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Problem 2.22				
Student	Exam 1	Exam 2	Final Exam	Overall Score
Davis	82	77	94	84.3
Graham	66	80	75	73.7
Jones	95	100	97	97.3
Meyers	47	62	78	62.3
Richardson	80	58	73	70.3
Thomas	74	81	85	80
Williams	57	62	67	62
AVERAGE	71.6	74.3	81.3	75.7

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Problem 2.3(a)

Grade Report
Santa Claus
123-45-6789

Course	Credits	Grade
Chemistry I	4	3
Physics I	4	3.3
English Composition	3	2
Intro to Engineering	3	4
Calculus I	3	3.7
Seminar	1	2.7

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Problem 2.3(b)

Grade Report

Santa Claus
123-45-6789

Course	Credits	Grade
Chemistry I	4	3.0
Physics I	4	3.3
English Composition	3	2.0
Intro to Engineering	3	4.0
Calculus I	3	3.7
Seminar	1	2.7

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Problem 2.4 (a)

Physical Constants

Constant	Value	Units
Avogadro's number	6.022142E+23	1/mols
Ideal gas constant	0.082054	liter atm/mol K
Pi	3.141593	
Speed of light	2.997925E+08	m/s
Speed of sound	343.000000	m/s

Problem 2.4 (b)

Physical Constants

Constant	Value	Units
Avogadro's number	6.022E+23	1/mols
Ideal gas constant	0.082	liter atm/mol K
Pi	3.142	
Speed of light	2.998E+08	m/s
Speed of sound	343.000	m/s

Bill of Materials
(Course Number and Title)
(Name of Project Group)

Part Number	Part Name	Description
#83-17300	Raspberry Pi 2 Model B	Microcontroller
H2181-ND	Conn Socket Housing, 4 Position	Rectangular Housing Connector
3DR-Data-433Mhz	3DRobotics 3DR Radio Telemetry Kit	Telemetry
LM741CNNS	LM 741 Op-Amp	Operational Amplifier
WRL-12577	SparkFun BlueSMiRF Silver	Bluetooth Modem

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Quantity	Per Unit Price
2	$35
5	$0.16
1	$26.99
3	$0.59
1	$20.95

Bill of Materials
ENGIN 300 Microelectronics
Auto-Balancing Robot

Part Number	Part Name	Description
#83-17300	Raspberry Pi 2 Model B	Microcontroller
3DR-Data-433Mhz	3DRobotics 3DR Radio Telemetry Kit	Telemetry
WRL-12577	SparkFun BlueSMiRF Silver	Bluetooth Modem
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Problem 2.6(a)

Semester Grade Report
Santa Claus

Course	Credits	Grade
Chemistry I	4	3
Physics I	3	3.3
English Composition	3	2.7
Engineering Analysis	3	4
Calculus I	3	3.7
Seminar	1	2.7

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Problem 2.6(b)

Semester Grade Report
Santa Claus

Course	Credits	Grade
Chemistry I	4	3.0
Physics I	3	3.3
English Composition	3	2.7
Engineering Analysis	3	4.0
Calculus I	3	3.7
Seminar	1	2.7

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Problem 2.7	
Item	*Quantity*
Screws	6500
Nuts	9000
Bolts	5400
Total	20900

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Problem 2.8			
Item	*Quantity*	*Cost each*	*Value*
Screws	6500	$ 0.02	$ 130.00
Nuts	7500	$ 0.04	$ 300.00
Bolts	6200	$ 0.05	$ 310.00
Total	20200		$ 740.00
Average	$0.04		

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Prob 2.9

Course	Credits	Grade	(Credits) x (Grade)
Chemistry I	4	3	12
Physics I	4	3.3	13.2
English Comp	3	2	6
Intro to Engineering	3	4	12
Calculus I	3	3.7	11.1
Seminar	1	2.7	2.7
	18		57

GPA 3.166667

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Prob. 2.10

	mass	Mol Wt	n	V	T (Deg C)	P
(a)	400	28	14.28571	10	22	34.5799
(b)	400	28	14.28571	10	37	36.3382
(c)	400	28	14.28571	7	22	49.39986
(d)	300	32	9.375	10	18	22.38536

