

1.3.1

(a): $1 \text{ lb/in}^2 = 6894.72 \text{ N/m}^2$

(b): $1 \text{ kip} = 4448.2 \text{ N}$

(c): $1 \text{ ft}^3 = 0.0283 \text{ m}^3$

(d): $1 \text{ in}^2 = 0.0006452 \text{ m}^2$

1.3.3

11.03 m/s

36.17 ft/s

24.66 mph

1.3.5

Radcliffe's time per mile: 5.26 min

Radcliffe's average speed: 5.10 m/s

Radcliffe ran each mile faster by: 2.47 s

Note that the difference between the two runners could also be expressed in minutes (0.041 min), or as a difference in average speed (5.103 m/s for Radcliffe vs 5.064 m/s for Ndereba, or 0.04 m/s difference).

1.3.7

Stiffness: 1.45E+04 N/m 9.94E+02 lb/ft

Unstretched Length: 1.68E-01m 5.52E-01ft

1.4.1

(a): z-axis points out

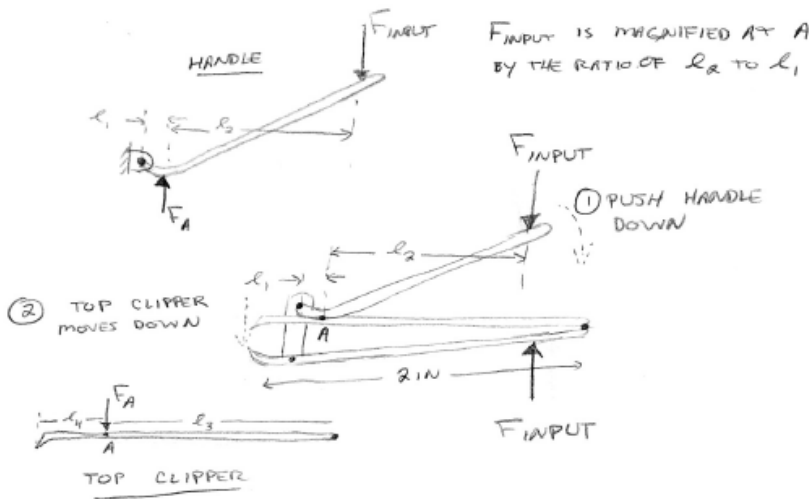
(b): z-axis points in

(c): x-axis points out

(d): y-axis points out

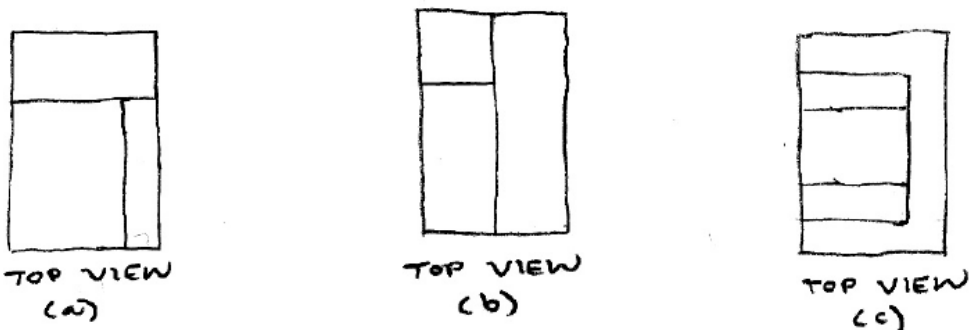
1.5.1

Here is one device as an example:



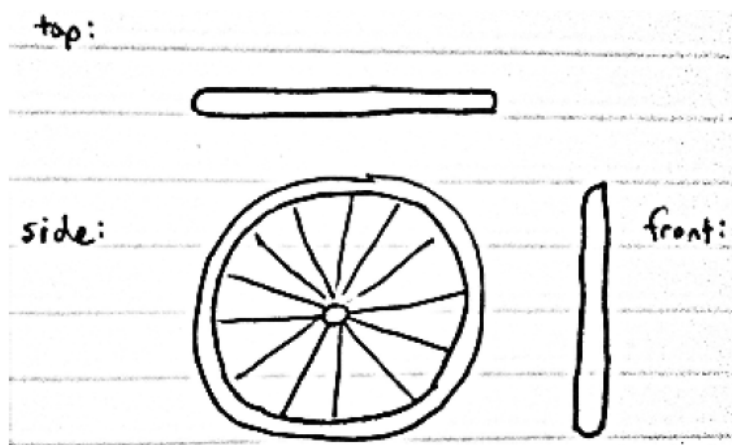
Particular attention should be paid to guidelines given in Section 1.5, especially the last four items listed in Box 1.3. These include proportion, scale, symbols and planning. Objects should be in good proportion, there should be a sense of scale to the drawing (using something of known size, a textual note, grid, or a few dimensions), appropriate use of symbols (arrows, people, coordinates, etc.), and proper planning to show multiple views, etc.

