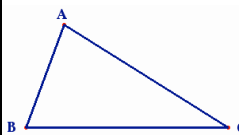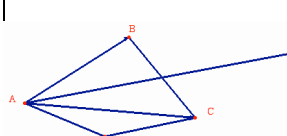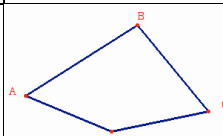**I -** Answer the questions by TRUE or FALSE and explain your answer or show why by a picture :

Let ABC be a regular triangle,

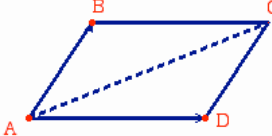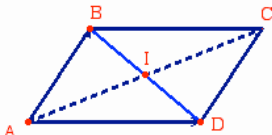| Question	Answer	Explanation or Picture	Score
1. $\overrightarrow{AB} = \overrightarrow{AC} + \overrightarrow{BC}$?	False	$\overrightarrow{AB} = \overrightarrow{AC} + \overrightarrow{CB}$ $\neq \overrightarrow{AC} + \overrightarrow{BC}$	4
2. $\overrightarrow{AB} = \overrightarrow{CB} - \overrightarrow{CA}$?	True	$\overrightarrow{AB} = \overrightarrow{AC} + \overrightarrow{CB} = \overrightarrow{CB} - \overrightarrow{CA}$	4
3. $\overrightarrow{AC} = \overrightarrow{AB} + \overrightarrow{BC}$?	True	$\overrightarrow{AC} = \overrightarrow{AB} + \overrightarrow{BC}$ by definition of the Addition of two vectors	4
4. $\overrightarrow{CB} = \overrightarrow{AB} + \overrightarrow{CA}$?	True	$\overrightarrow{CB} = \overrightarrow{CA} + \overrightarrow{AB} = \overrightarrow{AB} + \overrightarrow{CA}$	4
5. $\overrightarrow{BC} = \overrightarrow{AC} - \overrightarrow{AB}$?	True	$\overrightarrow{BC} = \overrightarrow{BA} + \overrightarrow{AC} = \overrightarrow{AC} - \overrightarrow{AB}$	4

II - Answer the questions by TRUE or FALSE and explain your answer or show why by a picture:

Let ABCD be an ordinary quadrilateral

Question	Answer	Explanation or Picture	Score
6. $\overrightarrow{AD} = \overrightarrow{AB} + \overrightarrow{AC}$?	False	$\overrightarrow{AB} + \overrightarrow{AC} = \overrightarrow{AE} \neq \overrightarrow{AD}$	5
7. $\overrightarrow{AB} + \overrightarrow{BC} + \overrightarrow{CD} = \overrightarrow{DA}$?	False	$\overrightarrow{AB} + \overrightarrow{BC} + \overrightarrow{CD}$ $= \overrightarrow{AC} + \overrightarrow{CD}$ $= \overrightarrow{AD} \neq \overrightarrow{DA}$	5
8. $\overrightarrow{AB} + \overrightarrow{DA} = \overrightarrow{DC} + \overrightarrow{CB}$?	True	$\overrightarrow{AB} + \overrightarrow{DA} = \overrightarrow{DA} + \overrightarrow{AB} = \overrightarrow{DB}$ $\overrightarrow{DC} + \overrightarrow{CB} = \overrightarrow{DB}$	5
9. $\overrightarrow{DA} + \overrightarrow{AB} + \overrightarrow{BC} + \overrightarrow{CD} = \overrightarrow{O}$	True	$\overrightarrow{DA} + \overrightarrow{AB} = \overrightarrow{DB}$ $\overrightarrow{BC} + \overrightarrow{CD} = \overrightarrow{BD}$ $\overrightarrow{DB} + \overrightarrow{BD} = \overrightarrow{DD} = \overrightarrow{O}$	5
10. $\overrightarrow{AB} + \overrightarrow{AD} = \overrightarrow{CB} + \overrightarrow{CD}$?	False	$\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AC}$ $\overrightarrow{CD} + \overrightarrow{DA} = \overrightarrow{CA}$ $\overrightarrow{AC} \neq \overrightarrow{CA}$	5

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Mathematics - Geometry ++ Junior 8
Final TEST - Dec. 16 – 30 min.– p.2/2

ANSWERS

III - Answer the questions by TRUE or FALSE and explain your answer or show why by a picture: given the parallelogram (A,B,C,D). and I the Midpoint of [AC].

