Sam Q1–7
Sandra Q8→12
Megan Q13→16
Ken Q17→20

Carlingford High School

Mathematics

Year 10 Term 3 Examination

5.2 Course

2018

Name: SOLUTIONS

Class: 5.2.___

Circle your teacher's name: Mr Cheng Ms Strilakos

Ms Gamble/Mrs Hooper Mrs Pennington

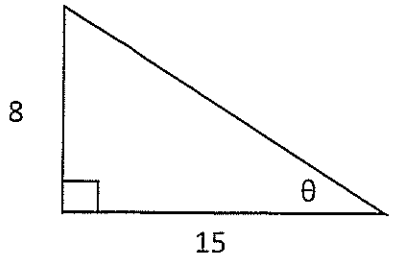
Time allowed: 50 minutes

- Board approved calculators may be used.
- Show all necessary working.
- Marks may be deducted for careless or untidy work.
- Complete the examination in blue or black pen.

TOPIC	Trigonometry	Probability	Algebra	TOTAL
	/28	/37	/10	/75

TRIGONOMETRY

Q.1 (i) Find the length of the hypotenuse in the triangle below.



$h = \sqrt{8^2 + 15^2}$

$= \sqrt{64 + 225} = 17$

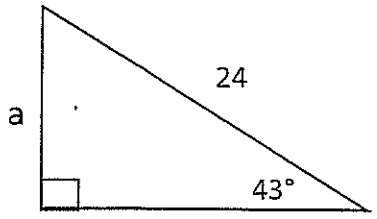
(ii) Hence find the value of $\sin\theta$ for the same triangle.

$\sin\theta = 8/17$, $\theta = 28°$

[2]

Q.2 Find the value of the pronumeral in each triangle, correct to 1 d.p.

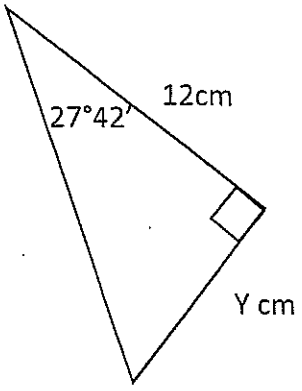
(i)



$\sin 43° = \frac{a}{24}$

$a = 24 \sin 43° = 16.4$

(ii)



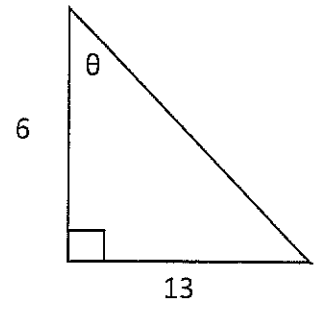
$\tan 27°42' = \frac{Y}{12}$

$Y = 12 \tan 27°42'$

$= 6.3$ cm

[4]

Q.3 Find the value of θ in the following triangle.(Give answer to nearest degree)

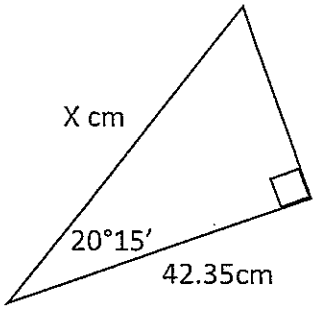


$\tan\theta = 13/6$

$\theta = 65°$

[2]

Q.4 Find the value of the pronumeral, correct to 1 d.p.

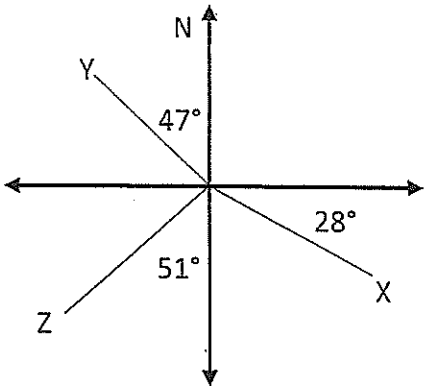


$\cos 20°15' = \frac{42.35}{X}$

$X = \frac{42.35}{\cos 20°15'} = 45.1$ cm

[2]

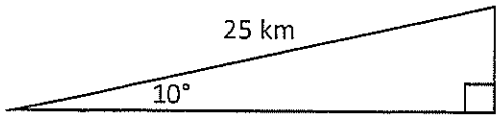
5 What is the three figure bearing from O of each named point in the diagram?



