW INDEPENDENT TRIAL EXAMS – 2007
MATHEMATICS (2 Unit) PRELIMINARY EXAMINATION
MARKING GUIDELINES**

Question 1

a) **Outcomes assessed : P3**

Marking Guidelines	
Criteria	Marks
• Give evaluation of expression	1
• Give correct answer in scientific notation with 3 significant figures	1

Answer

$$122 \div (3.17 \times 10^{15}) \quad \therefore 122 \div (3.17 \times 10^{15}) = 3.848580442 \times 10^{-14} \\ = 3.85 \times 10^{-14}$$

b) (i) **Outcomes assessed : P3, P4**

Marking Guidelines	
Criteria	Marks
• Correctly factorises cubic binomial.	1

Answer

$$27 - 8x^3 \quad \therefore 27 - 8x^3 = (3 - 2x)(9 + 6x + 4x^2)$$

b) (ii) **Outcomes assessed : P3, P4**

Marking Guidelines	
Criteria	Marks
• Correctly factorises quadratic trinomial	1
• Correctly factorises difference of 2 squares	1

Answer

$$x^2 - 4x + 4 - y^2 \quad \therefore x^2 - 4x + 4 - y^2 = (x - 2)^2 - y^2 \\ = (x - 2 + y)(x - 2 - y)$$

c) **Outcomes assessed : P3**

Marking Guidelines	
Criteria	Marks
• Multiplication by correct conjugate surd	1
• Correct manipulation of surds	1

Answer

$$\frac{2}{\sqrt{3}-2} \quad \therefore \frac{2}{\sqrt{3}-2} = \frac{2}{\sqrt{3}-2} \times \frac{\sqrt{3}+2}{\sqrt{3}+2} \\ = \frac{2\sqrt{3}+4}{3-4} \\ = -2\sqrt{3}-4$$

d) **Outcomes assessed : P3**

Marking Guidelines	
Criteria	Marks
• Correct solution in surd form	1

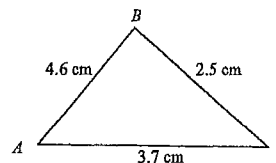
Answer

$$\frac{(\sqrt{2})^5}{2} \quad \therefore \frac{(\sqrt{2})^5}{2} = 2\sqrt{2}$$

e) **Outcomes assessed : P4**

Marking Guidelines	
Criteria	Marks
• Correctly substituted cosine rule	1
• Correct angle size	1

Answer



$$\cos A = \frac{3.7^2 + 4.6^2 - 2.5^2}{2 \times 3.7 \times 4.6} \\ = \frac{28.6}{34.04} \\ A = \cos^{-1}\left(\frac{28.6}{34.04}\right) \\ A = 32^\circ 50' \\ A = 33^\circ$$

f) **Outcomes assessed : P3, P4**

Marking Guidelines	
Criteria	Marks
• Correctly forms a linear equation	1
• Correctly answers question. (improper fraction acceptable)	1

Answer

$$\frac{2x-5}{3} - \frac{2-x}{5} = \frac{1}{2} \quad \therefore 10(2x-5) - 6(2-x) = 15 \\ 20x - 50 - 12 + 6x = 15 \\ 26x = 77 \\ x = 2\frac{25}{26}$$

Question 2

a) Outcomes assessed: P3, P4

Marking Guidelines	
Criteria	Marks
• Correct substitution into the quadratic formula	1
• Correct evaluation leading to 2 correct x values in surd form (simplification not necessary)	1

Answer

$$x^2 + 2x - 7 = 0 \quad \therefore x = \frac{-2 \pm \sqrt{4 - 4 \times (-7)}}{2}$$

$$x = \frac{-2 \pm \sqrt{32}}{2}$$

$$x = \frac{-2 \pm 4\sqrt{2}}{2}$$

$$x = -1 \pm 2\sqrt{2}$$

b) Outcomes assessed: P3, P4

Marking Guidelines	
Criteria	Marks
• One correct solution	1
• Two correct solutions	1

