

EQUITY LEARNING PLACE

Elementary Math Topical (**Inequalities**)

Question 1:

Given that $-1 \leq x \leq 5$ and $-5 < y < 2$, find the

a) greatest possible integer value of $3y - 2x$,

b) smallest possible integer value of $\frac{y^3}{x^2}$.

a) Greatest: when $y = 1$ and $x = -1$

$$3(1) - 2(-1) = 5$$

b) Smallest: when $y = -4$ and $x = -1$

$$\frac{(-4)^3}{(-1)^2} = -64$$

Question 2:

Solve the inequality $2x - 1 < 8 + x \leq 3x + 2$.

$$2x - 1 < 8 + x$$

and

$$8 + x \leq 3x + 2$$

$$x < 9$$

$$6 \leq 2x$$

$$3 \leq x$$

$$\therefore 3 \leq x < 9$$

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Question 3:

a) Solve the inequalities $-1 < \frac{2}{5}x + 1 < -x - 1$.

b) Write down all the integers that satisfy $-1 < \frac{2}{5}x + 1 < -x - 1$

a)

$$-1 < \frac{2}{5}x + 1$$

and

$$\frac{2}{5}x + 1 < -x - 1$$

$$-2 < \frac{2}{5}x$$

$$\frac{2}{5}x + x < -2$$

$$-5 < x$$

$$\frac{7}{5}x < -2$$

$$x < -\frac{10}{7}$$

$$\therefore -5 < x < -\frac{10}{7}$$

b) The integers are $-4, -3, -2$ and -1

Question 4:

a) Solve the inequality $-10 + x < 7 - 2x \leq 6$.

b) Given that \sqrt{x} is an integer, find the largest possible value of x which satisfies $-10 + x < 7 - 2x \leq 6$.

a)

$$-10 + x < 7 - 2x$$

and

$$7 - 2x \leq 6$$

$$3x < 17$$

$$1 \leq 2x$$

$$x < \frac{17}{3}$$

$$\frac{1}{2} \leq x$$

$$\therefore \frac{1}{2} \leq x < \frac{17}{3}$$

b) x is a perfect square. Largest possible is 4

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Question 5:

Given that $-3 \leq x < 4$ and $-5 \leq y < 2$ where x and y are integers, find the

a) the greatest possible value of $x - y$,

b) the least possible value of $x^2 + y$,

c) the largest possible value of $\frac{y}{x}$.

a) Greatest possible when $x = 3, y = -5$

$$3 - (-5) = 8$$

b) Least possible value when $x = 3, y = 1$

$$(3)^2 + 1 = 10$$

c) Largest possible value when $x = -1, y = -5$

$$\frac{-5}{-1} = 5$$

Question 6:

Given that $-5 < x < 7$ and $-10 \leq y \leq -2$, where x and y are integers, find

a) the smallest possible value of $\frac{x}{y}$,

b) the smallest possible value of $x^2 + y^2$.

a) Smallest possible value when $x = 6, y = -2$

$$-\frac{6}{2} = -3$$

b) Smallest possible value when $x = -4, y = -10$

$$(-4)^2 + (-10)^2 = 116$$

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Question 7:

Solve the inequality $-12 < 2x - 3 < 3x$.

$$-12 < 2x - 3$$

and

$$2x - 3 < 3x$$

$$-9 < 2x$$

$$-3 < x$$

$$-\frac{9}{2} < x$$

$$\therefore -3 < x$$

Question 8:

Solve $-8 \leq 3 - 2x < -0.5x$.

$$-8 \leq 3 - 2x$$

and

$$3 - 2x < -0.5x$$

$$2x \leq 11$$

$$3 < 1.5x$$

$$x \leq \frac{11}{2}$$

$$2 < x$$

$$\therefore 2 < x \leq \frac{11}{2}$$

Question 9:

Given that $-6 \leq x \leq -1$, $-2 \leq y \leq 8$ and x and y are integers, find the

a) smallest value of $\frac{y}{x}$,

b) largest value $x - y^2$.

a) smallest value when $x = -1, y = 8$

$$\frac{8}{-1} = -8$$

b) largest value when $x = -1, y = 0$

$$-1 - (0)^2 = -1$$

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Question 10:

a) Solve the inequalities $-1 \leq \frac{x+5}{3} \leq 1$.

b) Show your solution on the number line.

a)

$$-1 \leq \frac{x+5}{3}$$

and

$$\frac{(x+5)}{3} \leq 1$$

$$-3 \leq x+5$$

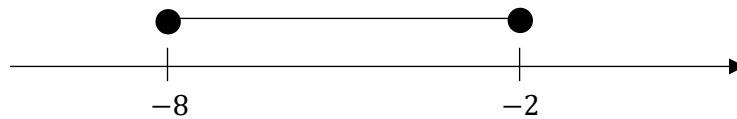
$$x+5 \leq 3$$

$$-8 \leq x$$

$$x \leq -2$$

$$\therefore -8 \leq x \leq -2$$

b)



Question 11:

a) Solve the inequality $-4 \leq 3x - 7 < 2x + 1$.

b) Write down the largest integer value of x which satisfies the inequality $-4 \leq 3x - 7 < 2x + 1$.

c) Show your solutions for the inequality $-4 \leq 3x - 7 < 2x + 1$ on a number line.

a)

$$-4 \leq 3x - 7$$

and

$$3x - 7 < 2x + 1$$

$$3 \leq 3x$$

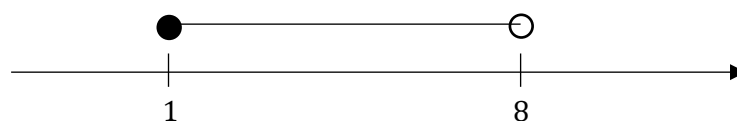
$$x < 8$$

$$1 \leq x$$

$$\therefore 1 \leq x < 8$$

b) Largest integer value is 7.

