Carlingford High School

Year 10 (5.2) Mathematics

Yearly Exam 2017

Name: _____ **Class: 10Ma5.2**_____

Please circle your teacher's name:

Ms Wilson/Mrs Young Mrs Lobejko Mr Jiang

- Time allowed: *90 minutes*
- Board approved calculators may be used
- Show all necessary working using blue or black pen
- Marks may be deducted for untidy setting out

TOPIC	STANDARD	EXTENSION(*)	TOTAL
Multiple Choice	/25		/25
Linear Relationships	/5	/2	/7
Data Analysis	/5	/2	/7
Compound Interest	/5	/2	/7
Trigonometry	/5	/2	/7
Algebra	/5	/2	/7
Probability	/5	/2	/7
Surface Area and Volume	/5	/2	/7
Equations and Inequations	/5	/2	/7
Geometry	/5	/2	/7
Graphs	/5	/2	/7
Simultaneous Equations	/5		/5
TOTAL	/75	/20	/100

Multiple Choice – Answer on the answer sheet provided.

Suggested time 20 minutes, 25 marks.

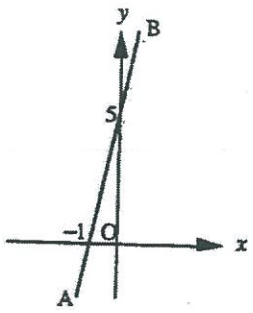
1. The equation of the line through (-3,4) parallel to the y axis is

A. $x = -3$
B. $x = 4$
C. $y = -3$
D. $y = 4$

2. Which point lies on the line $7x-3y-10=0$?

A. (-2, -8)
B. (1,1)
C. (-1,-1)
D. (2,8)

3. What is the equation of the line AB?



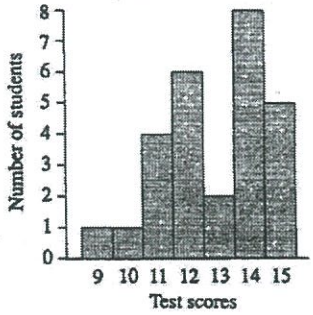
A. $y = \frac{1}{5}x - 1$
B. $y = \frac{1}{5}x + 5$
C. $y = 5x - 1$
D. $y = 5x + 5$

4. For this set of scores which of the following statements is correct?

Score	*Frequency*
5	3
6	1
7	2
8	7

A. There are 4 scores and their mean is 6.5.
B There are 4 scores and their mean is 7.
C. There are 13 scores and their mean is 6.5.
D. There are 13 scores and their mean is 7.

5. The results of a Year 10 class test are shown in the frequency histogram below:



The median test score is:

A. 11
B. 12
C. 13
D. 14

6. The greatest return on a compound interest investment will be made if interest is:

A. compounded monthly
B. compounded quarterly
C. compounded six-monthly
D. compounded yearly

7. A bottle of soft drink costs \$2.50. If the inflation rate is predicted to average 2%p.a. for the next 5 years, the cost of the soft drink in 5 years will be:

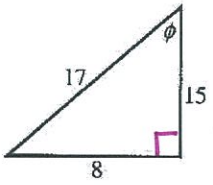
A. \$2.60
B. \$2.75
C. \$2.70
D. \$2.76

8. Matthew receives a normal hourly rate of \$22.60 per hour. What is his pay when he works 8 hours at a normal rate and 3 hours at time-and-a half?

A. \$180.80
B. \$282.50
C. \$248.60
D. \$316.40

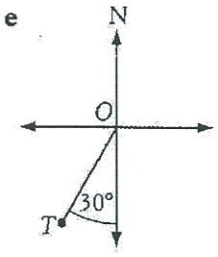
9. Which of the following is correct?

