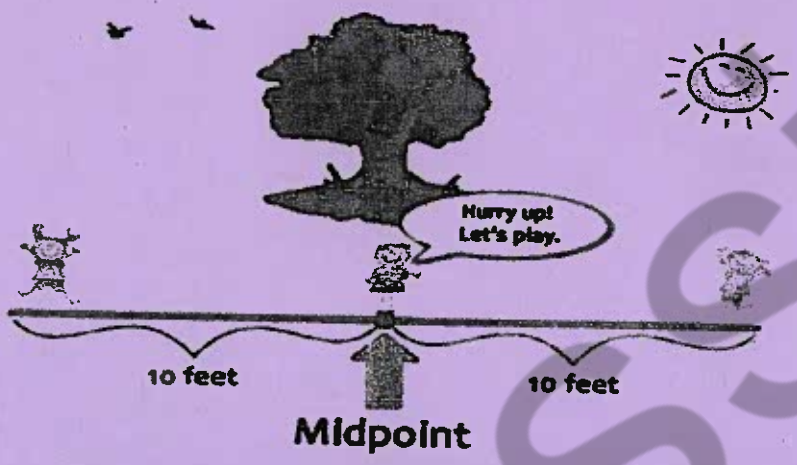
Solution Key

Booklet #3

Math 404

Analytic Geometry:
- Distance
- Midpoint
- Midpoint Backwards
- Point of Division



Mrs. Nassif

Nassif

ANALYTIC GEOMETRY

DISTANCE BETWEEN TWO POINTS

Find the distance between the two points.

1.] (-4, 2) and (2,-1) (6.71)

2.] (-2, -3) and (-2, 4) 7

3.] (3, 2) and (5, -2) 4.5

4.] (5, -7) and (8,-2) 5.83

5.] (-1, 2) and (2, -4) 6.7

6.] (4, 3) and (-3, 4) 7.1

7.] (0, 4) and (2, 3) 2.2

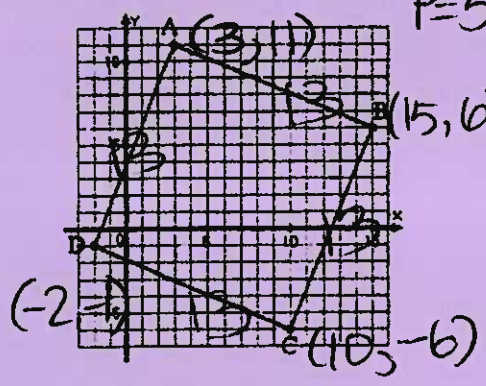
8.] (1, -9) and (6, -6) 5.83

9.] (5, -10) and (- 5, 4) 17.2

10.] (5, 5) and (- 6, - 4) 14.2

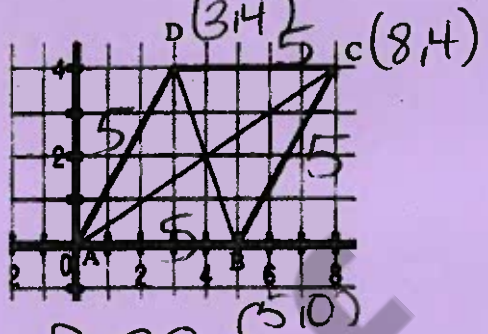
11.] **Find the perimeter of the shapes below given the following coordinates.**

A.



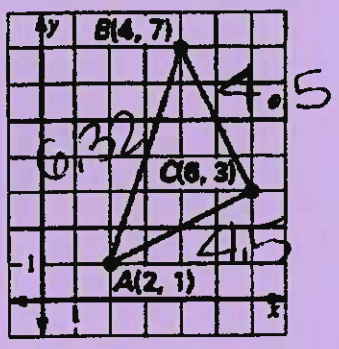
P=52

C.



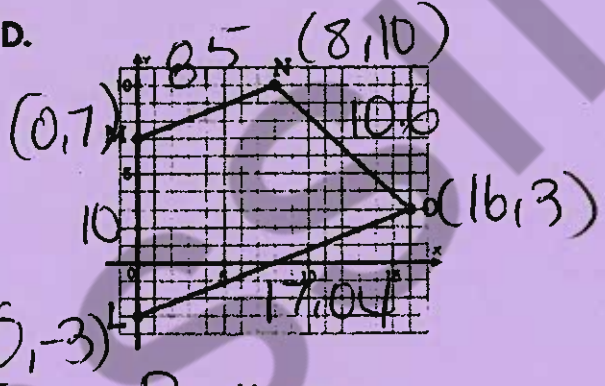
P=20

B.



P=15.32

D.



P=46.25

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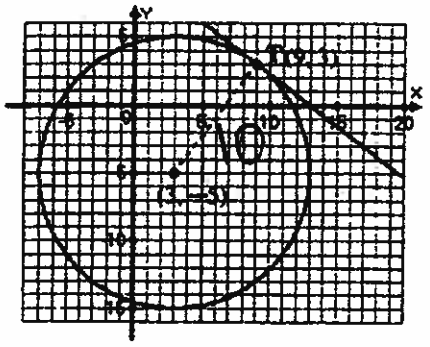
12.] Find the length of the diameter.

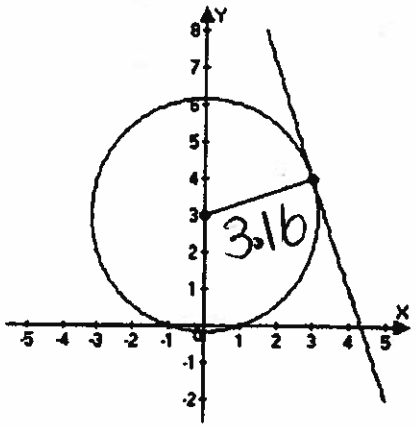
10X2=20

a.



3.16X2=6.32

B.

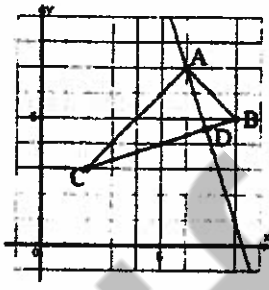


13.] Find the area of triangle ABC given the height AD of triangle ABC where D is on side BC for A(6,7), B(8,5), and C(2,3). D=(8,4.5)

d(B,C)=6.32

d(A,D)=2.7

$A = \frac{6.32 \times 2.7}{2} = 8.51$



14.] Classify ΔABC with A(–3, 7), B(4, 5), C(–1, 0) as scalene, isosceles, or equilateral.

d(AB)=7.3 d(BC)=7.1 d(AC)=7.3 ISOSCELES

15.] Prove that the quadrilateral with vertices M(5,3), N(15,9), O(9,19), and P(-1,13) is a square. (You have to show that distances are equal and sides are perpendicular.)

16.] ΔLMN has vertices $L(-2, 3)$, $M(3, 4)$, $N(2, -1)$.

a. Determine whether the triangle is equilateral, isosceles or scalene.

b. Determine the perimeter of ΔLMN.

d(LM)=5.1

d(MN)=5.1

d(LN)=5.7

P=15.9

ISOSCELES

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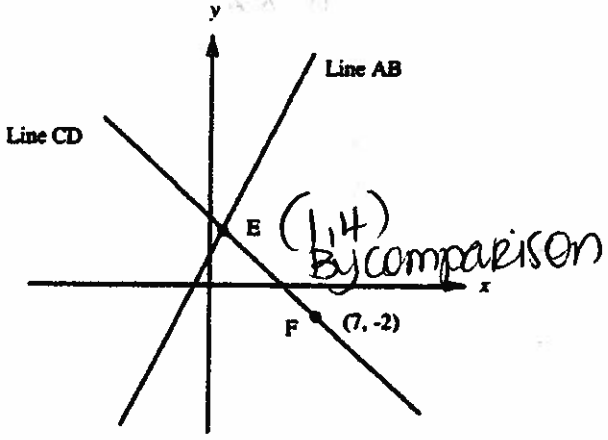
Distance

1 A municipal land surveyor drew a graph on a Cartesian plane showing two sections of a planned water main. These two sections are represented by lines AB and CD whose equations are as follows :

Line AB : $y = 2x + 2$
Line CD : $y = -x + 5$

These lines meet at point E.

A valve is located at points E and F.

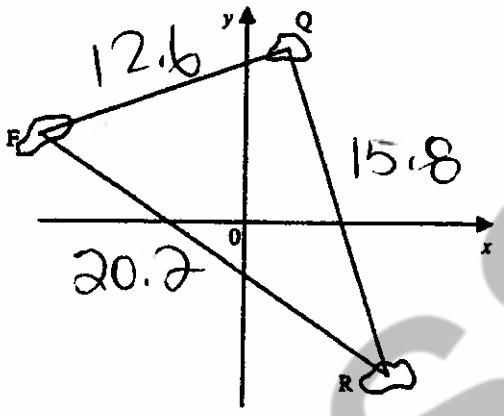


What is the distance between the valve at point E and the valve at point F?

$d(EF) = 8.5$

2 The positions of 3 islands are given by the following points :

F(-10, 4), Q(2, 8) and R(7, -7)



What distance, to the nearest tenth, would a boat have to travel to make a round trip to the three islands?

