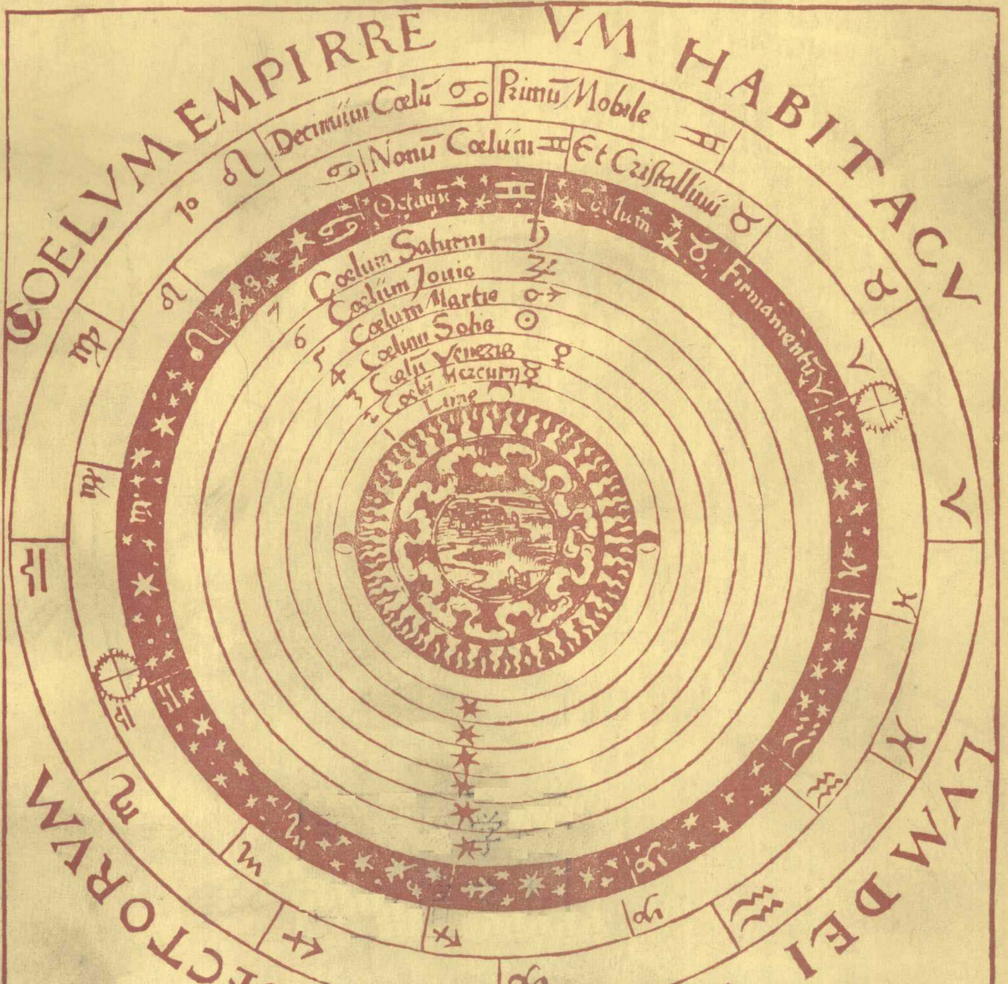
SOLUTIONS GUIDE
to accompany

UNIVERSITY PHYSICS
SIXTH EDITION

Sears • Zemansky • Young



A. LEWIS FORD

SOLUTIONS GUIDE to accompany

SEARS ZEMANSKY YOUNG | UNIVERSITY PHYSICS

SIXTH EDITION

A. LEWIS FORD

Texas A&M University

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PREFACE

This solution manual contains detailed solutions for 562 of the 1596 problems in the 6th Ed. of University Physics. The problems to be included were not chosen at random, but rather have been carefully selected so as to include at least one representative example of each problem type. This solution manual greatly expands the set of worked-out examples that go with the presentation of the physics laws and concepts in the text. The remaining 1034 problems constitute an ample set of problems for the students to tackle on their own.

This manual is intended to serve a purpose different from that of a study guide. A primary function of the manual is to provide the student with models to follow in working physics problems. The problems are worked out in the manual in the manner and style in which the students should carry out their own solutions.

The author will gratefully receive comments as to style, points of physics, errors, or anything else relating to the manual.

I wish to thank Professor Hugh Young for help in various stages of the preparation of the manual. And I want to thank my wife Linda and children Ben and Jason for their patience and support during the many hours spent in preparing this manual.

Texas A and M University
November 1981

A.L.F.

