Problem 1

Version 1242 °

1) $1242\,° = \frac{69}{20}$ rotations

$= 3 + \frac{9}{20}$ rotations

≈ 3.45 rotations

2) $\theta = \frac{69 \cdot \pi}{10}$ radians ≈ 21.68 radians

3) AL $= \frac{138 \cdot \pi}{5}$ inches ≈ 86.71 inches

4) Sames as #3

AL $= \frac{138 \cdot \pi}{5}$ inches ≈ 86.71 inches

5a) LS $\frac{in}{seconds} = \frac{69 \cdot \pi}{125} \frac{in}{seconds}$

$\approx 1.73 \frac{in}{seconds}$

5b) LS $\frac{feet}{seconds} = \frac{23 \cdot \pi}{500} \frac{feet}{seconds}$

$\approx 0.14 \frac{feet}{seconds}$

5c) LS $\frac{feet}{minute} = \frac{69 \cdot \pi}{25} \frac{feet}{minute}$

$\approx 8.67 \frac{feet}{minute}$

6a) AS $\frac{radians}{second} = \frac{69 \cdot \pi}{500} \frac{radians}{second}$

$\approx 0.43 \frac{radians}{second}$

6b) AS $\frac{radians}{minute} = \frac{207 \cdot \pi}{25} \frac{radians}{minute}$

$\approx 26.01 \frac{radians}{minute}$

7a) AS $\frac{radians}{second} = \frac{68 \cdot \pi}{5} \frac{radians}{second} \approx 42.73 \frac{radians}{second}$

7b) LS $\frac{in}{second} = 544 \cdot \pi \approx 1709.03 \frac{in}{second}$

7c) LS $\frac{feet}{minute} = 2720 \cdot \pi \approx 8545.13 \frac{feet}{minute}$

Solutions 1242 $\quad d = 8_{in} \quad r = 4_{in}$

① $\frac{1242}{360}$ rev $= \boxed{\frac{69}{20} = 3.45 \text{ rotations}}$

② $\theta = \frac{1242}{180}\pi = \boxed{\frac{69}{10}\pi \text{ radians} \simeq 21.68 \text{ radians}}$

③ $AL = \left(\frac{69\pi}{10} \text{ radians}\right)(4) = \frac{276}{10}\pi \boxed{= \frac{138}{5}\pi \text{ inches} \simeq 86.71 \text{ inches}}$

④ Same as number ③ $\boxed{\frac{138\pi}{5} \text{ inches} \quad 86.71 \text{ inches}}$

⑤ $t = 50$

a) $LS_{in/sec} = AL \cdot r = \left(\frac{138\pi}{5}\right)\left(\frac{1}{50}\right) = \boxed{\frac{138\pi}{250} = \frac{69\pi}{125} \simeq 1.73 \text{ in/sec}}$

b) $LS_{ft/sec} = LS_{in/sec} \cdot \frac{1 \text{ ft}}{12 \text{ in}} = \frac{69\pi}{125} \cdot \frac{1}{12} = \frac{69\pi}{1500} = \frac{23\pi}{500}$

$\boxed{LS_{ft/sec} = \frac{23\pi}{500} \text{ ft/sec} \simeq 0.14 \text{ ft/sec}}$

c) $LS_{ft/min} = LS_{ft/sec} \cdot \frac{60 \text{ sec}}{1 \text{ m}} = \boxed{\frac{23\pi}{500} \cdot \frac{60}{1} = \frac{1380\pi}{500} \text{ ft/min}}$

$\boxed{LS_{ft/min} = \frac{69\pi}{25} \frac{\text{ft}}{\text{min}} \simeq 8.67 \text{ ft/min}}$

⑥ $t = 50\text{sec}$ $\quad \theta = \frac{69\pi}{10}$ radians

6a) $AS_{rad/sec} = \frac{\theta r}{t} = \left(\frac{69\pi}{10}\right)\left(\frac{1}{50}\right) = \boxed{\frac{69\pi}{500} \frac{rad}{sec}}$

$$\boxed{AS_{rad/sec} \approx 0.43 \text{ rad/sec}}$$

6b) $AS_{rad/min} = AS_{rad/sec} \cdot \frac{60\text{sec}}{1\text{min}} = \frac{69\pi}{500} \cdot \frac{60}{1}$

$$\boxed{AS_{rad/min} = \frac{4140\pi}{500} = \frac{207\pi}{25} \text{ rad/min} \approx 26.01 \text{ rad/min}}$$

