Carlingford High School

Mathematics

Year 10 5.2 Course

Term 3 Exam

2015

Name: _____ Class: 10M2. ___

Teacher: Ms Strilakos Ms Kellahan

Time allowed: 55 minutes

- Board approved calculators may be used.
- Show all necessary working.
- Marks may be deducted for careless or untidy work.
- Questions marked with an asterisk * are extension level questions.
- Complete the examination in blue or black pen.
- Pencil is only to be used for diagrams.
- All diagrams are **NOT** drawn to scale

Topic	Probability	Algebra	Trigonometry	Total
Mark	/15	/20	/21	/56
Extension*	/6	/3	/4	/13
Total	/21	/23	/25	/69

Probability (21 marks)

1. The frequency of an event is 5 and the total number of frequencies is 40. What is the relative frequency? 1

   Circle the correct answer.

   A 0.125 **B** 0.05

   C 0.80 **D** 0.875

2. One card is selected from cards labelled 11, 12, 13, 14, 15, 16, 17 and 18. What is the probability of an odd number that is divisible by 3? 1

   Circle the correct answer.

   A 12.5% **B** 50%

   C 75% **D** 100%

3. A letter is chosen at random from the word 'PICTON'. What is the probability that the letter will *not* be a consonant? 1

   Circle the correct answer.

   A $\frac{1}{6}$ **B** $\frac{1}{3}$

   C $\frac{2}{3}$ **D** $\frac{5}{6}$

4. Thirty cards are numbered from 1 to 30. Find the probability of the following outcomes: 2

   a) odd number.

   _____

   b) divisible by 7.

   _____

5. The number of crimes in two suburbs is recorded in the two-way table below. 4

	Suburb C	Suburb D	Total
House Robbery	29	13	42
Car Robbery	17	23	40
Total		36	

   a) Complete the table.

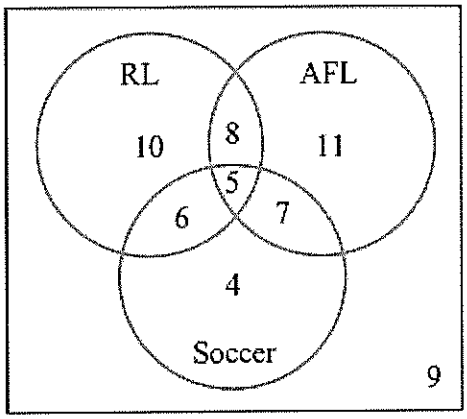
   b) What is the probability that the crime committed in both suburbs was a house robbery?

   _____

   c) What is the probability that in suburb C the crime was a car robbery?

   _____

6. The Venn diagram represents the results of a survey of which sports people liked to watch. 3



   Calculate the probability that a person chosen at random from this group:

   a) likes all 3 sports?

   _____

   b) likes rugby league but not soccer or AFL?

   _____

   c) does not like any of these sports?

   _____

7. 30 people were surveyed on their favourite type of music. The results were:

- 17 liked Hip-Hop
- 14 liked Rock
- 6 like Rock and Hip-Hop

a) Show this information in a Venn diagram. 1

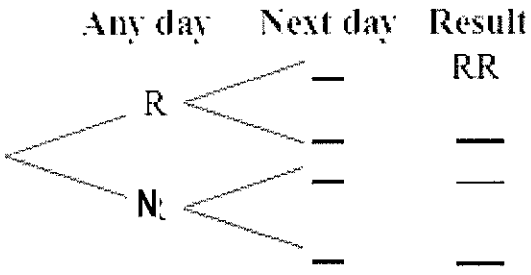
b) If one person was chosen at random, find the probability that the person 2

i) likes hip-hop but not rock

i) likes hip-hop or rock but not both.

9.* During summer in Brisbane the probability that it will rain on any day is 0.3. The probability of rain the day after a rainy day is 0.8, and the probability of rain after a non-rainy day is 0.2.

a) Complete this probability tree where R is the event it rains and N is the event it does not rain. 2



b) Find the probability that on two consecutive days: 4

i) it rains on both days

ii) it rains on the second day but not on the first

iii) it rains on at least one of the days.