Answer

$$|3 - 2x| \geq 1$$

$$-1 \geq 3 - 2x \quad 3 - 2x \geq 1$$

$$2x \geq 4 \quad 2 \geq 2x$$

$$x \geq 2 \quad x \leq 1$$

$$\therefore x \leq 1 \text{ or } x \geq 2$$

c) Outcomes assessed: P4

Marking Guidelines	
Criteria	Marks
• Correct solution	1

Answer

c) $(0.973 \times 0.9691) \times 100 = 94.29343\%$

d) Outcomes assessed: P4

Marking Guidelines	
Criteria	Marks
• Correct diagram with all information, including altitude	1
• Correct substitution into Pythagoras' Theorem	1
• Correct solution	1

Answer

d) $AD^2 = 40^2 - 20^2$
 $AD^2 = 1200$
 $AD = 34.64$

e) Outcomes assessed: P3, P4

Marking Guidelines	
Criteria	Marks
• One correct solution, correctly obtained.	1
• Two correct solutions	1

Answer

e) $\begin{cases} 2x - y = 9 \\ x + 2y = -3 \end{cases}$
 $x = -3 - 2y$
 $2(-3 - 2y) - y = 9$
 $-6 - 4y - y = 9$
 $-5y = 15$
 $y = -3$
 $x = -3 - 2(-3)$
 $x = 3$

f) Outcomes assessed: P3

Marking Guidelines	
Criteria	Marks
• Correct common denominator with correct numerator	1
• Correct solution from working above	1

Answer

f) $\frac{1}{x^2 - 5x + 6} + \frac{1}{x - 3} = \frac{1}{(x - 2)(x - 3)} + \frac{1}{x - 3}$
 $= \frac{1}{(x - 2)(x - 3)} + \frac{x - 2}{(x - 2)(x - 3)}$
 $= \frac{1 + x - 2}{(x - 2)(x - 3)}$
 $= \frac{x - 1}{(x - 2)(x - 3)}$

Question 3

a)(i) Outcomes assessed: P7

Marking Guidelines

Criteria	Marks
• Correct application of product rule	1
• Correct solution	1

Answer

$$\begin{aligned} \text{a) (i)} \quad \frac{d}{dx} (x(1-x)^7) &= (1-x)^7 + x \cdot 7(1-x)^6 \cdot (-1) \\ &= (1-x)^7 - 7x(1-x)^6 \\ &= (1-x)^6 (1-x-7x) \\ &= (1-x)^6 (1-8x) \end{aligned}$$

a)(ii) Outcomes assessed: P7

Marking Guidelines

Criteria	Marks
• Correct application of quotient rule	1
• Correct solution	1

Answer

$$\begin{aligned} \text{(ii)} \quad \frac{d}{dx} \left(\frac{3x}{2-x} \right) &= \frac{3(2-x) - 3x \cdot -1}{(2-x)^2} \\ &= \frac{6 - 3x + 3x}{(2-x)^2} \\ &= \frac{6}{(2-x)^2} \end{aligned}$$

a)(iii) Outcomes assessed: P7

Marking Guidelines

Criteria	Marks
• Correct application of function of a function rule with fractional power.	1
• Correct solution	1

Answer

$$\begin{aligned} \text{(iii)} \quad \frac{d}{dx} \sqrt{5-x^4} &= \frac{d}{dx} (5-x^4)^{\frac{1}{2}} \\ &= \frac{1}{2} (5-x^4)^{-\frac{1}{2}} \cdot (-4x^3) \\ &= \frac{-2x^3}{\sqrt{5-x^4}} \end{aligned}$$

a)(iv) Outcomes assessed: P7

Marking Guidelines

Criteria	Marks
• Correct derivative of two terms	1
• Correct derivative of third term.	1