$P = 48.6$

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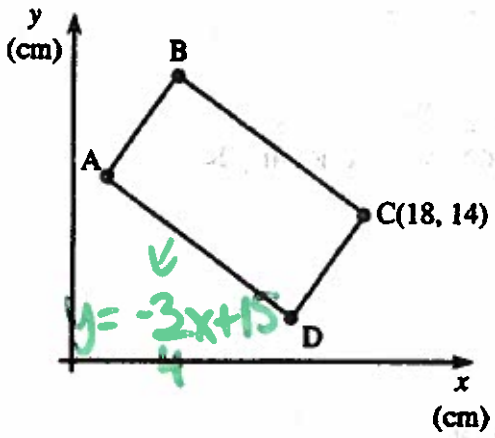
3 The perimeter of rectangle ABCD represented in the Cartesian plane on the right is 52 cm.



The equation associated with segment AD is $3x + 4y - 60 = 0$.

$y = -\frac{3}{4}x + 15$

$y = \frac{4}{3}x + b$

What is the length of segment AD?

$14 = \frac{4}{3}(18) + b$

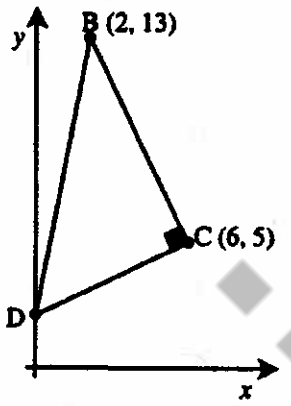
$14 = 24 + b$

$b = -10$

$y = \frac{4}{3}x - 10$

$\frac{4}{3}x - 10 = -\frac{3}{4}x + 15$

4 In triangle BCD drawn in the Cartesian plane on the right, $m\angle BCD = 90°$.



Point D is located on the y-axis.

What is the length of hypotenuse BD, to the nearest hundredth?

Step1 Find Slope $\overline{BC}$

$a = \frac{13-5}{2-6} = \frac{8}{-4} = -2$

Step2 Find Slope $\overline{CD}$

$-2 \rightarrow \frac{1}{2}$

Step3 Find equation $\overline{CD}$

$y = \frac{1}{2}x + b$

$5 = \frac{1}{2}(6) + b$

$b = 2$ $D(0, 2)$

Step4 Find $d(BD)$

$d = \sqrt{(13-2)^2 + (2-0)^2}$

$d = 11.2$

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MIDPOINT BETWEEN TWO POINTS

Find the MIDPOINT between the two points.

1.] (0, 2) and (6, 4) (3,3)

2.] (-2, 2) and (6, 4) (2,3)

3.] (6,-7) and (-6, 3) (0,-2)

4.] (-11, 3) and (8,-7) (-1.5,-2)

5.] (2, 3) and (1, -1) (1.5,1)

6.] (7, 3) and (-1, -4) (3,-0.5)

7.] (3, -5) and (-3, 0) (0,-2.5)

8.] (6, -7) and (3, -5) (4.5,-6)

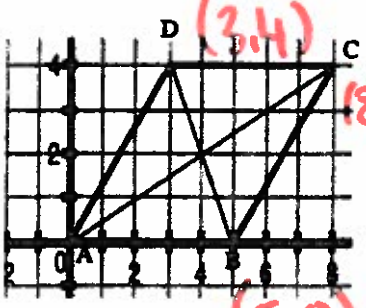
9.] (5, 1) and (-8, 6) (-1.5,3.5)

10.] (-4, -3) and (1, 4) (-1.5,0.5)

For the given endpoints of a diameter of a circle, find

		a. the center of the circle	b. the radius of the circle
11.]	(-8, 6) and (0, 0)	(-4,3)	5
12.]	(4,-9) and (-2, -9)	(1,-9)	3
13.]	(-5, 7) and (4, -2)	(-0.5, 2.5)	6.36
14.]	(-2, -3) and (4, 5)	(1, 1)	5
15.]	(3, 4) and (2, 1)	(2.5,2.5)	1.58

16.] Verify that the midpoint of diagonal AC is the same as the midpoint of diagonal BD.



(3,4)

(8,4)

(5,0)

(0,0)

$M(AC) = M(BD) = ?$

$\left(\frac{8+0}{2}, \frac{4+0}{2}\right) = \left(\frac{5+3}{2}, \frac{4+0}{2}\right)$?

$(4,2) = (4,2)$ ✓

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Midpoint

Q (9,5)
T
(3,9) L
B (21,18)

1 **In a Cartesian co-ordinate system, La Tuque is located at point (3, 9), Baie-Comeau at point (21, 18) and Quebec City at point (9, 5).**

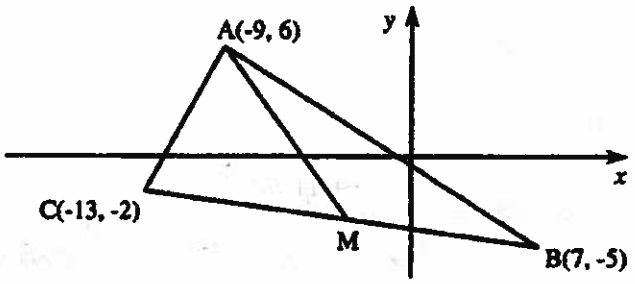
Tadoussac M(BQ) = (15, 11.5)

Tadoussac is located at the midpoint of the segment joining the points corresponding to Quebec and Baie-Comeau.

In Cartesian plane units, what is the measure of the segment joining the points corresponding to La Tuque and Tadoussac?

$d(T,L) = \sqrt{(3-15)^2+(9-11.5)^2} = 12.3$

2 **In the Cartesian plane below, segment AM is a median of triangle ABC.**



What are the coordinates of point M? M = (-3, -3.5)

3 **Consider square PQRS in the Cartesian plane below.**

Vertex P is located on the *y*-axis.

Diagonals PR and QS intersect at E. What are the coordinates of point E?

Slope $\overline{QR} = \frac{56-20}{36-54} = \frac{36}{-18} = -2$

Slope $\overline{PQ} = 1/2$

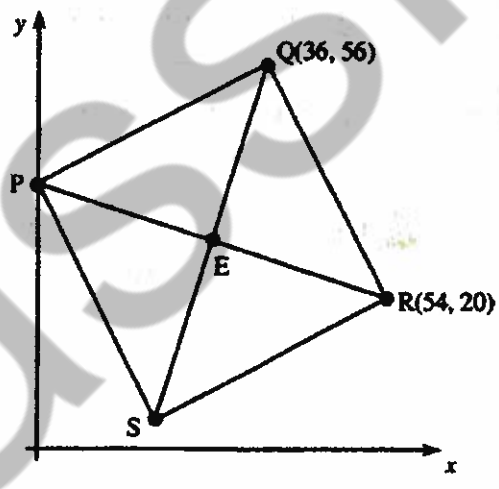
eq. $\overline{PQ}$ = $y = 1/2x + b$

$56 = 1/2(36) + b$

$56 = 18 + b$

$b = 38$

$y = 1/2x + 38$



M(PR) = (27, 29)

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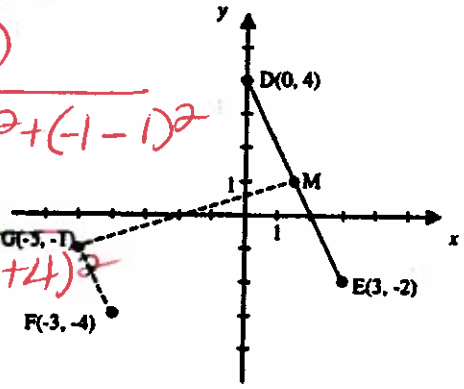
4 To service a new residential development, the town surveyor has drawn on a Cartesian plane the new part of the water main that must be constructed.

$\overline{DE}$ represents the existing water main.

$\overline{FG}$ and $\overline{GM}$ represent the new water main, where M is the midpoint of $\overline{DE}$



$M(DE) = (1.5, 1)$

$d(GM) = \sqrt{(-5-1.5)^2+(-1-1)^2}$

$= 6.8$

$d(FG) = \sqrt{(-5+3)^2+(-1+4)^2}$

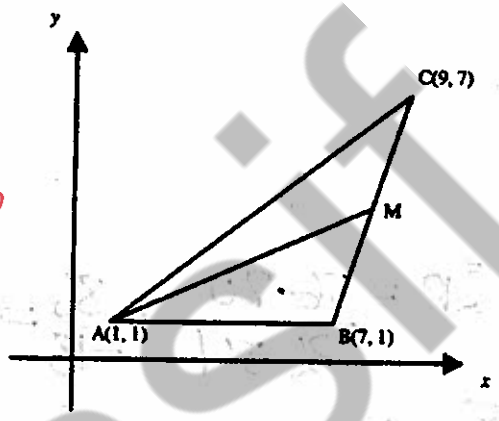
$= 3.6$

Rounded to the nearest tenth, what is the total length of the new water main FGM?

$FGM = 3.6 + 6.8$

$= 10.41$

5 In a Cartesian plane, the coordinates of the vertices of triangle ABC are A(1, 1), B(7, 1) and C(9, 7). The median AM is also drawn. What is the perimeter of triangle AMB?



$M(BC) = (8, 4)$

$d(AM) = \sqrt{(8-1)^2+(4-1)^2} = 7.6$

$d(MB) = \sqrt{(8-7)^2+(4-1)^2} = 3.2$

$d(AB) = \sqrt{(7-1)^2+(1-1)^2} = 6$

Total $= 16.8$

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MIDPOINT BACKWARDS

Given the midpoint and one endpoint of a line segment, find the other endpoint.