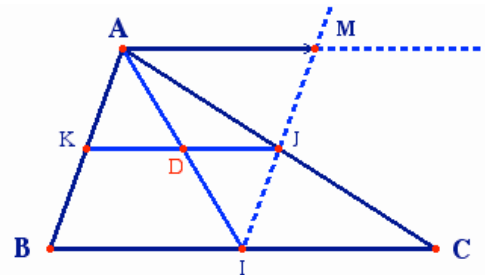|	Question	Answer	Explanation or Picture	Score
11.	$\overrightarrow{AB} + \overrightarrow{AD} = \overrightarrow{CB} + \overrightarrow{CD}$?	False	$\overrightarrow{AB} + \overrightarrow{AD} = \overrightarrow{AC}$ $\overrightarrow{CB} + \overrightarrow{CD} = \overrightarrow{CA}$ $\overrightarrow{AC} \neq \overrightarrow{CA}$	5
12.	$\overrightarrow{AB} = \overrightarrow{CD}$?	False	$\overrightarrow{AB} = \overrightarrow{DC} \neq \overrightarrow{CD}$	5
13.	$\overrightarrow{BA} + \overrightarrow{BC} = 2\overrightarrow{BI}$?	True	$\overrightarrow{BA} + \overrightarrow{BC} = \overrightarrow{BD}$ $\overrightarrow{BD} = 2\overrightarrow{BI}$	5
14.	$\overrightarrow{IB} + \overrightarrow{ID} = \overrightarrow{O}$	True	$\overrightarrow{IB} = \overrightarrow{DI}$ $\therefore \overrightarrow{IB} + \overrightarrow{DI} = \overrightarrow{O}$	5
15.	$\overrightarrow{AI} + \overrightarrow{IC} = \overrightarrow{O}$?	False	$\overrightarrow{AI} + \overrightarrow{IC} = \overrightarrow{AC}$ $\overrightarrow{AC} \neq \overrightarrow{O}$	5

IV - Let A,B,C be an ordinary triangle : [10 pts]

16. Build the point M such that $4\overrightarrow{MA} - 2\overrightarrow{MB} + 2\overrightarrow{MC} = \overrightarrow{O}$

$$2\overrightarrow{MA} - (\overrightarrow{MA} + \overrightarrow{AB}) + (\overrightarrow{MA} + \overrightarrow{AC}) = \overrightarrow{O}$$

$$2\overrightarrow{MA} - \overrightarrow{AB} + \overrightarrow{AC} = \overrightarrow{O}$$

$$2\overrightarrow{AM} = \overrightarrow{AC} - \overrightarrow{AB} = \overrightarrow{BC} \text{ then } \overrightarrow{AM} = \frac{1}{2}\overrightarrow{BC} = \overrightarrow{BI}$$

V - Let I,J,K be the midpoints of the sides, and D the midpoint of [JK].

Prove that $\overrightarrow{AI} = 2\overrightarrow{AD}$ [20 pts]

$$\overrightarrow{AI} = \overrightarrow{AB} + \overrightarrow{BI} = \overrightarrow{AB} + \frac{1}{2}\overrightarrow{BC} = \overrightarrow{AB} + \frac{1}{2}(\overrightarrow{BA} + \overrightarrow{AC}) = \frac{1}{2}(\overrightarrow{AB} + \overrightarrow{AC})$$

$$\overrightarrow{AD} = \overrightarrow{AK} + \overrightarrow{KD} = \overrightarrow{AK} + \frac{1}{2}\overrightarrow{KJ} = \overrightarrow{AK} + \frac{1}{2}(\overrightarrow{KA} + \overrightarrow{AJ}) = \frac{1}{2}(\overrightarrow{AK} + \overrightarrow{AJ})$$

$$\overrightarrow{AI} = \frac{1}{2}(\overrightarrow{AB} + \overrightarrow{AC}) = \frac{1}{2}(2\overrightarrow{AK} + 2\overrightarrow{AJ}) = \overrightarrow{AK} + \overrightarrow{AJ} = 2\overrightarrow{AD}$$