

# Answers.

## Grade 11 Physics – Math Basics

### Algebra

1. Rearrange the following equations for the variable stated.

a. Rearrange  $\lambda = \frac{\Delta x d}{L}$  to solve for d.

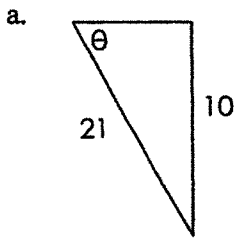
$$d = \frac{\lambda L}{\Delta x}$$

b. Rearrange  $v = \frac{\lambda}{T}$  to solve for T.

$$T = \frac{\lambda}{v}$$

### Trigonometry

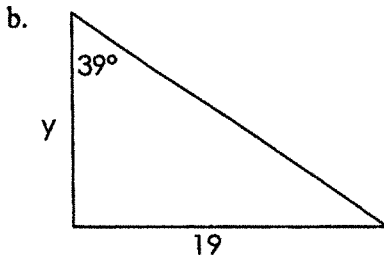
2. Calculate the unknown variable for each of the following right triangles:



$$\sin \theta = \frac{o}{h}$$

$$\sin \theta = \frac{10}{21}$$

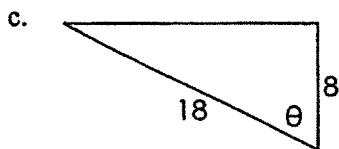
$$\theta = 28.44^\circ$$



$$\tan \theta = \frac{o}{h}$$

$$\tan 39 = \frac{19}{y}$$

$$y = \frac{19}{\tan 39} \rightarrow y = 23.46$$



$$\cos \theta = \frac{a}{h}$$

$$\cos \theta = \frac{18}{10}$$

$$\theta = 63.61^\circ$$

### Using Your Calculator

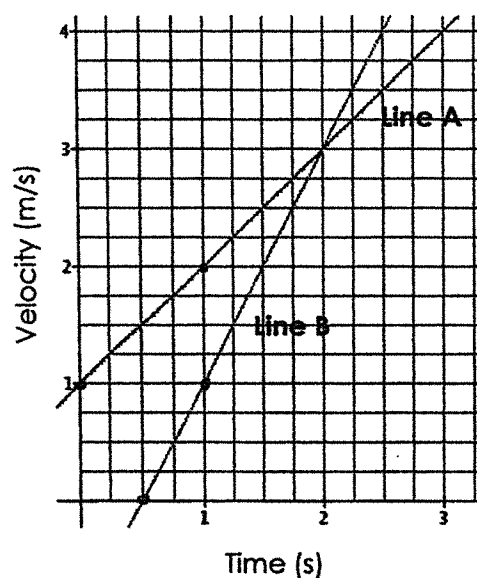
3. Use your calculator to solve the following:

a.  $\frac{15.2(31.4 - 5.5)}{6.2} + 125 = \underline{188.50}$

b.  $\frac{22.1 \tan(66) + 33}{3.6} = \underline{22.95}$

### Linear Graphs

4. Use the following graph to answer the questions below.



a. Calculate the slope of Line A.

$$m = \frac{\text{rise}}{\text{run}} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{2 - 1}{1 - 0} = \frac{1}{1} = \boxed{2.00}$$

b. Calculate the slope of Line B.

$$m = \frac{\text{rise}}{\text{run}} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{1 - 0}{1 - 0} = \boxed{1.00}$$

## Grade 11 Physics – Unit Conversion

Convert the following:

1. 2.4 days to s:

$$2.4 \text{ days} \times \frac{24 \text{ h}}{1 \text{ day}} \times \frac{60 \text{ min}}{1 \text{ h}} \times \frac{60 \text{ s}}{1 \text{ min}} = 207360 \text{ s} = 2.1 \times 10^5 \text{ s}$$

