Sydney Technical High School

Year 10

Assessment Task 1 – Term 2

2010

MATHEMATICS

Time allowed-seventy minutes

Directions to students:

- Attempt all questions.
- All questions are of equal value.
- Necessary working should be shown.
- Marks may not be awarded for untidy and/or disorganisd work.
- Board approved calculators may be used.
- Ensure you have filled in your solution booklet details correctly

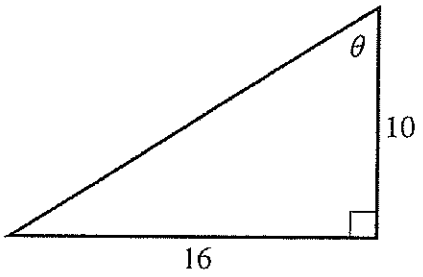
Name: _____ Teacher: _____

Qu 1	Qu 2	Qu 3	Qu 4	Qu 5	Total
					/60

Question One

12 Marks

a) Find the angle θ to the nearest degree. **2**



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b) Wally is a casual worker, who is paid \$296.64 for 24 hours' work.

i) Calculate Wally's hourly rate of pay. **1**

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ii) Calculate the number of hours that Wally will need to work to earn more than \$450.00. **2**

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c) Solve the following quadratic equations that are expressed in factorised form.

i) $(x - 6)(x + 2) = 0$ **1**

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ii) $(2x + \frac{1}{3})(-5x + 40) = 0$ **2**

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d) Georgio buys 6 rose bushes and 5 daisy plants for \$57.25. Thomas buys 3 rose bushes and 12 daisy plants for \$40.50. Find the total cost for one daisy plant and one rose plant. **4**

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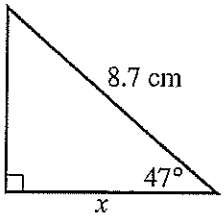
Question Two

12 Marks

a) Calculate the length of the side (labelled x) in the following triangle, correct to 1 decimal place. **2**



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b) A rectangle has an area of $72m^2$. Its length is 6m more than its breadth.
Letting the short side be x, form a quadratic equation to solve the equation **3**

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c) Solve the equation $2(x-5)^2-(x-5)-15=0$. **3**

d) Solve the following pair of simultaneous equations using the substitution method. **4**

