Candidate Name | Index. No | Class

3EX

MATHEMATICS

4048

[80 marks]

SEMESTER ONE EXAMINATION

May 2015

2 hours

Additional material: Electronic Calculator, Geometrical Instruments, writing papers, graph paper.

INSTRUCTIONS TO CANDIDATES

Do not open this booklet until you are told to do so.

Write your name, index number and class on all the work you hand in.

Write in dark blue or black pen.

You may use a pencil for any diagrams or graphs.

Do not use staples, paper clips, glue or correction fluid.

Answer **ALL** questions.

For **Section A**, write your answers in the spaces provided on the question paper.

For **Section B**, write your answers in the spaces on the separate answer paper provided.

If working is needed for any question, it must be shown with the answer.

Omission of essential working will result in loss of marks.

INFORMATION FOR CANDIDATES

The use of an approved scientific calculator is expected, where appropriate.

If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to **three** significant figures. Give answers in degrees to **one** decimal place.

For π ,use either your calculator value or 3.142, unless the question requires the answer in terms of π .

The number of marks is given in brackets [ ] at the end of each question or part question.

The total number of marks for this paper is **80**.

Brand & Model of Calculator

For Examiner's Use	
Section A	40
Section B	40
Total	**80**

This document consists of **10** *printed pages.* 67

Setter: Mrs Quek Ai Jee

Vetter: Mr Nara

For Examiner's Use

SECTION A [40 marks]

Answer **all** the questions

For Examiner's Use

1 (a) Simplify $1 \div 2x^{-3}$

Answer..... [1]

(b) Simplify $x^2y \times x^3y^{-2}$

Answer..... [1]

---

2 Simplify $2x - 3(1-x)^2$.

Answer ..... [2]

---

3 (a) Factorise $1 - 4x^2$

Answer ..... [1]

(b) Factorise fully $6x^2 - 3xy - 10x + 5y$

Answer ..... [2]

For Examiner's Use

4 . (a) The number 5003.08 can be written as $5\times10^3+3\times10^x+8\times10^y$.
Given that x and y are integers, find the values of x and y.

Answer $x=$..... $y=$..... [2]

(b) The diameter of the Sun is $1.392\times10^6\,km$.
The diameter of the Earth is $1.275\times10^4\,km$.
How many times bigger is the diameter of the Sun than the diameter of Earth? Give your answer in standard form.

Answer ..... [1]

5 A vase has a height of 12 cm and capacity 300 cm³.
A geometrically similar vase has a height of 15.6 cm and a base diameter of 7.8 cm.

(a) Calculate the base diameter of the smaller vase.

Answer .....*cm* [1]

(b) Calculate the capacity of the larger vase

Answer .....cm^3 [2]

For Examiner's Use

6 (a) Solve the inequality $3-2x>10$.

Answer ..... [1]

(b) Hence write down the greatest integer value of x which satisfies $3-2x>10$

Answer ..... [1]

---

7 A map is drawn to a scale of 1: 20000.

(a) This scale can be written in the form 1 cm: x km. Find x.

Answer ..... [1]

(b) On the map the area of the Bishan-Ang Mo Kio Park is 15.5 cm^2. Calculate the real area of the park, in square kilometres.

Answer .....km^2 [2]

For Examiner's Use

For Examiner's Use

8 (a) Solve the equation $2(x+1)^2 = 3(x+1)$

Answer $x =$ ..... or $x =$ ..... [2]

(b) One solution of the equation $3x^2 + 7x + k = 0$, where k is a constant, is $x = -3$. Find

(i) the value of k,

Answer $k =$ ..... [1]

(ii) the second solution of the equation.

Answer $x =$ ..... [1]

---

9 (a) Given that $\sqrt{5} \times (5^2)^{k-1} = 1$. Find the value of k.

Answer $k =$ ..... [2]

(b) Solve the equation $\frac{2x}{3} - \frac{5-x}{2} = 1$

Answer $x =$ ..... [2]

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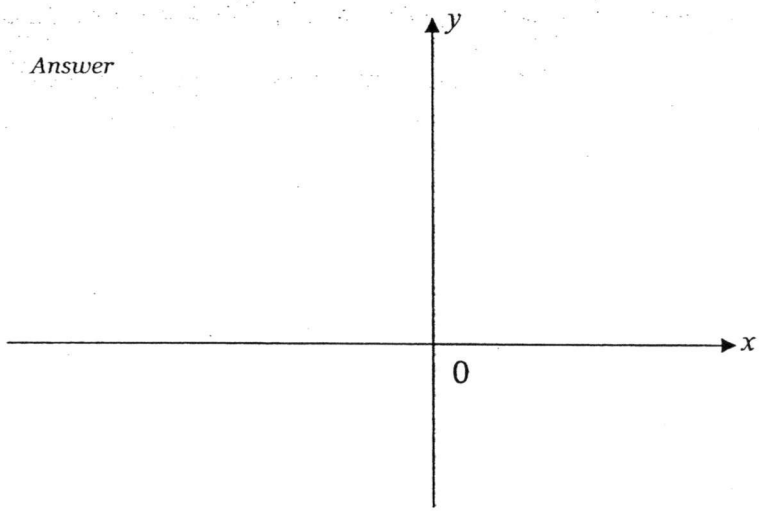
For Examiner's Use

For Examiner's Use

10 (a) Sketch the quadratic graph of $y = 5-(x+2)^2$.