CONTENTS

Chapter	Problems	Page
19	3,5,6,10,13,15,16	152
20	5,8,13,14,17,18,22,23,24	157
21	3,5,6,9,13,17,19,23,27,28	161
22	3,6,7,12,13,14	165
23	2,9,11,13,14,15,19,20,22,24	167
24	5,6,8,11,12,14,17,20	174
25	3,7,9,11,14,16,20,24,26,27	179
26	2,4,9,13,16,18,19,20,21,24,29,32,33,39,40	186
27	3,6,7,9,15,16,19,22,23,27,29	195
28	1,6,8,9,11,14,18,21,24,27,28,29,36,37	201
29	2,3,9,10,14,16,18,20,24,28,31,36,38,40,43,45, 48,49,53	206
30	3,5,7,10,11,14,18,19	217
31	2,6,9,12,15,16	221
32	3,7,10,12,14,18,22,24,25,28,31	225
33	2,5,6,8,10,14,18,19,25,27,30,31,34	232
34	2,5,9,10,14,16,20,23,25,27,29	239
35	3,4,9,10	244
36	4,10,13,14,17,20,23,26,28,30,32	246
37	3,5,9,12,14,17	252
38	6,7,9,11,13,20,22,25,27,29,31,36,38	255
39	1,4,9,10,13,16,19,21,23	260

Chapter	Problems	Page
40	1,3,6,12,14,21,22,24,26,32,35,38,39,42,45, 47,49	264
41	2,5,8,9,10,14,16,20,23,25,28	274
42	2,3,8,11,13,19,21	279
43	2,5,8,12,16,20,24,26,27,31	282
44	2,6,11,15,17,21,23,25	287
45	5,8,13,16,19,20,22,24,26	290
46	2,5,8,12,13,14	294
47	2,4,7,9,12,17,19,21	296

Problems 2, 3, 10, 14, 21, 26, 27, 30, 34, 39, 40

1-2

To convert units multiply by a fraction in which the numerator and denominator are equal, but which changes the units to the desired ones:

$$1\,g\cdot cm^{-3} = (1\,g\cdot cm^{-3})\left(\frac{1\,kg}{10^3\,g}\right)\left(\frac{10^2\,cm}{1\,m}\right)^3 = \underline{1000\,kg\cdot m^{-3}}.$$

1-3

a) $$60\,mi\cdot hr^{-1} = (60\,\cancel{mi}\cdot \cancel{hr}^{-1})\left(\frac{5280\,ft.}{1\,\cancel{mi}}\right)\left(\frac{1\,\cancel{hr}}{3600\,s}\right) = \underline{88\,ft\cdot s^{-1}}.$$

b) $$100\,km\cdot hr^{-1} = (100\,\cancel{km}\cdot \cancel{hr}^{-1})\left(\frac{10^3\,m}{1\,\cancel{km}}\right)\left(\frac{1\,\cancel{hr}}{3600\,s}\right) = \underline{27.8\,m\cdot s^{-1}}.$$

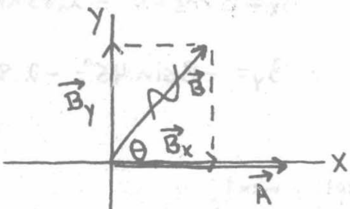
1-10

$$2.0\text{ liters} = (2.0\,\cancel{\text{liters}})\left(\frac{1000\,\cancel{cm}^3}{1\,\cancel{\text{liter}}}\right)\left(\frac{1\,in}{2.54\,\cancel{cm}}\right)^3 = \underline{122\,in^3}$$

(The answer should be expressed as $120\,in^3$ to show only two significant figures, since 2.0 liters has only two significant figures.)

1-14

Choose the x-axis to be in the direction of $\vec{A}$.



$A_x = A \qquad B_x = B\cos\theta$

$A_y = 0 \qquad B_y = B\sin\theta$

$$\vec{R} = \vec{A} + \vec{B}$$

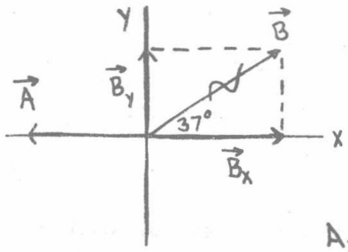
$$R_x = A_x + B_x = A + B\cos\theta$$

$$R_y = A_y + B_y = B\sin\theta$$

$$\Rightarrow R = \sqrt{R_x^2 + R_y^2} = \sqrt{(A + B\cos\theta)^2 + (B\sin\theta)^2}$$

$$R = \sqrt{A^2 + 2AB\cos\theta + B^2\cos^2\theta + B^2\sin^2\theta} = \sqrt{A^2 + 2AB\cos\theta + B^2}\text{, as desired.}$$

1-21



$B_x = B\cos 37° = (20N)(0.799) = 16.0N$

$B_y = B\sin 37° = (20N)(0.602) = 12.0N$

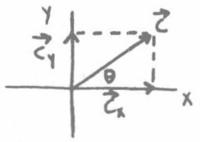
($\vec{B}_x$ is in the positive x-direction, so B_x is positive; $\vec{B}_y$ is in the positive y-direction, so B_y is positive.)

$A_x = -A = -7N$ ($\vec{A}$ is in the negative x-direction.)