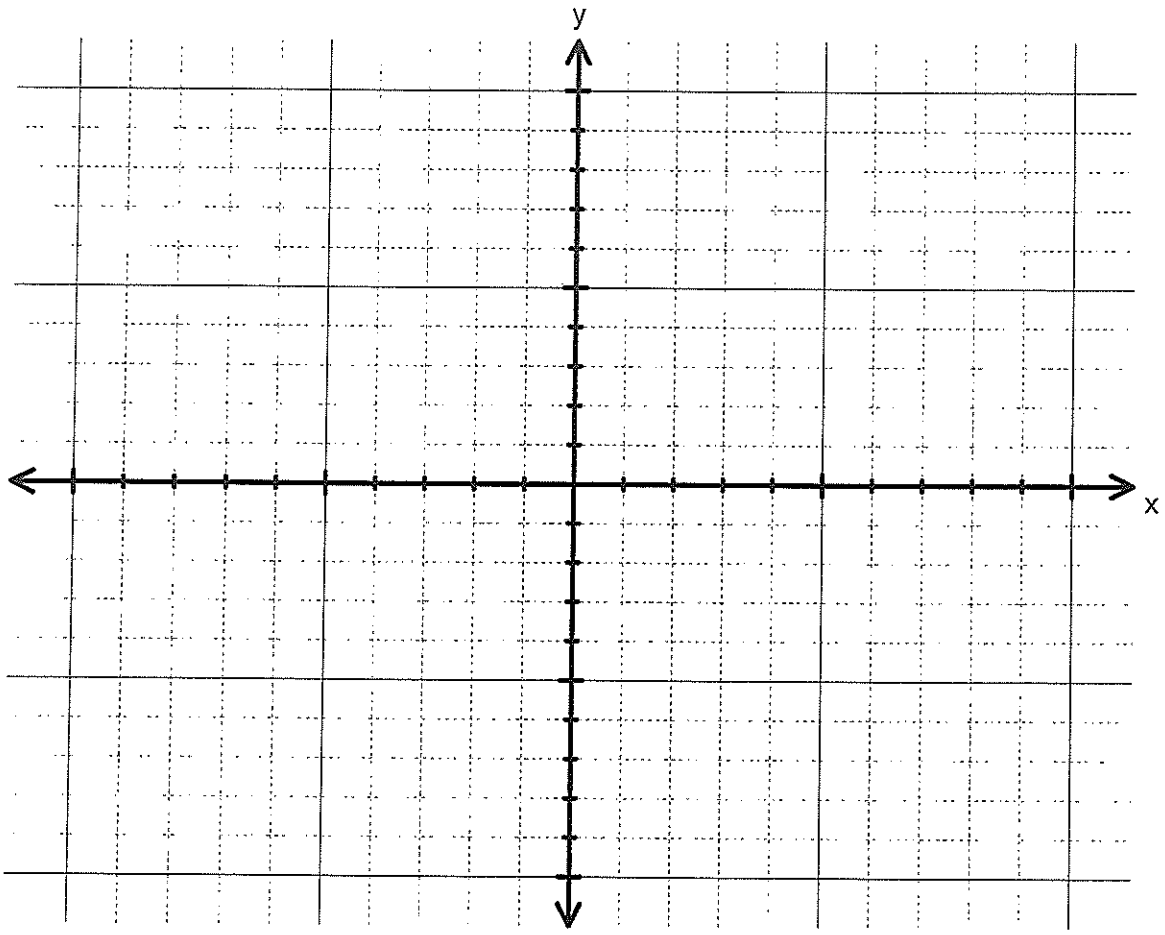
$$4x-y=34$$
$$3x-4y=32$$

Question Three — 12 Marks

a) Solve the following pair of simultaneous equations using a graphical method. **3**

$y = 5 - 2x$

$y = 2x - 7$ (Marking the point of intersection)



b) Jonathan borrowed $12 500 from the bank to buy a car. Simple interest is charged on the loan at a rate of 8.5% per annum over 5 years. How much interest did Jonathan pay? **2**

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b) Narelle and Paula are captains for a game of basketball. There are 12 other players and it is Narelle and Paula's job to pick teams by alternately selecting one player at random from the remaining group. Paula has first pick. **3**

i) Are the events 'Danielle is picked by Paula' and 'Danielle is picked by Narelle' independent?

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ii) What is the probability that Danielle is not picked first by Paula?

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iii) If Danielle is not picked by Paula what is the probability that she is then picked by Narelle with her first selection?

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a) Sam was on a raft at sea observing a lighthouse on a vertical cliff at an angle of elevation of 31°. The cliff was 165 m high.

i) Draw a diagram using x to indicate the horizontal distance from Sam to the base of the cliff. **2**

ii) Calculate the horizontal distance from Sam to the base of the cliff to the nearest metre. **2**

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Question Four — 12 Marks

a) A helicopter flies 30 km in a direction of N47°E. How far east of the starting point is it, correct to 2 decimal places? **3**

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b) Luigi is paid a base wage of $280 per week as well as 10% of his sales.

i) How much would Luigi earn in a week if he sold $1345 worth of merchandise? **2**

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ii) How much merchandise would Luigi need to sell to earn $98.50 commission? **2**

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iii) How much merchandise would he need to sell to earn a total of $468 in a week? **2**

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c) In a bag there are three balls, one green, one blue and one yellow. In a second bag there are two balls, one red and one green. One ball is chosen from each bag. 3

i) Draw a tree diagram to show all possible colour combinations that may be selected.

ii) Find the probability that two green balls are selected.

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iii) What is the probability of at least one of the balls selected being green?

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Question Five

12 Marks

a) Solve the following quadratic equation $x^2 - 9x + 14 = 0$ using the quadratic formula. **3**

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b) Emma works as a butcher. She is paid $12.56 per hour for a 38-hour working week. If Emma works overtime the first four hours are paid at time-and-a-half and the remainder at double time. Calculate Emma's wage in a week where she works 44 hours. **4**

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c) A two-way table is used to display the results of a test conducted on a new method of detecting if an unborn baby has a gene making it vulnerable to a cancer. To verify the test, it is conducted on 1000 unborn babies each of whom is known to either have or not have the gene.

	Positive	Negative	Total
With the gene	186	14	
Without the gene	65	735	
Total			

i) Complete the table. **1**

ii) How many false positives were recorded? **1**

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ii) If a person is selected at random from this group find the probability that the unborn baby:
i) has the gene **1**

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ii) tested positive to the gene. **1**

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iii) If an unborn baby has the gene what is the probability that it goes undetected by the new procedure? **1**

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☺ ☺ ☺**END OF EXAMNATION**☺ ☺ ☺

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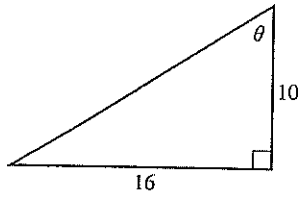

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b) Wally is a casual worker, who is paid \$296.64 for 24 hours' work.

i) Calculate Wally's hourly rate of pay. 1

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ii) Calculate the number of hours that Wally will need to work to earn more than \$450.00. 2

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c) Solve the following quadratic equations that are expressed in factorised form.

i) $(x-6)(x+2)=0$ 1

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.....

