CARLINGFORD HIGH SCHOOL

DEPARTMENT OF MATHEMATICS

Year 10 (5.2) Mathematics

Term 4 Yearly Exam 2018

Time allowed : ***90 Minutes***

Name : _____ **Class : 10M2.** _____

Please circle your Teacher's name: **Mr Cheng** **Mrs Pennington** **Ms. Strilakos** **Ms Gamble**

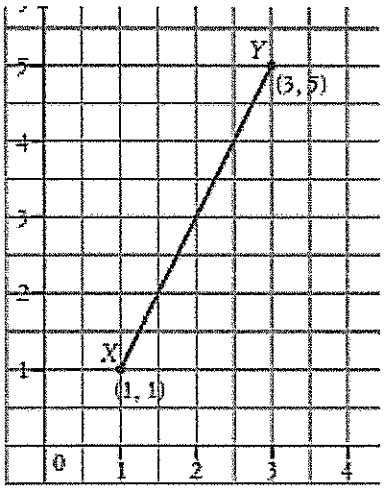
Instructions

- Board approved calculators may be used
- Show all necessary working by using blue/ black pen except graphs/diagrams
- Marks may be deducted for untidy setting out

TOPICS	TOTAL
Multiple Choice	/18
Linear Relationships	/7
Compound Interest	/7
Surface Area	/7
Equations & Inequalities	/7
Data Analysis	/7
Graphs	/7
Trigonometry	/7
Algebra	/7
Probability	/7
Geometry	/7
Simultaneous Equation	/7
TOTAL	/95

Multiple Choice Questions (Suggested time 18 mins, 18 marks)

Questions 1, 2 and 3 refer to this diagram of interval XY



1 What is the closest length of interval XY ?

(A) 4.5 units **(B)** 10 units **(C)** 8 units **(D)** 3.9 units

2 What is the midpoint of XY ?

(A) (2, 3) **(B)** (2.5, 3) **(C)** (2.5, 2.5) **(D)** (2 , 2.5)

3 What is the gradient of XY ?

(A) -3 **(B)** $\frac{3}{5}$ **(C)** $-\frac{5}{3}$ **(D)** 2

4 Jane is paid a commission of 2.5% on the value of goods she sells. She also receives a weekly retainer of \$875. How much will Jane earn if she sells goods to the value of \$41 600 in one week?

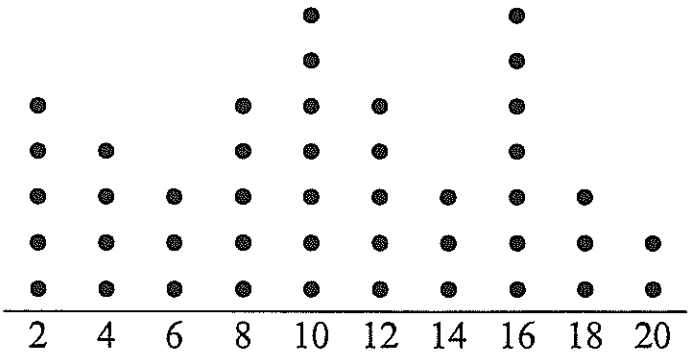
(A) \$1061.88 **(B)** \$2187.50 **(C)** \$1915 **(D)** \$1018.13

5 Calculate the area of a semicircle with a diameter of 14 cm.

(A) 21.99 cm^2 **(B)** 43.98 cm^2 **(C)** 76.97 cm^2 **(D)** 153.9 cm^2

6

Which of the following best describes the data displayed in the dot plot below:



(A) Bimodal **(B)** Positive skewed **(C)** Normally distributed **(D)** Negative skewed

7 Solve $x^2 + 3x - 40 = 0$.

(A) $x = 4$ or -10 **(B)** $x = -4$ or 10 **(C)** $x = -5$ or 8 **(D)** $x = 5$ or -8

8 Theo works as a fitter in a factory and is paid normal rates of \$46.50 per hour for a 35 hour week, then time and a half for any overtime.

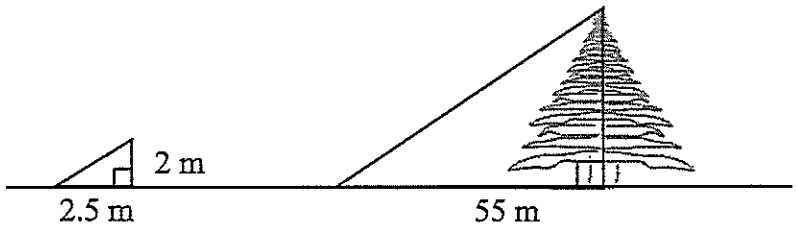
What would he earn for a week where he worked 42 hours?