Answer

$$\begin{aligned} \text{(iv)} \quad \frac{d}{dx} \left(7x - \frac{3}{x} - 2 \right) &= \frac{d}{dx} (7x - 3x^{-1} - 2) \\ &= 7 + 3x^{-2} \\ &= 7 + \frac{3}{x^2} \end{aligned}$$

b)(i) Outcomes assessed: P2, P4

Marking Guidelines

Criteria	Marks
• Obtaining each condition for similar triangles. (1 mark each)	2
• Condition for similarity	1

Answer

$$\begin{aligned} \text{b) (i)} \quad \text{let } \angle ABD &= x \\ \angle BDA &= 90^\circ && \text{(Given } AD \perp BC) \\ \therefore \angle BAD &= 90 - x && \text{(}\angle \text{sum of } \triangle ABD) \\ \angle BAC &= 90^\circ && \text{(Given } BA \perp AC) \\ \therefore \angle DAC &= 90 - (90 - x) && \text{(}\angle \text{sum of right } \triangle BAC) \\ \angle DAC &= x \\ \text{In } \triangle ABD \text{ and } \triangle CAD &&& \\ \angle ABD &= \angle CAD && \text{(both } = x) \\ \angle BDA &= \angle ADC = 90^\circ && \text{(given } AD \perp BC) \\ \therefore \triangle ABD &\parallel \triangle CAD && \text{(equiangular)} \end{aligned}$$

b)(ii) Outcomes assessed: P7

Marking Guidelines

Criteria	Marks
• Correct solution from correct ratio statement	1

Answer

$$\begin{aligned} \text{(ii)} \quad \frac{AD}{4} &= \frac{9}{AD} && \text{(corresponding sides of similar } \triangle \text{'s are in the same ratio)} \\ AD^2 &= 36 \\ AD &= 6 \end{aligned}$$

Question 4

a)(i) Outcomes assessed: P4

Marking Guidelines		Marks
Criteria		
<ul style="list-style-type: none"> Correct solution with correct reason. 		1

Answer:

(i) $m = \tan(135^\circ)$
 $m = -1$

a)(ii) Outcomes assessed: P4

Marking Guidelines		Marks
Criteria		
<ul style="list-style-type: none"> Correct substitution into point-gradient formula 		1
<ul style="list-style-type: none"> Correct solution. 		1

Answer:

(ii) $y - 1 = -1(x - 2)$
 $y - 1 = -x + 2$
 $x + y - 3 = 0$

a)(iii) Outcomes assessed: P4

Marking Guidelines		Marks
Criteria		
<ul style="list-style-type: none"> One mark for each correct solution 		2

Answer

(iii) $x = 0, y = 3$ C(0, 3)
 $y = 0, x = 3$ B(3, 0)

a)(iv) Outcomes assessed: P4

Marking Guidelines		Marks
Criteria		
<ul style="list-style-type: none"> Correct solution 		1

Answer

(iv) $BC^2 = 3^2 + 3^2$
 $BC^2 = 9 + 9$
 $BC^2 = 18$
 $BC = 3\sqrt{2}$

a)(v) Outcomes assessed: P4

Marking Guidelines		Marks
Criteria		
<ul style="list-style-type: none"> Correct solution 		1

Answer

(v) $d = \frac{|4 + 5 - 3|}{\sqrt{1 + 1}}$
 $d = \frac{6}{\sqrt{2}} = 3\sqrt{2}$

a)(vi) Outcomes assessed: P2, P4

Marking Guidelines		Marks
Criteria		
<ul style="list-style-type: none"> Correct area of one triangle 		1
<ul style="list-style-type: none"> Correct area of second triangle and correct final solution 		1

Answer

(vi) $A = \frac{1}{2} \times 3 \times 3 + \frac{1}{2} \times 3\sqrt{2} \times \frac{6}{\sqrt{2}}$
 $A = 4\frac{1}{2} + 9$
 $A = 13.5 \text{ units}^2$

b) Outcomes assessed: P2, P4, P5, P6, P7

Marking Guidelines		Marks
Criteria		
<ul style="list-style-type: none"> Correct derivative and gradient of tangent 		1
<ul style="list-style-type: none"> Correct gradient of normal from above 		1
<ul style="list-style-type: none"> Correct equation of normal 		1