Answer



[2]

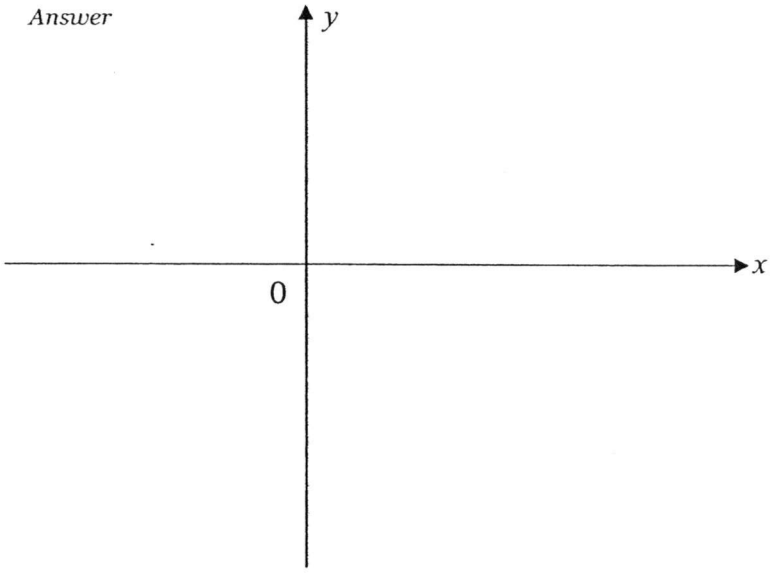
(b) Write down the coordinates of the maximum point of the curve $y = 5-(x+2)^2$.

Answer ..... [1]

---

11 (a) Sketch the graph of $y = x(x-5)$.

Answer



[2]

[2]

(b) Write down the equation of the line of symmetry of the graph of $y = x(x-5)$.

Answer ..... [1]

For Examiner's Use

12 Given that $2 \leq x \leq 6$ and $-5 \leq y \leq 3$, find

(a) the possible minimum value of $(2x+y)^2$.

Answer ..... [1]

(b) the possible maximum value of $\frac{y^2}{x}$.

Answer ..... [1]

(c) the possible minimum value of $y(1-x)^2$.

Answer ..... [1]

---

13 (a) Express x^2-6x+5 in the form $(x-p)^2+q$.

Answer ..... [2]

(b) Hence write down the minimum value of x^2-6x+5

Answer ..... [1]

(c) Hence or otherwise, solve the equation $x^2-6x+5=12$.

Answer $x =$ ..... or $x =$ ..... [2]

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SECTION B [40 marks]

Answer **all** the questions on the separate answer paper provided.

1. (a) Given that the roots of a quadratic equation are -1 and $\frac{2}{3}$, form the quadratic equation with integer coefficients. [2]

(b) Solve the equation $2x+1+\frac{x+1}{x-1}=-1$. [3]

---

2. (a) Express as a single fraction in its simplest form $\frac{3x}{(2x-1)^2}-\frac{1}{(2x-1)}$. [2]

(b) Given that $\sqrt{\frac{x^2-y}{y}}=\frac{3}{2x}$, express y in terms of x. [3]

---

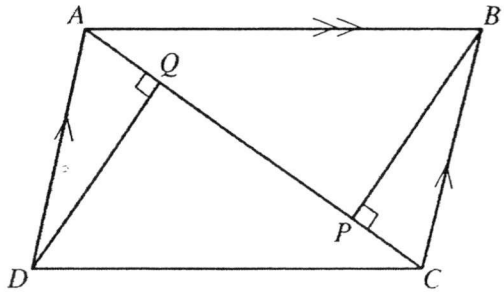
3. (a) Solve the inequality $3x+1 < 9-5x \leq 24$. [3]

(b) Ahmad needs a loan of \$80 000 to buy a new car.
Bank A charges an interest rate of 2.45% per annum compounded monthly.
Bank B charges a simple interest rate of 2.65% per annum.
Which bank should he borrow from if he were to take a five year loan?
Justify your answer. [4]

[Formulae for Compound Interest : Total amount $= P\left(1+\frac{r}{100}\right)^n$]

---

4. In the diagram, $ABCD$ is a parallelogram. The points P and Q lie on the diagonal AC such that angle AQD = angle $BPC = 90°$.