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Prob. 2.11

	P	r	i	n	F	
(a)	1000	5.5	0.055	20	$2,917.76	
(b)	1000	6	0.06	20	$3,207.14	$289.38 additional
(c)	1000	5.5	0.055	30	$4,983.95	
(d)	5000	5.75	0.0575	25	$20,229.23	

Prob. 2.12

Part	V	R1	R2	R3	R Total	i	V1	V2	V3	P1	P2	P3
(a)	12	150	250	50	450	0.026667	4	6.666667	1.333333	0.106667	0.177778	0.035556
(b)	15	150	250	50	450	0.033333	5	8.333333	1.666667	0.166667	0.277778	0.055556
(c)	12	175	100	225	500	0.024	4.2	2.4	5.4	0.1008	0.0576	0.1296

Part	V	R1	R2	R3	R4	R Total	i	V1	V2	V3	V4	P1	P2	P3	P4
(d)	12	150	250	50	200	650	0.018462	2.769231	4.615385	0.923077	3.692308	0.051124	0.085207	0.017041	0.068166

Problem 2.13(a)

Electrical Circuit Analysis

Known Information:

Source voltage V =	12	volts
Resistance R1 =	10	ohms
Resistance R2 =	5	ohms
Resistance R3 =	20	ohms

Solution:

Resistance Rt =	25	ohms
Voltage drop V1 =	12	volts
Current i1 =	1.2	amperes
Current i2 =	0.48	amperes
Current i =	1.68	amperes
Voltage drop V2 =	2.4	volts
Voltage drop V3 =	9.6	volts

Redundant Checks:

V = (V1 + V2) =	12	volts	(check)
Req =	7.142857	volts	
i = V/Req =	1.68	amperes	(check)

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Problem 2.13(b)

Electrical Circuit Analysis

Known Information:

Source voltage V =	12	volts
Resistance R1 =	10	ohms
Resistance R2 =	5	ohms
Resistance R3 =	10	ohms

Solution:

Resistance Rt =	15	ohms
Voltage drop V1 =	12	volts
Current i1 =	1.2	amperes
Current i2 =	0.8	amperes
Current i =	2	amperes
Voltage drop V2 =	4	volts
Voltage drop V3 =	8	volts

Redundant Checks:

V = (V1 + V2) =	12	volts	(check)
Req =	6	volts	
i = V/Req =	2	amperes	(check)

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Problem 2.14

Part (a)

Mean fluid velocity =	**10**	**ft/sec**	
Outer pipe diameter =	**4**	**in**	
Pipe thickness =	**0.25**	**in**	
Cross sectional flow area =	**0.067**	**sq ft**	(calculate)
Volumetric flow rate =	**0.668**	**cu ft/sec**	(calculate)

Part (b)

Volumetric flow rate =	**1.5**	**cu ft/sec**	
Mean fluid velocity =	**10**	**ft/sec**	
Cross sectional flow area =	**0.15**	**sq ft**	(calculate)
Pipe thickness =	**0.375**	**in**	
Outer pipe diameter =	**5.994**	**in**	(calculate)

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Problem 2.15

t2 =	0.25	in
d1 =	3	in
t1 =	0.125	in
d2 =	4.922952	in

Nominal pipe diameter: 5 in

Problem 2.16

(a)

Density =	13,600	kg/m^3
Gravity =	9.8	m/s^2
Height =	10	cm
Pressure difference =	13,328	Pa

Nominal solution: 13.3 kPa

(b)

Density =	13,600	kg/m^3
Gravity =	9.8	m/s^2
Pressure difference =	20,000	Pa
Height =	0.15006	m

Nominal solution: 15 cm

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Bill of Materials
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3DR-Data-433Mhz	3DRobotics 3DR Radio Telemetry Kit	Telemetry
WRL-12577	SparkFun BlueSMiRF Silver	Bluetooth Modem
LM741CNNS	LM 741 Op-Amp	Operational Amplifier
H2181-ND	Conn Socket Housing, 4 Position	Rectangular Housing Connector
		Grand Total

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Quantity	Per Unit Price	Subtotal
2	$35.00	
1	$26.99	
1	$20.95	
3	$0.59	
5	$0.16	

