

Carlingford High School



Mathematics

Year 10 (5.2) Term 3 Exam

2017

Name: _____

Class: 10MA2 ____

Time allowed: 55 minutes

- Show all necessary working
- Answer all questions in the spaces provided
- Marks may be deducted for careless or untidy work
- Questions marked with an asterisk * are more challenging
- Complete the examination in blue or black pen
- All questions are worth 1 mark unless otherwise shown

Marking Scale

Topic		Question	Mark
Algebra	Expanding Binomial Products	1	/1
		2	/4
	Factorising Quadratic Expressions	3abc	/3
		*3d	/2
		Total	/10

Topic		Question	Mark
Probability	Relative Frequency	4	/2
		5	/2
	Venn Diagrams	6	/4
	Two-way Tables	7	/2
	Two and Three-step Experiments	8	/2
		9	/4
	Selecting with and without Replacement	10	/4
	Dependent and Independent Events	11	/2
	Conditional Probability	*12	/2
		Total	/24

Topic		Question	Mark
Trigonometry	Pythagoras' Theorem	13	/2
	Trigonometric Ratios	14	/2
	Finding an Unknown Side	15	/4
	Finding an Unknown Angle	16	/3
	Angles of Elevation and Depression	*17	/2
		18a	/1
	Bearing Problems	*18b	/2
		Total	/16

Exam Mark	
/50	%

Question 1

Find two numbers that multiply to give -12 and add to give 1.

Question 2

Expand and simplify each binomial product.

(a) $(a + 8)(a + 3)$ [2 marks]

(b) $(b - 5)^2$

(c) $(3c + 7)(3c - 7)$

Question 3

Factorise each quadratic expression fully.

(a) $y^2 + 7y + 12$

(b) $y^2 + y - 6$

(c) $y^2 - 25$

*(d) $2y^2 - 14y + 20$ [2 marks]

Question 4

All students in Year 10 were asked to choose their favourite colour from four given options.

Their answers are given in the table below.

Outcome	Frequency
Red	20
Blue	38
Yellow	33
Green	9

(a) How many students are there in Year 10?

(b) Write the relative frequency of *Red*, giving your answer as a decimal.

Question 5

A four-sided die is rolled 400 times, and the results are given in the following table.

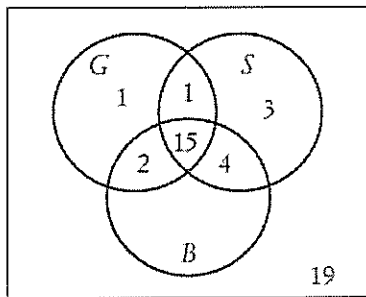
Outcome	Frequency
1	95
2	110
3	108
4	87
Total	400

(a) Find the experimental probability of rolling and odd number.

(b) Find the theoretical probability of rolling a 2 or a 3.

Question 6

This Venn diagram shows the number of countries that won gold, silver and bronze medals at the Vancouver Winter Olympics.



- (a) How many countries competed at these Olympics?
- (b) How many countries only won silver medals?
- (c) What is the probability of selecting a country at random that won gold, silver and bronze medals?
- (d) Of the countries that won gold medals, what is the probability of selecting a country that did not win a silver medal?

Question 7

Two Year 10 classes were surveyed to find out whether they lived in an even or odd-numbered house.

	Even	Odd
10MA1	17	13
10MA5	14	16

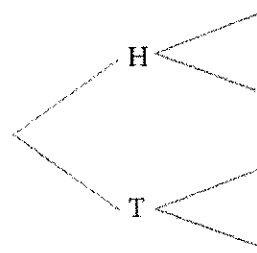
- (a) What is the probability of randomly selecting a student who lives in an odd-numbered house?

- (b) What is the probability of randomly selecting a 10MA5 student who lives in an even-numbered house?

Question 8

Two coins are tossed.

Complete the tree diagram and list the sample space. [2 marks]



Question 9

A blue and a red die are rolled.

- (a) How many different possible outcomes are there?
- (b) Find the probability of:
- (i) Rolling a pair of sixes.
 - (ii) Rolling at least one 2.
 - (iii) **Not** rolling a 4.

Question 10

The numbers 2, 3 and 5 are written on separate cards and placed in a bag.

Three cards are drawn at random, **without** replacement, to form a three-digit number.

(a) List the sample space.

(b) Find the probability of forming:

(i) An even number.

(ii) A number greater than 500.

(iii) An even number that's greater than 500.

Question 11

Are the following pairs of events **dependent** or **independent**.

(a) Tossing two coins and obtaining a head on the first coin and a tail on the second coin.

(b) Electing a captain from a group of players, then electing a vice-captain from the same group.

