

Part I: Selected Response

Place your answers on the answer sheet provided for Part I. Do not return the sheets containing the questions for part I. (10 marks)

1) What is the value for x in the diagram to the right?

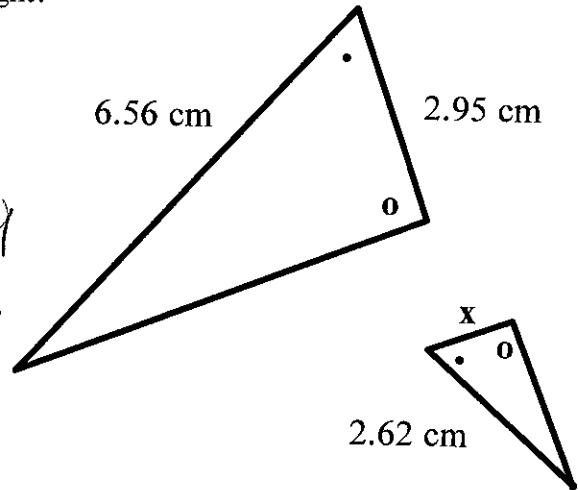
- a) 0.85 cm
- b) 1.18 cm
- c) 5.83 cm
- d) 7.39 cm

$$\frac{6.56}{2.62} = \frac{2.95}{x}$$

$$6.56x = 7.729$$

$$\frac{6.56x}{6.56} = \frac{7.729}{6.56}$$

$$x = 1.18$$



2) What is the value for "x" in the diagram to the right?

- a) 0.9 cm
- b) 2.9 cm
- c) 8.4 cm
- d) 9.3 cm

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

$$5.1^2 = 4.2^2 + b^2$$

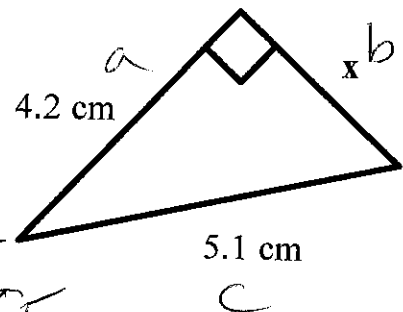
$$26.01 = 17.64 + b^2$$

$$26.01 - 17.64 = 12.64 - 12.64 + b^2$$

$$8.37 = b^2$$

$$\sqrt{8.37} = \sqrt{b^2}$$

$$2.9 = b$$



3) If  $\sin(a) = \cos(b)$ , which answer below is true?

- a)  $a + b = 0^\circ$
- b)  $a + b = 90^\circ$
- c)  $a - b = 90^\circ$
- d)  $ab = 90^\circ$

4) If  $\frac{\sin(A)}{\cos(B)} = \tan(C)$ , which answer below is true?

- a)  $AB = C$
- b)  $A + B = C$
- c)  $A - B = C$
- d)  $A = B = C$

5) What is the value for  $\theta$  in the diagram to the right?

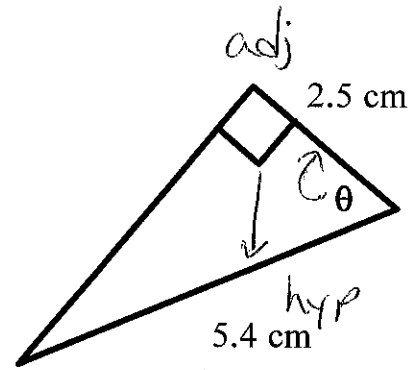
- a)  $24.8^\circ$
- b)  $27.6^\circ$
- c)  $62.4^\circ$
- d)  $65.2^\circ$

$$\cos \theta = \frac{\text{adj}}{\text{hyp}}$$

$$\cos \theta = \frac{2.5}{5.4}$$

$$\cos \theta = 0.4630$$

$$\cos^{-1}(\cos \theta) = \cos^{-1}(0.4630) \rightarrow \theta = 62.4^\circ$$



6) What is the value for  $x$  in the diagram to the right?