1.5.3

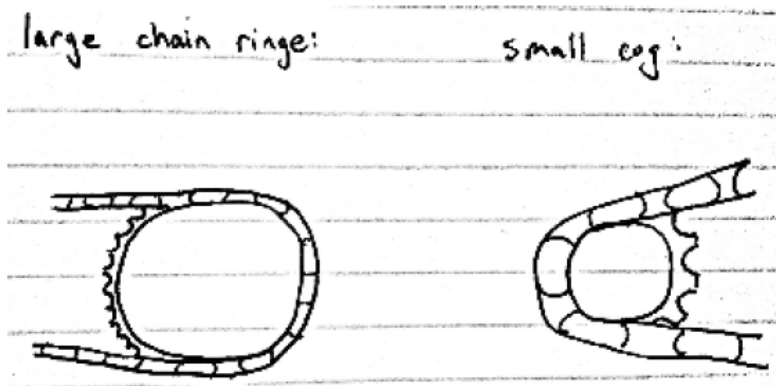


1.5.5

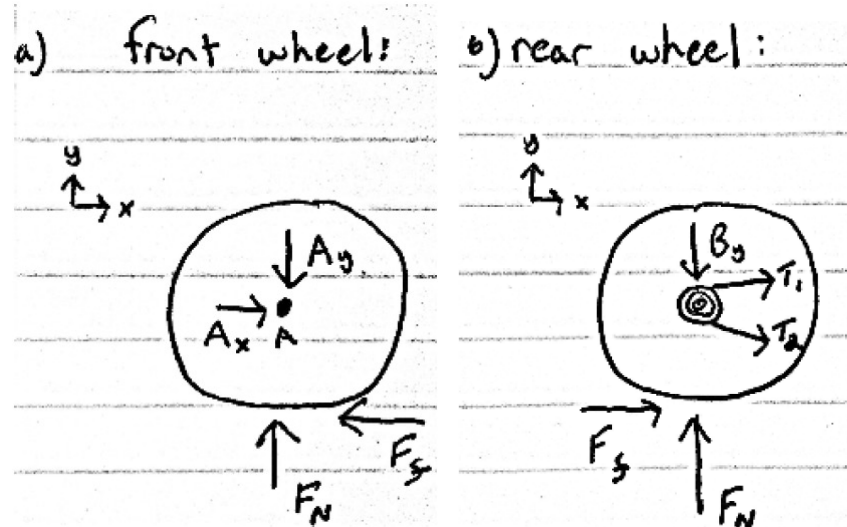
1:

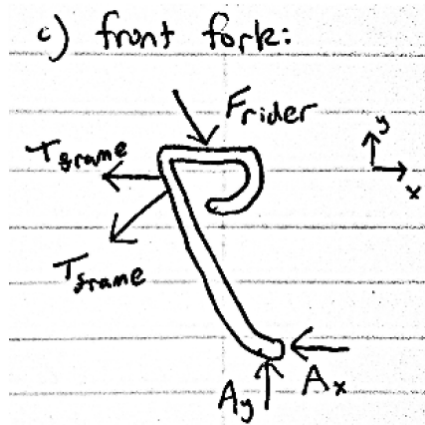


2 (answers will vary):

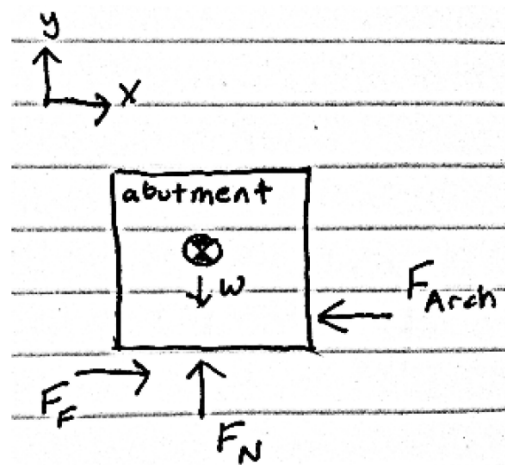


4:





1.5.7



- (a) The arch is in compression and the ends of the arch want to slowly move outwards under increased load.
- (b) The abutments restrict the ends of the arch from moving outward.
- (c) The arch is pushing on the abutments.
- (d) The frictional force of the abutments against the ground prevents them from sliding.
- (e) The abutments provide more resistance to the load pushing downward.
- (f) See drawing.
- (g) A heavier abutment will allow for higher load on the arch because it will not slide as easily.
- (h) There are no forces pulling on the abutment. In the suspension bridge, the anchorage is being pulled by the cables. This is the opposite from what is occurring with the abutment. The analysis requires modeling the amount of horizontal force that the arch bridge applies with a corresponding vertical load. The abutment will then need to balance that horizontal force without moving.

1.6.1

For clarity, should be shown as the column on the far right:

(a): 0.0154 1.54(10^{-2})

(b): 0.837 8.37(10^{-1})

(c): 1.84 1.84(10^0)

(d): 26.4 2.64(10^1)

(e): 375 3.75(10^2)

(f): 6470 6.47(10^3)

1.6.3

$\sigma = (force)/(length)^2$ or force over area

$I = (length)^4$ or length to the forth power

1.6.5

Candy	kcal	mi	m	N	lb
Crunch	230	2.3	3700	0.24	0.054
100 Grand	190	1.9	3100	0.20	0.045
Butterfinger	270	2.7	4300	0.28	0.063
Kit-Kat	220	2.2	3500	0.23	0.052
3 Musketeers	260	2.6	4200	0.27	0.061
Twix	280	2.8	4500	0.29	0.066
Snickers	280	2.8	4500	0.29	0.066
Milky Way	270	2.7	4300	0.28	0.063
M.W.-Lite	170	1.7	2700	0.18	0.040
M.W.-Midnight	220	2.2	3500	0.23	0.052

1.6.7

$$||W_{anchorage}|| = 427 \text{ MN}$$