7a) $d = 80\text{in}$ $\quad r = 40\text{in}$ $\quad$ rotations 6.8 rotations

$\theta = 6.8 \cdot 2\pi = 13.6\pi$ radians

a) $AS = \frac{13.6\pi \text{ radians}}{1 \text{ sec}}$

$AS_{rad/sec} \approx 42.73$ rad/sec

b) $LS_{in/sec} = AS_{rad/sec} \cdot r$

$= (13.6\pi)(40)$

$LS_{in/sec} = 544\pi$ inches/sec

≈ 1709.03 inches/sec

c) $LS_{ft/min} = LS_{in/sec} \cdot \frac{60\text{sec}}{1\text{min}} \cdot \frac{1\text{ft}}{12\text{in}}$

$= (544\pi) \cdot (5) = 2720\pi$

$= 2720\pi$ ft/min ≈ 8545.13 ft/min

Problem 1

Version 1020 °

1) $1020\,° = \frac{17}{6}$ rotations

$= 2 + \frac{5}{6}$ rotations

≈ 2.8333333 rotations

2) $\theta = \frac{17 \cdot \pi}{3}$ radians ≈ 17.8 radians

3) AL $= \frac{17 \cdot \pi}{2}$ inches ≈ 26.7 inches

4) Sames as #3

AL $= \frac{17 \cdot \pi}{2}$ inches ≈ 26.7 inches

5a) LS $\frac{in}{seconds} = \frac{17 \cdot \pi}{20} \frac{in}{seconds}$

$\approx 2.67 \frac{in}{seconds}$

5b) LS $\frac{feet}{seconds} = \frac{17 \cdot \pi}{240} \frac{feet}{seconds}$

$\approx 0.22 \frac{feet}{seconds}$

5c) LS $\frac{feet}{minute} = \frac{17 \cdot \pi}{4} \frac{feet}{minute}$

$\approx 13.35 \frac{feet}{minute}$

6a) AS $\frac{radians}{second} = \frac{17 \cdot \pi}{30} \frac{radians}{second}$

$\approx 1.78 \frac{radians}{second}$

6b) AS $\frac{radians}{minute} = 34 \cdot \pi \frac{radians}{minute}$

$\approx 106.81 \frac{radians}{minute}$

7a) AS $\frac{radians}{second} = \frac{18 \cdot \pi}{5} \frac{radians}{second} \approx 11.31 \frac{radians}{second}$

7b) LS $\frac{in}{second} = 36 \cdot \pi \approx 113.1 \frac{in}{second}$

7c) LS $\frac{feet}{minute} = 180 \cdot \pi \approx 565.49 \frac{feet}{minute}$

Solutions 1020

① $\angle = 1020^\circ$ $\boxed{\#\text{ of rev} = \frac{1020^\circ}{360} = \frac{17}{6} = 2.8\overline{3}\text{ rot.}}$

② $\underline{1020^\circ} \cdot \frac{\pi}{180} = \theta = \frac{1020}{180}\pi = \frac{17\pi}{3}$ radians

$$\boxed{\theta = \frac{17\pi}{3}\text{ radians} \simeq 17.80\text{ radians}}$$

③ $AL = \theta r$ $d = 3\text{in}$ $r = \frac{3}{2}\text{in}$ $r = \frac{3}{2}\cdot\frac{1}{12} = \frac{3}{24} = \frac{1}{8}\text{ft}$

$$AL_{in} = \frac{17\pi}{3}\cdot\frac{3}{2} = \frac{51\pi}{6} = \frac{17\pi}{2}$$

$$\boxed{AL_{in} = \frac{17\pi}{2}\text{in} \simeq 26.70\text{in}}$$

④ Same as #3 $\boxed{AL = \frac{17}{2}\pi\text{ in} \simeq 26.70\text{in}}$

⑤ $t = 10\text{sec}$ $t_{min} = \frac{10}{60} = \frac{1}{6}\text{ min}$ $t_{hour} = \frac{10}{3600} = \frac{1}{360}\text{ hr}$

$$LS_{in/sec} = \frac{\theta r}{t} = \theta r \cdot \frac{1}{t} = \frac{17\pi}{3}\cdot\frac{3}{2}\cdot\frac{1}{10} = \frac{51\pi}{60}$$