- a) 1.1 cm
- b) 2.8 cm
- c) 5.8 cm
- d) 6.4 cm

$$\sin \theta = \frac{\text{opp}}{\text{hyp}}$$

$$\sin 24^\circ = \frac{2.6}{x}$$

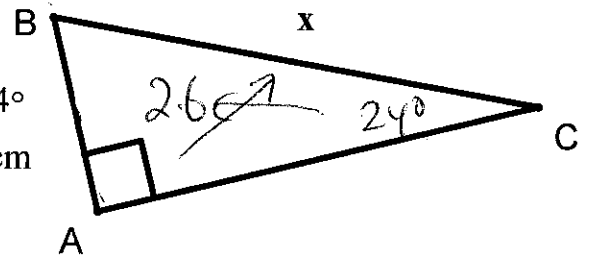
$m\angle BCA = 24^\circ$   
 $m \overline{AB} = 2.6 \text{ cm}$

$$0.4067 = \frac{2.6}{x}$$

$$0.4067x = 2.6$$

$$\frac{0.4067x}{0.4067} = \frac{2.6}{0.4067}$$

$$x = 6.4$$



7) What is the value for  $\theta$  in the diagram to the right?

- a)  $23.7^\circ$
- b)  $26.1^\circ$
- c)  $63.9^\circ$
- d)  $66.3^\circ$

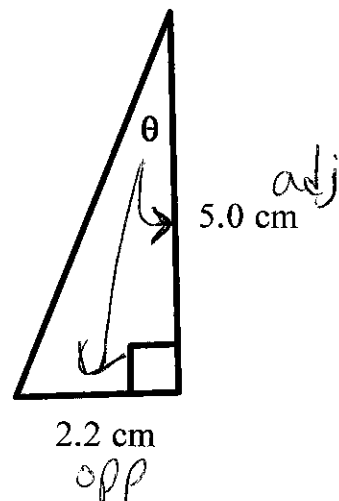
$$\tan \theta = \frac{\text{opp}}{\text{adj}}$$

$$\tan \theta = \frac{2.2}{5.0}$$

$$\tan \theta = 0.4400$$

$$\tan^{-1}(\tan \theta) = \tan^{-1}(0.4400)$$

$$\theta = 23.7^\circ$$



8) If  $-4 = \sqrt{3x-8}$ , what is the value for x?

- a) -7
- b) 7
- c) -7 or 7
- d) There is no solution.

9) If  $-3 = |2x+7|$ , what is the value for x?

- a) -2
- b) -5
- c) -2 and -5
- d) There is no solution.

10) Which answer below represents a Pythagorean triple?

- a) 2, 3,  $\sqrt{14}$
- b)  $\sqrt{5}, \sqrt{7}, 12$
- c)  $\sqrt{2}, \sqrt{3}, \sqrt{5}$
- d) 2, 5,  $\sqrt{13}$

$$(\sqrt{2})^2 + (\sqrt{3})^2 = (\sqrt{5})^2$$

$$2 + 3 = 5$$

Multiple Choice Answers

1. b	6. d
2. b	7. a
3. b	8. d
4. d	9. d
5. c	10. c

Students are required to answer all questions in the space provided. All workings, including diagrams, should be shown. Submit the answer sheet for Part I and all pages of Part II. Place your name on each page.

1) Simplify each of the following:

(4 marks each)

a)  $-2\sqrt{98} - 4\sqrt{52} + 4\sqrt{27} - 6\sqrt{50} - 3\sqrt{48}$

$$\begin{aligned} &= -2(7\sqrt{2}) - 4(2\sqrt{13}) + 4(3\sqrt{3}) - 6(5\sqrt{2}) - 3(4\sqrt{3}) \\ &= -14\sqrt{2} - 8\sqrt{13} + 12\sqrt{3} - 30\sqrt{2} - 12\sqrt{3} \\ &= -44\sqrt{2} - 8\sqrt{13} \end{aligned}$$

b)  $\frac{2}{7}\sqrt{8} + \frac{3}{5}\sqrt{45} - \frac{5}{8}\sqrt{20} + \frac{1}{2}\sqrt{32}$