(A) \$488.25 **(B)** \$1 953.00 **(C)** \$2 115.75 **(D)** \$2 929.50

9 Solve $3(2c - 5) = 41 - c$

(A) $c = 4$ **(B)** $c = 5$ **(C)** $c = 6$ **(D)** $c = 8$

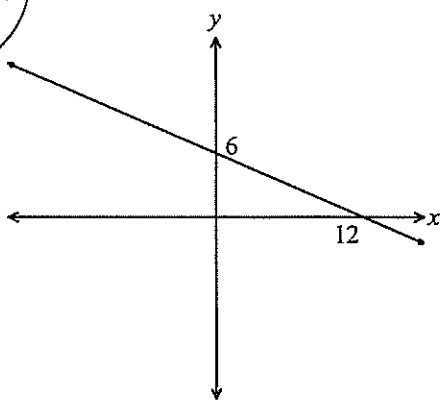
10 To estimate the height of a tree, Tran stands a 2 metre long pole vertically. He measures the length of its shadow to be 2.5 m and the length of the shadow of the tree to be 55 m. The height of the tree is closest to:



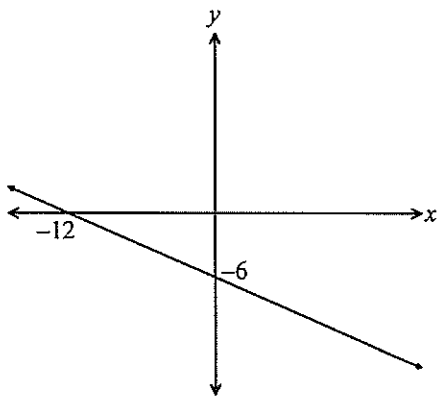
(A) 22m **(B)** 44m **(C)** 50 m **(D)** 69m

11 Which of the following graphs best represents the equation $y = 6 - \frac{1}{2}x$?

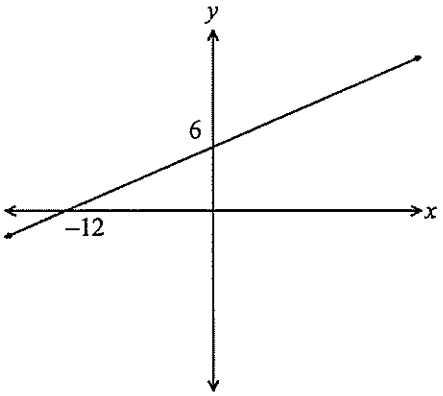
(A)



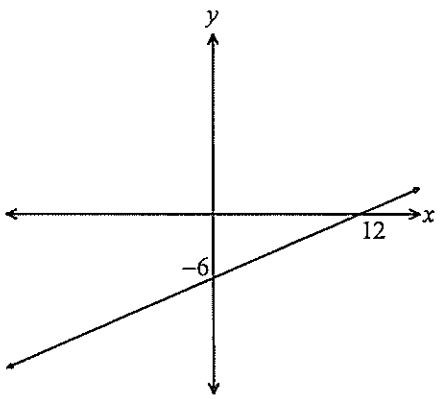
(B)



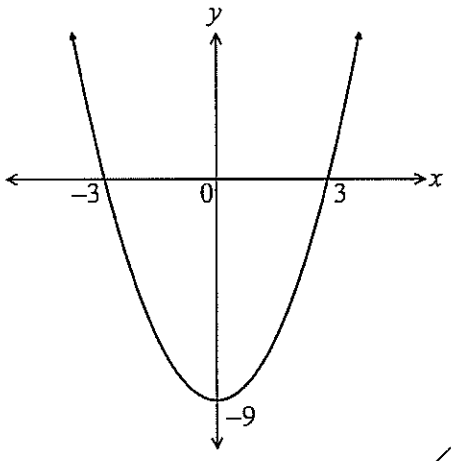
(C)



(D)

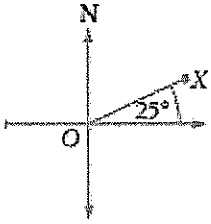


12 What is the equation of the curve shown below?



(A) $y = 9 - x^2$ **(B)** $y = x^2 - 3$ **(C)** $y = x^2 - 9$ **(D)** $y = 3x^2 - 9$

13 What is the bearing of X from O ?



(A) 25° **(B)** 65° **(C)** 025° **(D)** 065°

14 Each interior angle of a regular octagon is

(A) 1080 **(B)** 80 **(C)** 135 **(D)** 125

15 Karen and Barry are discussing having a family. They agree they would like to have three children. Karen says that she would like to have two girls and a boy in any order. What is the probability that she will get her wish if they do have three children?