$A_y = 0$

$\vec{C} = \vec{A} + \vec{B} \Rightarrow C_x = A_x + B_x = -7N + 16N = 9.0N$

$C_y = A_y + B_y = 0 + 12N = 12.0N$

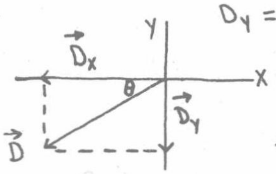


$C = \sqrt{C_x^2 + C_y^2} = \sqrt{(9.0N)^2 + (12.0N)^2} = \underline{15.0N}$

$\tan\theta = \frac{C_y}{C_x} = \frac{12.0N}{9.0N} = 1.33 \Rightarrow \theta = \underline{53.1°}$ (above the x-axis)

$\vec{D} = \vec{A} - \vec{B} \Rightarrow D_x = A_x - B_x = -7N - 16N = -23.0N$

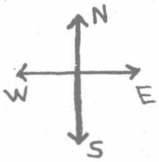
$D_y = A_y - B_y = 0 - 12N = -12.0N$

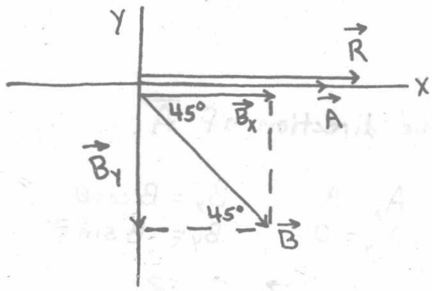


$D = \sqrt{D_x^2 + D_y^2} = \sqrt{(-23.0N)^2 + (-12.0N)^2} = \underline{25.9N}$

$\tan\theta = \frac{|D_y|}{|D_x|} = \frac{12.0N}{23.0N} = 0.522 \Rightarrow \theta = \underline{27.6°}$ (below the negative x-axis)

1-26





$R_x = 5km,\ R_y = 0$

$A_x = 2km,\ A_y = 0$

$B_x = B\cos 45° = 2.83km$

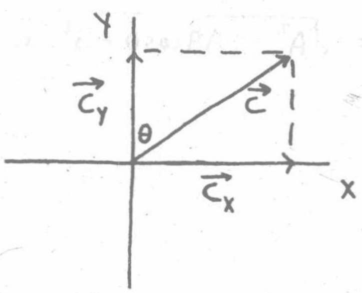
$B_y = -B\sin 45° = -2.83km$

$\vec{R} = \vec{A} + \vec{B} + \vec{C}$; $\vec{C}$ is the unknown third displacement.

$\Rightarrow \vec{C} = \vec{R} - \vec{A} - \vec{B}$

$C_x = R_x - A_x - B_x = 5km - 2km - 2.83km = +0.17km$

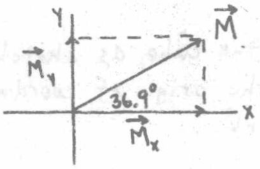
$C_y = R_y - A_y - B_y = 0 - 0 - (-2.83km) = +2.83km$



$C = \sqrt{C_x^2 + C_y^2} = \sqrt{(0.17km)^2 + (2.83km)^2} = \underline{2.84km}$

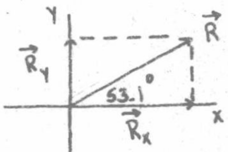
$\tan\theta = \frac{C_x}{C_y} = \frac{0.17km}{2.83km} = 0.060 \Rightarrow \theta = \underline{3.4°}$ (East of North)

1-27



$M_x = M \cos 36.9° = (5\,cm)(0.800) = 4.00\,cm$

$M_y = M \sin 36.9° = (5\,cm)(0.600) = 3.00\,cm$



$R_x = R \cos 53.1° = (5\,cm)(0.600) = 3.00\,cm$

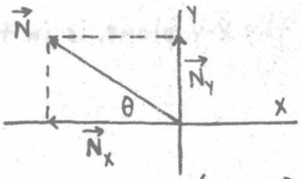
$R_y = R \sin 53.1° = (5\,cm)(0.800) = 4.00\,cm$

a) $\vec{R} = \vec{M} + \vec{N} \Rightarrow \vec{N} = \vec{R} - \vec{M}$

$N_x = R_x - M_x = 3.00\,cm - 4.00\,cm = \underline{-1.00\,cm}$

$N_y = R_y - M_y = 4.00\,cm - 3.00\,cm = \underline{1.00\,cm}$

b) $\vec{N}$



$N = \sqrt{N_x^2 + N_y^2} = \sqrt{(-1.00\,cm)^2 + (1.00\,cm)^2} = \underline{1.41\,cm}$

$\tan\theta = \dfrac{|N_y|}{|N_x|} = \dfrac{1.00\,cm}{1.00\,cm} = 1.00 \Rightarrow \theta = \underline{45°}$ (above the negative x-axis)

(Or, $\vec{N}$ is at $45° + 90° = 135°$ counterclockwise from the +x-axis.)

