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Year 10 Mathematics Linear Equations Review Mock CAT

50 Marks. 60 Minutes Writing.

Results:

Short Answer Questions	/ 36
Extended Response Questions	/ 14

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Section A: Short Answer Questions (36 Marks)

Question 1 (1 mark)

Solve for x : $3x - 7 = 11$

Question 2 (1 mark)

Solve for x : $\frac{x}{4} + 5 = 2$

Question 3 (1 mark)

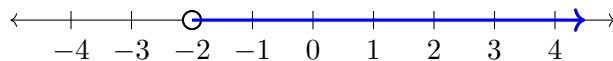
Solve for x : $5(x - 3) = 2(x + 6)$

Question 4 (1 mark)

Solve for x : $\frac{2x + 1}{3} = \frac{x - 2}{2}$

Question 5 (1 mark)

Write the inequality represented by the number line below.

**Question 6 (1 mark)**

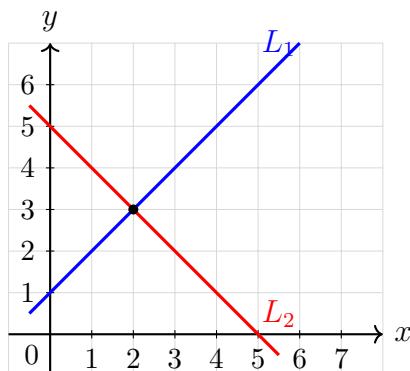
Make r the subject of the formula: $A = \pi r^2$

Question 7 (2 marks)

Make x the subject of the formula: $y = \frac{ax + b}{c}$

Question 8 (2 marks)

The graph shows two lines L_1 and L_2 .



- Write down the equations of lines L_1 and L_2 . (1 mark)
- State the coordinates of the point of intersection. (1 mark)

Question 9 (2 marks)

Solve the following pair of simultaneous equations using the **substitution** method:

$$\begin{cases} y = 2x - 1 \\ 3x + y = 14 \end{cases}$$

Question 10 (2 marks)

Solve the following pair of simultaneous equations using the **elimination** method:

$$\begin{cases} 2x + 3y = 12 \\ 4x - 3y = 6 \end{cases}$$

Question 11 (2 marks)

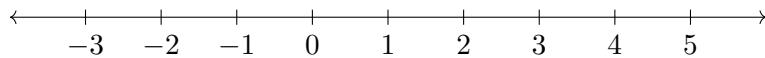
Solve the simultaneous equations:

$$\begin{cases} 3x - 2y = 7 \\ x + 4y = -2 \end{cases}$$

Question 12 (2 marks)

Solve the inequality and represent the solution on a number line:

$$3x + 5 > 14$$

**Question 13** (2 marks)

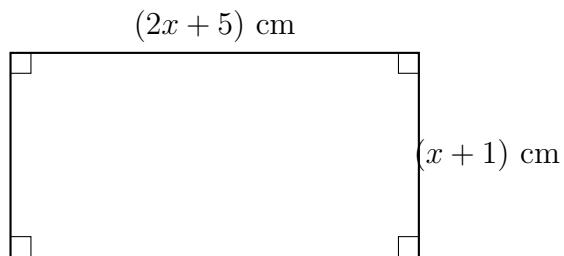
Solve the inequality: $\frac{x - 4}{2} \leq 3$

Question 14 (2 marks)

Solve the inequality: $-2x + 7 < 13$

Question 15 (3 marks)

The diagram shows a rectangle with dimensions given in centimetres.



- a. Write an expression for the perimeter of the rectangle. (1 mark)

- b. If the perimeter is 54 cm, find the value of x . (1 mark)

- c. Hence, find the area of the rectangle. (1 mark)

Question 16 (2 marks)

The formula for converting temperature from Celsius (C) to Fahrenheit (F) is:

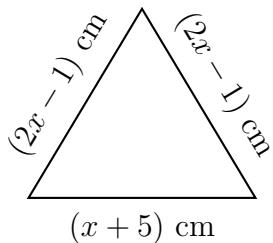
$$F = \frac{9C}{5} + 32$$

- a. Convert 25°C to Fahrenheit. (1 mark)

- b. Make C the subject of the formula. (1 mark)

Question 17 (3 marks)

The diagram shows an isosceles triangle with sides as labelled.



- Write an expression for the perimeter of the triangle. (1 mark)
- If the perimeter is 38 cm, find the value of x . (1 mark)
- Find the length of each side of the triangle. (1 mark)

Question 18 (3 marks)

A phone plan charges a \$30 monthly fee plus \$0.15 per minute for calls.

- Write an equation for the total monthly cost C in terms of the number of minutes m used. (1 mark)
- If Sarah's bill was \$52.50, how many minutes did she use? (1 mark)
- Another plan charges \$45 monthly with \$0.10 per minute. For how many minutes would both plans cost the same? (1 mark)

Question 19 (4 marks)

At a cinema, adult tickets cost \$18 and child tickets cost \$12.

