Topic test 4 Equations and inequalities

- Time allowed: 45 minutes
- Part A: 20 multiple-choice questions (40 marks)
- Part B: 13 free-response questions (60 marks)

Name: SOLUTIONS

Part A

20 multiple-choice questions
2 marks each: 40 marks
Circle the correct answer.

1 Solve $\frac{3p}{5} = 18$.

A $p = 7\frac{2}{3}$ B $p = 10\frac{4}{5}$
(C) $p = 30$ D $p = 87$

2 Solve $n^2 - 10 = 26$.

A $n = \pm 4$ (B) $n = \pm 6$
C $n = \pm 8$ D $n = \frac{\pm\sqrt{26}}{10}$

3 Solve $12 - 2a = 16$.

(A) $a = -2$ B $a = 2$
C $a = -4$ D $a = 4$

4 Solve $4y + 7 = y - 14$.

A $y = 2\frac{1}{3}$ B $y = -2\frac{1}{3}$
C $y = 7$ (D) $y = -7$

5 Solve $3(2d + 5) = 4d$.

A $d = -4$ B $d = -2\frac{1}{2}$
C $d = -15$ (D) $d = -7\frac{1}{2}$

6 Alan is 5 times the age of his son, Tom. In 6 years, he will be 3 times the age of Tom. How old is Tom now?

(A) 6 years B 12 years
C 8 years D 11 years

7 Solve $4x - 6 < 12$.

A $x > 1.5$ B $x < 1.5$
C $x > 4.5$ (D) $x < 4.5$

8 The cost, $\$C$, of a taxi trip is given by the formula $C = 2.4n + 5$, where n is the number of kilometres travelled. What is the cost of an 18 km trip?

A \$21.60 B \$55.20
C \$13.32 (D) \$48.20

9 Use the formula from Question 8 to find the number of kilometres travelled in a trip that cost \$26.60.

A 69 km B 3 km
C 13 km (D) 9 km

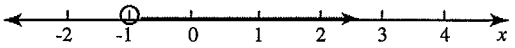
10 Solve $4t^2 = 64$.

A $t = \pm 2$ (B) $t = \pm 4$
C $t = \pm 8$ D $t = \pm 16$

11 Solve $\frac{h}{4} = \frac{7}{12}$.

A $h = 6\frac{6}{7}$ B $h = 21$
(C) $h = 2\frac{1}{3}$ D $h = 16$

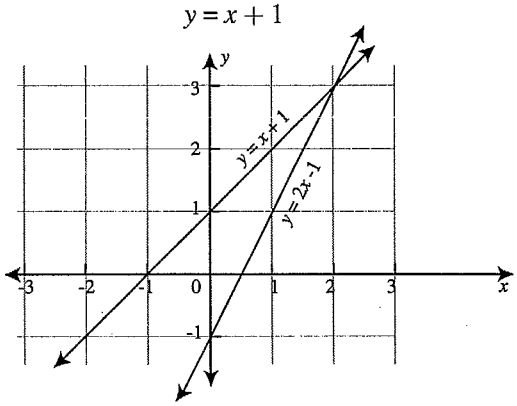
12 Which inequality is graphed on this number line?



A $x < -1$ B $x \leqslant -1$
(C) $x > -1$ D $x \geqslant -1$

13 Use the graphs below to solve the simultaneous equations:

$y = 2x - 1$
$y = x + 1$



(A) $x = 2, y = 3$ B $x = 3, y = 4$
C $x = -1, y = -1$ D $x = 3, y = 2$

14 Use the guess-and-check method to solve these simultaneous equations:

$x + y = 5$
$y = 3x + 9$

A $x = 4, y = 1$ B $x = 3, y = 18$
(C) $x = -1, y = 6$ D $x = -3, y = 0$

Topic test 4: Equations and inequalities *continued*

15 The formula for the volume of a cylinder is $V = \pi r^2 h$. If a cylinder has a height of 12 cm and a volume of 603.19 cm^3, what is the radius of its base?

