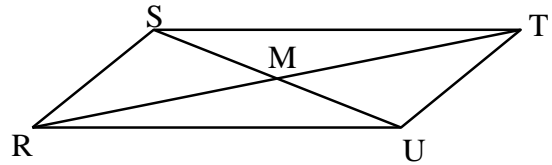


1

Quadrilateral RSTU is a parallelogram and M is the point of intersection of its diagonals.



Antoine lists the following vector operation statements:

- 1) $\overrightarrow{ST} + \overrightarrow{SR} = 2\overrightarrow{MU}$
- 2) $\overrightarrow{UT} + \overrightarrow{UR} = 2\overrightarrow{SM}$
- 3) $\overrightarrow{RS} + \overrightarrow{RU} = \overrightarrow{RT}$
- 4) $\overrightarrow{MT} + \overrightarrow{MR} + \overrightarrow{MS} + \overrightarrow{MU} = \vec{0}$
- 5) $\overrightarrow{SR} - \overrightarrow{ST} = \overrightarrow{RT}$

Which of these statements are true?

- | | |
|--------------------|--------------------|
| A) 1, 2 and 3 only | C) 2, 4 and 5 only |
| B) 1, 2 and 5 only | D) 1, 3 and 4 only |

2

Given the following information:

\vec{a} and \vec{b} are nonzero vectors in the plane

$\vec{a} \neq \vec{b}$

k is a scalar not equal to zero

$k \neq 1$

Which of the following statements is true?

A) $k(\vec{a} \bullet \vec{b}) = k\vec{a} \bullet k\vec{b}$

B) $k(\vec{a} + \vec{b}) = k\vec{a} + k\vec{b}$

C) If $\vec{a} \bullet \vec{b} = 0$ then \vec{a} and \vec{b} are collinear

D) If $\vec{a} = k\vec{b}$ then \vec{a} and \vec{b} are noncollinear

3

Given \vec{u} and \vec{v} two vectors that are not opposite.

Which of the following is FALSE?

A) $\vec{u} \bullet \vec{v} = \vec{v} \bullet \vec{u}$

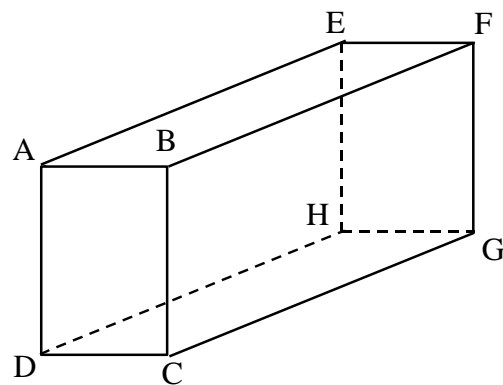
C) $2(\vec{u} + \vec{v}) = 2\vec{u} + 2\vec{v}$

B) $2\vec{u} \bullet 3\vec{v} = 6\vec{v} \bullet \vec{u}$

D) $2\vec{u} + 3\vec{v} = 3\vec{u} + 2\vec{v}$

4

Given the following prism having a rectangular base.



Which vector is equivalent to the resultant of the expression $\overrightarrow{AD} + \overrightarrow{HE} + \overrightarrow{AE}$?

A) \overrightarrow{DH}

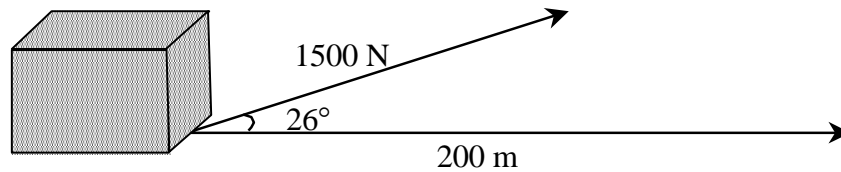
C) \overrightarrow{FB}

B) \overrightarrow{BE}

D) \overrightarrow{BC}

5

The Egyptians used an ingenious pulley system to move the blocks of stone used in the construction of pyramids. To minimize the work needed to displace the blocks, they applied a force oriented at 26° . (Work (Nm) is the scalar product of the force vector and the displacement vector.)



Rounded to the nearest Nm, what work is needed to displace a block of stone horizontally for a distance of 200 m, if the force applied to it is 1500 N oriented at 26° ?