$$\begin{aligned} &= \frac{2}{7}(2\sqrt{2}) + \frac{3}{5}(3\sqrt{5}) - \frac{5}{8}(2\sqrt{5}) + \frac{1}{2}(4\sqrt{2}) \\ &= \frac{4}{7}\sqrt{2} + \frac{9}{5}\sqrt{5} - \frac{10}{8}\sqrt{5} + 2\sqrt{2} \\ &= \frac{4}{7}\sqrt{2} + 2\sqrt{2} + \frac{9}{5}\sqrt{5} - \frac{10}{8}\sqrt{5} \\ &= \frac{4}{7}\sqrt{2} + \frac{14}{7}\sqrt{2} + \frac{72}{40}\sqrt{5} - \frac{50}{40}\sqrt{5} \\ &= \frac{18}{7}\sqrt{2} + \frac{22}{40}\sqrt{5} \\ &= \frac{18}{7}\sqrt{2} + \frac{11}{20}\sqrt{5} \end{aligned}$$

$$\begin{aligned} \sqrt{98} &= \sqrt{49 \times 2} \\ &= \sqrt{49} \times \sqrt{2} \\ &= 7\sqrt{2} \end{aligned}$$

$$\begin{aligned} \sqrt{52} &= \sqrt{4 \times 13} \\ &= \sqrt{4} \times \sqrt{13} \\ &= 2\sqrt{13} \end{aligned}$$

$$\begin{aligned} \sqrt{27} &= \sqrt{9 \times 3} \\ &= \sqrt{9} \times \sqrt{3} \\ &= 3\sqrt{3} \end{aligned}$$

$$\begin{aligned} \sqrt{50} &= \sqrt{25 \times 2} \\ &= \sqrt{25} \times \sqrt{2} \\ &= 5\sqrt{2} \end{aligned}$$

$$\begin{aligned} \sqrt{48} &= \sqrt{16 \times 3} \\ &= \sqrt{16} \times \sqrt{3} \\ &= 4\sqrt{3} \end{aligned}$$

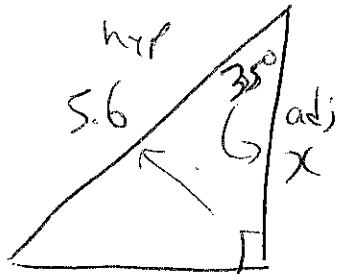
$$\sqrt{8} = \sqrt{4 \times 2} = 2\sqrt{2}$$

$$\begin{aligned} \sqrt{45} &= \sqrt{9 \times 5} = \sqrt{9} \times \sqrt{5} \\ &= 3\sqrt{5} \end{aligned}$$

$$\begin{aligned} \sqrt{20} &= \sqrt{4 \times 5} = \sqrt{4} \times \sqrt{5} \\ &= 2\sqrt{5} \end{aligned}$$

$$\begin{aligned} \sqrt{32} &= \sqrt{16 \times 2} = \sqrt{16} \times \sqrt{2} \\ &= 4\sqrt{2} \end{aligned}$$

- 2) A ladder that is 5.6 m long is leaned against a wall in such a way as to make a  $35^\circ$  angle with the wall. Assuming the wall is vertical and the base of the ladder is on the ground, how high up the wall did the ladder actually reach? (3 marks)