X= 118° Y= 313° Z= 231°

[3]

Q.6 An aircraft, after take-off, climbs at a constant angle of 10° to the horizontal.



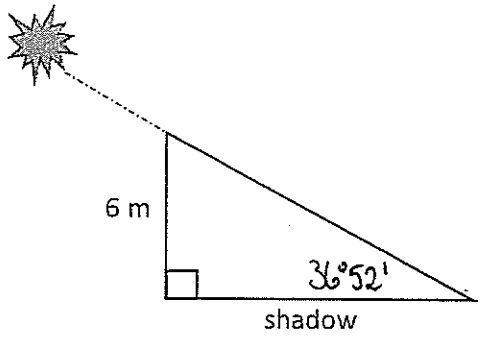
What is its altitude after it has travelled 25 km along this path?

$\sin 10° = \frac{a}{25}$ $a = 25 \sin 10°$

$= 4.34$ km

[1]

Q.7 A vertical pole 6 metres high casts a shadow on the ground when the sun is at an angle of elevation of 36°52′.



(i) Write the angle of elevation in the triangle on the diagram.

(ii) Find the length of this shadow.

$\tan 36°52' = \frac{6}{\text{shadow}}$

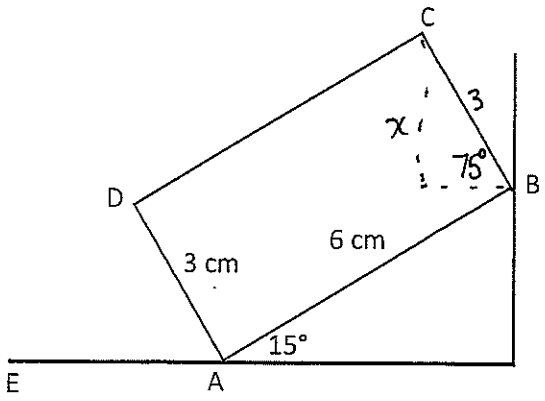
$\text{shadow} = \frac{6}{\tan 36°52'} = 8$ metres

(iii) What is the angle of elevation of the sun when the length of the shadow is doubled?

$\tan \theta = \frac{6}{16}$ $\theta = 20°33'$

[1+2+2]

Q.8 A rectangular block 6 cm by 3 cm rests against a vertical wall and makes an angle of 15° with the horizontal.



(i) Calculate the vertical height above the ground of B. (2 d.p.)

$B = 6 \sin 15°$

$= 1.55$cm 1

(ii) What is the size of $\angle DAE$?

$75°$ 1

(iii) Calculate the vertical height above the ground of C. (2 d.p.)

$C = B + x$

$x = 3 \sin 75° = 2.90$cm 1

$\therefore C = 1.55 + 2.90$

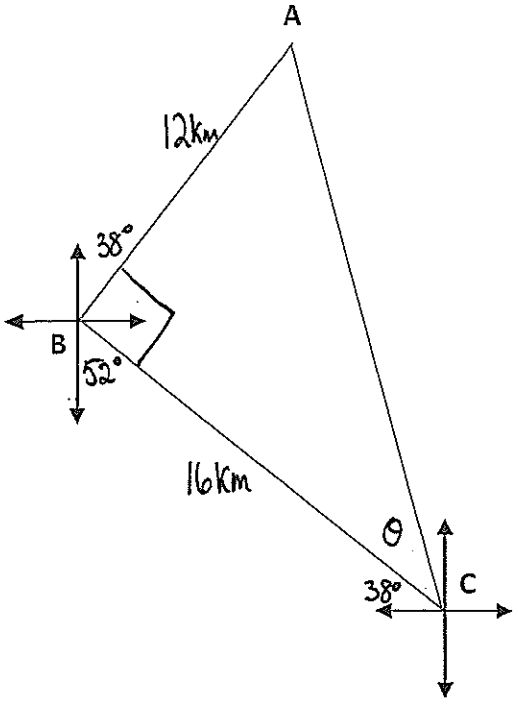
$= 4.45$ cm 1

[1+1+2]