(a) Prove that ΔADQ is congruent to ΔCBP. [2]

(b) Name another pair of congruent triangles. [1]

---

5. Nicole cycles from her house to school at an average speed of 12 km/h every morning. The school is $(2x + 5)$ km away from her house. She realises that if she increases the average speed of her cycling by x km/h, she could save 20 minutes of her travelling time.

(a) Write down an expression, in terms of x, for the time taken for Nicole to travel to school at 12 km/h. [1]

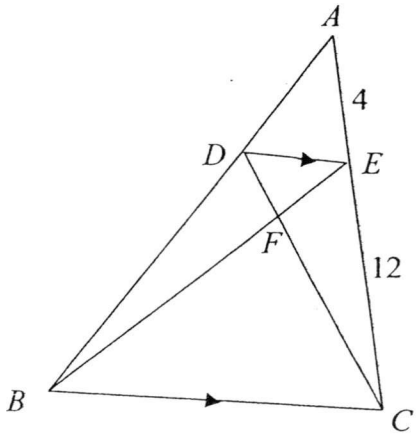
(b) Hence, form an equation in x and show that it reduces to $2x^2 + x - 48 = 0$. [2]

(c) Solve the equation $2x^2 + x - 48 = 0$. [2]

(d) Find the distance between Nicole's house and her school. [1]

---

6. In the diagram below, D and E are two points on ΔABC in which $DE \,//\, BC$. Given that CD and BE intersect at F. $AE = 4$ cm and $EC = 12$ cm.



(a) Show that triangles ABC and ADE are similar. [2]

(b) Find the length of DE if $BC = 18$ cm. [2]

(c) Find

(i) $\dfrac{EF}{FB}$ [1]

(ii) $\dfrac{area\ of\ \Delta DEF}{area\ of\ \Delta CBF}$ [1]

(iii) $\dfrac{area\ of\ \Delta ADE}{area\ of\ trapezium\ DECB}$ [1]

(iv) $\dfrac{area\ of\ \Delta ABE}{area\ of\ \Delta ABC}$ [1]

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7. **Answer the whole of this question on a sheet of graph paper.**

The variables x and y are connected by the equation $y = \frac{1}{2}(2-x)(5+x)$.

The table below shows some values of x and the corresponding values of y

x	−5	−4	−3	−2	−1	0	1	2	3
y	0	3	p	6	6	5	3	*0*	*-4*

(a) Find the value of p [1]

(b) Using a scale of 2 cm to 1 unit on each axis, draw the graph of the equation $y = \frac{1}{2}(2-x)(5+x)$ for $-5 \leq x \leq 3$. [3]

(c) Hence, use your graph to solve the equation $(2-x)(5+x) = 8$. [2]

------END-----

Candidate Name | Index. No | Class

MAYFLOWER SECONDARY SCHOOL

3EX

MATHEMATICS	4048
[80 marks]	
	SEMESTER ONE EXAMINATION
Marking Scheme	May 2015
	2 hours

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The number of marks is given in brackets [ ] at the end of each question or part question.

The total number of marks for this paper is **80**.

Brand & Model of Calculator

For Examiner's Use	
Section A	40
Section B	40
Total	**80**

This document consists of **10** *printed pages.*

Setter: Mrs Quek Ai Jee

Vetter: Mr Nara

↑3

For Examiner's Use

SECTION A [40 marks]

Answer **all** the questions

For Examiner's Use

1 (a) Simplify $1 \div 2x^{-3}$

$1 \div 2x^{-3}$

$= 1 \div \frac{2}{x^3}$

$= 1 \times \frac{x^3}{2}$

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

Answer $\frac{x^3}{2}$ [1]

(b) Simplify $x^2y \times x^3y^{-2}$

$x^2y \times x^3y^{-2}$

$= x^5y^{-1}$

$= \frac{x^5}{y}$

Answer x^5y^{-1} or $\frac{x^5}{y}$ [1]

---

2 Simplify $2x-3(1-x)^2$.

$2x-3(1-x)^2$

$= 2x-3(1-2x+x^2)$ (1)

$= 2x-3+6x-3x^2$

$= -3x^2+8x-3$ (1)

Answer $-3x^2+8x-3$ [2]

---

3 (a) Factorise $1-4x^2$

$1-4x^2$

$= 1^2-(2x)^2$

$= (1-2x)(1+2x)$

Answer $(1-2x)(1+2x)$ [1]

(b) Factorise fully $6x^2-3xy-10x+5y$

$6x^2-3xy-10x+5y$

$= 3x(2x-y)-5(2x-y)$ (1)

$= (2x-y)(3x-5)$ (1)

Answer $(2x-y)(3x-5)$ [2]

For Examiner's Use

4 (a) The number 5003.08 can be written as $5\times10^3+3\times10^x+8\times10^y$.
Given that x and y are integers, find the values of x and y.