c)



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Question 12:

A milk company pays its sales promoter at any supermarket an amount of \$ S per week. The amount is made up of a basic wage of \$300 plus a commission of 65¢ for each of n cartons of fresh milk sold.

a) Express n in terms of S .

b) Calculate the least number of cartons of milk the sales promoter must sell in a week if she wants to earn more than \$500 in the week.

a) $S = 300 + 0.65n$

$$n = \frac{S - 300}{0.65}$$

$$n = \frac{20S - 6000}{13}$$

b) $300 + 0.65n \geq 500$

$$0.65n \geq 200$$

$$n \geq 307.69$$

Least amount of milk is 308.

Question 13:

a) Solve the inequalities $9 < 25 - 4x \leq 23$.

b) Write down the prime numbers that satisfy $9 < 25 - 4x \leq 23$.

a)

$$9 < 25 - 4x$$

and

$$25 - 4x \leq 23$$

$$4x < 16$$

$$2 \leq 4x$$

$$x < 4$$

$$\frac{1}{2} \leq x$$

$$\therefore \frac{1}{2} \leq x < 4$$

b) The prime numbers are 2 and 3.

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Question 14:

Solve the inequality $\frac{x}{2} - 3 < \frac{2x-5}{3} \leq 10 - x$.

$$\frac{x}{2} - 3 < \frac{2x-5}{3}$$

and

$$\frac{(2x-5)}{3} \leq 10 - x$$

$$3x - 9 < 4x - 10$$

$$2x - 5 \leq 30 - 3x$$

$$1 < x$$

$$5x \leq 35$$

$$x \leq 7$$

$$\therefore 1 < x \leq 7$$

Question 15:

Solve the inequality $-\frac{5x}{4} - 4 < 3 + \frac{x}{4} \leq 6$.

Represent the above solution on a number line

$$-\frac{5x}{4} - 4 < 3 + \frac{x}{4}$$

and

$$3 + \frac{x}{4} \leq 6$$

$$-5x - 16 < 12 + x$$

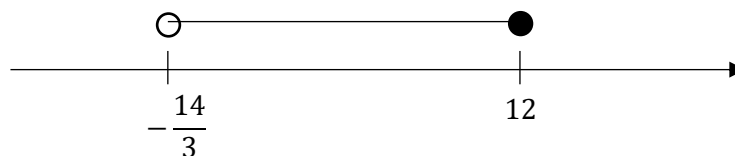
$$12 + x \leq 24$$

$$-28 < 6x$$

$$x \leq 12$$

$$-\frac{14}{3} < x$$

$$\therefore -\frac{14}{3} < x \leq 12$$



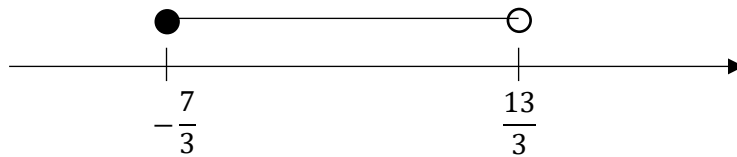
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Question 16:

- a) Solve the inequalities $-10x - 34 \leq 2x - 6 < 7 - x$.
- b) Represent the solution set on a number line
- c) Hence, list all the prime values of x for $-10x - 34 \leq 2x - 6 < 7 - x$.

$-10x - 34 \leq 2x - 6$	and	$2x - 6 < 7 - x$
$-28 \leq 12x$		$3x < 13$
$-\frac{7}{3} \leq x$		$x < \frac{13}{3}$
	$\therefore -\frac{7}{3} \leq x < \frac{13}{3}$	



- c) Prime numbers are 2 and 3

Question 17:

- a) Solve the inequality $\frac{3x+5}{2} < 2x-1$.
- b) Write down the smallest prime integer that satisfies $\frac{3x+5}{2} < 2x-1$.

a) $3x + 5 < 4x - 2$

$7 < x$

- b) smallest integer prime number is 11.

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Question 18:

Solve $\frac{(x+1)}{2} \leq x-7 \leq 3(x-12)$

$$\frac{x+1}{2} \leq x-7$$

and

$$x-7 \leq 3(x-12)$$

$$x+1 \leq 2x-14$$

$$x-7 \leq 3x-36$$

$$15 \leq x$$

$$29 \leq 2x$$

$$\frac{29}{2} \leq x$$

$$\therefore x \leq 15$$

Question 19:

Mrs Lim buys x apples at \$0.30 each and $(x-5)$ oranges at \$0.40 each. She wishes to spend less than \$10.

- Write down an inequality in x to represent this information.
- Solve the inequality.
- Hence, find the largest possible number of apples Mrs Lim can buy.

a) $0.3x + 0.4(x-5) < 10$

b) $0.3x + 0.4x - 2 < 10$

$$0.7x < 12$$

$$x < \frac{120}{7}$$

- c) Largest possible number of apples is 17.

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Question 20:

In a set of 20 True / False questions, 2 points are awarded for a correct answer and 1 point is deducted for a wrong answer. No points are awarded or deducted for an unanswered question. Amy answered 18 questions and left the remaining unanswered. If her total score is greater than 30, find the minimum number of questions she answered correctly.

Let x be the number of correct answers.

$$2x - 1(18 - x) > 30$$

$$2x - 18 + x > 30$$

$$3x > 48$$

$$x > 16$$

The minimum number of questions she answered correctly is 17.