Name: _____

Date: _____

Review for Grade 9 Math Exam - Unit 6 - Linear Equations and Inequalities

Multiple Choice

Identify the choice that best completes the statement or answers the question.

____ 1. Solve: $9x - 15 = 3$

a. $46\frac{\cdot}{3}$ b. 9 c. –2 d. 2

____ 2. Solve: $5 = -3x + 14$

a. $-19\frac{\cdot}{3}$ b. 3 c. –3 d. $19\frac{\cdot}{3}$

____ 3. Solve: $4x + 2.8 = 6.4$

a. –1.2 b. –0.4 c. 5.7 d. 0.9

____ 4. Solve: $\frac{x}{7} - 4 = 5$

a. 39 b. 2 c. 63 d. 33

____ 5. Write an equation for this statement: A number divided by 2, plus 5, is 8.

a. $\frac{x+5}{2} = 8$ b. $\frac{x}{2} = 5 + 8$ c. $\frac{2}{x} + 5 = 8$ d. $\frac{x}{2} + 5 = 8$

____ 6. Solve: $3(x + 5) = 12$

a. $7\frac{\cdot}{3}$ b. –6 c. –1 d. 4

____ 7. A number times 5, minus 6, is 8. Write an equation to determine the number.

a. $6 - 5x = 8$ b. $5x - 6 = 8$ c. $5 - 6x = 8$ d. $6x - 5 = 8$

____ 8. Solve: $13 - 4x = 3x - 8$

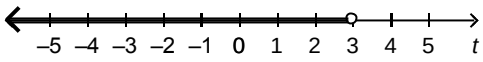
a. $x = -3$ b. $x = \frac{1}{3}$ c. $x = -\frac{1}{3}$ d. $x = 3$

____ 9. Solve: $3(5q - 4) = 2(4q + 6)$

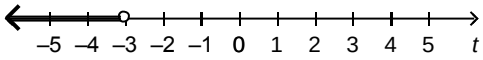
a. $q = -3\frac{3}{7}$ b. $q = \frac{7}{24}$ c. $q = -\frac{7}{24}$ d. $q = 3\frac{3}{7}$

____ 10. Which of these graphs is a solution of $t \leq 3$?

i)



ii)



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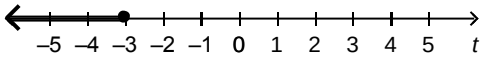

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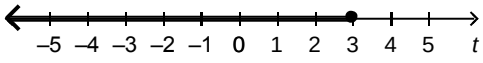
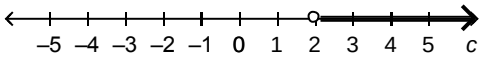


a. Graph ii b. Graph iii c. Graph iv d. Graph i

____ 11. Which of these graphs is a solution of $c > -3$?

i)



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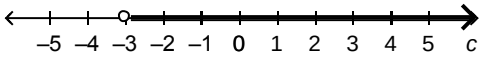

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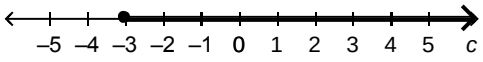

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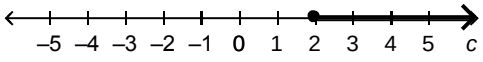
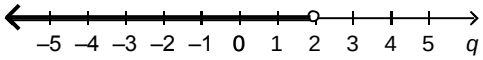


a. Graph i b. Graph ii c. Graph iv d. Graph iii

____ 12. Which of these graphs represent the solution of the inequality $q - 2 \leq 0$?

i)