Algebra (23 marks)

1. When $(x + 4)(x - 2)$ is expanded and simplified the result is: 1

A $x^2 + 6x + 8$ **B** $x^2 - 6x - 8$

C $x^2 + 2x - 8$ **D** $x^2 - 2x - 8$

2. The solutions to $(x - 5)(x + 2) = 0$ are: 1

A $x = 5$ or $x = -2$

B $x = -5$ or $x = 2$

C $x = 5$ or $x = 2$

D $x = -5$ or $x = -2$

3. Expand and simplify:

a) $(3x + 4)(x + 2)$ 2

b) $(x + 6)^2$ 1

c) $(7x + 8)(7x - 8)$ 1

d) $(4x - 2)(x + 3) - 4x^2 + 2$ 2

4. Factorise:

a) $x^2 + 7x - 30$ 1

b) $y^2 - 9$ 1

c) $x^2 - 14x + 49$ 1

d) $5x^2 + 20x - 60$ 2

5. When a number is decreased by 3 and the result doubled, the answer equals the original number. Use an equation to find the number. Let the number be n. 2

6. Solve the following equations.

a) $x^2 = 4$ 1

b) $2g\,(g + 8) = 0$ 1

c) $k^2 + 4k + 3 = 0$ 2

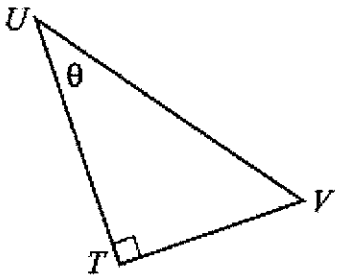
d) $j^2 - 3j - 40 = 0$ 2

7*. The sum of Peter's and Susan's ages is 20 years. If Peter's age was doubled, it would be 5 years more than three times Susan's age. How old is Susan? 3

Test continues next page...

Trigonometry (25 marks)

1. For the triangle below the hypotenuse is: 1

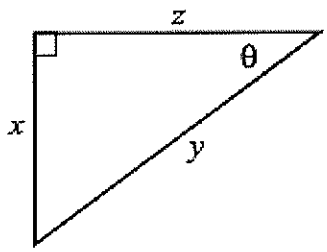


Circle your answer.

A) UT B) UV

C) TV D) none of these

2. For the triangle below the side adjacent to θ is: 1

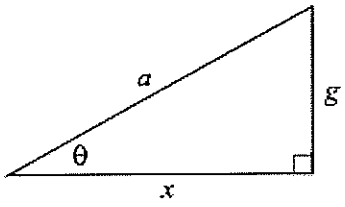


Circle your answer.

A) z B) y

C) x D) none of these

3. For the triangle below the expression for tan θ is: 1



Circle your answer.

A) $\frac{g}{x}$ B) $\frac{x}{g}$

C) $\frac{g}{a}$ D) $\frac{x}{g}$

4. The angle of depression from the top of a cliff 140 m high to a boat at sea is 31°. The distance from the boat to the base of the cliff is closest to:

Circle your answer.

A) 84m B) 72m

C) 272m D) 233m

5. The answer to 15tan 68°23' to three decimal places is: 1

Circle your answer.

A) 37.126 B) 37.853

C) 37.854 D) 37.977

6. Given cos θ = 0.75, then θ to the nearest minute is: 1

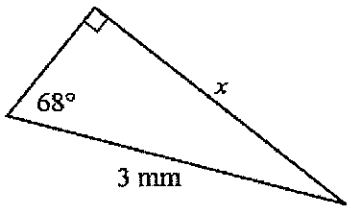
Circle your answer.