	Endpoint	Midpoint
1.]	(-9, -1)	(8, 14)
2.]	(10, 12)	(6, 9)
3.]	(-8, -10)	(10, -7)
4.]	(-11, 9)	(3, -11)
5.]	(-2, 7)	(12, -10)
6.]	(11, 14)	(10, 14)
7.]	(14, -8)	(5, 8)
8.]	(-9,0)	(10, -7)
9.]	(1, 1)	(-2, -2)
10.]	(100, 20)	(-20, -90)

DIVISION POINT

Complete the table below.

Ratio	Fraction	a	b
2:1	2/3	2	1
3:5	3/8	3	5
2:5	2/7	2	5
4:7	4/11	4	7
3:6	3/9	3	6
1:6	1/7	1	6
2:3	2/5	2	3
4:4	4/8	4	4
1:2	1/3	1	2
4:2	4/6	4	2
1:4	1/5	1	4
2:1	2/3	2	1

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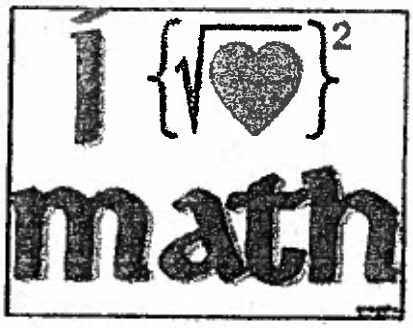
POINT OF DIVISION

Find the point of division.



1. Point P divides a segment with endpoints A(-3, 4) and B (6, 1) in the ratio 2:1 from point A.
2. Point P divides segment AB in the ratio 3:1 from B where A (-3, 1) and B (5, 3).
3. Point P divides a line segment with endpoints A(14, 4) and B (2, 1) in the ratio 1:2 from B.
4. On segment AB, point P is 2/5ths of the way from A where A (-1, 2) and B (-16, 2).
5. Point P is 3/8^{ths} of the way from B on segment AB where A (-12, -17) and B (-4, -1).
6. Find the point two-thirds of the way from A along the line from A(-2, -3) to B(4, 6).
7. If A(-5, 7) and B(3, -9), find the point that divides AB in a ratio of 3:5 from B
8. Point P divides a segment with endpoints A(6, -9) and B (8, 10) in the ratio 4/7ths of the way from point A.
9. Point P divides segment ST in the ratio 2/5ths of the way from S where S (-3, 10) and T (15, 3).
10. Point P divides a line segment with endpoints S(14, 4) and T (2, 1) in the ratio 1:2 from T.
11. Find the point two-thirds of the way from D along the line from C(-20, -30) to D(40, 60).
12. If R(-55, 75) and S(35, -95), find the point that divides RS in a ratio of 3:2 from S
13. Point P divides a segment with endpoints Y(6, -9) and Z (8, 10) in the ratio 4/5ths of the way from point Y.
14. Point P divides segment EF in the ratio 4/5ths of the way from F where E (-30, 10) and F (15, 30).
15. Point P divides a line segment with endpoints J(14, 4) and K (2, 1) in the ratio 4:5 from K.

ANSWERS

1. (3,2)
2. (-1,1.5)
3. (6,2)
4. (-7,2)
5. (-7,-7)
6. (2,3)
7. (0,-3)
8. (7.14,1.86)
9. (4.2,7.2)
10. (6,2)
11. (0,0)
12. (-19,7)
13. (7.6,6.2)
14. (-21,14)
15. (7.3,2.3)

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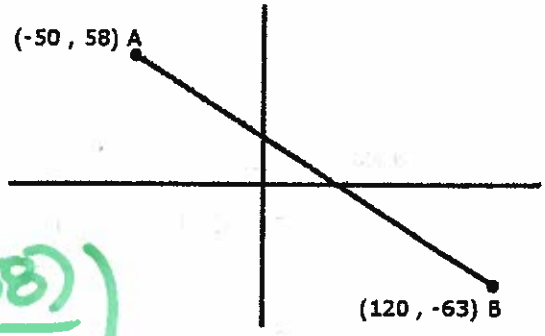
Division Point

1. What are the coordinates of the ordered pair located $\frac{2}{3}$ of the way **from A** along line segment $\overline{AB}$?

A: (-50 , 58)
B: (120 , -63)

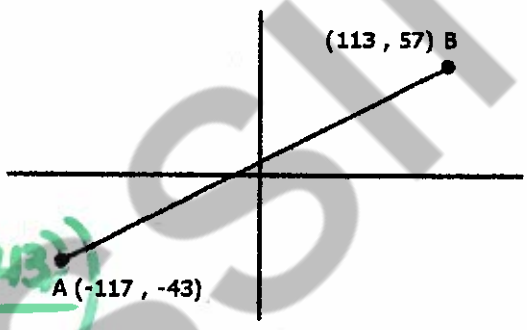


$$\left(\frac{2(120)+1(-50)}{2+1}, \frac{2(-63)+1(58)}{2+1}\right)$$

$$(63.3, -22.7)$$

2. Find the coordinates of the ordered pair that divides line segment $\overline{AB}$ in a ratio of 1:3 starting from A.

A: (-117 , -43)
B: (113 , 57)



$$\left(\frac{1(113)+3(-117)}{1+3}, \frac{1(57)+3(-43)}{1+3}\right)$$

$$(-59.5, -18)$$

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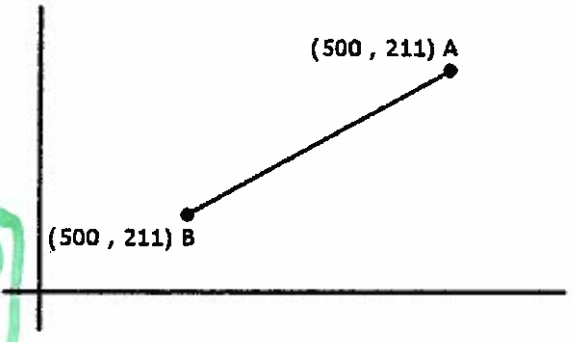
3. What are the coordinates of the ordered pair located $\frac{3}{8}$ of the way along line segment $\overline{BA}$?

A: (500 , 211)
B: (260 , 131)

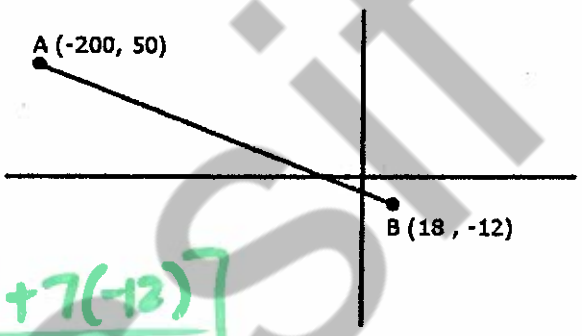


$$\left[\frac{3(500)+5(260)}{3+5}, \frac{3(211)+5(131)}{3+5}\right]$$

(350, 161)

4. What is the location of the ordered pair that divides segment $\overline{BA}$ in a ratio of 1:7

A: (-200 , 50)
B: (18 , -12)



$$\left[\frac{1(-200)+7(18)}{1+7}, \frac{1(50)+7(-12)}{1+7}\right]$$

(-9.25 , -4.25)

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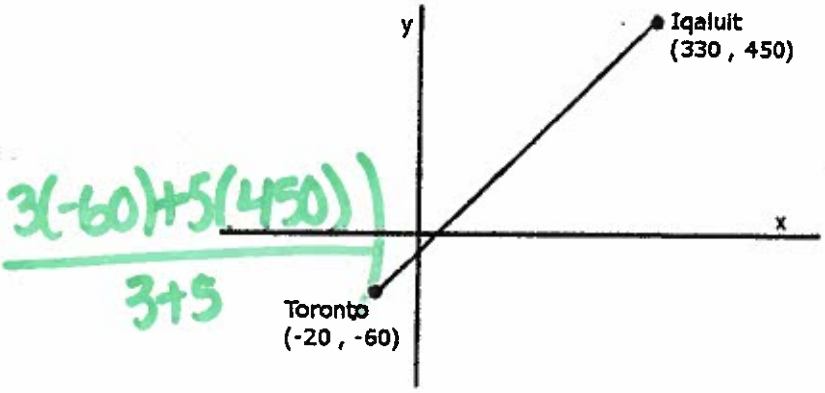
11

5. A flock of geese migrate from Iqaluit **(330 , 450)** to Toronto **(-20 , -60)** every year. Last year they stopped to feed at a location ~~[illegible]~~ that divides their trip in a **ratio** of **3:5**.
What are the coordinates of the place they stop?



$$\left(\frac{3(-20)+5(330)}{3+5}, \frac{3(-60)+5(450)}{3+5}\right)$$

$$(198.75, 258.75)$$

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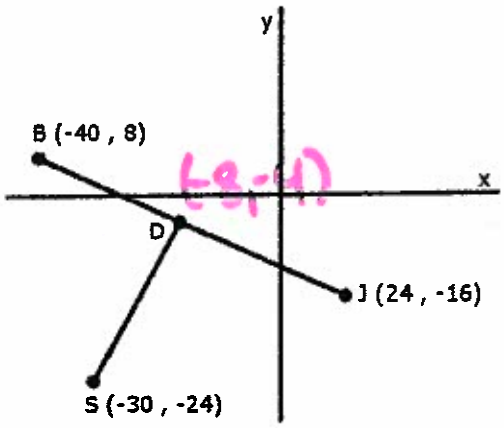
Mixed Problems

1. Diego lives exactly in between James, J (24 , -16), and Brad, B (-40 , 8).
How far is it from Diego's house, D, to the school, S (-30, -24)?
Round your answer to the nearest tenth.