$$\cos \theta = \frac{\text{adj}}{\text{hyp}}$$

$$\cos 35^\circ = \frac{x}{5.6}$$

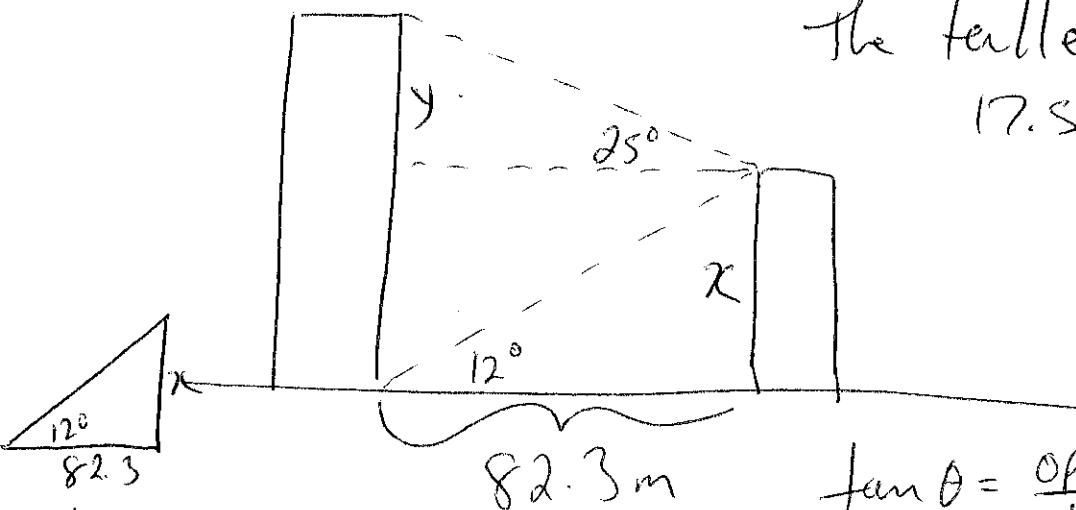
$$\frac{0.8192}{1} \times \frac{x}{5.6}$$

$$x = 4.6$$

The ladder reached 4.6 m the wall.

- 3) Two office towers are 82.3 m apart. From the shorter one, the angle of elevation to the top of the other is  $25^\circ$ , while the angle of depression to the base is  $12^\circ$ . How tall is each tower? (7 marks)

The smaller tower is 17.5 m  
 The taller tower is  
 $17.5 + 38.4 = 55.9 \text{ m}$



$$\tan \theta = \frac{\text{opp}}{\text{adj}}$$

$$\tan 12^\circ = \frac{x}{82.3}$$

$$\frac{0.2126}{1} \times \frac{x}{82.3}$$

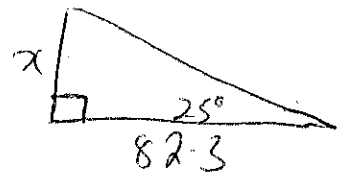
$$x = 17.5$$

$$\tan \theta = \frac{\text{opp}}{\text{adj}}$$

$$\tan 25^\circ = \frac{x}{82.3}$$

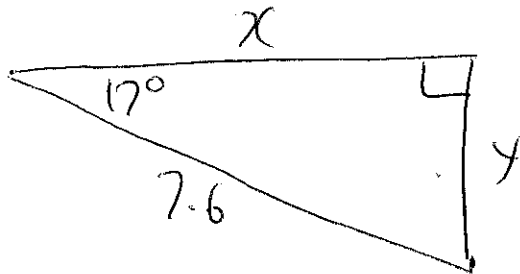
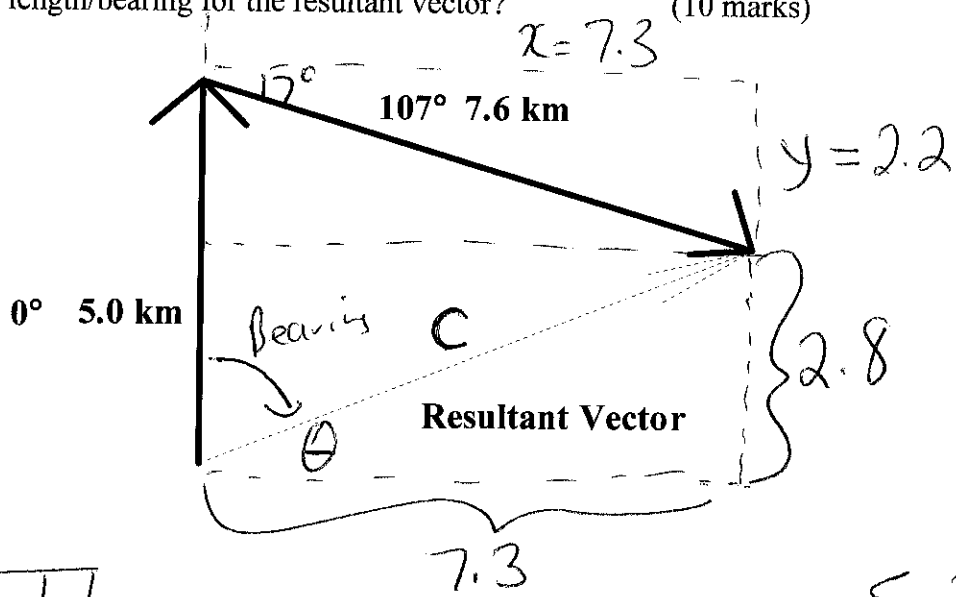
$$\frac{0.4663}{1} \times \frac{x}{82.3}$$