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ii) $(2x + \frac{1}{3})(-5x + 40) = 0$ 2

d) Georgio buys 6 rose bushes and 5 daisy plants for \$57.25. Thomas buys 3 rose bushes and 12 daisy plants for \$40.50. Find the total cost for one daisy plant and one rose plant. 4

Question Two

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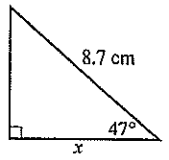
a) Calculate the length of the side (labelled x) in the following triangle, correct to 1 decimal place. 2



b) A rectangle has an area of $72m^2$. Its length is 6m more than its breadth. Letting the short side be x, form a quadratic equation to solve the equation 3

c) Solve the equation $2(x-5)^2-(x-5)-15=0$. 3

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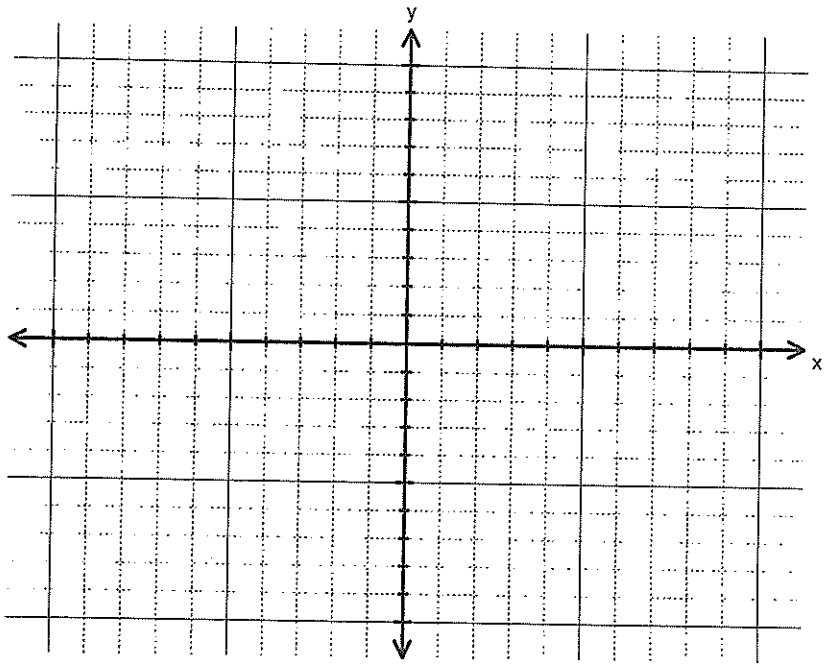

b) Jonathan borrowed $12 500 from the bank to buy a car. Simple interest is charged on the loan at a rate of 8.5% per annum over 5 years. How much interest did Jonathan pay? 2

b) Narelle and Paula are captains for a game of basketball. There are 12 other players and it is Narelle and Paula's job to pick teams by alternately selecting one player at random from the remaining group. Paula has first pick. 3

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a) Sam was on a raft at sea observing a lighthouse on a vertical cliff at an angle of elevation of 31°. The cliff was 165 m high.

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c) A two-way table is used to display the results of a test conducted on a new method of detecting if an unborn baby has a gene making it vulnerable to a cancer. To verify the test, it is conducted on 1000 unborn babies each of whom is known to either have or not have the gene.

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Question One

12 Marks

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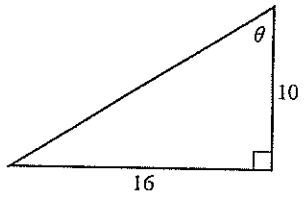


$\tan\theta = \frac{16}{10}$

$\theta \doteq 58°$

b) Wally is a casual worker, who is paid \$296.64 for 24 hours' work.
i) Calculate Wally's hourly rate of pay. 1

$296.64 \div 24 = \$12.36$

ii) Calculate the number of hours that Wally will need to work to earn more than \$450.00. 2

$450 \div 12.36 = 36.41$

Wally needs to work 37 hours to earn more than \$450

c) Solve the following quadratic equations that are expressed in factorised form.
i) $(x-6)(x+2)=0$ 1

$x = 6 \quad x = -2$

ii) $(2x + \frac{1}{3})(-5x + 40) = 0$ 2

$2x + \frac{1}{3} = 0$ $-5x + 40 = 0$

$2x = \frac{-1}{3}$ $-5x = -40$

$x = \frac{-1}{6}$ $x = 8$

1 mark for one solution
2 marks for both solution

d) Georgio buys 6 rose bushes and 5 daisy plants for \$57.25. Thomas buys 3 rose bushes and 12 daisy plants for \$40.50. Find the total cost for one daisy plant and one rose plant. 4

x = 1 rose
y = 1 daisy

$6x + 5y = \$57.25$ — (1)
$3x + 12y = \$40.50$ — (2)
(2) x 2

1 mark for simultaneous equations

$6x + 5y = \$57.25$ — (1)
$6x + 24y = \$81.00$ — (3)
$-19y = -\$23.75$
$y = 1.25$

1 mark for y

Sub into (1)
$6x + 5y = \$57.25$
$6x + 5 \times 1.25 = \$57.25$
$6x + 6.25 = \$57.25$
$6x = \$51$
$x = \$8.50$

1 mark for x

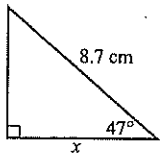
1 rose + 1 daisy
$x + y$ =
$8.50 + 1.25 = \$9.75$

1 mark for Solution

Question Two

12 Marks

a) Calculate the length of the side (labelled x) in the following triangle, correct to 1 decimal place. 2