A. $tan\emptyset = \frac{8}{15}$
B. $tan\emptyset = \frac{15}{8}$
C. $sin\emptyset = \frac{15}{17}$
D. $cos\emptyset = \frac{8}{17}$



10. What is the bearing of T from O?

A. 150°
B. 030°
C. 330°
D. 210°



11. Which of the following is NOT correct?

A. the value of $\tan\theta$ can never be greater than 1
B. the value of $\sin\theta$ can never be greater than 1
C. the value of $\cos\theta$ can never be greater than 1
D. $\tan 45° = 1$

12. The expression $x^2 + 5x - 6$ can be factorised to give

A. $(x+3)(x+2)$
B. $(x-6)(x+1)$
C. $(x-3)(x-2)$
D. $(x+6)(x-1)$

13. $(x+2)$ is a factor of the expression:

A. $x^2 + 4x - 3$
B. $x^2 - 4$
C. $x^2 - 4x + 4$
D. $x^2 + x - 6$

14. A letter is chosen from the word HAPPINESS. What is the probability that the chosen letter is NOT a vowel?

A. $\frac{1}{3}$
B. $\frac{1}{9}$
C. $\frac{2}{3}$
D. $\frac{2}{9}$

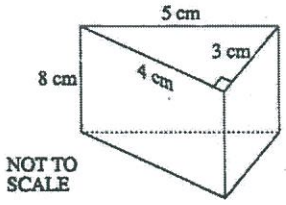
15. One card is selected from a regular deck of playing cards. What is the probability that it is a heart?

A. $\frac{1}{52}$
B. $\frac{1}{4}$
C. $\frac{1}{13}$
D. $\frac{3}{4}$

16. A bag contains red, white and blue balls. The probability of choosing a red ball is 0.2 and the probability of choosing a white ball is 0.7. What is the probability of choosing a blue ball?

A. 0.1
B. 0.72
C. 0.27
D. 0.9

17. The volume of this triangular prism is:



A. $48cm^3$
B. $60cm^3$
C. $80cm^3$
D. $96cm^3$

18. The volume of a cylinder with a height of 6cm and radius of 2cm is:

A. $75cm^3$
B. $302cm^3$
C. $113cm^3$
D. $452cm^3$

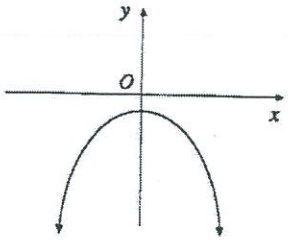
19. A number x is decreased by 7, then this amount is doubled. The result is 85. Which of these equations represents this?

A. $7 - 2x = 85$
B. $2(7 - x) = 85$
C. $2x - 7 = 85$
D. $2(x - 7) = 85$

20. Solve $5 - 3x < 11$

A. $x < -2$
B. $x < 2$
C. $x > -2$
D. $x > -2$

21. The equation of this graph could be:



A. $y = -x^2 + 3$
B. $y = -x^2 - 3$
C. $y = x^2 + 3$
D. $y = x^2 - 3$

22. The graph represented by the equation $x^2 + y^2 = 9$ would be:

A. a straight line
B. a parabola
C. a circle
D. an exponential curve

23. The exterior angle sum any polygon is:

A. 90°
B. 360°
C. 180°
D. 540°

24. The number of sides on a hexagon is:

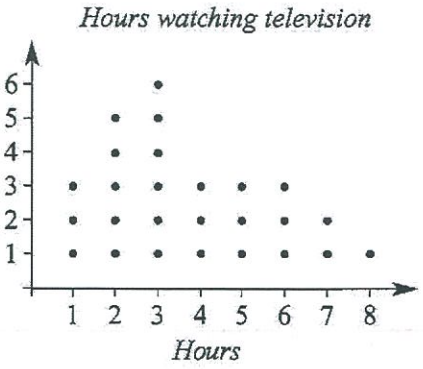
A. 5
B. 8
C. 6
D. 10

25. Find the value of x when these equations are solved simultaneously:

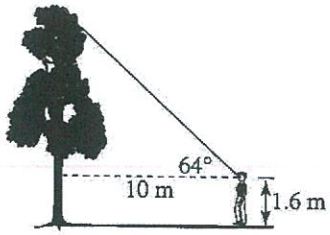
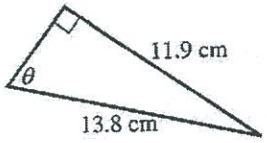
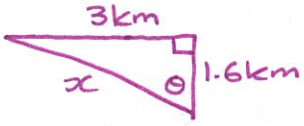
$$y = 2x + 9$$
$$x + 5y = 1$$

