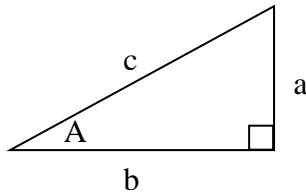# Physics 20 - Lesson 10
Trigonometry Review – Answer Key

/30

1)

/3

$$\sin A = \frac{a}{c} \qquad \cos A = \frac{b}{c} \qquad \tan A = \frac{a}{b}$$

$$c^2 = a^2 + b^2$$

2)
/2.5

a) $\theta = 27.1°$ c) $\theta = 47.4°$ e) $\theta = 85.5°$
b) $\theta = 48.4°$ d) $\theta = 77.1°$

3)
/4.5

$\sin 30° = 0.5$ $\cos 30° = 0.866$ $\tan 30° = 0.577$

$\sin 45 = 0.707$ $\cos 45 = 0.707$ $\tan 45 = 1$

$\sin 60 = 0.866$ $\cos 60 = 0.5$ $\tan 60 = 1.732$

4)

/5

$opp = 42 \times \sin 30°$ $adj = 42 \times \cos 30°$

$\boxed{opp = 21cm}$ $\boxed{adj = 36.4cm}$

5)

/3
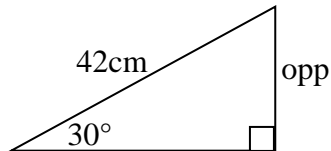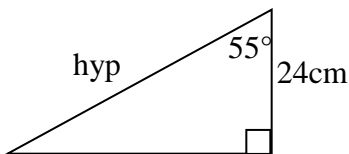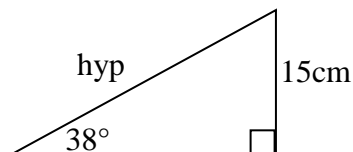

$$cos55° = \frac{24}{hyp}$$

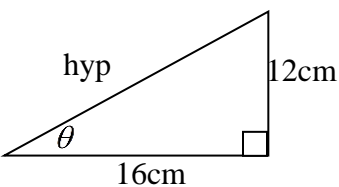$$hyp = \frac{24}{\cos 55°} = \boxed{41.8m}$$

6)

/3

$$\sin 38° = \frac{15}{hyp} \quad hyp = \frac{15}{\sin 38°}$$

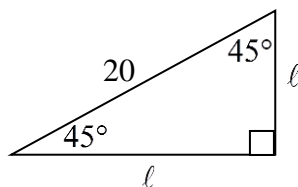$$\boxed{hyp = 24.4cm}$$

7)

/5

$$hyp = \sqrt{12^2 + 16^2}$$

$\boxed{hyp = 20m}$

$$\tan \theta = \frac{12}{16}$$

$\boxed{\theta = 36.9°}$

8)

/4

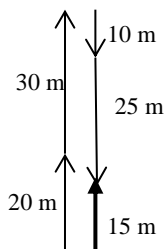angles are $45° \rightarrow \dfrac{90}{2} = 45$

$\ell^2 + \ell^2 = 20^2$

$2\ell^2 = 20^2 \qquad \ell = \sqrt{\dfrac{20^2}{2}} = \boxed{14.14m}$

/73

1)

/6

distance
$$\Delta d = \Delta d_1 + \Delta d_2 + \Delta d_3 + \Delta d_4$$
$$\Delta d = 20\,m + 10\,m + 30\,m + 25\,m$$
$$\boxed{\Delta d = 85\,m}$$
displacement
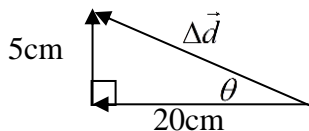$$\Delta \vec{d} = \Delta \vec{d}_1 + \Delta \vec{d}_2 + \Delta \vec{d}_3 + \Delta \vec{d}_4$$
$$\Delta \vec{d} = 20\,m[N] + 10\,m[S] + 30\,m[N] + 25\,m[S]$$
$$\boxed{\Delta \vec{d} = 15\,m\ [\text{N}]}$$

2)

/8

distance
$$\Delta d = \Delta d_1 + \Delta d_2$$
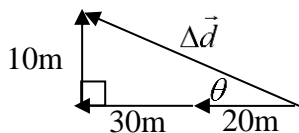$$\Delta d = 20\,cm + 5\,cm$$
$$\boxed{\Delta d = 25\,cm}$$
displacement
$$\Delta d = \sqrt{20^2 + 5^2} \qquad \theta = \tan^{-1}\frac{5}{20}$$
$$\Delta d = 20.6\,cm \qquad \theta = 14^o$$
$$\boxed{\Delta \vec{d} = 20.6\,cm\ [14°\ \text{N of W}]}$$

3)

/8

distance
$$\Delta d = \Delta d_1 + \Delta d_2$$
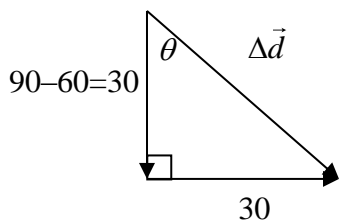$$\Delta d = 20\,m + 30\,m + 10\,m$$
$$\boxed{\Delta d = 60\,m}$$
displacement
$$\Delta d = \sqrt{10^2 + 50^2} \qquad \theta = \tan^{-1}\frac{10}{50}$$
$$\Delta d = 51\,m \qquad \theta = 11°$$
$$\boxed{\Delta \vec{d} = 51\,m\ [11°\ \text{N of W}]}$$

4)