A) 131 511 Nm

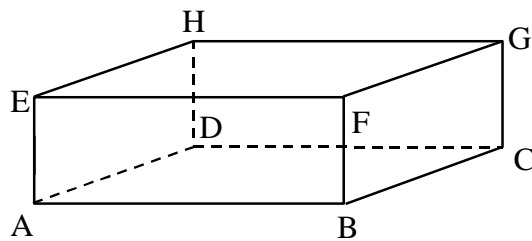
C) 228 768 Nm

B) 194 076 Nm

D) 269 638 Nm

6

The following figure represents a right prism.



Which of these statements is FALSE?

A) $\overrightarrow{BC} + \overrightarrow{GF} = \vec{0}$

C) $\overrightarrow{AB} \bullet \overrightarrow{AD} = 0$

B) $\overrightarrow{AB} - \overrightarrow{FE} = \vec{0}$

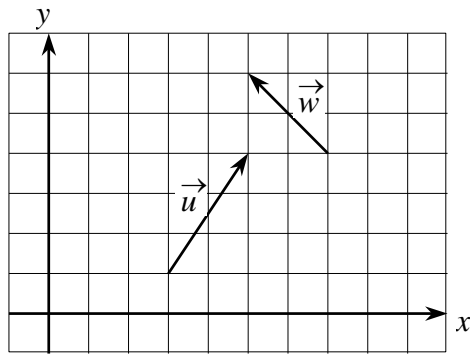
D) $\overrightarrow{EH} + \overrightarrow{HF} + \overrightarrow{FG} - \overrightarrow{EG} = \vec{0}$

7

Given the three vectors u , v , and w .

$$\vec{v} = (-2, -3)$$

\vec{u} and \vec{w} are represented in the Cartesian plane below:

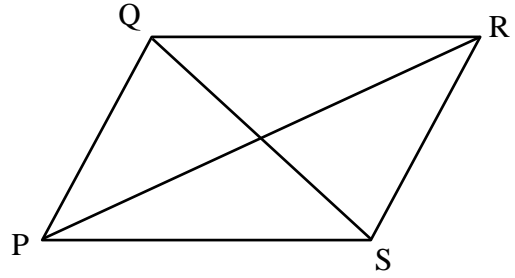


Which of the following statements is TRUE?

- A) \vec{v} and $-\vec{u}$ are opposite.
- B) \vec{u} and \vec{v} are equivalent.
- C) \vec{w} and $(\vec{v} + \vec{w})$ are perpendicular.
- D) \vec{u} and $3\vec{v}$ are collinear.

8

Given vector parallelogram PQRS .

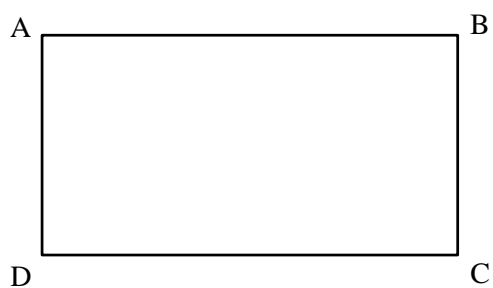


Which of the following statements is FALSE?

- A) $\overrightarrow{PQ} + \overrightarrow{QR} = \overrightarrow{PR}$
- B) $\overrightarrow{RP} - \overrightarrow{SP} = \overrightarrow{RS}$
- C) $\overrightarrow{PS} + \overrightarrow{SR} = \overrightarrow{RP}$
- D) $\overrightarrow{SQ} + \overrightarrow{QR} + \overrightarrow{RS} = \vec{O}$

9

Consider rectangle ABCD shown below.



Which of the following statements is true?

A) $\overrightarrow{DA} + \overrightarrow{AB} = \overrightarrow{AC}$

C) $\overrightarrow{AB} \cdot \overrightarrow{BC} = \overrightarrow{DC} + \overrightarrow{CB}$

B) $\overrightarrow{AB} \cdot \overrightarrow{BC} = \overrightarrow{AC}$

D) $\overrightarrow{AB} \cdot \overrightarrow{AD} = \overrightarrow{AB} \cdot \overrightarrow{BC}$

10

Given vectors $\vec{u} = (-3, 9)$, $\vec{v} = (6, 2)$, $\vec{w} = (6, -18)$ and $k \neq 0$.

Which of the following statements is FALSE?