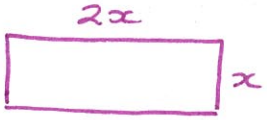
A. $x = 4$
B. $x = 2$
C. $x = \frac{-8}{11}$
D. $x = -4$

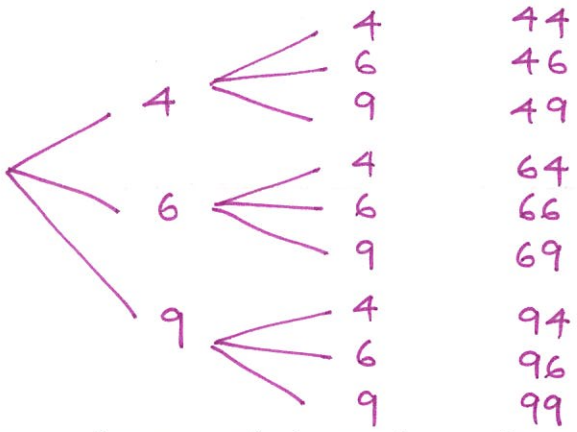
	Linear Relationships (7 marks) Answer in the space provided:	Mark
1	Write the equation of a straight line with gradient 3 and y intercept -2. $y = 3x - 2$	[1]
2	The interval AB on a number plane has endpoints A(-4,2) and B (6,4). Find: (a) the gradient of AB $= \frac{4-2}{6-(-4)}$ $= \frac{1}{5}$ (b) the length of AB as a surd $AB = \sqrt{[6-(-4)]^2 + (4-2)^2}$ $= \sqrt{104}$ (c) the midpoint of AB $= \left(\frac{-4+6}{2}, \frac{2+4}{2}\right)$ $= (1,3)$	[1] [1] [1]
3	Find the equation of the line parallel to y=2x+3 and passing through (1,4) $m = 2, \quad 4 = 2(1) + b$ $b = 2$ $\therefore y = 2x + 2$	[1]
4*	A triangle has vertices X(1,3), Y (0,0) and Z (7,1). **Prove** that this triangle is right angled. $m_{XY} = \frac{0-3}{0-1} = 3$ $\quad m_{YZ} = \frac{1-0}{7-0} = \frac{1}{7}$ $\quad m_{ZX} = \frac{1-3}{7-1} = -\frac{1}{3}$ $m_{XY} \times m_{ZX} = 3 \times (-\frac{1}{3})$ $= -1$ $\therefore$ XY is perpendicular to ZX $\therefore \triangle XYZ$ has a right-angle	[2]

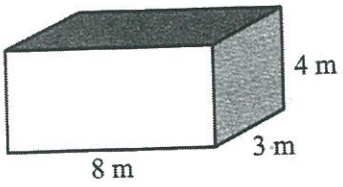
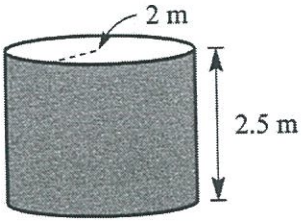
	Data Analysis (7 marks) Answer in the space provided:	Mark
1	The dot plot below represents the number of hours Joyce spent watching television over 26 weekends.  (a) What is the range of hours spent watching TV? 8 − 1 = 7 (b) What **percentage** of weekends did Joyce spend more than 6 hours watching TV? Answer to 2 decimal places. $\frac{3}{26} \times 100 = 11.54\%$	[1] [1]
2	The stem and leaf plot below shows the age of 25 offenders who were caught speeding. Find: *Stem* | *Leaf* 1 | 8 8 9 9 9 2 | 0 0 0 1 1 3 4 6 9 3 | 0 1 2 7 4 | 2 5 5 | 3 6 8 6 | 6 7 | 4 (a) the range 74 − 18 = 56 (b) the mode 19 and 20 (c) the median 26	[1] [1] [1]
3*	Consider the points scored by a football team in a season. ~~17,31,6,26,30,23,29,25,19,72,21,28,22,28,12.~~ 6, 12, 17, (19) 21, 22, 23, (25) 26, 28, 28, (29) 30, 31, 72 (a) Find the interquartile range. 29 − 19 = 10 (b) Explain why the interquartile range would be a better measure of spread than the range. not affected by outliers	[1] [1]