1-30

$\vec{A} = 2\hat{i} + 3\hat{j}$, $\vec{B} = \hat{i} - 2\hat{j}$

a) $A_x = 2$, $A_y = 3$ $\Rightarrow A = \sqrt{A_x^2 + A_y^2} = \sqrt{(2)^2 + (3)^2} = \underline{3.61}$

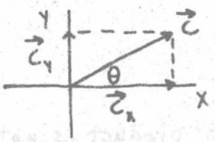
$B_x = 1$, $B_y = -2$ $\Rightarrow B = \sqrt{B_x^2 + B_y^2} = \sqrt{(1)^2 + (-2)^2} = \underline{2.24}$

b) $\vec{C} = \vec{A} + \vec{B}$

$C_x = A_x + B_x = 2 + 1 = 3$

$C_y = A_y + B_y = 3 - 2 = 1$ $\Rightarrow \vec{C} = \underline{3\hat{i} + \hat{j}}$

c)



$C = \sqrt{C_x^2 + C_y^2} = \sqrt{(3)^2 + (1)^2} = \underline{3.16}$

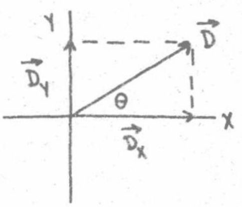
$\tan\theta = \dfrac{C_y}{C_x} = \dfrac{1}{3} = 0.333 \Rightarrow \theta = \underline{18.4°}$ (above the + x-axis)

d) $\vec{D} = \vec{A} - \vec{B}$

$D_x = A_x - B_x = 2 - 1 = 1$

$D_y = A_y - B_y = 3 - (-2) = 5$ $\Rightarrow \vec{D} = \underline{\hat{i} + 5\hat{j}}$

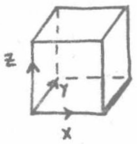
e)



$D = \sqrt{D_x^2 + D_y^2} = \sqrt{(1)^2 + (5)^2} = \underline{5.10}$

$\tan\theta = \dfrac{D_y}{D_x} = \dfrac{5}{1} = 5 \Rightarrow \theta = \underline{78.7}°$ (above the + x-axis)

1-34



Let the coordinate axis point along edges of the cube, as sketched. Then the diagonal from the cube vertex at the origin of coordinates is in the direction of the vector $\vec{d} = \vec{i} + \vec{j} + \vec{k}$.
One of the vectors along an edge is $\vec{e} = \vec{i}$.

$\vec{d} \cdot \vec{e} = de \cos\theta$

$d = \sqrt{\vec{d} \cdot \vec{d}} = \sqrt{(\vec{i}+\vec{j}+\vec{k}) \cdot (\vec{i}+\vec{j}+\vec{k})} = \sqrt{1+1+1} = \sqrt{3}$.

$e = \sqrt{\vec{e} \cdot \vec{e}} = \sqrt{\vec{i} \cdot \vec{i}} = 1$.

But also $\vec{d} \cdot \vec{e} = (\vec{i}+\vec{j}+\vec{k}) \cdot \vec{i} = 1$. (Since $\vec{i} \cdot \vec{i} = 1$, $\vec{j} \cdot \vec{i} = \vec{k} \cdot \vec{i} = 0$.)

Therefore, $\cos\theta = \frac{\vec{d} \cdot \vec{e}}{de} = \frac{1}{\sqrt{3}} \Rightarrow \theta = \underline{54.7^\circ}$

The diagonal of a face, for example of the face in the x-y plane, is in the direction of the vector $\vec{d}' = \vec{i} + \vec{j}$.

$\vec{d}' \cdot \vec{e} = d'e \cos\theta$

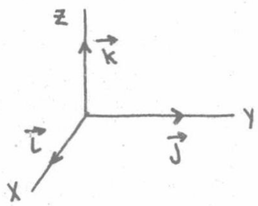
$d' = \sqrt{\vec{d}' \cdot \vec{d}'} = \sqrt{(\vec{i}+\vec{j}) \cdot (\vec{i}+\vec{j})} = \sqrt{1+1} = \sqrt{2}$.

But also $\vec{d}' \cdot \vec{e} = (\vec{i}+\vec{j}) \cdot \vec{i} = 1$

$\Rightarrow \cos\theta = \frac{\vec{d}' \cdot \vec{e}}{d'e} = \frac{1}{\sqrt{2}} \Rightarrow \theta = \underline{45^\circ}$ (Different from the above angle.)

1-39

a)



$\vec{i} \times \vec{j} = -\vec{j} \times \vec{i} = \vec{k}$
$\vec{i} \times \vec{k} = -\vec{k} \times \vec{i} = -\vec{j}$
$\vec{j} \times \vec{k} = -\vec{k} \times \vec{j} = \vec{i}$

$\vec{i} \times \vec{i} = \vec{j} \times \vec{j} = \vec{k} \times \vec{k} = 0$

Then, $\vec{i} \times (\vec{i} \times \vec{j}) = \vec{i} \times \vec{k} = -\vec{j}$.
But $(\vec{i} \times \vec{i}) \times \vec{j} = 0$, since $\vec{i} \times \vec{i} = 0$.