Answer

b) $y = 3x^2 - 2$
 $y' = 6x$
 At $x = 2$
 $y' = 12$
 Gradient of normal = $-\frac{1}{12}$
 At $x = 2, y = 10$ (2, 10)
 $y - 10 = -\frac{1}{12}(x - 2)$
 $12y - 120 = -x + 2$
 $x + 12y = 122$

Question 5

a)(i) Outcomes assessed: P3, P4

Marking Guidelines		Marks
Criteria		
• Correct solution		1

Answer

(a)(i) $\alpha\beta = \frac{5}{3}$

a)(ii) Outcomes assessed: P3, P4

Marking Guidelines		Marks
Criteria		
• Correct solution		1

Answer

(ii) $\alpha + \beta = \frac{1}{3}$

a)(iii) Outcomes assessed: P2, P3, P4

Marking Guidelines		Marks
Criteria		
• Correct solution from (i) and (ii)		1

Answer

(iii) $\alpha^2 + \beta^2 = (\alpha + \beta)^2 - 2\alpha\beta$
 $= \left(\frac{1}{3}\right)^2 - 2 \times \frac{5}{3}$
 $= -3\frac{2}{9}$

a)(iv) Outcomes assessed: P2, P3, P4

Marking Guidelines		Marks
Criteria		
• Correct solution from parts (i) and (iii)		1

Answer

(iv) $\frac{\alpha}{\beta} + \frac{\beta}{\alpha} + 1 = \frac{\alpha^2 + \beta^2}{\alpha\beta} + 1$
 $= \frac{-3\frac{2}{9}}{\frac{5}{3}} + 1$
 $= \frac{-5}{3} + 1$
 $= -1\frac{14}{15} + 1$
 $= \frac{-14}{15}$

b)(i) Outcomes assessed: P3, P4

Marking Guidelines		Marks
Criteria		
• Correct substitution for $\tan^2 A$		1
• Correct substitution for $1 - \sin^2 A$ (or vice-versa) and final solution		1

Answer

b)(i) $\tan^2 A(1 - \sin^2 A) = \frac{\sin^2 A}{\cos^2 A} \cdot \cos^2 A$
 $= \sin^2 A$

b)(ii) Outcomes assessed: P3, P4

Marking Guidelines		Marks
Criteria		
• Correctly obtain $\sin A = \pm \frac{1}{2}$		1
• Correct final solutions		1

Answer:

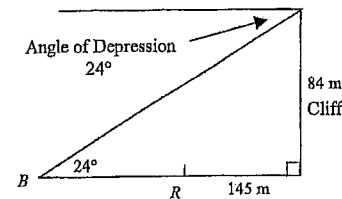
(ii) $4 \tan^2 A(1 - \sin^2 A) = 1$
 $4 \sin^2 A = 1$
 $\sin^2 A = \frac{1}{4}$
 $\sin A = \pm \frac{1}{2}$
 $A = 30^\circ, 150^\circ, 210^\circ, 330^\circ$

c)(i) Outcomes assessed: P2, P4

Marking Guidelines		Marks
Criteria		
• Correctly draw diagram showing angle of depression		1

Answer:

c)(i)



c)(ii) Outcomes assessed: P2, P3, P4

Marking Guidelines		Marks
Criteria		
• Correct use of tan		1
• Correct distance from ship to cliff base.		1
• Correct distance from ship to rocks obtained from answer above		1

Answer:

$$(ii) \tan 24^\circ = \frac{84}{x}$$

$$x = \frac{84}{\tan 24^\circ}$$

$$x = 188.667$$

$$\text{Distance} = 189 - 145 = 44 \text{ m}$$

Question 6

n)(i) Outcomes assessed: P2, P4

Marking Guidelines		Marks
Criteria		
• Correctly obtain each of 3 criteria for congruent triangles		3