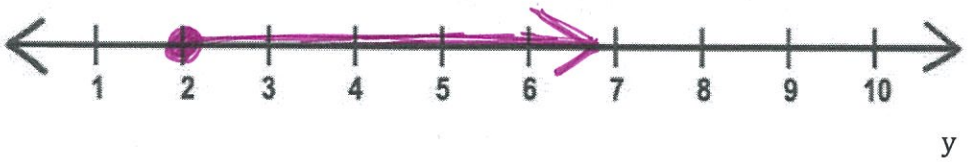
	Compound Interest (7 marks) Answer in the space provided:	Mark
1	Calculate the simple interest when: (a) \$5000 is invested at 4%p.a for 6 years. $I = 500 \times 0.04 \times 6$ $= \$120$ (b) \$2200 is invested at 8%p.a for 6 months $I = 2200 \times 0.08 \times \frac{6}{12}$ $= \$88$	[1] [1]
2	A computer depreciates by 30% each year. If it cost \$4000 when new, find its value after 3 years $A = 4000(1-0.3)^3$ $= \$1372$	[1]
3	A digital TV is purchased under the following terms:  Deposit: \$110 Repayments: \$41.85 each month for 2 years (a) Find the total amount paid for the television. $A = 110 + 41.85 \times 12 \times 2$ $= \$1114.40$ (b) The marked price was \$800. Calculate the additional charges as a percentage of the marked price. $1114.40 - 800 = \$314.40$ $\frac{314.40}{800} \times 100 = 39.3\%$	 [1] [1]
4*	Jo had to decide between investing \$1000 at a simple interest rate of 11% p.a. for 4 years or investing the same amount at a compound interest rate for the same period of time. Which would be the better investment and by how much? $I = 1000 \times 0.11 \times 4$ $= 440$ $A = 440 + 1000$ $= 1440$ $A = 1000(1+0.11)^4$ $= 1518.07$ $1518.07 - 1440 = \$78.07$ Compound interest by \$78.07	2]

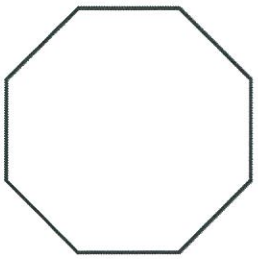
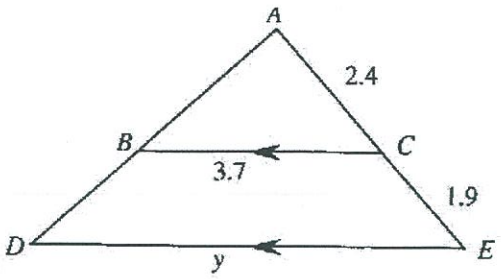
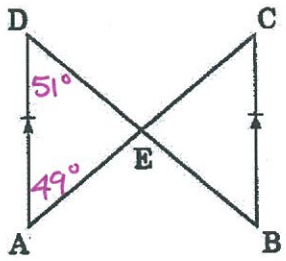
	Trigonometry (7 marks) Answer in the space provided:	Mark
1	Calculate the following correct to 4 decimal places: (a) $4.9\cos 25° =$ 4.4409 (b) $\frac{3.8}{\sin 14°12'} =$ 15.4908	[1] [1]
2	Find the height of the tree, correct to one decimal place.  $\tan 64° = \frac{h}{10}$ $h = 10 \tan 64°$ $= 20.5$ tree $= 1.6 + 20.5$ $= 22.1$ m	[2]
3	Find the size of the unknown angle θ, correct to the nearest minute.  $\sin\theta = \frac{11.9}{13.8}$ $\theta = \sin^{-1}\left(\frac{11.9}{13.8}\right)$ $= 59° 35'$	[1]
4*	A hiker walks 3km east and then 1.6km south. (a) How far is the hiker from the starting point?  $x^2 = 3^2 + 1.6^2$ $x = \sqrt{11.56}$ $= 3.4$ km (b) On what bearing would the hiker have to walk to return to the starting point? Give your answer to the nearest degree. $\tan\theta = \frac{3}{1.6}$ $\theta = \tan^{-1}\left(\frac{3}{1.6}\right)$ $= 62°$ $360° - 62° = 298°$ Bearing $= 298°$	[1] [1]

