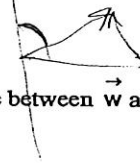
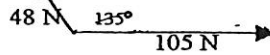


1. Determine the resultant of two forces of 215 N and 127 N acting at an angle of 112° to each other.

2. Determine the equilibrant of the given forces:



3. Express \vec{u} as a linear combination of \vec{v} and \vec{w} where $|\vec{u}| = 5$, $|\vec{v}| = 13$ and $|\vec{w}| = 22$ if the angle between \vec{w} and \vec{u} is 40° and the angle between \vec{u} and \vec{v} is 35° and \vec{u} lies between \vec{v} and \vec{w} .

4. A, B, C and D are collinear points. B divides AC in the ratio 2:5 and D divides BC in the ratio 6:-1. a) Express \vec{OA} as a linear combination of \vec{OB} and \vec{OC} . b) Express \vec{OC} as a linear combination of \vec{OA} and \vec{OD} .

5. Lauren drags a Christmas tree up the ramp into the barn.

- a) If the force she exerts is 132N at an angle of 40° to the ramp, what is the magnitude of the force in the direction of the motion?
- b) If the ramp is at an angle of 15° to the ground, what is the magnitude of the force tending to lift the tree vertically?

6. If $\vec{u} = (2, 1, -4)$, $\vec{v} = (5, -1, 0)$ and $\vec{w} = (-2, -2, 1)$ find: a) $3\vec{u} - 4\vec{v} + \vec{w}$ b) $|\vec{v} - \vec{u}|$ c) $(\vec{u} + \vec{v}) \cdot \vec{w}$
 d) $(\vec{v} + \vec{w}) \times \vec{u}$ e) $(\vec{u} \times \vec{v}) \times \vec{w}$

7. Given the points P(-2,1,3), Q(1,3,4) and R(3,-2,0), find: a) \vec{PQ} b) $|\vec{QR}|$ c) the area of ΔPQR

8. If the vectors (1,-2,3) and (3,-4,k) are orthogonal, find the value of k.

9. In each of the following, determine, if possible, three vectors that form a basis for space. Express the fourth vector as a linear combination of the other three: a) (3,4,-5), (-1,-2,3), (1,-2,5), (-2,1,-1)
 b) (1,-1,-1), (3,-2,-1), (-2,0,-2), (3,-3,-3)

10. Determine the vector equation for each line: a) the line through points P(2,-5,-2) and Q(3,6,4)

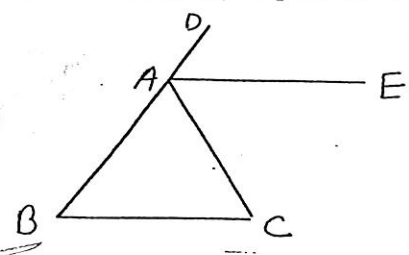
b) the line through (-3,-5) perpendicular to the line $\frac{x+1}{-2} = \frac{y}{3}$

c) the line, in space, parallel to $\frac{x}{-5} = \frac{y-3}{-2} = \frac{z+2}{2}$ $x = -5u, y = 3 - 2u, z = -2 + 2u$

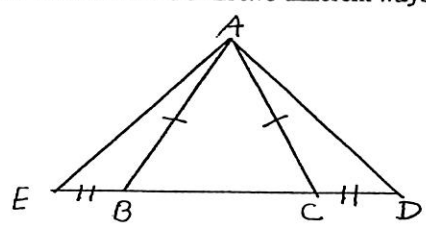
11. Find the vector and parametric equations of the plane: a) through (1,-2,1) with direction vectors (6,-2,1) and (-3,-1,0)
 b) through (1,-2,3) parallel to the xz-plane
 c) through (1,-1,-6), (3,4,0) and (-1,-8,2)
 d) through (0,-4,-1) containing the line $(x,y,z) = (2,-1,-2) + t(-1,4,5)$

12. Determine any points of intersection: a) $\frac{x-2}{2} = \frac{y}{-3} = \frac{z+1}{4}$ and $2x-3y+z-4=0$
 b) $3x+y-z-4=0, 2x-3y+z-6=0$
 c) $2x+y+z=5, 4x-y-3z=12, 3x+5y+z=21$

13. If $AB = AC$ and $AE \parallel BC$, prove that AE bisects $\angle CAD$.



14. Prove $AD = AE$ in two different ways.



Answers to Exam Review Sheet

- 1. 204.7 n at 35° to 215 N force
- 2. 78.7 n at -154° to 105 N force
- 3. $\vec{u} = 0.26\vec{v} + 0.13\vec{w}$
- 4 a) $\vec{OA} = \frac{7}{5}\vec{OB} - \frac{2}{5}\vec{OC}$ b) $\vec{OC} = \frac{1}{8}\vec{OA} + \frac{7}{8}\vec{OD}$ 5. a) 101N b) 108N
- 5a) (-16,5,-11) b) $\sqrt{29}$ c) -18 d) (11,14,9) e) (-34, 18,-32) 7 a)(3,2,1) b) $3\sqrt{5}$ c) $\frac{1}{2}\sqrt{566}$ 8. $-\frac{11}{3}$
- 9. a) $(3,4,-5) = -2.5(-1,-2,3) + .5(1,-2,5) + 0(-2,1,-1)$ b) No basis $(3,-3,-3) = 3(1,-1,-1) + 0(3,-2,-1) + 0(-2,0,-2)$
- 10. a) $(x,y,z) = (2,-5,-2) + k(1,11,6)$ b) $(x,y) = (-3,-5) + n(3,2)$ c) $(x,y,z) = (0,0,0) + t(-5,1,2)$
- 11. a) $(x,y,z) = (1,-2,1) + t(6,-2,1) + k(-3,-1,0)$, $x = 1+6t-3k, y = -2-2t-k, z = 1+t$
 b) $(x,y,z) = (1,-2,3) + t(1,0,0) + k(0,0,1)$, $x = 1+t, y = -2, z = 3+k$
 c) $(x,y,z) = (0,-4,-1) + n(2,3,-1) + k(-1,4,5)$, $x = 2n-k, y = -4+3n+4k, z = -1-n+5k$
- 12 a) $(\frac{36}{17}, \frac{-3}{17}, \frac{-13}{17})$ b) $x = 2t + 2, y = 5t, z = 11t + 2$ c) (2.3 5 -2.5)