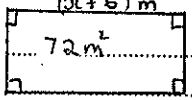


$\cos 47° = \frac{x}{8.7}$ 1 mark

$x = 8.7 \times \cos 47°$

$= 5.9\text{cm}$ 1 mark for solution

b) A rectangle has an area of $72m^2$. Its length is 6m more than its breadth. Letting the short side be x, form a quadratic equation to solve the equation 3



$x(x + 6) = 72$
$x^2 + 6x = 72$
$(x+3)^2 = 72 + 9$
$(x+3)^2 = 81$
$x + 3 = \pm\sqrt{81}$
$x = \pm 9 - 3$
$x = 6$
$x \neq -12$

OR

$x^2 + 6x - 72 = 0$
$x = \frac{-6 \pm \sqrt{6^2 - 4 \times 1 \times -72}}{2 \times 1}$
$x = \frac{-6 \pm \sqrt{36 + 288}}{2}$
$x = \frac{-6 \pm \sqrt{324}}{2}$
$x = \frac{-6 \pm 18}{2}$
$x = 6$
$x \neq -12$

1 mark for equation

1 mark for length

1 mark for breadth

Length of rectangle is 6m, Breadth is 12m.

c) Solve the equation $2(x-5)^2-(x-5)-15=0$. 3

let $m = x-5$

$\therefore \quad 2m^2 - m - 15 = 0$

$(2m+5)(m-3) = 0$

$m = -\frac{5}{2} \qquad m = 3$

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

$x = 2\frac{1}{2} \qquad x = 8$

d) Solve the following pair of simultaneous equations using the substitution method. 4

$4x - y = 34$

$3x - 4y = 32$

$4x - y = 34$

$y = 4x - 34$

$3x - 4y = 32$

$3x - 4(4x - 34) = 32$

$3x - 16x + 136 = 32$

$-13x = -104$

$x = 8$

$y = 4x - 34 \qquad x = 8$

$y = 4 \times 8 - 34 \qquad y = -2$

$y = 32 - 34$

$y = -2$

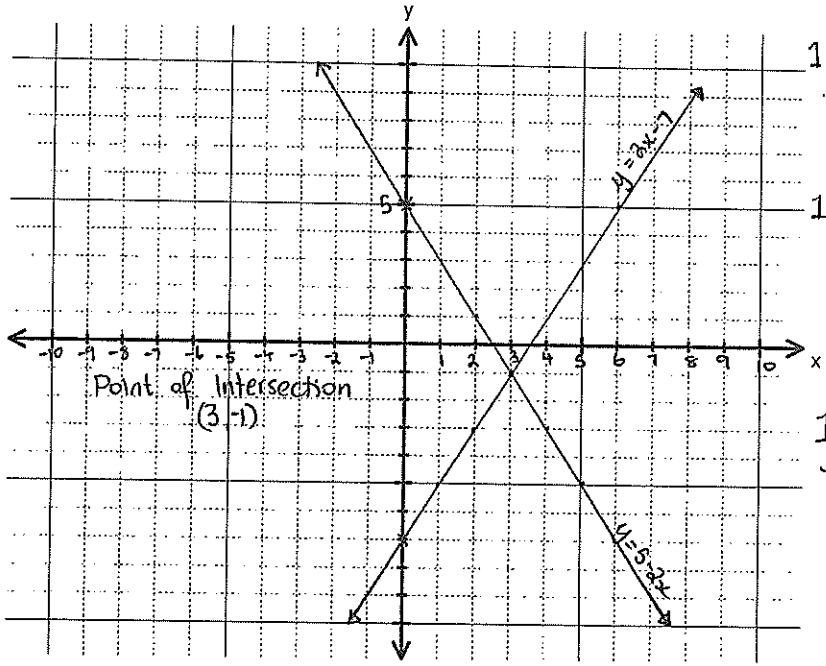
Question Three

12 Marks

a) Solve the following pair of simultaneous equations using a graphical method. 3

$y = 5 - 2x$

$y = 2x - 7$ (Marking the point of intersection)



1 mark for the line $y = 2x - 7$

1 mark for the line $y = 5 - 2x$

1 mark for the point of intersection

b) Jonathan borrowed $12 500 from the bank to buy a car. Simple interest is charged on the loan at a rate of 8.5% per annum over 5 years. How much interest did Jonathan pay? 2

$I = 5 \times 0.085 \times 12500$ $\qquad P = 12500$

$= \$5312.50$ $\qquad r = 8.5\% \rightarrow 0.085$

$n = 5$

b) Narelle and Paula are captains for a game of basketball. There are 12 other players and it is Narelle and Paula's job to pick teams by alternately selecting one player at random from the remaining group. Paula has first pick. 3

i) Are the events 'Danielle is picked by Paula' and 'Danielle is picked by Narelle' independent?

No 1 mark

ii) What is the probability that Danielle is not picked first by Paula?

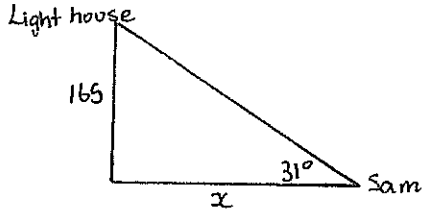
P(Danielle is not picked by Paula) = $\frac{11}{12}$ 1 mark

iii) If Danielle is not picked by Paula what is the probability that she is then picked by Narelle with her first selection?

