

1. Calculate  $\frac{11.83^3}{18.52 - 2.70}$ .

(a) Write down the first five digits on your calculator display.

(b) Correct your answer in part (a) to 2 significant figures.

Answer (a)..... [1]

(b) ..... [1]

2. For a birthday party, with 203 guests, the caterer will be charging \$ 30.90 per person. By approximating both the charge and the number of guests to 2 significant figures, estimate the cost of the catering for the party. Show your working and give your answer to 3 significant figures.

Answer ..... [2]

3. Consider the following sequence of numbers

0, 7, 26, 63.....

Write down

(a) the next term in the sequence

(b) an expression for the nth term of the sequence of numbers.

Answer (a)..... [1]

(b) ..... [1]

4. At 8 am, Alvin, Ben and Calvin started jogging from the starting point of a 400 m circular track. Alvin took 100 seconds, Ben took 105 seconds and Calvin took 126 seconds respectively to complete one round. What time would they meet again at the starting point, if they were jogging in the same direction at constant speed ?

*Answer* ..... [3]

5. (a) Factorise  $3xy - 6ay + 8a - 4x$  completely.

*Answer* (a)..... [2]

- (b) (i) Factorise  $st + sr$ .

- (ii) Hence, using the result from (i) find the value of  $6789 \times 501 + 6789 \times 499$ .

*Answer* (b) (i)..... [1]

(ii).....[2]

6. (a) Write down the largest integer that satisfy  $-2 \leq a < 3$ .

*Answer (a)*  $a = \dots\dots\dots$  [1]

- (b) Solve the inequality  $2x - 4x \geq 3 - 9$  and illustrate the solution on the number line.

*Answer (b)*  $\dots\dots\dots$  [3]

7. (a) The price of a macbook is \$1298 including 7% sales tax. Calculate the price of the Macbook before tax, correcting your answer to the nearest cents.

*Answer (a)*  $\dots\dots\dots$  [2]

- (b) Members of Spartan Sports Shop are entitled to a 8% discount on all items sold in the shop. If a customer pays cash, he will receive a 6% discount on the amount due. The marked price of a pair of sports shoes is \$109. Find out the amount a member has to pay if he pays by cash.

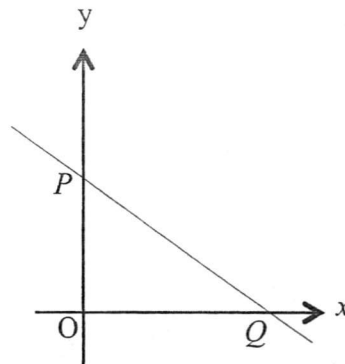
*Answer (b)*  $\dots\dots\dots$  [2]

8. The diagram shows a sketch of the graph of  $3y = 12 - 2x$ .

The line crosses the axes at  $P$  and  $Q$ .

Find

- (a) the coordinates of  $P$ ,
- (b) the coordinates of  $Q$ , and
- (c) the gradient of  $PQ$ .



Answer (a) ..... [1]

(b) ..... [1]

(c) ..... [2]

9. Consider the following numbers :  $\sqrt{7}$ ,  $\frac{5}{7}$ ,  $\pi$ ,  $-5$ ,  $23$ ,  $0$ ,  $\frac{1}{4}$ ,  $1$ .

(a) Arrange the numbers in the ascending order.

Answer (a)..... [2]

(b) From the list of the numbers above, state

- (i) the irrational number(s).
- (ii) the recurring decimal(s).
- (iii) the prime number(s).

Answer (b) (i) ..... [1]

(ii)..... [1]

(iii)..... [1]

10. (a) (i) Express 504 as a product of its prime factors.

*Answer (a) (i)* ..... [2]

(ii) Given that  $\frac{504}{k}$  is a perfect square, write down the smallest possible value of  $k$ .

*Answer (ii)  $k =$*  ..... [1]

(b) Find the highest common factor of 504 and 60. Express your answer in ***index notation***.

