

Instructions

A single bound reference and a CAS and scientific calculator permitted.

Answer all questions in the spaces provided.

Round final solutions to 2 decimal places unless specified otherwise.

In questions where more than one mark is available, appropriate working must be shown.

Multiple choice questions are worth one mark each.

Section A

Multiple Choice Questions

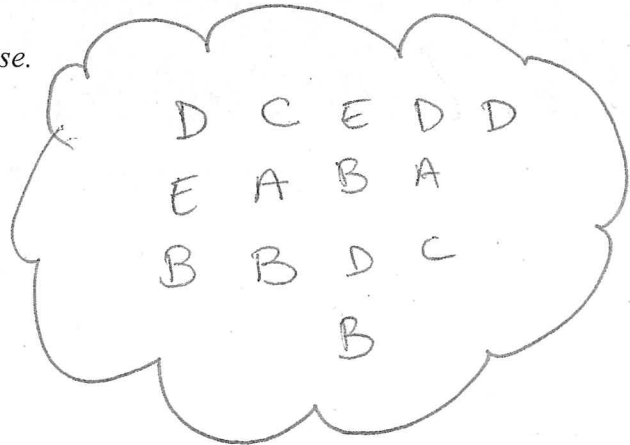
14 marks

Circle the letter corresponding to the correct response.

1. If $s - 10 = 54$, what is the value of s ?

- A. 4
- B. 5.4
- C. 44
- D. 64**
- E. 540

$$s = 64$$



2. What is the value of I , when $P = 2000$, $R = 0.04$ and $T = 3$ are substituted into the rule $I = PRT$?

- A. 2003.04
- B. 2003.4
- C. 24000
- D. 2400
- E. 240**

$$I = 240$$

3. Which of these equations has the solution $a = -2$?

- ~~A. $5 + a = -7$ $a = -12$~~
- B. $12 - a = 14$ $a = -2$**
- C. $a + 8 = 10$
- D. $7a = 14$
- E. $\frac{18}{-4a} = 9$

4. The cost of hiring a plumber is \$150 plus \$85 for every hour of work. If a plumber works for 3.5 hours on a particular job, how much will he earn?

A. \$235

B. \$405

C. \$447.50

D. \$525

E. \$610

$$\$150 + \$85 \times 3.5$$

$$= 447.5$$

5. Which is correct if y is made the subject of the equation $12x = 14y - 3$?

A. $y = \frac{6}{7}x + \frac{3}{14}$

B. $y = \frac{6}{7}x + 3$

C. $y = \frac{7}{6}x + \frac{3}{14}$

D. $y = \frac{6}{7}x - \frac{3}{14}$

E. $y = -\frac{6}{7}x + \frac{3}{14}$

$$14y = 12x + 3$$

$$y = \frac{12x + 3}{14}$$

$$y = \frac{6x}{7} + \frac{3}{14}$$

6. The solution to the simultaneous equations

$$\begin{aligned} 3y - 2x &= 8 & - \textcircled{1} \\ 2y + 5x &= -1 & - \textcircled{2} \end{aligned}$$

Is:

A. $x = -1, y = -2$

B. $x = -1, y = 2$

C. $x = 1, y = -2$

D. $x = 2, y = -1$

E. $x = 1, y = 9$

$\textcircled{1} \times 5 :$

$$15y - 10x = 40 \quad - \textcircled{3}$$

$\textcircled{2} \times 2 :$

$$4y + 10x = -2 \quad - \textcircled{4}$$

$\textcircled{3} + \textcircled{4} :$

$$19y = 38$$

$$y = 2$$

sub $y = 2$ into $\textcircled{1}$

$$6 - 2x = 8$$

$$-2x = 2$$

$$x = -1$$

7. The slope of the line passing through (10, 9) and (6, -3) is:

- A. -3
- B. $-\frac{1}{3}$
- C. $\frac{1}{3}$
- D. 1.5
- E. 3

$$\frac{9 + 3}{10 - 6} = \frac{12}{4} = 3$$

8. Players at a football club pay a fee of \$130 each year. They also pay a fee of \$12 for every game they play in that year. Last year, Maddie paid a total of \$262 in fees at this football club. How many games did Maddie play last year?