P(Danielle is picked by Narelle) = $\frac{1}{11}$ 1 mark

a) Sam was on a raft at sea observing a lighthouse on a vertical cliff at an angle of elevation of 31°. The cliff was 165 m high.

i) Draw a diagram using x to indicate the horizontal distance from Sam to the base of the cliff. 2



ii) Calculate the horizontal distance from Sam to the base of the cliff to the nearest metre. 2

$\tan 31° = \frac{165}{x}$ 1 mark

$x = \frac{165}{\tan 31°}$

$x = 274.6$ m

$x = 275°$ 1 mark for correct answe

Question Four

12 Marks

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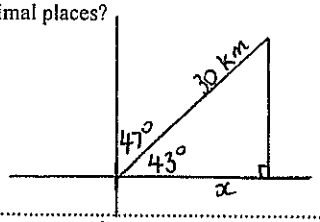


$\cos 43° = \frac{x}{30}$ or $\sin 47° = \frac{x}{30}$

$x = 30 \cos 43°$ $x = 30 \sin 47°$

$x = 21.94$ (2dp) $x = 21.94$ km

b) Luigi is paid a base wage of $280 per week as well as 10% of his sales.

i) How much would Luigi earn in a week if he sold $1345 worth of merchandise? 2

$280 + 0.10 \times \$1345$

$= 280 + 134.50$

$= \$414.50$

ii) How much merchandise would Luigi need to sell to earn $98.50 commission? 2

$98.50 \div 0.1 = \$985$

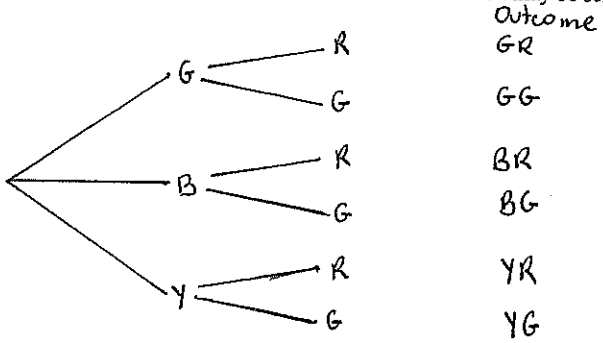
iii) How much merchandise would he need to sell to earn a total of $468 in a week? 2

$468 - 280 = \$188$

$188 \times 10 = \$1880$

c) In a bag there are three balls, one green, one blue and one yellow. In a second bag there are two balls, one red and one green. One ball is chosen from each bag. 3

i) Draw a tree diagram to show all possible colour combinations that may be selected.



ii) Find the probability that two green balls are selected.

$P(G,G) = \frac{1}{6}$

iii) What is the probability of at least one of the balls selected being green?

P(at least one green) = $\frac{4}{6} \rightarrow \frac{2}{3}$

Question Five

12 Marks

a) Solve the following quadratic equation $x^2 - 9x + 14 = 0$ using the quadratic formula. 3

$a = 1$
$b = 9$
$c = 14$

$x^2 - 9x + 14 = 0$

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$x = \frac{9 \pm \sqrt{9^2 - 4 \times 1 \times 14}}{2 \times 1}$

$x = \frac{9 \pm \sqrt{25}}{2}$

$x = 2, 7$

b) Emma works as a butcher. She is paid $12.56 per hour for a 38-hour working week. If Emma works overtime the first four hours are paid at time-and-a-half and the remainder at double time. Calculate Emma's wage in a week where she works 44 hours. 4

44 hours = 38 + 4 + 2

Normal | time & a half | double time

$38 \times 12.56 = 477.28$ 1 mark

$4 \times 1\frac{1}{2} \times 12.56 = 75.36$ 1 mark

$2 \times 2 \times 12.56 = 50.24 +$ 1 mark

$602.88 1 mark

c) A two-way table is used to display the results of a test conducted on a new method of detecting if an unborn baby has a gene making it vulnerable to a cancer. To verify the test, it is conducted on 1000 unborn babies each of whom is known to either have or not have the gene.

	Positive	Negative	Total
With the gene	186	14	200
Without the gene	65	735	800
Total	251	749	1000

i) Complete the table. 1

ii) How many false positives were recorded? 1

65

ii) If a person is selected at random from this group find the probability that the unborn baby:

i) has the gene 1

$\frac{200}{1000} = \frac{1}{5}$

ii) tested positive to the gene. 1

$\frac{251}{1000}$

iii) If an unborn baby has the gene what is the probability that it goes undetected by the new procedure? 1

$\frac{14}{200} \rightarrow \frac{7}{100}$

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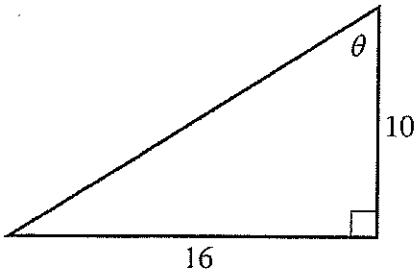
12 Marks

a) Find the angle θ to the nearest degree. **2**



$\tan\theta = \frac{16}{10}$

$\theta \doteq 58°$

b) Wally is a casual worker, who is paid \$296.64 for 24 hours' work.