*Answer (b)* ..... [2]

11. (a) Expand and simplify  $5y(4x-8)-4x(3-4y)$ .

*Answer (a)* ..... [2]

(b) (i) Factorise the result in part (a).

(ii) Hence or otherwise, find the value of the expression when  $x = -8$  and  $y = 5$ .

*Answer (b) (i)* ..... [1]

(ii) ..... [2]

12. (a) Express  $\frac{2(x-2)}{3} - \frac{2x-5}{6} - \frac{1}{2}$  as a single fraction in its simplest form.

*Answer* (a) ..... [3]

(b) Hence solve the equation  $\frac{2(x-2)}{3} - \frac{2x-5}{6} - \frac{1}{2} = 1\frac{1}{4}$ .

*Answer* (b) ..... [2]

13. The employees of a company in Singapore are offered an increase in wages calculated according to two different schemes.

Scheme *A* gives an increase of 5 % of their monthly wage.

Scheme *B* gives an increase of 3.5 % of their monthly wage plus an extra \$60 per month.

- (a) Harry's present monthly salary is \$900. Which scheme should he choose ?  
Explain your answer.

*Answer* (a) ..... [2]

- (b) Kelvin finds that his new monthly wage will be the same under both schemes. Find his current monthly wage.

*Answer* (b) ..... [2]



14. Evaluate the following without the use of calculators.

(a)  $(-3)^3 + 81 \div 9 + 4 \times (-7)^2$ ,

*Answer (a) .....* [2]

(b)  $\left[ \frac{6}{7} - \left( -\frac{3}{4} \right) \right] \div \left[ -\frac{5}{6} - 1\frac{1}{3} \right]$ .

*Answer (b) .....* [4]

15. Sticks of equal length are used to form a series of regular hexagons. The first three figures are shown below.



Figure 1

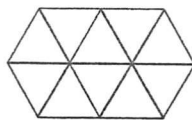


Figure 2

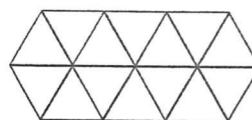


Figure 3

Figure	Number of small equilateral triangles	Number of sticks used
1	6	12
2	10	19
3	14	26
⋮	⋮	⋮
5	$a$	$b$
⋮	⋮	⋮
$n$	$h$	$k$

- (a) Find the values of  $a$  and  $b$ .

Answer (a)  $a = \dots\dots\dots$  [1]

$b = \dots\dots\dots$  [1]

- (b) Express  $h$  in terms of  $n$ .

Answer (b)  $h = \dots\dots\dots$  [1]

- (c) Express  $k$  in terms of  $n$ .

Answer (c)  $k = \dots\dots\dots$  [1]

- (d) How many small equilateral triangles will there be in the Figure 25?

Answer (d)  $\dots\dots\dots$  [1]

- (e) How many sticks will be needed to form the Figure 40?

Answer (e)  $\dots\dots\dots$  [1]

