ADAMA SCIENCE AND TECHNOLOGY UNIVERSITY SPECIAL SCHOOL

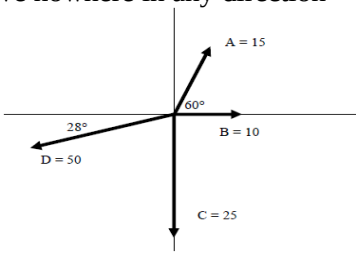
G: 11 Mathematics practice question On Vector and Transformation

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1. Classify the following physical quantities as ***scalar*** and ***vector*** quantities

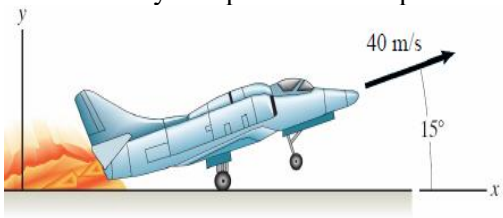
a. Time	e. Distance	i. Force	l. Speed	o. Time	r. momentum.
b. Mass	f. Displacement	j. Volume	m. Acceleration	p. Weight	
c. Work	g. Length	k. Temperature	n. Area	q. Density	
d. Torque	h. Velocity				

2. Based on your knowledge, classify the measures of the following situations as scalar or vector.
   (a) A football is kicked on flat ground at a velocity of 15 m/s at an angle of 25^0.
   (b) The width of your classroom.
   (c) The flow of a river.
   (d) The number of students in your class room.
   (e) A man walks 4 km north
   (f) The direction of your home from your school.
   (g) The wind is blowing towards east
   (h) When an open door is closed.
   (i) When you move nowhere in any direction
3. Observe the following vectors. Complete the chart for X- component and Y-component for all the vectors.

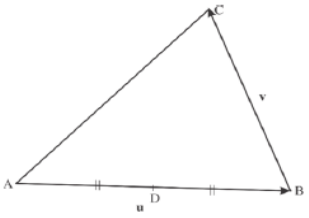


Vector	X-comp.	Y-comp
$\overrightarrow{A}$		
$\overrightarrow{B}$		
$\overrightarrow{C}$		
$\overrightarrow{D}$		

4. A student walks a distance of 3km due east, then another 4km due south. Find the displacement relative to his starting point.
5. What are the x and y components of the plane's velocity?



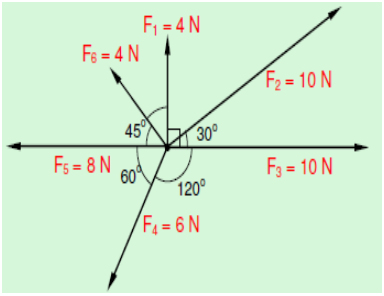
6. A car travels due east at 60km/hr for 15 minutes, then turns and travels at 100km/hr along a freeway heading due north for 15 minutes. Find the displacement from its starting point.
7. In the triangle ABC given below, $\overrightarrow{AB}$ represents **u** and $\overrightarrow{BC}$ represents **v.** If D is the midpoint of $\overrightarrow{AB}$, then express $\overrightarrow{AC}$, $\overrightarrow{CA}$, and $\overrightarrow{DC}$ in terms of **u** and **v.**