5003.08
$= 5000 + 3 + 0.08$
$= 5\times10^3 + 3\times10^0 + 8\times10^{-2}$

Answer $x =$ 0 (1) $y =$ −2 (1) [2]

(b) The diameter of the Sun is 1.392×10^6 *km*.
The diameter of the Earth is 1.275×10^4 *km*.
How many times bigger is the diameter of the Sun than the diameter of Earth? Give your answer in standard form.

$$\frac{1.392\times10^6}{1.275\times10^4}$$
$$= 1.09\times10^2 \quad (3\text{ s.f})$$

Answer 1.09×10^2 [1]

5 A vase has a height of 12 cm and capacity 300 cm³.
A geometrically similar vase has a height of 15.6 cm and a base diameter of 7.8 cm.

(a) Calculate the base diameter of the smaller vase.

By property of similarity
$$\frac{d}{7.8} = \frac{12}{15.6}$$
$$d = \frac{12}{15.6}\times7.8$$
$$= 6$$

Answer 6 *cm* [1]

(b) Calculate the capacity of the larger vase

$$\frac{V}{300} = \left(\frac{15.6}{12}\right)^3 \quad (1)$$
$$V = \left(\frac{15.6}{12}\right)^3 \times 300$$
$$V = 659.1 \quad (1)$$

Answer 659.1 cm^3 [2]

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For Examiner's Use

6 (a) Solve the inequality $3-2x>10$.

$3-2x>10$

$-2x>7$

$x<-\frac{7}{2}$

$x<-3\frac{1}{2}$

Answer $x<-3\frac{1}{2}$ [1]

(b) Hence write down the greatest integer value of x which satisfies $3-2x>10$

Answer -4 [1]

---

7 A map is drawn to a scale of 1: 20000.

(a) This scale can be written in the form 1 cm: x km. Find x.

$1:20000$

$= 1\text{cm}: 20000\text{cm}$

$= 1\text{cm}: \frac{20000}{100\times1000}\text{km}$

$= 1\text{cm}: \frac{1}{5}\text{km}$

$= 1\text{cm}: 0.2\text{km}$

Answer $\frac{1}{5}$ or 0.2 [1]

(b) On the map the area of the Bishan-Ang Mo Kio Park is 15.5 cm². Calculate the real area of the park, in square kilometres.

area scale

$= 1\text{cm}^2 : 0.2^2\text{km}^2$

$= 1\text{cm}^2 : 0.04\text{km}^2$ (1)

Real area of the park

$= 15.5\times0.04\text{km}^2$

$= 0.62\text{km}^2$ (1)

Answer 0.62 km^2 [2]

For Examiner's Use

8 (a) Solve the equation $2(x+1)^2 = 3(x+1)$

$2(x+1)^2 = 3(x+1)$

$2(x+1)^2 - 3(x+1) = 0$

$(x+1)[2(x+1)-3] = 0$

$(x+1)(2x-1) = 0$ (1)

$x+1=0$ or $2x-1=0$

$x=-1$ or $x=\frac{1}{2}$ (1)

Answer $x = \ldots -1 \ldots$ or $x = \ldots \frac{1}{2} \ldots$ [2]

(b) One solution of the equation $3x^2 + 7x + k = 0$, where k is a constant, is $x = -3$. Find

(i) the value of k,

Sub $x=-3$ into $3x^2+7x+k=0$

$3(-3)^2 + 7(-3) + k = 0$

$27 - 21 + k = 0$

$k = -6$

Answer $k = \ldots -6 \ldots$ [1]

(ii) the second solution of the equation.

$3x^2 + 7x - 6 = 0$

$(x+3)(3x-2) = 0$

$x = -3$ or $x = \frac{2}{3}$

Answer $x = \ldots \frac{2}{3} \ldots$ [1]

---

9 (a) Given that $\sqrt{5} \times (5^2)^{k-1} = 1$. Find the value of k.

$\sqrt{5} \times (5^2)^{k-1} = 1$

$5^{\frac{1}{2}} \times 5^{2k-2} = 5^0$ (1)

$5^{\frac{1}{2}+2k-2} = 5^0$

$5^{2k-\frac{3}{2}} = 5^0$

$2k - \frac{3}{2} = 0$

$2k = \frac{3}{2}$

$k = \frac{3}{4}$ (1)

Answer $k = \ldots \frac{3}{4} \ldots$ [2]

(b) Solve the equation $\frac{2x}{3} - \frac{5-x}{2} = 1$

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

Multiply the equation by 6

$4x - 3(5-x) = 6$ (1)

$4x - 15 + 3x = 6$

$7x = 6 + 15$

$x = \frac{21}{7}$

$x = 3$ (1)

OR $\frac{2(2x) - 3(5-x)}{6} = 1$

$\frac{4x - 15 + 3x}{6} = 1$ (1)

$7x - 15 = 6$

$7x = 21$

$x = 3$ (1)