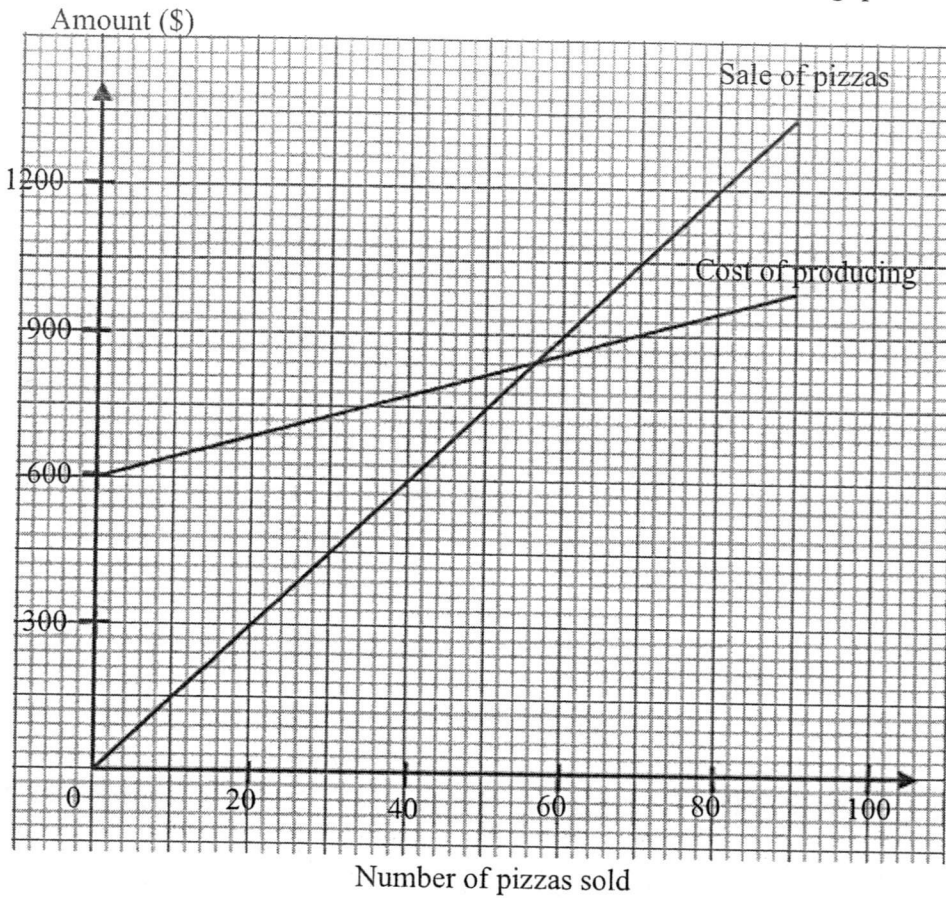
- (f) Is it possible for Figure  $n$  to have 300 small equilateral triangles?  
Explain your reasons clearly.

.....  
 .....  
 ..... [2]

16. The average age of four men is 32.  
Calvin is 6 years younger than Alex and 3 times as old as Benedict. Derek's age is two times the difference between Alex's age and Benedict's age. Taking Calvin's age as  $x$  years old, form an equation and use it to find Derek's age.

*Answer* Derek's age is ..... [4]

17. The graphs show the amount received by a shop from the sale of pizzas and the cost of producing the pizzas. Use the graphs to answer the following questions.



- (a) Find the  
 (i) total amount received from selling 70 pizzas.  
 (ii) profit earned from selling 76 pizzas.

Answer (a) (i) ..... [1]

(ii) ..... [2]

- (b) What is the selling price of one pizza?

Answer (b) ..... [1]

- (c) Explain the meaning of the point of intersection of the graphs.

.....  
 ..... [1]

18. Answer the whole of this question on a sheet of graph paper.

Given the equation  $y = -7x - 3$ ,

$x$	-3	0	2
$y$	18	-3	$s$

- (a) Find the value of  $s$ . [1]
- (b) Using a scale of 2 cm to represent 1 unit on the  $x$ - axis and 1 cm to 2 units on the  $y$ - axis, draw the graph of  $y = -7x - 3$  for the value of  $x$  from -3 to 2. [3]
- (c) Using the graph, find the value of
- (i)  $y$  when  $x = 1.4$ , [1]
- (ii)  $x$  when  $y = 10.8$ . [1]
- (d) From your graph, is  $(-1, 5)$  a solution of  $y = -7x - 3$ ? Explain your answer. [1]

- END OF PAPER -

1. Calculate  $\frac{11.83^3}{18.52 - 2.70}$ .

(a) Write down the first five digits on your calculator display.

(b) Correct your answer in part (a) to 2 significant figures.

Answer (a)..... 104.65 ..... [B1]

(b) ..... 100..... [B1]

2. For a birthday party, with 203 guests, the caterer will be charging \$ 30.90 per person. By approximating both the charge and the number of guests to 2 significant figures, estimate the cost of the catering for the party. Show your working and give your answer to 3 significant figures.