*Question 12

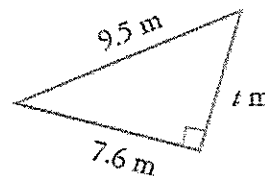
Noah's drawer contains five different pairs of coloured socks – black, blue, brown, green and white. Unfortunately, he has forgotten to roll them into pairs.

(a) Without looking, Noah takes two socks from the drawer. If one of the socks is black, what is the probability that he has selected a matching pair?

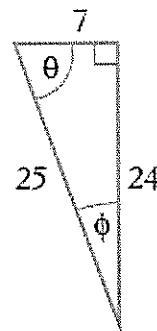
(b) Noah replaces the two socks he selected in (a). He selects three socks. If the first two socks are blue and white, what is the probability that he has selected a matching pair this time?

Question 13

Find the value of t , correct to one decimal place.
[2 marks]



Question 14



For this triangle, write a fraction for:

(a) $\sin \theta$

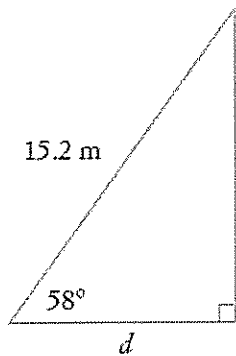
(b) $\tan \phi$

Question 15

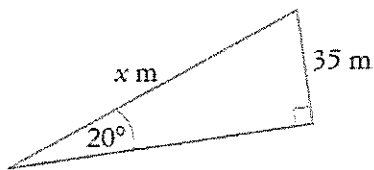
Find the value of each pronumeral correct to one decimal place.

[4 marks]

(a)



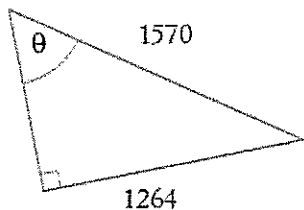
(b)

**Question 16**

In each of the following, find the size of angle θ

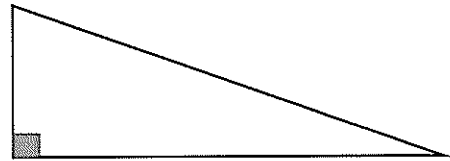
(a) $\sin \theta = 0.872$, correct to the nearest degree.

(b) Correct to the nearest minute. [2 marks]

***Question 17**

Karena is standing 1.75km from a 275m high mobile phone tower.

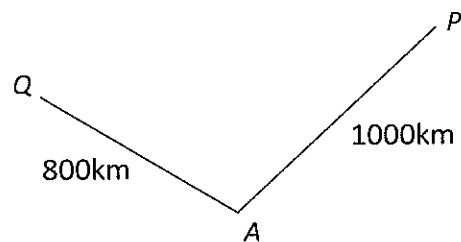
Find the angle of elevation of the top of the tower from Karena, correct to the nearest degree. [2 marks]

**Question 18**

Two planes leave an airport at the same time.

Plane Q travels 800km on a bearing of 284° .

Plane P travels 1000km on a bearing of 014° .

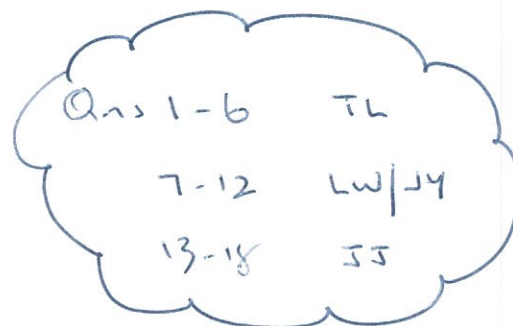


(a) Find $\angle QAP$.

*(b) Calculate the bearing of Q from P , correct to the nearest degree. [2 marks]

END OF TEST

Carlingford High School



Mathematics

Year 10 (5.2) Term 3 Exam

2017

Name: SOLUTIONS

Class: 10MA2

Time allowed: 55 minutes

- Show all necessary working
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		18a	/1
	Bearing Problems	*18b	/2
		Total	/16

Exam Mark	
/50	%

Question 1

Find two numbers that multiply to give -12 and add to give 1.

4 and -3

Question 2

Expand and simplify each binomial product.

(a) $(a + 8)(a + 3)$ [2 marks]

$$\begin{aligned} & a^2 + 3a + 8a + 24 \quad \checkmark \\ & = a^2 + 11a + 24 \quad \checkmark \end{aligned}$$

(b) $(b - 5)^2$

$$b^2 - 10b + 25$$

(c) $(3c + 7)(3c - 7)$

$$9c^2 - 49$$

Question 3

Factorise each quadratic expression fully.