i) Calculate Wally's hourly rate of pay. **1**

$296.64 \div 24 = \$12.36$

ii) Calculate the number of hours that Wally will need to work to earn more than \$450.00. **2**

$450 \div 12.36 = 36.41$

Wally needs to work 37 hours to earn more than \$450

c) Solve the following quadratic equations that are expressed in factorised form.

i) $(x-6)(x+2)=0$ **1**

$x = 6 \quad x = -2$

ii) $(2x + \frac{1}{3})(-5x + 40) = 0$ 2

$2x + \frac{1}{3} = 0$ $-5x + 40 = 0$

$2x = \frac{-1}{3}$ $-5x = -40$

$x = \frac{-1}{6}$ $x = 8$

1 mark for one solution
2 marks for both solution

d) Georgio buys 6 rose bushes and 5 daisy plants for $57.25. Thomas buys 3 rose bushes and 12 daisy plants for $40.50. Find the total cost for one daisy plant and one rose plant. 4

x = 1 rose
y = 1 daisy

$6x + 5y = \$57.25$ — (1)
$3x + 12y = \$40.50$ — (2)
(2) × 2

1 mark for simultaneous equations

$6x + 5y = \$57.25$ — (1)
$6x + 24y = \$81.00$ — (3)
$-19y = -\$23.75$
$y = 1.25$

1 mark for y

Sub into (1)
$6x + 5y = \$57.25$
$6x + 5 \times 1.25 = \$57.25$
$6x + 6.25 = \$57.25$
$6x = \$51$
$x = \$8.50$

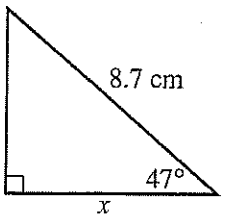
1 mark for x

1 rose + 1 daisy
$x + y =$
$8.50 + 1.25 = \$9.75$

1 mark for Solution

Question Two — 12 Marks

a) Calculate the length of the side (labelled x) in the following triangle, correct to 1 decimal place. **2**

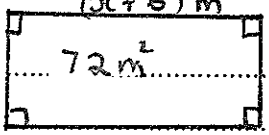


$\cos 47° = \frac{x}{8.7}$ — 1 mark

$x = 8.7 \times \cos 47°$

$= 5.9\text{ cm}$ — 1 mark for solution

b) A rectangle has an area of $72m^2$. Its length is 6m more than its breadth. Letting the short side be x, form a quadratic equation to solve the equation **3**



$x(x+6) = 72$

$x^2 + 6x = 72$

$(x+3)^2 = 72 + 9$

$(x+3)^2 = 81$

$x + 3 = \pm\sqrt{81}$

$x = \pm 9 - 3$

$x = 6$

$x \neq -12$

OR

$x^2 + 6x - 72 = 0$

$x = \frac{-6 \pm \sqrt{6^2 - 4 \times 1 \times -72}}{2 \times 1}$

$x = \frac{-6 \pm \sqrt{36 + 288}}{2}$

$x = \frac{-6 \pm \sqrt{324}}{2}$

$x = \frac{-6 \pm 18}{2}$

$x = 6$

$x \neq -12$

1 mark for equation

1 mark for length

1 mark for breadth

Length of rectangle is 6m, Breadth is 12m.

c) Solve the equation $2(x-5)^2-(x-5)-15=0$. **3**

let $m = x-5$

$\therefore \quad 2m^2 - m - 15 = 0$

$(2m+5)(m-3) = 0$

$m = -\frac{5}{2} \qquad m = 3$

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

$x = 2\frac{1}{2} \qquad x = 8$

d) Solve the following pair of simultaneous equations using the substitution method. **4**