Step1: Find midpoint D

$M = \left(\frac{-40+24}{2}, \frac{8-16}{2}\right)$

$(-8, -4)$

Step2 Find d(SD)

$d = \sqrt{(-8+30)^2 + (-4+24)^2}$

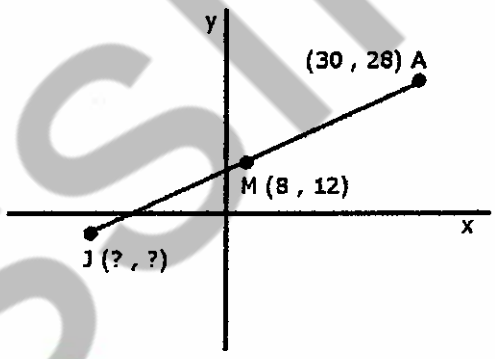
$= 29.7$

Ans: 29.7 units

Midpoint Backwards

SKIP

2. Jeff and Alan run at each other at the same speed.
They collide at point M (8, 12).
Alan started running from point A (30, 28).
Where did Jeff start running from?



$M(x,y) = \left(\frac{x_1+30}{2}, \frac{y_1+28}{2}\right) = (8, 12)$

$\frac{x_1+30}{2} = 8$ | $\frac{y_1+28}{2} = 12$

$x_1 = -14$ | $y_1 = -4$

$J(-14, -4)$

13

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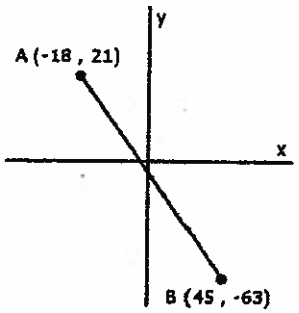
3. What is the point that divides line AB into a ratio of **2 : 5** , starting from point A?

A (-18 , 21)
B (45 , -63)

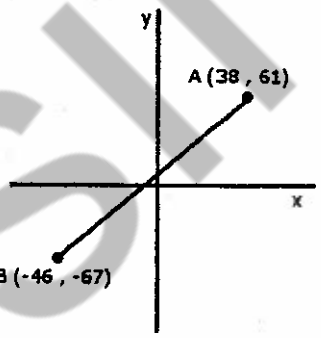


$$\left(\frac{3(45)+5(-18)}{2+5}, \frac{2(-63)+5(21)}{2+5}\right)$$

$$(0, -3)$$

4. What is the point that divides line AB into a ratio of **1 : 3** , starting from point B ?

A (38 , 61)
B (-46 , -67)



$$\left(\frac{1(38)+3(-46)}{1+3}, \frac{1(61)+3(-67)}{1+3}\right)$$

$$(-25, -35)$$

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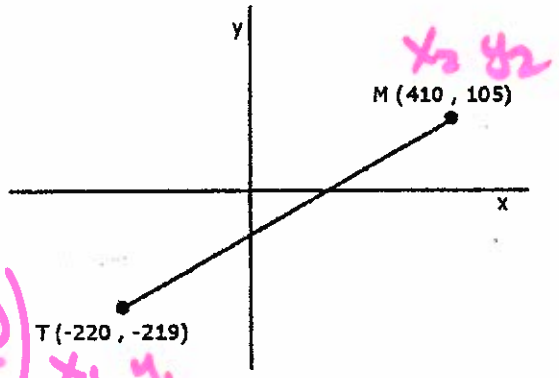
5. Mike is travelling from Montreal to Toronto ***and back.***
On the ***return trip***, he stops at a gas station that divides the line between the cities into a ratio of **2:1**
What are the coordinates of the point where Mike stopped?

Montreal (410 , 105)

Toronto (-220 , -219)



x_2 y_2

x_1 y_1

$$P(x,y) = \left(\frac{2(410)+1(-220)}{3}, \frac{2(105)+1(-219)}{3}\right)$$

$$= (200, -3)$$

Answer: Mike stopped at coordinates (200 , -3)

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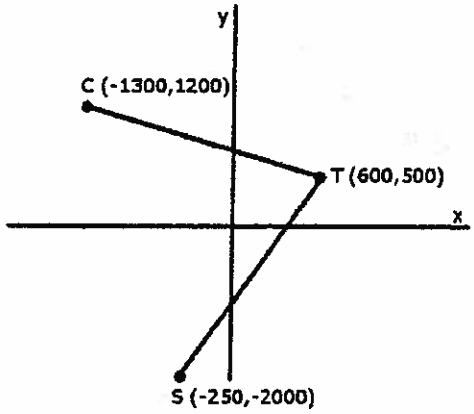
ANALYTIC GEOMETRY – 09 – Practice Quiz

1. Every morning, Chad must jog from his home to Trevor's house, before finally running to school.

How far is his entire morning run? (*round the final answer to the nearest tenth*)



$d(CT) = \sqrt{(600+1300)^2 + (500-1200)^2}$

$= 2024.84\,m$

$d(ST) = \sqrt{(600+250)^2 + (500+2000)^2}$

$= 2640.54\,m$

$2024.84 + 2640.54 = 4665.4\,m$

The trip is 4665.4 meters long.

16

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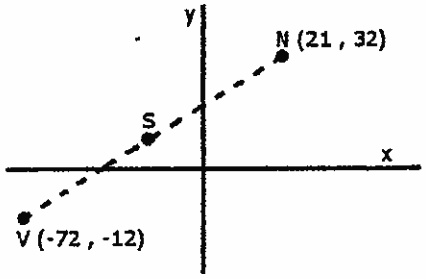
2. Vivi and Nicole are eating lunch outside together when a squirrel falls from a tree and lands on top of them. They each run in opposite directions at exactly the same speed. **If Vivi ends up at coordinates V (-72, -12) and Nicole ends up at N (21, 32), where did the squirrel land?**

$\left(\frac{-72+21}{2}, \frac{-12+32}{2}\right)$

$(-25.5, 10)$



The Squirrel landed at (-25.5 , 10 **)**

3. A giant water balloon was dropped from a plane, landing on Tyler and Zack at coordinates **W (42, -15)** and sending the two boys flying off an equal distance in opposite directions.

If Tyler ends up at coordinates **T (-18, 36)**, where would we expect to find **Zack**?

$42 = \frac{x_1 - 18}{2}$

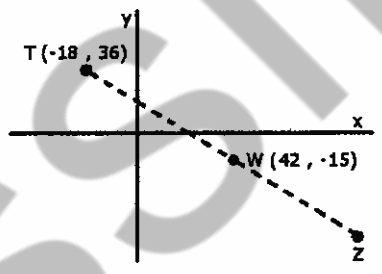
$84 = x_1 - 18$

$x_1 = 102$

$-15 = \frac{y_1 + 36}{2}$

$-30 = y_1 + 36$

$y_1 = -66$



Zack would be found at (102 , -66 **)**

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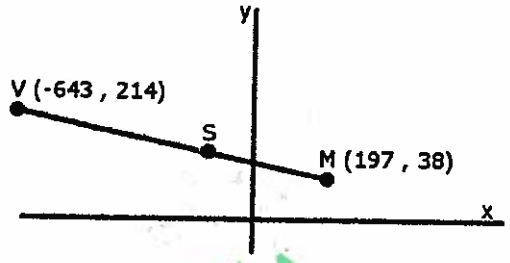
4. Wesley drives from from Montreal to Vancouver, but must stop for sleep at a point that divides his trip in a ratio of **3:5**. What are the coordinates of Wesley's rest stop?



$$\left(\frac{3(-643)+5(197)}{3+5}, \frac{3(214)+5(38)}{3+5}\right)$$

$(-118, 104)$

Wesley's rest stop $(-118, 104)$

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5. A boat filled with fireworks is sailing along on a path described by the rule $y = 2x - 32$. At the same time, an abandoned oil tanker is drifting along on a path described by $2y + 6x - 206 = 0$

When the two ships collide, the explosion will be visible by every vessel within a distance of **30 km.**

A raft filled with kittens is floating at coordinates **K (21 , -4).**

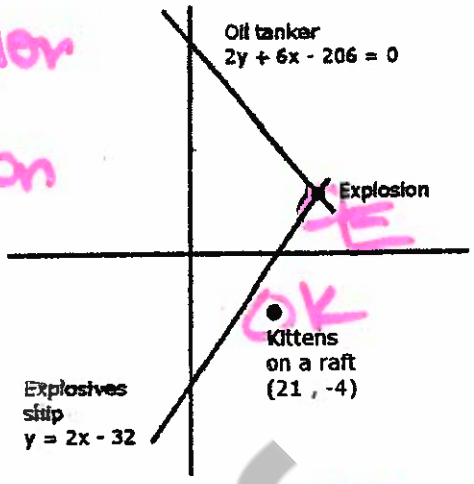
Do the kittens see the fireworks?

Step1: Find coord. of explosion

$2y+6x-206=0$ } Substitution
$y=2x-32$

$2(2x-32)+6x-206=0$
$4x-64+6x-206=0$
$10x-270=0$
$x=27$

$y=2(27)-32$
$y=22$
$(27,22)$



Step2 Find d(E,K)

$d=\sqrt{(-4-22)^2+(21-27)^2}$
$=\sqrt{712}$
$=26.68$ Km

Point of intersection between boats (27 , 22) .
Distance between the explosion and the kittens 26.68 km
Do the kittens see the fireworks? Yes .