$$x = 38.4$$



4) What is the length/bearing for the resultant vector? (10 marks)

$$107^\circ - 90^\circ = 17^\circ$$



$$5 - 2.2 = 2.8$$

$$\tan \theta = \frac{2.8}{7.3}$$

$$\tan \theta = 0.3836$$

$$\tan^{-1}(\tan \theta) = \tan^{-1}(0.3836)$$

$$\theta = 21^\circ$$

$$\sin 17^\circ = \frac{y}{7.6}$$

$$0.2924 = \frac{y}{7.6}$$

$$\cos 17^\circ = \frac{x}{7.6}$$

$$0.9563 = \frac{x}{7.6}$$

$$y = 2.2$$

$$x = 7.3$$

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

$$c^2 = 2.8^2 + 7.3^2$$

$$c^2 = 7.84 + 53.29$$

$$c^2 = 61.13$$

$$\sqrt{c^2} = \sqrt{61.13}$$

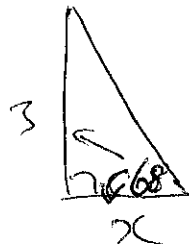
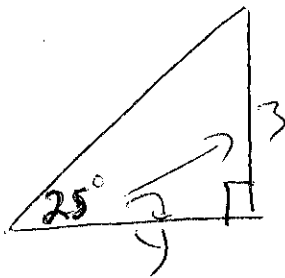
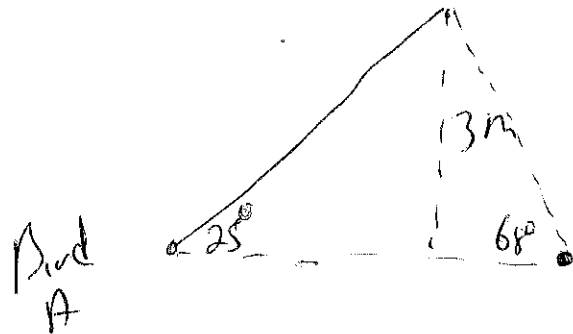
$$c = 7.8$$

$$90^\circ - 21^\circ = 69^\circ$$

Vector distance = 7.8 km

Vector bearing =  $69^\circ$

- 5) Two blue jays (not baseball players... birds!) are feeding beneath a 3m high bird feeder. One bird observes a squirrel at the top of the feeder at an angle of elevation of  $68^\circ$  while another observes the same squirrel at an angle of elevation of  $25^\circ$ . How far apart are the two birds? (6 Marks)



$$\tan \theta = \frac{\text{OPP}}{\text{adj}}$$

$$\tan 25^\circ = \frac{3}{y}$$

$$0.4663 = \frac{3}{y}$$

$$\begin{aligned} 0.4663y &= 3 \\ \frac{0.4663}{0.4663} \quad \frac{0.4663}{0.4663} \\ y &= 8.6 \end{aligned}$$