$$4x - y = 34$$
$$3x - 4y = 32$$

$4x - y = 34$

$y = 4x - 34$

$3x - 4y = 32$

$3x - 4(4x-34) = 32$

$3x - 16x + 136 = 32$

$-13x = -104$

$x = 8$

$y = 4x - 34$ $\qquad x = 8$

$y = 4 \times 8 - 34$ $\qquad y = -2$

$y = 32 - 34$

$y = -2$

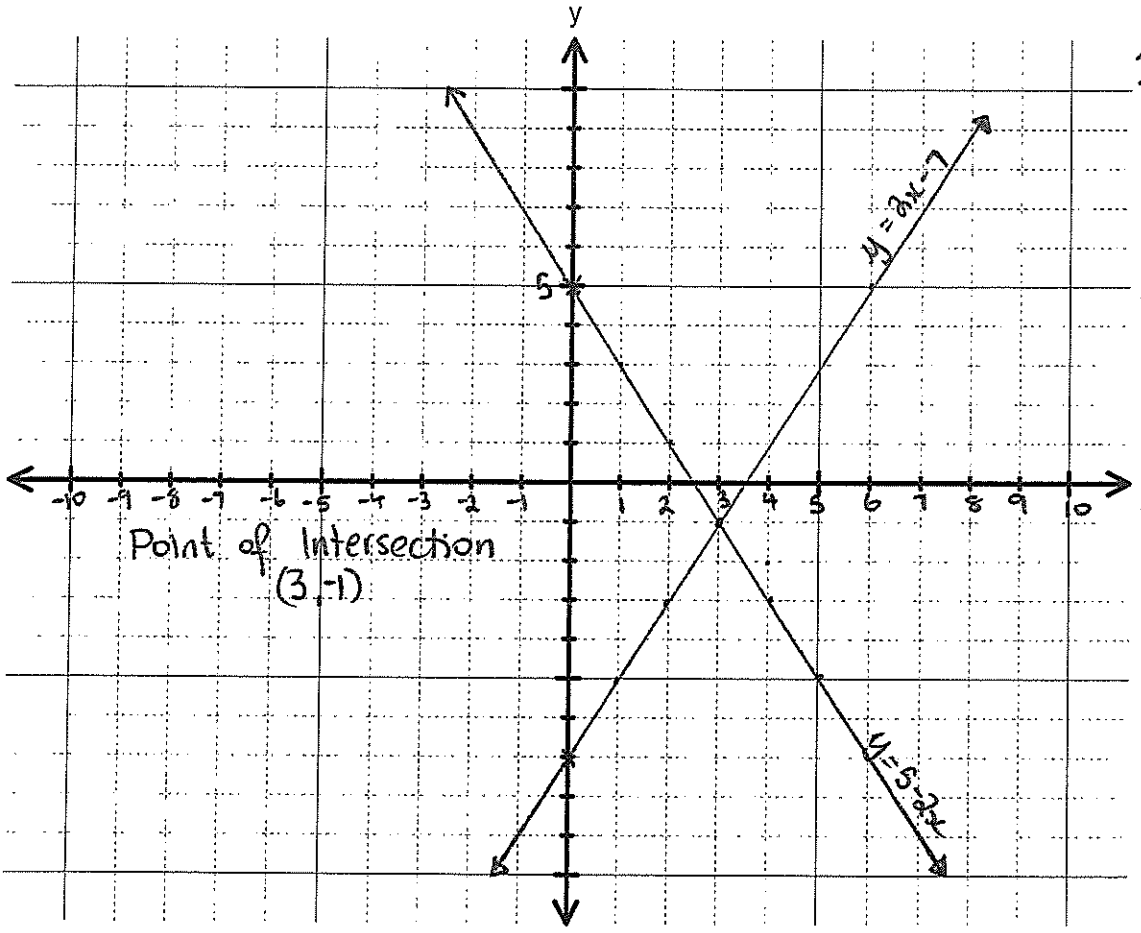
Question Three

12 Marks

a) Solve the following pair of simultaneous equations using a graphical method. **3**

$y = 5 - 2x$

$y = 2x - 7$ (Marking the point of intersection)



1 mark for the line $y = 2x - 7$

1 mark for the line $y = 5 - 2x$

1 mark for the point of intersection

b) Jonathan borrowed \$12 500 from the bank to buy a car. Simple interest is charged on the loan at a rate of 8.5% per annum over 5 years. How much interest did Jonathan pay? **2**

$I = 5 \times 0.085 \times 12500$

$= \$5312.50$

$P = 12500$

$r = 8.5\% \rightarrow 0.085$

$n = 5$

b) Narelle and Paula are captains for a game of basketball. There are 12 other players and it is Narelle and Paula's job to pick teams by alternately selecting one player at random from the remaining group. Paula has first pick. 3

i) Are the events 'Danielle is picked by Paula' and 'Danielle is picked by Narelle' independent?

No 1 mark

ii) What is the probability that Danielle is not picked first by Paula?

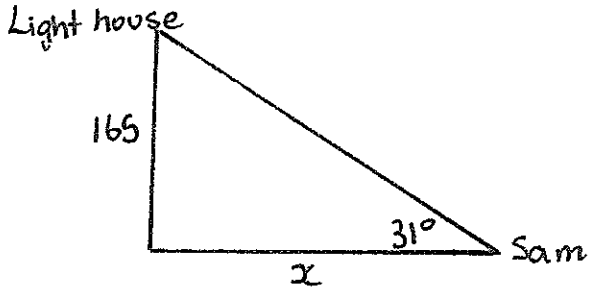
P(Danielle is not picked by Paula) = $\frac{11}{12}$ 1 mark

iii) If Danielle is not picked by Paula what is the probability that she is then picked by Narelle with her first selection?