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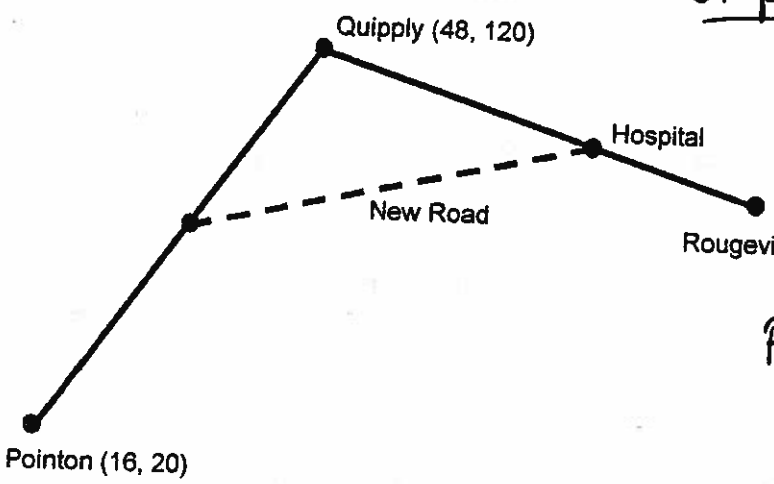
Word Problems

1)

Three small towns are located in the Quebec countryside. A map of the region, scaled in kilometres, shows the location of these towns and the roads connecting them. On the map, ordered pairs indicate the coordinates of each town. The location of the hospital is also shown to be two thirds of the way from Quipply to Rougeville.



Step 1: Find midpoint $\overline{QP}$

$M = \left(\frac{48+16}{2}, \frac{120+20}{2}\right)$

$= (32, 70)$

Step 2 Find point of Division H

$P = \left(\frac{2(93)+1(48)}{3}, \frac{2(90)+1(120)}{3}\right)$

$= (78, 100)$

In order to make it easier for Pointon residents to reach the hospital quickly, the government has decided to build a new road. The road will start at the midpoint between Pointon and Quipply and go directly to the hospital.

Rounded to the nearest kilometre, what is the length of the new road?

Step 3: Find distance of New Road

$d = \sqrt{(78-32)^2 + (100-70)^2}$

$= 54.9$

The length of New Road = 54.92km

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2)

Three linear equations are shown below.

ℓ_1: $y = -\frac{4}{3}x + 20$

ℓ_2: $4x + 3y - 10 = 0$ $\rightarrow y = \frac{-4}{3}x + 10$

ℓ_3: $8x - 6y + 15 = 0$ $\rightarrow y = \frac{-8}{6}x - \frac{15}{6} = -4/3x - 5/2$

Which of the following statements is TRUE?

A) Two lines are parallel, and the remaining line is perpendicular to both of these.

B) Two lines are perpendicular, and no lines are parallel.

C) Two lines are parallel, and no lines are perpendicular.

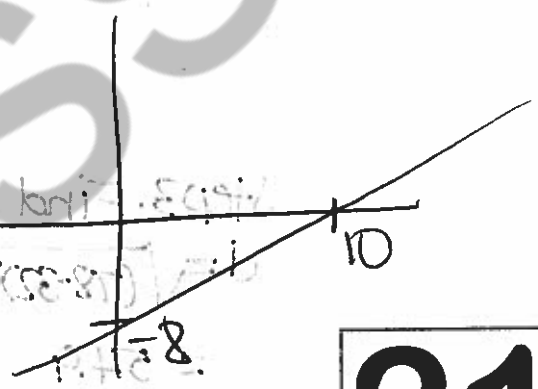
D) No lines are parallel, and no lines are perpendicular.

3)

A line in the Cartesian plane has the following characteristics:

- **Its x-intercept is 10.** (10, 0)
- **Its y-intercept is −8.** (0, −8)

What is the slope of this line?



$m = \frac{-8-0}{0-10} = \frac{4}{5}$

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2)

Three linear equations are shown below. (Write all in functions and compare

ℓ_1: $y = -\frac{4}{3}x + 20$

ℓ_2: $4x + 3y - 10 = 0$ → $y = -\frac{4}{3}x + 10$

ℓ_3: $8x - 6y + 15 = 0$ → $y = -\frac{8}{6}x - \frac{15}{6}$ → $-\frac{4}{3}x - \frac{5}{2}$

Which of the following statements is TRUE?

A) Two lines are parallel, and the remaining line is perpendicular to both of these.

B) Two lines are perpendicular, and no lines are parallel.

C) Two lines are parallel, and no lines are perpendicular.

D) No lines are parallel, and no lines are perpendicular.

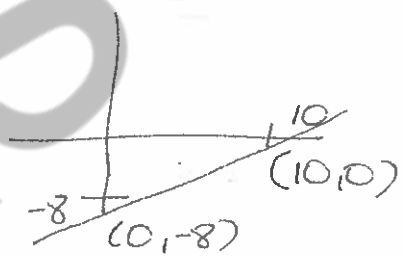
3)

A line in the Cartesian plane has the following characteristics:

- Its x-intercept is 10.
- Its y-intercept is -8.

What is the slope of this line?

Draw a sketch



$a = \frac{-8-0}{0-10} = \frac{-8}{-10} = \frac{4}{5}$

Slope = 4/5

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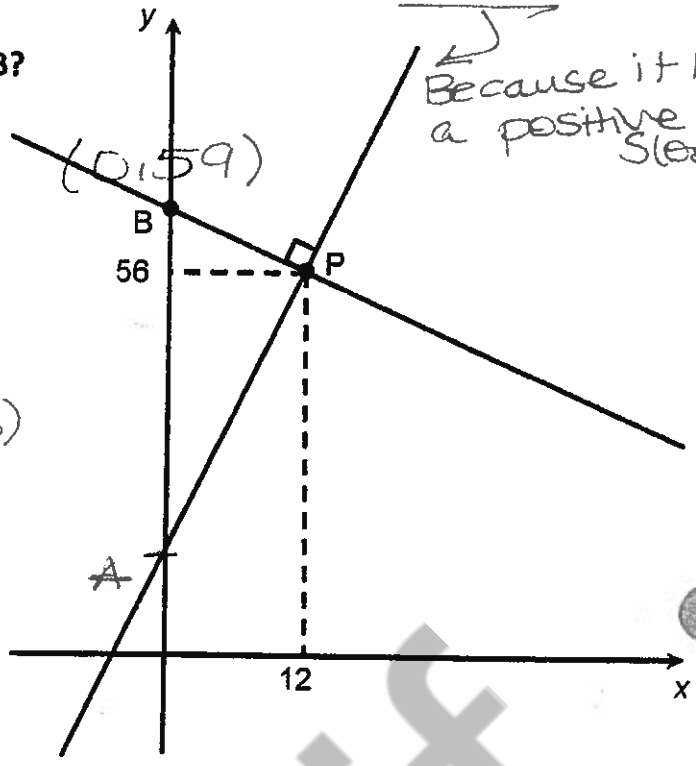
4)

Two perpendicular lines intersect at point P(12, 56) as shown on the Cartesian plane below. The equation of one of the lines is represented by $y = 4x + 8$.

What are the coordinates of point B?



Because it has a positive slope

step1 Find slope $\overline{BP}$

$\overline{BP} \perp \overline{AP}$

Therefore $4 \rightarrow \frac{-1}{4}$

step2 Find equation $\overline{AP}$

$y = -\frac{1}{4}x + b$ plug (12,56)

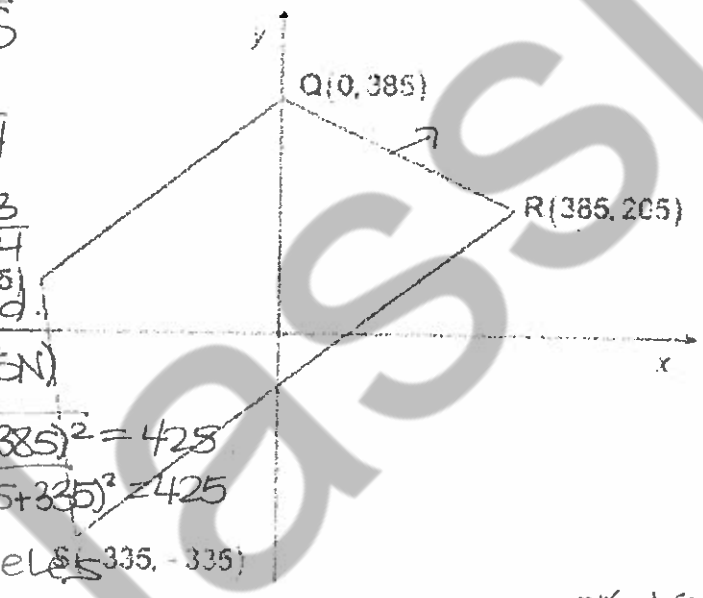
$56 = \frac{-1}{4}(12) + b$

$b = 59$

5)

Coordinate B = (0,59)

Consider quadrilateral NQRS represented below in the Cartesian plan.