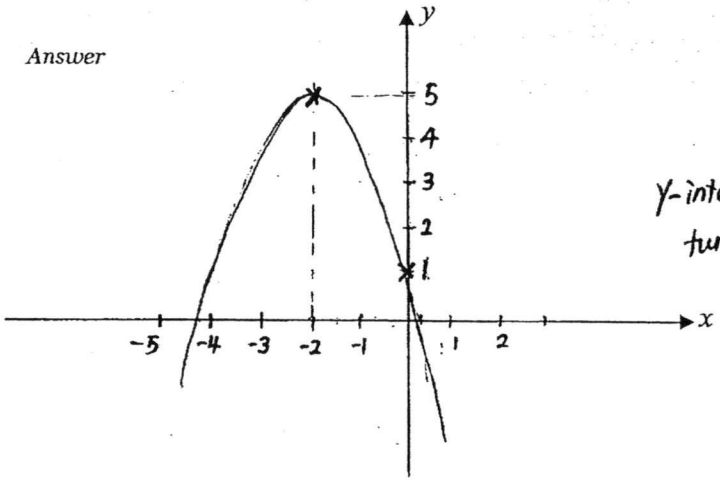
Answer $x = \ldots 3 \ldots$ [2]

For Examiner's Use

10 (a) Sketch the quadratic graph of $y = 5-(x+2)^2$. Label the y-intercept clearly.

For Examiner's Use

Answer



y-intercept } (1)
turning pt }
shape (1)

[2]

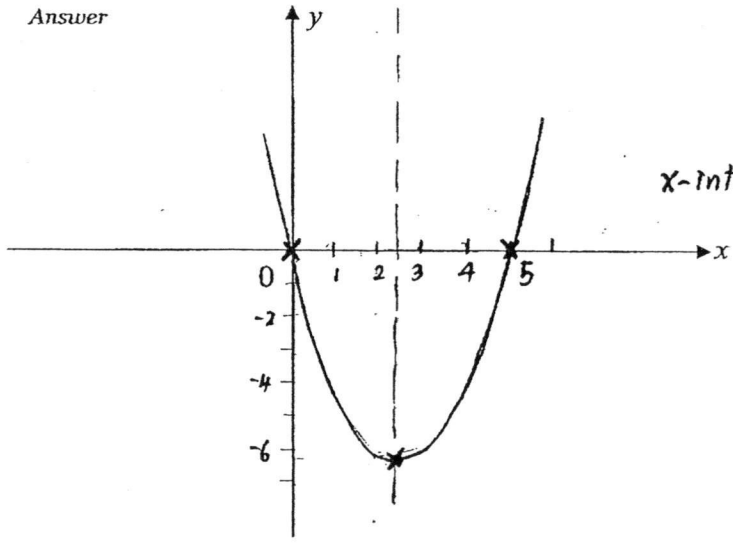
(b) Write down the coordinates of the maximum point of the curve $y = 5-(x+2)^2$.

Answer (-2, 5) [1]

---

11 (a) Sketch the graph of $y = x(x-5)$. Label the x-intercepts clearly.

Answer



x-intercepts (1)
shape (1)

[2]

(b) Write down the equation of the line of symmetry of the graph of $y = x(x-5)$.

$x = \frac{0+5}{2}$

$x = 2.5$

Answer $x = 2.5$ [1]

For Examiner's Use

12 Given that $2 \leq x \leq 6$ and $-5 \leq y \leq 3$, find

(a) the possible minimum value of $(2x+y)^2$.

$[2\times 2+(-4)]^2 = 0$

Answer 0 [1]

(b) the possible maximum value of $\frac{y^2}{x}$.

$\frac{(-5)^2}{2} = 12\frac{1}{2}$

Answer $12\frac{1}{2}$ [1]

(c) the possible minimum value of $y(1-x)^2$.

$-5(1-6)^2 = -5\times 25 = -125$

Answer -125 [1]

---

13 (a) Express x^2-6x+5 in the form $(x-p)^2+q$.

x^2-6x+5
$= x^2-6x+(\frac{-6}{2})^2+5-(\frac{-6}{2})^2$ (1)
$= x^2-6x+3^2+5-9$
$= (x-3)^2-4$ (1)

Answer $(x-3)^2-4$ [2]

(b) Hence write down the minimum value of x^2-6x+5

Answer -4 [1]

(c) Hence or otherwise solve the equation $x^2-6x+5=12$.

$x^2-6x+5=12$
$(x-3)^2-4=12$
$(x-3)^2=16$
$x-3=\pm\sqrt{16}$ (1)
$x-3=-4$ or $x-3=4$
$x=-4+3$ $x=4+3$
$x=-1$ (1) $x=7$

$x^2-6x+5-12=0$
$x^2-6x-7=0$
$(x+1)(x-7)=0$ (1)
$x=-1$ or $x=7$ (1)

Answer $x=-1$ or $x=7$ [2]

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SECTION B [40 marks]

Answer **all** the questions on the separate answer paper provided.