Solutions :

Estimated cost

= \$200 × 31 ----- [M1]

= \$6200 ----- [A1]

Answer ..... \$.6200..... [2]

3. Consider the following sequence of numbers

0, 7, 26, 63.....

Write down

(a) the next term in the sequence

(b) an expression for the nth term of the sequence of numbers.

Answer (i).....124..... [B1]

(ii) .....  $n^3 - 1$  ..... [B1]

4. At 8 am, Alvin, Ben and Calvin are at the starting point of 400 m circular track. Alvin takes 100 seconds, Ben takes 105 seconds and Calvin takes 126 seconds respectively to complete one round. What time will they meet again at the starting point, if they are running in the same direction?

Solution :

$$100 = 2^2 \times 5^2$$

$$105 = 3 \times 5 \times 7 \quad [M1]$$

$$126 = 2 \times 3^2 \times 7$$

$$LCM = 2^2 \times 3^2 \times 5^2 \times 7$$

$$= 6300 \text{-----} [M1]$$

$$= 105 \text{ mins}$$

Time they will meet again at 0945 [A1]

Answer .....0945..... [3]

5. (a) Factorise  $3xy - 6ay + 8a - 4x$  completely.

$$3xy - 6ay + 8a - 4x$$

$$= 3y(x - 2a) + 4(2a - x) \text{-----} [M1]$$

$$= 3y(x - 2a) - 4(x - 2a)$$

$$= (x - 2a)(3y - 4) \text{-----} [A1]$$

Answer (a).....  $(x - 2a)(3y - 4)$  ..... [2]

- (b) (i) Factorise  $st + sr$ .

(ii) Hence, using the result from (i) find the value of  $6789 \times 501 + 6789 \times 499$ .

$$(i) \quad st + sr = s(t + r) \text{-----} [B1]$$

$$(ii) \quad 6789 \times 501 + 6789 \times 499$$

$$= 6789(501 + 499) \text{-----} [M1]$$

$$= 6789(1000)$$

$$= 6789000 \text{-----} [A1]$$

6. (a) Write down the largest integer that satisfy  $-2 \leq a < 3$ .

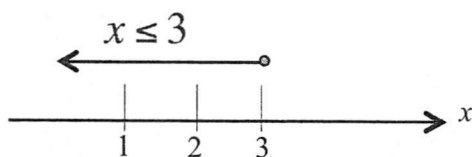
Answer (a)  $a = \dots\dots\dots 2 \dots\dots\dots$  [B1]

- (b) Solve the inequality  $2x - 4x \geq 3 - 9$  and illustrate the solution on the number line.

$$2x - 4x \geq 3 - 9$$

$$-2x \geq -6 \text{-----} [M1]$$

$$x \leq 3 \text{-----} [A1]$$



[A1]

Answer (b)  $\dots\dots\dots x \leq 3 \dots\dots\dots$  [3]

7. (a) The price of a macbook is \$1298 including 7% sales tax. Calculate the price of the Macbook before tax, correct your answer to the nearest cents.

$$= 1298 \times \frac{100}{107} \text{-----} [M1]$$

$$= 1213.08 \text{-----} [A1]$$

Answer (a)  $\dots\dots\dots \$1213.08 \dots\dots\dots$  [2]

- (b) Members of Spartan Sports Shop are entitled to a 8% discount on all items sold in the shop. If a customer pays cash, he will receive a 6% discount on the amount due. The marked price of a pair of sports shoes is \$109. Find out the amount a member has to pay if he pays by cash.