8. A car travels due east at 60km/hr for 15 minutes, then turns and travels at 100km/hr along a freeway heading due north for 15 minutes. Find the displacement from its starting point.
9. If *ABCDEF* is a regular polygon in which $\overrightarrow{AB}$ represents a vector **v** and $\overrightarrow{BC}$ represents a vector **w,** express each of the following vectors interms of **v** and **w**. i). $\overrightarrow{CD}$ ii) $\overrightarrow{DE}$ iii) $\overrightarrow{EF}$ iv) $\overrightarrow{AF}$
10. Find the resultant in the *x*-direction, $\overrightarrow{R_x}$, and *y*-direction, $\overrightarrow{R_y}$ for the following forces:
    • $\overrightarrow{F_1}$ = 1.5 N in the positive *x*-direction • $\overrightarrow{F_2}$ = 1.5 N in the positive *x*-direction • $\overrightarrow{F_3}$ = 2 N in the negative *x*-direction
11. Find the resultant in the *x*-direction, *Rx*, and *y*-direction, *Ry* for the following forces:
    • $\overrightarrow{F_1}$ = 3 N in the positive *x*-direction
    • $\overrightarrow{F_2}$ = 1 N in the positive *x*-direction
    • $\overrightarrow{F_3}$ = 2 N in the negative *x*-direction
    • $\overrightarrow{F_4}$ = 3 N in the positive *y*-direction
12. Determine whether the following two vectors are parallel or not. Then determine the magnitude of the two vectors.
    a. $\vec{u} = 3\hat{\imath} + 4\hat{\jmath}$ and $\vec{v} = 9\hat{\imath} + 12\hat{\jmath}$ b. $\vec{w} = 6\hat{\imath} + 8\hat{\jmath}$ and $\vec{u} = -3\hat{\imath} - 4\hat{\jmath}$ c. $\vec{a} = \left(\frac{1}{4}, \frac{3}{2}\right)$ and $\vec{b} = \left(\frac{1}{2}, \frac{3}{4}\right)$
13. Sketch the resultant of the following force vectors using the tail-to-head method by first determining the resultant in the *x*- and *y*-directions:
    • $\overrightarrow{F_1}$ = 2 N in the positive *y*-direction
    • $\overrightarrow{F_2}$ = 1.5 N in the negative *y*-direction
    • $\overrightarrow{F_3}$ = 1.3 N in the negative *y*-direction
    • $\overrightarrow{F_4}$ = 1 N in the negative *x*-direction
14. Two vectors act on the same point. What should the angle between them be so that a maximum resultant is obtained?

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15. Find the dot product of the following vectors. a. u = 4i + 2j and v = 3i −5j b. u = −2i + 2j and v = 7i + 4j
16. Resolve each of the following vectors into components:
    a) $\overrightarrow{F_1}$ = 105 N at 15^0 to the positive *x*-axis. c) $\overrightarrow{F_3}$ = 11.3 N at 225^0 to the positive *x*-axis.
    b) $\overrightarrow{F_2}$ = 27 N at 150^0 to the positive *x*-axis. d) $\overrightarrow{F_4}$ = 149 N at 330^0 to the positive *x*-axis.
17. Find the cosine of the angle formed by the following two vectors
    a. u = 4i + 3j and v = 4i – 3j b. u = −2i + 3j and v = 3i + 2j
18. Let u = (1, –1), v = (1, 1) and w = (–2, 3). Find the cosines of the angles between:
    a. u and v b. v and w c. u and w
19. Say whether the vectors are orthogonal, parallel or neither
    a. u = (−5, 3) and v = (6, −8) c. u = $\left(-1, \frac{1}{2}\right)$ and v = (3, 6)
    b. u = (4, 6) and v = (−3, 2) d. u = (2, 6) and v = (−3, − 9)
20. Find the angle between the two vectors 2i + 3i and 5i − 2j.
21. Show that (a). (u − v).(u + v) = $u^2 - v^2$ (b). $(u \mp v)^2 = u^2 \mp 2\, u \cdot v + v^2$, where $u^2 = u \cdot u$
22. Vectors u and v make an angle $\theta = \frac{2\pi}{3}$ between them. If |u| = 5 and |v| = 12, find
    a. u ⋅ v b. (u – v) ⋅ (u + v) c. $(u + v)^2$ d. |3u + v| d. the angle between |3u + v| and v
23. Given a triangle with vertices A (1, 5), B (2, 1), and C (4, 6), find angles of ΔBCA.
24. Let |u| = 13, |v| = 19 and |u + v| = 24. Calculate a. u.v b. |u – v| c. |3u + 4v|
25. Let a = 3i + j, b = 2i – 2j and c = i + 3j be vectors. Find the unit vectors in the direction of each of the following vectors. a) a + b b) $2a + b - \frac{3}{2}c$
26. If **u**, **v**, **w**, **z** are vectors from the origin to the points A, B, C, D, respectively, and **v** – **u** = **w** – **z**, then show that ABCD is a parallelogram.
27. The figure shows the magnitudes and directions of six coplanar forces (forces on the same plane).