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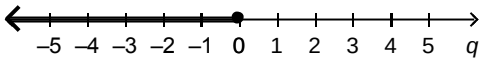
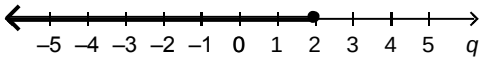
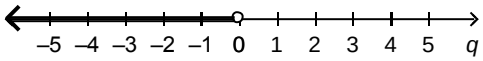


iii)



iv)



a. Graph ii b. Graph iv c. Graph iii d. Graph i

____ 13. Solve: $12t - 8 < 16 + 13t$

a. $t > -24$ b. $t < -3$ c. $t < -24$ d. $t > 8$

____ 14. Solve: $20 - 3t > 5$

a. $t < -5$ b. $t > -5$ c. $t < 5$ d. $t > 5$

____ 15. An equipment rental company charges a flat rate of $25, plus $13 per day for insurance. Kyle has $121. Write an inequality to represent the number of days, *d*, for which he can rent equipment.

a. $25 + 13d > 121$ c. $25 + 13d \leq 121$

b. $25 + 13d \geq 121$ d. $25 + 13d < 121$

Short Answer

16. Here is a student's solution for this question:
Solve: $3x + 5 = 18$

$$3x + 5 = 18$$
$$\frac{3x}{3} + 5 = \frac{18}{3}$$
$$x + 5 = 6$$
$$x + 5 - 5 = 6 - 5$$
$$x = 1$$

Identify any errors in the solution.

17. A student solved this equation: $4(3w - 6) = 3 - 6w$

$$12w - 6 = -3w$$
$$12w - 6 + 6 = -3w + 6$$
$$12w = -3w + 6$$
$$12w - (-3w) = -3w + 6 - (-3w)$$
$$15w = 6$$
$$w = \frac{6}{15}$$

Identify any errors the student made, and then solve the original equation above.

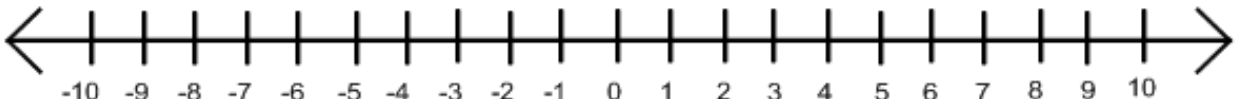
18. Solve: $\frac{3}{4}(5x-4)=\frac{1}{2}(4x+3)$

19. Car Rental Company A charges $29 a week, plus $13 per kilometre driven.
Car Rental Company B charges $85 a week, plus $6 per kilometre driven.

Determine the distance you must drive for the two rental costs to be the same.
Model the problem with an equation.

20. Solve: $8w-4 \geq 7w-2$

21. Solve and graph: $10.8-1.8b > 14.04$



22. A games room charges a $13 entrance fee, plus $2.35 per hour of play time. Anne-Marie has $29.45. For how long can she play in the games room?
    a) Choose a variable and write an inequality for this problem.
    b) Solve the inequality.

23. The cost to rent a banquet hall is $500, plus $35 per person. A company's social committee has $4700 to put towards renting a banquet hall.
    How many people could attend the function if they rented the banquet hall?
    a) Choose a variable and write an inequality to solve the problem.
    b) Solve the inequality.

Problem

24. Solve: $4(6x - 7) - (3x - 5) = 40$
    Show your work.

25. Solve: $3(p + 5) + 4(p - 2) = 4(p + 6)$
    Show your work.

26. A cell phone company offers two different plans.
Plan A: Monthly fee of $28, plus $0.38 per minute
Plan B: Monthly fee of $22, plus $0.46 per minute

a) Write an equation to determine the time in minutes that results in the same monthly cost for both plans.
b) Solve the equation.
c) Verify the solution.

27. Solve: $\frac{2}{3}(x+2)-\frac{1}{2}(x-4)>\frac{1}{4}(x+5)$
Show your work.

28. Company A charges $17, plus $11 per day to rent a piece of equipment.
Company B charges $33, plus $9 per day to rent the same piece of equipment.
a) How many days must the piece of equipment be rented for the cost to be the same at both companies?
b) How many days must the piece of equipment be rented for Company B to be less expensive?