(A) $\frac{3}{8}$ **(B)** $\frac{1}{2}$ **(C)** $\frac{2}{3}$ **(D)** $\frac{5}{8}$

16 Nathan has invested \$5000 at 8% p.a. compounded yearly, for a holiday.

What is the total value of his investment after 3 years?

(A) \$5100.67 **(B)** \$6200.00 **(C)** \$6298.56 **(D)** \$6351.19

17 P varies inversely with q. If when q = 4, P= 38, find P when q = 5

(A) 5.1 cm **(B)** 7.8 cm **(C)** 73.2 **(D)** 30.4 cm

18 What is the value of sin θ?

(A) $\frac{5}{13}$ **(B)** $\frac{5}{12}$ **(C)** $\frac{12}{13}$ **(D)** $\frac{12}{5}$

End of Multiple Choice Questions

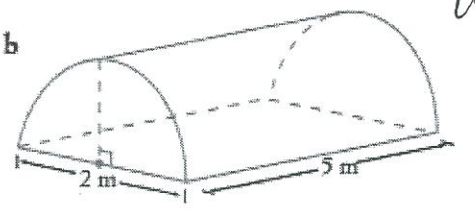
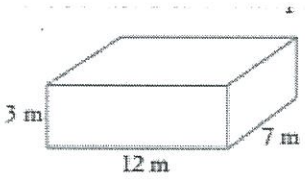
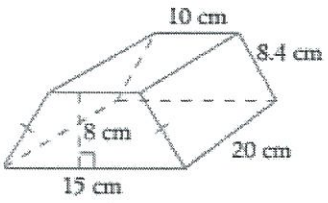
Answer in the space provided

	Linear Relationships (7 marks)	Mark
1	Write the equation of a line that has a gradient of 2 and a y-intercept of -5. $y = 2x - 5$	[1]
2	The interval AB on a number plane has endpoints $A(-2, 10)$ and $B(4, 5)$. Find: **a).** the gradient of AB. $m = \frac{5-10}{4+2} = \frac{-5}{6}$	[1]
	b). the length of AB as a surd. $\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$ $= \sqrt{(4+2)^2 + (5-10)^2}$ $= \sqrt{6^2+25} = \sqrt{61}$	[1]
	c). the midpoint of AB. $M\left(\frac{-2+4}{2}, \frac{10+5}{2}\right) = (1, 7{\cdot}5)$	[1]
3	Find the gradient of the line $3x - 4y = 8$. $4y = 3x - 8$ $y = \frac{3}{4}x - \frac{8}{2}$ $m = \frac{3}{4}$	[1]
4	Find the equation of the line that is perpendicular to $y = 2x + 6$ passing through the point $(2,-7)$ $m = 2$ $\therefore m_2 = -\frac{1}{2}$ Eg: $y + 7 = -\frac{1}{2}(x-2)$ $2y + 14 = -x + 2$ $x + 2y + 12 = 0$ $y + 7 = \frac{1}{2}x + 1$ $y = \frac{1}{2}x - 6$	[2]

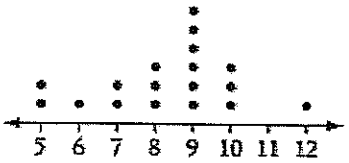
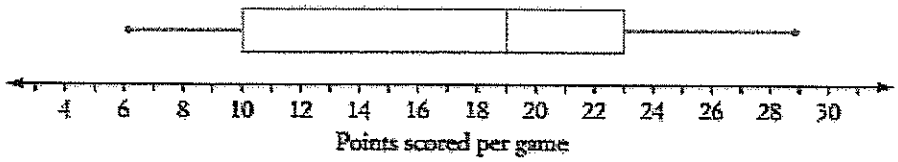
Answer in the space provided