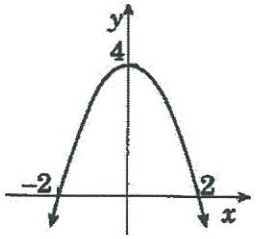
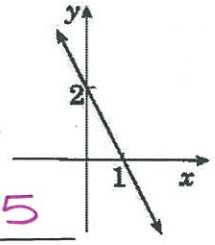
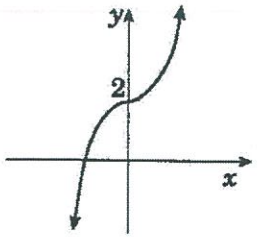
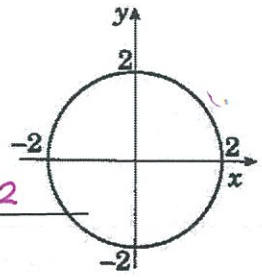
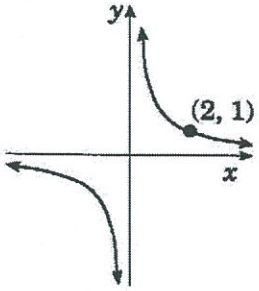
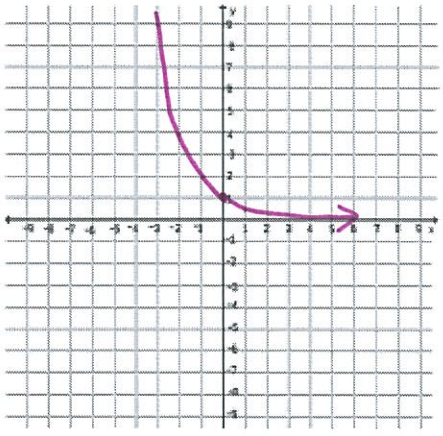
	Algebra (7 marks) Answer in the space provided:	**Mark**
1	Expand and simplify: $-4(2x+7) =$ $-8x-28$	[1]
2	Factorise each of these expressions: (a) $x(x+3)-2(x+3) =$ $(x+3)(x-2)$ (b) $x^2+7x-18 =$ $(x+9)(x-2)$	[1] [1]
3	Simplify this expression: $\frac{3m-6}{4} \times \frac{8m}{m(m-2)}$ $= \frac{3(m-2)}{4_1} \times \frac{{}^{2}8m}{m(m-2)}$ $= 6$	[2]
4*	A rectangular garden bed is twice as long as it is wide. Its area is 84.5m^2. Find the length of the garden bed.  $2x \times x = 84.5$ $2x^2 = 84.5$ $x^2 = 42.25$ $x = \sqrt{42.25}$ $= 6.5$ length $= 2 \times 6.5$ $= 13m$	[2]

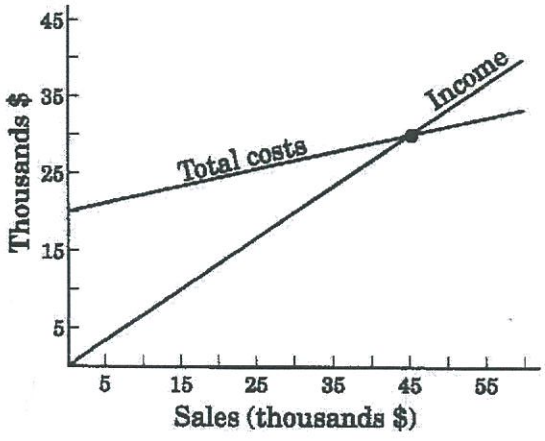
	Probability (7 marks) Answer in the space provided:	Mark
1	What is meant if the probability of an event occurring is found to be 1? it is certain to happen	[1]
2	A two digit number is formed using the digits 4, 6 and 9. The same number can be repeated. (a) Draw a tree diagram to represent all possible outcomes.  (b) How many elements are in the sample space? 9 (c) What is the probability of forming a number where both digits are the same? $\frac{3}{9} = \frac{1}{3}$ (d) What is the probability of forming a number which is even? $\frac{6}{9} = \frac{2}{3}$	[1] [1] [1]
3*	A bag contains 9 blue marbles, 6 yellow marbles and 5 red marbles. Two marbles are drawn from the bag without replacement. (20) Find the probability that: (a) Given one marble is red, the other is yellow. $\frac{6}{19}$ (b) Given one marble is blue, the other is also blue. $\frac{8}{19}$	[1] [1]