2. 8.1 km to m:

$$8.1 \text{ km} \times \frac{1000 \text{ m}}{1 \text{ km}} = 8100 \text{ m}$$

3. 25.0 km/h to m/s:

$$\frac{25.0 \text{ km}}{1 \text{ h}} \times \frac{1000 \text{ m}}{1 \text{ km}} \times \frac{1 \text{ h}}{60 \text{ min}} \times \frac{1 \text{ min}}{60 \text{ s}} = 6.94 \text{ m/s}$$

4. 16.3 km/h to m/s:

$$\frac{16.3 \text{ km}}{1 \text{ h}} \times \frac{1000 \text{ m}}{1 \text{ km}} \times \frac{1 \text{ h}}{60 \text{ min}} \times \frac{1 \text{ min}}{60 \text{ s}} = 4.53 \text{ m/s}$$

5. 5.12 m/s to km/h:

$$\frac{5.12 \text{ m}}{1 \text{ s}} \times \frac{1 \text{ km}}{1000 \text{ m}} \times \frac{60 \text{ s}}{1 \text{ min}} \times \frac{60 \text{ min}}{1 \text{ h}} = 18.4 \text{ km/h}$$

6. 1.23 m/s to km/h:

$$\frac{1.23 \text{ m}}{1 \text{ s}} \times \frac{1 \text{ km}}{1000 \text{ m}} \times \frac{60 \text{ s}}{1 \text{ min}} \times \frac{60 \text{ min}}{1 \text{ h}} = 4.43 \text{ km/h}$$

7. 19.3km/s to m/s:

$$\frac{19.3 \text{ km}}{1 \text{ s}} \times \frac{1000 \text{ m}}{1 \text{ km}} = 19300 \text{ m/s}$$

8. 4.6m/min to km/h:

$$\frac{4.6 \text{ m}}{1 \text{ min}} \times \frac{1 \text{ km}}{1000 \text{ m}} \times \frac{60 \text{ min}}{1 \text{ h}} = 0.28 \text{ km/h}$$

9. 503km/day to m/s:

$$\frac{503 \text{ km}}{1 \text{ day}} \times \frac{1000 \text{ m}}{1 \text{ km}} \times \frac{1 \text{ day}}{24 \text{ h}} \times \frac{1 \text{ h}}{60 \text{ min}} \times \frac{1 \text{ min}}{60 \text{ s}} = 5.82 \text{ m/s}$$

10. 19.3m/s to km/day:

$$\frac{19.3 \text{ m}}{1 \text{ s}} \times \frac{1 \text{ km}}{1000 \text{ m}} \times \frac{60 \text{ s}}{1 \text{ min}} \times \frac{60 \text{ min}}{1 \text{ h}} \times \frac{24 \text{ h}}{1 \text{ day}} = 1667.5 \text{ km/day} = 1.67 \times 10^4 \text{ km/day}$$

11.  $1.23 \times 10^{15}$  m/day to km/h:

$$\frac{1.23 \times 10^{15} \text{ m}}{1 \text{ day}} \times \frac{1 \text{ km}}{1000 \text{ m}} \times \frac{1 \text{ day}}{24 \text{ h}} = 5.13 \times 10^{10} \text{ km/h}$$

12. 67.8m/h to km/s:

$$\frac{67.8 \text{ m}}{1 \text{ h}} \times \frac{1 \text{ km}}{1000 \text{ m}} \times \frac{1 \text{ h}}{60 \text{ min}} \times \frac{1 \text{ min}}{60 \text{ s}} = 1.88 \times 10^{-5} \text{ km/s}$$

## Grade 11 Physics – Using Prefixes Answers

1.  $2.4 \times 10^{-9}$  s
2.  $6.9 \times 10^3$  m OR  $69 \times 10^2$  m
3.  $1.21 \times 10^8$  g OR  $121 \times 10^6$  g
4. 7.98Mm
5. 512kg (because  $512000\text{g} = 512 \times 10^3$  g)
6. 33 $\mu$ g (because  $0.000033\text{g} = 33 \times 10^{-6}$  g)
7. 0.65 $\mu$ L and 650nL
8. 0.9fm (because  $9 \times 10^{-16}$  m =  $0.9 \times 10^{-15}$  m)