Solution :

Price of sport shoe

$$= 109 \times \frac{94}{100} \times \frac{92}{100} \text{-----} [M1]$$

$$= \$94.26 \text{-----} [A1]$$

Answer (b)  $\dots\dots\dots \$94.26 \dots\dots\dots$  [2]

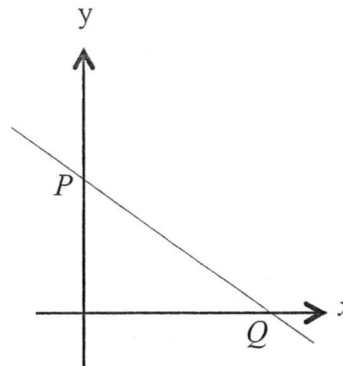


8. The diagram shows a sketch of the graph of  $3y = 12 - 2x$ .

The line crosses the axes at  $P$  and  $Q$ .

Find

- (a) the coordinates of  $P$
- (b) the coordinates of  $Q$ , and
- (c) the gradient of  $PQ$ .



Solution :

When  $x = 0$   $3y = 12 - 2(0)$   
 $y = 4$

When  $y = 0$ ,  $3(0) = 12 - 2x$   
 $2x = 12$   
 $x = 6$

Gradient of  $PQ$

$$= -\frac{4}{6} \text{-----} [M1]$$

$$= -\frac{2}{3} \text{-----} [A1]$$

Answer (a)  $P(0,4)$  [1]

(b)  $Q(6,0)$  [1]

(c)  $-\frac{2}{3}$  [2]

9. Consider the following numbers :  $\sqrt{7}$ ,  $\frac{5}{7}$ ,  $\pi$ ,  $-5$ ,  $23$ ,  $0$ ,  $\frac{1}{4}$ ,  $1$ .

(a) Arrange the numbers in the ascending order.

Answer (a).....  $-5, 0, \frac{1}{4}, \frac{5}{7}, 1, \sqrt{7}, \pi, 23$  ..... [2]

(b) Write down

- (i) the irrational number(s).
- (ii) the recurring decimal(s).
- (iii) the prime number(s).

Answer (b) (i) .....  $\sqrt{7}, \pi$  ..... [1]

(ii).....  $\frac{5}{7}$  ..... [1]

(iii).....  $23$  ..... [1]

10. (a) (i) Express 504 as a product of its prime factors.

Solution :

(a) (i)  $504 = 2^3 \times 3^2 \times 7$  -----[B1]

2	504	
2	252	
2	126	
3	63	[M1]
3	21	
	7	

Answer (a) (i) .....  $504 = 2^3 \times 3^2 \times 7$  ..... [2]

(ii) Given that  $\frac{504}{k}$  is a perfect square, write down the smallest possible value of  $k$ .

Solution :

$$\frac{504}{k} = \frac{2^3 \times 3^2 \times 7}{k}$$

For perfect square,  $k = 2 \times 7$  [B1]

Answer (ii)  $k =$  .....14..... [1]

(b) Find the highest common factor of 504 and 60. Express your answer in **index notation**.

$$504 = 2^3 \times 3^2 \times 7$$

$$60 = 2^2 \times 3 \times 5$$
 -----[M1]

$$\text{HCF} = 2^2 \times 3$$
 -----[A1]

Answer (b) .....  $2^2 \times 3$  ..... [2]

11. (a) Expand and simplify  $5y(4x-8)-4x(3-4y)$ .

$$\begin{aligned} & 5y(4x-8)-4x(3-4y) \\ & = 20xy-40y-12x+16xy \text{-----} [M1] \\ & = 36xy-40y-12x \text{-----} [A1] \end{aligned}$$

*Answer* (a) (i) .....  $36xy-40y-12x$  ..... [2]

(b) (i) Factorise the result in part (a).

(ii) Hence or otherwise, find the value of the expression when  $x=-8$  and  $y=5$ .