(A) 4 cm B 9.4 cm
C 6.5 cm D 16 cm

16 Rearrange $4x - y = 10$ so that y is the subject.

A $y = 4x + 10$ (B) $y = 4x - 10$
C $y = -4x + 10$ D $y = -4x - 10$

17 The x-value that solves $y = 2x - 2$ and $x + y = 7$ simultaneously is:

A $x = 1$ B $x = 3$
(C) $x = 5$ D $x = 6$

18 The angle sum of a polygon with n sides is $S = 180(n - 2)$. How many sides has the polygon whose angle sum is 1440°?

A 9 B 8
(C) 10 D 12

19 Solve $7(d + 5) \geqslant 55$.

A $d \geqslant 1\frac{4}{7}$ B $d \geqslant 7\frac{1}{7}$
(C) $d \geqslant 2\frac{6}{7}$ D $d \geqslant 12\frac{6}{7}$

20 Solve: $2x + y = 12$
$3x - y = 3$

A $x = 1, y = 0$ (B) $x = 3, y = 6$
C $x = 5, y = 1$ D $x = -9, y = 6$

Part B

13 free-response questions
60 marks
Show working where appropriate.

21 (4 marks) Solve $\frac{m - 6}{3} \leqslant -2$ and graph the solution on the number line.

$m - 6 \leq -6$

$m \leq 0$

22 (6 marks) Solve:

a $2(d + 4) + 3(d - 2) = 7$

$2d + 8 + 3d - 6 = 7$

$5d + 2 = 7 \Rightarrow 5d = 5$

$d = 1$

b $6(3r - 7) = 8(r + 3)$

$18r - 42 = 8r + 24$

$10r = 66$

$r = 6.6$

23 (4 marks) The body mass index of an adult is given by the formula

$$\text{BMI} = \frac{m}{h^2}$$

where m is the mass in kilograms and h is the height in metres.

a Find correct to one decimal place the BMI of Caroline who is 1.61 m tall and has a mass of 58 kg.

22·37 (to 2 d.p.)

b Jake has a mass of 70 kg and has a BMI of 22.34. Calculate his height correct to the nearest 0.01 m.

$h^2 = \frac{m}{BMI} = \frac{70}{22.34}$

$\therefore h = 1.77\text{m}$ (to 2 d.p.)

24 (5 marks)

a Complete the table using the equation.

$y = 11 - 2x$

x	-2	-1	0	1	2	3
y	15	13	11	9	7	5

b $y = 3x + 1$

x	-2	-1	0	1	2	3
y	-5	-2	1	4	7	10

Use the two tables above to solve the simultaneous equations:

$y = 3x + 1$
$y = 11 - 2x$ } $x = 2, y = 7$

25 (6 marks) Solve:

a $\frac{3k + 6}{2} = 11$

$3k + 6 = 22$

$3k = 16$

$k = \frac{16}{3} = 5\frac{1}{3}$

b $\frac{5a - 1}{6} = \frac{2a + 7}{2}$

$(5a - 1) = 3(2a + 7)$

$5a - 1 = 6a + 21$

$\therefore -22 = a$

Topic test 4: Equations and inequalities *continued*

26 (6 marks) A rectangle is 3 times as long as it is wide. Find its length and width if:

a its perimeter is 56 cm

$\ell = 21$ cm $w = 7$ cm

b its area is 108 cm^2.

$\ell = 18$ cm $w = 6$ cm

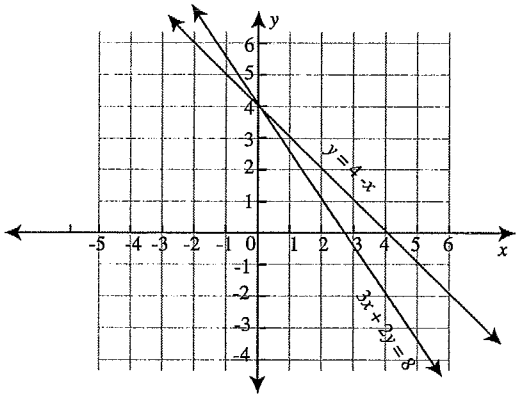
27 (4 marks) Solve $\frac{2x}{5} + \frac{x}{3} = 9$ $11x = 135$