Bill of Materials
ENGIN 300 Microelectronics
Auto-Balancing Robot

Part Number	Part Name	Description	Quantity	Per Unit Price	Subtotal
#83-17300	Raspberry Pi 2 Model B	Microcontroller	2	$35.00	$70.00
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WRL-12577	SparkFun BlueSMiRF Silver	Bluetooth Modem	1	$20.95	$20.95
LM741CNNS	LM 741 Op-Amp	Operational Amplifier	3	$0.59	$1.77
H2181-ND	Conn Socket Housing, 4 Position	Rectangular Housing Connector	5	$0.16	$0.80
		Grand Total			**$120.51**

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Problem 2.18		
(a) Round(average(C2:C8),1)		
(b) Round(average(B4:D4),1)		
(c) Round(average(E2:E8),1)		
Round(average(B10:D10),1)		

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Bill of Materials
ENGIN 300 Microelectronics
Auto-Balancing Robot

Part Number	Part Name	Description
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3DR-Data-433Mhz	3DRobotics 3DR Radio Telemetry Kit	Telemetry
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		Grand Total

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Quantity	Per Unit Price	Subtotal
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1	$26.99	
1	$20.95	
3	$0.59	
5	$0.16	

Bill of Materials
ENGIN 300 Microelectronics
Auto-Balancing Robot

Part Number	Part Name	Description	Quantity	Per Unit Price	Subtotal
#83-17300	Raspberry Pi 2 Model B	Microcontroller	2	$35.00	$70.00
3DR-Data-433Mhz	3DRobotics 3DR Radio Telemetry Kit	Telemetry	1	$26.99	$26.99
WRL-12577	SparkFun BlueSMiRF Silver	Bluetooth Modem	1	$20.95	$20.95
LM741CNNS	LM 741 Op-Amp	Operational Amplifier	3	$0.59	$1.77
H2181-ND	Conn Socket Housing, 4 Position	Rectangular Housing Connector	5	$0.16	$0.80
		Grand Total			**$120.51**

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Problem 2.20

t2 =	0.25	in
d1 =	3	in
t1 =	0.125	in
d2 =	4.922952	in

Nominal pipe diameter: 5 in

Problem 2.21

(a)

x =	0.3	
y =	1.626279	

(b)

x =	2.5	
y =	3.7	
z =	2.727636	

(c)

theta =	27	degrees
y =	1.975377	

Problem 2.22(a)

Simulate throwing a pair of dice

One	Two	Sum
=RAND()	=RAND()	
=INT(6*A6)+1	=INT(6*B6)+1	**=A7+B7**

Problem 2.22(b)

Simulate throwing a pair of dice

One	Two	Sum
0.387604	0.618873	
3	4	**7**

Complex Number = ***x*** **+** ***y*** ***i** = ***x*** **+** ***y**** **j**

(where *x* = Real Part and *y* = Imaginary Part and both of them are real numbers)

Given:	**To Be Determined:**
x (Real Part):	Magnitude (***m*** = sqrt (x^2 + y^2)):
y (Imaginary Part);	Phase (***ϕ*** = arctan(y/x) in degree):
Given:	**To Be Determined:**
m (Maginitude):	***x*** (= *m* *cos(*ϕ*)):
ϕ (Phase in degree):	***y*** (= *m* *sin(*ϕ*)):

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Complex Number = ***x*** **+** ***y*** ***i** = ***x*** **+** ***y** j**

(where *x* = Real Part and *y* = Imaginary Part and both of them are real numbers)

Given:		**To Be Determined:**	
x (Real Part):	3.00	Magnitude (***m*** = sqrt (x^2 + y^2)):	5.00
y (Imaginary Part):	4.00	Phase (***ϕ*** = arctan(y/x) in degree):	53.13

Given:		**To Be Determined:**	
m (Maginitude):	5.00	***x*** (= *m* *cos(*ϕ*)):	3.00
ϕ (Phase in degree):	53.13	***y*** (= *m* *sin(*ϕ*)):	4.00

Problem 2.24

ITEM	QTY
Screws	8000
Nuts	7500
Bolts	6200
TOTAL	21700

Problem 2.25				
Student	Exam 1	Exam 2	Final Exam	Overall Score
Davis	82	77	94	84.3
Graham	66	80	75	73.7
Jones	95	100	97	97.3
Meyers	47	62	78	62.3
Richardson	80	58	73	70.3
Thomas	74	81	85	80
Williams	57	62	67	62
AVERAGE	71.6	74.3	81.3	75.7

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