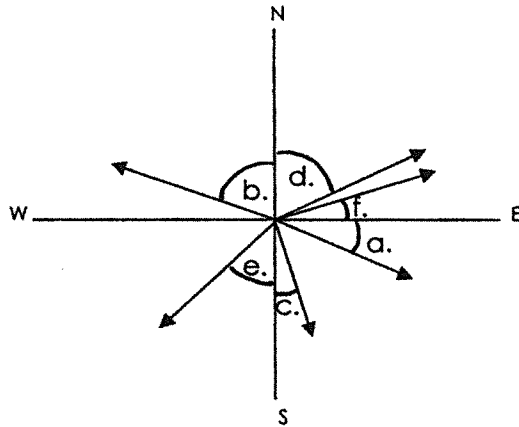
## Grade 11 Physics – Angles Answers

1. a.  $68^\circ$  W of S, [S $68^\circ$ W],  $22^\circ$  SW, [W $22^\circ$ S]

b.  $32^\circ$  E of S, [S $32^\circ$ E],  $58^\circ$  SE, [E $58^\circ$ S]

2. a

3.



## Counting Significant Figures Answers

	# of Sig Figs
700	1
45136	5
600.0	4
690	2
108	3
550	2
0.000730	3
566.90	5
2001	4
$5.0 \times 10^2$	2
500	1
607	3
$2.01 \times 10^4$	3
432.000	6
81	2
80	1
$1.00 \times 10^3$	3
65	2
201	3
192	3
5400	2
100.0	4
7.29	3
0.000004	1
8000000	1
0.010060	5
10.02	4
22	2
357	3
400	1
0.00530	3
320	2

	# of Sig Figs
$5.0 \times 10^8$	2
$4.23 \times 10^5$	3
46800	3
126.48	5
$2.00 \times 10^{10}$	3
1.0005	5
90.0	3
$9.2 \times 10^{-5}$	2
7000	1
450.0	4
250	2
305	3
0.006200	4
565.05	5
5500	2
74.00	4
7040.0	5
$23.7 \times 10^{-2}$	3
4301.0	5
0.00056	2
$1.4 \times 10^7$	2
$4.293 \times 10^4$	4
40280	4
33214	5
705	3
600	1
2.003	4
200.0	4
0.0001	1
218	3
4755.50	6
22568	5

