**The exam is identical in format to this review sheet. Only the actual numerical values and equations will vary.**

**Multiple-Choice:**
Record all answers to the multiple-choice questions here. To clearly distinguish between A and D, it is recommended that you use capital letters. *(90 points total—3 points each)*

**Free-Response:** *(10 points total—2 points each)*
You must show a reasonable amount of work that leads to your answer. Where it is impossible to show your work, explain the mental leaps that you made to draw your conclusion. Where estimation is required, round or truncate all answer to the thousandths place.

Given the $u = <3,1>$, $v = <6,-5>$, and $w = <3,-4>$, evaluate each of the following and classify each answer as a scalar or a vector.

| 31 | $u \cdot v$ |
|----|----|
| 32 | $-2w \cdot v$ |
| 33 | $2u - 6w$ |
| 34 | $3\|u\| + \|v\|$ |
| 35 | $(v \cdot w) \cdot u$ |

Name_____

**MULTIPLE CHOICE.  Choose the one alternative that best completes the statement or answers the question.**

**Find the component form and magnitude of the indicated vector.**

1) Given that P = (9, 8) and Q = (17, 9), find the component form and magnitude of the vector $\overrightarrow{PQ}$ .     1) _____

    A) $\langle$–8, –1$\rangle$, $\sqrt{65}$        B) $\langle$8, 1$\rangle$, 65        C) $\langle$–8, –1$\rangle$, 65        D) $\langle$8, 1$\rangle$, $\sqrt{65}$

2) Given that P = (–5, 4) and Q = (–13, –5), find the component form and magnitude of the     2) _____

    vector 3 $\overrightarrow{PQ}$ .

    A) $\langle$24, 27$\rangle$, $3\sqrt{145}$                B) $\langle$–24, –27$\rangle$, $3\sqrt{145}$

    C) $\langle$–54, –27$\rangle$, $3\sqrt{405}$             D) $\langle$–24, –27$\rangle$, $\sqrt{435}$

**Find the component form of the indicated vector.**

3) Let **u** = $\langle$1, –4$\rangle$, **v** = $\langle$–7, 9$\rangle$. Find **u** + **v**.     3) _____

    A) $\langle$10, –11$\rangle$            B) $\langle$–6, 5$\rangle$        C) $\langle$–3, 2$\rangle$        D) $\langle$8, –13$\rangle$

4) Let **u** = $\langle$–1, 2$\rangle$, **v** = $\langle$–4, 3$\rangle$. Find **u** – **v**.     4) _____

    A) $\langle$3, –1$\rangle$             B) $\langle$–3, –7$\rangle$        C) $\langle$–5, 5$\rangle$        D) $\langle$–4, 6$\rangle$

5) Let **u** = $\langle$–7, 5$\rangle$, **v** = $\langle$–6, –4$\rangle$. Find **v** – **u**.     5) _____

    A) $\langle$1, –9$\rangle$             B) $\langle$–13, 1$\rangle$        C) $\langle$3, –11$\rangle$        D) $\langle$12, 2$\rangle$

6) Let **u** = $\langle$–2, –4$\rangle$. Find 2**u**.     6) _____

    A) $\langle$4, –8$\rangle$             B) $\langle$–4, 8$\rangle$        C) $\langle$–4, –8$\rangle$        D) $\langle$4, 8$\rangle$

7) Let **u** = $\langle$4, 6$\rangle$. Find –9**u**.     7) _____

    A) $\langle$–36, –54$\rangle$            B) $\langle$36, –54$\rangle$        C) $\langle$–36, 54$\rangle$        D) $\langle$36, 54$\rangle$

8) Let **u** = $\langle$–6, –8$\rangle$, **v** = $\langle$–9, 2$\rangle$. Find –7**u** – 5**v**.     8) _____

    A) $\langle$105, 30$\rangle$            B) $\langle$–3, 66$\rangle$        C) $\langle$98, 35$\rangle$        D) $\langle$87, 46$\rangle$

9) Let **u** = $\langle$5, –5$\rangle$, **v** = $\langle$–5, –2$\rangle$. Find 2**u** + 3**v**.     9) _____

    A) $\langle$0, –14$\rangle$            B) $\langle$–5, –7$\rangle$        C) $\langle$25, –4$\rangle$        D) $\langle$–5, –16$\rangle$

**Find the magnitude and direction angle for the following vector. Give the direction angle as an angle in [0°, 360°) rounded to the nearest tenth.**

10) $\langle$1, 10$\rangle$     10) _____

    A) $\sqrt{101}$, 264.3°        B) $\sqrt{101}$, 84.3°        C) $\sqrt{101}$, 5.7°        D) $\sqrt{101}$, 185.7°

11) $\langle$–14, 15$\rangle$     11) _____

    A) $\sqrt{421}$, 43°        B) $\sqrt{421}$, 47°        C) $\sqrt{421}$, 133°        D) $\sqrt{421}$, 137°