- A. 10
- B. 11
- C. 12
- D. 13
- E. 14

$$130 + 12x = 262$$

$$x = 11$$

9. An equilateral triangle has side lengths that are x cm long. Each of the side lengths is increased by 3 cm to create a new triangle with a total perimeter of 25.8 cm. The value of x in the new triangle is:

- A. 22.8
- B. 16.8
- C. 8.6
- D. 5.6
- E. 9.0

$$3(x + 3) = 25.8$$

$$3x + 9 = 25.8$$

$$3x = 16.8$$

$$x = 5.6$$

10. Which of the following is NOT a linear equation?

- A. $y + 8 = 0$
- B. $A = \pi r^2$
- C. $C = 2\pi r^1$
- D. $\frac{A}{l} = w$
- E. $7 - 3z = 9$

2019 Further Maths Exam 1 2019

11. The cost \$ C , of using K kilowatt hours of electricity can be calculated using the equation below: $C = 52 + 0.15 \times K$. From this equation, it can be concluded that there is:

- A. no fixed charge and the electricity used is charged at \$0.15 per kilowatt hour
- B. no fixed charge and the electricity used is charged at \$52.00 per kilowatt hour
- C. a fixed charge of \$0.15 and the electricity used is charged at \$52.00 per kilowatt hour
- D. a fixed charge of \$52.00 and the electricity used is charged at \$0.15 per kilowatt hour.
- E. a fixed charge of \$52.00 and the electricity used is charged at \$15.00 per kilowatt hour

2016 Further Maths Exam 1 2019

12. A phone company charges a fixed, monthly line rental of \$28 and \$0.25 per call. Let n be the number of calls that are made in a month. Let C be the monthly phone bill, in dollars. The equation for the relationship between the monthly phone bill, in dollars, and the number of calls is:

- A. $C = 28 + 0.25n$
- B. $C = 28n + 0.25$
- C. $C = n + 28.25$
- D. $C = 28(n + 0.25)$
- E. $C = 0.25(n + 28)$

2015 Further Maths Exam 1 2019

13. To raise funds, a club plans to sell lunches at a weekend market. The club will pay \$190 to rent a stall. Each lunch will cost \$12 to prepare and will be sold for \$35. To make a profit of at least \$1000, the minimum number of lunches that must be sold is:

- A. 22
- B. 35
- C. 36
- D. 51
- E. 52

$$190 + (35 - 12)x = 1000$$

$$190 + 23x = 1000$$

$$23x = 810$$

$$x = 35.2$$

14. The Blue Caps Cricket Club has different prices for its junior and senior subscriptions. The total cost for two junior subscriptions and one senior subscription is \$225. The cost of a senior subscription is three times the cost of a junior subscription. The cost of a senior subscription is:

- A. \$45
- B. \$75
- C. \$90
- D. \$135**
- E. \$180

$$\begin{aligned}
 & x + 3x \\
 2x + 3x &= 225 \\
 5x &= 225 \\
 x &= 45 \quad \leftarrow \text{junior} \\
 \text{senior} &= 135
 \end{aligned}$$

Section B

Short Answer Questions

30 marks

Include working throughout.

1. The sum of potential energy and kinetic energy is found using the formula: $E = mgh + mv^2$

(a) Calculate the value of E if $m = 2$,
 $v = 2$, $h = 10$ and $g = 9.8$

$$E = (2)(9.8)(10) + (2)(2)^2 \quad \textcircled{1} m$$

$$E = 196 + 8$$

$$E = 204 \quad \textcircled{1} a$$

2 marks

(b) Calculate the value of m if $E = 56$,
 $g = 9.8$, $h = 10$ and $v = 3$

$$56 = m(9.8)(10) + m(3)^2 \quad \textcircled{1} m$$

$$56 = 98m + 9m$$

$$m = \frac{56}{107} \quad \textcircled{1} a$$

$$\text{or} \\ m = 0.52$$

2 marks

2. The circumference of a circle, C , is $C = 2\pi r$, where r is the radius. Calculate the circumference of a bike wheel with a radius of 27 cm. Answer correct to 2 decimal places.

$$C = 2\pi(27) \quad \textcircled{1} m$$

$$= 169.65 \quad \textcircled{1} a$$

2 marks

3. Calculate the value of y when $x = 11$ using the equation $6y - 3x = 21$.

$$6y - 3(11) = 21 \quad \textcircled{1} m$$

$$6y = 21 + 33$$

$$y = 9 \quad \textcircled{1} a$$

2 marks

4. Suggested cooking times for roasting x kilograms of meat are given by the table below:

Meat type	Minutes/kilogram
Chicken (well done)	45 mins/kg + 20 mins
Lamb (medium)	55 mins/kg + 25 mins
Lamb (well done)	65 mins/kg + 30 mins
Beef (medium)	55 mins/kg + 20 mins
Beef (well done)	65 min/kg + 30 mins

*just 'overall minutes' ?
table potentially misleading.*

(a) How long, to the nearest minute, will it take to roast 2 kg of beef (medium)?

$$\begin{aligned} & \underline{20 \text{ mins}} + \underline{110 \text{ mins}} \quad \textcircled{1} m \\ & = \underline{130 \text{ mins}} \quad \textcircled{1} a \end{aligned}$$

or 2 hrs 10 mins

2 marks

(b) At what time should you put a 4kg leg of lamb in the oven if you wish to serve it well done at 7 p.m?

$$\begin{aligned} & \underline{30 \text{ mins}} + \underline{260 \text{ mins}} \quad \textcircled{1} m \\ & = \underline{290 \text{ mins}} \sim \underline{4 \text{ hrs } 50} \end{aligned}$$

2:10 pm $\textcircled{1} a$

2 marks

5. A football club wishes to purchase pies from a catering company. The total cost of pies and delivery by the company is given by: $C = 27 + 2.25x$, where C is the cost (\$) and x is the number of pies.