4

Q.9 Two yachts sail in a straight line from a buoy **B**. One sails 12 km in the direction N 38° E to a position **A**, and the other sails 16 km in the direction S 52° E to a position **C**.

(i) Complete the diagram to show this information.



(1)

(ii) How far apart are the two yachts?

20km.

(Can use Pythagoras) $d^2 = 12^2 + 16^2$ (1)

$d = \sqrt{400} = 20\text{km}$.

(iii) What is the bearing of the first yacht as seen from the second yacht?

$\tan\theta = \frac{12}{16}$ (1) $\theta = 36°52'$ (1)

∴ the bearing of A from C is

$270° + 38° + 36°52'$

$= 344°52'$ (1)

(5)

[1+1+3]

PROBABILITY

Q.10 A set of cards is numbered

1, 2, 3, ... 20.

A card is drawn at random from the set.

What is the probability that the number on it is divisible by:

(i) 3 $Pr = \frac{6}{20} = \frac{3}{10}$ 1

(ii) 5 $Pr = \frac{4}{20} = \frac{1}{5}$ 1

(iii) 3 or 5 or both?

$Pr = \frac{9}{20}$ 1 [3]

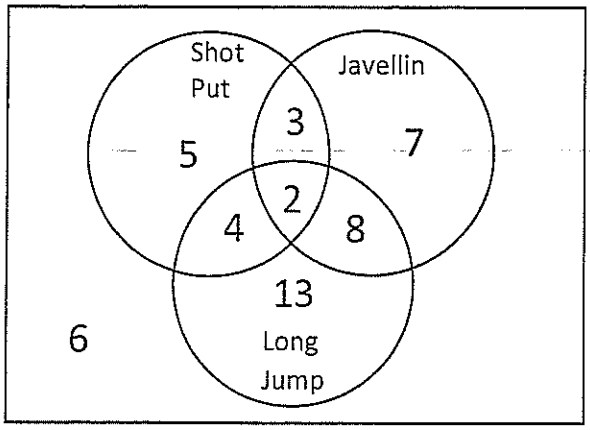
Q.11 A bag contains 12 balls of which 4 are blue, 6 are green and 2 are red. A ball is drawn from the bag, the colour noted, and then it is replaced. This is done 60 times. The results are shown in the table below.

Event	Frequency
Blue	16
Green	38
Red	6

(i) What is the experimental probability of drawing out a blue ball? $\frac{16}{60} = \frac{4}{15}$ 1

(ii) What is the theoretical probability of drawing out a blue ball? $\frac{4}{12} = \frac{1}{3}$ 1 [2]

Q.12 The Venn Diagram shows the number of Year 10 students surveyed who competed in the shot put, long jump, and javelin events at the School Athletics carnival.



(i) How many students were surveyed altogether? 48 1

(ii) How many students competed in the javelin and long jump only? 28 1
(accepted either by wording ambiguous) 8

(iii) How many students competed in only one of these three events? 25 1

(iv) How many students competed in two of these events only? 15 1

(v) What is the probability that a student chosen at random from the group surveyed competed in shot put but not javelin? $\frac{9}{48} = \frac{3}{16}$ 1

(vi) What is the probability of selecting a student who competed in either the long jump or the javelin, but not both? $\frac{27}{48} = \frac{9}{16}$ 1

[6]

Q.13 The two way table below shows the distribution of members of the audience at a play.