step1 Show $\overline{QN} // \overline{RS}$

slope $\overline{QN} = \frac{385-85}{0+400} = \frac{3}{4}$

slope $\overline{RS} = \frac{-335-205}{-335-385} = \frac{3}{4}$

Therefore it is a trapezoid.

step2 Show $d(QR) = d(SN)$

$d(QR) = \sqrt{(385-0)^2+(205-385)^2} = 425$

$d(SN) = \sqrt{(-400+335)^2+(85+335)^2} = 425$

Therefore it is isosceles

means $d(QR) = d(SN)$

Show that quadrilateral NQRS is a trapezoid and that it is isosceles.

means $\overline{QN} // \overline{RS}$

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6)

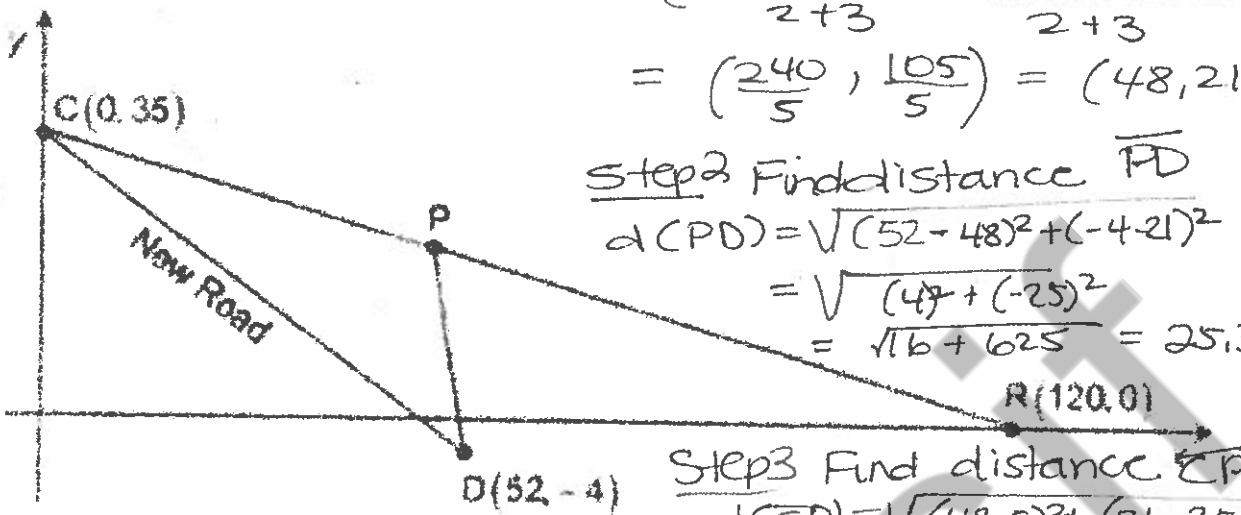
A new road was recently built to connect towns C and D.

Before this new road was built, motorists had to drive through town P to get from town C to town D.

In the following Cartesian plane:

- The new road is represented by line segment CD.
- Line segments CP and PD represent the roads that motorists had to take before the new road was built.

The scale of this graph is in kilometres.



From point C, point P is located $\frac{2}{5}$ of the way along line segment CR.

Instead of driving through town P, Melanie takes the new road to get from town C to town D.

To the nearest km, how many kilometres less does Melanie have to drive when taking the new road?

Step1: Find coordinate P.

$P = \left(\frac{2(120)+3(0)}{2+3}, \frac{2(0)+3(35)}{2+3}\right)$

$= \left(\frac{240}{5}, \frac{105}{5}\right) = (48, 21)$

Step2 Find distance $\overline{PD}$

$d(PD) = \sqrt{(52-48)^2+(-4-21)^2}$

$= \sqrt{(4)^2+(-25)^2}$

$= \sqrt{16+625} = 25.32$

Step3 Find distance $\overline{CP}$

$d(CP) = \sqrt{(48-0)^2+(21-35)^2}$

$= \sqrt{48^2+(-14)^2}$

$= \sqrt{2304+196} = 50$

Step4 Find distance $\overline{CD}$

$d(CD) = \sqrt{(52-0)^2+(-4-35)^2}$

$= \sqrt{52^2+(-39)^2} = 65$

Step5 $(\overline{PC}+\overline{PD}) - \overline{CD}$

$(25.32+50) - 65$

$= 10.32$

The New Road is 10.32 km less of a drive.

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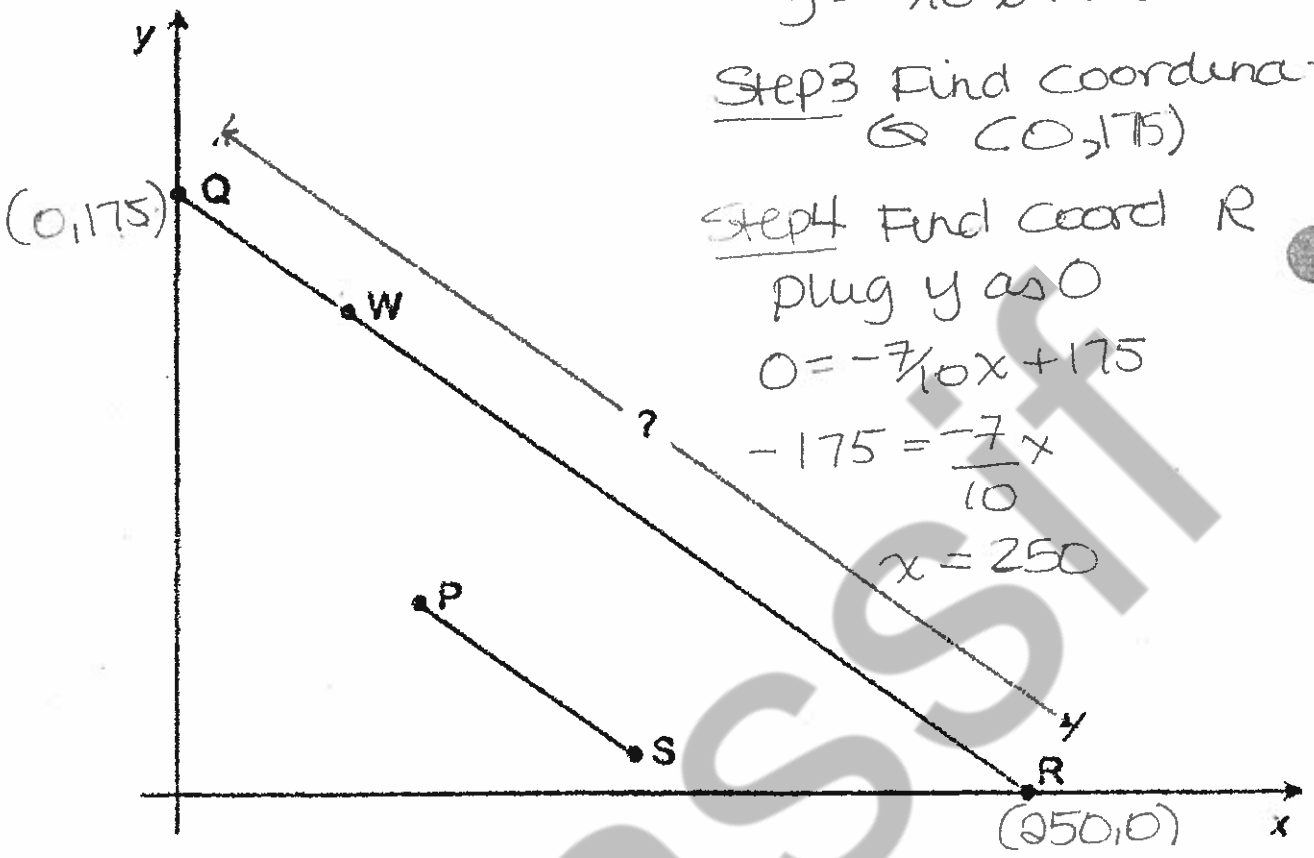
7)

In the Cartesian plane represented below,

- $\overline{PS} \parallel \overline{QR}$
- point R is on the *x*-axis
- point Q is on the *y*-axis
- point W(50, 140) is on line segment QR
- the equation associated with line segment PS is $y = -\frac{7}{10}x + 105$



To the nearest tenth, what is the length of line segment QR?

Step1 Find slope $\overline{QR}$

$\overline{QR} \parallel \overline{PS}$

$-7/10 \rightarrow -7/10$

Step2: Find equation $\overline{QR}$

$y = -7/10\,x + b$ plug (50,140)

$140 = -7/10(50) + b$

$b = 175$

$y = -7/10\,x + 175$

Step3 Find coordinate Q (0,175)

Step4 Find coord R

plug y as 0

$0 = -7/10\,x + 175$

$-175 = \frac{-7}{10}x$

$x = 250$

Step5: Find d (QR)

$d(QR) = \sqrt{(-250-0)^2 + (0-175)^2}$

$= \sqrt{(-250)^2 + (-175)^2}$

$= \sqrt{62500 + 30625}$

$= 305.16$

The length (QR) is 305.16 units

24

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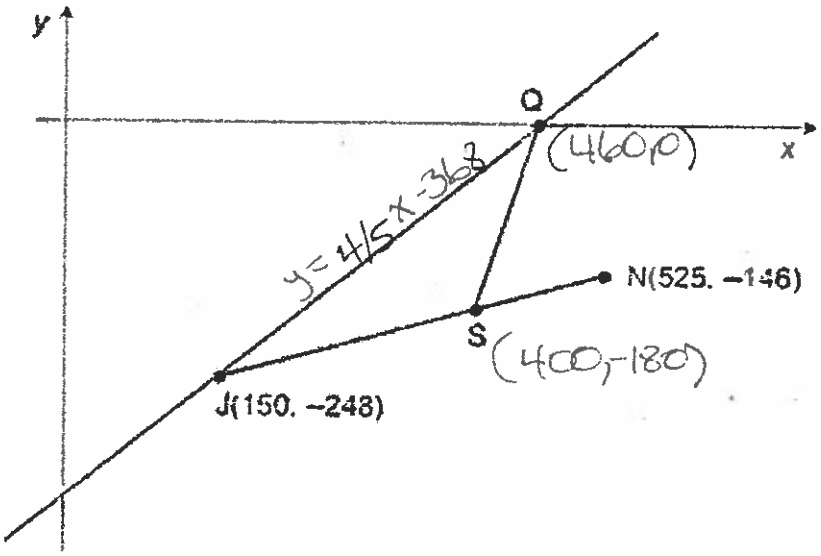
8)

Line JQ as well as line segments JN and QS are represented below in the Cartesian plane.