1. (a) Given that the roots of a quadratic equation are -1 and $\frac{2}{3}$, form the quadratic equation with integer coefficients. [2]

(b) Solve the equation $2x+1+\frac{x+1}{x-1}=-1$. [3]

---

2. (a) Express as a single fraction in its simplest form $\frac{3x}{(2x-1)^2}-\frac{1}{(2x-1)}$. [2]

(b) Given that $\sqrt{\frac{x^2-y}{y}}=\frac{3}{2x}$, express y in terms of x. [3]

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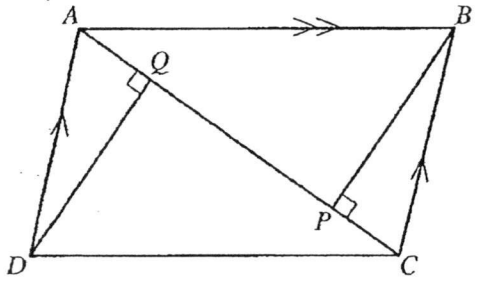
3. (a) Solve the inequality $3x+1 < 9-5x \leq 24$. [3]

(b) Ahmad needs a loan of \$80 000 to buy a new car.
Bank A charges an interest rate of 2.45% per annum compounded monthly.
Bank B charges a simple interest rate of 2.65% per annum.
Which bank should he borrow from if he were to take a five year loan?
Justify your answer. [4]

[Formulae for Compound Interest : Total amount $= P\left(1+\frac{r}{100}\right)^n$]

---

4. In the diagram, $ABCD$ is a parallelogram. The points P and Q lie on the diagonal AC such that angle AQD = angle $BPC = 90°$.



(a) Prove that ΔADQ is congruent to ΔCBP. [2]

(b) Name another pair of congruent triangles. [1]

---

5. Nicole cycles from her house to school at an average speed of 12 km/h every morning. The school is $(2x + 5)$ km away from her house. She realises that if she increases the average speed of her cycling by x km/h, she could save 20 minutes of her travelling time.

(a) Write down an expression, in terms of x, for the time taken for Nicole to travel to school at 12 km/h. [1]

(b) Hence, form an equation in x and show that it reduces to $2x^2 + x - 48 = 0$. [2]

(c) Solve the equation $2x^2 + x - 48 = 0$. [2]

(d) Find the distance between Nicole's house and her school. [1]

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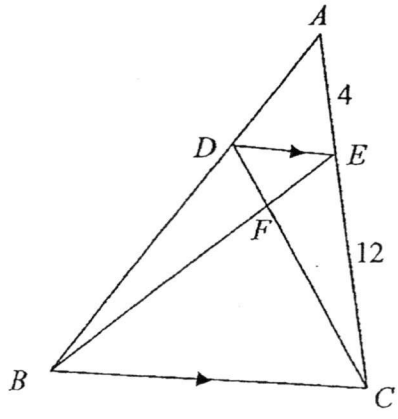
6. In the diagram below, D and E are two points on ΔABC in which $DE \parallel BC$. Given that CD and BE intersect at F. $AE = 4$ cm and $EC = 12$ cm.



(a) Show that triangles ABC and ADE are similar. [2]

(b) Find the length of DE if $BC = 18$ cm. [2]

(c) Find

(i) $\dfrac{EF}{FB}$ [1]

(ii) $\dfrac{area\ of\ \Delta DEF}{area\ of\ \Delta CBF}$ [1]

(iii) $\dfrac{area\ of\ \Delta ADE}{area\ of\ trapezium\ DECB}$ [1]

(iv) $\dfrac{area\ of\ \Delta ABE}{area\ of\ \Delta ABC}$ [1]

---

7. **Answer the whole of this question on a sheet of graph paper.**

The variables x and y are connected by the equation $y = \frac{1}{2}(2-x)(5+x)$.

The table below shows some values of x and the corresponding values of y

x	−5	−4	−3	−2	−1	0	1	2	3
y	0	3	p	6	6	5	3	*0*	*-4*

(a) Find the value of p [1]

(b) Using a scale of 2 cm to 1 unit on each axis, draw the graph of the equation $y = \frac{1}{2}(2-x)(5+x)$ for $-5 \leq x \leq 3$. [3]

(c) Hence, use your graph to solve the equation $(2-x)(5+x) = 8$. [2]

------END-----

3EX Mathematics SA1
SECTION B Marking Scheme [40]

1. (a) Given the roots are -1 and $\frac{2}{3}$

$\Rightarrow x = -1 \quad , \quad x = \frac{2}{3}$

$\Rightarrow x+1 = 0 \quad\quad 3x-2 = 0$

$\therefore$ quadratic equation $(x+1)(3x-2) = 0$ (M1)

$3x^2 + x - 2 = 0$ (A1)

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

Multiply the equation by $(x-1)$

$(x-1)(2x+1) + (x+1) = -1(x-1)$ (M1)