	Stalls	Dress Circle	Balcony	Total
Adults	36	39	37	112
Children	41	21	31	93
Total	77	60	68	205

(i) Use the details already in the table to fill in the empty cells.

(ii) What is the probability that a person chosen randomly from the audience is

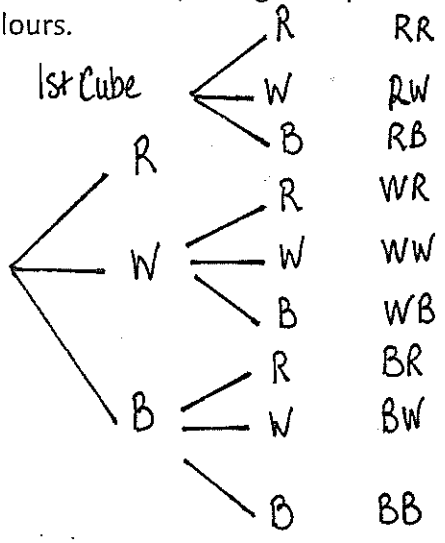
(a) an adult sitting in the balcony? $\frac{37}{205}$

(b) a child? $\frac{93}{205}$

(c) sitting in the balcony? $\frac{68}{205}$ [4]

Q.14 Two cubes each have two faces painted red, another two white and the other two blue. They are rolled together.

(i) Draw a tree diagram to show all the possible outcomes, listing each possible pairing of colours.



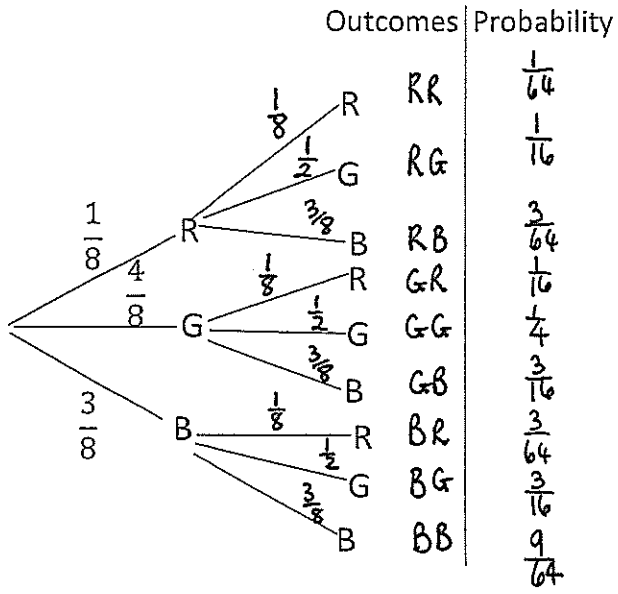
(ii) What is the probability that both colours are the same? $\frac{3}{9} = \frac{1}{3}$

(iii) What is the probability that one is red and the other white?

$\frac{2}{9}$

[1+1+1]

Q.15 Consider the tree diagram below which shows the probability of spinning each of the colours red, green and blue, on each of two successive spins. The probability of spinning a red is $\frac{1}{8}$, green is $\frac{4}{8}$, and blue is $\frac{3}{8}$.



(i) List all 9 outcomes and their respective probabilities in the columns next to the tree diagram.

[1+2]

What is the probability of spinning:

(ii) Two of the same colour?

$\frac{1}{64} + \frac{1}{4} + \frac{9}{64} = \frac{26}{64} = \frac{13}{32}$

(iii) A red and a blue?

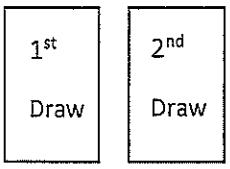
$\frac{3}{64} + \frac{3}{64} = \frac{3}{32}$

(iv) A green then a red in that order?