A) $k\vec{u} + k\vec{v} = k(\vec{u} + \vec{v})$

B) $k\vec{v} \cdot k\vec{w} = k(\vec{v} + \vec{w})$

C) \vec{u} and \vec{w} are collinear.

D) \vec{u} and \vec{v} are orthogonal.

11

The magnitudes of two vectors are 12 and 16 respectively, and their directions differ by 60 degrees.

What is the magnitude of the resultant of these two vectors?

A) -96

C) 24.34

B) 14.42

D) 96

12

Given vectors \vec{u} (1, -2), \vec{v} (3, -4) and \vec{w} (5, 6).

What is the resultant of the following expression?

$$(2\vec{u} + \vec{v}) \bullet \vec{w}$$

A) -32

C) 23

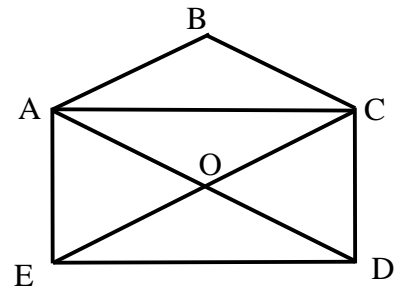
B) -23

D) 73

13

Given the figure on the right in which:

- $\overline{AE} \parallel \overline{CD}$
- $\overline{AC} \parallel \overline{ED}$
- $\overline{AC} \perp \overline{CD}$



Consider the following 5 statements about figure ABCDE:

- 1) $\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AC}$
- 2) $\overrightarrow{EA} + \overrightarrow{CD} = \vec{0}$
- 3) $\overrightarrow{AB} + \overrightarrow{AB} = 2\overrightarrow{BC}$
- 4) $\overrightarrow{EA} = -\overrightarrow{AE}$
- 5) $\overrightarrow{AC} + \overrightarrow{DO} = \overrightarrow{OE}$

Which of the statements are true?

A) 1, 2 and 3

C) 2, 4 and 5

B) 1, 2 and 4

D) 3, 4 and 5

14

Given that u and v are vectors, which of the following is NOT a vector?

A) $\vec{u} + \vec{v}$

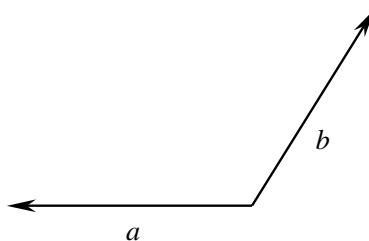
C) $\vec{u} \bullet \vec{v}$

B) $\vec{u} - \vec{v}$

D) $2(\vec{u} + \vec{v})$

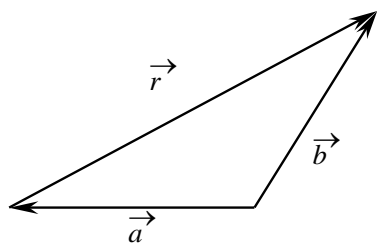
15

Given \vec{a} and \vec{b} , two vectors illustrated below.

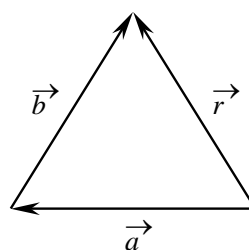


Which one of the following diagrams illustrates the relation between \vec{a} and \vec{b} and \vec{r} , the resultant vector?

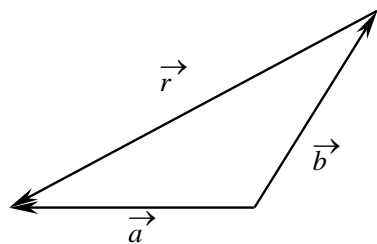
A)



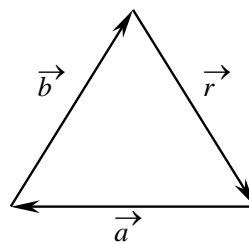
C)



B)



D)



16 An airplane flying East at 150 km/h encounters a 50 km/h wind blowing in a 30° East of North direction.

What will be the airplane's resultant velocity?