	Compound Interest (7 marks)	Mark
1	Calculate the simple interest when \$7500 is borrowed at 5% p.a. for 5 months. $I = PRN$ $= 7500 \times \frac{5}{100} \times \frac{5}{12}$ $= \$156.25$	[1]
2	A principal of \$25 000 is invested at 4.5% p.a. compounded monthly for 3 years. Calculate: **a).** the final amount of the investment. $A = P(1+r)^n$ $\quad n = 3 \times 12 = 36$ $= 25000\left(1 + \frac{0.375}{100}\right)^{36}$ $= \$28606.20$ **b).** the interest earned. $I = A - I$ $= 28606.20 - 25000$ $= \$3606.20$	[1] [1]
3	If Peter annual salary is \$85000. He receives 17.5% for his leave loading of 4 weeks pay. Calculate his a). Weekly pay (Assume 1 year = 52.18 weeks) Weekly pay $= \$85000 \div 52.18 = \$1628.98$ b) His annual leave loading $LL = \frac{17.5}{100} \times 1628.98 \times 4$ $= \$1140.29$	[1] [1]
4	Braden bought a new car for \$14990, which depreciates by 10% p.a. a) Find the depreciated value of the car after 5 years. $A = 14990\left(1 - \frac{10}{100}\right)^5$ $= \$8851.45$ b) Express the depreciated value as a percentage of the original price correct to 1 decimal point. Depreciated value $= 14990 - 8851.45$ $= 6138.55$ $\% = \frac{6138.55}{14990} \times 100 = 41.0\%$	[1] [1]

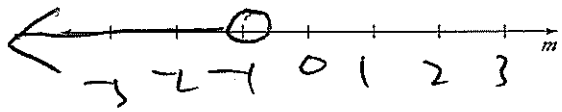
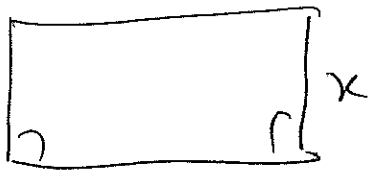
Answer in the space provided

	Surface Area (7 marks)	Mark
1	Find the total surface area of this closed semi cylinder.  $TSA = \pi r^2 + \frac{1}{2}(2\pi rL)$ $= \pi r^2 + \pi rh$ $= \pi(1)^2 + \pi(1)(5)$ +10 $= 6\pi\ m^2$ +10 $\approx 18.84\ m^2$ +10 $28.84 m^2$	[2]
2	Find its surface area.  $TSA = 3\times12\times2 + 12\times7\times2 + 3\times7\times2$ $= 72 + 168 + 42$ $= 282\ m^2$	[2]
3	 Finf the total surface area of the solid. $TSA = 2\left[\frac{1}{2}\times(10+15)\times8\right] + 20\times8.4\times2 + 10\times20 + 15\times20$ $= 200 + 336 + 200 + 300$ $= 1036\ m^2$	[3]

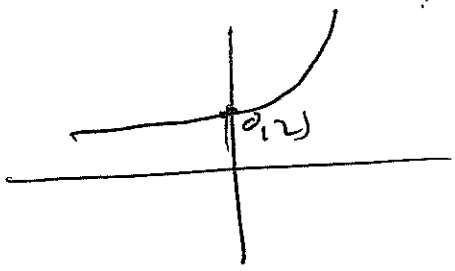
Answer in the space provided

	Data Analysis (7 marks)	Mark
1	This following is a dot plot.  Find: **a).** the range. $12-5=7$	[1]
	b). the mode. 9	[1]
	c). the median. $\frac{9+9}{2}=9$	[1]
	d) the interquartile range $Q_3=9$, $Q_1=7$ $= 9-7=2$	[1]
2	**Stem | Leaf** 1 | 3 5 8 9 2 | 0 1 3 3 4 5 6 3 | 5 8 9 9 4 | 1 3 5 | 4	
	a). Describe the shape of this distribution. Positively skew.	[1]
	b). Describe an outlier? A value that "lies outside" (much smaller or larger) than most of the other values in the set of data.	[1]
3	The box-and-whisker plot shows the number of points per game scored by Ben in 28 basketball games during the season.  	
	How many percent did Ben scored greater than to 23 points? 25%	[1]