A) 41°24′ B) 41°25′

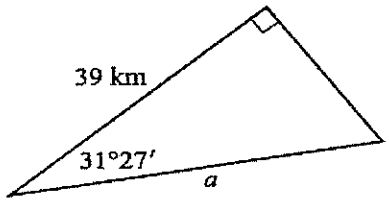
C) 48°34′ D) 48°35′

7. For each triangle find the missing side to two decimal places. Show all working.

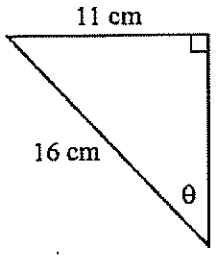
a) 2



b) 2

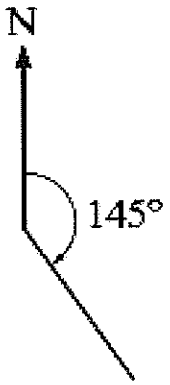


8. Find θ to the nearest minute. 2



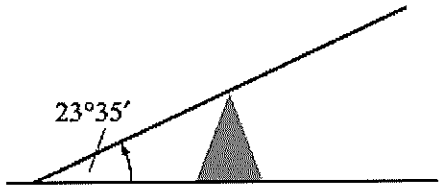
9. A rally driver travels 210 km on a bearing of 145°T.

a) Label the information on the diagram below 1

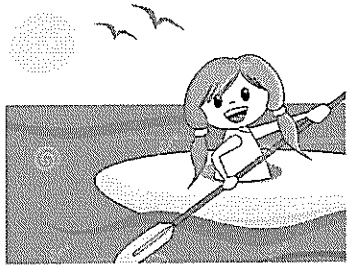


b) How far east of the starting position would the rally driver be now, to one decimal place? 2

10. A seesaw is 6.3 m long. When one end is resting on the ground it makes an angle of 23°35′ with the ground. 2
Find the height of the other end above ground level to one decimal place.



11. Emily is a kayaker. She paddles due west for 1.5 km, then turns due south and covers a further 800 m.



a) Draw a diagram to represent this information. 1

b) How far to the nearest 100m must Emily travel to return to her starting point? 2

c) On what bearing does Emily travel to get back to her starting point? 1

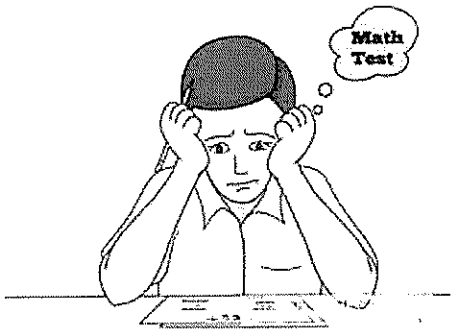
12. * Town *X* is 185 km west and 260 km north of town *Y*.

a) Draw a diagram to represent this information. 2

b) Find the bearing of *Y* from *X*. 2

~ END OF TEST~

Go back and Check your work!



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Total	/21	/23	/25	/69

Probability (21 marks)

1. The frequency of an event is 5 and the total number of frequencies is 40. What is the relative frequency? 1

Circle the correct answer.

(A) 0.125 **B** 0.05

C 0.80 **D** 0.875

2. One card is selected from cards labelled 11, 12, 13, 14, (15) 16, 17 and 18. What is the probability of an odd number that is divisible by 3? 1

Circle the correct answer.

(A) 12.5% **B** 50%

C 75% **D** 100%

3. A letter is chosen at random from the word 'PICTON'. What is the probability that the letter will *not* be a consonant? 1

Circle the correct answer.

A $\frac{1}{6}$ (B) $\frac{1}{3}$

C $\frac{2}{3}$ **D** $\frac{5}{6}$

4. Thirty cards are numbered from 1 to 30. Find the probability of the following outcomes: 2

a) odd number.

$P(\text{odd}) = \frac{1}{2}$

b) divisible by 7. 7 14 21 28

$P(\div 7) = \frac{4}{30} = \frac{2}{15}$

5. The number of crimes in two suburbs is recorded in the two-way table below. 4

	Suburb C	Suburb D	Total
House Robbery	29	13	42
Car Robbery	17	23	40
Total	46	36	82

a) Complete the table.