Thus $\vec{i} \times (\vec{i} \times \vec{j})$ does not equal $(\vec{i} \times \vec{i}) \times \vec{j}$. (The repeated vector product is not associative.)

b) In general, $\vec{A} \times (\vec{B} \times \vec{C})$ is not equal to $(\vec{A} \times \vec{B}) \times \vec{C}$.

1-40

$$\vec{A} = A_x \vec{i} + A_y \vec{j} + A_z \vec{k}$$
$$\vec{B} = B_x \vec{i} + B_y \vec{j} + B_z \vec{k}$$
$$\vec{C} = C_x \vec{i} + C_y \vec{j} + C_z \vec{k}$$

From Eq. (1-28), $\vec{B} \times \vec{C} = (B_y C_z - B_z C_y)\vec{i} + (B_z C_x - B_x C_z)\vec{j} + (B_x C_y - B_y C_x)\vec{k}$

Then,

$$\vec{A} \cdot (\vec{B} \times \vec{C}) = A_x (B_y C_z - B_z C_y) + A_y (B_z C_x - B_x C_z) + A_z (B_x C_y - B_y C_x)$$
$$= (A_y B_z - A_z B_y) C_x + (A_z B_x - A_x B_z) C_y + (A_x B_y - A_y B_x) C_z \text{ (By regrouping terms.)}$$

And,

$$\vec{A} \times \vec{B} = (A_y B_z - A_z B_y)\vec{i} + (A_z B_x - A_x B_z)\vec{j} + (A_x B_y - A_y B_x)\vec{k}$$

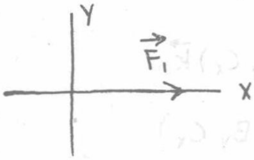
$$(\vec{A} \times \vec{B}) \cdot \vec{C} = (A_y B_z - A_z B_y) C_x + (A_z B_x - A_x B_z) C_y + (A_x B_y - A_y B_x) C_z .$$

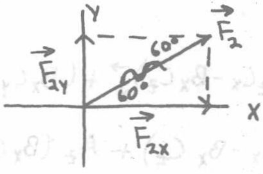
This result for $(\vec{A} \times \vec{B}) \cdot \vec{C}$ is identical to that derived above for $\vec{A} \cdot (\vec{B} \times \vec{C})$, so we have shown that $\vec{A} \cdot (\vec{B} \times \vec{C}) = (\vec{A} \times \vec{B}) \cdot \vec{C}$.

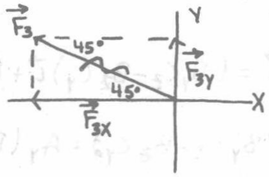
CHAPTER 2

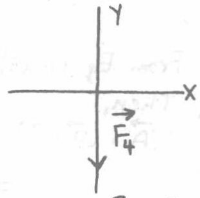
Problems 5, 6, 7, 9, 14, 18, 19, 20, 23, 26, 28, 31, 32, 35

2-5









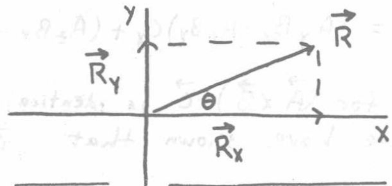
$F_{1x} = 200N$
$F_{1y} = 0$

$F_{2x} = F_2 \cos 60° = (300N)(0.5)$
$F_{2x} = 150N$
$F_{2y} = F_2 \sin 60° = (300N)(0.866)$
$F_{2y} = 260N$

$F_{3x} = -F_3 \cos 45°$
$F_{3x} = -(100N)(0.707) = -70.7N$
$F_{3y} = F_3 \sin 45°$
$F_{3y} = (100N)(0.707) = 70.7N$

$F_{4x} = 0$
$F_{4y} = -200N$

$\vec{R} = \vec{F}_1 + \vec{F}_2 + \vec{F}_3 + \vec{F}_4$



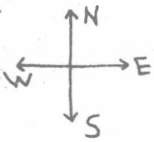
$R_x = F_{1x} + F_{2x} + F_{3x} + F_{4x}$
$R_x = 200N + 150N - 71N + 0 = 279N$

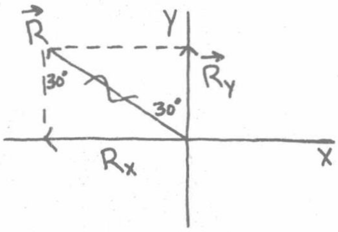
$R_y = F_{1y} + F_{2y} + F_{3y} + F_{4y}$
$R_y = 0 + 260N + 71N - 200N = 131N$

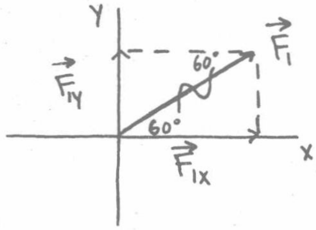
$R = \sqrt{R_x^2 + R_y^2} = \sqrt{(279N)^2 + (131N)^2} = \underline{308\,N}$