(a) Using the equation provided, complete the table below:

x	40	45	50	55	60	65
C (\$)	117	128.25	139.50	150.75	162	173.25

error
-1 for error

2 marks

(b) If the total cost for the pies was \$189, how many pies were purchased?

$$189 = 27 + 2.25x, \quad x = 72$$

1 mark

(c) How much did each individual pie cost?

$$\$2.25$$

1 mark

(d) Explain what 27 represents in the formula.

The cost for catering delivery

1 mark

6. Solve the following linear equations:

(a) $4 + t = -6$

$$t = -10$$

1 mark

(b) $\frac{2x-1}{3} = 4$

$$2x-1 = 12 \quad (1) \text{ m}$$

$$2x = 13$$

$$x = \frac{13}{2} \quad (1) \text{ a}$$

$$x = 6.5$$

2 marks

7. Solve the following linear equations (show working):

(a) $2(n-3) + 4(n+7) = 10$

$$2n - 6 + 4n + 28 = 10 \quad (1) \text{ m}$$

$$6n = -12$$

$$n = -2 \quad (1) \text{ a}$$

2 marks

(b) $5(p+4) = 25 + (7-p)$

$$5p + 20 = 32 - p \quad (1) \text{ m}$$

$$6p = 12$$

$$p = 2 \quad (1) \text{ a}$$

2 marks

8. In Australian football, a goal (g) is worth 6 points and a behind (b) is worth 1 point. The total number of points (P) is given by:

$$P = 6g + b$$

- (a) Rearrange the equation for g

$$6g = P - b$$

$$g = \frac{P - b}{6}$$

1 mark

- (b) Calculate the number of goals scored by a team, if they accumulated 70 points and 16 behinds.

$$g = \frac{70 - 16}{6} \quad (1) m$$

$$g = 9 \quad (1) a$$

\therefore 9 goals scored.

2 marks

9. Year 11 students want to run a social to fundraise for a local charity. The cost of hiring a photobooth and photographer is \$990 and they are selling tickets for \$15 per person. The profit, P , is found by subtracting the photography hire cost from the money raised selling tickets.

- (a) Construct a formula for the profit, P , if t is the number of tickets sold.

$$P = 15t - 990$$

1 mark

- (b) The students counted a profit of \$825. How many tickets did they sell?

$$825 = 15t - 990 \quad (1) m$$

$$15t = 1815$$

$$t = 121 \quad (1) a$$

\therefore 121 tickets

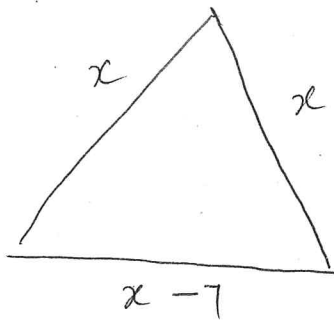
2 marks

Include working throughout.

Question 1 (4 marks)

Two sides of a triangle are equal represented by the length, x . The remaining side is 7 cm shorter

(a) Draw a diagram of the triangle, marking its dimensions in terms of x .



1 mark

(b) The perimeter of the triangle is 68 cm. Write an equation to represent this situation.

$$x + x + x - 7 = 68$$

$$3x - 7 = 68$$

1 mark

(c) Solve the equation and hence state the dimensions of the triangle.

$$3x - 7 = 68$$

$$3x = 75$$

$$x = 25 \text{ (i) m}$$

$$25 \text{ cm}, 25 \text{ cm}, 18 \text{ cm} \text{ (ii) a.}$$

2 marks

Question 2 (8 marks)

A water charging system increases the amount people pay as the amount of water used increases. The charging system is modelled by

$$C = 5 + 0.4x \quad 0 \leq x < 30$$

$$C = -31 + 1.6x \quad x \geq 30$$

C is the charge in dollars and x is the amount of water used in kilolitres (kL).