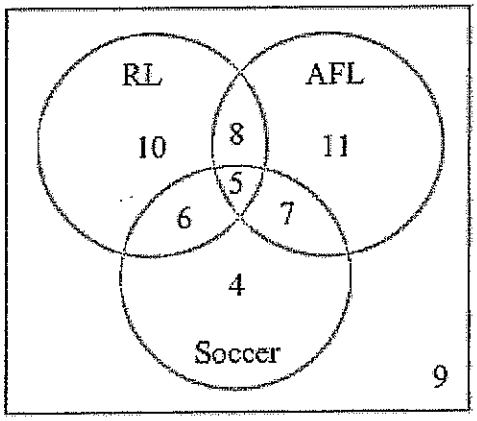
b) What is the probability that the crime committed in both suburbs was a house robbery?

$P(\text{house}) = \frac{21}{41}$

c) What is the probability that in suburb C the crime was a car robbery?

$P(\text{car}) = \frac{17}{46}$.

6. The Venn diagram represents the results of a survey of which sports people liked to watch. 3



Calculate the probability that a person chosen at random from this group:

a) likes all 3 sports?

$P(\text{all 3}) = \frac{5}{60} = \frac{1}{12}$

b) likes rugby league but not soccer or AFL?

$P(\text{only rugby}) = \frac{10}{60} = \frac{1}{6}$

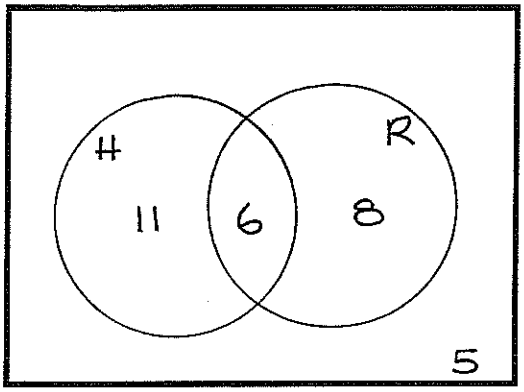
c) does not like any of these sports?

$P(\text{none}) = \frac{9}{60} = \frac{3}{20}$

7. 30 people were surveyed on their favourite type of music. The results were:

- 17 liked Hip-Hop
- 14 liked Rock
- 6 like Rock and Hip-Hop

a) Show this information in a Venn diagram. 1



b) If one person was chosen at random, find the probability that the person 2

i) likes hip-hop but not rock

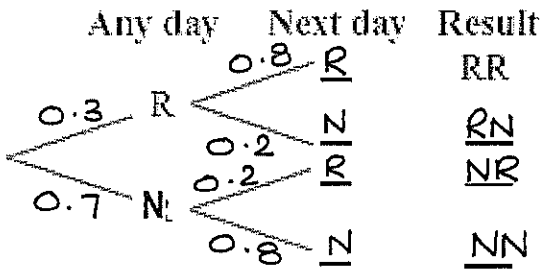
P(like only H) = 11/30

i) likes hip-hop or rock but not both.

P(not both H or R) = 19/30.

9.* During summer in Brisbane the probability that it will rain on any day is 0.3. The probability of rain the day after a rainy day is 0.8, and the probability of rain after a non-rainy day is 0.2.

a) Complete this probability tree where R is the event it rains and N is the event it does not rain. 2



b) Find the probability that on two consecutive days: 4

i) it rains on both days

P(RR) = 0.3 × 0.8

= 0.24

ii) it rains on the second day but not on the first

P(NR) = 0.7 × 0.2

= 0.14

iii) it rains on at least one of the days. 2

P(at least one day)

= 1 − P(none)

= 1 − 0.7 × 0.8

= 0.44.

Algebra (23 marks)