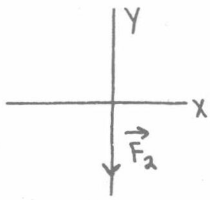
$\tan\theta = \frac{R_y}{R_x} = \frac{131N}{279N} = 0.470 \Rightarrow \theta = \underline{25.2°}$

2-6





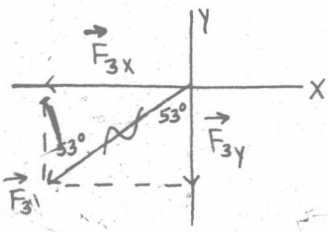




$R_x = -R \sin 30° = -(1000N)(0.5) = -500N$
$R_y = R \cos 30° = (1000N)(0.866) = 866N$

$F_{1x} = F_1 \cos 60° = (400N)(0.5) = 200N$
$F_{1y} = F_1 \sin 60° = (400N)(0.866) = 346N$

$F_{2x} = 0$
$F_{2y} = -200N$



$\vec{R} = \vec{F}_1 + \vec{F}_2 + \vec{F}_3 + \vec{F}_4$

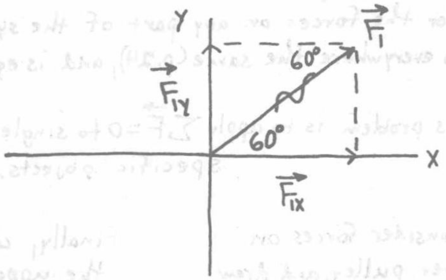
$\Rightarrow \vec{F}_4 = \vec{R} - \vec{F}_1 - \vec{F}_2 - \vec{F}_3$

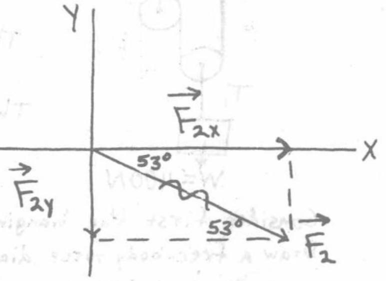
$F_{4x} = R_x - F_{1x} - F_{2x} - F_{3x} = -500N - 200N - 0 - (-320N)$
$F_{4x} = \underline{-380N \text{ (West)}}$

$F_{3x} = -F_3 \sin 53° = -(400N)(0.799) = -320N$
$F_{3y} = -F_3 \cos 53° = -(400N)(0.602) = -241N$

$F_{4y} = R_y - F_{1y} - F_{2y} - F_{3y} = 866N - 346N - (-200N) - (-241N)$
$F_{4y} = \underline{961\,N \text{ (North)}}$

2-7





$F_{1x} = F_1 \cos 60° = (8N)(0.5) = 4.00N$

$F_{1y} = F_1 \sin 60° = (8N)(0.866) = 6.93N$

$F_{2x} = F_2 \cos 53° = (5N)(0.60) = 3.00N$

$F_{2y} = -F_2 \sin 53° = -(5N)(0.80) = -4.00N$

a) $\vec{R} = \vec{F}_1 + \vec{F}_2$

$R_x = F_{1x} + F_{2x} = 4.00N + 3.00N = \underline{7.00N}$

$R_y = F_{1y} + F_{2y} = 6.93N - 4.00N = \underline{2.93N}$

b) $R = \sqrt{R_x^2 + R_y^2}$

$R = \sqrt{(7.00N)^2 + (2.93N)^2} = \underline{7.59N}$

c) $\vec{R} = \vec{F}_1 - \vec{F}_2$

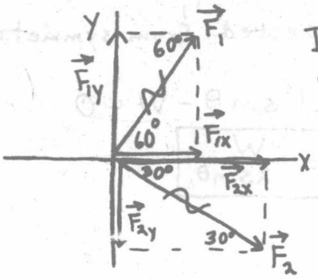
$R_x = F_{1x} - F_{2x} = 4.00N - 3.00N = 1.00N$

$R_y = F_{1y} - F_{2y} = 6.93N - (-4.00N) = 10.93N$

$R = \sqrt{R_x^2 + R_y^2}$

$R = \sqrt{(1.00N)^2 + (10.93N)^2} = \underline{11.0N}$

2-9



If the crate is to move in the positive x-direction, then $\vec{R} = \vec{F}_1 + \vec{F}_2 + \vec{F}_3$ must be in the x-direction. $\Rightarrow R_y = 0$. ($\vec{F}_3$ is the force the boy exerts.)

$\vec{R}_y = \vec{F}_{1y} + \vec{F}_{2y} + \vec{F}_{3y}$

$\Rightarrow R_y = F_1 \sin 60° - F_2 \sin 30° + F_{3y} = 0$

$F_{3y} = F_2 \sin 30° - F_1 \sin 60° = (80N)(0.5) - (100N)(0.866)$

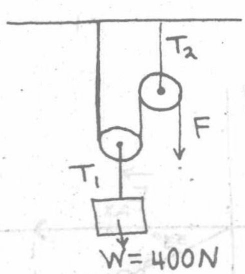
$F_{3y} = 40N - 86.6N = -46.6N$

$\vec{F}_3 = \vec{F}_{3x} + \vec{F}_{3y}$; $F_3 = \sqrt{F_{3x}^2 + F_{3y}^2}$

For the smallest F_3, take $F_{3x} = 0 \Rightarrow F_3 = |F_{3y}| = 46.6N$.

