SPH3U UNIVERSITY PHYSICS

REVIEW: MATH SKILLS

 Calculations Using Measurements (P.651; 653)

Rounding

If measurements are approximate, the calculations based on them must also be approximate. Scientists agree that calculated answers should be rounded so they do not give a misleading idea of how precise the original measurements were. Use these rules when making calculations and rounding answers to calculations.



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ROUNDING RULES FOR ROUND 1. When the first a should not be ch	ligit to be dropp	ed is 4 or less, the last o	ligit retained
For example:	3.141 326	rounded to 4 digits is	3.141
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	digit to be dropp ast one digit oth	ped is greater than 5, or if Per than zero, the last digit re	
For example:	2.221 372 4.168 501	rounded to five digits is rounded to four digits is	2.2214 4.169
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Rounding			
	ligit discar	rded is five or a five follow creased by 1 if it is odd, bu	, , ,
For example:	2.35 2.45 -6.35	rounded to two digits is rounded to two digits is rounded to two digits is	2.4 2.4 -6.4
NOTE! This is sometimes ca	lled the <mark>e</mark> l	ven-odd rule.	
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Adding &	Subtracting	
When adding and	ING & SUBTRACTING <i>(for subtracting, the answer has the same number of the measurement with the fewest decimal places.</i>	
For example:	6.6 cm + 18.74 cm + 0.766 cm = 26.106 cm = 26.1 cm	
	be rounded to 26.1 cm because the first measurement precision to a tenth of a centimetre.	
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Multiplying & Dividing

RULES FOR MULTIPLYING & DIVIDING

When multiplying and/or dividing, the answer has the same number of significant digits as the measurement with the fewest number of significant digits.

For example:

- 77.8 km/h x 0.8967 h = 69.76326 km
- = 69.8 km

NOTE!

The certainty of the answer is limited to three significant digits, so the answer is rounded up to 69.8 km. The same applies to scientific notation. For example,

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 $(5.5 \times 10^4) * (5.675 \times 10^{-2}) = 9.7 \times 10^5$

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Mul	ticton	Calcu	lations
riui	ustep	Calcu	lations

RULES FOR MULTISTEP CALCULATIONS

For multistep calculations, round-off errors occur if you use the rounded-off answer from an earlier calculation in a subsequent calculation. Thus, leave all digits in your calculator until you have finished all your calculations and then round the final answer.

For example:		5.21 x 0.45 ÷ 0.00600		
	=	2.3445 + 0.00600 or	=	2.3 + 0.00600
	=	390.75	=	383.333333
	=	390 🖌	=	380 🗶

NOTE!

The certainty of the answer is limited to two significant digits, so the answer is rounded accordingly. In the second example though, rounding occurred during the calculation which introduced a round-off error.

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Calculations – Summary

ADDING & SUBTRACTING

fewest decimal places

MULTIPLYING & DIVIDING

fewest number of significant digits

MULTISTEP CALCULATIONS

• leave all digits in the calculator until finished and then round

NOTE!

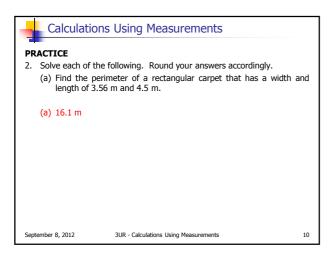
If a combination of addition, subtraction, multiplication and division are involved, follow the rules for multiplying and dividing.

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Calculations Using Mea	surements		
PRACTICE			
1. Perform the following operations.	Round your ans	swers accordingly.	
(a) 67.8 + 968 + 3.87	1039.67	= 1040	
(b) 463.66 + 29.2 + 0.17	493.03	= 493.0	
(c) 68.7 - 23.95	44.75	= 44.8	
(d) (2.6)(42.2)	109.72	= 110	
(e) (65)(0.041)(325)	866.125	= 870	
(f) (0.0060)(26)(55.1)	8.5956	= 8.6	
(g) 650 ÷ 4.0	162.5	= 160	
(h) 3.5 ²	12.25	= 12	
(i) $(1.62 \times 10^{-3})(7.3 \times 10^{-1})$	0.0011826	= 0.0012	
(j) $(5.019 \times 10^{-4}) \div (3.1 \times 10^{-7})$	1619.0322	= 1600	
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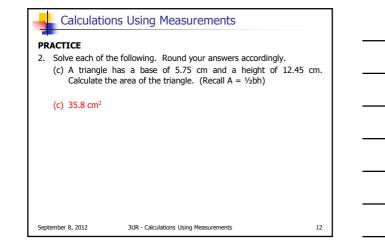
Calculations Using Measurements
PRACTICE
 Solve each of the following. Round your answers accordingly. (b) Find the area of a rectangle whose sides are 4.5 m and 7.5 m.
(b) 34 m ²

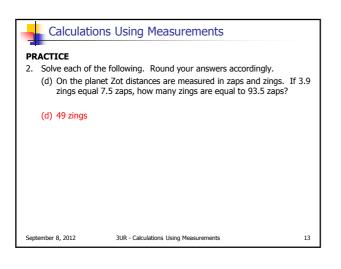
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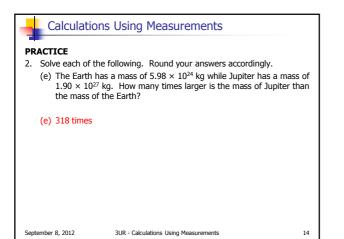
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