28. Three forces $\mathbf{F}_1 = 2\mathbf{i} + 3\mathbf{j}$, $\mathbf{F}_2 = \mathbf{i} + 2\mathbf{j}$ and $\mathbf{F}_3 = 3\mathbf{i} - \mathbf{j}$ measured in Newton act on a particle causing it to move from **A** = **i** − 2**j** to **B** = 3**i** + 4**j** where AB is measured in meters. Find the total work done by the combined forces.
29. Find the parametric and symmetric equations of the line passing through the point (-3, 5) and parallel to the line *x* = 1 + 3*t*, *y* = –1 – 2*t*.
30. Find a) the vector equation b) the parametric equation and c. the standard equation of the line though (2, –1) and (5, 3).
31. Determine whether each of the following pairs of lines are parallel, perpendicular or neither.
    i) $L_1 : x = -6 - t,\ y = 2 + 3t$; $L_2 : x = 3t,\ y = -1 + t$
    ii) $L_1 : x = 2t,\ y = -2 + 3t$; $L_2 : (x,\ y) = (1,\ 5) + t(-4, -6)$
    iii) $L_1 : x = 1 - 2t,\ y = -4$; $L_2 : x = t,\ y = 2 + 2t$
32. Find the vector equation of a line $y = -x + 3$.
33. Find the line through P = (1, 1, 1) and perpendicular to the line $\vec{r}(t) = (1, 2) + t(2, -1)$.
34. Find the vector equation of line passing through the point having vector 5**i** + 4**j** and having direction vector (-3, 4).
35. Find the standard form of equation of a line $\vec{r}(t) = (-3, 2) + t(1, 4),\ t \in \mathbb{R}$.
36. Given an equation of a line ℓ by P = (1, 0) + *t* (2, 2), $t \in \mathbb{R}$., find out whether the, points A(1, 0), B(2, 2), C(–5, –6) and D (3, 0) lie on ℓ. For those of them lying on ℓ find the respective values of the parameter *t*.
37. The standard equation of a line is $\frac{x-2}{1} = \frac{y+3}{-5}$. Rewrite the equation in parametric and vector equation form.
38. Find a vector equation of a line L passing through the point $(1, 0)$ and parallel to the line containing points $(-1, 2)$ and $(1, 3)$. Check whether the point P$(-5, -3)$ lies on L.
39. Are the points A, B and C collinear? **a)** A(1, –4), B (–2, –3), C(11, –11) **b)** A(–2, –3), B(4, 9), C (–11, –21)
40. Find the point of intersection of the pair of lines $L_1 : x = -6 - t,\ y = 2 + 3t$ and $L_2 : \begin{cases} x = 1 - 3t \\ y = -2 + t \end{cases},\ t \in \mathbb{R}$
41. Find the cosine of the angle between the lines $L_1 : x = 2 - t, y = 1 + t,\ t \in \mathbb{R}$ and $L_2 : \frac{x-3}{-1} = \frac{y+1}{3}$
42. Find an equation of the circle centred at C (1, −3) and radius 6.

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Mathematics practice question 4G11 UNIT 5 AND 6 BY YM