(5a) $\boxed{LS_{in/sec} = \frac{17\pi}{20}\text{ in/sec} \simeq 2.67\text{ in/sec}}$

(5b) $LS_{ft/sec} = LS_{in/sec}\cdot\frac{1\text{ft}}{12} = \frac{17\pi}{20}\cdot\frac{1}{12} = \boxed{\frac{17\pi}{240}\text{ ft/sec} \simeq 0.22\text{ ft/sec}}$

(5c) $LS_{ft/min} = LS_{ft/sec}\cdot\frac{60\text{sec}}{1\text{min}}$

$$= \frac{17\pi}{240}\cdot 60 = \frac{1020\pi}{240} = \boxed{\frac{17\pi}{4}\text{ ft/min} \simeq 13.35\text{ ft/min}}$$

(6) $t = 10\,sec \quad t_{min} = \frac{1}{6} \quad t_{hr} = \frac{1}{360}$

$\theta = \frac{17\pi}{3}$

$AS_{rad/sec} = \frac{\theta}{t_{sec}} = \frac{17\pi}{3} \cdot \frac{1}{10} = \frac{17\pi}{30} \frac{rad}{sec}$

(6a) $\boxed{AS_{rad/sec} = \frac{17\pi}{30} \frac{rad}{sec} \approx 1.78\ rad/sec}$

$AS_{rad/min} = AS_{rad/sec} \cdot \frac{60\,sec}{1\,min} = \frac{17\pi}{30} \cdot 60$

(6b) $\boxed{AS_{rad/min} = \frac{1020}{30}\pi \frac{rad}{min} = 34\pi\ rad/min \approx 106.81 \frac{rad}{min}}$

OR $A_{rad/min} = \frac{\theta}{t_{min}} = \frac{17\pi}{3} \cdot \frac{1}{\frac{1}{6}} = \frac{17\pi}{3} \cdot 6$

$\boxed{A_{rad/min} = \frac{102\pi}{3} = 34\pi\ rad/min \approx 106.81\ rad/min}$

(7) $d = 20\,in \quad r = 10\,in \quad r_{ft} = \frac{10}{12} = \frac{5}{6}\,ft \quad rev = 1.8\ rev/sec$

(7a)

$\boxed{AS = \frac{\theta}{t} = \frac{1.8\ rev}{1\,sec} \cdot \frac{2\pi\ rad}{1\ rev} = \frac{3.6\pi\ rad}{1\,sec} \approx 11.31\ rad/sec}$

(7b) $r = 10\text{ in}$ $\quad r = \frac{5}{6}\text{ ft}$ $\quad \Theta = 3.6\pi\text{ rad}$ $\quad AS\ \frac{3.6\pi\text{ rad}}{\text{sec}}$

$$LS_{in/sec} = \frac{\Theta r}{t} = AS \cdot r = (3.6\pi)(10) = 36\pi\ \text{in/sec}$$

$$\boxed{LS_{in/sec} = 36\pi\ \text{in/sec} \approx 113.10\ \text{in/sec}}$$

(7c) $$LS_{ft/min} = LS_{in/sec} \cdot \frac{60\text{ sec}}{1\text{ min}} \cdot \frac{1\text{ ft}}{12\text{ in}}$$

$$= LS_{in/sec} \cdot 5$$

$$= 36\pi \cdot 5$$

$$\boxed{LS_{ft/min} = 180\pi\ \text{ft/min} \approx 565.49\ \text{ft/min}}$$

OR $$LS_{ft/min} = \left(\frac{\Theta}{t}\right)\frac{\text{rad}}{\text{min}} \cdot r_{ft}$$