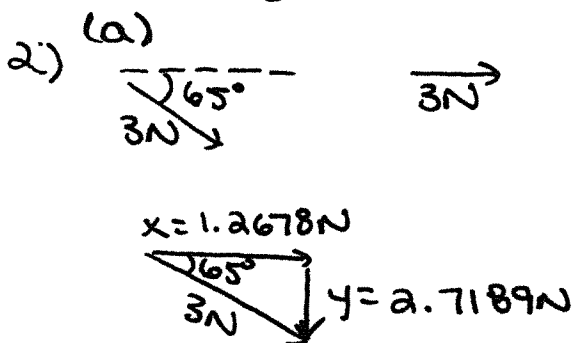
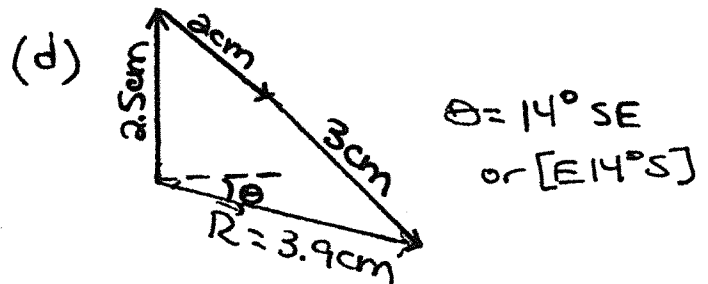
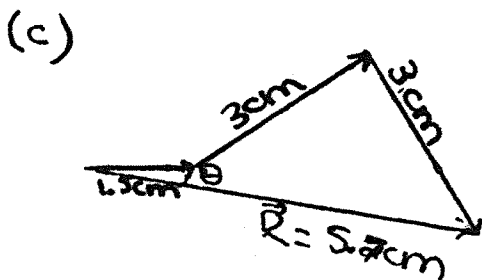
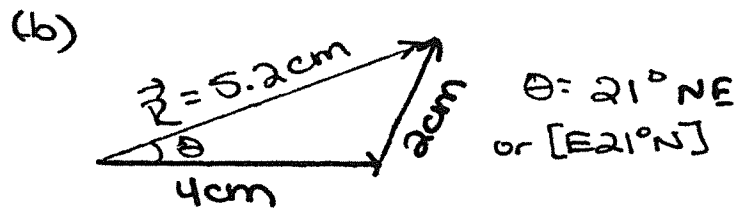
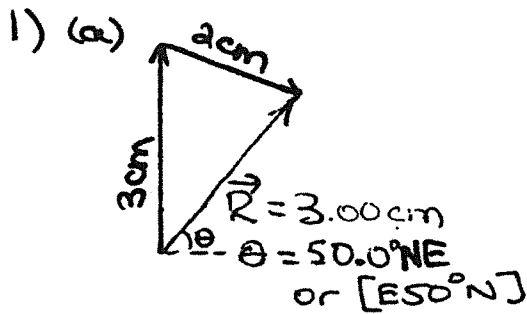
## Calculations with Significant Figures Answers

	Answer
$4.60 + 3$	8
$2.15 \times 3.1 \times 100$	700
$80 \div 0.675$	100
$1.0007 \times 0.009$	0.009
$75 - 2.55$	72
$38 \div 7$	5
$0.008 + 0.05$	0.06
$500000 \div 5.002$	100000
$13.7 \times 2.5$	34
$410 + 3.300$	413
$22.4420 + 56.981$	79.423
$200 - 87.3$	113
$500009 \div 17.000$	29412
$50.0 \times 2.00$	$1.00 \times 10^2$
$4.56 \times 9.000 \div 4.601$	8.92
$74.160 - 4.8 - 0.470$	68.9
$5.00009 \times 0.06$	0.3
$5003 \div 3.781$	1323
$6.790 - 2$	5
$18.640 + 670.445$	689.085
$67.5 - 0.009$	67.5
$5.5 + 3.7 + 2.97$	12.2
$300 \times 10.6$	3000
$71.86 - 13.1$	58.8
$51 \div 7$	7
$(59.3 \div 0.0054) + 1$	$1 \times 10^4$
$200 \times 3.58$	700
$640 - 627.03$	13
$357.89 + 0.002$	357.89
$65 \times 0.000837$	0.054
$835 \div 0.040621$	$2.06 \times 10^4$
$(34 + 5.02) \div 2.222$	18

	Answer
$0.059 \times 6.95$	0.41
$5000 \div 55$	90
$2.25 + 6$	8
$3.48 + 53.252 + 0.601$	57.33
$10 - 9.9$	0
$0.003 \div 106$	0.00003
$47 \times 2.56 \div 1.090$	110
$2.3 \times 3.45 \times 7.42$	59
$2.2 + 4.26 - 0.00003$	6.5
$38.000 \div 4.4$	8.6
$7000.40 + 6.2 + 6.32$	7012.9
$1000 \times 0.000041$	0.04
$87.003 + 7.00$	94.00
$0.70 - 0.1$	0.6
$45.2 + 1.444 - 2.2$	44.4
$17.95 + 32.42 + 50$	100
$89 \div 9.0$	9.9
$0.04 + 2.7$	2.7
$6.790 - 2.5$	4.3
$0.00003 \times 727$	0.02
$6.7 + 30030 - 12220$	17817
$0.003 \div 5$	0.0006
$97.0 \times 2.00756$	195
$84.675 - 3$	82
$(4.63 \times 10^5) \div (2.5 \times 10^5)$	0.65
$3.14 \times 5.6$	18
$208 \div 9.0$	23
$12.09 - 6.7$	5.4
$89.010 \times 70.00$	6231
$52.00 \div 7.30$	7.12
$3.01 + 2.151$	5.16
$78.7 - 33.31$	45.4



