

TOPIC TEST

Equations and linear functions

- Time allowed: 45 minutes
- Part A: 20 multiple-choice questions (20 marks)
- Part B: 8 free-response questions (30 marks)
- Total: 50 marks

Part A

20 multiple-choice questions
1 mark each: 20 marks
Circle the correct answer.

1 Solve the equation $6 + 9p = 4$.

- A $p = \frac{2}{9}$
- B $p = -\frac{2}{9}$
- C $p = \frac{10}{9}$
- D $p = -4\frac{1}{2}$

2 In which line was an error made in solving this equation?

- $7d + 17 = d - 9$ Line 1
- $6d + 17 = -9$ Line 2
- $6d = 26$ Line 3
- $d = \frac{26}{6}$ Line 4
- $d = 4\frac{1}{3}$ Line 5

- A Line 2
- B Line 3
- C Line 4
- D Line 5

3 Which 2 equations have the same solution?

- 1 $7a - 5 = 9$
- 2 $\frac{a+5}{6} = 2$
- 3 $\frac{-4a}{3} = 8$
- 4 $4 - 3a = -2$

- A 1 and 3
- B 2 and 3
- C 1 and 4
- D 2 and 4

4 Solve $\frac{8-2p}{3} = -4$.

- A $p = -2$
- B $p = 10$
- C $p = 8$
- D $p = -10$

5 Solve $5(2 - 3m) = 25$.

- A 5
- B 4
- C 1
- D -1

6 $L = \frac{17.55}{M-4}$. Calculate M when $L = 4.5$.

- A 7.6
- B 7.7
- C 7.9
- D 8.5

7 The recommended maximum heart rate (MHR, in beats per minute) for a person is approximated by the formula:

$$\text{MHR} = 205.8 - 0.685a$$

where a = age of the person.

What is the age of a person whose recommended maximum heart rate is 190 beats per minute?

- A 23
- B 24
- C 76
- D 75

8 Find the value of a in the formula $h = \frac{2A}{a+b}$ if

$h = 12.8$, $A = 67.2$ and $b = 4.9$.

- A 15.4
- B 5.4
- C 10.1
- D 5.6

9 The subject of the formula $D = ms + k$ is changed to m . Which of the following is correct?

- A $m = \frac{D-k}{s}$
- B $m = \frac{k-D}{s}$
- C $m = \frac{D}{s} - k$
- D $m = \frac{k}{s} - D$

10 Which of the following is correct when the subject of the formula $p = \frac{A-B}{4}$ is changed to B ?

- A $B = 4P - A$
- B $B = 4A - P$
- C $B = A - 4P$
- D $B = P - 4A$

11 What is the linear function for this table of values?

x	3	7	15	19
y	-2	14	46	62

- A $y = 2x - 8$
- B $y = 4x - 14$
- C $y = 3x - 7$
- D $y = 5x - 29$

12 Which of the following equations is a linear function?

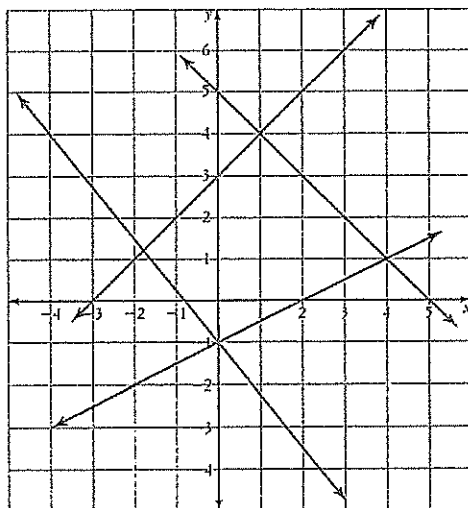
- A $d = 6 - 6n$
- B $y = 3^x$
- C $xy = 5$
- D $s = 4t^2$

13 What is the equation of a linear function with gradient $\frac{3}{4}$, vertical intercept 2, independent variable r and dependent variable s ?

- A $r = 2 - \frac{3}{4}s$
- B $s = 2 + \frac{3}{4}r$
- C $s = -\frac{3}{4}r - 2$
- D $s = 2 - \frac{3}{4}r$

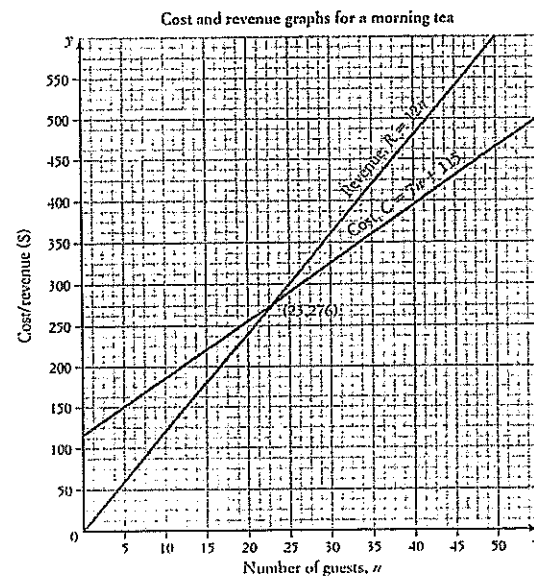
- 14 The volume of water in a glass is proportional to the depth of the water. When the depth is 5.5 cm, the volume is 535.7 cm³. What is the volume when the depth is 18 cm?
- A 1982.09 cm³
 B 1928.52 cm³
 C 1801.9 cm³
 D 1753.2 cm³
- 15 A tank is filling with water at a constant rate. The increase in the water level varies directly with time. If the water level increased by 60 cm in 9 minutes, how long would it take to increase by 160 cm?
- A 33 min
 B 25 min
 C 24 min
 D 26 min

16 Use the graph below to solve the simultaneous equations $y = \frac{1}{2}x - 1$ and $y = 5 - x$.



- A $x=4, y=1$ B $x=0, y=-1$ C $x=1, y=4$ D $x=-1.8, y=1.2$

This graph shows the revenue and cost functions of catering for a morning tea. Use this graph for Questions 17, 18 and 19.