The boy should apply a force of <u>46.6N</u> in the <u>negative</u> <u>y-direction.</u>

2-14



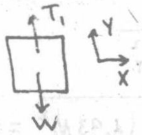
Constant speed ⇒ the system is in equilibrium.

⇒ $\Sigma \vec{F} = 0$ for the forces on any part of the system.

The tension in the rope is everywhere the same (p.24), and is equal to F.

The secret to solving this problem is to apply $\Sigma \vec{F} = 0$ to single, specific objects.

Consider first the hanging object. Draw a free-body force diagram, select a coordinate axis system, and apply $\Sigma F_x = 0$, $\Sigma F_y = 0$.

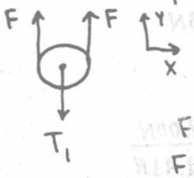


$\Sigma F_y = 0$

$T_1 - W = 0$

$T_1 = W = \underline{400N}$

Next consider forces on the lower pulley, and draw a free-body diagram for it.



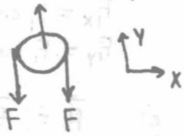
$\Sigma F_y = 0$

$2F - T_1 = 0$

$F = T_1/2$

$F = 400N/2 = \underline{200N}$

Finally, consider the upper pulley.



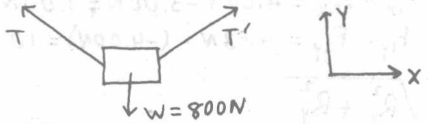
$\Sigma F_y = 0$

$T - 2F = 0$

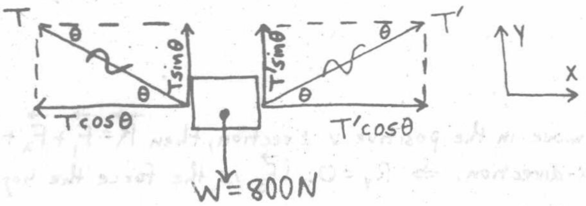
$T = 2F = \underline{400N}$

2-18

Consider the forces on the man.



Before applying the equilibrium conditions $\Sigma F_x = 0$ and $\Sigma F_y = 0$, must resolve T and T' into x and y components.



$\Sigma F_x = 0 \Rightarrow T'\cos\theta - T\cos\theta = 0.$

$T' = T,$

as expected from symmetry.

$\Sigma F_y = 0 \Rightarrow 2T\sin\theta - W = 0$

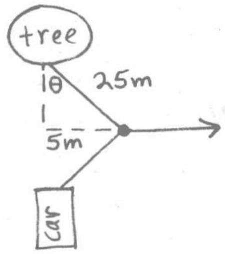
$$\boxed{T = \frac{W}{2\sin\theta}}$$

a) $\theta = 15° \Rightarrow T = \dfrac{800N}{2\sin 15°} = \dfrac{800N}{2(0.259)} = \underline{1540N}$

b) $T = 20,000N \Rightarrow \theta = ?$

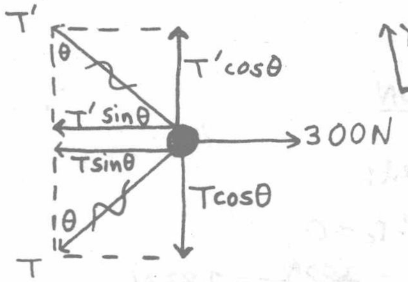
$T = \dfrac{W}{2\sin\theta} \Rightarrow \sin\theta = \dfrac{W}{2T} = \dfrac{800N}{2(20,000N)} = 0.02 \Rightarrow \theta = \underline{1.15°}$

2-19



$$\sin\theta = \frac{5\text{m}}{25\text{m}} = 0.2 \Rightarrow \theta = 11.5°$$

The known force of 300N is applied to the middle of the rope, so first consider the forces on the midpoint of the rope.



$\Sigma F_y = 0 \Rightarrow T'\cos\theta - T\cos\theta = 0.$

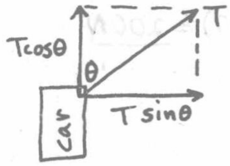
$T' = T$, as expected from symmetry.

$\Sigma F_x = 0 \Rightarrow 300\text{N} - 2T\sin\theta = 0$

$2T\sin\theta = 300\text{N}$

$$T = \frac{300\text{N}}{2(\sin\theta)} = \frac{300\text{N}}{2(0.2)} = \underline{750\text{N}}$$

Forward component of the tension force on the car:

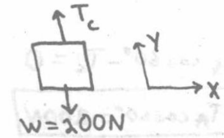


The force being asked for is $T\cos\theta$, the y-component of T.