P(Danielle is picked by Narelle) = $\frac{1}{11}$ 1 mark

a) Sam was on a raft at sea observing a lighthouse on a vertical cliff at an angle of elevation of 31°. The cliff was 165 m high.

i) Draw a diagram using x to indicate the horizontal distance from Sam to the base of the cliff. 2



ii) Calculate the horizontal distance from Sam to the base of the cliff to the nearest metre. 2

$\tan 31° = \frac{165}{x}$ 1 mark

$x = \frac{165}{\tan 31°}$

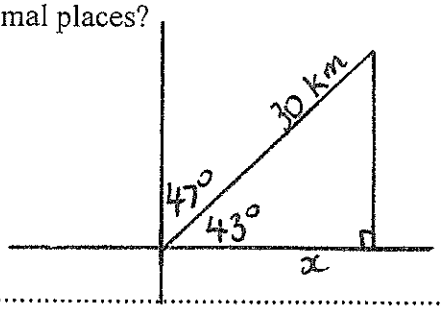
$x = 274.6$ m

$x = 275°$ 1 mark for correct answe

Question Four

12 Marks

a) A helicopter flies 30 km in a direction of N47°E. How far east of the starting point is it, correct to 2 decimal places? **3**



$\cos 43^\circ = \frac{x}{30}$ or $\sin 47^\circ = \frac{x}{30}$

$x = 30 \cos 43^\circ$ $x = 30 \sin 47^\circ$

$x = 21.94$ (2dp) $x = 21.94$ km

b) Luigi is paid a base wage of $280 per week as well as 10% of his sales.

i) How much would Luigi earn in a week if he sold $1345 worth of merchandise? **2**

$280 + 0.10 \times \$1345$

$= 280 + 134.50$

$= \$414.50$

ii) How much merchandise would Luigi need to sell to earn $98.50 commission? **2**

$98.50 \div 0.1 = \$985$

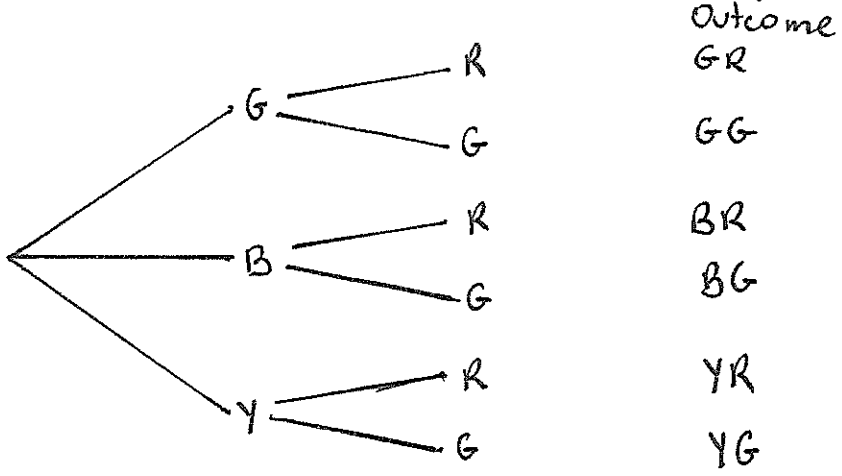
iii) How much merchandise would he need to sell to earn a total of $468 in a week? **2**

$468 - 280 = \$188$

$188 \times 10 = \$1880$

c) In a bag there are three balls, one green, one blue and one yellow. In a second bag there are two balls, one red and one green. One ball is chosen from each bag. **3**

i) Draw a tree diagram to show all possible colour combinations that may be selected.



ii) Find the probability that two green balls are selected.

$P(G, G) = \frac{1}{6}$

iii) What is the probability of at least one of the balls selected being green?

$P(\text{at least one green}) = \frac{4}{6} \rightarrow \frac{2}{3}$

Question Five — 12 Marks

a) Solve the following quadratic equation $x^2 - 9x + 14 = 0$ using the quadratic formula. **3**

$x^2 - 9x + 14 = 0$

$a = 1$, $b = -9$, $c = 14$

$x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$x = \dfrac{9 \pm \sqrt{9^2 - 4 \times 1 \times 14}}{2 \times 1}$

$x = \dfrac{9 \pm \sqrt{25}}{2}$

$x = 2, 7$

b) Emma works as a butcher. She is paid \$12.56 per hour for a 38-hour working week. If Emma works overtime the first four hours are paid at time-and-a-half and the remainder at double time. Calculate Emma's wage in a week where she works 44 hours. **4**

44 hours = 38 + 4 + 2

Normal | time & a half | double time

$38 \times 12.56 = 477.28$ 1 mark

$4 \times 1\frac{1}{2} \times 12.56 = 75.36$ 1 mark

$2 \times 2 \times 12.56 = 50.24$ + 1 mark

\$602.88 1 mark

c) A two-way table is used to display the results of a test conducted on a new method of detecting if an unborn baby has a gene making it vulnerable to a cancer. To verify the test, it is conducted on 1000 unborn babies each of whom is known to either have or not have the gene.

	Positive	Negative	Total
With the gene	186	14	200
Without the gene	65	735	800
Total	251	749	1000

i) Complete the table. 1

ii) How many false positives were recorded? 1

65

ii) If a person is selected at random from this group find the probability that the unborn baby:
i) has the gene 1

$\frac{200}{1000} = \frac{1}{5}$

ii) tested positive to the gene. 1

$\frac{251}{1000}$

iii) If an unborn baby has the gene what is the probability that it goes undetected by the new procedure? 1

$\frac{14}{200} \rightarrow \frac{7}{100}$

☺ ☺ ☺END OF EXAMNATION☺ ☺ ☺