- 17 What profit is made when the number of guests is 27 more than the number required to break even?
- A 120
 B 130
 C 135
 D 140
- 18 How many guests would result in a loss of \$80?
- A 5
 B 7
 C 10
 D 12
- 19 What does the 7 represent in the cost function?
- A The amount each person pays
 B The set-up cost
 C The number of people required to break even
 D The cost to the catering firm per person
- 20 The point of intersection of the lines $y = 3x - 3$ and $y = mx + 2$ is (2, 3). What is the value of m ?
- A $\frac{1}{2}$
 B $\frac{1}{3}$
 C $\frac{1}{4}$
 D 1

Part B

8 free-response questions
30 marks
Show all working

21 Solve each equation.

a $9f - 12 = 43 - 6f$

b $6(2m + 4) = 5(m + 9)$

c $\frac{8 - 5p}{3} = -4p$

d $26 - x = \frac{x}{4} + 2$

[8 marks]

22 If $G = \frac{x - y - z}{3}$, calculate z when $G = 2.1$, $x = 9.4$ and $y = 2.6$.

[2 marks]

23 The volume of a cone is $V = \frac{1}{3}\pi r^2 h$, where r is the base radius and h is the height. If the cone has a volume of 1450.47 cm^3 and a radius of 9 cm , find its height to the nearest centimetre.

[3 marks]

24 The cross-sectional area of a tunnel is in the shape of an isosceles trapezium given by $A = (cs + w)c$, where:

c = the vertical height of the tunnel

s = the positive gradient of the tunnel sides

w = the width of the tunnel's roof.

Calculate w when $A = 98.8 \text{ m}^2$, $c = 5.2 \text{ m}$, and $s = 2$.

[3 marks]

25 The volume of a trapezoidal prism is $V = \frac{h}{2}(a + b)H$. Change the subject of the formula to b .

[2 marks]

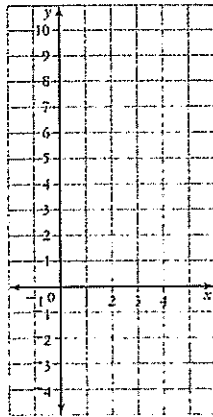
26 For the table of values shown, find:

x	4	6	8	10
y	-1	-6	-11	-16

a the gradient m

b the y intercept c

c the equation of the line $y = mx + c$ and graph the function on the grid provided.



[4 marks]

27 The number of bacteria in a sample of milk is checked at the start of each day.

Day, d	0	1	2	3	4	5
Bacteria per mL, B	3000	15 727	28 454	41 181	53 908	66 635

a Find the linear function for B in terms of d .

b If this linear function was graphed, what would be the gradient of the line and what would it represent?

c What would be the vertical intercept of the line and what would it represent?

d Calculate the amount of bacteria per millilitre on the tenth day.

e Milk is unfit for use when the number of bacteria exceeds 100 000/mL. At the start of which day will this occur?

[5 marks]

28 The mass of wood is directly proportional to its volume. The mass, M (g) of a type of wood is given for different volumes, V (cm³), in the table below.

Volume, V (cm ³)	5	11	27
Mass M (g)	2.1	4.62	11.34

a Find the equation for M in terms of V .

b Find the volume of a piece of wood if it has a mass of 235.2 g.

[3 marks]

This is the end of the test.
Use the rest of the page for extra working space.

Answers
Part A

- | | | | | |
|------|------|------|------|------|
| 1 B | 2 B | 3 C | 4 B | 5 D |
| 6 C | 7 A | 8 D | 9 A | 10 C |
| 11 B | 12 A | 13 D | 14 D | 15 C |
| 16 A | 17 C | 18 B | 19 D | 20 A |

Part B

21 a $3\frac{2}{3}$ b 3 c $-1\frac{1}{7}$ d 19.2

22 0.5

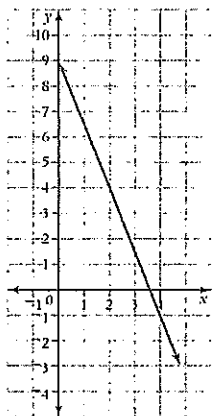
23 a 17 cm

24 8.6 cm

25 $b = \frac{2V}{hH} - a$

26 a -2.5 b 9

c $y = -2.5x + 9$



- 27 a
- $B = 12\,727d + 3000$
-
- b 12 727, the increase in bacteria/mL per day
-
- c 3000, the number of bacteria at the start
-
- d 130 270 bacteria/mL.
-
- e 8th day

28 a $M = 0.42 V$ b 560 cm^3