# Grade 11 Physics - Adding Vectors using Scale Diagrams and Components Solutions



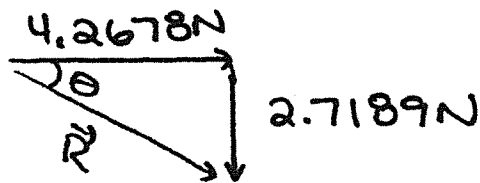
x:  $\leftarrow \rightarrow +$   
 $+ 1.2678\text{ N}$   
 $+ 3\text{ N}$   


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 $+ 4.2678\text{ N}$

y:  $\uparrow \downarrow -$   
 $- 2.7189\text{ N}$

$\rightarrow$   
 over

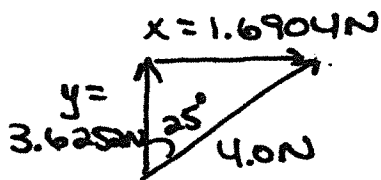
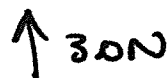
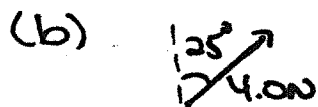


$$\vec{R} = \sqrt{4.2678^2 + 2.7189^2} \quad \tan \theta = \frac{2.7189}{4.2678}$$

$$= 5.1 \text{ N} \quad \theta = 33^\circ$$

**5.1 N [33°SE]**

or [E33°S]

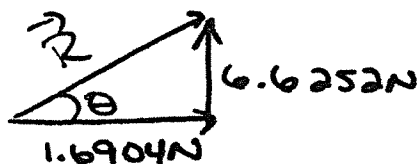


x:  $\leftarrow \rightarrow +$   
+1.6904N

y:  $\uparrow \downarrow$   
+3.6252N  
+3.0N  

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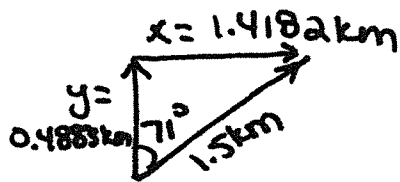
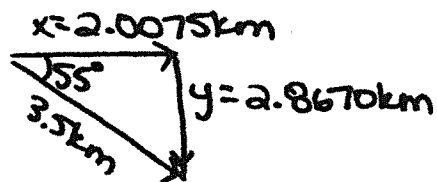
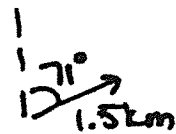
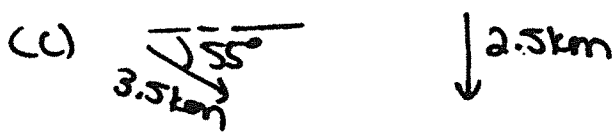
6.6252N



$\vec{R} = 6.8 \text{ N}$

$\theta = 76^\circ$

**6.8 N [76°NE]** or [E76°N]

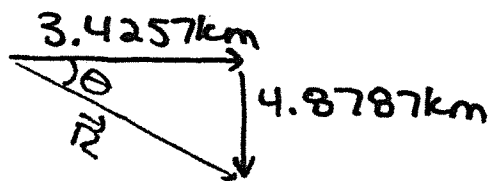


$x_i: \leftarrow \rightarrow +$

$$\begin{aligned} &+ 2.0075 \text{ km} \\ &+ 1.4182 \text{ km} \\ \hline &+ 3.4257 \text{ km} \end{aligned}$$

