

1

Linear Inequalities in One Unknown

Let's Review

1. Notations

For real numbers a and b , $a > b$ means that a is greater than b ;

$a < b$ means that a is smaller than b ;

$a \geq b$ means that a is greater than or equal to b ;

$a \leq b$ means that a is smaller than or equal to b ;

$a \neq b$ means that a is not equal to b .

2. Properties of Inequalities

(a) Transitive Property

If $a > b$ and $b > c$, then $a > c$.

(b) Additive Property

If $a > b$ and c is a real number, then $a + c > b + c$.

(c) Multiplicative Properties

(i) If $a > b$ and $c > 0$, then $ac > bc$.

(ii) If $a > b$ and $c < 0$, then $bc > ac$.

(iii) If $a \neq 0$, then $a^2 > 0$.

(d) Reciprocal Properties

(i) If $a > b > 0$, then $\frac{1}{b} > \frac{1}{a}$.

(ii) If $a > b$ and **both a and b are negative**, then $\frac{1}{b} > \frac{1}{a}$.

e.g. $4 > 3 > 0$

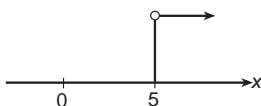
e.g. $-2 > -5$

$$\therefore \frac{1}{3} > \frac{1}{4}$$

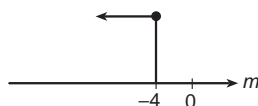
$$\therefore \frac{1}{-5} > \frac{1}{-2}$$

3. Representation on a Number Line

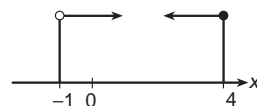
e.g. $x > 5$



e.g. $m \leq -4$



e.g. $-1 < x \leq 4$



4. Solving Linear Inequalities in One Unknown

e.g. Solve $5 - x < \frac{4x - 5}{2}$ and represent the solution on a number line.

Solution: $5 - x < \frac{4x - 5}{2}$

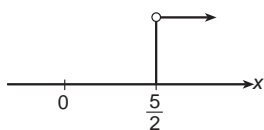
$$2(5 - x) < 2\left(\frac{4x - 5}{2}\right)$$

$$10 - 2x < 4x - 5$$

$$10 + 5 < 4x + 2x$$

$$15 < 6x$$

$$x > \frac{5}{2}$$



Let's Practise

Level 1

For questions 1 – 4, choose the most suitable answer from the four choices.

1. If $a > 0$, which of the following inequalities must be correct?

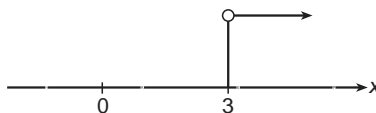
A. $3a + 5 > 5a$

B. $3a + 5 > 5$

C. $-a > 0$

D. $a - 10 > 10$

2. What does the following graph represent?



A. $x \neq 3$

B. $x > 3$

C. $x < 3$

D. $x = 3$

3. If $a > b > 0 > c$, which of the following is incorrect?

A. $a + b > a + c$

B. $ab > ac$

C. $a - b > c - b$

D. $ac > b(0)$



Learning from Mistakes

There are mistakes in the solution below. Correct the mistakes.

Prove that $\triangle ABC \sim \triangle AED$.

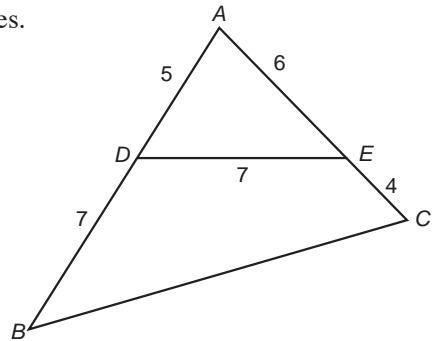
Solution:

$$\angle EAD = \angle BAC \text{ (common)}$$

$$\angle AED = \angle ACB$$

$$\angle ADE = \angle ABC$$

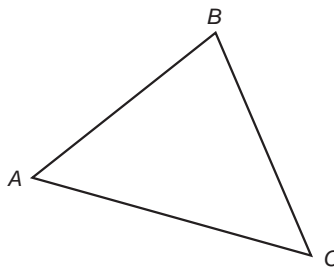
$$\therefore \triangle ABC \sim \triangle AED \text{ (equiangular)}$$



Open-ended Question

Draw a circle passing through the points A , B and C given below.

[Hint: Draw perpendicular bisectors of AB , BC and AC .]