43. Find the equation of the circle whose end points of a diameter are P(–2, 2) and Q(5, 3).
44. Find an equation of the circle centred at origin and passes through (1, 3).
45. Find an equation of the circle cantered at C (−4, 2) and passes through (2, −5).
46. Find the equation of the tangent to the circle $x^2 + y^2 + 4x - 8y = 0$ at the point (−4, 8).
47. Find equation of the tangent line through P(−4, −3) point on the circle $x^2 + y^2 = 25$.
48. Show that the given point lies on the circle and find the equation of the tangent at the point.
    a) $x^2 + y^2 - 2x - 4y - 9 = 0$ at P(1, 4) **b)** $(x+2)^2 + y^2 = 3$ at P(–1, 2)
49. If a translation T takes the origin to the point A(–3, 2), find the image of the rectangle ABCD with vertices A(3, 1), B(5, 1), C(5, 4) and D(3, 4).
50. Triangle ABC is transformed into triangle A'B'C' by the translation vector (4, 3) and If A = (2, 1), B = (3, 5) and C = (–1, –2), find the coordinates of A', B' and C'.
51. Find the equation of the image of the circle $(x + 1)^2 + (y - 3)^2 = 5$ when translated by the vector $\overrightarrow{PQ}$, where P = (1, –1) and Q = (–4, 3).
52. A translation T takes the origin to A(3, –2). A second translation S takes the origin to B(–2, –1). Find where T followed by S takes the origin, and where S followed by T takes the origin.
53. If a translation T takes (2, –5) to (–2, 1), find the image of the line $\boldsymbol{\ell}$ **:** $2x - 3y = 7$.
54. If a translation T takes the origin to (4, –5), find the image of each of the following lines.
    a. $y = 3x + 7$ **b.** $4y + 5x = 10$
55. If the point A(3, –2) is translated to the point A'(7, 10), then find the equation of the image of
    a. the ellipse $4x^2 + 3y^2 - 2x + 6y = 0$ **b.** the parabola $y2 = 4x$
    c. the hyperbola $xy = 1$ **d.** the function $f(x) = x^3 - 3x^2 + 4$
56. The vertices of triangle ABC are A (2, 1), B (3, –2) and C (5, –3). Give the coordinates of the vertices after: **a.** a reflection in the x-axis **b.** a reflection in the y-axis
    c. a reflection in the line $x + y = 0$ **d.** a reflection in the line $y = x$.
57. Find the image of the point (–4, 3) after a reflection about the line $\ell : y = x - 2$.
58. If the image of the point (–1, 2) under reflection is (1, 0), find the line of reflection.
59. Find out some of the figures which are their own images in reflection about the line $y = x$.
60. Find the image of the line $\boldsymbol{\ell}$ **:** $y = x + 4$ after it has been reflected about the line $\boldsymbol{L}$ **:** $y = x - 3$.
61. Find the image of the line $\boldsymbol{\ell}$ **:** $y = 2x + 1$ after it has been reflected about the line $\boldsymbol{L}$ **:** $y = 3x + 2$.
62. The image of the circle $x^2 + y^2 - x + 2y = 0$ when it is reflected about the line L is $x^2 + y^2 - 2x + y = 0$. Find the equation of L.
63. Find image of the circle $x^2 + y^2 - 4x - 2y + 4 = 0$ after reflection in the line $\boldsymbol{L} : y = x - 1$.
64. Given an equation of a circle $(x - 1)^2 + (y - 2)^2 = 36$, find the equation of the image circle after a reflection about the line $y = x + 2$.
65. If T is a translation that sends (0, 0) to (3, −2) and M is a reflection that maps (0, 0) to (2, 4), find
    a) T(M(1, 3)) **b)** M(T(1, 3))
66. In a reflection, the image of the line $y - 2x = 3$ is the line $2y - x = 9$. Find the axis of reflection.
67. Find the image of the circle $x^2 + y^2 = 2$ after reflection in the line $= x$.
68. Find the image of the circle $(x - 2)^2 + (y + 1)^2 = 9$ after reflection in the line **:** $y = -x$.
69. Rectangle ABCD has vertices A (1, 2), B (4, 2), C (4, –1) and D (1, –1). Find the images of the vertices of the rectangle when the axes are rotated about (0, 0) through an angle $\theta = \pi$
70. Find the point into which the given point is transformed by a rotation of the axes through the indicated angles, about the origin. a. $(-3, 4)$; 90^0 b (–2, 0); 60^0 c. (0, 1); $\frac{\pi}{4}$ d. (–1, 2); 150^0
71. Find an equation of the line into which the line with the given equation is transformed under a rotation through the indicated angle about the origin. (a). $3x - 4y = 7$; acute angle θ such that $\tan\theta = \frac{3}{4}$ b. $2x + y = 3$; $\theta = \frac{\pi}{3}$
72. Find an equation of the circle into which the circle with the given equation is transformed under a rotation through the indicated angle, about the origin.
    a. $x^2 + y^2 = 9$; $\theta = -\frac{3\pi}{2}$ b. $x^2 + (y - 2)^2 = 4$; $\theta = 30^0$ c. $x^2 + y^2 + 4x - 6y + 12 = 0$; $\theta = 765^0$