Review for Grade 9 Math Exam - Unit 6 - Linear Equations and Inequalities
Answer Section

MULTIPLE CHOICE

1. ANS: D PTS: 1 DIF: Easy
   REF: 6.1 Solving Equations by Using Inverse Operations LOC: 9.PR3
   TOP: Patterns and Relations (Variables and Equations) KEY: Procedural Knowledge
2. ANS: B PTS: 1 DIF: Easy
   REF: 6.1 Solving Equations by Using Inverse Operations LOC: 9.PR3
   TOP: Patterns and Relations (Variables and Equations) KEY: Procedural Knowledge
3. ANS: D PTS: 1 DIF: Easy
   REF: 6.1 Solving Equations by Using Inverse Operations LOC: 9.PR3
   TOP: Patterns and Relations (Variables and Equations) KEY: Procedural Knowledge
4. ANS: C PTS: 1 DIF: Easy
   REF: 6.1 Solving Equations by Using Inverse Operations LOC: 9.PR3
   TOP: Patterns and Relations (Variables and Equations) KEY: Procedural Knowledge
5. ANS: D PTS: 1 DIF: Moderate
   REF: 6.1 Solving Equations by Using Inverse Operations LOC: 9.PR3
   TOP: Patterns and Relations (Variables and Equations) KEY: Conceptual Understanding
6. ANS: C PTS: 1 DIF: Moderate
   REF: 6.1 Solving Equations by Using Inverse Operations LOC: 9.PR3
   TOP: Patterns and Relations (Variables and Equations) KEY: Procedural Knowledge
7. ANS: B PTS: 1 DIF: Easy
   REF: 6.2 Solving Equations by Using Balance Strategies LOC: 9.PR3
   TOP: Patterns and Relations (Variables and Equations)
   KEY: Conceptual Understanding | Procedural Knowledge
8. ANS: D PTS: 1 DIF: Moderate
   REF: 6.2 Solving Equations by Using Balance Strategies LOC: 9.PR3
   TOP: Patterns and Relations (Variables and Equations) KEY: Procedural Knowledge
9. ANS: D PTS: 1 DIF: Difficult
   REF: 6.2 Solving Equations by Using Balance Strategies LOC: 9.PR3
   TOP: Patterns and Relations (Variables and Equations) KEY: Procedural Knowledge
10. ANS: C PTS: 1 DIF: Easy
    REF: 6.3 Introduction to Linear Inequalities LOC: 9.PR4
    TOP: Patterns and Relations (Variables and Equations) KEY: Conceptual Understanding
11. ANS: B PTS: 1 DIF: Easy
    REF: 6.3 Introduction to Linear Inequalities LOC: 9.PR4
    TOP: Patterns and Relations (Variables and Equations) KEY: Procedural Knowledge
12. ANS: C PTS: 1 DIF: Easy
    REF: 6.4 Solving Linear Inequalities by Using Addition and Subtraction
    LOC: 9.PR4 TOP: Patterns and Relations (Variables and Equations)
    KEY: Procedural Knowledge
13. ANS: A PTS: 1 DIF: Moderate
    REF: 6.4 Solving Linear Inequalities by Using Addition and Subtraction
    LOC: 9.PR4 TOP: Patterns and Relations (Variables and Equations)
    KEY: Procedural Knowledge

14. ANS: C PTS: 1 DIF: Easy
REF: 6.5 Solving Linear Inequalities by Using Multiplication and Division
LOC: 9.PR4 TOP: Patterns and Relations (Variables and Equations)
KEY: Procedural Knowledge
15. ANS: C PTS: 1 DIF: Moderate
REF: 6.5 Solving Linear Inequalities by Using Multiplication and Division
LOC: 9.PR4 TOP: Patterns and Relations (Variables and Equations)
KEY: Procedural Knowledge

SHORT ANSWER

16. ANS:
Error: If the student is going to divide by 3 first, each term must be divided by 3. Alternatively, the student could subtract 5 from each side first, then divide each side by 3.