(a) $y^2 + 7y + 12$

$$\begin{array}{l} 4 \\ 3 \end{array} \quad (y+4)(y+3)$$

(b) $y^2 + y - 6$

$$\begin{array}{l} 3 \\ -2 \end{array} \quad (y+3)(y-2)$$

(c) $y^2 - 25$

$$(y+5)(y-5)$$

* (d) $2y^2 - 14y + 20$

[2 marks]

$$2(y^2 - 7y + 10) \quad \checkmark$$

$$\begin{array}{l} -5 \\ -2 \end{array} \quad = 2(y-5)(y-2) \quad \checkmark$$

Question 4

All students in Year 10 were asked to choose their favourite colour from four given options.

Their answers are given in the table below.

Outcome	Frequency
Red	20
Blue	38
Yellow	33
Green	9

(a) How many students are there in Year 10?

100

(b) Write the relative frequency of Red, giving your answer as a decimal.

$$\frac{20}{100} = 0.2$$

Question 5

A four-sided die is rolled 400 times, and the results are given in the following table.

Outcome	Frequency
1	95
2	110
3	108
4	87
Total	400

(a) Find the experimental probability of rolling an odd number.

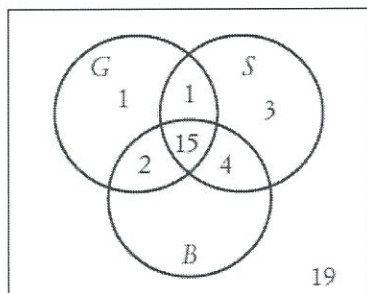
$$\frac{95+108}{400} = \frac{203}{400} \text{ or } 0.5075$$

(b) Find the theoretical probability of rolling a 2 or a 3.

$$\frac{1}{2}$$

Question 6

This Venn diagram shows the number of countries that won gold, silver and bronze medals at the Vancouver Winter Olympics.



(a) How many countries competed at these Olympics?

45

(b) How many countries only won silver medals?

3

(c) What is the probability of selecting a country at random that won gold, silver and bronze medals?

$$\frac{15}{45} = \frac{1}{3}$$

(d) Of the countries that won gold medals, what is the probability of selecting a country that did not win a silver medal?

$$\frac{3}{19}$$

Question 7

Two Year 10 classes were surveyed to find out whether they lived in an even or odd-numbered house.

	Even	Odd
10MA1	17	13
10MA5	14	16

(a) What is the probability of randomly selecting a student who lives in an odd-numbered house?

$$\frac{29}{30}$$

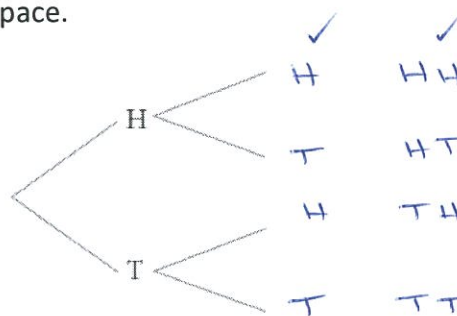
(b) What is the probability of randomly selecting a 10MA5 student who lives in an even-numbered house?

$$\frac{14}{60} = \frac{7}{30}$$

Question 8

Two coins are tossed.

Complete the tree diagram and list the sample space. [2 marks]



Question 9

A blue and a red die are rolled.

(a) How many different possible outcomes are there?

36

(b) Find the probability of:

(i) Rolling a pair of sixes.

$$\frac{1}{36}$$

(ii) Rolling at least one 2.

{12, 21, 22, 23, 24, 25, 26, 32, 42, 52, 62}

$$\frac{11}{36}$$

(iii) Not rolling a 4.

Rolling a 4:

{14, 24, 34, 41, 42, 43, 44, 45, 46, 54, 64}

$$1 - \frac{11}{36} = \frac{25}{36}$$

Question 10

The numbers 2, 3 and 5 are written on separate cards and placed in a bag.

Three cards are drawn at random, **without** replacement, to form a three-digit number.

(a) List the sample space.

$\{235, 253, 325, 352, 523, 532\}$

(b) Find the probability of forming:

(i) An even number.

$$\frac{2}{6} = \frac{1}{3}$$

(ii) A number greater than 500.

$$\frac{2}{6} = \frac{1}{3}$$

(iii) An even number that's greater than 500.

$$\frac{1}{6}$$

Question 11

Are the following pairs of events **dependent** or **independent**.

(a) Tossing two coins and obtaining a head on the first coin and a tail on the second coin.

independent

(b) Electing a captain from a group of players, then electing a vice-captain from the same group.

dependent

*Question 12

Noah's drawer contains five different pairs of coloured socks – black, blue, brown, green and white. Unfortunately, their owner has forgotten to roll them into pairs.