$$= (3.6\pi \cdot 60)\left(\frac{5}{6}\right)$$

$$\boxed{LS_{ft/min} = 180\pi\ \text{ft/min} \approx 565.49\ \text{ft/min}}$$

Problem 1

Version 822 °

1) $822° = \frac{137}{60}$ rotations

$= 2 + \frac{17}{60}$ rotations

≈ 2.2833333 rotations

2) $\theta = \frac{137 \cdot \pi}{30}$ radians ≈ 14.35 radians

3) AL $= \frac{137 \cdot \pi}{15}$ inches ≈ 28.69 inches

4) Sames as #3

AL $= \frac{137 \cdot \pi}{15}$ inches ≈ 28.69 inches

5a) LS $\frac{in}{seconds} = \frac{137 \cdot \pi}{225} \frac{in}{seconds}$

$\approx 1.91 \frac{in}{seconds}$

5b) LS $\frac{feet}{seconds} = \frac{137 \cdot \pi}{2700} \frac{feet}{seconds}$

$\approx 0.16 \frac{feet}{seconds}$

5c) LS $\frac{feet}{minute} = \frac{137 \cdot \pi}{45} \frac{feet}{minute}$

$\approx 9.56 \frac{feet}{minute}$

6a) AS $\frac{radians}{second} = \frac{137 \cdot \pi}{450} \frac{radians}{second}$

$\approx 0.96 \frac{radians}{second}$

6b) AS $\frac{radians}{minute} = \frac{274 \cdot \pi}{15} \frac{radians}{minute}$

$\approx 57.39 \frac{radians}{minute}$

7a) AS $\frac{radians}{second} = \frac{48 \cdot \pi}{5} \frac{radians}{second} \approx 30.16 \frac{radians}{second}$

7b) LS $\frac{in}{second} = 192 \cdot \pi \approx 603.19 \frac{in}{second}$

7c) LS $\frac{feet}{minute} = 960 \cdot \pi \approx 3015.93 \frac{feet}{minute}$

Solutions 822

① Revolutions $\frac{822}{360} = \frac{137}{60} = \boxed{2.28\overline{3} \text{ rotations}}$

② $822 \cdot \frac{\pi}{180} = \frac{822}{180}\pi = \frac{137}{30}\pi$ radians ≈ 14.35 radians

$\boxed{\theta = \frac{137}{30}\pi \text{ radians} \approx 14.35 \text{ radians}}$

③ $AL = \theta r$ $d = 4$ $r = 2$ inches $r = \frac{2}{12} = \frac{1}{6}$ ft

$AL = \theta r = \left(\frac{137}{30}\pi\right)(2) = \frac{274\pi}{30}$ inches $= \frac{137}{15}\pi$ inches

$\boxed{AL \approx 28.69 \text{ inches}}$

④ Same as #3 $\boxed{AL = \frac{137\pi}{15} \text{ inches} \approx 28.69 \text{ inches}}$

5a) $t = 15$ sec. $t = \frac{15}{60}$ min $= \frac{1}{4}$ min $t = \frac{15}{3600}$ hr $= \frac{1}{240}$ hr

$LS_{in/sec} = \frac{AL}{t} = AL \cdot \frac{1}{t} = \frac{137\pi}{15} \cdot \frac{1}{15} = \frac{137\pi}{225}$ in/sec

5a) $\boxed{LS_{in/sec} = \frac{137\pi}{225} \text{ in/sec} \approx 1.91 \text{ in/sec}}$

5b) $LS_{ft/sec} = LS_{in/sec} \cdot \frac{1 ft}{12 in} = \frac{137\pi}{225} \cdot \frac{1}{12} = \frac{137}{2700}\pi$

$\boxed{LS_{ft/sec} = \frac{137}{2700}\pi \text{ ft/sec} \approx 0.16 \text{ ft/sec}}$

5c)

$S_{ft/min} =$

$S_{ft/sec} \cdot \frac{60 sec}{1 min}$

$\frac{137\pi \cdot 60}{2700} = \frac{8220\pi}{2700}$

$\boxed{\frac{137\pi}{45} \approx 9.56 \text{ ft/min}}$

(6) AS $\quad \theta = \frac{137\pi}{30}$ rad $\quad t = 15$ sec

$t = \frac{1}{4}$ min

$t = \frac{1}{240}$ hr

$$AS = \frac{\theta}{t} = \frac{\theta}{1} \cdot \frac{1}{t} = \frac{137\pi}{30} \cdot \frac{1}{15} = \frac{137\pi}{450}$$