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73. Find the image of (1, 0) after it has been rotated -60^0 about the point (3, 2).
74. If M is a reflection in the line $y = -x$ and R is a rotation about the origin through 90^0, find
    (a) M(R(3, 0)) b. R(M(0, 2)) c. R(R(1, −1))
75. In a rotation R, the image of A(6, 2) is $A'(3,\ 5)$ and the image of B(7, 3) is $B'(2, 6)$. Find the image of (0, 0).
76. Find the image of (0, 1) after it has been rotated 45^0 about (5, 3).
77. Find an equation of the line into which the line with the given equation is transformed under a rotation through the indicated angle about (0, 1). a. $2x-3y=5$; $\theta=\frac{8\pi}{3}$ b. $4x+2y=1$; $\theta=-45^0$
78. Find an equation of the circle into which the circle with the given equation is transformed under a rotation through the indicated angle, about the (1, 0). a. $x^2+y^2=2$; $\theta=\frac{3\pi}{2}$ b. $(x+1)^2+(y-2)^2=4$; $\theta=60^0$
79. Find the image of the circle $3x^2+3y^2+6x-6y+5=0$ in the mirror line $l: 2y-x=8$
80. A translation T takes the point (2, 3) into point (6, 4). Then find the images of the following under T.
    a). $T(-12,-7)$ d). The triangle with the vertices $A(3,\ 2)$, $B(-4,\ 3)$ and $C(-1,\ 2)$
    b). The parabola $y=2x^2-4x+5$ e). The line $l: y-2(2x-y)=0.5\big(y-(1-2x)\big)$
    c). The ellipse $4(x-2)^2+9(y+1)^2=36$ f). The circle $144x^2+144y^2-96x+72y-119=0$
81. Find the image of each of the following under reflection along the line $x=2$.
    a. $M(3,\ 2)$ b. $4y-8x+16=0$ c. $4x^2+4y^2-4x+8y-15=0$
82. If the image of the line $2x-3y=7$ under a translation is $2x-3y=0$, then what is the translation vector of the translation line?
83. A translation takes $x^2+(y+1)^2=5$ to $(x-2)^2+y^2=5$. What is the image of point (1, 3) under this transformation?
84. Find the image of each of the following under reflection along the line $y+3=0$.
    a. $M\ (-4,-3)$ b. $y=5x-3$ c. $x^2+9y^2-4x=5$
85. Find the image of the point $(2,\ -3)$ in the mirror line $l: y-3x-1=0$
86. Given a circle with equation given by $x^2+y^2-6x-4y+9=0$. Find the equation of the image of the circle after it has been reflected about the line $l: y=4x-3$?
87. If the image of (2, –3) under reflection along the line L is (5, 1), then find the equation of L.
88. Find the image of the line $L: y-x=2$ after it has been reflected along the line $l: y=2-3x$.
89. Let R be a rotation of a plane through an angle of 90^0 in ccw direction about origin. Find the images of the following plane figures under R.
    a. The point P(2, –1) c. The circle $(x+1)^2+(y-1)^2=5$
    b. The line $y-x+3=0$ d. The hyperbola $4y^2-(x+1)^2=16$
90. Find the image of an ellipse $4(x+1)^2+9(y-1)^2=1$ under rotation by $\pi\ rad.$ in clockwise direction about origin?
91. Find the image of the circle $(x-2)^2+(y+4)^2=1$ when it is rotated through 30^0 about the point $(4,\ 6)$.
92. Find the image of the line $l: x+2y=2$ after it has been rotated through 225° about the point $(-3,\ 2)$.
93. If a plane is rotated through 120° about the point (0, –2), then under this rotation find the image of
    a. $(-4,-5)$ c. $x^2+y^2-2x-8y-10=0$ e. $y^2-4x+12=0$
    b. $x^2-y^2-3y=0$ d. $2y-3x+1=0$
94. If T is a translation that sends $(0.5,-1.5)$ to $(2.5,\ 1.5)$ and R is a rotation about the origin through $\frac{\pi}{2}$ in clockwise direction, then find a. $T\big(R(1,\ 2)\big)$ b. $R\big(T(1,\ 2)\big)$
95. If T is a translation that sends $(-1,-1)\ to\ (2,\ -3)$ and M is a reflection that maps $(-1,\ -1)$ to $(1,3)$, then find
    a. $T\big(M(1,\ 1)\big)$ b. $M\big(T(1,\ 1)\big)$
96. If M is a reflection in the line $l: y+x=0$ and R is a rotation about the origin through π, then find
    a. $M\big(R(4,\ 5)\big)$ b. $R\big(M(4,\ 5)\big)$
97. What is the image of the line given by $(x,y)=(-1,0)+t(3,\ 6)\ , t\in\mathbb{R}$ under a translation that takes (1, 0) to (0, 1) followed by the reflection about the line $y=2x$?