$x = 12\frac{3}{11}$

28 (2 marks) Use the graphs below to solve the simultaneous equations:

$y = 4 - x$

$3x + 2y = 8.$



29 (6 marks) Solve:

a $3b^2 + 4 = 79$

$3b^2 = 75$

$b^2 = 25$ $\therefore b = \pm 5$

b $\frac{2m^2}{27} = 6$

$2m^2 = 162$

$m^2 = 81$

$m = \pm 9$

30 (4 marks) In my money box I have \$58 in \$1 and \$2 coins. If there are 37 coins altogether, use an equation to work out how many \$2 coins there are.

Let x = \$1, y = \$2 coins.

$\therefore x + y = 37$

$x + 2y = 58$ } Solve simultaneously

$x = 16, y = 21$

31 (4 marks) Solve these simultaneous equations graphically:

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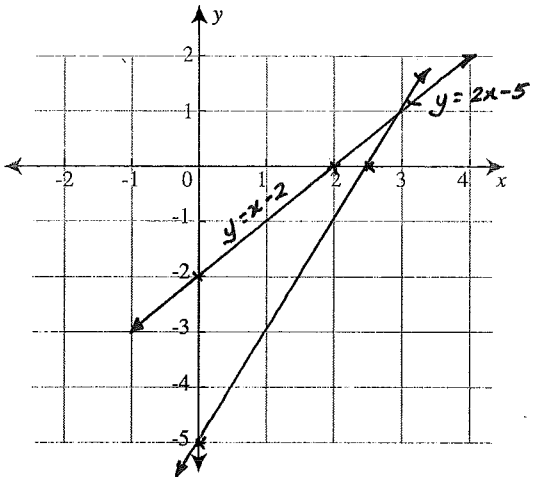

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$4x + 3y = -5$

$2x + y = -3.$

$4x + 3y = -5$ ... (i)

$4x + 2y = -6$ ... (ii)

(i)-(ii) $y = 1$

$x = -2$

33 (5 marks) A farm contains only pigs and chickens. If they have a total of 200 legs and 96 heads, use a pair of simultaneous equations to find the number of pigs and the number of chickens on the farm.

Let p = number of pigs

c = " " chickens

$\therefore 4p + 2c = 200$ ... (i)

$p + c = 96$ ... (ii)

$2p + 2c = 192$ ... (iii)

(i)-(iii) $2p = 8$

$p = 4, c = 92$

END OF TEST.
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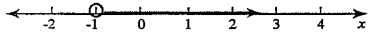

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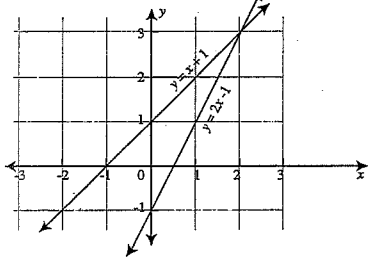

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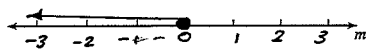

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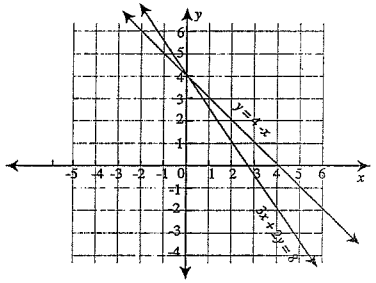

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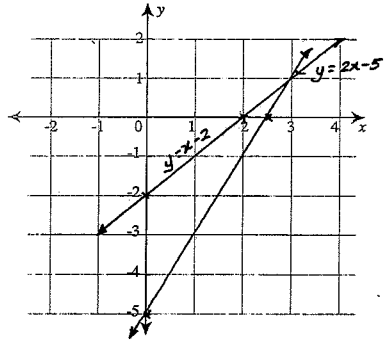

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