90–60=30

θ $\Delta\vec{d}$

30

/8

distance $\Delta d = \Delta d_1 + \Delta d_2 = 90cm + 60cm + 30cm$

$\boxed{\Delta d = 180cm}$

displacement

$\Delta d = \sqrt{30^2 + 30^2}$ $\tan\theta = \dfrac{30}{30}$

$\Delta d = 42.4cm$ $\theta = 45°$

$\boxed{\Delta\vec{d} = 42.4cm \text{ [45° E of S]}}$

5)

60km-20km = 40km

50km

$\Delta\vec{d}$

/6
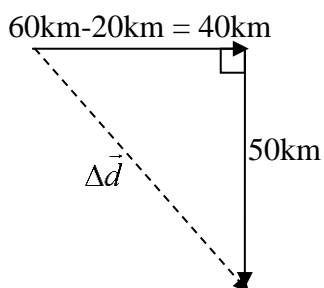
$\Delta d = \sqrt{40^2 + 50^2}$ $\theta = \tan^{-1}\dfrac{50}{40}$

$\Delta d = 64.0km$ $\theta = 51.3°$ S of E

$\boxed{\Delta\vec{d} = 64.0km \text{ [51.3° S of E]}}$

6)   a) $\Delta d = 858m + 287m$

$\boxed{\Delta d = 1155m}$

b)

858m

297m

θ

$\Delta\vec{d}$

/9
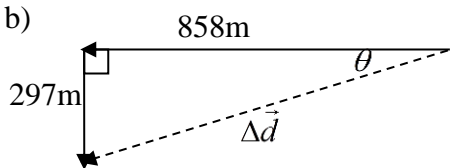
$\Delta d = \sqrt{858^2 + 287^2}$ $\theta = \tan^{-1}\dfrac{287}{858}$

$\Delta d = 908m$

$\theta = 19°$

$\Delta\vec{d} = 908m \text{ [19° S of W]}$

c)

$v_{avg} = \dfrac{\Delta d}{\Delta t}$

$v_{avg} = \dfrac{(858m + 297m)}{13\min}$

$\boxed{v_{avg} = 88.8 \, m/_{\min}}$

$v_{avg} = 88.8 \, m/_{\min}$

7) $\underline{\text{N-S}}$
$\Delta d = -500m + 350m + 390m + 190m$

$\Delta d = +430m$

580m

$\Delta d = \sqrt{580^2 + 430^2}$ $\theta = \tan^{-1}\dfrac{580}{430}$

$\Delta d = 722m$

$\theta = 53°$

$\boxed{\vec{\Delta d} = 722m \ [53° \text{ W of N}]}$

/10 $\underline{\text{E-W}}$
$\Delta d = 480m - 1650m + 590m$
$\Delta d = -580m$

$\vec{\Delta d}$ θ 430m
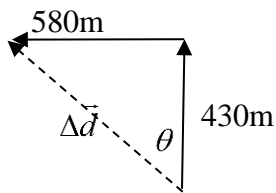
b)

$$v_{avg} = \frac{\Delta d}{\Delta t}$$

$$v_{avg} = \frac{500 + 350 + 390 + 190 + 480 + 1650 + 590}{201\,\text{min}}$$

$$\boxed{v_{avg} = 20.6\,{}^{m}\!/_{\text{min}}}$$

8) a) car $\Delta d = 48km$
       canoe $\Delta d = 12km$

b) since the canoe and the car start from the same point and end up together at the same spot, the canoe has the same displacement $\vec{\Delta d} = 12km \ [20° \text{ E of N}]$

c) car $v = \dfrac{\Delta d}{\Delta t} = \dfrac{48km}{1.2h}$
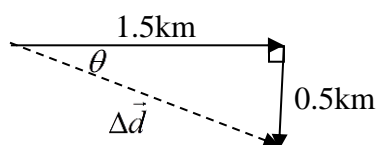
/6
$$\boxed{v = 40\,{}^{km}\!/_{h}}$$

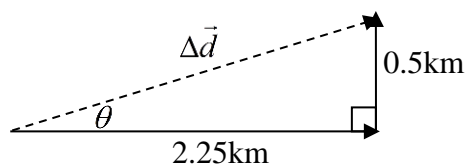   canoe $v = \dfrac{\Delta d}{\Delta t} = \dfrac{12km}{1.2h}$

$$\boxed{v = 10\,{}^{km}\!/_{h}}$$

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9) a)

$\Delta d = \sqrt{1.5^2 + 0.5^2}$ $\theta = \tan^{-1}\dfrac{0.5}{1.5}$

$\Delta d = 1.6 km$ $\theta = 18°$ S of E

$\boxed{\vec{\Delta d} = 1.6 km\ [18°\ \text{S of E}]}$

b)

/12

$\Delta d = \sqrt{0.5^2 + 2.25^2}$ $\theta = \tan^{-1}\dfrac{0.5}{2.25}$

$\Delta d = 2.3 km$ $\theta = 12.5°$ N of E

$\boxed{\vec{\Delta d} = 2.3 km\ [12.5°\ \text{N of E}]}$

c)
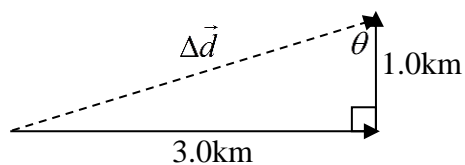
$\Delta d = \sqrt{1.0^2 + 3.0^2}$ $\theta = \tan^{-1}\dfrac{3.0}{1.0}$

$\Delta d = 3.2 km$ $\theta = 72°$ W of S

$\boxed{\vec{\Delta d} = 3.2 km\ [72°\ \text{W of S}]}$