CHOOSE THE BEST ANSWER FROM THE GIVEN ALTERNATIVES

98. Suppose a triangle has vertices $A(1,\ 2)$, $B(3,\ 4)$ and $C(2,\ 5)$ on a plane. What is the interior angle of ΔABC at vertex B? A. 30^0 B. 45^0 C. 60^0 D. 90^0
99. Let $|\vec{a}|=3$, $\vec{b}$ is unit vector, $\vec{a}$ and $\vec{b}$ makes an angle $\theta=\frac{\pi}{3}$. Then $\left|\vec{a}-2\vec{b}\right|$ = _____

A. $\sqrt{5}$ B. $\sqrt{7}$ C. $\sqrt{8}$ D. $\sqrt{19}$

100. What are the x and y-components of vector $\vec{u}$ with magnitude 15 and direction 120^0 from +ive x-axis?
A. $\left(-\frac{15}{2}, \frac{15\sqrt{3}}{2}\right)$ B. $\left(-\frac{15}{3}, 15\sqrt{2}\right)$ C. $(10\sqrt{3}, 7.5)$ D. $\left(12\sqrt{3}, -\frac{15}{\sqrt{2}}\right)$

101. Let $\vec{a}$ and $\vec{b}$ be two vectors such that $|\vec{a}| = 4$ and $|2\vec{a} - \vec{b}| = |\vec{a} + \vec{b}|$. then $\vec{a}.\vec{b}$ is ____
A. 8 B. 10 C. 12 D. 24

102. If $\vec{u}$ is a vector in the direction as vector $\vec{v} = (-3, 4)$ having length three times the length of $\vec{v}$, what is the length of $\vec{u} - \frac{3}{2}\vec{v} - 2\vec{j}$, where $\vec{j}$ is the unit vector in the direction of +ve y-axis?
A. $\frac{1}{2}\sqrt{185}$ B. $\frac{1}{2}\sqrt{145}$ C. $\frac{21}{2}$ D. $\frac{17}{2}$

103. Let ABCD be a parallelogram, and $\overrightarrow{AC}$ and $\overrightarrow{BD}$ its diagonals. Which of the following is **NOT TRUE**?
A. $\overrightarrow{AB} = \overrightarrow{AC} - \overrightarrow{BC}$ B. $\overrightarrow{AB} = \overrightarrow{BC} - \overrightarrow{BD}$ C. $\overrightarrow{AC} + \overrightarrow{BD} = 2\overrightarrow{BC}$ D. $\overrightarrow{CD} + \overrightarrow{BD} = \overrightarrow{AD}$

104. In the xy-plane, if $(i + 5j) - \vec{x} = (3i + 2j) - 2(i - 3j)$, then the norm of the vector $\vec{x}$ is
A. 11 B. $\sqrt{10}$ C. 3 D. $\sqrt{3}$

105. Which of the following is the reflection of the parabola $y = x^2 + 1$ in the line $y = -x$?
A. $y = -x^2 - 1$ B. $y = x^2 - 1$ C. $x = y^2 + 1$ D. $x = -y^2 - 1$

106. Consider the circle given by $x^2 + y^2 = 2$ and the line l given by parametric vector equation $(x, y) = (2, 0) + t(-1, 1)$. Which of the following is **true**?
A. l is tangent to the circle at $\left(\frac{1}{2}, \frac{\sqrt{7}}{2}\right)$. C. l intersects with the circle at two distinct points.
B. l and the circle have no common point. D. The distance from the center of the circle to l is $\sqrt{2}$