$T\cos\theta = (750\text{N})(\cos 11.5°) = (750\text{N})(0.980) = \underline{735\text{N}}$

2-20

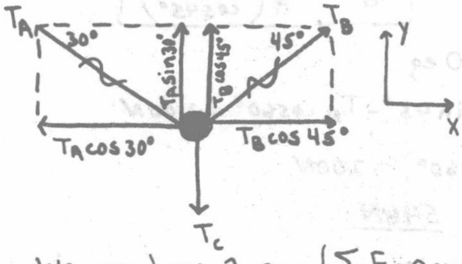
a) The known force in the problem is the weight of the suspended object. It makes sense therefore to consider first the forces on the suspended object.



$\Sigma F_y = 0 \Rightarrow T_c - W = 0$

$T_c = W = \underline{200\text{N}}$

Next consider the forces on the knot where the three ropes meet:



$\Sigma F_x = 0 \Rightarrow \boxed{T_B\cos 45° - T_A\cos 30° = 0}$

$\Sigma F_y = 0 \Rightarrow T_A\sin 30° + T_B\sin 45° - T_c = 0$

$T_c = 200\text{N} \Rightarrow \boxed{T_A\sin 30° + T_B\sin 45° = 200\text{N}}$

We now have 2 eqs. ($\Sigma F_x = 0$ and $\Sigma F_y = 0$) and two unknowns (T_A and T_B). Solve one eq. for one unknown in terms of the other, and substitute into the second eq.

2-20 (Cont.)

$$T_B \cos 45° - T_A \cos 30° = 0 \Rightarrow T_B = T_A\left(\frac{\cos 30°}{\cos 45°}\right)$$

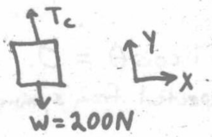
Substitute this into the $\Sigma F_y = 0$ eq. $\Rightarrow T_A(\sin 30° + \cos 30°) = 200N$

$$T_A = \frac{200N}{\sin 30° + \cos 30°} = \underline{146N}$$

Then $T_B = T_A\left(\frac{\cos 30°}{\cos 45°}\right) = 146N\left(\frac{.866}{.707}\right) = \underline{179N}$

b)

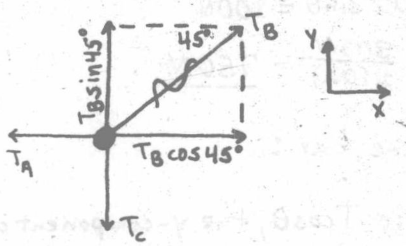
Forces on the suspended object:



$$\Sigma F_y = 0 \Rightarrow T_c - W = 0$$

$$T_c = W = \underline{200N}$$

Forces on the knot where the 3 ropes are joined:



$$\Sigma F_y = 0 \Rightarrow T_B \sin 45° - T_c = 0$$

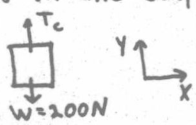
$$T_B = \frac{T_c}{\sin 45°} = \frac{200N}{0.707} = \underline{283N}$$

$$\Sigma F_x = 0 \Rightarrow T_B \cos 45° - T_A = 0$$

$$T_A = T_B \cos 45° = (283N)(0.707) = \underline{200N}$$

c)

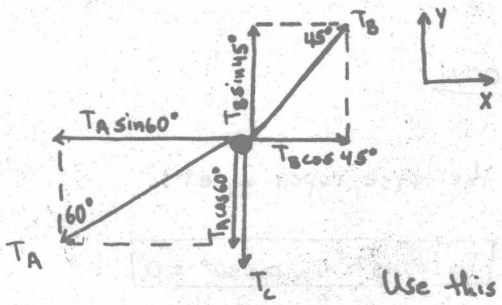
Forces on the suspended object:



$$\Sigma F_y = 0 \Rightarrow T_c - W = 0$$

$$T_c = W = \underline{200N}$$

Forces on the knot where the ropes are joined:



$$\Sigma F_y = 0 \Rightarrow T_B \sin 45° - T_A \cos 60° - T_c = 0$$

$$T_c = 200N \Rightarrow \boxed{T_B \sin 45° - T_A \cos 60° = 200N}$$

$$\Sigma F_x = 0 \Rightarrow T_B \cos 45° - T_A \sin 60° = 0$$

$$\boxed{T_B = T_A\left(\frac{\sin 60°}{\cos 45°}\right)}$$

Use this in the $\Sigma F_y = 0$ eq.

$$\Rightarrow T_A\left(\frac{\sin 60°}{\cos 45°}\right)\sin 45° - T_A \cos 60° = 200N$$

$\sin 45° = \cos 45° \Rightarrow T_A(\sin 60° - \cos 60°) = 200N$

$$T_A = \frac{200N}{\sin 60° - \cos 60°} = \underline{546N}$$

And, $T_B = T_A \frac{\sin 60°}{\cos 45°} = (546N)\left(\frac{0.866}{0.707}\right) = \underline{669N}$