A group bought 15 tickets in total and paid \$222.

a. Let a be the number of adult tickets. Write an expression for the number of child tickets. (1 mark)

b. Write an equation for the total cost. (1 mark)

c. Solve the equation to find the number of adult and child tickets purchased. (2 marks)

Section B: Extended Response Questions (14 Marks)

Question 20 (6 marks)

Two car rental companies offer the following rates:

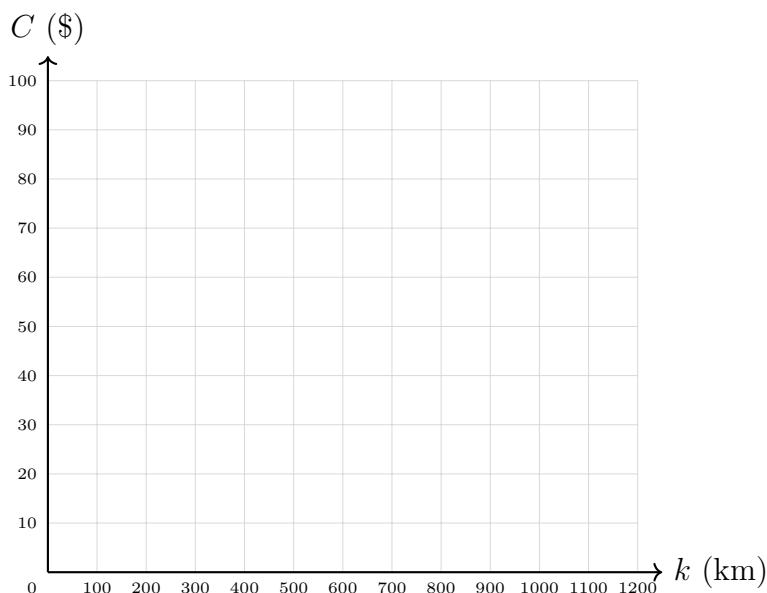
Company A: \$50 per day plus \$0.20 per kilometre

Company B: \$80 per day plus \$0.10 per kilometre

a. Write an equation for the daily cost C_A of renting from Company A in terms of kilometres k travelled. (1 mark)

b. Write an equation for the daily cost C_B of renting from Company B in terms of kilometres k travelled. (1 mark)

c. On the axes below, sketch both cost equations. Label each line clearly. (2 marks)

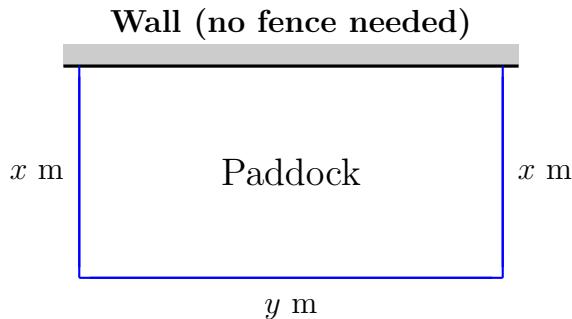


d. For what distance would both companies charge the same amount? (1 mark)

e. If you plan to drive 400 km in one day, which company offers the better deal? Justify your answer. (1 mark)

Question 21 (8 marks)

A farmer has 120 metres of fencing to enclose a rectangular paddock. One side of the paddock is against an existing wall, so fencing is only needed for three sides. Let x metres be the length of the side perpendicular to the wall.



- a. Write an expression for the total length of fencing in terms of x and y . (1 mark)

- b. Given that the farmer uses all 120 m of fencing, write an expression for y in terms of x . (1 mark)

- c. Write an expression for the area A of the paddock in terms of x only. (1 mark)

- d. If the farmer wants the paddock to have an area of 1600 m^2 , form an equation and solve it to find the possible values of x . (3 marks)

- e. State both possible sets of dimensions for the paddock. (2 marks)

ANSWER KEY

Section A: Short Answer Questions

1. $x = 6$
2. $x = -12$
3. $x = 9$
4. $x = 7$
5. $x > -2$
6. $r = \sqrt{\frac{A}{\pi}}$ (or $r = \pm \sqrt{\frac{A}{\pi}}$)
7. $x = \frac{cy - b}{a}$
8. (a) $L_1 : y = x + 1$, $L_2 : y = -x + 5$ (b) (2, 3)
9. $x = 3, y = 5$
10. $x = 3, y = 2$
11. $x = \frac{12}{7}, y = -\frac{13}{14}$
12. $x > 3$ (open circle at 3, arrow right)
13. $x \leq 10$
14. $x > -3$
15. (a) $P = 2(2x + 5) + 2(x + 1) = 6x + 12$ (b) $x = 7$ (c) Area = $19 \times 8 = 152 \text{ cm}^2$
16. (a) 77°F (b) $C = \frac{5(F - 32)}{9}$
17. (a) $P = (2x - 1) + (2x - 1) + (x + 5) = 5x + 3$ (b) $x = 7$ (c) Two sides of 13 cm, base of 12 cm
18. (a) $C = 30 + 0.15m$ (b) 150 minutes (c) 300 minutes
19. (a) $15 - a$ (b) $18a + 12(15 - a) = 222$ (c) 7 adult, 8 child tickets

Section B: Extended Response Questions

Question 20:

- (a) $C_A = 50 + 0.20k$
- (b) $C_B = 80 + 0.10k$
- (c) Graph: C_A starts at (0, 50) with gradient 0.20; C_B starts at (0, 80) with gradient 0.10; lines intersect at (300, 110)
- (d) $k = 300$ km (where $50 + 0.20k = 80 + 0.10k$)

- (e) At 400 km: $C_A = \$130$, $C_B = \$120$. Company B is cheaper by \$10.

Question 21:

- (a) Total fencing = $2x + y$
- (b) $2x + y = 120 \Rightarrow y = 120 - 2x$
- (c) $A = x \times y = x(120 - 2x) = 120x - 2x^2$
- (d) $120x - 2x^2 = 1600$
 $2x^2 - 120x + 1600 = 0$
 $x^2 - 60x + 800 = 0$
 $(x - 20)(x - 40) = 0$
 $x = 20 \text{ or } x = 40$
- (e) When $x = 20$: $y = 120 - 40 = 80 \text{ m} \Rightarrow \text{Dimensions: } 20 \text{ m} \times 80 \text{ m}$
When $x = 40$: $y = 120 - 80 = 40 \text{ m} \Rightarrow \text{Dimensions: } 40 \text{ m} \times 40 \text{ m}$