	Surface Area and Volume (7 marks) Answer in the space provided:	Mark
1	How many cm^3 are there in $3.6m^3$? $3\,600\,000\ cm^3$	[1]
2	Consider the rectangular prism below:  (a) Find the volume. $8\times3\times4 = 96m^2$ (b) Find the surface area. $2(8\times4 + 8\times3 + 3\times4) = 136m^2$	[1] [1]
3	Consider the cylinder below:  (a) Find the volume, correct to the nearest m^3. $V = \pi \times 2^2 \times 2.5$ $= 31m^3$ (b) Find the capacity, correct to the nearest kilolitre.	[1] [1]
4*	A rectangular prism has a square base and a height of 15cm. If its volume is $735cm^3$, find the length of the base. $V = x^2 \times h$ $735 = x^2 \times 15$ $x^2 = 49$ $x = 7\ cm$	[2]

	Equations and Inequations (7 marks) Answer in the space provided:	Mark
1	Solve $x^2 + 7x = 0$. $x(x+7) = 0$ $x = 0, -7$	[2]
2	(a) Solve $\frac{y-4}{3} \geq -2$ $y - 4 \geq -6$ $y \geq -2$	[2]
	(b) Graph this solution on the number line.  	[1]
3*	Solve $3x^2 + 11x + 2 = 0$. Leave your answer in EXACT form. $x = \frac{-11 \pm \sqrt{11^2 - 4(3)(2)}}{2(3)}$ $= \frac{-11 \pm \sqrt{97}}{6}$ 6 1 | 6 2 | 3	[2]

	Geometry (7 marks) Answer in the space provided:	Mark
1	 This is a regular octagon. Find the size of each interior angle. $\frac{(8-2)\times 180}{8} = 135°$	[1]
2	 (a) Prove that ΔABC is similar to ΔADE. In Δ's ABC and ADE ∠BAC = ∠DAC (common) ∠ABC = ∠ADE (corresponding angles, BC ∥ DE) ∴ ΔABC ||| ΔADE (AAA) (b) Hence find a value for y correct to 1 decimal place. Give a reason for your answer $\frac{y}{3.7} = \frac{2.4+1.9}{2.4}$ (ratio of sides, similar triangles) $y = \frac{3.7\times 4.3}{2.4}$ $= 6.6$ (1dp)	[2] [2]
3*	 (a) Which congruence test proves ΔADE ≡ ΔADE? AAS (b) If <ADE = 51° and < DAE =49°, find the size of <CBE. 51°	[1] [1]

	Graphs (7 marks) Answer in the space provided	Mark
1	From the list below match each equation to its correct graph. (Note: not every equation has a graph) 1. $y = 2^x$ ~~2. $x^2 + y^2 = 4$~~ 3. $y = (x+2)^2$ ~~4. $y = 4 - x^2$~~ ~~5. $y = -2x + 2$~~ ~~6. $y = x^3 + 2$~~ 7. $y = 2x - 1$ ~~8. $xy = 2$~~ 9. $y = (x-2)^2$ 10. $y = -2 - x^3$  4  5  6  2  8	[5]
2*	Draw a neat sketch $y = 2^{-x}$  Name the point where this graph cuts the y axis. 1	[1] [1]

	Simultaneous Equations (5 marks) Answer in the space provided:	Mark
1	Solve these equations simultaneously: $2x + y = 7$ ① $x = y - 4$ ② sub ② into ① $2(y-4) + y = 7$ $2y - 8 + y = 7$ $3y = 15$ $y = 5$ sub $y=5$ into ② $x = 5 - 4$ $= 1$ $\therefore x = 1, y = 5$	[2]
2	Solve these equations simultaneously: $5x + y = 10$ ① $3x + y = 8$ ② ① − ② $2x = 2$ $x = 1$ sub into ① $5(1) + y = 10$ $y = 5$ $\therefore x = 1, y = 5$	[2]
3	A company graphs its income versus total costs.  Once the business is underway, find the "break-even" point. That is, where total costs = income. Total costs = $30 000 Income = $45 000	[1]

-END OF EXAM-