- From point J, point S is located $\frac{2}{3}$ of the way along line segment JN.
- Point Q is on the x-axis.
- The equation of line JQ is $y = \frac{4}{5}x - 368$.

What is the equation associated with line segment QS?

Step1 Find coord S

$P = \left(\frac{2(525)+1(150)}{2+1}, \frac{2(-140)+1(-2}{2+1}\right.$

$= \left(\frac{1050+150}{3}, -\frac{292-248}{3}\right)$

$= \left(\frac{1200}{3}, -\frac{540}{3}\right)$

$= (400, -180)$

Step2 Find coord. Q (?, 0)

$0 = \frac{4}{5}x - 368$

$x = 460$

Q (460, 0)

Step3: Find equation $\overline{QS}$

$a = \frac{-180-0}{400-460} = \frac{-180}{-60} = 3$

$y = 3x + b$

$0 = 3(460) + b$

$0 = 1380 + b$

$b = -1380$

The equation of $\overline{QS}$ is $y = -3x - 1380$

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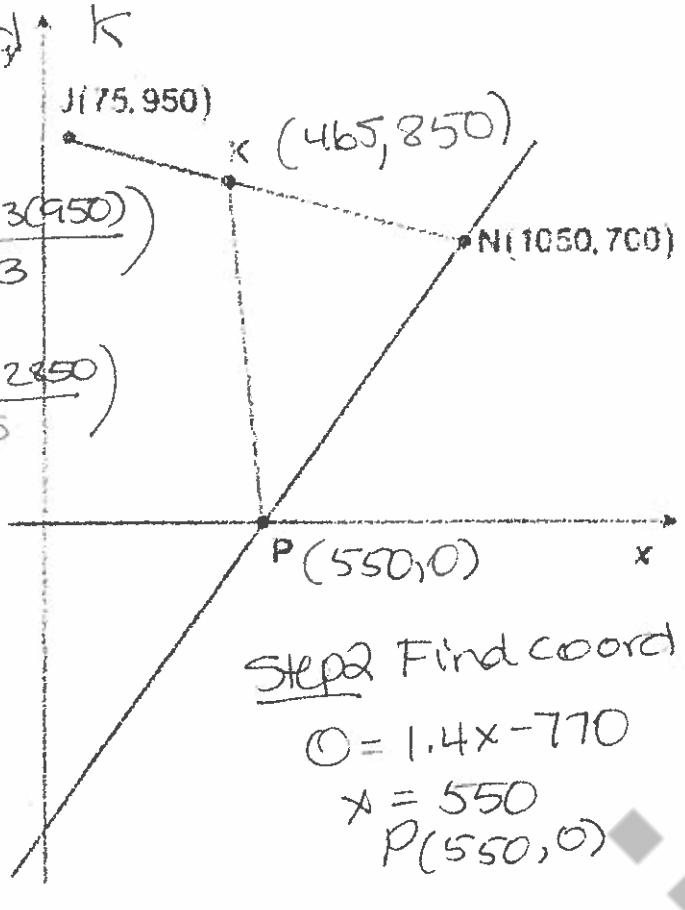
9)

Line PN and line segments JN and KP are represented below in the Cartesian plane.



Step1 Find coord K

$P = \left(\frac{2(1050)+3(75)}{2+3}, \frac{2(700)+3(950)}{2+3}\right)$

$= \left(\frac{2100+225}{5}, \frac{1400+2850}{5}\right)$

$= \left(\frac{2325}{5}, \frac{4250}{5}\right)$

$= K(465, 850)$

Step2 Find coord P(?,0)

$0 = 1.4x - 770$

$x = 550$

$P(550, 0)$

- From point J, point K is located $\frac{2}{5}$ of the way along line segment JN.
- Point P is on the x-axis.
- The equation of line PN is $y = 1.4x - 770$.

What is the equation associated with line segment KP?

Step3 Find equation $\overline{KP}$.

$a = \frac{0-850}{550-465} = \frac{-850}{85} = -10$

$y = -10x + b$

$0 = -10(550) + b$

$b = 5500$

equation $\overline{KP}$ = $y = -10x + 5500$

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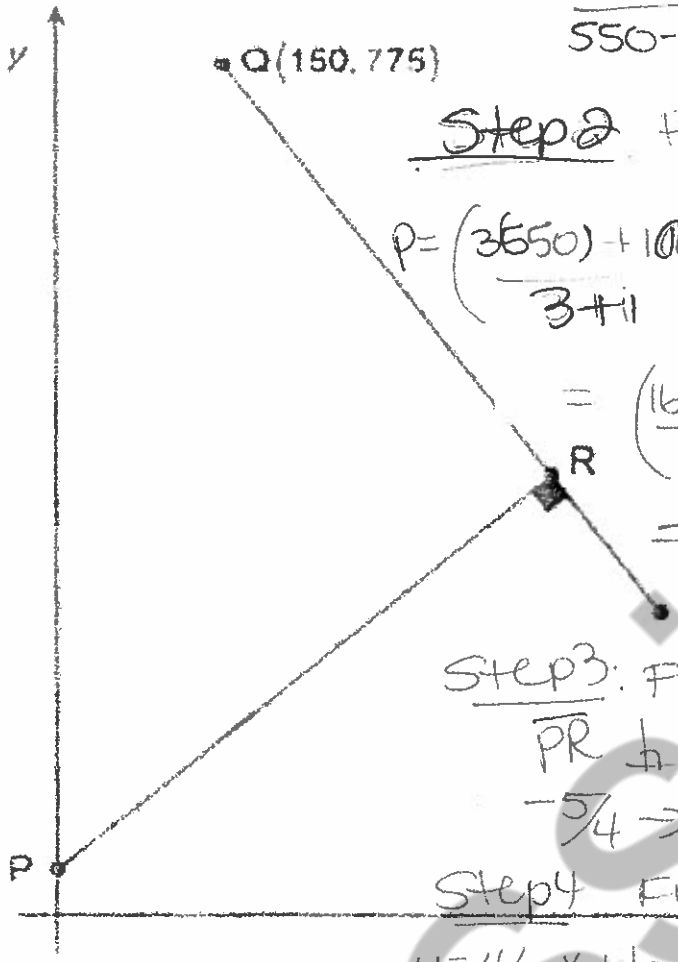
10)

In the Cartesian plane represented below,

- $\overline{PR} \perp \overline{QW}$
- from point Q, point R is located $\frac{3}{4}$ of the way along line segment QW
- point P is on the y-axis



What are the coordinates of point P?

Step 1 Find slope $\overline{QW}$

$a = \frac{275-775}{550-150} = \frac{-500}{400} = \frac{-5}{4}$

Step 2 Find coord R

$P = \left(\frac{3(550)+1(150)}{3+1}, \frac{3(275)+1(775)}{3+1}\right)$

$= \left(\frac{1650+150}{3+1}, \frac{825+775}{4}\right)$

$= (450, 400)$

Step 3: Find Slope $\overline{PR}$

$\overline{PR} \perp \overline{QW}$

$-5/4 \rightarrow 4/5$

Step 4 Find equation PR

$y = 4/5x + b$ plug 'R'

$400 = \frac{4}{5}(450) + b$

$b = 40 \leftarrow$ y-int.

Step 5 coord P (0, 40)

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/40

Assignment #1 – Distance, Midpoint and Point of Division
Math CST 404

Due: Name: Solution Key.

A – Multiple Choice – select only one answer, 4 points each.

1. Given A(0, –10) and B(5, 68) what is the midpoint of line AB?

   a) (10, 116)
   c) (5, 29)
   b) (2.5, 29)
   d) (2.5, 58)

2. Given A(–3, 1) and B(4, –25) what is the distance between points A and B?

   a) 725
   c) 26.93
   b) 577
   d) 24.02

3. Given A(–3, 1) and B(22, –39), what are the coordinates of the point P which divides AB in a ratio of 4 : 1?

   x_1, y_1 x_2, y_2 $a\ b$

   $\left[\frac{4(22)+1(-3)}{5}, \frac{4(-39)+1(1)}{5}\right]$

   a) (97, –159)
   c) (18.2, –29.4)
   b) (17, –31)
   d) (20, –32)

4. Given A(4, 10) and B(28, 106), into what fraction does the point P(20, 74) divide the line AB?

   x_1, y_1 x_2, y_2

   a) 3/2
   c) 1/3 $a=1$ $b=2$
   b) 2/3 $a=2$ $b=1$
   d) ½ Midpoint

$(20,74) = \left[\frac{a(28)+b(4)}{a+b}, \frac{a(106)+b(10)}{a+b}\right]$

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B - Short Answer - write your answer in the space provided, 4 points each.