$2x^2 - x - 1 + x + 1 = -x + 1$

$2x^2 + x - 1 = 0$ (M1)

$(2x-1)(x+1) = 0$

$x = \frac{1}{2}$ or $x = -1$ (A1)

2 (a) $\frac{3x}{(2x-1)^2} - \frac{1}{2x-1}$

$= \frac{3x - (2x-1)}{(2x-1)^2}$ (M1)

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

$= \frac{x+1}{(2x-1)^2}$ (A1)

2 (b) $\sqrt{\frac{x^2-y}{y}} = \frac{3}{2x}$

$\frac{x^2-y}{y} = \left(\frac{3}{2x}\right)^2$

$\frac{x^2-y}{y} = \frac{9}{4x^2}$ (M1)

$4x^2(x^2-y) = 9y$

$4x^4 - 4x^2y = 9y$

$-4x^2y - 9y = -4x^4$

$4x^2y + 9y = 4x^4$ (M1)

$y(4x^2+9) = 4x^4$

$y = \frac{4x^4}{4x^2+9}$ (A1)

3(a) $3x+1 < 9-5x \leq 24$

$\Rightarrow 3x+1 < 9-5x$ and $9-5x \leq 24$

$\Rightarrow 3x+5x < 9-1$ and $-5x \leq 24-9$

$8x < 8$ $\quad -5x \leq 15$

$x < 1$ (M1) $\quad x \geq -3$ (M1)

$\Rightarrow x < 1$ and $x \geq -3$

$\Rightarrow -3 \leq x < 1$ (A1)

(b) Bank A : compound Interest

$P = \$80000$, $r = \frac{2.45}{12}$, $n = 5 \times 12 = 60$

$A = P\left[1+\frac{r}{100}\right]^n$

$A = \$80000\left[1+\frac{\left(\frac{2.45}{12}\right)}{100}\right]^{60}$ (M1)

$A = \$90414.24$ (2d.p)

Interest charged $= \$90414.24 - \$80000 = \$10414.24$ (A1)

Bank B : simple Interest

$P = \$80000$, $R = 2.65$, $T = 5$

$I = \frac{PRT}{100}$

$I = \$\frac{80000 \times 2.65 \times 5}{100}$

$I = \$10600$ (A1)

He should borrow from Bank A as Bank A charged less interest than Bank B. (1)

4) (a) $\triangle ADQ$ $\quad$ $\triangle CBP$

(M1)
$\angle AQD = \angle CPB = 90^\circ$ (Given) (A)

$\angle DAQ = \angle BCP$ (alt. $\angle$s, DA // CB) (A)

$AD = CB$ ($\because$ ABCD is a parallelogram) (S)

Hence $\triangle ADQ \equiv \triangle CBP$ (AAS) (A1)

(b) $\triangle DAC \equiv \triangle BCA$

$\triangle DQC \equiv \triangle BPA$

} either one (1)

5 (a) $T = \frac{2x+5}{12} h$

(b) $\frac{2x+5}{12} - \frac{2x+5}{12+x} = \frac{20}{60}$ (M1)

$\frac{2x+5}{12} - \frac{2x+5}{12+x} = \frac{1}{3}$

Multiply the equation by $12(12+x)$:

$(12+x)(2x+5) - 12(2x+5) = 4(12+x)$

$24x + 60 + 2x^2 + 5x - 24x - 60 - 48 - 4x = 0$

$2x^2 + x - 48 = 0$ (A1)

(c) $2x^2 + x - 48 = 0$

$x = \frac{-1 \pm \sqrt{1^2 - 4 \times 2 \times (-48)}}{2 \times 2}$ (M1)

$x = \frac{-1 \pm \sqrt{385}}{4}$

$x = -5.15535$ or $x = 4.65535$

(rejected) $x = 4.66$ (3 s.f.) (A1)

(d) distance $= 2x + 5$

$= 2 \times 4.65535 + 5$

$= 14.3$ km (A1)

6. (a)

$\triangle ABC$		$\triangle ADE$	
$\angle BAC$	=	$\angle DAE$	(common $\angle$s)
$\angle ABC$	=	$\angle ADE$	(corresp. $\angle$s, $DE \parallel BC$)
$\angle ACB$	=	$\angle AED$	(corresp. $\angle$s, $DE \parallel BC$)

(M1)

Hence $\triangle ABC$ & $\triangle ADE$ are similar (AAA) (A1)

(b) $\triangle ADE$ & $\triangle ABC$ are similar

$\Rightarrow \frac{DE}{BC} = \frac{AE}{AC}$

$\frac{DE}{18} = \frac{4}{16}$ (M1)

$DE = \frac{1}{4} \times 18$

$DE = 4.5$ cm (A1)