A) 180 km/h [E 14° N]

C) 200 km/h [N 30° E]

B) 195 km/h [E 7° N]

D) 132 km/h [E 19° S]

17 Given $\vec{u} = (3, 2)$, and $\vec{v} = (1, -4)$

What are the components of the resultant of the following vector operation?

$$\vec{u} - 2\vec{v}$$

A) (1, 10)

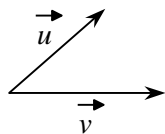
C) (2, 6)

B) (1, -6)

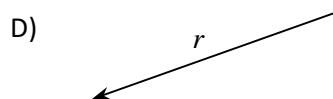
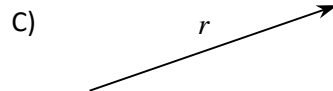
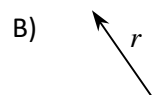
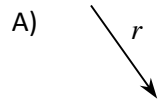
D) (5, -6)

18

Given vectors \vec{u} and \vec{v} shown below.

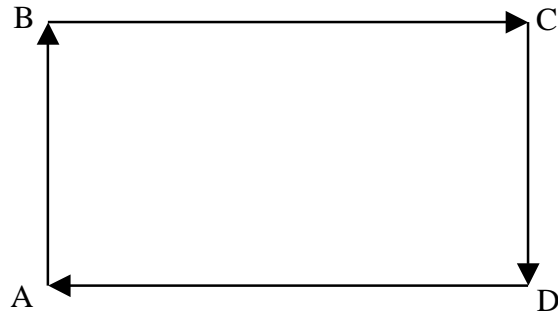


Which of the following vectors represents the resultant, r , of $\vec{u} - \vec{v}$?



19

Given vectors \overrightarrow{AB} , \overrightarrow{BC} , \overrightarrow{CD} , \overrightarrow{DA} below:



Which proposition is TRUE?

A) $\overrightarrow{AB} + \overrightarrow{BC} + \overrightarrow{CD} = \overrightarrow{DA}$

C) $\overrightarrow{AB} + \overrightarrow{BC} = -(\overrightarrow{DA} + \overrightarrow{AB})$

B) $\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{CD} + \overrightarrow{DA}$

D) $\overrightarrow{AB} + \overrightarrow{CD} = \vec{0}$

20

Vector $u = (2, -5)$ makes an angle of 40° with vector v whose magnitude is 7.8 units.

To the nearest tenth, what is the scalar product (dot product) of \vec{u} and \vec{v} ?

A) 27.0 units

C) 32.2 units

B) 27.4 units

D) 42.0 units

21

Consider vectors u and v and constant k .

Which of the following is a scalar?

A) $k(\vec{u} + \vec{v})$

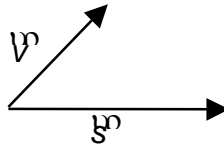
C) $k\vec{u}$

B) $\vec{v}(\vec{u} \bullet \vec{v})$

D) $k(\vec{u} \bullet \vec{v})$

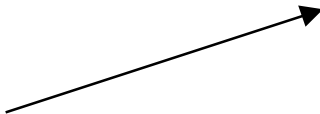
22

Consider vectors v and s below.

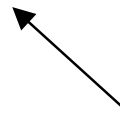


What is the resultant vector of $\vec{v} - \vec{s}$?

A)



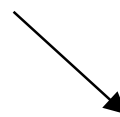
C)



B)

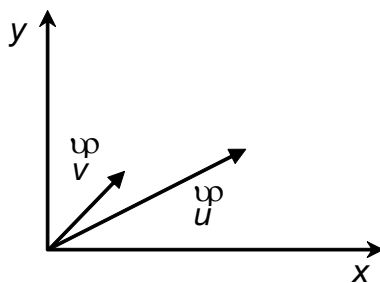


D)



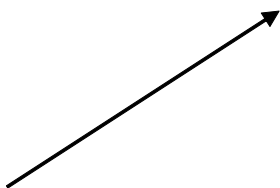
23

Consider the graph of \vec{u} and \vec{v} below.



Which of the following is the resultant, $\vec{u} + \vec{v}$?

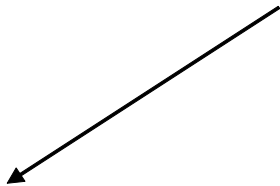
A)



C)



B)



D)



2- Correction key

1 D

2 B

3 D

4 A

5 D

6 B

7 D

8 C

9 D

10 B

11 C

12 B

13 B

14 C

15 C

16 A

17 A

18 B

19 D

20 C

21 D

22 C

23 A