(a) Use the appropriate equation to determine the charge for using

(i) 20 kL

$$C = 5 + 0.4 \times 20$$

$$C = 13$$

$$\therefore \$13$$

1 mark

(ii) 30kL

$$C = -31 + 1.6 \times 30$$

$$C = 17$$

$$\therefore \$17$$

1 mark

(iii) 60kL

$$C = -31 + 1.6 \times 60$$

$$C = -31 + 96$$

$$C = 65$$

$$\therefore \$65$$

1 mark

(b) How much does a kilolitre of water cost when you use

(i) less than 30kL

$$\$0.40$$

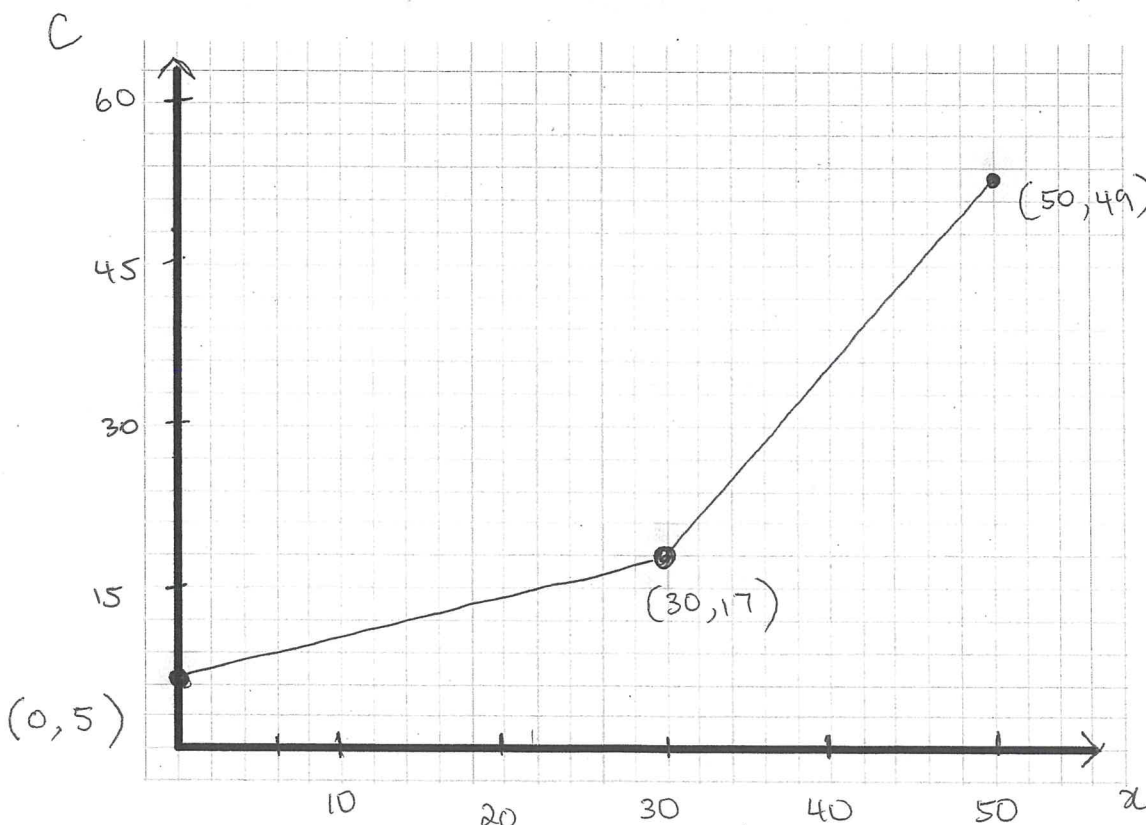
1 mark

(ii) more than 30kL

$$\$1.60$$

1 mark

(c) Use the equations to construct a piecewise graph for $0 \leq x \leq 50$



① m correct piece wise direction

① m scale / label

① m correct start and end point

3 marks

Question 3 (4 marks)

The Melbourne Museum charges \$10 for students aged 16+ years and \$15 for adults.

One hundred and twenty-five people attended the Melbourne Museum within the first two hours of opening, an amount of \$1325 was been collected in ticket fees.

Write a set of equations to represent the number of tickets sold and the amount collected in ticket fees and determine how many adults, x , and students, y , attended the museum during this time period.

$$\text{tickets sold} = x + y = 125 \quad \text{--- (1) m}$$

$$\text{amount collected} = 15x + 10y = 1325 \quad \text{--- (2) (1) m}$$

$$\text{(1) } \times 10 :$$

$$10x + 10y = 1250 \quad \text{--- (3)}$$

$$\text{(2) } - \text{(3)}$$

$$5x = 75$$

$$x = 15$$

sub x into (1):

$$15 + y = 125$$

$$y = 110$$

$$\therefore \text{adults} = \frac{15}{1\text{m}}, \text{ students} = \frac{110}{1\text{m}}$$

4 marks

END OF TEST