$$\tan 68^\circ = \frac{3}{x}$$

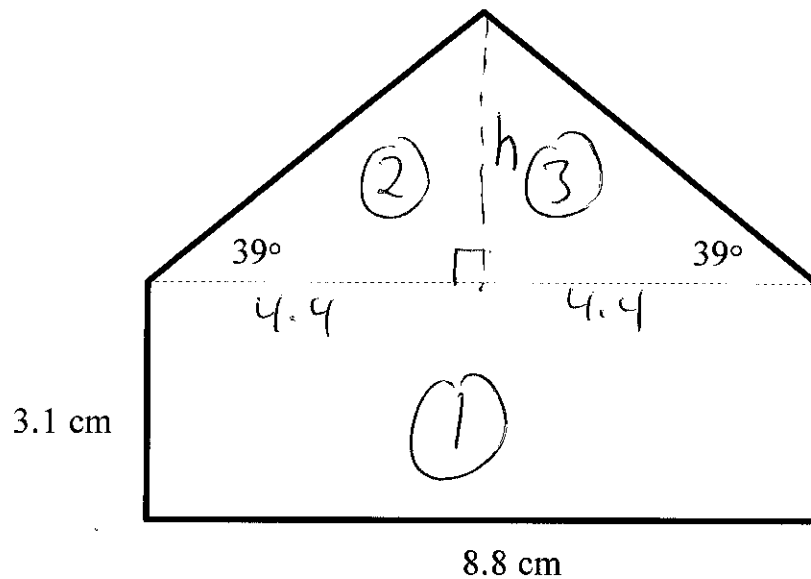
$$2.4751 = \frac{3}{x}$$

$$\begin{aligned} 2.4751x &= 3 \\ \frac{2.4751}{2.4751} \quad \frac{3}{2.4751} \\ x &= 1.2 \end{aligned}$$

The birds are  $8.6 + 1.2 = 9.8$  m apart.

6) Find the area of the shape below. Be sure to show all workings.

(6 marks)



$$\textcircled{1} \text{ Area} = b \times h$$

$$A = 3.1 \times 8.8$$

$$A = 27.28 \text{ cm}^2$$

$$\textcircled{2} \tan \theta = \frac{\text{opp}}{\text{adj}}$$

$$\tan 39^\circ = \frac{h}{4.4}$$

$$\frac{0.8098}{1} = \frac{h}{4.4}$$

$$h = 3.56 = 3.6$$

$$\textcircled{3} A = \frac{1}{2} \times b \times h$$

$$A = 0.5 \times 4.4 \times 3.6$$

$$A = 23.76 \text{ cm}^2$$

$$A = \frac{1}{2} \times b \times h$$

$$A = 0.5 \times 4.4 \times 3.6$$

$$A = 23.76 \text{ cm}^2$$

$$\text{Total Area} = 27.28 + 23.76 + 23.76$$

$$= 82 \text{ cm}^2$$



7) Solve for x. Verify your solutions.

a)  $\sqrt{2x+4} = \sqrt{3x-5}$

(5 marks)

$$(\sqrt{2x+4})^2 = (\sqrt{3x-5})^2$$

$$2x+4 = 3x-5$$

$$2x-2x+4 = 3x-2x-5$$

$$4 = x-5$$

$$4+5 = x-5+5$$

$$9 = x$$

Check:

$$\sqrt{2(9)+4} = \sqrt{3(9)-5}$$

$$\sqrt{18+4} = \sqrt{27-5}$$

$$\sqrt{22} = \sqrt{22}$$

b)  $|2x-5|-3=10$

(5 marks)

$$|2x-5|-3+3 = 10+3$$

$$|2x-5| = 13$$

$$-(2x-5) = 13$$

$$-2x+5 = 13$$

$$-2x+5-5 = 13-5$$

$$\frac{-2x}{-2} = \frac{8}{-2}$$

$$x = -4$$

$$2x-5 = 13$$

$$2x-5 = 13$$

$$2x-5+5 = 13+5$$

$$\frac{2x}{2} = \frac{18}{2}$$

$$x = 9$$

Check

$$|2(-4)-5|-3 = 10$$

$$|-8-5|-3 = 10$$

$$|-13|-3 = 10$$

$$13-3 = 10$$

$$10 = 10$$

$$|2(9)-5|-3 = 10$$

$$|18-5|-3 = 10$$

$$|13|-3 = 10$$

$$13-3 = 10$$

$$10 = 10$$