*Solution :*

$$\begin{aligned} & 36xy-40y-12x \\ \text{(i)} & = 4(9xy-10y-3x) \text{----} [B1] \end{aligned}$$

$$\begin{aligned} & 4(9xy-10y-3x) \\ \text{(ii)} & = 4(9(-8)(5)-10(5)-3(-8)) \text{-----} [M1] \\ & = 4(-360-50+24) \\ & = -1544 \text{-----} [A1] \end{aligned}$$

*Answer* (b) (i) ...  $4(9xy-10y-3x)$  ..... [1]

(ii) .....  $-1544$  ..... [2]

12. (a) Express  $\frac{2(x-2)}{3} - \frac{2x-5}{6} - \frac{1}{2}$  as a single fraction in its simplest form.

$$\begin{aligned} & \frac{2(x-2)}{3} - \frac{2x-5}{6} - \frac{1}{2} \\ &= \frac{4(x-2)}{6} - \frac{2x-5}{6} - \frac{3}{6} \\ &= \frac{4(x-2) - (2x-5) - 3}{6} \text{-----[M1]} \\ &= \frac{4x-8-2x+5-3}{6} \\ &= \frac{2x-6}{6} \text{-----[M1]} \\ &= \frac{x-3}{3} \text{-----[A1]} \end{aligned}$$

Answer (a) .....  $\frac{x-3}{3}$  ..... [2]

- (b) Hence solve the equation  $\frac{2(x-2)}{3} - \frac{2x-5}{6} - \frac{1}{2} = 1\frac{1}{4}$ .

Solution :

$$\begin{aligned} & \frac{2(x-2)}{3} - \frac{2x-5}{6} - \frac{1}{2} = 1\frac{1}{4} \\ & \frac{x-3}{3} = \frac{5}{4} \\ & 4(x-3) = 15 \text{-----[M1]} \\ & 4x-12 = 15 \\ & 4x = 27 \\ & x = 6\frac{3}{4} \text{-----[A1]} \end{aligned}$$

Answer (b) .....  $6\frac{3}{4}$  ..... [2]

13. The employees of a company in Singapore are offered an increase in wages calculated according to two different schemes.

Scheme *A* gives an increase of 5 % of their monthly wage.

Scheme *B* gives an increase of 3.5 % of their monthly wage plus an extra \$ 60 per month.

- (a) Harry's present monthly salary is \$900. Which scheme should he choose ? Explain your answer.

For scheme A

$$\text{Total salary after increment} = \$900 \times 1.05 = \$945$$

For scheme B

$$\text{Total salary after increment} = \$900 \times 1.035 + 60 = \$991.50 \text{ -----[M1]}$$

He should choose scheme B because the increment is bigger. ----[A1]

*Answer* (i) .....Scheme B..... [2]

- (b) Kelvin finds that his new monthly wage will be the same under both schemes. Find his current monthly wage.

Let his salary be \$ $x$

$$1.05x = 1.035x + 60 \text{ -----[M1]}$$

$$1.05x - 1.035x = 60$$

$$0.015x = 60$$

$$x = \$4000 \text{ -----[A1]}$$

His current salary is \$4000.

14. Evaluate the following without the use of calculators.

(a)  $(-3)^3 + 81 \div 9 + 4 \times (-7)^2$ ,

$$\begin{aligned} & (-3)^3 + 81 \div 9 + 4 \times (-7)^2 \\ & = -27 + 9 + 4 \times 49 \text{-----} [M1] \\ & = -27 + 9 + 196 \\ & = 178 \text{-----} [A1] \end{aligned}$$

Answer (a) .....178..... [2]

(b)  $\left[ \frac{6}{7} - \left( -\frac{3}{4} \right) \right] \div \left[ -\frac{5}{6} - 1\frac{1}{3} \right]$ .

Solution :

$$\begin{aligned} & \left[ \frac{6}{7} - \left( -\frac{3}{4} \right) \right] \div \left[ -\frac{5}{6} - 1\frac{1}{3} \right] \\ & = \left[ \frac{6}{7} + \frac{3}{4} \right] \div \left[ -\frac{5}{6} - \frac{4}{3} \right] \text{-----} [M1] \\ & = \left[ \frac{24}{28} + \frac{21}{28} \right] \div \left[ -\frac{5}{6} - \frac{8}{6} \right] \\ & = \left[ \frac{45}{28} \right] \div \left[ -\frac{13}{6} \right] \text{-----} [M1] \\ & = \frac{45}{28} \times \left( -\frac{6}{13} \right) \text{-----} [M1] \\ & = -\frac{135}{182} \text{-----} [A1] \end{aligned}$$