(a) Without looking, Noah takes two socks from the drawer. If one of the socks is black, what is the probability that he has selected a matching pair?

$$\frac{1}{9}$$

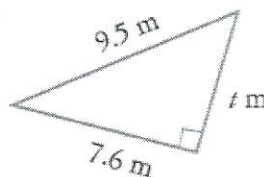
(b) Noah replaces the two socks he selected in (a). He selects three socks. If the first two socks are blue and white, what is the probability that he has selected a matching pair this time?

$$\frac{2}{8} = \frac{1}{4}$$

Question 13

Find the value of t , correct to one decimal place.

[2 marks]



$$\begin{aligned} t^2 &= 9.5^2 - 7.6^2 \checkmark \\ t &= 5.7 \checkmark \end{aligned}$$

Question 14



For this triangle, write a fraction for:

(a) $\sin \theta$

$$\frac{24}{25}$$

(b) $\tan \phi$

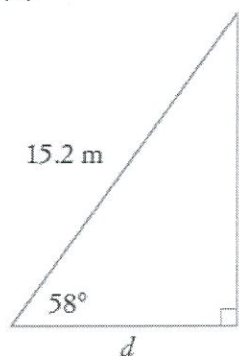
$$\frac{7}{24}$$

Question 15

Showing all working, find the value of each pronumeral correct to one decimal place.

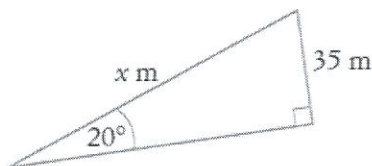
[4 marks]

(a)



$$\cos 58^\circ = \frac{d}{15.2} \quad \checkmark$$
$$d = 15.2 \cos 58^\circ$$
$$= 8.1 \text{ m} \quad \checkmark$$

(b)



$$\sin 20^\circ = \frac{35}{x} \quad \checkmark$$
$$x = \frac{35}{\sin 20^\circ}$$
$$x = 102.3 \text{ m} \quad \checkmark$$

Question 16

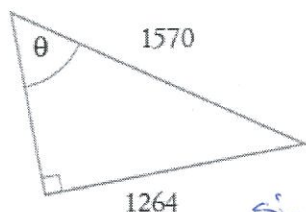
In each of the following, find the size of angle θ

(a) $\sin \theta = 0.872$, correct to the nearest degree.

$$61^\circ$$

(b) Correct to the nearest minute.

[2 marks]



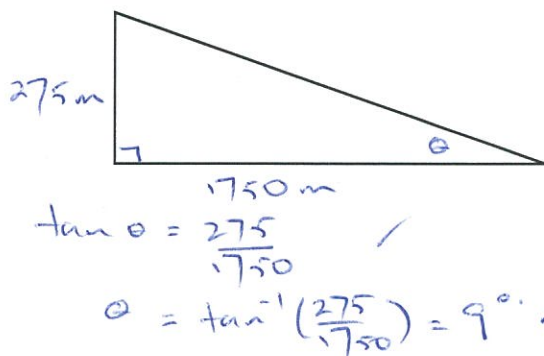
$$\sin \theta = \frac{1264}{1570} \quad \checkmark$$
$$\theta = \sin^{-1}\left(\frac{1264}{1570}\right)$$
$$= 53^\circ 37' \quad \checkmark$$

*Question 17

Karena is standing 1.75 km from a 275 m high mobile phone tower.

Find the angle of elevation of the top of the tower from Karena, correct to the nearest degree.

[2 marks]



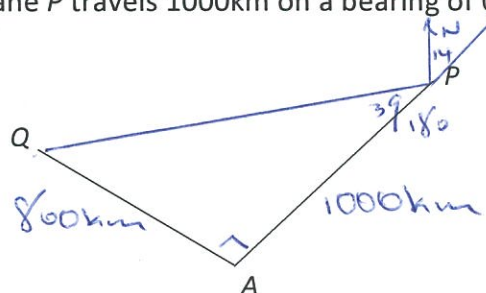
$$\tan \theta = \frac{275}{1750} \quad \checkmark$$
$$\theta = \tan^{-1}\left(\frac{275}{1750}\right) = 9^\circ \quad \checkmark$$

Question 18

Two planes leave an airport at the same time.

Plane Q travels 800 km on a bearing of 284° .

Plane P travels 1000 km on a bearing of 014° .



(a) Find $\angle QAP$.

$$(360 - 284) + 14 = 90^\circ$$

*(b) Calculate the bearing of Q from P, correct to the nearest degree.

[2 marks]

$$\tan P = \frac{800}{1000}$$
$$\therefore \angle P = 39^\circ \quad \checkmark$$

$$\text{Bearing} = 14 + 180 + 39$$
$$= 233^\circ \quad \checkmark$$

END OF TEST