12) $\langle$–7, 0$\rangle$     12) _____

    A) –7, 0°        B) 7, 0°        C) –7, 180°        D) 7, 180°

**Find the component form of the vector v.**

13)
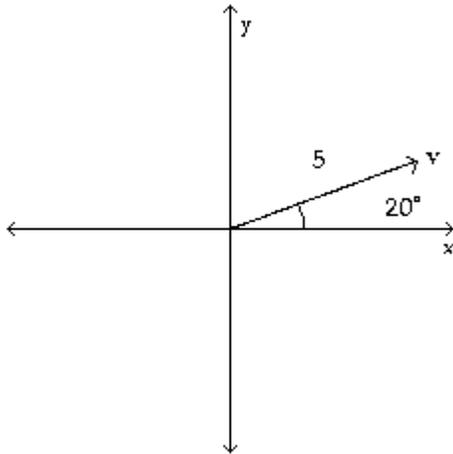


A) ≈ ⟨0.94, 0.34⟩          B) ≈ ⟨4.70, 1.71⟩          C) ≈ ⟨1.71, 4.70⟩          D) ≈ ⟨4.70, 1.82⟩

14)
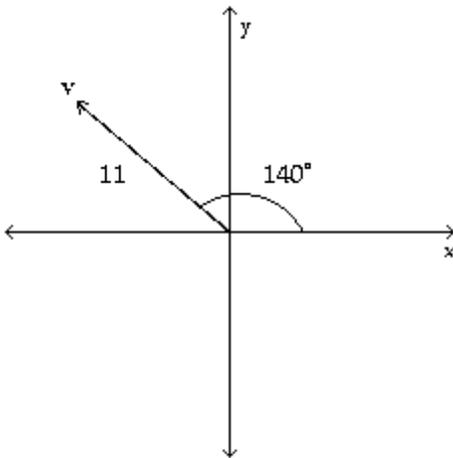


A) ≈ ⟨−0.77, 0.64⟩          B) ≈ ⟨−7.07, 8.43⟩          C) ≈ ⟨−8.43, 7.07⟩          D) ≈ ⟨−7.78, 7.78⟩

**Solve the problem.**

15) A plane is heading due south with an airspeed of 297 mph. A wind from a direction of 54.0° is blowing at 17.0 mph. Find the bearing of the plane. (Note that bearings are measured from north, clockwise.) Round results to an appropriate number of significant digits.
    A) 183°               B) 87°               C) 178°               D) 92°

16) One rope pulls a barge directly east with a force of 84 N, and another rope pulls the barge directly north with a force of 90 N. Find the magnitude of the resultant force acting on the barge.
    A) 7560 N               B) 174 N               C) 6 N               D) 123 N

17) A basketball player shoots the ball with a velocity of 12.2 ft/s at an angle of 36.3° with the horizontal.  To the nearest tenth, find the magnitude of the horizontal component of the resultant vector.
    A) 9.8 ft/s               B) 3.6 ft/s               C) 7.2 ft/s               D) 4.9 ft/s

**Find a · b.**

18) $\mathbf{a} = \langle 3, 4 \rangle$, $\mathbf{b} = \langle 1, 3 \rangle$

    A) $\langle 4, 7 \rangle$        B) 15        C) 9        D) $\langle 3, 12 \rangle$

18) _____

19) $\mathbf{a} = \langle 2, -1 \rangle$, $\mathbf{b} = \langle -2, 5 \rangle$

    A) $\langle 0, 4 \rangle$        B) –9        C) –1        D) $\langle -4, -5 \rangle$

19) _____

20) $\mathbf{a} = 4\mathbf{i} + 4\mathbf{j}$, $\mathbf{b} = 4\mathbf{i} + 5\mathbf{j}$

    A) 4        B) $\langle 8, 9 \rangle$        C) 36        D) $\langle 16, 20 \rangle$

20) _____

21) $\mathbf{a} = 5\mathbf{j}$, $\mathbf{b} = \mathbf{i} + 4\mathbf{j}$

    A) $\langle 1, 20 \rangle$        B) –20        C) 20        D) $\langle 0, 20 \rangle$

21) _____

**Use the dot product to find $|\,\mathbf{v}\,|$.**

22) $\mathbf{v} = \langle 3, 7 \rangle$

    A) 10        B) $2\sqrt{10}$        C) 4        D) $\sqrt{58}$

22) _____

23) $\mathbf{v} = 7\mathbf{j}$

    A) 0        B) –7        C) 7        D) 49

23) _____

24) $\mathbf{v} = \langle 3, 4 \rangle$

    A) 25        B) 7        C) –1        D) 5

24) _____

**Find the angle between the given vectors to the nearest tenth of a degree.**

25) $\mathbf{u} = \langle 3, 9 \rangle$, $\mathbf{v} = \langle 4, 7 \rangle$

    A) 21.3°        B) –4.3°        C) 11.3°        D) 5.7°

25) _____

26) $\mathbf{u} = \langle 7, 6 \rangle$, $\mathbf{v} = \langle -8, 2 \rangle$

    A) 135.4°        B) 125.4°        C) 62.7°        D) 52.7°

26) _____

27) $\mathbf{u} = \sqrt{5}\mathbf{i} - 9\mathbf{j}$, $\mathbf{v} = \sqrt{5}\mathbf{i} + \mathbf{j}$

    A) 100.1°        B) 90.4°        C) 45.2°        D) 65.9°

27) _____

**Determine whether the vectors u and v are parallel, orthogonal, or neither.**

28) $\mathbf{u} = \langle 4, 3 \rangle$, $\mathbf{v} = \langle 20, 15 \rangle$

    A) Parallel        B) Orthogonal        C) Neither

28) _____

29) $\mathbf{u} = \langle 9, 7 \rangle$, $\mathbf{v} = \langle 7, 5 \rangle$

    A) Parallel        B) Neither        C) Orthogonal

29) _____

30) $\mathbf{u} = \langle 1, 0 \rangle$, $\mathbf{v} = \langle 0, -2 \rangle$

    A) Neither        B) Parallel        C) Orthogonal

30) _____

1) D
2) B
3) B
4) A
5) A
6) C
7) A
8) D
9) D
10) B
11) C
12) D
13) B
14) C
15) A
16) D
17) A
18) B
19) B
20) C
21) C
22) D
23) C
24) D
25) C
26) B
27) A
28) A
29) B
30) C