Answer (b) .....  $-\frac{135}{182}$  ..... [4]

15. Sticks of equal length are used to form a series of regular hexagons. The first three figures are shown below.



Figure 1

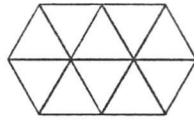


Figure 2

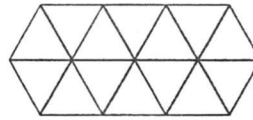


Figure 3

Figure	Number of small equilateral triangles	Number of sticks used
1	6	12
2	10	19
3	14	26
⋮	⋮	⋮
5	$a$	$b$
⋮	⋮	⋮
$n$	$h$	$k$

- (c) Find the values of  $a$  and  $b$ .

Answer (a)  $a = \dots\dots\dots 22 \dots\dots\dots$  [1]

$b = \dots\dots\dots 40 \dots\dots\dots$  [1]

- (d) Express  $h$  in terms of  $n$ .

Answer (b)  $h = \dots\dots 4n+2 \dots\dots$  or  $4(n-1)+6 \dots\dots\dots$  [1]

- (e) Express  $k$  in terms of  $n$ .

Answer (c)  $k = \dots\dots 7n+5 \dots\dots$  or  $7(n-1) + 12 \dots\dots\dots$  [1]

- (f) How many small equilateral triangles will there be in the Figure 25?

$h=4(25)+2=102$  [A1]

Answer (d)  $\dots\dots\dots 102 \dots\dots\dots$  [1]

- (g) How many sticks will be needed to form the Figure 40?

$k=7(40)+5 = 285$  [B1]

Answer (e)  $\dots\dots\dots 285 \dots\dots\dots$  [1]

- (h) Is it possible for Figure  $n$  to have 300 small equilateral triangles ?

Explain your reasons clearly.

Solution :  $300=4n+2$

$4n = 298 \dots\dots\dots$  [M1]

$n = 74.5 \dots\dots$  [A1]

Answer  $n$  is an integer(whole number) , therefore it is not possible to equal to

74.5

$\dots\dots\dots$  [2]

16. The average age of four men is 32. Calvin is 6 years younger than Alex and 3 times as older as Benedict. Derek's age is two times the difference of Alex and Benedict. Taking Calvin's age as  $x$  years old, find the age of Derek.

Solution :