(c) (i) $\triangle FDE$ & $\triangle FCB$ are similar

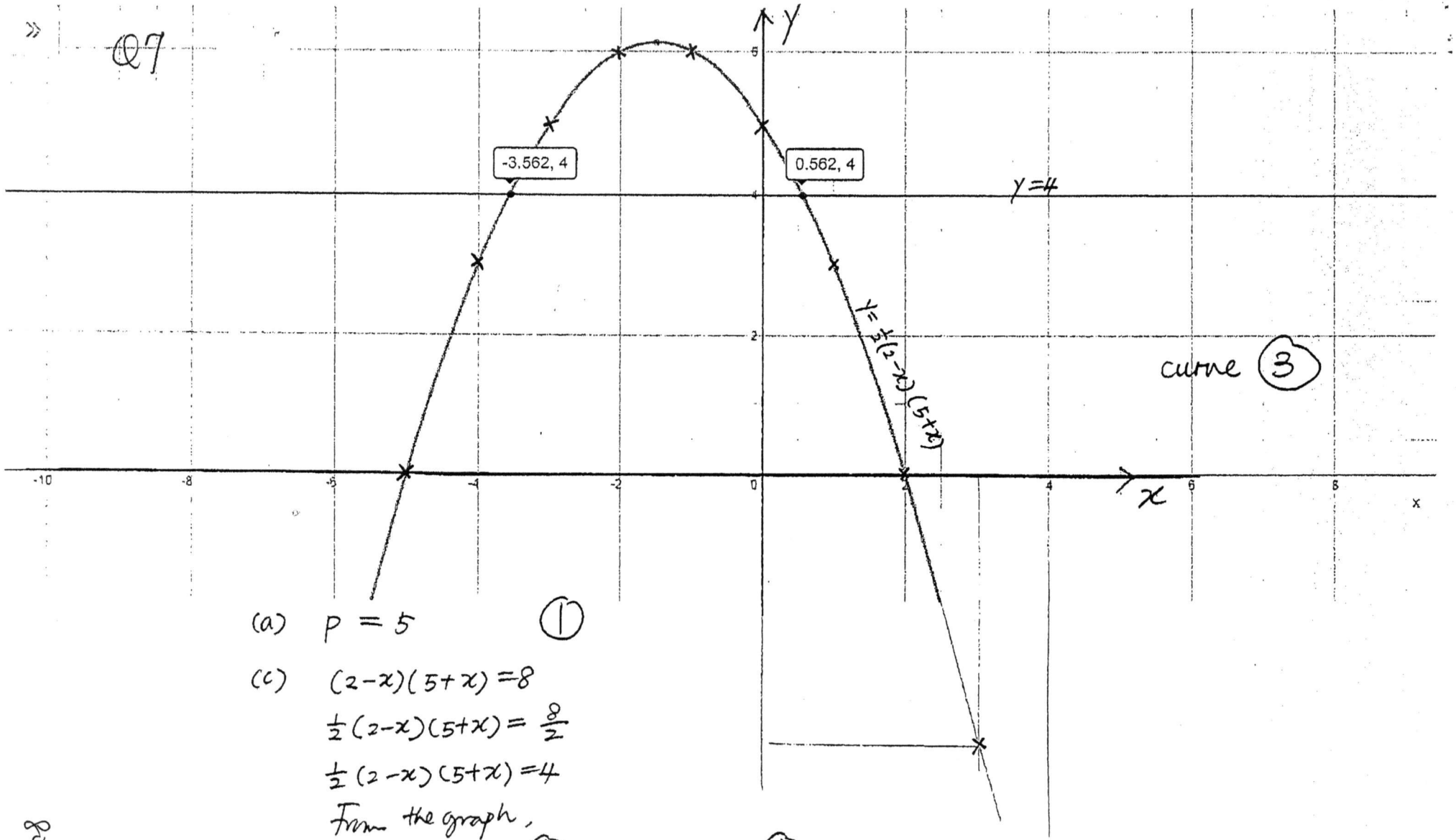
$\Rightarrow \frac{EF}{FB} = \frac{DE}{CB} = \frac{1}{4}$ (1)

(ii) $\frac{\text{area of } \triangle DEF}{\text{area of } \triangle CBF} = \left(\frac{1}{4}\right)^2 = \frac{1}{16}$ (1)

(iii) $\frac{\text{area of } \triangle ADE}{\text{area of } \square DECB} = \frac{1}{16-1} = \frac{1}{15}$ (1)

(iv) $\frac{\text{area of } \triangle ABE}{\text{area of } \triangle ABC} = \frac{AE}{AC} = \frac{4}{16} = \frac{1}{4}$ (1)

Q7



(a) $p = 5$ (1)

(c) $(2-x)(5+x) = 8$

$\frac{1}{2}(2-x)(5+x) = \frac{8}{2}$

$\frac{1}{2}(2-x)(5+x) = 4$

From the graph,

$x = -3.55$ (1) or $x \approx 0.55$ (1)

accepted: $x \approx -3.5$ $x \approx 0.5$

$x \approx -3.6$ $x \approx 0.6$