1. Given A(−12, 2) and B(72, 18), give the coordinates of the point P, which is 7/8 of the way from B to A.

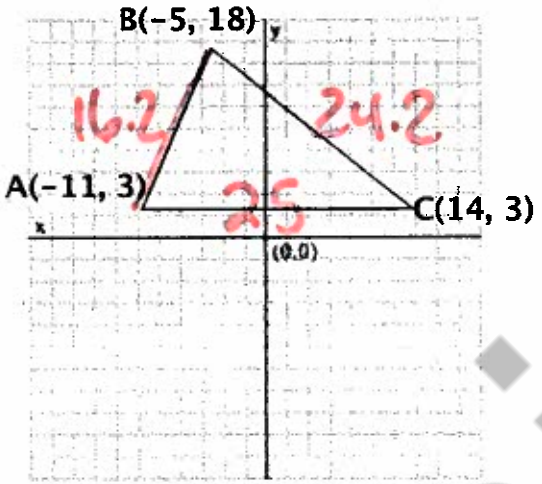
$x_2\ y_2 \qquad x_1\ y_1$

$a=7 \quad b=1$

P: (−1.5 , 4)

$\left[\frac{7(-12)+1(72)}{8}, \frac{7(2)+1(18)}{8}\right]$

2. Determine the perimeter, to the nearest tenth of a cm (one decimal place), of triangle ABC.



$d(AB) = \sqrt{(-11+5)^2+(3-18)^2}$

$= 16.2$

$d(AC) = \sqrt{(-11-14)^2+(3-3)^2}$

$= 25$

$d(BC) = \sqrt{(-5-14)^2+(18-3)^2}$

$= 24.2$

Perimeter of triangle ABC: 65.4 cm.

$P = 16.2 + 25 + 24.2$

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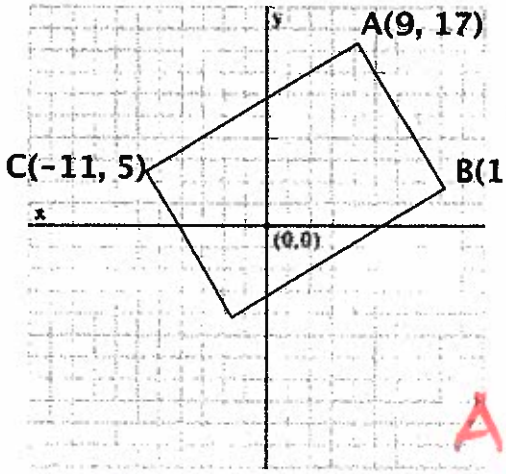
3. Determine, to the nearest tenth of a cm^2 (one decimal place), the area of rectangle ABCD.

$d(AC) = \sqrt{(9+11)^2+(17-5)^2} = 23.3$

$d(AB) = \sqrt{(16.5-9)^2+(4.5-17)^2} = 14.6$

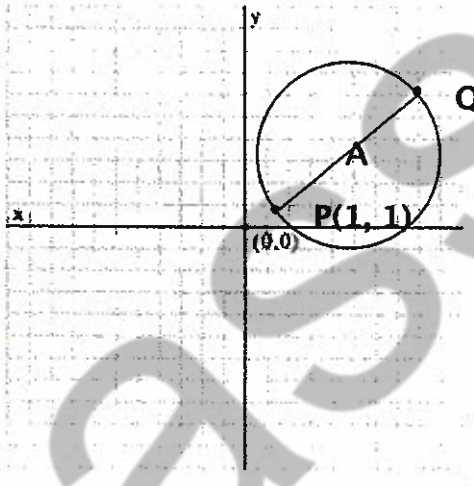


$A = L \times W$

Area of rectangle ABCD: 340.2 cm^2.

4. Determine, to the nearest tenth of a centimeter (one decimal place), the length of the circumference of the circle below, whose center is A.

$d(QP) = \sqrt{(17-1)^2+(13-1)^2} = 20$



$C = \pi d = \pi(20) = 62.8$

Circumference : 62.8 cm.

Nassit

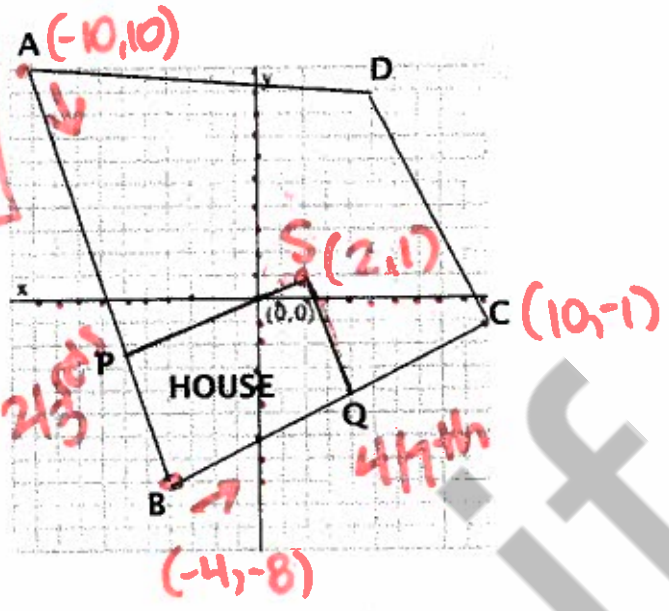
C – Extended Answer – Show all your work in the space provided, 4 points each.

1. Jeremy owns a piece of land, as seen in the Cartesian plane below. His house is located in the shaded area of the land. Jeremy needs to put a fence up around his land going from one corner of the house, P, all the way around to the other corner Q. Point P is located 2/3 of the way from A to B. Point Q is located 4/7 of the way from B to C. If the fencing costs $8.95 per metre, how much will Jeremy pay to put fence on his property?

Step1

$P = \left[\frac{2(-4)+1(-10)}{3}, \frac{2(8)+1(10)}{3}\right]$

$P = (-6, -2)$



$Q = \left[\frac{4(10)+3(-4)}{7}, \frac{4(-1)+3(8)}{7}\right]$

$Q = (4, -4)$

Step2

$d(SP) = \sqrt{(2+6)^2+(1+2)^2} = 8.5$

$d(SQ) = \sqrt{(2-4)^2+(1+4)^2} = 5.4$

Step3

Total length of Fence = 13.9m

$8.95\$/m \times 13.9m = 124.41\$$

It will cost Jeremy $ 124.41 to put fence around his property.

Nassif

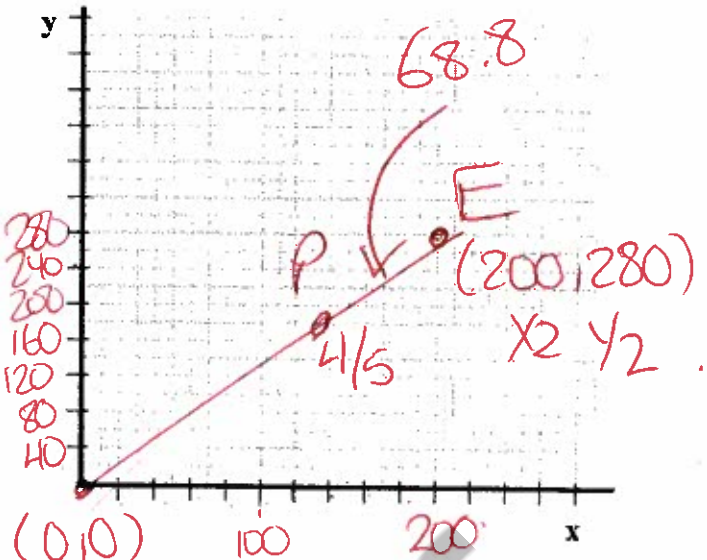
2. At a ski hill, an old cable car is being tested before the season starts to see if it needs maintenance. The crew runs the cable car starting from the bottom and it manages to go for 5 trips before breaking down 4/5 of the way. Given that the bottom of the cable car is at point (0, 0) and the top is at point (200, 280), what is the total distance, in metres, that the cable car traveled before breaking down? (One "trip" is one way up or one way down).

$a=4$

$b=1$

$P=\left(\frac{4(200)+1(0)}{5}, \frac{4(280)+1(0)}{5}\right)$

$(160, 224)$



$d(SP)=\sqrt{(224-0)^2+(160-0)^2}$

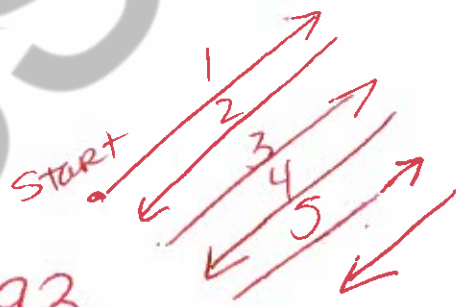
$=275.3$

$d(SE)=\sqrt{(200-0)^2+(280-0)^2}$

$=344.1$

$344.1-275.3=68.8$

$5(344.1)+68.8=1789.3$



The total distance that the cable car traveled is 1789.3 m.

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