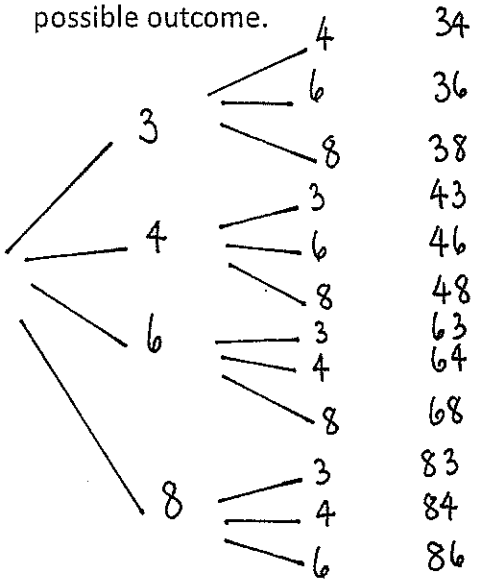
$\frac{1}{16}$

[3]

Q.16 Four cards numbered 3, 4, 6, and 8 are placed in a box. One card is drawn from the pile and placed on the table face up. Then a second card is drawn from the remaining three and placed next to it, to form a 2- digit number.



(i) Draw a tree diagram to show each possible outcome.



What is the probability that the two-digit number formed by these two cards:

(ii) Is an even number?

$\frac{9}{12} = \frac{3}{4}$

(iii) Is a number which is divisible by 3?

$\frac{4}{12} = \frac{1}{3}$

(iv) Contains two digits which add to 9 or more?

$\frac{10}{12} = \frac{5}{6}$

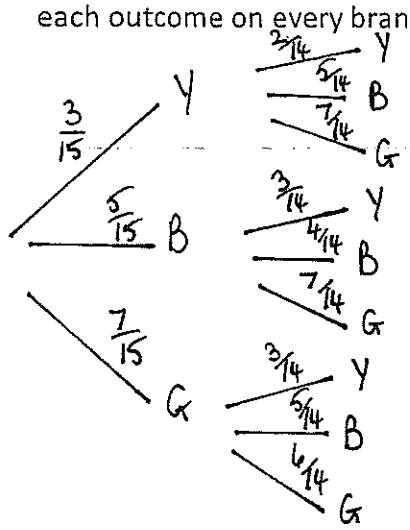
(v) Contains two digits which are the same?

0

[2+1+1+1+1]

Q.17 A bag contains 3 yellow, 5 blue and 7 green marbles. Two marbles are drawn from the bag without replacement.

(i) Draw a tree diagram to show all possible outcomes, and write the probabilities of each outcome on every branch.



(i) Given that the first marble drawn is green, what is the probability that the second marble drawn is also green?

$\frac{6}{14}$

(ii) Given that the first marble is yellow, what is the probability that the second is blue?

$\frac{5}{14}$

(iii) What is the probability that, given one of the marbles is blue, the other is green?

$\frac{35}{210} + \frac{35}{210} = \frac{70}{210} = \frac{1}{3}$

(iv) What is the probability of drawing a blue and a yellow?

$\frac{15}{210} + \frac{15}{210} = \frac{30}{210} = \frac{1}{7}$

[3+1+1+1+1]

ALGEBRA

Q.18 Expand and simplify each binomial product.

(i) $(y-3)(y+8)$

$y^2 + 5y - 24$

(ii) $(4b+8)(5b-2)$

$20b^2 - 8b + 40b - 16$

$= 20b^2 + 32b - 16$

(iii) $(7-5a)(5a-7)$

$35a - 49 - 25a^2 + 35a$

$= 70a - 49 - 25a^2$ [1+2+2]

Q.19 Find two numbers whose:

(i) product is -18 and whose sum is 3

$6 \& -3$

(ii) product is 32 and whose sum is -12

-8 and -4

[2]

Q.20 Factorise each of the following quadratic expressions:

(i) $x^2 + 8x + 15$

$(x+3)(x+5)$

(ii) $w^2 - w - 42$

$(w-7)(w+6)$

(iii) $r^2 + 4r - 45$ [3]

$(r+9)(r-5)$

END OF TEST