107. Let l be the line whose equation is $2x - y = 10$. Which one of the following is the equation of the image of l after a reflection in the line $y = 2x - 5$ followed by a rotation through the angle of 90^0 about the origin?
A. $x + 2y = 0$ B. $2x + y = 0$ C. $x + 2y = 5$ D. $x - 2y = 5$

108. Which one of the following is a vector equation of the line tangent to the circle $x^2 + y^2 + 2x - 7 = 0$ at $(1, 2)$?
A. $(x, y) = (0, 3) + \lambda(-1, 2)$ B. $(x, y) = (1, 2) + \lambda(2, -1)$ C. $(x, y) = (0, 3) + \lambda(1, -1)$ D. $(x, y) = (1, 2) + \lambda(-1, 2)$

109. What is the image of the ellipse $3x^2 + (y+1)^2 = 1$ under translation that takes $(0, 1)$ to $(2, 2)$ followed by the reflection through the $y-$ axis?
A. $(x+2)^2 + 3(y-2)^2 = 1$ B. $3(x+2)^2 + (y-2)^2 = 1$ C. $(x+2)^2 + 3y^2 = 1$ D. $3(x+2)^2 + y^2 = 1$

110. The equation of the image of the line $y = x + 1$ after rotation about the origin through 90^0 in counterclockwise direction is: A. $y = -x$ B. $y = -x + 1$ C. $y = x - 1$ D. $y = -x - 1$

111. If the line $3x - 4y + 10 = 0$ is translated by T to $3x - 4y + 27 = 0$ and the image of point $(0, 1)$ by T is $(3, t)$, then which of the following is the value of *t*? A. -3 B. -1 C. -2 D. 0

112. If a straight line passes through the point $(1, 0)$ and the center of the circle whose equation is $(x-2)^2 + (y+1)^2 = 4$, which of the following is the parametric vector equation of the line?
A. $(x, y) = (1, 0) + t(2, -1)$ B. $(x, y) = (1, 0) + t(-2, 1)$ C. $(x, y) = (2, -1) + t(1, 0)$ D. $(x, y) = (1, 0) + t(-1, 1)$

113. What is the image of the line given by $(x, y) = (-1, 0) + t(3, 6)$, $t \in \Re$, under the translation that takes $(1, 0)$ to $(0, 1)$ followed by the reflection about the line $y = 2x$? A. $y = 2x + 3$ B. $y = 2x - 3$ C. $y = 2x + 6$ D. $y = 2x - 5$

114. What is the image of the ellipse whose equation is $2(x+2)^2 + (y-1)^2 = 2$ under translation that takes $(2, 1)$ to $(4, 0)$ followed by rotation 90^0 ? A. $x^2 + 2y^2 = 2$ B. $2x^2 + y^2 = 2$ C. $2(x-4)^2 + y^2 = 2$ D. $(x-4)^2 + 2y^2 = 2$

115. The image of the point $(-1, 3)$ when reflected along the line $y = x$ is
A. $(3, -1)$ B. $(1, 3)$ C. $(-3, 1)$ D. $(-1, -3)$

116. If two lines $y = x$ and $y = x - 4$ are tangent to a circle at $(2, 2)$ and $(4, 0)$, respectively, then what is the equation of the circle?
A. $(x-2)^2 + y^2 = 4$ B. $(x-4)^2 + (y-2)^2 = 4$ C. $(x-3)^2 + (y-1)^2 = 2$ D. $(x-1)^2 + (y+1)^2 = 10$

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117. What is the equation of a line that passes through the point $(-1,\ 2)$ and parallel to the vector $(1, -1)$?

A. $2x - y = 1$ B. $x + y - 1 = 0$ C. $x - 2y = 3$ D. $y - 2x + 1 = 0$

118. Which of the following points is the reflection of $(1,-1)$ on the line $y = x + 2$?

A. $(-1, 1)$ B. $(-3,3)$ C. $(-7, -1)$ D. $(1, 7)$

119. If l is the line passing through $(0,\ 2)$ and parallel to $V = \vec{i} + 3\vec{j}$, which one of the following is true about l and the circle $(x-2)^2 + (y-1)^2 = 5$?