1. When $(x + 4)(x - 2)$ is expanded and simplified the result is: 1

A $x^2 + 6x + 8$ **B** $x^2 - 6x - 8$

C $x^2 + 2x - 8$ **D** $x^2 - 2x - 8$

2. The solutions to $(x - 5)(x + 2) = 0$ are: 1

A $x = 5$ or $x = -2$

B $x = -5$ or $x = 2$

C $x = 5$ or $x = 2$

D $x = -5$ or $x = -2$

3. Expand and simplify:

a) $(3x + 4)(x + 2)$ 2

$= 3x^2 + 6x + 4x + 8$

$= 3x^2 + 10x + 8$

b) $(x + 6)^2$ 1

$= x^2 + 12x + 36$

c) $(7x + 8)(7x - 8)$ 1

$= 49x^2 - 64$

d) $(4x - 2)(x + 3) - 4x^2 + 2$ 2

$= 4x^2 + 12x - 2x - 6 - 4x^2 + 2$

$= 10x - 4.$

4. Factorise:

a) $x^2 + 7x - 30$ 1

$= (x - 3)(x + 10)$

b) $y^2 - 9$ 1

$= (y - 3)(y + 3)$

SS

AK

c) $x^2 - 14x + 49$ 1

$= (x - 7)(x - 7)$

$= (x - 7)^2$

d) $5x^2 + 20x - 60$ 2

$= 5(x^2 + 4x - 12)$ 1

$= 5(x + 6)(x - 2)$ 1

5. When a number is decreased by 3 and the result doubled, the answer equals the original number. Use an equation to find the number. 2

Let the number be n.

$(n - 3) \times 2 = n$ 1

$2n - 6 = n$

$\therefore n = 6$ 1

6. Solve the following equations.

a) $x^2 = 4$ 1

$x = \pm 2$

b) $2g(g + 8) = 0$ 1

$g = 0$ or $g = -8$

c) $k^2 + 4k + 3 = 0$ 2

$(k+3)(k+1) = 0$

$\therefore k = -3$ or $k = -1$.

d) $j^2 - 3j - 40 = 0$ 2

$(j-8)(j+5) = 0$

$\therefore j = 8$ or $j = -5$

7*. The sum of Peter's and Susan's ages is 20 years. If Peter's age was doubled, it would be 5 years more than three times Susan's age. How old is Susan? 3

$P + S = 20 \Rightarrow P = 20 - S$ 1

$2P = 5 + 3S$

$2(20 - S) = 5 + 3S$

$40 - 2S = 5 + 3S$ 1

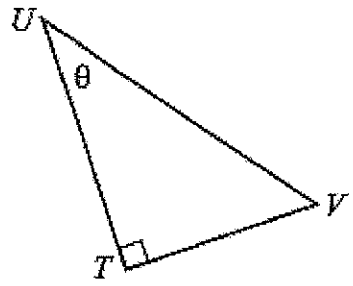
$-5S = -35$

$\therefore S = 7.$ 1

Test continues next page...

Trigonometry (25 marks)

1. For the triangle below the hypotenuse is: 1

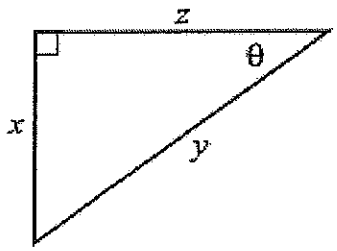


Circle your answer.

A) UT (B) UV

C) TV D) none of these

2. For the triangle below the side adjacent to θ is: 1

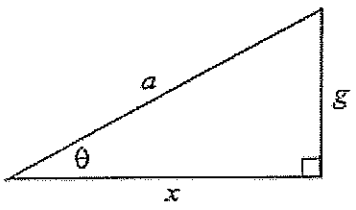


Circle your answer.

(A) z B) y

C) x D) none of these

3. For the triangle below the expression for tan θ is: 1

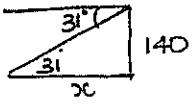


Circle your answer.

(A) $\frac{g}{x}$ B) $\frac{x}{g}$

C) $\frac{g}{a}$ D) $\frac{x}{g}$

4. The angle of depression from the top of a cliff 140 m high to a boat at sea is 31°. The distance from the boat to the base of the cliff is closest to:



Circle your answer.

A) 84m B) 72m

C) 272m (D) 233m

5. The answer to 15tan 68°23' to three decimal places is: 1

Circle your answer.

A) 37.126 B) 37.853

(C) 37.854 D) 37.977

6. Given cos θ = 0.75, then θ to the nearest minute is: 1

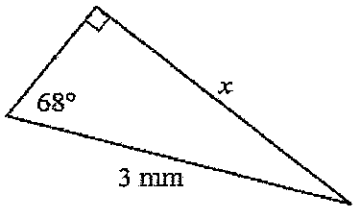
Circle your answer.