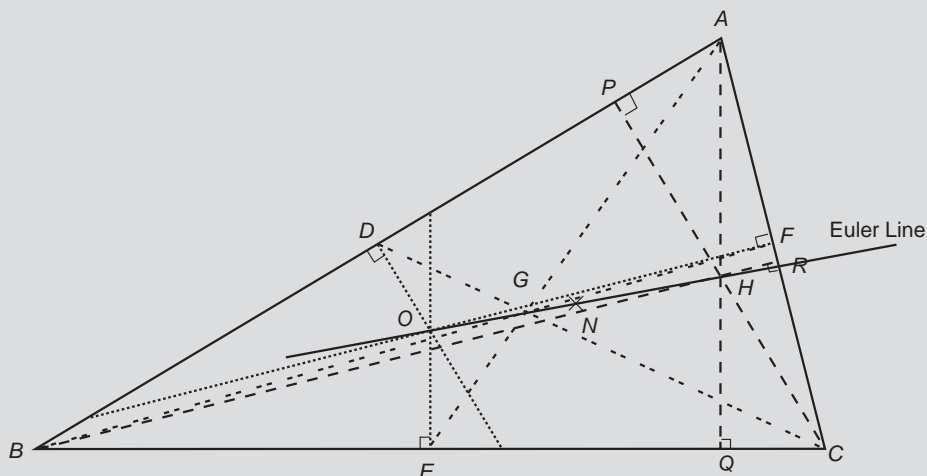




Enrichment Mathematics

Euler Line

The orthocentre H , the centroid G and the circumcentre O of any triangle all lie on a straight line, known as the Euler Line. This is illustrated in the figure below.



In the figure, we have $GH = 2OG$.

If you construct a circle centred at the mid-point N of OH with radius NP , what do you find?

You may visit the following website to see the Euler line of triangles in different shapes:

 <http://www.cut-the-knot.org/triangle/EulerLine.shtml>

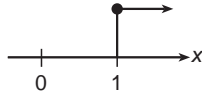
Glossary

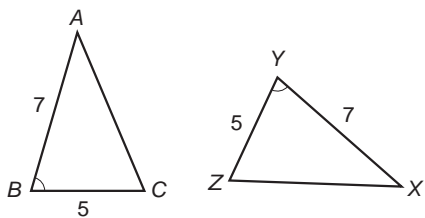
altitude	頂垂線／高	angle bisector	角平分線
bisect	平分	centroid	形心
circumcentre	外心	congruent	全等
deductive geometry	演繹幾何	diagonal	對角線
equiangular	等角	in-centre	內心
intercept theorem	截線定理	median	中線
mid-point theorem	中點定理	orthocentre	垂心
parallelogram	平行四邊形	perpendicular bisector	垂直平分線
proportional	成比例	quadrilateral	四邊形
rhombus	菱形	similar	相似

Revision Test 1

Choose the most suitable answer from the four choices.

1. Which of the following inequalities is represented by the diagram below?



- A. $2x \geq -2$
 B. $2x - 1 \geq 1$
 C. $-2x \geq -2$
 D. $3x - 2 \leq 2x - 1$
2. If $a > b$ and $c < 0$, which of the following must be true?
 I. $ac > bc$
 II. $a + c > b + c$
 III. $-ac > -bc$
 A. II only B. III only
 C. I and II only D. II and III only
3. $1 \text{ km}^2 =$
 A. $1 \times 10^{10} \text{ cm}^2$ B. 1000 cm^2
 C. $1 \times 10^8 \text{ cm}^2$ D. $1 \times 10^8 \text{ m}^2$
4. Which of the following is CORRECT?
 A. $(-x)^3 \times (x)^{-5} = x^{-2}$
 B. $(2x^3)^2 = 4x^9$
 C. $(-2^2 xy^{-1})^3 = \frac{64x^3}{y^3}$
 D. $(-x)^{-1} = \frac{-1}{x}$
5. $X = A + B + C$, A is increased from 400 by 40%, B is increased from 350 by 35%, and C is increased from 250 by 25%. What is the percentage change in X ?
 A. Increased by 100%
 B. Increased by 35%
 C. Increased by 34.5%
 D. Increased by 25%
6. x is increased by 10%, then decreased by 20% and then increased by 10%. What is the percentage change in x ?
 A. Increased by 3.2%
 B. Unchanged
 C. Increased by 0.83%
 D. Decreased by 3.2%
7. Which of the following is a rational number?
 A. 2π B. $\sqrt{24}$
 C. $\sqrt{1+81}$ D. 3.1416
8. $(\sqrt{3} - 1)(1 + \sqrt{3}) =$
 A. 2 B. $2\sqrt{3}$
 C. $\sqrt{3} - 1$ D. $2 - \sqrt{3}$
9. Which of the following is correct?

 A. $\triangle ABC \cong \triangle XYZ$ (SAS)
 B. $\triangle ABC \cong \triangle XYZ$ (SSS)
 C. $\triangle ABC \cong \triangle XYZ$ (AAS)
 D. $\triangle ABC \sim \triangle XYZ$ (ratio of 2 sides, inc. \angle)

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Percentage (3)

1. When a number is increased by $x\%$ ($x \neq 0$), and then decreased by $x\%$, explain why the result is not equal to the original number.

2. The following shows the tax rate of a country in 2 consecutive financial years.

Financial year	Tax rate
2006 – 2007	4%
2007 – 2008	5%

Mrs. Chan owns a flat and she had to pay quarterly rates of \$2560 in 2006 – 2007. Since the tax rate in 2007 – 2008 was changed from 4% to 5%, Mrs. Chan suggested that the new quarterly rates would also be increased by $(5\% - 4\%) = 1\%$. Do you agree with her? Explain your answer briefly.