PTS: 1 DIF: Moderate REF: 6.1 Solving Equations by Using Inverse Operations
LOC: 9.PR3 TOP: Patterns and Relations (Variables and Equations)
KEY: Procedural Knowledge | Communication
17. ANS:
Errors:
The student forgot to multiply 4 by 6 when using the distributive property.
3 - 6w is not equal to -3w.

Correct solution:

$$\begin{aligned} 4(3w - 6) &= 3 - 6w \\ 12w - 24 &= 3 - 6w \\ 12w - 24 + 24 &= 3 - 6w + 24 \\ 12w &= -6w + 27 \\ 12w - (-6w) &= -6w + 27 - (-6w) \\ 18w &= 27 \\ w &= \frac{27}{18} \text{ or } 1\frac{9}{18} \text{ or } 1\frac{1}{2} \text{ or } 1.5 \end{aligned}$$

PTS: 1 DIF: Moderate REF: 6.2 Solving Equations by Using Balance Strategies
LOC: 9.PR3 TOP: Patterns and Relations (Variables and Equations)
KEY: Procedural Knowledge | Communication

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18. ANS:
$x = 2\frac{4}{7}$

PTS: 1 DIF: Difficult REF: 6.2 Solving Equations by Using Balance Strategies
LOC: 9.PR3 TOP: Patterns and Relations (Variables and Equations)
KEY: Procedural Knowledge

19. ANS:
Let d represent the distance driven.
$29 + 13d = 85 + 6d$

PTS: 1 DIF: Difficult REF: 6.2 Solving Equations by Using Balance Strategies
LOC: 9.PR3 TOP: Patterns and Relations (Variables and Equations)
KEY: Procedural Knowledge

20. ANS:
$w \geq 2$

PTS: 1 DIF: Moderate
REF: 6.4 Solving Linear Inequalities by Using Addition and Subtraction
LOC: 9.PR4 TOP: Patterns and Relations (Variables and Equations)
KEY: Procedural Knowledge

21. ANS:
$b < -1.8$

PTS: 1 DIF: Easy
REF: 6.5 Solving Linear Inequalities by Using Multiplication and Division
LOC: 9.PR4 TOP: Patterns and Relations (Variables and Equations)
KEY: Procedural Knowledge

22. ANS:
a) Let h represent the number of hours of play time.
$13 + 2.35h \leq 29.45$
b) $h \leq 7$

PTS: 1 DIF: Moderate
REF: 6.5 Solving Linear Inequalities by Using Multiplication and Division
LOC: 9.PR4 TOP: Patterns and Relations (Variables and Equations)
KEY: Procedural Knowledge

23. ANS:
a) Let p represent the number of people.
$500 + 35p \leq 4700$
b) $p \leq 120$

PTS: 1 DIF: Moderate
REF: 6.5 Solving Linear Inequalities by Using Multiplication and Division
LOC: 9.PR4 TOP: Patterns and Relations (Variables and Equations)
KEY: Procedural Knowledge

PROBLEM

24. ANS:

$$\begin{aligned}
4(6x-7)-(3x-5) &= 40\\
24x-28-3x+5 &= 40\\
24x-3x-28+5 &= 40\\
21x-23 &= 40\\
21x-23+23 &= 40+23\\
21x &= 63\\
\frac{21x}{21} &= \frac{63}{21}\\
x &= 3
\end{aligned}$$

PTS: 1 DIF: Difficult REF: 6.1 Solving Equations by Using Inverse Operations
LOC: 9.PR3 TOP: Patterns and Relations (Variables and Equations)
KEY: Procedural Knowledge

25. ANS:

$$\begin{aligned}
3(p+5)+4(p-2) &= 4(p+6)\\
3(p)+3(5)+4(p)+4(-2) &= 4(p)+4(6)\\
3p+15+4p-8 &= 4p+24\\
3p+4p+15-8 &= 4p+24\\
7p+7 &= 4p+24\\
7p+7-4p &= 4p+24-4p\\
3p+7 &= 24\\
3p+7-7 &= 24-7\\
3p &= 17\\
\frac{3p}{3} &= \frac{17}{3}\\
p &= \frac{17}{3}
\end{aligned}$$

So, $p = \frac{17}{3}$, or $5\frac{2}{3}$.