A) 41°24′ (B) 41°25′

C) 48°34′ D) 48°35′

7. For each triangle find the missing side to two decimal places. Show all working.

a) 2

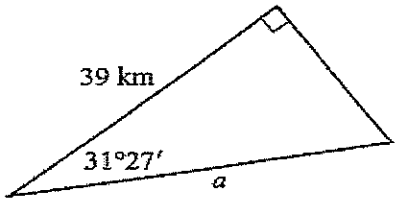


$\sin 68 = \frac{x}{3}$

$x = 3\sin 68°$

$x = 2.78$ mm must be 2dp

b) 2



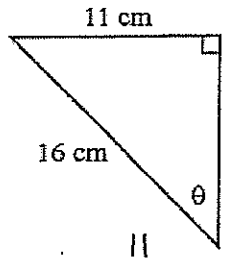
$\cos 31^\circ 27' = \frac{39}{a}$

$a = 39 / \cos 31^\circ 27'$

$a = 45.72$ km.

must have units

8. Find θ to the nearest minute. 2



$\sin\theta = \frac{11}{16}$

$\theta = 43^\circ 26'$

must be nearest minute.

9. A rally driver travels 210 km on a bearing of 145°T.

a) Label the information on the diagram below 1

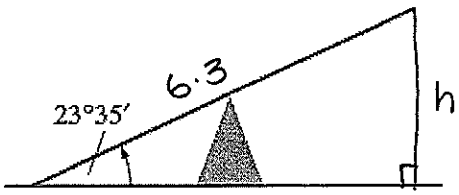
b) How far east of the starting position would the rally driver be now, to one decimal place? 2

$\cos 55^\circ = \frac{x}{210}$

$x = 210 \cos 55^\circ$

$= 120.5$ km.

10. A seesaw is 6.3 m long. When one end is resting on the ground it makes an angle of 23°35′ with the ground. 2
Find the height of the other end above ground level to one decimal place.

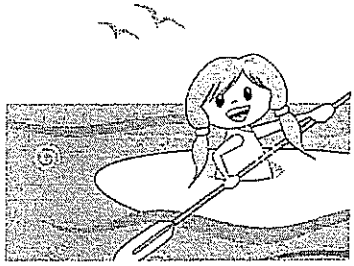


$\sin 23^\circ 35' = h / 6.3$

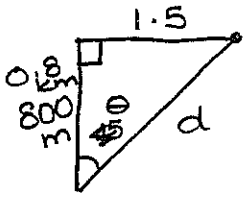
$h = 6.3 \times \sin 23^\circ 35'$

$\therefore h = 2.5$ m

11. Emily is a kayaker. She paddles due west for 1.5 km, then turns due south and covers a further 800 m.



a) Draw a diagram to represent this information. 1



b) How far to the nearest 100m must Emily travel to return to her starting point?

$d = \sqrt{1.5^2 + 0.8^2}$ 2

$= 1700$ m $= 1.7$ km.

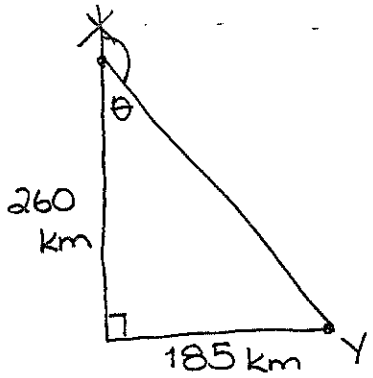
c) On what bearing does Emily travel to get back to her starting point? 1

$\tan\theta = \frac{1.5}{0.8}$

$\theta = 061^\circ 56'$

12. Town X is 185 km west and 260 km north of town Y.

a) Draw a diagram to represent this information. 2



b) Find the bearing of Y from X. 2

$\tan\theta = 185 \div 260$

$= 35°26'$

$\therefore$ bearing $= 180 - 35°26'$

$= 144°34'$

~ END OF TEST~

Go back and Check your work!