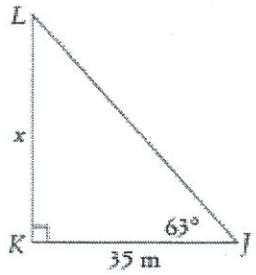
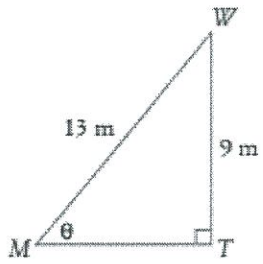
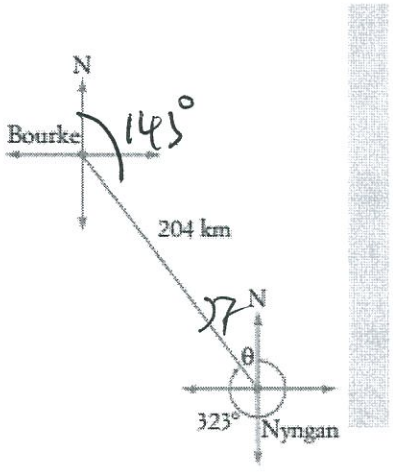
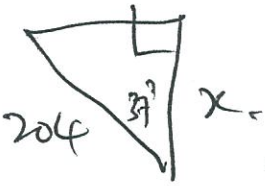
Answer in the space provided

	Equations & Inequalities (7 marks)	**Mark**
1	Solve $b^2 - 5b = 0$ $b(b-5)=0$ $b=0$ or $b=5$	[2]
2	**a).** Solve $5-2m > 7$ $5-2m>7$ $-2m>2$ $m<-1$ **b).** Graph the solution on the number line below.  	[2] [1]
3	A rectangle is four times as long as it is wide. Find its length and width if its perimeter is 180 cm. Let x = width  $x+x+4x+4x=180$ $\therefore 10x = 180$ $x = 18$ $4x = 18 \times 4 = 72$ width = 18 cm Length = 72 cm.	[2]

Answer in the space provided

	Graphs (7 marks)	Mark
1	If $y = x^2$ is drawn. Describe the effect of the following graph in relation with the graph $y = x^2$ Use words like moved up/down/left/right , wider/narrower , concave up/down , reflecting, coefficient of…etc	[1]
	a) $y = 3x^2$ It is narrower than $y = x^2$	[1]
	b) $y = x^2 + 1$ $y = x^2$ is moved up by 1 unit	[1]
	c) $y = (x+1)^2$ $y = x^2$ is moved to the left by 1 unit.	[1]
	d) $y = -x^2$ $y = x^2$ is reflected about the x-axis.	
2	a) $x^2 + y^2 = 8$ represents a circle. What is the centre of the circle and the radius?	[2]
	centre $(0,0)$ radius $= \sqrt{8}$ $= 2\sqrt{2}$	
	b) Write down one exponential equation which cuts the y axis at (0,2)	{1}
	 $y = 2^x + 1$	

Answer in the space provided

	Trigonometry (7 marks)	Mark
1	 Find x correct to 1 decimal place $\frac{x}{35} = \tan 63$ $x = 35 \times \tan 63$ $= 68.7\text{m}$.	[2]
2	a).  $\sin\theta = \frac{9}{13}$ $\theta = 43°49'$ Find angle WMT to the nearest minutes.	[2]
3	Colin leaves Nyngan and drives 204km to Bourke The bearing of Bourke from Nyngan is 323°	
	a) Find the value of θ in the diagram.  $\theta = 360 - 323$ $= 37°$	[1]
	b) How far north of Nyngan is Bourke ?  $\frac{x}{204} = \cos 37$ $x = 204 \cos 37$ $= 162.9466$	[1]
	c) What is the bearing of Nyngan from Bourke? { corresponding angle $= 180 - 37$ $= 143$ ∴ Bearing is $143°$	[1]

Answer in the space provided

	Probability (7 marks)	Mark
1	Two dice are rolled ,	
	a). Draw a table to list all outcomes.	[2]

	1	2	3	4	5	6
1	11	12	13	14	15	16
2	21	22	23	24	25	26
3	31	32	33	34	35	36
4	41	42	43	44	45	46
5	51	52	53	54	55	56
6	61	62	63	64	65	66

b). How many outcomes are there?