Answer:

6) a) $AB \parallel DC$ (opposite sides of Parallelogram $ABCD$ parallel)

$\therefore AF \parallel DC$ (since $ABEF$ are collinear)

(i) In $\triangle BHE$ and $\triangle CHD$

$\angle EBH = \angle DCH$ (alternate angles, $BE \parallel DC$)

$\angle BHE = \angle CHD$ (vertically opposite angles)

$BH = HC$ (given H is the mid-point of BC)

$\therefore \triangle BHE \cong \triangle CHD$ (ASA)

a)(ii) Outcomes assessed: P2, P4

Marking Guidelines		Marks
Criteria		
• Correct solution with reason		1

Answer:

(ii) $DC = BE$ (corresponding sides in congruent triangles are equal $\triangle BHE \cong \triangle CHD$)

a)(iii) Outcomes assessed: P1, P2, P4

Marking Guidelines		Marks
Criteria		
• Correct solution with reason		1

Answer:

(iii) $DC = BE$ (proven above)

$DC = AB$ (opposite sides of parallelogram $ABCD$ are equal)

$DC = EF$ (opposite sides of parallelogram $CDEF$ are equal)

$AF = AB + BE + EF$

$AF = DC + DC + DC$ (since $DC = BE$, $DC = AB$, $DC = EF$)

$\therefore AF = 3DC$

b)(i)(a) Outcomes assessed: P4, P5

Marking Guidelines		Marks
Criteria		
• Correct solution		1

Answer:

b) (i)(a) $f(-2) = 3 - (-2)^2$

$$f(-2) = -1$$

b)(i)(b) Outcomes assessed: P4, P5

Marking Guidelines		Marks
Criteria		
• Correct solution		1

Answer:

$$(b) f(1) = 1^2 - 1$$

$$f(1) = 0$$

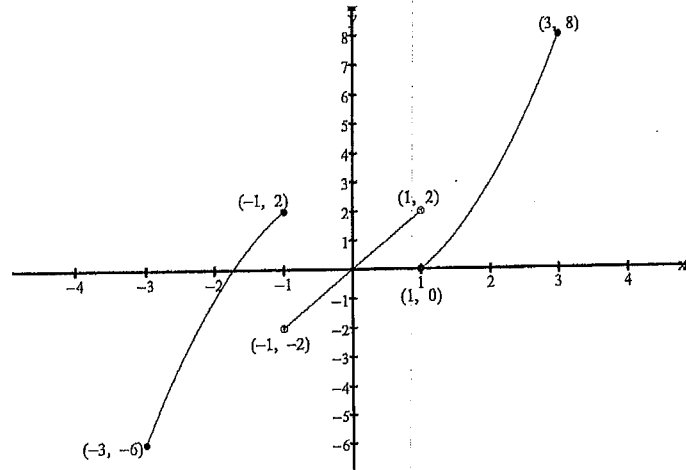
b)(ii) Outcomes assessed: P4, P5

Marking Guidelines

Criteria	Marks
• Correctly draw each of the 3 graphs (1 mark each)	3

Answer:

(ii)



b)(iii) Outcomes assessed: P3, P4

Marking Guidelines

Criteria	Marks
• Correct solution.	1

Answer:

(iii) Range $-6 \leq y \leq 8$

c) Outcomes assessed: P4

Marking Guidelines

Criteria	Marks
• Correct solution.	1

Answer:

(c) No real roots $\Delta < 0$
 $(k-3)^2 - 4 \times 2 \times 7k < 0$

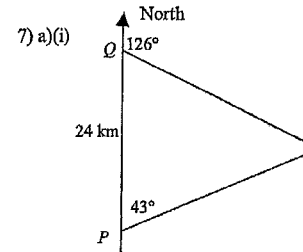
Question 7

a)(i) Outcomes assessed: P4

Marking Guidelines

Criteria	Marks
• Correct diagram with bearings shown.	1

Answer:



a)(ii) Outcomes assessed: P3, P4

Marking Guidelines

Criteria	Marks
• Correctly obtain angles in triangle	1
• Apply Sine Rule correctly	1
• Correct solution	1