(6a) $\boxed{AS_{rad/sec} = 0.95 \text{ rad/sec} = \frac{137\pi}{450}}$

(6b) $AS_{rad/min} = AS_{rad/sec} \cdot \frac{60 \text{ sec}}{1 \text{ min}}$

$$= \frac{137\pi}{450} \cdot 60 = \frac{8220}{450}\pi = \frac{274}{15}\pi$$

$$\boxed{AS_{rad/min} = \frac{274}{15}\pi \frac{\text{rad}}{\text{min}} \approx 57.39 \text{ rad/min}}$$

or $AS_{rad/min} = \frac{\theta}{t_{min}} = \frac{\theta}{1} \cdot \frac{1}{t_{min}} = \frac{137\pi}{30} \cdot \frac{1}{\frac{1}{4}}$

$$= \frac{137\pi}{30} \cdot \frac{4}{1} = \frac{548}{30}\pi = \frac{274\pi}{15}$$

$$\boxed{AS_{rad/min} = \frac{274\pi}{15} \approx 57.39 \text{ rad/min}}$$

(7) $\frac{\theta}{t} = \frac{4.8 \text{ rotations}}{1 \text{ sec}} = 4.8 \text{ rotations} \cdot \frac{2\pi \text{ rad}}{1 \text{ rotation}}$

$\boxed{AS = 9.6\pi \frac{\text{rad}}{\text{sec}}}$

$\boxed{\theta = 9.6\pi \text{ rad}}$

$d = 40 \text{ in}$

$r = 20 \text{ in}$

$r = \frac{20}{12} \text{ ft}$

$= \frac{5}{3} \text{ ft}$

(7a) $\boxed{AS_{\text{rad/sec}} = 9.6\pi \text{ rad/sec} \approx 30.16 \text{ rad/sec}}$

(7b) $LS_{\text{in/sec}} = AS_{\text{rad/sec}} \cdot r_{\text{in}} = (9.6\pi)(20)$

$\boxed{LS_{\text{in/sec}} = 192\pi \text{ in/sec} \approx 603.19 \text{ in/sec}}$

(7c) $LS_{\text{ft/min}} = LS_{\text{in/sec}} \cdot \frac{1 \text{ ft}}{12 \text{ in}} \cdot \frac{60 \text{ sec}}{1 \text{ min}}$

$= 192\pi \cdot \frac{1}{12} \cdot \frac{60}{1} = \frac{11520\pi}{12}$

$\boxed{LS_{\text{ft/min}} = 960\pi \text{ ft/min} \approx 3015.93 \text{ ft/min}}$

OR

$LS_{\text{ft/min}} = \frac{\theta_{\text{rad/min}}}{t_{\text{min}}} r_{\text{ft}} = \frac{(9.6\pi)(\frac{5}{3})}{\frac{1}{60} \text{ min}}$

$= 9.6\pi \cdot \frac{5}{3} \cdot \frac{60}{1} = 9.6\pi \cdot 100$

$\boxed{LS_{\text{ft/min}} = 960\pi \text{ ft/min} \approx 3015.93 \text{ ft/min}}$

Problem 1

Version 2872 °

1) $2872\,° = \frac{359}{45}$ rotations

$= 7 + \frac{44}{45}$ rotations

≈ 7.9777778 rotations

2) $\theta = \frac{718 \cdot \pi}{45}$ radians ≈ 50.13 radians

3) AL $= \frac{718 \cdot \pi}{15}$ inches ≈ 150.38 inches

4) Sames as #3

AL $= \frac{718 \cdot \pi}{15}$ inches ≈ 150.38 inches

5a) LS $\frac{in}{seconds} = \frac{718 \cdot \pi}{675} \frac{in}{seconds}$

$\approx 3.34 \frac{in}{seconds}$

5b) LS $\frac{feet}{seconds} = \frac{359 \cdot \pi}{4050} \frac{feet}{seconds}$

$\approx 0.28 \frac{feet}{seconds}$

5c) LS $\frac{feet}{minute} = \frac{718 \cdot \pi}{135} \frac{feet}{minute}$

$\approx 16.71 \frac{feet}{minute}$

6a) AS $\frac{radians}{second} = \frac{718 \cdot \pi}{2025} \frac{radians}{second}$