PTS: 1 DIF: Difficult REF: 6.2 Solving Equations by Using Balance Strategies
LOC: 9.PR3 TOP: Patterns and Relations (Variables and Equations)
KEY: Procedural Knowledge

26. ANS:

a) Let t represent the number of minutes.

$28 + 0.38t = 22 + 0.46t$

b)
$$\begin{aligned} 28 + 0.38t &= 22 + 0.46t \\ 28 + 0.38t - 0.38t &= 22 + 0.46t - 0.38t \\ 28 &= 22 + 0.08t \\ 28 - 22 &= 22 + 0.08t - 22 \\ 6 &= 0.08t \\ \frac{6}{0.08} &= \frac{0.08t}{0.08} \\ t &= 75 \end{aligned}$$

The monthly costs for both plans are the same at 75 min.

c) Verify: Substitute $t = 75$ into the original equation.

Left side $= 28 + 0.38t$
$= 28 + 0.38(75)$
$= 28 + 28.5$
$= 56.5$

Right side $= 22 + 0.46t$
$= 22 + 0.46(75)$
$= 22 + 34.5$
$= 56.5$

Since the left side equals the right side, $t = 75$ is the correct solution.

PTS: 1 DIF: Difficult REF: 6.2 Solving Equations by Using Balance Strategies
LOC: 9.PR3 TOP: Patterns and Relations (Variables and Equations)
KEY: Problem-Solving Skills | Communication

27. ANS:

Multiply each side of the inequality by 12.

$$12 \times \left(\frac{2}{3}(x+2) - \frac{1}{2}(x-4) \right) > 12 \times \frac{1}{4}(x+5)$$

$$\begin{aligned} 8(x+2) - 6(x-4) &> 3(x+5) \\ 8x + 16 - 6x + 24 &> 3x + 15 \\ 2x + 40 &> 3x + 15 \\ 2x + 40 - 2x &> 3x + 15 - 2x \\ 40 &> x + 15 \\ 40 - 15 &> x + 15 - 15 \\ 25 &> x \\ x &< 25 \end{aligned}$$

PTS: 1 DIF: Difficult
REF: 6.4 Solving Linear Inequalities by Using Addition and Subtraction
LOC: 9.PR4 TOP: Patterns and Relations (Variables and Equations)
KEY: Procedural Knowledge

28. ANS:

a) Let d represent the number of days to rent the piece of equipment.

$$\begin{aligned} 17 + 11d &= 33 + 9d \\ 17 + 11d - 9d &= 33 + 9d - 9d \\ 17 + 2d &= 33 \\ 17 + 2d - 17 &= 33 - 17 \\ 2d &= 16 \\ \frac{2d}{2} &= \frac{16}{2} \\ d &= 8 \end{aligned}$$

The piece of equipment must be rented for 8 days for the cost to be the same at both companies.

b) Let d represent the number of days to rent the piece of equipment.

$$\begin{aligned} 17 + 11d &> 33 + 9d \\ 17 + 11d - 9d &> 33 + 9d - 9d \\ 17 + 2d &> 33 \\ 17 + 2d - 17 &> 33 - 17 \\ 2d &> 16 \\ \frac{2d}{2} &> \frac{16}{2} \\ d &> 8 \end{aligned}$$

The piece of equipment must be rented for 9 or more days for Company B to be less expensive.

PTS: 1 DIF: Difficult
REF: 6.5 Solving Linear Inequalities by Using Multiplication and Division
LOC: 9.PR4 TOP: Patterns and Relations (Variables and Equations)
KEY: Problem-Solving Skills | Communication