Answer:

a)(ii) $\angle QLP = 126 - 43 = 83$

$$\frac{LQ}{\sin 43} = \frac{24}{\sin 83}$$

$$LQ = \frac{24 \sin 43}{\sin 83}$$

$$LQ = 16.49 \text{ km}$$

b)(i)(ii) Outcomes assessed: P4, P5

Marking Guidelines

Criteria	Marks
• Correct solution. 1 mark each answer. Max 3 marks for answers correctly obtained from incorrect working	4

Answer:

b) $y = 2x^2 + 4x - 1$
 $y + 1 = 2x^2 + 4x$
 $\frac{1}{2}(y+1) = x^2 + 2x$
 $\frac{1}{2}y + \frac{1}{2} + 1 = x^2 + 2x + 1$
 $(x+1)^2 = \frac{1}{2}(y+3)$
 $(x+1)^2 = 4\left(\frac{1}{8}\right)(y+3)$

(i) Vertex :- $(-1, -3)$
 Focus :- $\left(-1, -2\frac{7}{8}\right)$

(ii) Axis :- $x = -1$
 Directrix :- $y = -3\frac{1}{8}$

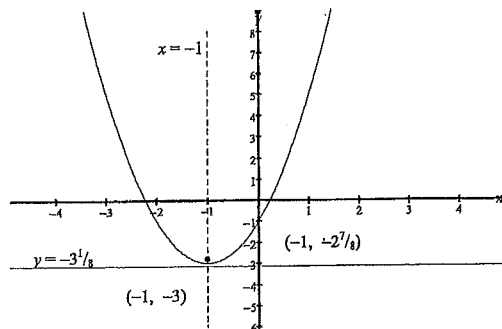
b)(iii) Outcomes assessed: P3, P4

Marking Guidelines

Criteria	Marks
• Correct graph from solutions in (i) and (ii)	1

Answer:

(iii)



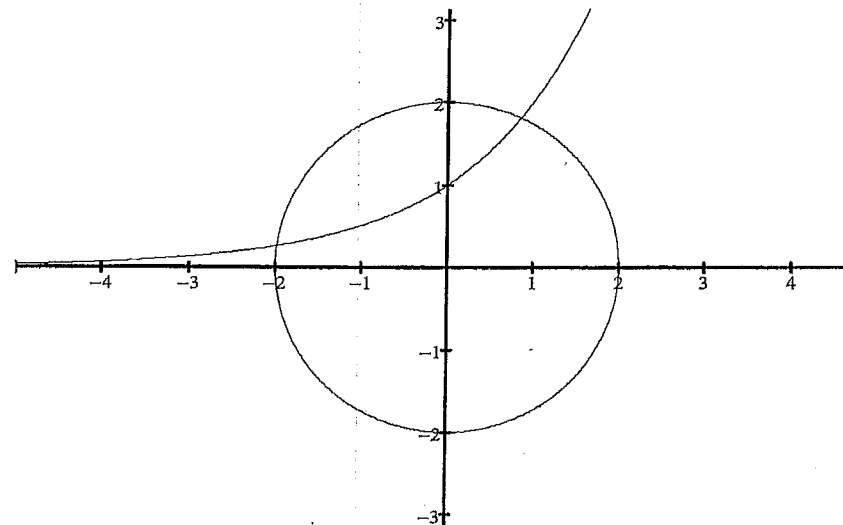
c)(i) Outcomes assessed: P5, P5

Marking Guidelines

Criteria	Marks
• Correct graphs. 1 mark each	2

Answer:

(c)(i)



c)(ii) Outcomes assessed: P4, P5

Marking Guidelines

Criteria	Marks
• Correct area shaded	1

Answer:

(ii)