$\approx 1.11 \frac{radians}{second}$

6b) AS $\frac{radians}{minute} = \frac{2872 \cdot \pi}{135} \frac{radians}{minute}$

$\approx 66.83 \frac{radians}{minute}$

7a) AS $\frac{radians}{second} = \frac{58 \cdot \pi}{5} \frac{radians}{second} \approx 36.44 \frac{radians}{second}$

7b) LS $\frac{in}{second} = 348 \cdot \pi \approx 1093.27 \frac{in}{second}$

7c) LS $\frac{feet}{minute} = 1740 \cdot \pi \approx 5466.37 \frac{feet}{minute}$

Solutions 2872

① Revolutions $\frac{2872}{360} = 7\frac{44}{45} = 7.9\overline{7} = \frac{395}{45}$

② $2872 \cdot \frac{\pi}{180} = \frac{2872}{180}\pi = 15.9\overline{5}\pi = \boxed{\frac{718}{45}\pi \text{ radians}}$

$\boxed{\theta \approx 50.13 \text{ radians}}$

③ $AL = \theta r$ inches $\quad d = 6 \rightarrow r = 3$ inches

$AL = \left(\frac{718}{45}\pi\right)(3) = \frac{4308}{45}\pi = \boxed{\frac{718}{15}\pi \text{ inches}}$

$\boxed{AL \approx 150.38 \text{ inches}}$

④ Same as #3 $\quad \frac{718\pi}{15}$ inches ≈ 150.38 in

⑤a $t = 45$ seconds $\quad LS_{in/sec} = \frac{AL}{t}$

$= \frac{\theta r}{t} = \frac{718\pi}{15} \cdot \frac{1}{45}$

$LS_{in/sec} = \frac{718}{675}\pi$

$LS_{in/sec} \approx 3.34$ in/sec

⑤b $LS_{ft/sec} = LS_{in/sec} \cdot \frac{1}{12} = \frac{718}{675}\pi \cdot \frac{1}{12} = \frac{718}{8100}\pi$

$LS_{ft/sec} = \frac{359}{4050}\pi$ ft/sec

$LS_{ft/sec} \approx 0.28$ ft/sec

(5c) $LS_{ft/min} = LS_{ft/sec} \cdot \frac{60\ sec}{1\ min}$

$= \frac{359\pi}{4050} \cdot 60$

$= \frac{21540\pi}{4050}$

$$\boxed{\begin{aligned} LS_{ft/min} &= \frac{718\pi}{135}\ ft/min \\ LS_{ft/min} &\approx 16.71\ ft/min \end{aligned}}$$

(6a) $t = 45\ sec \qquad t = 3/4\ min$

$AS = \frac{\theta}{t} = \frac{718\pi}{45} \cdot \frac{1}{45} = \frac{718\pi}{2025}\ \frac{radians}{sec}$

$\boxed{AS \approx 1.11\ rad/sec}$ $\boxed{AS_{rad/sec} = \frac{718\pi}{2025}\ \frac{radians}{sec}}$

(6b) $AS_{rad/min} = AS_{rad/sec} \cdot \frac{60\ sec}{1\ ft}$

$= \frac{43080\pi}{2025} = \frac{2872\pi}{135}$

$= \boxed{66.83\ \frac{rad}{min}}$

(7) $d = 60\,in$

$r = \frac{60}{2} = 30\,in$

$\theta = 5.8\,\frac{rev}{sec} \rightarrow 5.8(2\pi) = 11.6\pi$

$t = 1\,sec$

$AL = (11.6\pi)(30) = 348\pi\,in$ $\approx 1093.27\,in$

a) $AS = \frac{\theta}{t} = \frac{11.6\pi\,rad.}{1\,sec}$ $\approx 36.44\,\frac{rad}{sec}$

b) $LS = \frac{\theta r}{t} = \frac{348\pi\,in}{1\,sec}$ $\approx 1093.27\,in/sec$

$LS_{ft/min} = LS_{in/sec} \cdot \frac{60\,sec}{1\,min} \cdot \frac{1\,ft}{12\,in}$

$= LS_{ft/sec} \cdot 5$

$= (348\pi)(5)$

c) $LS_{ft/min} = 1740\pi\,ft/min$ $\approx 5466.37\,ft/min$