$$x + x + 6 + \frac{1}{3}x + 2\left(x + 6 - \frac{1}{3}x\right) = 128$$

$$2\frac{1}{3}x + 6 + 2\left(\frac{2}{3}x + 6\right) = 128 \text{-----} [M1]$$

$$2\frac{1}{3}x + \frac{4}{3}x + 6 + 12 = 128 \text{-----} [M1]$$

$$3\frac{2}{3}x = 110$$

$$x = 30 \text{-----} [A1]$$

*Age of Derek*

$$= 2\left(\frac{2}{3} \times 30 + 6\right)$$

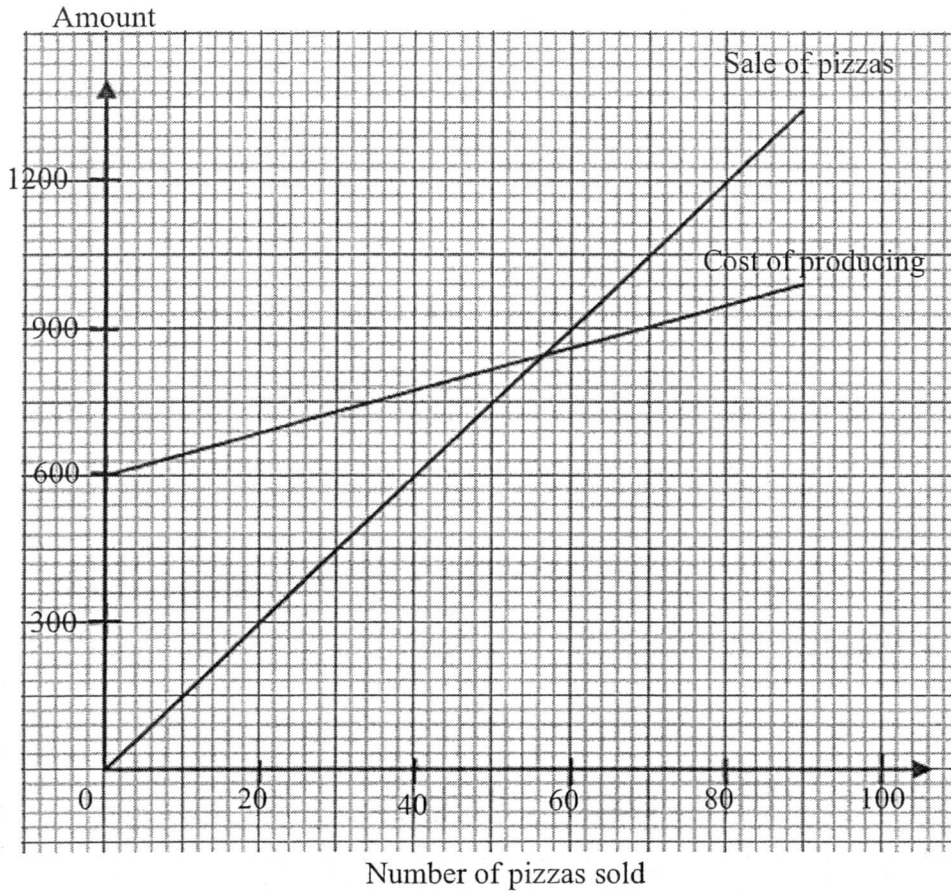
$$= 2(26)$$

$$= 52 \text{-----} [A1]$$



*Answer* The age of Derek is ..... [4]

17. The graphs show the amount received by a shop from the sale of pizzas and the cost of producing the pizzas. Use the graphs to answer the following questions.



- (a) Find the  
 (i) total amount received for selling 70 pizzas.

profit earned for selling 76 pizzas.

(ii) Profit = \$1140 – 930 -----[M1]  
 = \$210 -----[A1]

*Answer* (i) .....\$1050..... [B1]

(ii) .....\$210.....[2]

- (b) What is the selling price of one pizza?

$$= \frac{300}{20}$$

$$= \$15$$

*Answer* (b) .....\$15..... [A1]

(c) Explain the meaning of the point of intersection of the graphs.

The intersection point means the production cost = selling price [B1]

18. Answer the whole of this question on a sheet of graph paper.

Given the equation  $y = -7x - 3$ ,

$x$	-3	0	2
$y$	18	-3	$s$

- (a) Find the value of  $s$ . [1]
- (b) Using a scale of 2 cm to represent 1 unit on the  $x$ - axis and 1 cm to 2 units on the  $y$ - axis, draw the graph of  $y = -7x - 3$  for the value of  $x$  from -3 to 2. [3]
- (c) Using the graph, find the value of
- (i)  $y$  when  $x = 1.4$ , [1]
- (ii)  $x$  when  $y = 10.8$ . [1]
- (d) From your graph, is  $(-1, 5)$  a solution of  $y = -7x - 3$ ? Explain your answer. [1]

Solution :

(a)  $s = -7(2) - 3$   
 $= -17$  (B1)

(c) (i) When  $x = 1.4$   
From the graph  $y = -12.8$  (B1)

(ii) When  $y = 10.8$   
From the graph,  $x = -2 \pm 0.05$  (B1)

(d) When  $x = -1$   
 $y = -7(-1) - 3$   
 $y = 4$

Therefore  $(-1, 5)$  is not the solution of  $y = -7x - 3$

- END OF PAPER -