36 [1]

c). Find the probability of rolling a double (both numbers the same). [1]

$P(\text{Double}) = \frac{6}{36} = \frac{1}{6}$

d). Find the probability of rolling a total of 7. [1]

$P(\text{Total}=7) = \frac{6}{36} = \frac{1}{6}$

2	A bag contains 5 red marbles, 8 green marbles and 7 yellow marbles. Two marbles are drawn from the bag without replacement. What is the probability that:	
	a). given one marble is red, the other is yellow in that order?	[1]

$P(RY) = \frac{5}{20} \times \frac{7}{19} = \frac{35}{380} = \frac{7}{76}$ [1]

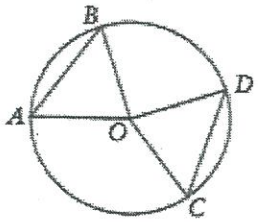
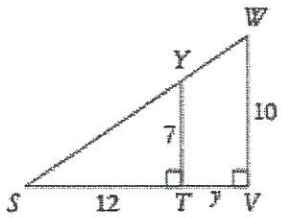
b). given one marble is green, the other is also green?

$P(GG) = \frac{8}{20} \times \frac{7}{19} = \frac{14}{95}$

Answer in the space provided

	Algebra (7 marks)	**Mark**
1	Expand and simplify (x+2)(x-3) $x(x-3)+2(x-3)$ $= x^2-3x+2x-6$ $= x^2-x-6$	[1]
2	Factorise each of these expressions. **a).** $x^2y + xy^2$ $xy(x+y)$	[1]
	b) $x(x-5) - 3(x-5)$ $(x-5)(x-3)$	[1]
	b). $x^2 - x - 6$ $(x-3)(x+2)$	[2]
3	Expand and simplify $5(2a-5+b)-7(b-3a)$ $10a-25+5b-7b+21a$ $31a-2b-25$	[2]

Answer in the space provided

	Geometry (7 marks)	Mark
1	What is the angle sum of a polygon with 9 sides. $(n-2)\times 180 = 7\times 180$ $= 1260^\circ$	[1]
2	How many sides does a regular polygon have if its exterior angle is 36°. $\frac{360}{36} = 10$ sides.	[1]
3	 O is the centre of the circle and AB=CD. Prove that ΔOAB≡ΔCOD In $\triangle$ OAB and $\triangle$ OCD (1) OA = OD (radii) (2) OB = OC (radii). AB = CD (Given) (3) ~~$\angle AOB = \angle COD$ (vert. opp $\angle$s)~~ $\therefore \triangle OAB \equiv \triangle COD$ (SSS)	[3]
4	 a) Which test shows that ΔSTY ||| ΔSVW. (Hint : No abbreviation…write a statement) three matching angles are equal. b) Find the value of y. (Leave answer in exact form) $\frac{y+12}{12} = \frac{10}{7}$ $\therefore y+12 = \frac{120}{7}$ $y = \frac{120}{7} - 12 = \frac{36}{7} = 5\frac{1}{7}$.	[1] [1]

Answer in the space provided

	Simultaneous equation (7 marks)	Mark
1	a) Use the method of substitution to solve $y = 5 - 2x$ and $y = 3x + 2$ $3x+2 = 5-2x$ $5x = 3$ $x = \frac{3}{5}$ ∴ $y = 3(\frac{3}{5})+2$ $= \frac{19}{5}$ $x=\frac{3}{5}\ y=\frac{19}{5}$	[2]
	b) Use the method of elimination to solve $5y - 4x = 1$ ... (1) $2y - 3x = 6$ ... (2) (1)×2 (2)×5 $10y - 8x = 2$ ... (3) $10y = 15x + 30$ ... (4) $7x = -28$ $x = -4$ Sub $x=-4$ into (1) $2y - 3(-4) = 6$ $2y + 12 = 6$ $2y = -6$ $y = -3$ ∴ $x=-4\ y=-3$	[2]
2	a) Peter bought a total of 16 DVDs and CDs. Each DVD cost \$25 and each CD cost \$18. Altogether, Peter spent \$351. How many CDs did he buy? (Form 2 equations and solve simultaneously) Let c = # of cd Let d = # of dvd. $c + d = 16$ ... (1) $18c + 25d = 351$ ... (2) (1)×18 $18c + 18d = 288$ ×3 (2) $18c + 25d = 351$ ×4 $-7d = -63$ $d = 9$ ∴ $c+9=16$ $c=7$. ∴ 7 cd's bought	[3]

End of Exam