A. l is tangent o the circle at $(0,\ 2)$.

B. l is tangent o the circle at some point *P*, where $P \neq (0,\ 2)$.

C. l intersects the circle at two distinct points.

D. The distance between l and the center of the circle is greater than $\sqrt{5}$.

120. If the translation T takes the circle $x^2 + y^2 - 2x + 6y + 3 = 0$ into the circle whose equation is $(x+2)^2 + (y-7)^2 = 7$, then what is the image of the origin under *T*? A. $(-3,\ 7)$ B. $(1,\ 2)$ C. $(1,\ -3)$ D. $(-2,\ 4)$

121. If a point $(2,\ 5)$ is reflected under a line to the point $(-3,1)$, what is the line of reflection?

A. $2x + 3y = 7$ B. $x + 3y = 7$ C. $8x + 10y = 19$ D. $2x + 3y + 5 = 0$

122. What is the image of the ellipse $(x-1)^2 + 4y^2 = 1$ under the translation that takes $(1,\ 1)$ to $(0,\ 2)$ followed by the reflection through the $x-$axis?

A. $x^2 + 4(y-1)^2 = 1$ B. $4x^2 + (y-1)^2 = 1$ C. $x^2 + 4(y+1)^2 = 1$ D. $4x^2 + (y+1)^2 = 1$

123. The image of a figure with vertices $A(1,\ 2), B(3,\ 6), C(-1,\ 2)$, and $D(-2, -2)$ after reflection across the $x-$axis is:

A. $A'(1,\ -2), B'(-3,\ -6), C'(1,\ -2)$, and $D'(2,\ 2)$ C. $A'(-1,\ 2), B'(-3,\ 6), C'(1,\ -2)$, and $D'(2, -2)$

B. $A'(1, -2), B'(3, -6), C'(-1,\ -2)$, and $D'(-2,\ 2)$ D. $A'(1, -2), B'(3,\ 6), C'(-1,\ 2)$, and $D'(-2, -2)$

124. If T is a translation that takes $(1,\ 2)$ to $(3, -2)$, then which of the following is **NOT** true?

A. $T(x,\ y) = (2 + x, y - 4)$ C. $(ToT)(x,\ y) = (4 + 2x,\ 2y - 8)$

B. $(T^{-1}oT)(x,\ y) = (x,\ y)$ D. $T^{-1}(x,\ y) = (x - 2, y + 4)$

125. Which of the following ordered pairs is the result of the reflection of $(4,\ 1)$ with respect to the line $y = x + 1$?

A. $(-1,\ 8)$ B. $(-3,\ 4)$ C. $(0,\ 5)$ D. $(-4,\ 3)$

126. If T is a translation that takes $(1,\ 2)$ to $(3,\ 4)$, then which of the following is **NOT** true?

A. $T(5,\ 6) = (7,\ 8)$ B. $T(0,\ 0) = (2,\ 2)$ C. $T^{-1}(0,0) = (-2,\ -2)$ D. $T(-3,\ 2) = (-2,\ 4)$

127. What is the image of the circle with equation $(x+2)^2 + (y-2)^2 = 1$, when it is rotated through $\frac{\pi}{6}$ about the origin?

A. $\left(x + \left(\sqrt{3} - 1\right)\right)^2 + \left(y - \left(\sqrt{3} + 1\right)\right)^2 = 1$ C. $\left(x + \left(\sqrt{3} + 1\right)\right)^2 + \left(y - \left(\sqrt{3} - 1\right)\right)^2 = 1$

B. $\left(x - \left(\sqrt{3} + 1\right)\right)^2 + \left(y + \left(\sqrt{3} - 1\right)\right)^2 = 1$ D. $\left(x - \left(\sqrt{3} - 1\right)\right)^2 + \left(y + \left(\sqrt{3} + 1\right)\right)^2 = 1$

128. Which of the following is **NOT** true about transformation?

A. Rotation is a rigid motion. C. Rotations move triangles into congruent triangles.

B. Reflection is not a rigid motion. D. Translations move angles to congruent angles.

129. The image of the circle $x^2 + y^2 - x + 2y = 0$ when it is reflected about the line L is $x^2 + y^2 - 2x + y = 0$. The equation of L is equal to: A. $y = x$ B. $y = 2x$ C. $y = -x$ D. $y = \frac{1}{2}x$

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