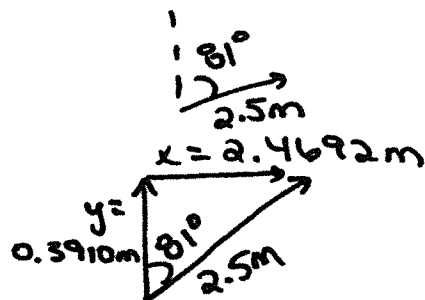
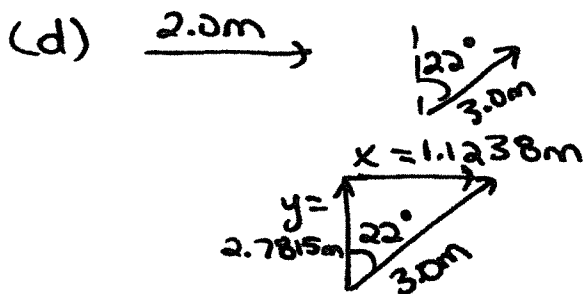
$y_i: \uparrow \downarrow$

$$\begin{aligned} &- 2.8670 \text{ km} \\ &- 2.5 \text{ km} \\ &+ 0.4883 \text{ km} \\ \hline &- 4.8787 \text{ km} \end{aligned}$$



$R = 5.96 \text{ km} = 6.0 \text{ km}$   
 $\theta = 55^\circ$

**6.0 km [55° SE]** or [E55°S]

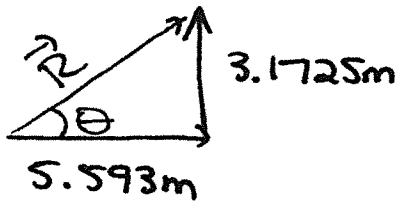


x:  $\leftarrow \rightarrow +$

+2.0m  
+1.1238m  
+2.4692m  
+5.593m

y:  $\uparrow \downarrow -$

+2.7815m  
+0.3910m  
+3.1725m



$$\vec{R} = 6.4\text{m}$$
$$\theta = 29.56^\circ = 30^\circ (2\text{sf})$$



6.4m [30° (2sf) NE]

## Grade 11 Physics - Distance and Displacement

- 0.8m [toward the buoy]
- (a) 10kg [lost]  
(b) \$6000 [increase]
- 3.0km
- distance = 25km and displacement = 3km [East]
- (a) 35km  
(b) 25.6km [30.6° SW] → or [w 30.6° S]
- (a) 40m [below the surface]  
(b) at water level
- (a) 0m  
(b) 314m



## Grade 11 Physics – Speed and Velocity Answers

1. 300m/s [South]
  2. 120m [South]
  3. (a) -1.4m/s  
(b) yes  
(c) no, we don't know if it's uniform
  4. (a) 42m/s  
(b) 0.36s (we assumed a constant speed)
  5. 139km [East]
  6. 1917m [above the ocean floor]
  7. (a) 0m/s  
(b) 100m/s
- 
- 

## Grade 11 Physics – Uniform Acceleration Answers

1. 11s
2. 4.9s
3. 8.0m/s [East]
4.  $18.75\text{m/s}^2$  [up]
5. 5.6s
6.  $1.1\text{m/s}^2$  [West]
7. 33m/s [South]

## Grade 11 Physics – Acceleration due to Gravity Answers

- (a) 19.6m/s [down]    (b) 58.8m/s [down]
- (a) 19.6m [down]    (b) 176m [down]
- (a) 27.6m/s [down] and 35.6m [down]  
(b) 66.8m/s [down] and <sup>225</sup>~~223~~m [down]
- (a) 5.4m/s [down]    (b) 28m [up]
- (a) 0.51s    (b) 2.8m [up]
- (a) 27.6m [down]    (b) 13.8m/s [down]
- (a) 10.4 m/s [up]    (b) 9.20m/s [down]
- 8.16s